Planting Guide for Pollinator Habitat in California Vineyards

(Photograph [L–R]: Xerces Society / Maddy Kangas, Isis Howard, and Anna Murray.)

Background

Although grapes do not require insect pollination in order to set fruit, vineyards can be excellent locations for establishing pollinator habitat. Permanent and temporary habitat in vineyards can support declining pollinator populations contributing to species recovery in key geographic areas throughout the state. Pollinator habitat plantings also attract other beneficial insects such as natural enemies that prey on crop pests. Using drought-tolerant California native plants that bloom throughout the year can provide an attractive aesthetic for agritourism, improve soil health, and help store carbon. Additionally, on-farm pollinator habitat can help achieve vineyard sustainability goals while addressing native insect and pollinator declines.

A number of factors should be considered when selecting plant species for permanent and temporary pollinator habitat including bloom time, water requirements, sun or shade requirements, soil type, and plant size at maturity. In addition, there are broader considerations to take into account such as fire-risk mitigation, pesticide-risk mitigation, and alternate hosts.

Managing Fire Risk

Many California vineyards are located at the wildland–urban interface (WUI) or the transitional zones between agricultural, urban, and wildland settings, where fire danger/risk is a constant reality. In many situations at the WUI, it is typical to see brush-management practices being used on vegetation that presents high fire risk. Creating wildlife habitat without increasing fire risk is a critical part of habitat management and project planning.

Management: Although some plants can be labeled as "fire resistant," anything can burn under the right conditions. Therefore, proper placement, design, and management are the key factors in mitigating fire risk in habitat restoration projects. Fire risk of new or existing habitat can be reduced by providing adequate irrigation, particularly during times of high fire risk (e.g., high temperatures, low humidity, heavy winds). Although most native species do not need irrigation once established, some supplemental water during dry months can reduce the flammability of most species. Fire risk can also be reduced by keeping habitat areas clear of dead wood, dry leaves, and other highly flammable materials. Thinning out dense shrub plantings as necessary, removing any fine fuels as they dry up and die back, and thinning out dense patches of new growth from natural regeneration to maintain fuel breaks is also recommended. Finally, including a layer of non-flammable materials such as pea gravel over mulched areas can also reduce risk.

Project Planning: For new projects, consider the distance to habitat areas from homes, structures, or other vulnerable features when designing habitat projects. Below are some planting and management recommendations based on defensible space and wildfire preparedness guidelines:

- **Immediate zone: 0–5 feet (0–1.5 meters) from homes or structure**
  - Avoid establishing pollinator habitat within the immediate zone and make sure to clean this area of leaf litter and vegetation to avoid ignition sources.

- **Intermediate zone: 5–30 feet (1.5–9 meters) from home or structures**
  - Avoid dense, woody pollinator habitat plantings in the Intermediate zone.
  - Employ careful landscaping to create breaks in between vegetation that can help influence fire behavior and reduce risk.
  - Focus on low-growing (e.g., under 2 feet [0.6 meters]) grasses and herbaceous species in this zone.
  - Trees and shrubs in this zone should be limited to small clusters of a few each to break up the continuity of the vegetation across the landscape
  - Remove ladder fuels (vegetation under trees) so a surface fire cannot reach the crowns (any growth from the first lateral branches and above).
  - Prune trees up to 6–10 feet (1.8–3 meters) from the ground; for shorter trees do not exceed one third of the overall tree height.
  - Space trees to have a minimum of 18 feet (5.5 meters) between crowns, with the distance increasing with the percentage of slope.
  - Tree placement should be planned to ensure the mature canopy is no closer than ten feet to the edge of any structure.
- **Extended zone: 30 feet (9 meters) or more from any structures**
  - Landscaping: The goal here is not to eliminate fire but to interrupt the fire's path and keep flames smaller and on the ground.
  - Dispose of heavy accumulations of ground litter/debris.
  - Remove dead plant and tree material.
  - Trees 30–60 feet (9–18 meters) from homes or structures should have at least 12 feet (3.5 meters) between canopy tops.*
  - Trees 60–100 feet (18–30 meters) from homes or structures should have at least 6 feet (1.8 meters) between the canopy tops.*

* NOTE: The distances listed for crown spacing are based on NFPA 1144, "Standard for Reducing Structure Ignition Hazards from Wildland Fire." However, the crown spacing needed to reduce or prevent crown fire potential could be significantly greater due to slope, the species of trees involved, and other site-specific conditions. Check with your local forestry professional to get advice on what is appropriate for your property.

Mitigating Pesticide Risk

Pesticides play a major role in pollinator and insect declines, therefore pesticide-risk mitigation practices should be implemented in order to protect pollinator habitat from pesticide contamination. This can be achieved through a combination of measures such as incorporating non-chemical options into pest management plans, eliminating prophylactic pesticide applications, selecting low-toxicity or targeted pesticides, and instituting risk-mitigation efforts that limit movement of pesticides into habitat.

In order to reduce drift risk, separate habitat areas from sprayed cropped areas with a pesticide-free buffer. While the appropriate size of a setback or pesticide-free area is dependent upon numerous site-specific factors, general recommendations are as follows:

- 40 feet (12 meters) from most ground-based applications
- 60 feet (18 meters) from the use of air blast sprayers
- 125 feet (38 meters) from crops treated with nitroguanidine neonicotinoids, including those planted with coated seeds.

In situations where spatial buffers are not feasible, consider installing vegetative drift barriers, composed of species that are not attractive to pollinators. Densely planted, linear arrangements of small-needled evergreen species are ideal for vegetative drift barriers. Vegetative buffers should be designed to grow above spray release height.

Alternate Hosts

Increasing biodiversity in and around vineyards and replacing weedy vegetation with native species in non-cropped areas promotes natural pest control and reduces the likelihood that these areas will serve as reservoirs for crop pests. Habitat with high plant diversity is less likely to promote pest and disease outbreaks compared to weedy field margins. High-quality native habitat can harbor and maintain robust populations of beneficial insects that provide natural pest control and are unlikely to serve as alternate hosts for crop pests. On the other hand, a number of non-native plant species (i.e., weeds) commonly found growing in and around vineyards in California can serve as alternate hosts for vineyard pests. Converting these areas to native pollinator habitat can significantly reduce pest pressure in adjacent vineyards.

Although native plants do not generally harbor or promote agricultural pests, it is possible that some may serve as alternate host plants for specific pests or diseases that can affect the target crop. Resources such as the University of California IPM website, local extension agents, UC Master Gardeners, and local NRCS staff can aid in proper plant selection geared to a specific site's needs.

The plant species included in the list opposite were researched extensively prior to their incorporation in Californian vineyards and were determined to be safe for use without the risk of serving as alternate hosts to vineyard pests when included in diverse plantings.

Plant Selection for Permanent Habitat

The plants on this list (see next page) are recommended for use in pollinator habitat restoration and enhancement projects in agricultural landscapes. These species have been selected because they are attractive to a diversity of different pollinator species, and, provided that a minimum of three different plant species from each blooming period (early, mid, and late season) are selected, will provide pollen and nectar resources throughout the season. A majority of plants recommended are native, drought tolerant, easy to establish, and do not serve as alternate hosts to crop pests or diseases.

Native Species for Permanent Habitat

SCIENTIFIC NAME	COMMON NAME	BLOOM	↻	Y	💧	☼	SOIL TEXTURE	ADDITIONAL DETAIL	NORTH COAST	CENTRAL COAST	CENTRAL VALLEY	SIERRA FOOTHILLS
Achillea millefolium	Common yarrow	Mid	P	F	L	☼	Coarse		x	x	x	x
Asclepias cordifolia	Heartleaf milkweed	Early–Mid	P	F	L	☼	Medium		x			x
Asclepias eriocarpa	Woollypod milkweed	Mid	P	F	L–M	☼	Any		x	x	x	x
Asclepias fascicularis	Narrowleaf milkweed	Mid	P	F	L–M	☼	Any		x	x	x	x
Asclepias speciosa	Showy milkweed	Mid	P	F	L–M	☼	Medium–Coarse		x			x
Baccharis pilularis	Coyotebrush	Late	P	W	L	☼	Any		x	x	x	x
Baccharis pilularis 'Pigeon Point'	Dwarf coyotebrush	Late	P	W	L	☼	Any		x	x		x
Baccharis salicifolia	Mule's fat	Early–Mid	P	W	M	☼	Any		x	x	x	x
Brickellia californica	California brickell bush	Mid–Late	P	W	L	☼	Coarse		x	x	x	x
Bromus carinatus	California brome	—	P	G	L–M	☼	Any		x	x	x	x
Calycanthus occidentalis	Spicebush	Early–Late	P	W	L–H	☼	Any		x			x
Ceanothus 'Concha'	California lilac 'Concha'	Early	P	W	L	☼	Any		x	x	x	x
Ceanothus cuneatus	Buck brush	EArly	P	W	L	☼	V		x	x		x
C. gloriosus var. *g.* 'Anchor Bay'	Point Reyes ceanothus	Early	P	W	L	☼	Coarse		x	x		
Ceanothus integerrimus	Deer brush	Early	P	W	L	☼	Any		x	x		x
Cercis occidentalis	Western redbud	Early	P	W	L	☼	Any		x	x	x	x
Deschampsia cespitosa	Tufted hairgrass	—	P	G	L–H	☼	Medium–Coarse		x			x
Diplacus aurantiacus	Sticky monkeyflower	Early–Mid	P	W	M	☼	Any		x	x	x	x
Epilobium canum	California fuschia	Late	P	F	L	☼	Any		x	x	x	x
Eriogonum fasciculatum	California buckwheat	Mid–Late	P	W	L	☼	Any		x	x	x	x
Eriogonum umbellatum	Sulphur buckwheat	Mid–Late	P	F	L	☼	Coarse					x
Eriophyllum confertiflorum	Golden yarrow	Early–Mid	P	F	M	☼	Any		x	x		x
Eriophyllum lanatum	Common woolly sunflower	Mid–Late	P	F	L	☼	Any		x		x	x
Frangula californica	California coffee berry	Early–Mid	P	W	L	☼	Any		x	x	x	x
Grindelia camporum	Gumplant	Mid–Late	P	F	L	☼	Any		x	x	x	x
Heuchera micrantha	Alum root	Mid	P	F	L–H	☼	Coarse		x	x		x
Koeleria macrantha	Prairie junegrass	—	P	G	L	☼	Any		x	x		x
Monardella odoratissima	Mountain monardella	Mid	P	F	L	☼	Any					x
Monardella villosa	Coyote mint	Mid	P	F	L	☼	Medium		x	x	x	x
Muhlenbergia rigens	Deergrass	—	P	G	L–M	☼	Any			x	x	x
Penstemon heterophyllus	Foothill penstemon	Early–Mid	P	F	L	☼	Any		x	x	x	x
Philadelphus lewisii	Mock orange	Early–Mid	P	W	L	☼	Coarse					x
Prunus ilicifolia	Hollyleaf cherry	Mid	P	W	M	☼	Any			x		
Prunus virginiana	Chokecherry	Early–Mid	P	W	L	☼	Any		x	x		x
Rhamnus ilicifolia	Hollyleaf redberry	Early–Mid	P	W	L	☼	Medium–Coarse		x	x		x
Ribes aureum	Golden currant	Early	P	W	L–H	☼	Any			x	x	
Rosa californica	California wildrose	Mid	P	W	M	☼	Medium		x	x	x	x
Salvia mellifera	Black sage	Mid	P	W	L	☼	Any		x	x	x	
Salvia sonomensis	Sonoma sage	Early–Mid	P	W	L	☼	Any		x	x		x
Sambucus nigra ssp. *cerulea*	Blue elderberry	Early–Mid	P	W	M	☼	Any		x	x	x	x
Scrophularia californica	California bee plant	Early–Mid	P	F	M	☼	Any		x	x		x
Solidago velutina spp. *californica*	Canada goldenrod	Mid–Late	P	F	L–M	☼	Any		x	x	x	x
Stipa pulchra	Purple needlegrass	—	P	G	L	☼	Any		x	x	x	x
Symphyotrichum chilense	Pacific aster	Late	P	F	L	☼	Any		x	x	x	x
Verbena lasiostachys	Western vervain	Mid–Late	P	F	M–H	☼	Any		x	x	x	x

KEY

↻ **LIFE CYCLE**—Perennial
Y **FORM**—Forb; Woody; Grass
💧 **WATER NEEDS**—Low; Medium; High

SUN NEEDS
☼ Full sun
☼ Full sun–partial shade
☼ Partial shade

ADDITIONAL DETAILS
Larval host
Attracts specialist bee
Attracts beneficial insects
Bumble bee plant
Nest site
Deer resistant

Seed Mixes for Temporary Habitat

Temporary or seasonal habitat features such as cover crops are multi-benefit additions to on-farm habitat. They can have large-scale benefits including attracting pollinators and beneficial insects, providing soil fertility, reducing compaction and erosion, reducing soil temperature, and increasing soil biodiversity. Highly attractive cover crop mixes that inckude workhorse species can provide substantial amounts of pollinator forage, both pollen and nectar, particularly when crops are not in bloom. The cover crop seed mixes below are comprised of both native and introduced species that are highly attractive to pollinators and other beneficial insects, are easy to establish, and compete well against weedy vegetation.

Vineyard Insectary Cover Crop Seed Mix—Perennial

SCIENTIFIC NAME	COMMON NAME	% OF MIX	SEEDING RATE†
Achillea millefolium	Yarrow	15.0%	0.11
Brassica hirta	White mustard	12.0%	2.86
Eschscholzia californica	California poppy	13.0%	0.87
Grindelia camporum	Gumplant	12.0%	1.00
Layia platyglossa	Tidy tips	12.0%	1.00
Phacelia tanacetifolia	Tansy phacelia	12.0%	0.63
Raphanus sativus	Tillage radish	10.0%	6.11
Trifolium incarnatum	Crimson clover	14.0%	2.64
	TOTALS	**100.0%**	**15.23**

† **SEEDING RATE—**Pure Live Seed (PLS) Lbs/ Acre

Vineyard Insectary Cover Crop Seed Mix—Annual

SCIENTIFIC NAME	COMMON NAME	% OF MIX	SEEDING RATE†
Brassica hirta	White mustard	18.0%	4.30
Eschscholzia californica	California poppy	16.0%	1.07
Layia platyglossa	Tidy tips	15.0%	0.91
Phacelia tanacetifolia	Tansy phacelia	15.0%	0.79
Raphanus sativus	Tillage radish	18.0%	11.0
Trifolium incarnatum	Crimson clover	18.0%	3.20
	TOTALS	**100.0%**	**21.27**

† **SEEDING RATE—**PLS Lbs/ Acre

Additional Resources

Fire Safety

Cal Fire Defensible Space Guidance: https://www.fire.ca.gov/programs/communications/defensible-space-prc-4291/

National Fire Protection Association Preparing Homes for Wildfire: https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Preparing-homes-for-wildfire

Pesticide Risk Mitigation

Protecting Habitat: https://xerces.org/publications/fact-sheets/guidance-to-protect-habitat-from-pesticide-contamination

UC IPM Website: http://ipm.ucanr.edu/

Additional Plant Lists and Seed Mixes

Pollinator Conservation Resource Center (California): https://www.xerces.org/pollinator-resource-center/california

Designing and Installing Habitat

Pollinator Conservation Resource Center (California): https://www.xerces.org/pollinator-resource-center/california

Funding Habitat Projects on Working Lands

https://beebettercertified.org/wp-content/uploads/2022/06/22-007_01_BBC_CA-Funding-Opportunites-Handout-2022.pdf

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