

## Insectary Plants

Insectary plants are those grown to attract, feed, and shelter insect parasites (parasitoids) and predators to enhance biological pest control. Insectary plants provide nectar and pollen, which the adults of many natural enemy species need to consume. Even if pests are abundant, certain natural enemies will be less abundant, shorter-lived, or produce fewer offspring unless nectar and pollen are available. Insectary plants can host alternate prey that will feed the natural enemies and keep them abundant locally. These **flowering plants also provide nectar, pollen, and shelter for bees**



(<http://www.ipm.ucanr.edu/PMG/C/S-TO-CULT-GC.001.html>)

**Insectary plants bordering tomato field.  
Photo by Rachael F. Long.**

([http://www.almonds.com/sites/default/files/bee\\_forage\\_one\\_sheet%5B1%5D.pdf](http://www.almonds.com/sites/default/files/bee_forage_one_sheet%5B1%5D.pdf)) (PDF) and other pollinating insects.

Companion plants, cover crops, and hedgerows grown for other purposes can also serve as insectary plants; the terms are sometimes used interchangeably. Farmscaping is a whole-farm approach to conserving desirable species and includes using companion and insectary plants, cover crops, hedgerows, and more.

Insectary plants increase the abundance and effectiveness of natural enemies that help suppress pest populations. The utility of insectary plants to attract, feed, and shelter natural enemies varies with the specifics of their planting and maintenance and the associated crop or garden situation. Biological pest control may be enhanced in the vicinity of insectary plants, but less so as the distance from them increases.

Insectary plantings require management and some types take up space that might otherwise be used to grow more of the marketed crops. Additional **practices to protect (conserve) natural enemies and pollinators** ([http://ipm.ucanr.edu/mitigation/protect\\_beneficials.html](http://ipm.ucanr.edu/mitigation/protect_beneficials.html)) are needed to adequately suppress the abundance of pests and their damage. Depending on the growing situation and pest problems, insectary plants may not always help to increase biological control.

Biological control can be effective only when any pesticides applied and the other management practices are compatible with the conservation of natural enemies. Preserve resident natural enemies by choosing cultural, mechanical, and selective chemical controls that do not kill parasites and predators or interfere with their activities. Use an **integrated pest management (IPM) program** (<http://ipm.ucanr.edu/GENERAL/whatisipm.html>) to maximize the effectiveness of biological control and minimize pest abundance and damage.

When pesticide application is warranted, consult the table of "Relative Toxicities of Insecticides and Miticides to Natural Enemies and Honey Bees" in the University of California (UC) IPM **Pest Management Guidelines** (<http://ipm.ucanr.edu/PMG/crops-agriculture.html>) for that crop to learn the impact of specific pesticides on parasites and predators. Use the nonpersistent and selective acaricides (miticides) and insecticides when feasible.

## Planting pattern

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Insectary plants can border or surround crops, edible gardens, and ornamental plants, or be interplanted in clumps or rows. How and where insectary plants are grown depends on factors such as land use, site conditions, and the extent to which the plants are intended to serve additional purposes. For example, hedgerows along field edges can serve as insectary plants and windbreaks without taking land out of crop production. Creating and restoring hedgerows and other field edge plantings to provide **habitat on farms for bees and natural enemies is needed to sustain global food production** (<http://calag.ucanr.edu/archive/?article=ca.2017a0020>) in intensive agricultural systems.

## Species selection

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Growing the right combination of **plants that flower sequentially** ([http://www.ipm.ucdavis.edu/PDF/MISC/Hedgerow\\_Plant\\_Selection.pdf](http://www.ipm.ucdavis.edu/PDF/MISC/Hedgerow_Plant_Selection.pdf)) (PDF) can provide nectar and pollen for adult natural enemies throughout the year. Choose plant species and cultivars that are well-adapted to the local soil and growing environment and compatible with the growth and cultural care of the other desirable plants grown. Certain crops, edible landscapes, and aesthetically pleasing ornamentals can serve as insectary plants.

For recommended annual insectary plants, see **Flower Flies (Syrphidae) and Other Biological Control Agents for Aphids in Vegetable Crops** (<http://anrcatalog.ucanr.edu/pdf/8285.pdf>) (PDF). For perennial insectary plant species and their management, consult **Establishing Hedgerows on Farms in California** (<http://anrcatalog.ucanr.edu/pdf/8390.pdf>) (PDF).

Avoid insectary-plant species that host arthropod pests or plant pathogens that can move to damage nearby crops or ornamentals. Consult the UC IPM publications on the plants you are considering for insectaries. Compare their pest species to those listed for your crops or other desirable plants grown:

**Commercial crops** (<http://ipm.ucanr.edu/PMG/crops-agriculture.html>) - UC IPM *Pest Management Guidelines*

Gardens and landscapes - UC IPM guide for

**Flowers** (<http://ipm.ucanr.edu/PMG/GARDEN/flowermenu.html>)

**Fruit trees, nuts, berries, and grapevines**  
(<http://ipm.ucanr.edu/PMG/GARDEN/fruit.html>)

**Trees and shrubs**  
(<http://ipm.ucanr.edu/PMG/GARDEN/plantmenu.html>)

**Vegetables and melons** (<http://ipm.ucanr.edu/PMG/GARDEN/veggies.html>)



(<http://www.ipm.ucanr.edu/PMG/S/I-DP-SYRP-AD.004.html>)

**Adult syrphid**  
([http://ipm.ucanr.edu/PMG/NE/syrphid\\_flies.html](http://ipm.ucanr.edu/PMG/NE/syrphid_flies.html))  
**feeding on pollen.**  
**Photo by Jack Kelly Clark.**

## Managing insectary plants

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Occasional watering is required in many situations to maintain insectary plantings. For example, drought-tolerant insectary perennials can be planted in the fall before California's rainy season, irrigated every 1 to 3 weeks during the drought season for the first 3 years, then deep watered less frequently during subsequent drought seasons, depending on the climate, plants, and soil type. Mowing, pruning, removal during certain stages of crop production or harvest, and replanting or overseeding are other common management practices. Vertebrate pests, such as cottontail rabbits, and weeds need to be monitored and managed to prevent crop damage.

## Overlapping strategies

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Plants grown for other purposes can also serve as natural enemy insectaries or otherwise enhance biological pest control.

### **Banker plants**

([http://msue.anr.msu.edu/news/common\\_banker\\_plants\\_in\\_insect\\_biological\\_control\\_systems](http://msue.anr.msu.edu/news/common_banker_plants_in_insect_biological_control_systems)). Hosts of plant-feeding species that are not pests of your crops or other desirable plants grown can be used to rear certain natural enemies. For example, plants infested with aphid species that don't feed on the crop can be inoculated with parasites or predators that will reproduce on them. These banker plants (e.g., in containers) with nonpest aphids and parasites or predators are scattered throughout a greenhouse or nursery to provide a continual source of natural enemies that disperse to consume pests on the crops, such as for **aphid control in greenhouses** (<https://ag.umass.edu/sites/agcenter/files/pdf-doc-ppt/AphidBankerPlantSystem.pdf>) (PDF).

**Beetle banks** ([http://oregonipm.ippc.orst.edu/Agroecology/NEW\\_BEETLE\\_BANK\\_1.pdf](http://oregonipm.ippc.orst.edu/Agroecology/NEW_BEETLE_BANK_1.pdf)) (PDF). Permanent strips planted with bunch grasses or other low-growing perennials shelter predatory, ground-dwelling invertebrates. Predaceous ground beetles, rove beetles, and spiders eliminated from cropped areas by cultivation, harvest, seasonal fallowing, or the application of certain pesticides will disperse from the protected mounds or strips (beetle banks) to recolonize the cropped areas.

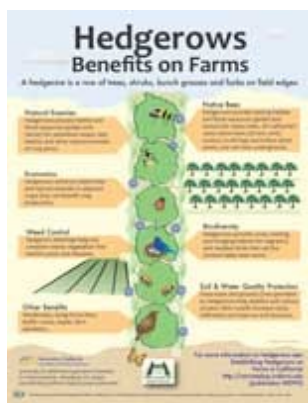
### **Companion plants**

([http://marinmg.ucanr.edu/Marin\\_Master\\_Gardener\\_Help\\_Desk/Leaflet/These\\_plants\\_are\\_true\\_companions/](http://marinmg.ucanr.edu/Marin_Master_Gardener_Help_Desk/Leaflet/These_plants_are_true_companions/)). Different species of plants can be grown close together for the purpose of benefiting one or more of them. Certain crops can benefit by planting other species that exclude weeds, improve soil, increase pollinator abundance, physically protect or support the crop, and increase natural enemy abundance. In addition to benefiting the primary crop, ideal companion plants can be harvested and used, such as compatible mixtures of culinary herbs, cut flowers, and vegetables. When multiple species grown together can be harvested for sale or other use, this crop-production strategy is termed **intercropping** (<https://www.sare.org/Learning-Center/Books/Crop-Rotation-on-Organic-Farms/Text-Version/Guidelines-for-Intercropping>) or **polyculture** (<https://www.sare.org/Learning-Center/Fact-Sheets/Polyculture-and-Reservoir-Ranching>).

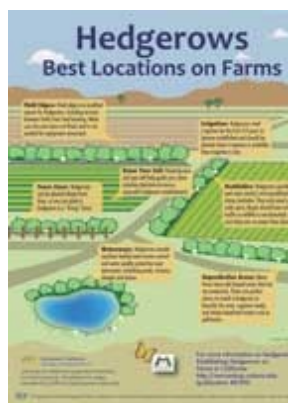
### **Cover crops.**

([http://ucanr.edu/sites/Nutrient\\_Management\\_Solutions/stateofscience/Cover\\_Crops\\_287/Cover\\_crop\\_tables/#table1](http://ucanr.edu/sites/Nutrient_Management_Solutions/stateofscience/Cover_Crops_287/Cover_crop_tables/#table1)) Also called a **floor cover** (<http://www.ipm.ucanr.edu/PMG/r602700111.html#FLOOR>) or ground cover, these low-growing, nonharvested plants help manage fertility, soil erosion and tilth (physical characteristics such as aeration and ease of tillage), and water infiltration (drainage) and runoff. A floor cover suppresses weeds and otherwise enhances production of the harvested crop. Cover crops are used in **vegetable production** (<http://anrcatalog.ucanr.edu/Details.aspx?itemNo=3517>), **vineyards** (<http://anrcatalog.ucanr.edu/Details.aspx?itemNo=3338>), and tree crops such as **walnuts** (<http://anrcatalog.ucanr.edu/pdf/21627e.pdf>) (PDF).

**Hedgerows** ([http://ceyolo.ucanr.edu/Custom\\_Program/Hedgerows/](http://ceyolo.ucanr.edu/Custom_Program/Hedgerows/)). Strips of shrubs, trees, and other perennials bordering crops and gardens provide many benefits and productively use margins (e.g., ditches and fence lines) that cannot be farmed. Hedgerow plantings can exclude undesirable weedy species, improve air quality, reduce erosion, and provide shade, wildlife habitat, and protection from wind as well as serve as insectary plants that **enhance biological pest control and pollination** (<https://doi.org/10.1093/jeetow086>) and **sustainability on farms** (<http://calag.ucanr.edu/archive/?article=ca.2017a0020>). Consult **Establishing Hedgerows on Farms in California** (<http://anrcatalog.ucanr.edu/pdf/8390.pdf>) (PDF) and the lists of California native perennial plants recommended for **hedgerows in the Sacramento Valley** (<http://www.ipm.ucanr.edu/PMG/C/S-NP-CULT-GC.005.html>).



(<http://www.ipm.ucanr.edu/PMG/C/S-NP-CULT-GC.003.html>)



(<http://www.ipm.ucanr.edu/PMG/C/S-NP-CULT-GC.002.html>)



(<http://www.ipm.ucanr.edu/PMG/C/S-NP-CULT-GC.001.html>)



(<http://www.ipm.ucanr.edu/PMG/C/S-NP-CULT-GC.004.html>)

**Illustrations by Rachael F. Long and Mary Fahey.**

**Wildflower plantings** ([http://www.xerces.org/wp-content/uploads/2015/02/NRCS\\_Specifications\\_California\\_CnsrvCvr\\_web.pdf](http://www.xerces.org/wp-content/uploads/2015/02/NRCS_Specifications_California_CnsrvCvr_web.pdf)) (PDF). Strips of forbs (herbaceous, flowering plants) on field crop edges can increase the abundance and longevity of bees and natural enemies.

## More information

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*Insectary Plants Publications from the University of California (UC) and Others*

### **Farmscaping to Enhance Biological Control**

(<http://extension.oregonstate.edu/sorec/sites/default/files/farmscaping.pdf>) (PDF), National Sustainable Agriculture Information Center

### **Farmscaping: Making Use of Nature's Pest Management Services**

(<http://articles.extension.org/pages/18573/farmscaping:-making-use-of-natures-pest-management-services#>) , Clemson University and eXtension

### **Flower Flies (Syrphidae) and Other Biological Control Agents for Aphids in Vegetable Crops**

(<http://anrcatalog.ucanr.edu/pdf/8285.pdf>) (PDF), UC

### **Good News for Hedgerows: No Effects on Food Safety in the Field**

(<http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=26370>) , adapted from **Crop Protection** (<https://www.sciencedirect.com/science/article/pii/S0261219418300292>) journal

***Hedgerow Benefits Align with Food Production and Sustainability Goals***

(<http://calag.ucanr.edu/archive/?article=ca.2017a0020>), UC

***Hedgerow Planting*** ([http://www.xerces.org/wp-content/uploads/2015/02/NRCS\\_Specifications\\_California\\_Hedge\\_web.pdf](http://www.xerces.org/wp-content/uploads/2015/02/NRCS_Specifications_California_Hedge_web.pdf))

(PDF), Xerces Society

***Hedgerows Enhance Beneficial Insects on Adjacent Tomato Fields***

(<http://escholarship.org/uc/item/9cd1x9nr.pdf>) (PDF), UC

***Hedgerows Enhance Beneficial Insects on Farms in California's Central Valley***

(<http://calag.ucanr.edu/Archive/?article=ca.v065n04p197>), UC

***Hedgerows on Farms in California, Establishing*** (<http://anrcatalog.ucanr.edu/pdf/8390.pdf>) (PDF), UC

***Pest Control and Pollination Cost-Benefit Analysis of Hedgerow Restoration in a***

***Simplified Agricultural Landscape*** (<https://academic.oup.com/jee/article/109/3/1020/2648794>), Journal of Economic Entomology, UC authored

***Recommended Plants & Seed Mixes For Pollinators & Beneficial Insects: Central Coast***

([http://www.xerces.org/wp-content/uploads/2015/02/SMRP\\_CaliforniaCentralCoast\\_Jan2015\\_web.pdf](http://www.xerces.org/wp-content/uploads/2015/02/SMRP_CaliforniaCentralCoast_Jan2015_web.pdf)) (PDF)

***- Central Valley*** ([http://www.xerces.org/wp-content/uploads/2015/02/SMRP\\_CaliforniaCentralValley\\_Jan2015\\_web.pdf](http://www.xerces.org/wp-content/uploads/2015/02/SMRP_CaliforniaCentralValley_Jan2015_web.pdf))

(PDF) - ***Southern California***

([http://www.xerces.org/wp-content/uploads/2015/02/SMRP\\_SouthernCalifornia\\_Jan2015\\_web.pdf](http://www.xerces.org/wp-content/uploads/2015/02/SMRP_SouthernCalifornia_Jan2015_web.pdf)) (PDF),

Xerces Society

***Natural Enemy Publications from the University of California***

***Natural Enemies Gallery*** (<http://ipm.ucanr.edu/PMG/NE/index.html>)

***Natural Enemies Handbook*** ([http://ipm.ucanr.edu/IPMPROJECT/ADS/manual\\_naturalenemies.html](http://ipm.ucanr.edu/IPMPROJECT/ADS/manual_naturalenemies.html))

***Protecting Natural Enemies and Pollinators***

([http://ipm.ucanr.edu/mitigation/protect\\_beneficials.html](http://ipm.ucanr.edu/mitigation/protect_beneficials.html))

***UC IPM Pest Management Guidelines*** (<http://ipm.ucanr.edu/PMG/crops-agriculture.html>) : Natural enemies of specific pests, by commercial crop

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