LINKING POLLINATOR HEALTH, PRODUCTION,
AND CONSERVATION PRACTICES

Best Management Practices For Pollinators In Winegrape Production In California

POLLINATOR PARTNERSHIP
Protect their lives. Preserve ours.

ACKNOWLEDGMENTS

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We are thankful for the many growers, pest control advisors, crop consultants, researchers, government authorities, and grower and industry associations that made possible the development of this guide for the California winegrape industry.

The project was funded by USDA-NRCS Grant USDA-NRCS-CA-23-MULTI-NOFO0001281.

Citation: Berger, L., C. Wilson, N. Cremers, L, Adams, M. Dakin, L. Morandin, and J. Lewis 2025. Best Management Practices for Pollinators in Winegrape Production in California. Pollinator Partnership, San Francisco.

Graphic design by Claudia Yuen.
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CALIFORNIA POLLINATOR COALITION (CPC)

The California Pollinator Coalition (CPC) was created in 2021 to establish California agriculture as an active, engaged, and responsible steward of pollinators and conservation practices in the most dynamic agroecosystems in the United States. The CPC is jointly managed by the California Department of Agriculture, the Almond Board of California, and Pollinator Partnership; Pollinator Partnership administers the program on behalf of all CPC members.

The CPC uses commodity specific, regionally appropriate, science-based information in developing best management practices for pollinators and recognizes the greatest net benefits to agriculture and the environment are achieved through voluntary measures.

Coalition Members

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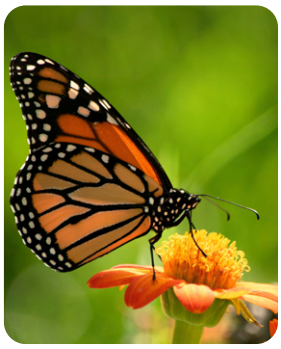
SECTION 1:

Introduction

Purpose of This Guide

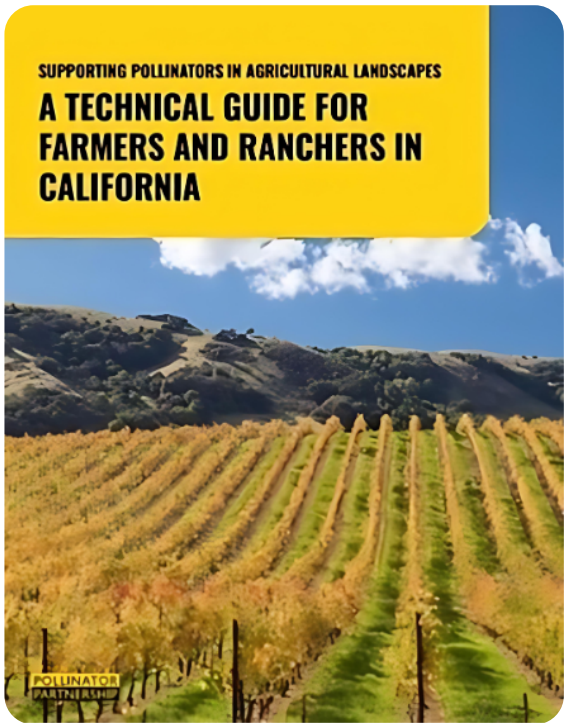
The information in this guide has been consolidated to equip growers with practical information on voluntary measures to protect pollinators and expand habitat in and around their vineyard operations in their unique production region in California.



Besides desiring to demonstrate advances in stewardship, there are concerns that new state and federal regulations may be enacted that could impact pesticide use, grazing rules, and other habitat protections if certain pollinating species are present in or near fields, or in other areas where agricultural practices are occurring.

The best management practices (BMPs) for pollinators in this guide have been developed by drawing from the practical and technical expertise of Pollinator Partnership and their resources, producer organizations, field experts, agencies, and the scientific community. The goal is to increase benefits to agriculture and the environment through innovation, efficient management, and science, and to communicate how the agricultural industry is using science-based information that is commodity and region specific.

The basis for the information presented in this document is Pollinator Partnership's Technical Guide for Farmers and Ranchers in California (pollinator.org/pollinator.org/assets/generalFiles/Farmer-Rancher-Guide-California.pdf) which describes general pollinator and habitat management.



Information in this guide has been consolidated to provide a user-friendly checklist of practices that can enhance pollinator resilience and agricultural productivity throughout the growing season in California. While there are specific examples of BMPs and habitat designs that could be utilized by producers within this region, it is recommended that producers consult with local experts to design and implement BMPs appropriate for their unique farming operations and locations.

SECTION 2:

The Context Of Pollinators In The Vineyard Environment

Need for Pollinator Best Management Practices in Central Coast Winegrape Production

While pollinators are not needed for production of winegrapes, the presence of native bees and other pollinators is a strong indicator of a healthy ecosystem and agronomic conditions that promote productive vines yielding high quality winegrapes.

In the last twenty years, the agricultural industry has increasingly recognized the importance of honey bees and other pollinators. Support for pollinator protection has been demonstrated by using the least toxic pesticides, and by fostering communication and cooperation amongst growers, beekeepers, pest control advisors, applicators, and regulators when pest management decisions are made. As the understanding and management of pollinators has expanded, there is an increasing interest in minimizing insecticide use and creating or managing pollinator-supporting habitat.

The California wine industry has a long history of stewardship and sustainability through the Wine Institute (wineinstitute.org/), California Association of Winegrape Growers (cawg.org/), Vineyard Team (vineyardteam.org/) and the California Sustainable Winegrape Alliance (sustainablewinegrowing.org/). Through these efforts, the industry has demonstrated commitment to continuous improvement in production and conservation of natural resources.

While there have been advances in conservation on working lands, there are also concerns related to conservation and regulation. At the regulatory level, there are concerns that threatened or endangered species designations may limit agricultural activities on farms and ranches. At the public level, there is increasing consumer and retailer demand for transparency and accountability about how food is grown.

The BMPs in this publication will enable winegrape growers to plan their activities with pollinators and habitat management in mind. This approach brings long term net benefits to agriculture and the environment, and is a part of a production system that may be described as sustainable and conservation based. While not all practices are feasible or practical in all situations, this BMP approach allows growers to assess their current practices and consider new practices that support pollinators.

FARMING AND CONSERVATION SUCCESS STORY WITH TRICOLORED BLACKBIRDS IN CALIFORNIA

The tricolored blackbird is found almost exclusively in California. A preferred area for nesting is in and between farmers' fields of cereal crops. Unfortunately, the traditional harvest period for these crops interferes with the completion of the full nesting cycle for the blackbirds and, in the recent decade, there have been serious reductions in populations. This trend, however, has been turned around due to the cooperative efforts of growers, dairy farmers, UC Cooperative Extension, Dairy Cares, Western United Dairymen, Audubon Society, Sustainable Conservation, and the USDA. These groups have worked directly with the agricultural community to obtain funding for growers who delay their harvests until the birds have left the fields. This program has prevented bird losses while avoiding economic and regulatory risks for farmers. Read more (dairycares.com/tricoloredblackbirds) about this win-win situation for both farming and conservation.

IMPORTANCE OF A CONSERVATION BENEFIT AGREEMENT (CBA) TO CENTRAL COAST WINEGRAPE GROWERS

Growers should be aware of new regulations related to endangered species that may restrict traditional flexibility in farming and/or pest management. In California, new pollinator species of concern include the monarch butterfly, two other butterflies, and a number of bumble bee species which may become regulated at the federal and/or state levels.

California producer groups are working closely with the US Fish and Wildlife Service (FWS) to develop a Conservation Benefit Agreement (CBA) with workable approaches to preserve natural resources such as pollinators, while allowing farmers to maintain their operations with little, if any, disruption to their regular practices.

A CBA is a voluntary agreement between the FWS and private property owners to use practices that contribute to the conservation or recovery of the agreement's covered species. In exchange for using FWS approved best management practices that contribute to the conservation of a covered species, landowners receive formal assurances (legal relief) that no additional activities will be required on a property and incidental take is allowed.

The exact requirements for inclusion in the CA CBA for potentially listed pollinators should be finalized in 2026. Likely actions that will be required by farms for a certificate of inclusion include:

- Maintenance, restoration, or enhancement of existing habitats
- Increasing habitat connectivity in non-farmed areas of property
- Planting cover crops to expand floral and nesting resources for pollinators and natural enemies
- Practicing integrated pest management

Growers will need to understand county- and area-specific requirements for both the farmed and non-farmed land around their vineyard. Your County Agricultural Commissioner and UC Cooperative Extension offices are the best sources of local information.

QUESTIONS ABOUT POLLINATORS IN VINEYARDS

Why be concerned about pollinators in a crop like grapes that do not require pollinators?
Even though the crop is not dependent upon bees and other pollinators for production, the vineyard and surrounding areas provide habitat for many organisms living in this rich agricultural and biological space. While different pollinators have specific needs to support each stage of their lifecycle, they all need high-quality habitat that provides an abundance of flowers, shelter and nesting sites, and protection from harmful pesticides. Actions that benefit pollinators also benefit beneficial insects and provide them with habitat. Farmers have the ability to protect pollinators and other beneficial organisms living in and around their operation, benefiting farm production, reducing inputs, and benefiting ecosystems and ecosystem services such as biodiversity and soil health.

What are the major risks to pollinators in agricultural areas?
1. Pest management activities that use pesticides that are harmful to pollinators
2. Removal of forage habitat for pollinators, including nectar and pollen resources
3. Disturbance or removal of nesting sites and overwintering areas for native bees and other pollinators

How will my farming practices be affected if pollinator species present in my region are listed under the state or Federal Endangered Species Act (ESA)?
There are differences between species listed federally and those listed by the State of California. Growers who adopt certain voluntary conservation measures prior to or after a species is listed, may be exempt from any additional regulation. Currently, a California CBA is being developed that outlines specific practices that can be employed to protect pollinators while still providing the necessary flexibility to manage crops. Using the BMPs outlined in this guide will assist you in developing a comprehensive plan for your operation that is likely to align with the pending CBA.

SECTION 3:

Best Management Practices For Pollinators

The BMPs in this document are voluntary guidelines developed to maintain agricultural production in a profitable, environmentally sensitive, and sustainable manner. This section outlines habitat actions and pest management practices that can support and protect pollinators.

Like other aspects of agriculture, one size does not fit all for pollinator conservation and habitat management, and this is especially true in the highly diverse and unique conditions in California. An assessment of operations, in relation to food safety, pest management, water management, economics, practicality, and other factors, is important to developing a successful plan.

Growers may already utilize many of these practices but are not aware of how they are contributing to pollinator health and biodiversity. The two main areas in which growers can support pollinators are through **1. habitat creation and management** that provides floral resources and nesting sites and by using **2. integrated pest management** practices that minimize harm to pollinators. These two areas are covered in this section. The worksheets at the end of the document are provided to help growers and land managers get started in understanding connections between practices and how they can be incorporated into vineyard operations.

1 Habitat Creation and Management

Creating or managing habitat can be a powerful tool in building your farm's resiliency by providing nutrition and nesting sites for pollinators, improving soil health, enhancing moisture retention, stabilizing nutrients, and supporting integrated pest management.

Supporting pollinators by creating new habitat or managing existing habitat can be aided by taking a "landscape" view of both cropped and non-farmed areas. Neighboring vegetation, water availability, and microclimates should be considered in your planning. There are multiple ways to create more habitat in and around vineyards, including cover cropping, planting supplemental floral resources for pollinators, such as in floral strips or patches, and establishing permanent hedgerows. Successful implementation for each unique production setting requires evaluating tradeoffs and financial challenges. Research is constantly contributing to new and improved information on cover crops and other practices. Staying up to date on new developments will help inform your decisions impacting crop quality and cost considerations in your vineyard.

WHY ADD OR ENHANCE HABITAT?

- **To Benefit the Farm Environment** Agricultural practices that enhance habitats and biodiversity have positive impacts on agricultural production through nutrient cycling, erosion control, water infiltration, soil conditioning, biological control of pests, and pollinator services.

- **To Contribute to Healthy Pollinator Populations** Floral resources and undisturbed areas provide nutrition and nesting sites for many species of pollinators.

- **To Add Market Value Adoption** of sustainable practices, such as providing habitat for pollinators, is increasingly valued by consumers and retailers. Use of sustainability certifications and third-party audits such as Certified California Sustainable Winegrowing, Bee Friendly Farming™, are examples of how growers can be recognized for using sustainable farming practices.

BENEFITS OF ADDING HABITAT	CONSIDERATIONS WHEN ADDING HABITAT
Builds soil structure	Cost of seed or plants
Increases organic matter	Added labor
Aids in moisture retention	Water use (primarily in first three years)
Reduces weed pressure	Land use
Supports natural enemies	Ongoing maintenance
Provides nutrition and nesting sites for pollinators	
Improves erosion control	
Increases biodiversity	

Preserving and creating habitat for pollinators is an achievable goal for large- and small-scale vineyard operations. Small actions taken by many growers and landowners can add up to large benefits for the agricultural community. In most vineyards, growers add habitat in two different forms:

- Flowering plants (native plants, cover crops, non-invasive weeds, or ornamental plants) that bloom early in the season to support pollinators.
- Flowering plants that, in combination, bloom from early spring to fall to support honey bees and wild bees such as bumble bees that need forage from spring to fall.
- Undisturbed soil, piles of debris such as sticks, dead leaves or compost, standing plant material such as hedgerows, old logs, etc., which provide nesting sites for ground, twig (tunnel), and cavity nesting bees.
- Protection from pesticides that are harmful to pollinators through application and drift through pesticide-free buffers and thoughtful management.

Creating and maintaining habitat around your farm can go a long way toward supporting healthy managed bees, such as honey bees, and increasing abundance, diversity, and resiliency of wild bee populations 1,2. Having habitat that supports honey bees, wild bees, and other pollinators can be as simple as reducing unnecessary vegetation control. As such, it can involve no extra work and even some labor savings:

- Recognize areas that are not actively managed for crop production, such as 'semi-natural' areas, which may provide floral and nesting resources for bees and other pollinators. Preserve these areas if possible.
- Selectively control weedy, non-native plants which can naturally result in an increase in pollinator-supporting plant species.
- Keep 'scrubby' areas rather than farming every piece of land.
- Identify areas that are lower production and 'marginal'. Keep these as habitat for beneficial insects rather than cultivating these sections. This can save money and enhance production.

Preserving and creating habitat for pollinators vineyard operations. Small actions taken by many growers and landowners can add up to large benefits for the agricultural community. In most vineyards, growers add habitat in two different forms:

- Annual in-row cover crops incorporated into the soil before vine budbreak.
- Permanent plantings on vineyard borders or surrounding areas.

Cover Crops

PRACTICE

Winegrape growers can use cover crops between rows to add nutrients, attract beneficial insects, enhance production, and reduce dust and erosion. Many growers also use compost to build organic matter in the soil. Compost creates a beneficial environment to hold and maintain nutrients in the soil and soak up and hold water. Cover crops also increase the carbon to nitrogen ratio in the soil, which promotes soil microorganisms and promotes healthy vines. They can also moderate ambient air temperature and reduce soil compaction by increasing soil tilth. Additionally, recent research has shown cover crops increase soil populations of mycorrhizae and other beneficial bacteria and fungi, which are extremely important to overall plant health and productivity.

California is also under increasing requirements to minimize nutrient discharges to ground and surface water and more effectively manage pesticide and sediment runoff into waterways. Cover crops are an excellent tool for vineyard managers to manage nutrient management. The benefits of using cover crops are increasingly recognized and this practice continues to grow. Additionally, many flowering species used in cover crop blends provide floral resources for pollinators and natural enemies for pest management.

Planting of cover crops between vines is usually done in the fall after all vineyard activities are completed. Fall seeding takes advantage of the fall and winter rains to support germination and establishment of seedlings. The cover crop should be planted with the intent to keep it in the ground as long as possible throughout the growing season with a strategic mowing regimen to maximize blooms each year. Cover crops can be composed of annual or perennial plants. Perennial cover crops typically consist of grasses that are mown both in the row and under vine. However, grasses offer little to no foraging value to pollinators. Annuals can be seeded into the grass cover crop in fall or spring to benefit soil health and provide a floral resource to pollinators and other beneficial insects. Some of the easier cover crops to establish usually consist of legume/grass blends, including legumes such as Vicia spp., Vigna spp., and Trifolium spp., and grasses such as Secale cereale, Avena sativa, and Hordeum vulgare. These cover crops can attract and support a variety of natural enemies that are active early in the season. However, because they are typically mown before flowering around bud break, their impacts for pest management and pollinator support are minimized. Leaving them to bloom provides pollinators with the foraging resources, which improves their health and reproductive success. In addition, cover crops support beneficial insects that help control pests.

Many commodity organizations and the Natural Resource Conservation Service (NRCS) have done a great deal of research on cover crops in California. A variety of seed blends of both native and introduced species are commercially available. Preferred blends that support pollinators have early, mid, and late bloom, are drought tolerant, and will not contribute to buildup of pests in vineyards.

CONSIDERATIONS

When selecting a cover crop for a vineyard, it is important to consider management goals, budget, and how best to establish these practices on site. Objectives may include improving soil health, managing pests, conserving water, and/or supporting pollinators.

Sustained groundwater use and recent declines in water availability have increased awareness of water conservation in vineyards. Cover crops can contribute by improving water infiltration from precipitation, reducing erosion, and building soil organic matter. Although the water use costs of cover crops are not fully understood, reports of grower concerns about this issue are rare. For long-term success, growers should understand the water and light requirements of each species when planning cover crops for multiple seasons.
While cover crop decisions can be complex, a wide range of support is available. Non-profits, UCCE, and private seed companies provide valuable guidance, and cover cropping has expanded significantly since 2021. These practices are now common topics at local meetings, offering growers opportunities to learn from regional successes.

To support pollinators, programs such as Seeds for Bees® promote the use of cover crops that provide critical forage for bees and other pollinators, especially during times of the year when natural forage is scarce. The seed mixes offered through this program are designed to bloom when pollinators need them most. Learn more: Seeds for Bees® (projectapism.org/sfb-home).

IMPLEMENTATION

Cover crop selection depends upon many factors, including slope of land, desired goals and outcomes, budget, and seed and equipment investment required. When choosing a cover crop, it's important to consider the goals. For example, low-growing grasses are drought-tolerant and reduce soil erosion, however, they do not provide the benefit of pollinator forage. Legumes help with nitrogen fixation, flowers for pollinators, and generally have a low carbon to nitrogen ratio which allows for relatively quick decomposition but can be difficult to manage and may lead to unintended pest pressures. Brassicas are quick growing, provide flowers for pollinators, suppress some harmful nematode species, generally decompose quickly once terminated before drying out, and provide water retention and soil health benefits, however, they may not thrive in poorly drained soils.

Typical cover crop mixes for vineyards can include a variety of species.

SPECIES OR SPECIES MIX	BENEFITS
Oats, peas, and vetch	Erosion control, provides nutrients, and creates habitat for pollinators and beneficial insects.
Annual small grains	Grows well in cool and wet months.
Blando brome, crimson clover, rose clover, and zorro fescue	Stabilizes soils and is a good choice for establishing a permanent cover crop.
Mustards, cereals, annual ryegrass, blando brome, and zorro fescue	Erosion control.
Canola, braco white mustard, nemfix yellow mustard, daikon radish, common yellow mustard	Enhances pollinator forage, creates habitat and forage for beneficial insects, and suppresses harmful nematodes.
Balansa clover, Persian clover, hykon rose clover, crimson clover, medic, berseem clover	Lower growing, adds nitrogen to soil, and easy to mow post-flowering.
Cayusa oats, Pacheco triticale, nitroplex peas, dundale peas, bell beans, canola, daikon radish, common yellow mustard, nemagon white mustard	Adds nitrogen to soil, builds soil organic matter, promotes carbon sequestration, and enhances pollinator forage.

Cover Crop Management	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Planning	Determine goals and strategy											
		Order seeds / manage planting										
Planting				Planting								
Growth					Monitor for pests, mow as needed							
Termination								If cover crops flower, apply pesticides at night				
Crop Harvest			Harvest									

FOR MORE INFORMATION ON COVER CROPS

Bee Friendly Farming, Seeds for Bees, and Buzz Seeds are excellent resources to help plan your pollinator friendly cover crop. Technical sheets such as this from Seeds for Bees can aid in your planning, planting, and termination timing of cover crops.

Cover Crop Planning Guide: Seed Mix (Apis m)

ADDITIONAL COVER CROP RESOURCES

COVER CROPPING IN VINEYARDS: AN INTRODUCTION TO COVER CROP MANAGEMENT

https://cecentralsierra.ucanr.edu/files/96232.pdf

COVER CROPS FOR CALIFORNIA GROWERS

anrcatalog.ucanr.edu/pdf/21471.pdf

COVER CROPS BEST MANAGEMENT PRACTICES FOR ALMONDS

almonds.com/sites/default/files/2021-07/Cover%20Crops%20Best%20Management%20Practices%20BMPs_0.pdf

SELECTING AND MANAGING VINEYARD COVER CROPS TO REDUCE CONSUMPTION OF NET BASIN WATER

vineyardteam.org/files/W-SARE%20Cover%20Crop%20Experiments-%20Macmillan.pdf

COVER CROP NITROGEN CREDITS FOR FARMS ON CALIFORNIA'S CENTRAL COAST (VIDEO)

youtube.com/watch?v=BTRKk7Zd1so

SEEDS FOR BEES TO OBTAIN COVER CROP SEED

projectapism.org/sfb-home

BUZZ SEEDS

buzzcovercropseeds.com/

COVER CROPS DATABASE FOR CALIFORNIA

ucanr.edu/sites/covercrops/Cover_Crop_Species_Selection_Tools/Cover_Crop_Database/

Perennial or Permanent Habitat (Hedgerows)

PRACTICE

One type of perennial or permanent habitat that can be added to vineyards are hedgerows. Hedgerows are lines or groups of trees, shrubs, and perennial and/or annual forbs and grasses that are planted along roadways, fences, field or block edges, or other non-cropped areas.

Hedgerows can include perennial plants that provide habitat for pollinators and other beneficial insects year-round. Often planted on field edges or non-cropped "spare" areas, they take little or no land out of production. Hedgerows can take several years to establish, but once they do, these plantings are easy to maintain and will continue to provide biodiversity and ecosystem services for many years.

Hedgerows serve a variety of purposes and can accommodate site-specific conditions. Hedgerow plantings have the potential to increase water infiltration, slow the flow of surface water runoff, reduce water and wind erosion, contributing to the protection and maintenance of downstream water quality. Hedgerows also provide habitat for beneficial insects and wildlife, increase plant diversity, enhance soil health, increase carbon storage in biomass and soil, and improve aesthetics on-farm. They also have the potential to intercept airborne particulate matter, reduce chemical drift and odor movement, and provide screens and barriers to noise and dust.

CONSIDERATIONS

Establishing a hedgerow is a long-term process that takes time and commitment in both planning and establishment. Establishing an irrigation system is essential before the hedgerow is planted. Not only can the system be used for the pre-irrigation of the site, but it can also provide the critical watering that newly planted plants require both immediately and in dryer seasons. However, once established, most native species are quite drought tolerant-greatly reducing the water provision requirements for your hedgerow.

In addition to irrigation, other factors to consider before planting a hedgerow include:

- Costs of planting a hedgerow
- Hydrology of area to be planted
- Availability of plant material
- Potential of limiting movement of equipment between crop rows
- Labor and equipment needs
- The time involved with management of weeds, irrigation and/or vigorous growth of branches
- The potential for wildlife (especially rodents, rabbits and birds)
- The risk of bringing in plants, mulch, or soils that spread plant diseases
- Plant mortality over time, and the need to replant
- Inadequate plant density leading to a sparse hedge with gaps
- Occasional spread of cultivated plants into adjacent crops
- Habitat for endangered species - consider the potential for attracting rare and endangered species

IMPLEMENTATION

UCCE Yolo County Farm Advisor Rachel Long and other researchers developed a guide to hedgerows (anrcatalog.ucanr.edu/pdf/8390.pdf). This schematic illustrates the multiple species of plants, all providing pollinator habitat and/or agronomic benefits to the neighboring crop.

Another good resource with steps to establish a hedgerow on the Central Coast (rcdsantacruz.org/images/brochures/pdf/Hedgerow_Brochure.pdf) has been developed by the Santa Cruz Resource Conservation District.

STEP 1. SITE SELECTION

Small margins of land directly next to vineyards, orchards, row crops, and pastures are ideal for hedgerow habitat. Areas without summer rainfall will need to have access to irrigation. A linear design allows for easier irrigation layouts; however, plants can also be arranged in any design that fits the area and aesthetic goals.

STEP 2. PREPARATION AND IRRIGATION INSTALLATION

Proper weed control is vital to the success of establishing pollinator habitat. Ideally, sites should have weed management for 12 months before planting. Repeated cultivation, or depending on need, a combination of foliar and pre-emergent herbicides can address both living and dormant vegetation. Irrigation greatly increases the chances of successful establishment in California. A drip system with emitters placed every 5 feet and within a few inches from the base of each plant is sufficient. Install irrigation after site preparation but before planting begins.

STEP 3. INSTALL HEDGEROW

Fall is the best time to plant your hedgerow, allowing native plant species to establish root systems before the hot and dry summer season. Pending unusual weather or other unforeseen setbacks, planting should occur as soon as possible after delivery of the planting material. Newly planted hedgerows should be watered immediately and should continue to be watered frequently until established, watering during dry periods for two to three years. Climatic and environmental conditions as well as the species planted will dictate water needs.

STEP 4. MAINTENANCE

Surveying the site for weeds on a regular basis is critical during the first year of establishment to prevent weeds from outcompeting the hedgerow plants before they have fully matured. Remove weeds as soon as they are observed, preferably by hand, but herbicide spot treatment may be used. Monitoring for weed re-establishment should continue throughout the lifetime of the planting. However, once the habitat reaches maturity, the planted vegetation will naturally provide a barrier to weeds thus reducing the need for management actions. Continue to remove weeds manually, mechanically, biologically, or spot treat with an herbicide as needed.

		YEAR 1 (2024)										YEAR 3 (2025)												YEAR 3 (2026)											
		M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Phase 1	**Site Preperation / Exsisting Vegetation Removal**																																		
	Mow and/ or remove vegetation																																		
	Site wide herbicide Applications or other weed control methods																																		
	Grass selective herbicide Applications on seeded area																																		
	Install irrigation																																		
Phase 2	**Habitat Installation**																																		
	Install hedgerow																																		
Phase 3	**Plant Establishment and Assessment**																																		
	Irrigation if needed																																		
	Plant monitoring																																		
	Spot spray herbicide																																		

Required Execute action if and when needed Ongoing

Hedgerow by Rachel Long UCCE, UCANR

SAMPLE HEDGEROW PLANT LIST:

HEDGEROW AND FARMSCAPING FOR CALIFORNIA AGRICULTURE, COMMUNITY ALLIANCE WITH FAMILY FARMERS, 2018

https://www.rcdmonterey.org/images/docs/publications/CAFF_Hedgerow_Manual_2018.pdf

PLANT NAME	SCIENTIFIC NAME	TYPE OR LOCATION
Buckwheat spp.	Eriogonum spp.	Medium shrub
Ceanothus spp.	Ceanothus spp.	Major shrub
Coffeeberry	Frangula californica (Rhamnus)	Major shrub
Coyote Brush	Baccharis pilularis	Major shrub
Deergrass	Muhlenbergia rigens	In between shrubs
Elderberry	Sambucus Mexicana	Major shrub
Flannel Bush	Fremontodendron californicum	Major shrub
Manzanita spp.	Manzanita spp.	Major shrub
Quailbush/Saltbush	Atriplex lentiformis	Major shrub
Redbud	Cercis occidentalis	Medium tree
Sage spp.	Salvia spp.	Major shrub
Toyon	Heteromeles arbutifolia	Major shrub
Yarrow	Achillea millefolium	In between shrubs

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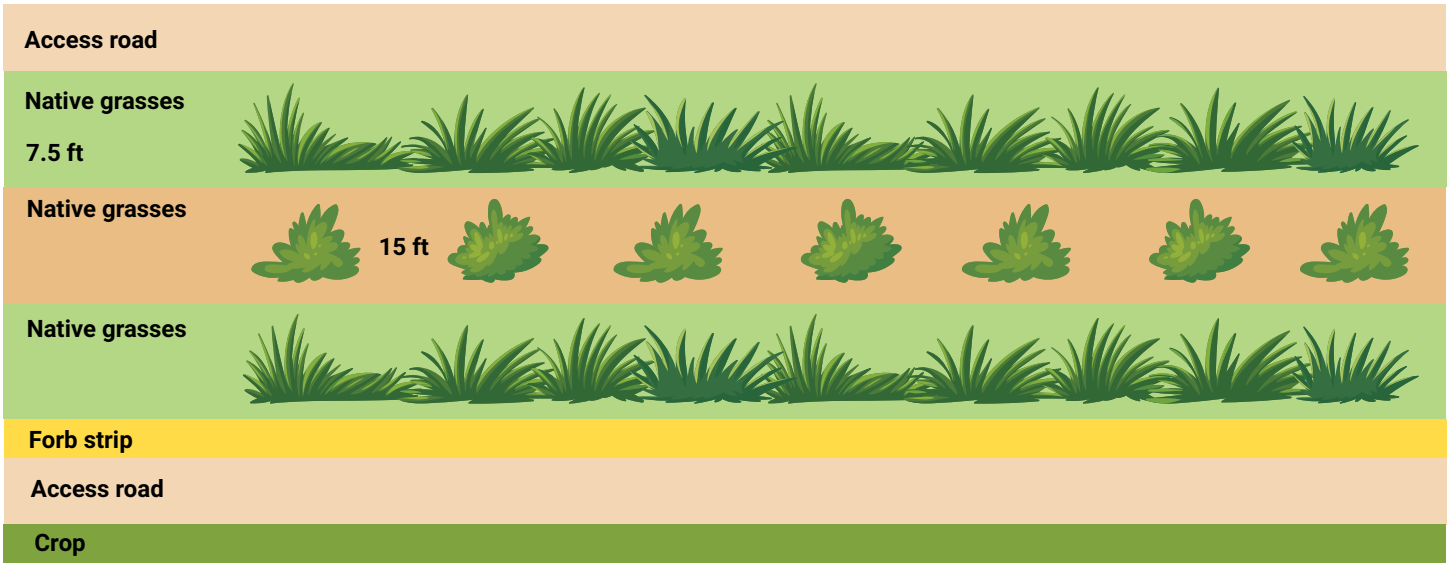
Hedgerow design that is well integrated into farming systems with a single row of shrubs and/or trees bordered by strips of native perennial grasses, or sedges or rushes if riparian.



LARGE SHRUBS (15 FT SPACING)
Toyon
Western redbud
Coyote brush
California coffeeberry
Elderberry

SMALLER SHRUBS AND FORBS AND PLUGS (7.5 FT SPACING)
California buckwheat
Yarrow
Milkweed
Aster
Goldenrod
Mugwort
Phacelia
Gum plant

NATIVE GRASS MIX
Purple needlegrass
Nodding needlegrass
California oniongrass
Squirrel tail
One-sided bluegrass
Blue wildrye
Creeping wildrye
Slender wheatgrass
Meadow barley

TREES (20–30 FT SPACING)
Willow
Cottonwood
Oak
California buckeye
California sycamore

FORB STRIP SEED MIX
Lupine
Clovers
Tarweed
Vinegarweed
California poppy
Gum plant
Phacelia

FOR MORE INFORMATION ON HEDGEROWS

ESTIMATED COSTS AND POTENTIAL BENEFITS FOR A PERENNIAL HEDGEROW PLANTING

caff.org/wp-content/uploads/2010/07/HedgerowPlanting.pdf

ESTABLISHING HEDGEROWS ON FARMS IN CALIFORNIA

anrcatalog.ucanr.edu/pdf/8390.pdf

CALIFORNIA NATIVE PLANT EXCHANGE

cnplx.info/index.html

HEDGEROWS AND FARMSCAPING FOR CALIFORNIA AGRICULTURE A RESOURCE GUIDE FOR FARMERS

rcdmonterey.org/images/docs/publications/CAFF_Hedgerow_Manual_2018.pdf

CALIFORNIA FARMERS PLANT HEDGEROWS TO CONSERVE WATER, IMPROVE SOIL HEALTH

wildfarmalliance.org/california_farmers_plant_hedgerows_olive_oil_times

BRINGING BIODIVERSITY TO THE VINEYARD

wildfarmalliance.org/bringing_biodiversity_to_the_vineyard

HABITAT ASSESSMENT GUIDE

xerces.org/publications/habitat-assessment-guides/pollinator-habitat-farms-and-agricultural-landscapes

HABITAT INSTALLATION GUIDE FOR CALIFORNIA

xerces.org/publications/habitat-installation-guides/california-422a-hedgerow-planting-pollinators

2 Integrated Pest Management

Integrated Pest Management (IPM) is critical in producing high quality wine grapes. Using a complimentary suite of IPM practices is a long-term and sustainable approach to healthy vines. Prevention of pests is the foundation of IPM programs and includes techniques such as sanitation, using clean planting stock, proper pruning and thinning of grapevines to improve airflow, cleaning equipment, and careful monitoring throughout the year.

IPM TECHNIQUES ARE UTILIZED IN CONJUNCTION TO CREATE IPM PROGRAMS. SEVEN MAJOR COMPONENTS ARE COMMON TO ALL IPM PROGRAMS:

1. Pest identification
2. Monitoring and assessing pests
3. Action thresholds
4. Preventative management
5. Using a combination of biological, cultural, physical/mechanical and chemical management tools
6. Monitoring effectiveness
7. Resistance management

REDUCING BEE EXPOSURE TO PESTICIDES

Product registration, toxicity testing, and product regulation are in place to protect pollinators from the negative effects of pesticides. Pesticide labels are legal documents. It is illegal to use a pesticide in any way other than for the purpose and in the manner stated on the label. Risks are reduced by following pesticide labels closely and paying attention to changes in use restrictions. Individuals should understand how to read a pesticide label in order to identify, understand, and mitigate potential impacts (ipm.ucanr.edu/bee-precaution-pesticide-ratings/) on pollinators. When organic or synthetic pesticides are needed, using least toxic products, in ways that do not interfere with foraging pollinators, can provide protection not only to bees, butterflies, and other pollinators, but also supports populations of beneficial organisms that provide natural biological control in vineyards.

In addition, properly following pesticide labels is important from an economic point of view for the winegrape grower, as well as an ecological point of view for bees and other beneficial insects. Applying too much of one pesticide or applying it outside of label use because of inattention to label details could cost the grower more money and could increase risk of the product to visiting bees.

Bee poisonings from exposure to pesticides can occur when:

- Beekeepers and growers do not adequately communicate.
- Pesticides are applied when bees are actively foraging.
- Pesticides are applied to the vines or weeds in the field or field margins during bloom.
- Pesticides are applied to other blooming plants in fields, field margins, or neighboring fields. Pesticides drift onto blooming plants adjacent to the vineyard.
- Systemic insecticides (like neonicotinoids) are translocated into the nectar and pollen of non-crop flowering plants because of their movement through soil and water.
- Bees collect insecticide-contaminated nesting materials, such as leaf pieces collected by alfalfa leafcutter bees.
- Honey bees collect insecticide-contaminated water (from drip tape or chemigation or in standing water near treated fields).
- Ground nesting or overwintering bees are exposed through soil contaminated with pesticide 3.

When using pesticides, in addition to following label directions and maintaining clear communications with beekeepers and other stakeholders, other ways of minimizing managed and wild bee exposure include:

- Ensure that pesticide drift is minimized to reduce contact with adjacent habitat.
- Avoid applying pesticides during warm evenings when honey bees are clustered on the outside of their hives.
- Avoid applying pesticides (especially insecticides) to any blooming flowers, even weeds; bees may be using these resources.
- Be aware that any pesticides applied to crops at any time of the year can be absorbed in soil, potentially impacting ground nesting bees or taken up by non-crop plants that bees forage on.
- Look for bees on crops, and for ground nests of solitary bees (e.g. long-horned bees, sweat bees, and mining bees) and bumble bees. Protect nest areas from insecticide spray.

CONTROLLING PESTS WITH PESTICIDES WHILE PROTECTING POLLINATORS IN VINEYARDS

- Do not treat flowering plants when in bloom.
- Do not spray where and when pollinators are actively foraging.
- Use short residual materials and low-hazard formulations if insecticides are warranted.
- Use UC IPM bee precaution ratings to select optimal product for your situation.
- Adjust spray programs in relation to weather conditions. If it is windy, do not spray.
- Read and follow all pesticide labels.
- Reduce pressure of spray nozzle to prevent pesticide drift.
- Inform neighboring growers and applicators of any apiaries or hive locations.
- Inform neighboring beekeepers of possible pesticide use in adjacent crops.
- Establish buffers between treated areas and hives or pollinator habitat.
- Do not apply when unusually low temperatures, dew, or precipitation are forecasted following treatment.
- When possible, use low toxicity, rapidly degradable chemicals.
- Establish buffers near water sources.
- Avoid tank mixing.

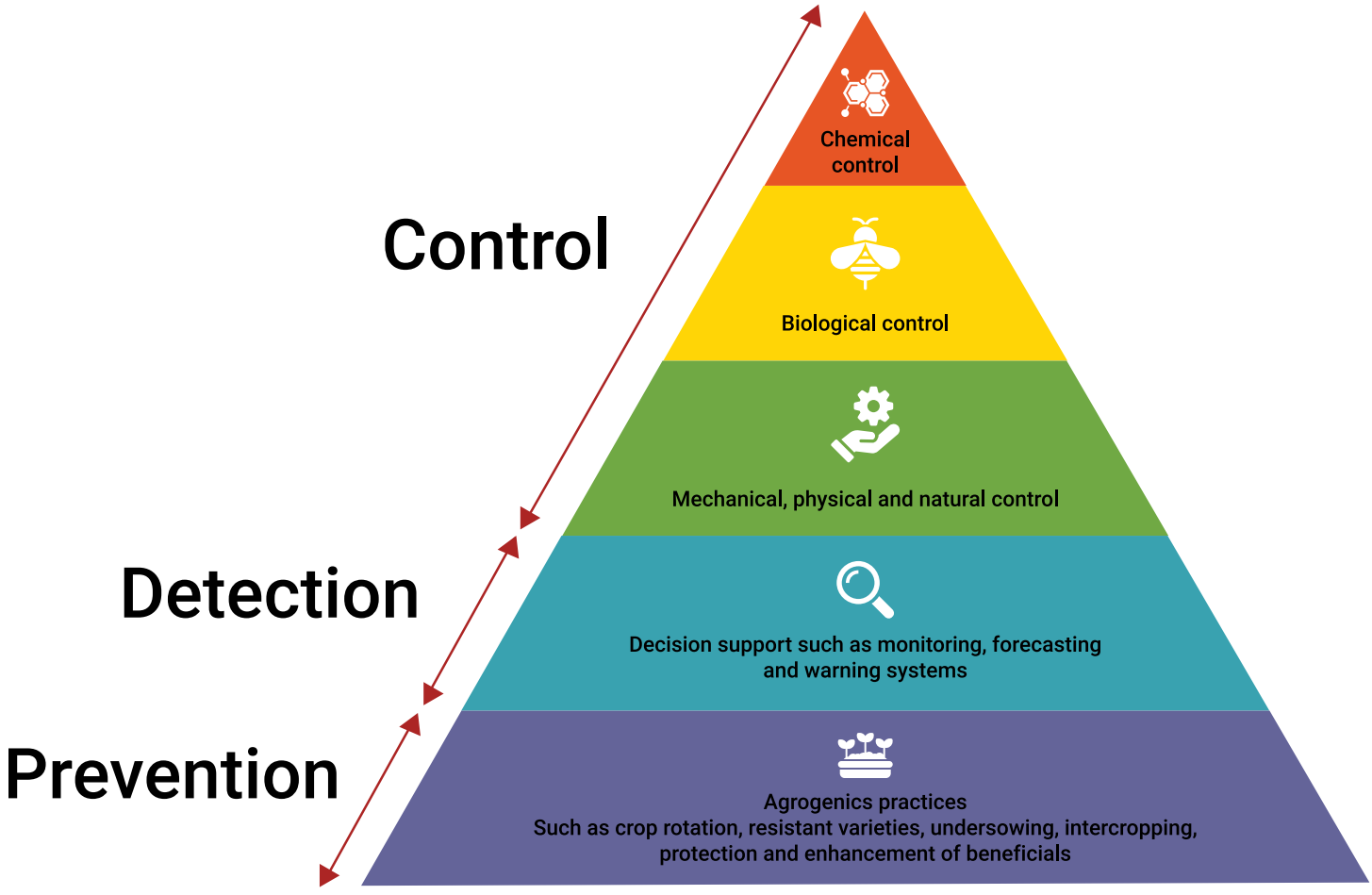
IPM DEFINITION

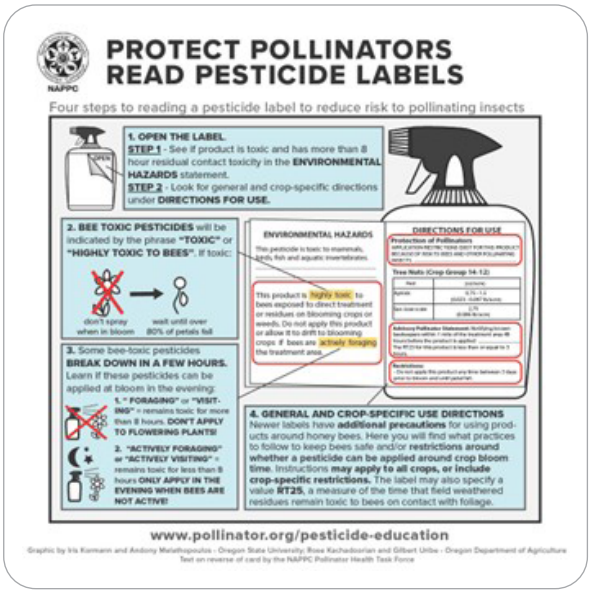
The University of California Statewide Integrated Pest Management Program (UC IPM) (s) defines IPM as an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of tactics. These may include biological control, mechanical control, habitat manipulation, modification of cultural practices, use of organic or synthetic pesticides, and use of resistant varieties.

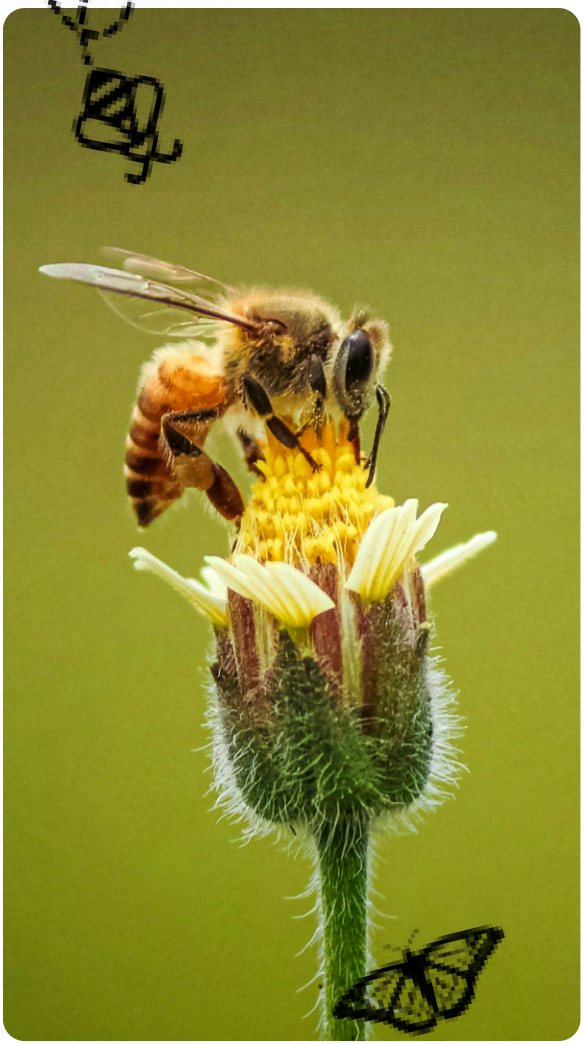
IPM TRIANGLE

With prevention as its foundation and first line of defense against pests, IPM uses decision support based on monitoring. Monitoring is critical when determining which input or management practice to use. Thus, IPM in vineyards begins before the vines are actively growing in spring. Walking vineyards throughout the year is vital to developing a long-term approach to pest management. Use pesticides only when there are no other options for managing a pest. Even at this point, however, there are choices that will bear on pollinator health, such as on what product to use and how and when to apply.

Pesticide labels have information on toxicity to bees and required mitigation. A simple guide on how to read a label to mitigate pollinator impacts can be read here (pollinator.org/pollinator.org/assets/generalFiles/Reading-Pesticide-Labels-NAPPC-with-mitigation-2022v.final.pdf). Ensure that all pesticides are used according to the label and are applied by a certified pesticide applicator.







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Stay informed on evolving IPM BMPs by taking a community approach - sharing with neighbors and attending local vineyard management meetings - along with utilizing resources available through UCCE and your local Agricultural Commissioner. Using the UC Year Round Guide to Winegrape Pest Management (ipm.ucanr.edu/PMG/C302/m302yi01.html%22%20%5Cl%20%22DORMANT) is an excellent resource to help alert you to potential pest issues and to help determine best monitoring and management techniques and timing from dormancy to post harvest periods.

BENEFITS OF USING IPM

- Enhanced environmental protection – reduced inputs, residues, and leaching
- Conservation of beneficial organisms such as pollinators and natural enemies
- Reduced health risks for workers
- Can be more long term (sustainable) and cost-effective
- Reduced reliance on pesticides
- Pest resistance management
- Improved public perception and confidence

EXAMPLE

Integrated Pest Management (IPM) for Vine Mealybug [4,5]

A key pest of grapevines throughout California is the vine mealybug (VMB), Planococcus ficus, which transmits several types of leaf roll viruses. These diseases delay fruit maturity and reduce berry quality and quantity at harvest. Additionally, VMB produces large amounts of honeydew that can cause sooty mold damage, and high densities of the insect lead to decreased plant vigor, defoliation, and the insects themselves can be contaminants of grape clusters. VMB's tendency to feed under the bark and below the soil surface offers a refuge from contact insecticides and natural enemies, making control tactics with pesticides difficult or entirely ineffective.

VMB can have up to seven generations per year, and they overwinter as eggs or newly hatched nymphs, called crawlers, in egg sacs under loose bark. In the spring, crawlers move to green shoots and mature by summer. Adult females lay eggs in old wood in late summer and early fall. The cryptic biology, small size of the crawler stage, lack of availability of effective products, label restrictions, insecticide resistance, and high rate of reproduction all contribute to making VMB a challenging pest to manage.

MONITORING

Using an integrated approach to VMB begins with knowing how to correctly identify the pest mealybug species, as there are several mealybugs that can be found in grapes. The body shape of VMB is oblong. The waxy filaments that protrude from the body of the vine mealybug are shorter and appear thicker or stubbier than those of the grape mealybug. VMB does not possess long tail filaments like the grape mealybug shown below.

GRAPE MEALYBUG

VS

VINE MEALYBUG

Use of regular scouting throughout the season and mapping of vineyards will help identify potential problems in the next season. Continually look for the VMB and symptoms, especially honey dew, sooty mold, and the presence of ants.

If the vineyard had an infestation at harvest, monitor for mealybugs in late February to early March the following year. Peel back the thin bark on spurs in the current season's prunings or loose bark on canes and look for the presence of grape mealybug crawlers. Monitoring should include looking for egg sacs or adult females; the presence of ants is also indicative of an infestation of VMB.

To assess adult activity, VMB pheromone lures are available and are used in red delta traps to monitor for males. There are two VMB male flights per year. Monitoring the spring flight of grape mealybug males can be used to predict the emergence of crawlers of the summer brood and to time control measures. Infestations may be spotted in both summer and winter by looking for the presence of honeydew and sooty mold. Also, look for ants on the vines because their presence is a good indication of a mealybug infestation. If ant activity is high, however, the amount of honeydew on the plant may be minimal because the ants harvest it.

Monitor for parasitism by collecting mealybugs and holding them in gelatin capsules (available from pharmacies) at room temperature for two to four weeks to detect parasite emergence. If parasitism is found, leaving untreated areas of the vineyard can provide refuges in which beneficial parasites can survive.

MANAGEMENT

Biological

One method of control is through the use of parasitic wasps, which parasitize VMB by laying their eggs in the pest. Amongst the most successful biological control agents is *Anagyrus pseudococci*, especially late in the season. However, the effectiveness of parasites can be disrupted by mealybug-tending ants and can be ineffective in the spring, as the parasitoid does not emerge until bloom.

Preventative

Practice good sanitation to avoid transmission of VMB or viruses on equipment and ensure workers do not enter uninfested vineyards after working in an infested area.

Another measure that can be used for controlling VMB populations is mating disruption. Pheromone mating disruption is considered more effective when used over large areas and when populations are low to moderate. Mating disruption is a low toxicity technique that involves the use of sex pheromones to prevent male insects finding females and mating. In grapes, mating disruption can control vine mealybug infestations by reducing the number of matings or delaying them. Mating disruptors can be applied as a spray or with dispensers and applications are made in the spring, before male mealybugs emerge. Mating disruptors may require a second application. More information on Mating Disruption of Grapevine Mealybug (lodigrowers.com/disruption-of-vine-mealybug-mating/).

Chemical

Given the various challenges that come with controlling VMB populations, there are circumstances when insecticides may be required. Use the UC IPM Guidelines for Wine Grapes (ipm.ucanr.edu/agriculture/grape/%22%20%5Cl%20%22gsc.tab=0), UC Bee Precaution Ratings (ipm.ucanr.edu/bee-precaution-pesticide-ratings/), and follow label instructions to ensure the proper and safest steps are taken when managing VMB with insecticides.

If monitoring indicates a small population, a single treatment in the delayed dormant period or spring, may adequately control populations. For high infestation levels, treat in the early spring and in the summer. Crawlers and young nymphs are the stages most susceptible to insecticides. Properly timed delay dormant/spring applications target these life stages.

EXAMPLE

Integrated Pest Management (IPM) for Light Brown Apple Moth [6]

The light brown apple moth (LBAM), Epiphyas postvittana, is found in California from Los Angeles to Sonoma counties. Typically, LBAM has two to four generations per year; however, LBAM overwinters as larvae and does not undergo diapause, a winter resting stage. Instead, they spend colder months in vegetation surrounding vineyards and can survive for up to two months without feeding. Once feeding, LBAM can cause direct damage to berries, which can lead to fungal diseases such as Botrytis. Look for overwintering caterpillars in vegetation surrounding vineyards.

Monitoring

Adult LBAMs emerge approximately one to three weeks after pupation and quickly begin to mate. Resting adults are often found on the undersides of leaves. Eggs are laid two to three days after emerging from the pupae and are laid in masses of as little as 20 to as many as 170 eggs per cluster. Eggs are slightly overlapped, much like scales, and can either be found with a green/transparent coating or a darkened yellow coloration depending on degree of maturity. Eggs are most commonly laid on the upper surfaces of leaves. Egg masses that have blackened are likely to have been parasitized and should not be counted as viable LBAM when monitoring. In the early spring, search leaves for egg masses near the base of the shoot. In summer, search for egg masses near the middle of the shoot. And in fall, search both vines, weeds, cover crops, etc.

Larvae emerge approximately one to two weeks after being laid. With webbing, larvae utilize new growth leaves, matting leaves together, matting leaves to shoots, or rolling leaves to form nests. This webbing typically begins in early spring. Look for clustered leaves that appear glued together for the presence of LBAM larvae. Search near leaf veins on the underside of new leaves, just below leaf tips, or signs of clustering of leaves glued to shoots. Beginning at bloom, monitor fruiting areas for this webbing, as larvae feed on flower and fruit clusters.

Adults can be monitored with LBAM pheromone traps and lures. To determine whether insecticide application is warranted, targeted approaches allow you to establish whether there is a potential pest population problem. Search your field edges near weeds and trees where pest populations can accumulate.

MANAGEMENT

Biological

Generalist insect and spider predators can aid in reducing egg and larval LBAM. Parasitic wasps, such as Meteorus spp. have also been documented to parasitize LBAM in California. Increase parasitoid, predator, and beneficial populations by planting permanent habitat, such as hedgerows along field edges.

Cultural

Sanitation of mummy cluster, desiccated fruit or nuts infected by pests in the dormant season for other crops can reduce the number of overwintering LBAM and pest population numbers. During the dormant season remove mummy clusters, place them in the row-middles and mow them as broad-leaved weeds are mowed in and around the vineyard before budbreak.

EXAMPLE

Integrated Pest Management (IPM) for Western Grape Leafhopper [7,8]

Western grape leafhoppers (WGLH), Erythroneura elegantula, typically prefer newly matured leaves, shaded within the vine canopy. Nymphal and adult stages of the insect feed on the cells within the grape leaf, resulting in stippling of leaves. This can also cause yellowing of the leaves and leaf loss. High levels of leaf loss can result in decreased sugar accumulation in fruit, sunburning of fruit, spotting of fruit from insect frass, and vine stress. When vines are infested with WGLH early in the season, shoot growth is often stunted. The amount of damage from WGLH is influenced by:

- Canopy developmental stage
- Vine age, health, and stress
- Cultivar
- Insecticide history

Monitoring

Begin sampling for WGLH about four weeks after budbreak by randomly selecting 20 vines in each vineyard block. Collect from a few vines in from the end of the row. To monitor first- generation nymphs, choose one leaf at the third or fourth node up from the basal node on each vine. To monitor second or third- generation nymphs, choose newly developed leaves that have fully expanded in the middle of the canes. Count nymphs on the underside of leaves. Be sure to note red eggs and eggs with holes in them as these indicate that the eggs were parasitized. You may need a hand lens. Continue to monitor weekly until harvest. At bloom, grape leafhopper monitoring efforts can be synchronized with spider mite and mealybug monitoring to increase efficiency.

MANAGEMENT

Biological

Many natural enemies exist in California that can aid in WGLH suppression. This includes egg parasites, Anagrus erythroneurae and A. daanei, amongst others, as well as predatory arthropods, including spiders, green lacewings, minute pirate bugs, lady beetles, black hunter thrips, and predaceous mites. Encourage beneficial arthropods in your vineyard by incorporating habitat.

Cultural

Reduce peak WGLH populations before adults emerge by removing basal leaves and lateral shoots during berry set and for two weeks following. Shoot thinning leads to a canopy being less prone to damage than a vine with vigorous growth. Time leaf removal from first generation nymph to fifth instar development. Reducing areas in the vineyard with vigorous growth helps reduce WGLH infestation; however, be careful not to remove too much foliage which can cause sunburned fruit.

Proper weed management is key. Leafhoppers overwinter in plant debris and leaf litter in or around vineyards. Reduce adult leafhopper refugia by reducing weed pressure before budbreak.

Resistant Varieties

Consider cultivars less susceptible to WGLH damage, such as rieslings or varieties with substantial leaf hairs, as compared to those more susceptible to WGLH damage, such as chardonnay, sauvignon blanc, cabernet sauvignon, and other smooth leaved varietals with small leaf hairs.

EXAMPLE

Integrated Pest Management (IPM) for Powdery Mildew [9,10]

Powdery mildew (PM) is caused by the fungus Erysiphe necator. E. necator has both a sexual and an asexual life stage. Its sexual life stage is predominantly the overwintering stage, while the asexual life stage occurs during the growing season. Most cultivars of winegrapes are highly susceptible to PM and symptoms can occur on fruit, foliage, and vine shoots. It only takes a small amount of PM to result in total crop failure. Symptoms of PM include gray to silver sheen on fruit and foliage, while cane scarring closely resembles spider webbing, or in more severe cases, blotchy, mottled cane tissue. Severe cluster infestations result in an unharvestable crop and can even lead to secondary development of Botrytis bunch rot. Foliar infections decrease the vine's ability to photosynthesize, resulting in premature defoliation.
In the first year of development, PM mates and overwinters fruit and foliage in the latter half of the growing season.
In the second year of development, excess moisture both from irrigation and the environment promote the fungus in late winter and early spring.

Monitoring
Monitoring for early stages of PM can be rather difficult and requires a hand lens. PM is generally confined to the lower surface of the leaves closest to the rootstalk or cordons. It is most effectively observed in the early morning or just before sunset, and appears as small yellow, red, to brown surfaces at the bottom of basal leaves.

MANAGEMENT
Prevention is crucial for PM management. Prevention techniques primarily include cultural and chemical approaches.

Cultural
Attempt to control canopy vigor through bud removal by dormant pruning, pre-bloom shoot thinning, sucker removal, shoot positioning, and fruit-zone leaf removal early in periods of peak fruit susceptibility. This will reduce canopy density, allow for spray penetration, and increase air flow and evaporation to reduce humidity- characteristics favored by PM. Avoid overhead irrigation or sprinklers as this can increase vine susceptibility to PM. Avoid over-irrigating vineyards as excess moisture can result in proliferation of the fungus.

PM has many additional hosts including weeds such as Boston ivy, Virginia creeper, and more. Remove unwanted vegetation and volunteer grapevines, when possible, to limit areas where PM can spread.

Chemical
Apply thorough fungicide coverage at regular intervals throughout the season when needed. Do not extend intervals longer than two weeks unless otherwise directed by the pesticide label. Low volume sprays are typically adequate in the early season when canopy growth is slow; however, higher volume applications may be needed as the canopy grows.

FOR MORE INFORMATION ON USING IPM IN VINEYARDS AND WAYS TO PROTECT POLLINATORS FROM PESTICIDES:

UC IPM
ipm.ucanr.edu

BEE FRIENDLY FARMING RESOURCES
pollinator.org/bff/farming-resources

BEE FRIENDLY FARMING PROGRAM
beefriendlyfarming.org

UC BEE PRECAUTION RATINGS
ipm.ucanr.edu/bee-precaution-pesticide-ratings/

HOW TO REDUCE BEE POISONINGS FROM PESTICIDES
ipm.ucanr.edu/legacy_assets/PDF/PMG/pnw591.pdf

PROTECTING BEES AND OTHER POLLINATORS FROM PESTICIDES
epa.gov/pollinator-protection

FUNGICIDES AND THEIR EFFECTS ON NON-TARGET ORGANISMS, ESPECIALLY HONEY BEES IN FUNGICIDES, BACTERICIDES, AND BIOLOGICALS FOR DECIDUOUS TREE FRUIT, NUT, STRAWBERRY, AND VINE CROPS 2025
https://ipm.ucanr.edu/legacy_assets/PDF/PMG/fungicideefficacytiming.pdf

HONEY BEE BEST MANAGEMENT PRACTICES FOR CALIFORNIA'S ALMOND INDUSTRY
almonds.com/almond-industry/orchard-management/pollination

SECTION 4:

Pollinator Actions That Support Biodiversity, Regulatory Compliance, Production, And Marketing

There is increasing retailer and consumer interest in transparency about farming practices and how sustainably farmers produce. The importance of incorporating conservation practices across the supply chain to more closely monitor environmental, social, and governance (ESG) priorities has increased.

Pollinator Best Management Practices consider synergies and tradeoffs that exist between productivity, adaptation, regulation, and mitigation with the goal of achieving net benefits for producers, consumers, and the environment. Protecting pollinators builds a more resilient vineyard system that improves:

Soil Health Healthy soils are vital to healthy vines. California grape growers use cover crops and permanent plantings to increase organic matter, add nutrients, control vine growth, attract beneficial insects, and prevent erosion.

Biodiversity and Ecosystems Vineyards with habitat areas and corridors help wildlife access forestland and water. Vineyard owners and growers often work with community and government groups to restore streams, wetlands, and riparian areas. These habitats can support pollinators and other beneficial insects. A variety of plants and animals is a sign of a healthy ecosystem. California winegrowers protect trees for owls, falcons, and other natural predators that help reduce otherwise harmful rodent populations. Biodiversity builds long-term stability of the ecosystem by enhancing recycling of nutrients, encouraging pollination, controlling pests and disease, regulating water flow, enabling microclimate, and storing of carbon.

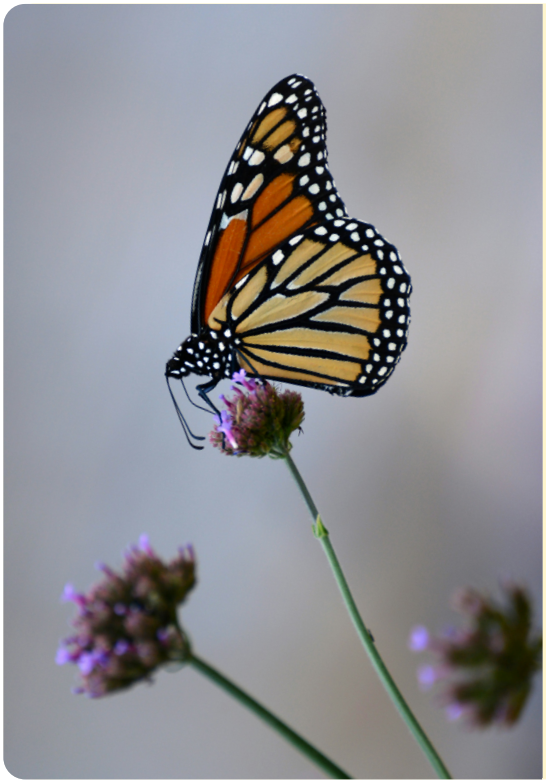
Integrated Pest Management Pest problems are a fact in vineyard management. California winegrowers have devised methods for managing pests first based on prevention and using techniques that minimize impacts to the environment such as biological control, sanitation, mating disruption, and use of least toxic pesticides.

Reduction of Greenhouse Gas Emissions Plants store carbon in the soil. By removing carbon from the air and storing it in roots, soil, and aboveground stems and leaves, cover crops and permanent pollinator habitat plantings increase soil organic carbon and mitigate greenhouse gases.

Certification programs and third-party audits show retailers, buyers, and consumers what you were doing to support pollinators and conservation. Examples include:

Building on major trends and successful regional efforts, the California Association of Winegrape Growers (CAWG) (cawg.org/) and the Wine Institute (wineinstitute.org/) have worked together to develop the California Sustainable Winegrowing Alliance (CSWA) (sustainablewinegrowing.org/sustainable_winegrowing_program.php) to give growers and vintners educational tools to increase adoption of sustainable practices and to measure and demonstrate ongoing improvement.

Bee Friendly Farming (BFF) is a certification program from Pollinator Partnership that collaborates with farmers to help protect, preserve, and promote pollinator health. The program works with a task force of experts from the North American Pollinator Protection Campaign (NAPPC) (pollinator.org/nappc) including scientists and farmers, setting standards for sustainable farming.



WHAT IS BIODIVERSITY AND WHY SHOULD I BE CONCERNED ABOUT IT?

Biodiversity refers to the variety of life in a given area — including plants, animals, insects, and microbes — and it plays a key role in the health of ecosystems like vineyards and their surrounding landscapes.

In vineyards, supporting biodiversity can lead to real benefits: improved pest control, better soil health, enhanced water retention, reduced erosion, and greater overall resilience.
A diverse community of organisms contributes to a balanced system where beneficial interactions — like pollination, natural pest control, and nutrient cycling — help keep the vineyard ecosystem stable and productive over time.

SECTION 5:

Grower Checklist For Pollinator Best Management Practices

This checklist will help you plan practices and understand linkages between habitat management, pollinator health, and conservation planning. Some practices will have long-term on-vineyard benefits. Use proper consideration as to whether practices are feasible or economically practical for your operation's need.

				Pollinator Health			Climate Smart Agriculture				
Practice Used	CBA Approved pesticide	Practice Area	Agricultural Practices in Winegrapes and Surrounding Areas	Pollinator Protection	Pollinator Nutrition	Nesting Site	Biodiversity	Soil Health	Water qaulity	Soil moisture retension	Integrated Pest & Dis-ease Mgmt.
			Extend Bloom Beyond Crop Pollination Period (Pre or Post)		●	●	●	●			
			Offer Forage on At Least 3% Land (Can Be Temporary)		●	●	●	●			
			Use Micro-Irrigation in Vineyard		●		●	●		●	
			Install Irrigation to Support Surrounding Habitat		●		●				
			Provide Permanent Habitat (Conservation Cover)		●	●	●	●		●	
			Practice Strip Cropping		●	●	●	●	●	●	●
			Install Constructed Wetland			●	●	●	●	●	●
			Install Grassed Waterway			●	●	●	●	●	●
			Plant Riparian Strip		●	●	●	●	●	●	●
			Establish a Windbreak		●	●	●	●		●	
			Rotate Crops		●		●	●		●	●
			Plant Cover Crops		●	●	●	●	●	●	●
			Provide Wildlife Habitat		●	●	●	●		●	●

				Pollinator Health			Climate Smart Agriculture				
Practice Used	CBA Approved pesticide	Practice Area	Agricultural Practices in Winegrapes and Surrounding Areas	Pollinator Protection	Pollinator Nutrition	Nesting Site	Biodiversity	Soil Health	Water qaulity	Soil moisture retension	Integrated Pest & Dis-ease Mgmt.
			Reseed/Replant at Optimal Time Window		●	●	●				
			Mow at Optimal Time Window		●	●	●			●	
			Mulch at Optimal Time Window		●	●	●			●	
			Use Prescribed Burning at Optimal Time Intervals		●	●	●				
			Use Prescribed Grazing at Optimal Time Intervals		●	●	●				
			Prune at Optimal Time Window		●		●				
			Leave Brush to Provide Nesting Sites		●	●	●	●		●	●
			Create Burned Open Habitat or Non-Cropland Areas		●		●	●		●	
			Practice Year-Round IPM in Vineyard Operation (UC IPM)	●	●	●	●	●		●	●
			Monitor Insect Pests With Traps and Visual Inspection		●		●	●		●	
			Use Pesticides According to Label (Organic and Synthetic)	●	●	●	●	●	●		●
			Follow US EPA Guidance on Tank Mixes	●				●			●
			Use Pesticide Risk Reduction (IPM Bee Toxicity Table)	●		●	●	●	●		●
			Apply Pesticides at Night / When Bees Are Not Foraging	●		●	●		●		●
			Use UC Bee Recommended Practices to Reduce Pesticide Drift	●		●	●	●	●		●
			Consider Weather Conditions to Minimize Drift	●		●	●	●	●		●
			Complete 1 CEU CAPCA/CCA on Pollinator Protection	●	●	●					●
			Complete Pollinator Stewardship Training of Field Staff	●	●	●	●	●			●

				Pollinator Health			Climate Smart Agriculture				
Practice Used	CBA Approved pesticide	Practice Area	Agricultural Practices in Winegrapes and Surrounding Areas	Pollinator Protection	Pollinator Nutrition	Nesting Site	Biodiversity	Soil Health	Water qaulity	Soil moisture retension	Integrated Pest & Dis-ease Mgmt.
			Adopt Comprehensive IPM Program Across Vineyards	●	●	●	●				
			Create Regional/Comprehensive Pollinator Conservation Plan	●	●	●	●	●	●		
			Use Sustainability Plan that includes Pollinator Protection	●	●	●	●	●	●		●
			Use an EPA-Recognized Pollinator Stewardship Plan	●	●	●	●	●	●		
			Implement New Technology to Improve Pollinator Management	●	●	●	●				●
			Use Beekeeper Technology to Record Hive Placement	●			●				●
			Use GIS for Habitat Planning and Mgmt.	●	●	●	●				●

SECTION 6:

Cost Sharing Opportunities And Other Resources

In recent years, interest in pollinator health, conservation practices, soil health, and sustainable practices has created funding mechanisms that can support transitioning to new practices.

Financial support, cost sharing, and grant programs, however, are quite dynamic and typically available in annual funding cycles. It is critical to look ahead, even into the next season, to identify funding sources and to determine your eligibility for these opportunities. This list will be updated as opportunities arise.

The following agencies and organizations have funding for pollinator and habitat related projects.

CDFA HEALTHY SOILS PROGRAM

Provides funding for growers to implement conservation management practices that sequester carbon, reduce atmospheric greenhouse gases and improve soil health.

More information:
cdfa.ca.gov/oefi/healthysoils/incentivesprogram.html

NRCS ENVIRONMENTAL QUALITY INCENTIVES PROGRAM

Provides funding for growers to conduct on-farm practices that improve environmental quality, including cover crops. For more information, see their website and contact the NRCS field office in your county. Be aware, the 2018 Farm Bill limits eligibility to growers with an average Adjusted Gross Income of less than $900,000.

More information:
https://www.nrcs.usda.gov/programs-initiatives/environmental-quality-incentives-program

NRCS Field Office Locator:
offices.sc.egov.usda.gov/locator/

PROJECT APIS M. SEEDS FOR BEES

Project Apis m. is committed to increasing honey bee-friendly habitat and cover crops in almonds and other California crops.

More information:
projectapism.org

Seeds for Bees program overview:
projectapism.org/seeds-for-bees.html

Seeds for Bees seed mixes:
projectapism.org/sfb-seed-mixes

Grower guides to benefits, water use, bloom competition, and FAQ's:
projectapism.org/seeds-for-bees-for-the-grower.html

POLLINATOR PARTNERSHIP

Pollinator Partnership is the largest non-profit in the world dedicated exclusively to the protection and promotion of pollinators and their ecosystems..

More information:
pollinator.org

Bee Friendly Farming Program overview:
beefriendlyfarming.org

Farming resources and grower guides:
pollinator.org/bff/resources

Agricultural grants:
pollinator.org/ag-grants

SECTION 6:

References

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Three Ways Vineyard Managers Can Support Pollinators

- Provide Floral Resources
- Protect Permanent Nesting Sites
- Use Integrated Pest Management

POLLINATOR PARTNERSHIP
Protect their lives. Preserve ours.