Attracting beneficial insects to home gardens

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Opening inquiry

What services are offered by a “good bug” in the garden?

Individual reflection (3 min)

Pair and share (7 min)

Group share

Photo: Heather Harrell

Group list

1. Pollination
2. Predators
3. Decomposers
4. Cleaners
5. Control of non-native plants
6. Food for other animals, like birds

Definitions

Beneficial: insect that performs valued services like pollination and pest control

Pollinator: animal that assists plants in reproduction

Natural enemy: organism that kills, decreases reproductive potential, or otherwise reduces numbers of another organism

Pest

Organism that damages or interferes with desirable plants in our landscapes

- Reduce yield, quality, functionality

Insects, diseases, nematodes, weeds, vertebrates

IPM: Integrated Pest Management

ipm.ucanr.edu

- Ecosystem-based strategy
- Focus on long-term prevention/suppression
- Correct pest identification and monitoring
- Combination of several management methods
  - Cultural practices
  - Mechanical + physical controls
  - Biological controls
  - Pesticides

Biological control

Use of *natural enemies*—predators, parasites, pathogens, and competitors—to control pests and their damage

Predator

Parasitoid

Break into groups, read literature

Pollination

Control of pests

Reducing pesticide use

Conservation of biodiversity, native wildlife

Plant species + management to attract + maintain beneficials

www.ourherbgarden.com

http://onepercentfortheplanet.org

General garden management

Provide water during dry periods (especially for lacewings)

Regular irrigation usually enough

Beware of mosquito habitat

General garden management

Keep dust down

- Windbreaks
- Groundcover/mulch (also provide humid, sheltered hiding places for spiders and ground beetles)
- Wet soil before moving, turning, etc.

General garden management

Avoid pesticides

Pesticides, especially insecticides, can kill beneficials

If using pesticides

Choose pesticides with LOW toxicity and LOW residue

If possible, do not spray on blooming plants while bees are foraging

Do not allow spray to drift on blooming plants

Bee precautions on pesticide labels

Pesticide toxicity to bees listed on pesticide labels is evaluated *mostly* in laboratory conditions + on honey bees

Thus, pesticide toxicity can significantly vary in field conditions and for different beneficials

Bee precaution pesticide ratings

Guidance on how to reduce bee poisoning, based on reported pesticide effects on adults and brood of honey bees and other bee species. Ratings are for the pesticide active ingredient, the common name.*

I Do not apply or allow to drift to plants that are flowering.

II Do not apply or allow to drift to plants that are flowering, except when the application is made between sunset and midnight if allowed by the pesticide label and regulations.

III No bee precaution, except when required by the pesticide label or regulations.

Note: These are not the pollinator protection statements on the pesticide labels. Some of the listed pesticides are not registered, or approved, for use. Make sure the pesticide use is legal and appropriate before making any application. Always read the label before making any pesticide application.

Active ingredient: Chlorothalonil

Pesticide type: fungicide

See example products below.

Potential Hazard[1] to				
			People and Other Mammals	
Water quality[2] (aquatic wildlife)	Natural enemies (beneficials)	Honey bees[3]	Acute[4]	Long Term[5]
H	L	H	VL	CA Prop 65 US EPA

Acute Toxicity to People and Other Mammals[4]

- Toxicity rating: **Not Acutely Toxic**
- Notes: Can cause severe eye and skin irritation.

Long-Term Toxicity to People and Other Mammals[5]

- **On US EPA list: Listed;**
- **On CA Proposition 65 list: Listed**
- Notes: EPA: Likely to be carcinogenic to humans

Water Quality Rating[2]

- Overall runoff risk rating: **High**
- Source: *Pesticide Choice: Best Management Practice for Protecting Surface Water Quality in Agriculture*. UC ANR Publication 8161.

Impact on Natural Enemies

- Overall toxicity rating: **Low**

Impact on Honey Bees[3]

- Toxicity category: **II - Apply only during late evening**

Pests for which it is mentioned in Pest Notes

Anthracnose • Peach Leaf Curl • Roses in the Garden and Landscape: Diseases and Abiotic Disorders • black spot

Use pesticides that target only the pest

Sluggo: snails and slugs

Bt: caterpillars

Ant baits

General garden management

Tolerate low levels of pests (predators need some food)

Decide on acceptable level of damage; scout regularly

Leafminer on potato

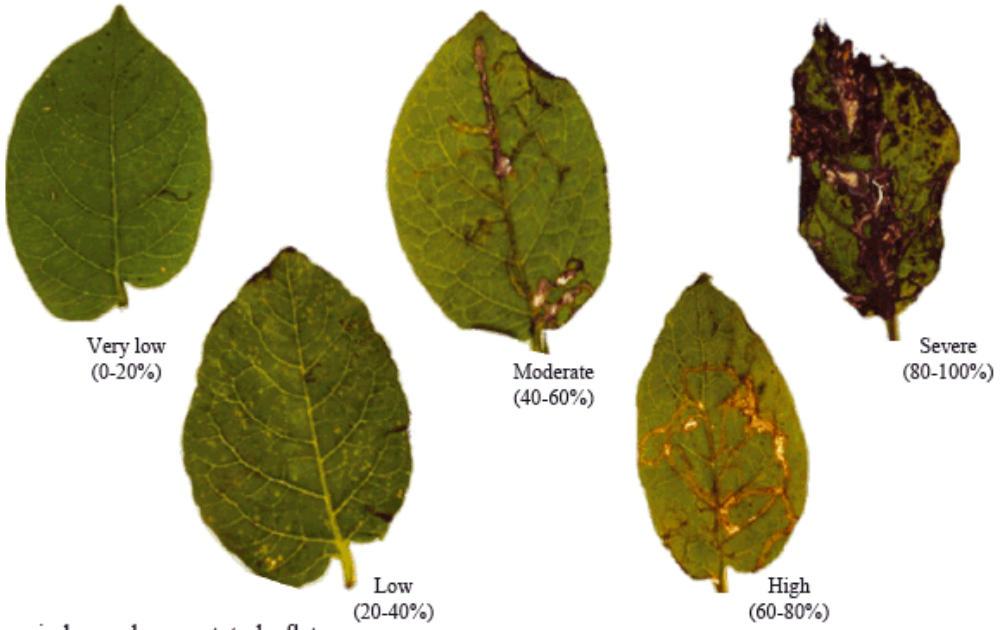


Fig 1 Damage index scale on potato leaflet.

www.scielo.br

Design concepts

Diverse floral resources

Arrangement and timing of flowering plants

Objective: Keep beneficials around with diverse plants, while confusing pests

Plant diversity:

- Interferes with host plant location by pests
  - Sight
  - Smell
- The more different plants in a given area, the better
  - Too many different smells can confuse insects
  - Large monocultures are easy to find

Broccoli intercropped with marigolds

Arrangement and timing of flowering plants

Diversity is the key → variety of food and habitats

- Height
- Physical structure
  - Hairs on leaves, nectaries, etc.
- Size of flowers
  - Smaller is usually better
- Time of flowering
  - Plan for blooming succession, so there are always flowers
- Include perennials and annuals, sun and shade plants

www.pacifichorticulture.org

Common Name	Genus/sp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Willow	*Salix spp.*								
CA lilac	*Ceanothus spp.*								
Coffeeberry	*Rhamnus californica*								
Yarrow	*Achillea millefolium*								
Silverlace Vine	*Polygonum aubertii*								

Ryan S. Davis

Sources of native plants:

- Intermountain Nursery, Auberry
- Las Pilitas, Santa Margarita
- Luis's Nursery, Visalia
- Elkhorn Native Plant Nursery, Moss Landing
- Native Sons
- And others…

Plant species selection

Flowers for pollen and nectar supplies (food)

Native plants may attract native insects

Plants that attract natural enemies

General rule:

Plants with nectar and small flowers

- Beneficials eat flower nectar, water and pollen when prey are scarce

Carrot family (Apiaceae)

Sunflower family (Asteraceae)

Mustard family (Brassicaceae)

Many California native plants

Attracting beneficials:
Apiaceae (Umbelliferae, carrot family)

Queen Anne's lace

atmywindow.com

www.organicgardener.com.au

Coriander (with hoverfly)

Dill

pantrygardenherbs.com

Fennel

galleryhip.co

Attracting beneficials: Asteraceae (sunflower family)

Yarrow

aggie-horticulture.tamu.edu

Cosmos

wallpaperwidehd.blogspot.com

Coreopsis

en.wikipedia.org

Marigolds

Gloriosa daisy

pixshark.com

California Sunflower (*Encelia*)

biophiliablog.wordpress.com

Attracting beneficials: Asteraceae (sunflower family)

Drought-tolerant California natives: Yarrow (*Achillea millefolium californica*)

www.suncrestnurseries.com

aggie-horticulture.tamu.edu

gardencoachpictures.wordpress.com

www.outsidepride.com

Dwarf/wooly yarrow

Check with nursery on natives and hybrids

www.suncrestnurseries.com

Attracting beneficials: Asteraceae (sunflower family)

Drought-tolerant California natives:

California Aster (*Aster chilensis*)

http://www.laspilitas.com

Desert Sunflower or Goldeneye
(*Viguiera* or *Bahiopsis*)

http://www.laspilitas.com

Mexican Bush Marigold
(*Tagetes lemmonii*)

http://www.smgrowers.com

California Goldenrod
(*Solidago californica*)

Attracting beneficials: Brassicaceae (mustard family)

Alyssum montanum

www.outsidepride.com

Good for rock gardens

Western wallflower
(Native)

www.laspilitas.com

Attracting beneficials: California natives

California buckwheat (*Eriogonum*)

- Attracts lacewings, hoverflies, ladybugs, and others
- Good for borders
- Sulfur buckwheat: shorter plant with yellow flowers
- Flowers dry, turn red in fall

www.laspilitas.com

Attracting beneficials: California natives

California lilac (*Ceanothus*)

- Especially good for hoverflies

Attracting beneficials: California natives

Coyote brush (*Baccharis*)

- Attracts hoverflies and lacewings

Attracting beneficials: California natives

Coyote brush (*Baccharis*)

Attracting beneficials: California natives

Hollyleaf cherry (*Prunus ilicifolia*)

- Attracts hoverflies and lacewings

Attracting beneficials: California natives

californianativegardendesign.blogspot.com

Baby blue eyes
(*Nemophila menziesii*)

- Attracts hoverflies

Attracting beneficials: California natives

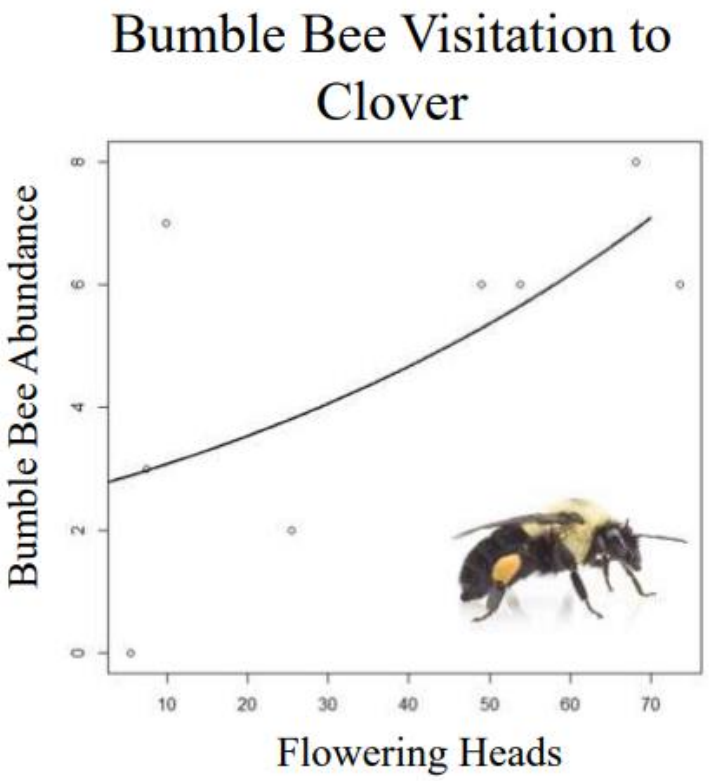
https://lashp.wordpress.com

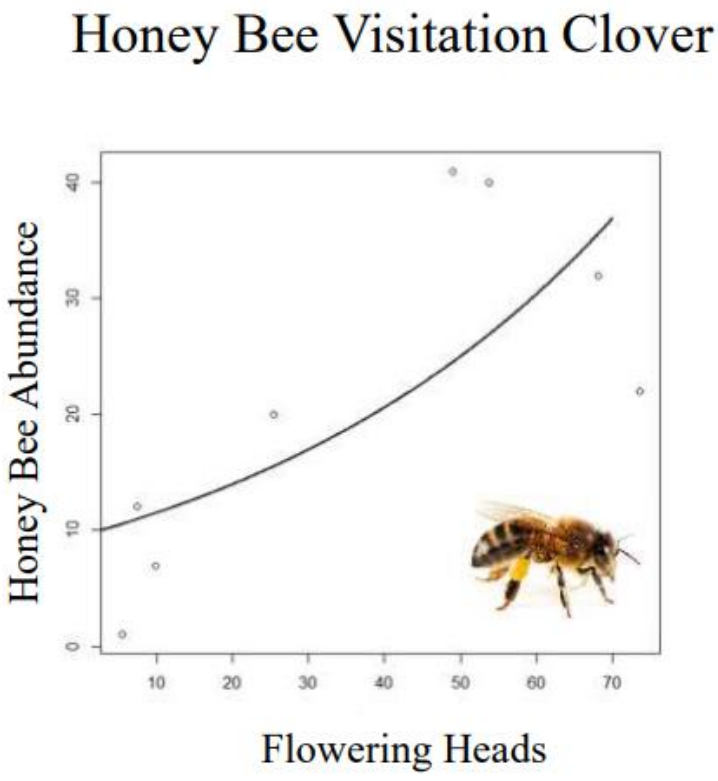
Lupines

- Attract ladybugs
- May also attract aphids

Leave some weeds?
Floral enrichment = food

Bee lawns





Lane, 2016, Bees and human landscapes: the turf lawn

Twitter: @ArkansasTurf

Not just flowers…

Attracting beneficials: California natives

Deer grass (*Muhlenbergia*)

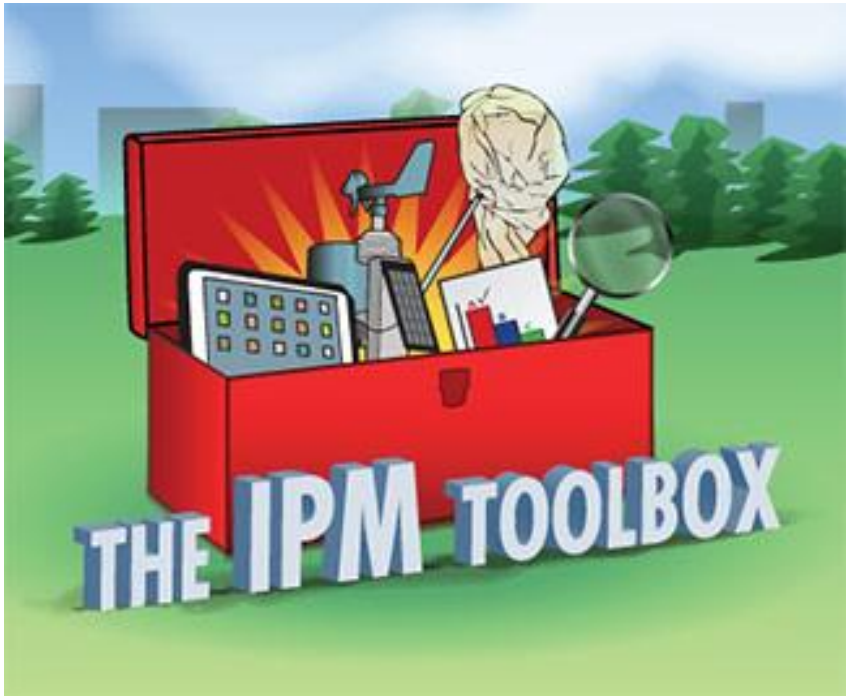
- Overwintering habitat for ladybugs

Questions about this section

Resources

IPM is not complicated!

But you need to know your pests and what IPM tools are available



Books

For vegetables, herbs, ornamental plants in home garden:

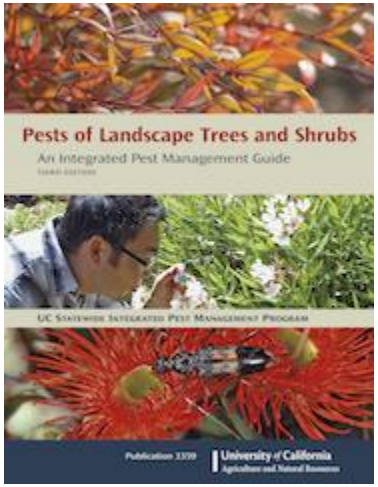
Pests of the Garden and Small Farm

(3rd edition, ANR publication #3332) $35

For woody ornamental plants:

Pests of Landscape Trees and Shrubs

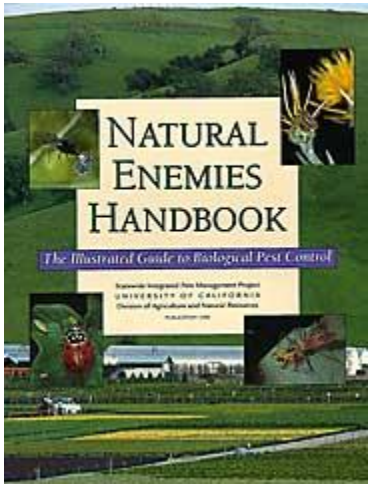
(3rd edition, ANR publication #3359) $37



Books

Natural Enemies Handbook: The Illustrated Guide to Biological Pest Control

(ANR publication #3386) $45



Comprehensive guide to biological control agents

Identify and understand the biology of beneficials that help control specific pests

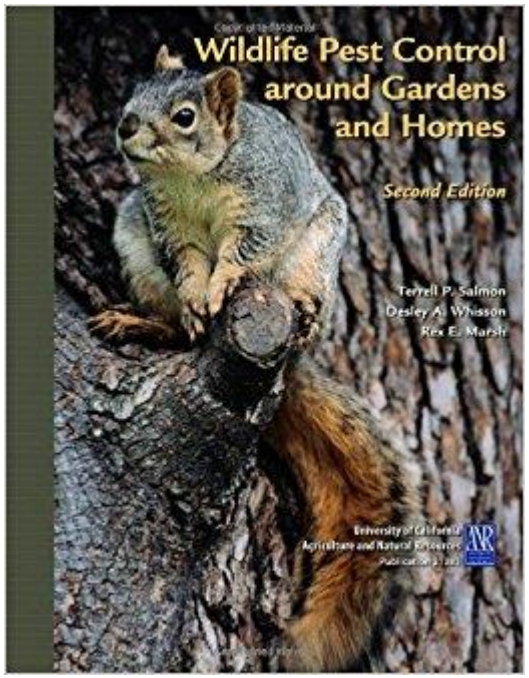
Quick Guide to easily match natural enemies with specific pests in your landscape

Books

For rodents, birds, other vertebrates:

Wildlife Pest Control around Gardens and Homes

(2nd edition, ANR publication #21385) $18



http://ipm.ucanr.edu/FAQ/natural-enemies-poster.pdf

Meet the Beneficials:

Natural Enemies of Garden Pests

Predators hunt, attack, and kill their prey. Encourage these natural enemies by avoiding pesticides that kill them; choosing plants that provide them pollen, nectar, and shelter; and keeping ants out of pest infested plants. Common predators that eat garden pests are pictured below.



Convergent lady beetles prefer to eat aphids but sometimes eat whiteflies and other soft-bodied insects. Shown here are the adult (left), larva (center), and cluster of eggs (right).

Green lacewing adults eat nectar and pollen. Some species also eat insects.

Green lacewing larvae feed on mites, eggs, and small insects, especially aphids.

Green lacewing eggs are laid on slender stalks in groups (as shown here) or individually.

Predaceous ground beetle adults stalk soil-dwelling insects, such as cutworms and root maggots.

Predaceous ground beetle larvae live on soil and in litter, feeding on almost any invertebrate.

Assassin bugs attack almost any insect.

Pirate bugs attack mites and any tiny insect, especially thrips.

Damsel bugs are predaceous on a wide variety of small insects.

Soldier beetle adults eat mostly aphids; their larvae are soil-dwelling.

Spiders, including this crab spider, attack all types of insects.

http://ipm.ucanr.edu/PDF/PESTNOTES/pnbiocontrol.pdf

BIOLOGICAL CONTROL AND NATURAL ENEMIES OF INVERTEBRATES

Integrated Pest Management for Home Gardeners and Landscape Professionals

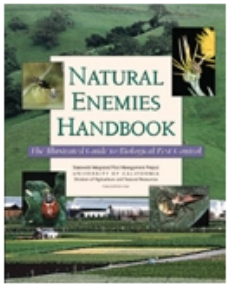
Biological control is the beneficial action of parasites, pathogens, and predators in managing pests and their damage. Biocontrol provided by these living organisms, collectively called "natural enemies," is especially important for reducing the numbers of pest insects and mites (Figure 1). Use of natural enemies for biological control of rangeland and wildland weeds (e.g., Klamath weed, St. Johnswort) is also effective. Plant pathogens, nematodes, and vertebrates also have many natural enemies, but this biological control is often harder to recognize, less well understood, and/or more difficult to manage. Conservation, augmentation, and classical biological control are tactics for harnessing natural enemies' benefits.

Figure 1. Adult convergent lady beetle feeding on aphids.

Figure 2. Parasitic wasp larvae (*Metaphycus*) visible through the surface of their scale insect host.

http://ipm.ucanr.edu/PMG/NE/index.html

Natural enemies gallery



Natural enemies are organisms that kill, decrease the reproductive potential of, or otherwise reduce the numbers of another organism. Natural enemies that limit pests are key components of integrated pest management programs. Important natural enemies of insect and mite pests include predators, parasites, and pathogens.

The UC IPM Natural Enemies Gallery includes natural enemy species commonly found on California farms and in landscapes. Additional species will be added over time.

For more information about natural enemies, purchase the Natural Enemies Handbook.

Predators | Parasites | List by order and family name | List by scientific name | List by pest

Additional resources

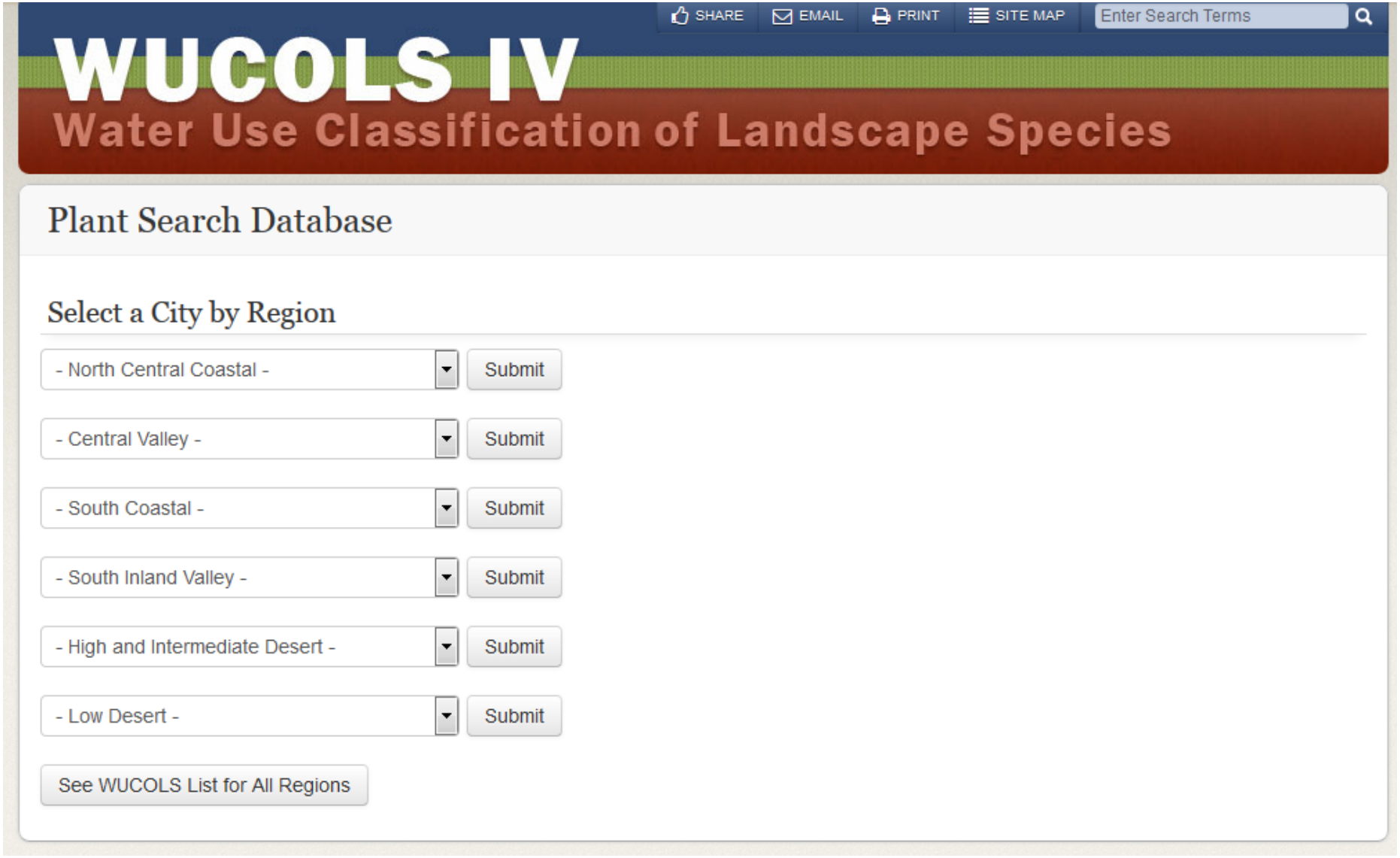
- Biological Control and Natural Enemies of Invertebrates Pest Note
- Video Narrated presentation on biological control (24 minutes)
- Poster: Meet the Beneficials: Natural Enemies of Garden Pests
- More biological control resources

Predators

A predator is an organism that attacks, kills, and feeds on several to many other individuals (its prey) in its lifetime.

Common name	Scientific name
Assassin bugs	Reduviidae family
Bigeyed bugs	*Geocoris* spp.
Brown lacewings	*Hemerobius* spp.
Convergent lady beetle	*Hippodamia convergens*

Resources for plant selection
http://ucanr.edu/sites/WUCOLS/



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ANR Publication 8498 | October 2013
http://anrcatalog.ucanr.edu
UC PEER REVIEWED

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How to Attract and Maintain Pollinators in Your Garden

Introduction

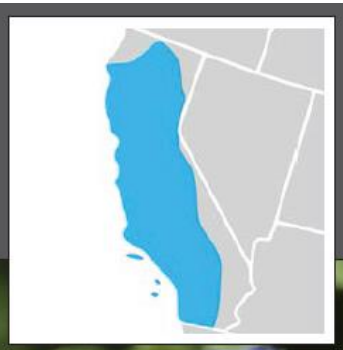
Nearly all ecosystems on earth depend on pollination of flowering plants for their existence and survival; furthermore, from 70 to 75 percent of the world's flowering plants and over one-third of the world's crop species depend on pollination for reproduction (Klein et al. 2007; NAS 2007). Take a stroll through your neighborhood or a botanical garden, or hike in the hills, and experience the shapes and smells of flowers surrounding you. When most people look at a flower, they notice the shape, smell, composition, or structure of the flower, but few take a moment to consider why the blossom appears and smells as it does (Frey 2001). Plants have evolved through time to offer unique flowers that attract select pollinators, thus ensuring that the pollinator's visits will provide them with another year of flowers and fruiting. The end result of the pollination process is that humans and animals of all kinds benefit from a bountiful supply of food and beauty (NAS 2007).

Photo: Kate Frey.

POLLINATOR PLANTS

California

XERCES SOCIETY
for Invertebrate Conservation



Application and transference

Conclusion

1. Establish diverse, native plants

2. Avoid pesticides