

Building and Maintaining A Pollinator Garden

A way to S.H.A.R.E.

Victoria Wojcik, Ph.D.
Associate Program Manager
Pollinator Partnership

POLLINATOR PARTNERSHIP

We know about pollinators in natural systems



POLLINATOR PARTNERSHIP

What pollinators needs to survive:



- Foraging habitat
- Nesting habitat/Shelter
- Water
- Lack of toxins and insecticides

POLLINATOR PARTNERSHIP

What do we know about pollinators in modified habitats ?



POLLINATOR PARTNERSHIP

What do we know about pollinators in modified habitats ?

Forage – very good data from many places

Mating – personal observations

Nesting – data generally lacking but bees must be nesting somewhere in the area

Species specific trends and behavior – some data on some species

POLLINATOR
PARTNERSHIP

Pollinators in Urban Landscapes

Nearly 50% of people live in cities.

By 2050 80% of the world population will live in cities.

POLLINATOR
PARTNERSHIP

The ecology of bees in urban landscapes matters



7

Pollinators in Urban Landscapes

- Present Globally (Studies from North America, Europe, Asia, South and Central America, Australia) – over 40 authors
- Urban areas can often be more diverse (Winfree et al.; Cane et al.)

POLLINATOR
PARTNERSHIP

Pollinators in Urban Landscapes

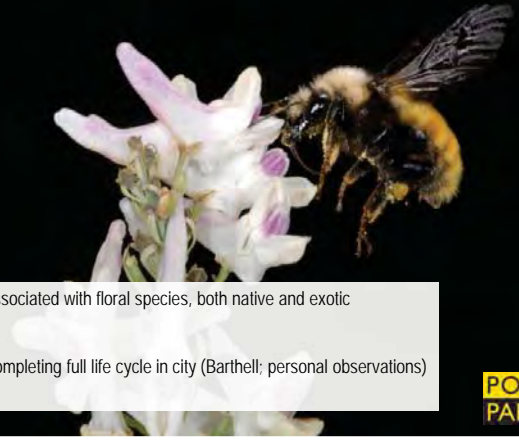
- Species of conservation/ag importance (Blue Orchard Bees, Honey Bees, Humming Birds, Bat)



POLLINATOR
PARTNERSHIP

Pollinators in Urban Landscapes

- Associated with floral species, both native and exotic
- Completing full life cycle in city (Barthell; personal observations)



POLLINATOR
PARTNERSHIP

Need to further define

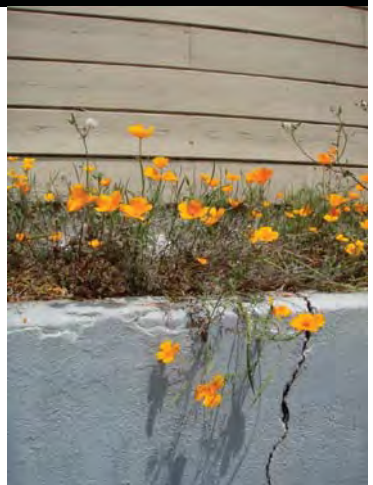
- Pollination systems
- Drivers of community structure
- Ecosystem services



POLLINATOR
PARTNERSHIP

California Poppy and bees: A model system for *in situ* study

- Is a local native – is present in natural landscapes for comparison
- Is abundant in urban landscapes – both planted and as an opportunist



Research Questions

- Are urban and natural land bee communities using CA poppies similar?
- What characterizes a more attractive resource patch?
- Is there anything unique about the urban landscape?



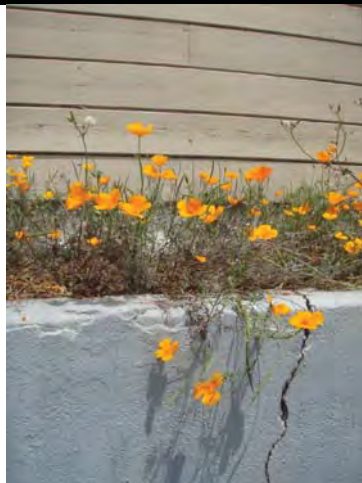
Actions

- Compare visitation rates (habitat usage) between urban and natural poppies to determine if there are any differences in the bee community.
- Assess the drivers of resource patch visitation in both urban and natural landscapes.
- Further investigate the impact of uniquely urban variables on bee visitation rates.



Bee visitors

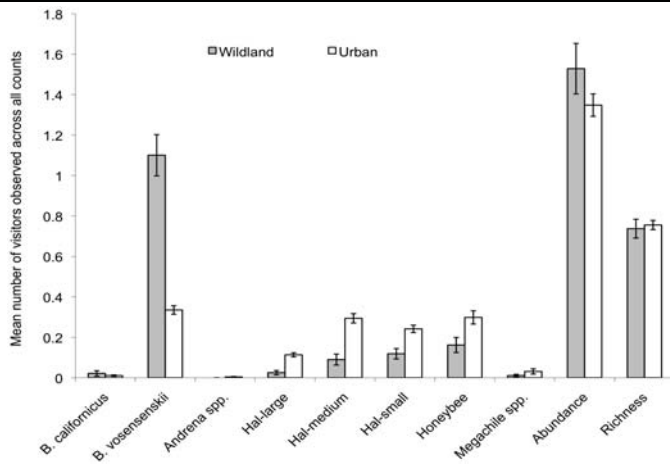
- *Bombus californicus*
- *Bombus vossenskii*
- *Apis mellifera*
- *Andrena* spp.
- *Megachile* spp.
- Halictids
 - Large (*Halicuts ligatus*, *H. rubicundus*, *Agapostemon texaus*)
 - Medium (*H. tripartitus*)
 - Small (*Lassioglossum* spp.)



General Results

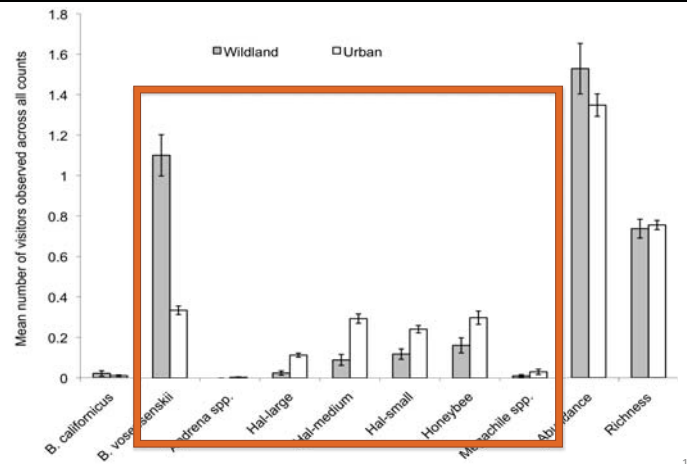
- Urban and Wild Land bee communities are different
- Urban and Wild Land bee communities respond to different factors
- Resource size and density is a dominant factor in urban landscapes, landuse is not.

Mean Abundance and Richness



17

Mean Abundance and Richness



18

Does Size Matter?



If every resident in Berkeley...

...planted one good bee plant in a flower pot...

...there would be 102,743 potential individual foraging and nesting sites scattered throughout the city.



**POLLINATOR
PARTNERSHIP**

**POLLINATOR
PARTNERSHIP**

If every household in Berkeley...

...had bee-appropriate landscaping...

Berkeley Area: 27.1 km² (10.5 sq mi)

Approximate number single family occupied units in Berkeley is 4000 and 26,000 renter occupied units (dividing by half for number of sites, 13,000)

Average landscaped area (2 x 5m) = 15 m²

(4000 + 13,000) x 15m² = 255,000 m² or 0.255 km² of bee nesting and foraging habitat.

...about 1% of Berkeley could be bee habitat.

Currently, only 7% of Berkeley is open space.

~ 14% increase!!!

POLLINATOR
PARTNERSHIP

Does Shape Matter?



POLLINATOR
PARTNERSHIP

Does Location
Matter?



Pollinator Gardens and Urban Agriculture –
Studies from New York and Brazil

Crop species are dependent on pollinator occurrence to fruit in urban areas. Pollinator gardening near community gardens increases urban agricultural yields (Matteson et al. 2008). Increasing the area of the crop in question also had an impact.



POLLINATOR
PARTNERSHIP

POLLINATOR
PARTNERSHIP

Pollinators are good neighbors and a great fit for every spot



Integrating pollinators into the activities of communities

Aesthetic Gardening

Agricultural Gardening

Cultural Gardening

Academic curriculum for pre-school, elementary schools and middle schools

Long term care facilities activity programs

Municipal beautification



**POLLINATOR
PARTNERSHIP**

How to S.H.A.R.E.

Simply Have Areas Reserved for the Environment



2. Provide Shelter

- Nesting blocks
- Wood
- Brambles
- Loose soil
- Bat boxes
- Leaves/host plants
- Open space

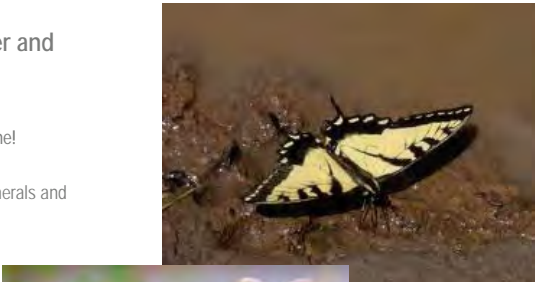


POLLINATOR
PARTNERSHIP

2. Provide water and
Substrates

Water – don't drown me!

Muddy water! For minerals and
nutrients.



POLLINATOR
PARTNERSHIP



Provide Structure

POLLINATOR
PARTNERSHIP



Pollinator Syndromes

"Pollinator Syndromes" describe flower characteristics, or traits, that may appeal to a particular type of pollinator. Such characteristics can be used to predict the type of pollinator that will aid the flower in successful reproduction. A combination of color, odor, quantity of nectar, location and type of pollen, and flower structure can each affect a potential pollinator's ability to locate a flower and its food resources.

Type of Pollinator								
Trait	Bat	Beet	Bee	Beetle	Bird	Butterfly	Fly	Moth
Color	White, green or purple	Bright white, yellow, black, or UV	White or green	Scarlet, orange, red or violet	Bright red and purple	Pale or dark brown, purple	Pale red, purple, pink or white	Pale green, brown, or colorless
Nectar guides	None	Present	None	None	Present	None	None	None
Odor	Strong and musky; emitted at night	Fresh, mild, pleasant	None to strongly fruity or foul	None	Faint but fresh	Putrid	Strong sweet; emitted at night	None
Nectar	Abundant; somewhat hidden	Usually present	Sometimes present	Ample; deeply hidden	Ample; deeply hidden	Usually absent	Ample; deeply hidden	None
Pollen	Ample	Limited; often sticky, scented	Ample	Limited	Limited	Limited	Limited	Abundant; small, smooth
Flower Shape	Bowl shaped; closed during day	Shallow; with landing platform; tubular	Large and bowl-shaped	Large, funnel-like; strong perch support	Narrow tube with spur; while landing past	Shallow; funnel-like or complex with trap	Regular; tubular without a lip	Regular and small

Photos credits: © Martin Tuttle, Tom Eason, Edward Ross, Ana Adams, Chris Carvalho, Paul Gossard

WWW.POLLINATOR.ORG

Plant the right plants. Make it a buffet all season long.

A general golden rule – plant at least three pollinator plant species that will bloom in each season (early Spring, Summer, and late Summer)

9 is the magic number

POLLINATOR
PARTNERSHIP

Plant the right plants. Native Plants or Non-Invasive Pollinator Plants

- Why Native Plants? Native plants build habitat for the greater ecosystem. They support sustainable growth that is productive for the animals and other plants in your area – the web of life that makes up the fabric of your unique ecoregion. They are what nature recommends!
- Finding Native Plants Take a plant list from the APP or the Ecoregional Guides and ask your local nursery to begin to stock more native plant species.

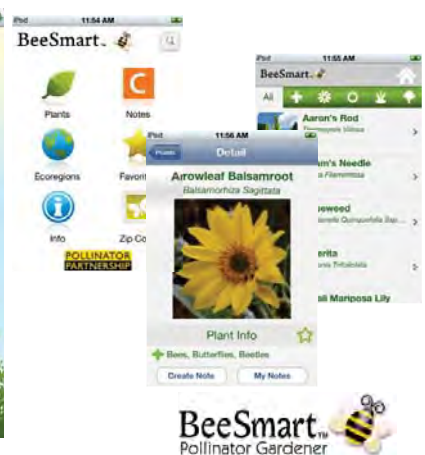
POLLINATOR
PARTNERSHIP

EcoRegional Planting Guides



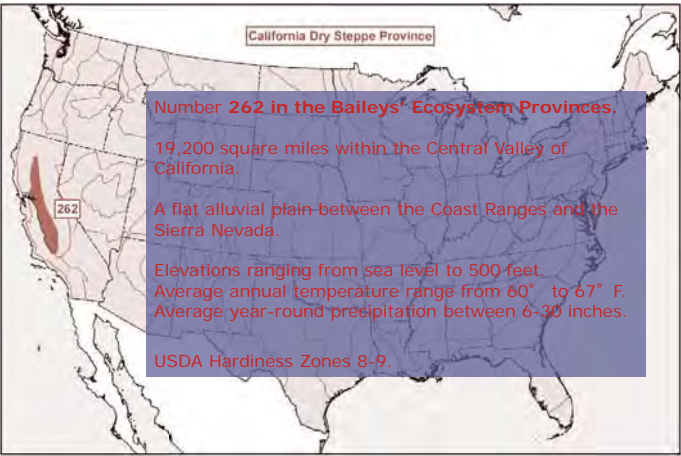
BeeSmart™ Pollinator Gardener App

<http://www.pollinator.org/beesmartapp.htm>





**POLLINATOR
PARTNERSHIP**



**POLLINATOR
PARTNERSHIP**



Pollinator Plants of the California Dry Steep

Botanical Name	Common Name	March	April	May	June	July	Aug	Sept
Trees & Shrubs								
<i>Aesculus californica</i>	California Buckeye		pinkish white	pinkish white				
<i>Cornus glabrata</i>	Brown dogwood		white	white				
<i>Cornus nuttallii</i>	Pacific Dogwood							
<i>Frangula californica</i> ssp. <i>californica</i>	Coffeberry			greenish	greenish			
<i>Frangula tomentella</i>	Hoary Coffeberry							
<i>Heteromeles arbutifolia</i>	Toyon				white	white	white	
<i>Prunus ilicifolia</i>	Hollyleaf Cherry	white						
<i>Rhamnus ilicifolia</i>	Hollyleaf Redberry				pale pink			
<i>Ribes aureum</i>	golden current		maroon - white	maroon - white				
<i>Rosa californica</i>	California Rose							
<i>Salix exigua</i>	Narrowleaf Willow		cream white	cream white				
<i>Salix gooddingii</i>	San Joaquin Willow		cream white	cream white				
<i>Salvia carduacea</i>	Thistle Sage			lavender	lavender			
<i>Salvia spathacea</i>	Hummingbird Sage			white to pale blue	white to pale blue			
<i>Sambucus nigra</i> ssp. <i>canadensis</i>	American Black Elderberry							
<i>Trichostema lanceolatum</i>	Vinegar Weed			violet	violet	violet	violet	

Pollinator Plants of the California Dry Steep

Perennial Flowers								
<i>Achillea millefolium</i> var. <i>californica</i>	Yarrow			white	white	white	white	
<i>Allium crispum</i>	Crinkled Onion							
<i>Aristolochia californica</i>	California Dutchman's Pipe							
<i>Asclepias californica</i>	California Milkweed				violet			
<i>Asclepias eriocarpa</i>	Woolpod Milkweed				creamy white and pale pinkish white	creamy white and pale pinkish white	creamy white and pale pinkish white	
<i>Asclepias fascicularis</i>	Narrowleaf Milkweed				creamy white	creamy white		
<i>Calandrinia ciliata</i>	Red Maids							
<i>Calochortus clavatus</i> var. <i>pallidus</i>	Yellow mariposa		yellow	yellow	yellow			

Pollinator Plants of the California Dry Steep

<i>Camissonia palmeri</i>	Palmer Evening Primrose							
<i>Cakile unguiculata</i>	Elegant clarkia			pink	pink			
<i>Delphinium cardinale</i>	Scarlet Larkspur	dark red	dark red					
<i>Dodecatheon clelandii</i>	Padre's Shooting Star		pale purple	pale purple				
<i>Eschscholzia californica</i>	California Poppy	orange-yellow	orange-yellow	orange-yellow	orange-yellow			
<i>Eriodictyon californicum</i>	Yerba Santa		lavender pink	lavender pink	lavender pink			
<i>Gilia capitata</i>	Bluehead Gilia		blue	blue				
<i>Helenium puberulum</i>	Rosilla			yellow	yellow	yellow	yellow	
<i>Hesperoyucca whipplei</i>	Chaparral yucca		white	white	white			
<i>Heterotheca grandiflora</i>	Telegraph Weed		yellow	yellow	yellow	yellow	yellow	yellow
<i>Koeckelia breviflora</i>	Bush Beardtongue		yellow	yellow				
<i>Lathyrus jepsonii</i>	Delta Tule Pea		white to pale pink	white to pale pink	white to pale pink			
<i>Lilium pardalinum</i>	Leopard Lily							
<i>Linum lewisii</i>	Blue Flax							
<i>Lupinus formosus</i>	Summer Lupine	blue	blue	blue				
<i>Mimulus cardinalis</i>	Scarlet Monkeyflower		red	red				

Pollinator Plants of the California Dry Steep

<i>Monardella leucocephala</i>	Merced Monardella							
<i>Oenothera deltoides</i>	Birdcage Evening Primrose	white	white					
<i>Penstemon centranthifolius</i>	Scarlet Bugler		red	red				
<i>Penstemon heterophyllus</i>	Foothill Penstemon		blue	blue				
<i>Phacelia imbricata</i>	Imbricate Phacelia		white	white				
<i>Potentilla glandulosa</i>	Sticky cinquefoil		creamy yellow	creamy yellow	creamy yellow	creamy yellow	creamy yellow	
<i>Ranunculus californicus</i>	California buttercup		yellow	yellow				
<i>Salvia caruacea</i>	Thistle Sage	pale lavender	pale lavender	pale lavender	pale lavender			
<i>Salvia columbariae</i>	Chia	blue	blue	blue	blue			
<i>Saxifraga californica</i>	California saxifrage	white	white	white				
<i>Sidalcea malviflora</i>	Dwarf Chkerbloom			pink	pink			
<i>Silene laciniata</i>	Cardinal Catchfly		red	red	red			
<i>Solidago californica</i>	California Goldenrod						yellow	yellow
<i>Stachys pycnantha</i>	Shortspike Hedge-nettle		white purple	white purple	white purple	white purple		
<i>Verbena lasiostachys</i>	Western Vervain				blue	blue		

The Bee List 11 plants that you can find anywhere that are for the bees! (with USDA Hardness Zones)

- *Lavandula* spp. (Lavender)
Z5-9
- *Rosemarinus officinalis* (Rosemary)
Z6-10
- *Salvia* spp. (Sage)
Z3-10
- *Echinacea* spp. (Coneflower)
Z3-9
- *Helianthus* spp. (Sunflower)
Z3-8
- *Nepeta* spp. (Catnip)
Z3-8
- *Penstemon* spp. (Penstemon)
Z3-9

- *Verbena* spp. (Verbena)
Z3-10
- *Monarda* spp. (Beebalm)
Z3-10
- *Aster* spp. (Aster)
Z3-9
- *Rudbeckia* spp. (Black-eyed Susan)
Z3-9
- *Origanum* spp. (Oregano)
Z5-10
- *Achillea millefolium* (Yarrow)
Z3-10

POLLINATOR PARTNERSHIP

Consider Monarchs – Especially in California



90% population decline in a decade

Unique species with an endangered phenomenon

Milkweed and nectar is key

A good California Milkweed:
Asclepias speciosa

**POLLINATOR
PARTNERSHIP**

Maintenance – Keeping out the Weeds and Pests

- Weed by hand
- Mulch to Prevent weeds naturally – but leave some open space for nesting
- Use chemicals as a last resort

**POLLINATOR
PARTNERSHIP**

Pesticides and Pollinators



**POLLINATOR
PARTNERSHIP**

Pesticide Toxicity

Insecticides: potentially the most toxic because most pollinators are insects.

Fungicides and herbicides: do not normally kill pollinators directly. Pollinators may be indirectly harmed when herbicides destroy the flowers.

Nematicides and miticides: toxic to pollinators

Rodenticides: may be toxic to bat and bird pollinators

**POLLINATOR
PARTNERSHIP**

Pesticide Toxicity

The EPA measures a pesticide's toxicity to bees by:

- The dose that causes death of bees; and
- How long the pesticide can affect bees after it has been applied to plants.

POLLINATOR
PARTNERSHIP

EPA assesses the bee toxicity using three types of studies

Honey Bee Acute Contact LD50 - a lab study determines the amount of pesticide that kills 50% of a test group of bees.

Honey Bee - Toxicity of Residues on Foliage - a lab test determines the amount of time that pesticide residues on leaves remain toxic to honey bees.

Field Testing for Pollinators may be required if the above tests indicate adverse effects on bees.

POLLINATOR
PARTNERSHIP

Toxicity Groups


- LD50 of the pesticide is greater than 11 micrograms per bee (**Toxicity Group III**), it is relatively nontoxic, and no bee caution statement is required on the label.
- LD50 is less than 11 but greater than 2 micrograms per bee, it is classified as **Toxicity Category II**, "toxic to bees."
- LD50 is less than or equal to 2 micrograms per bee, it is classified as **Toxicity Category I**, "highly toxic to bees."

POLLINATOR
PARTNERSHIP

Advice for Home Use



POLLINATOR
PARTNERSHIP



Use Integrated Pest Management (IPM) around the home.

- Where possible, avoid pest problems in the first place by burying infested plant residues, removing pest habitat, and planting disease and pest-resistant plant varieties.
- Carefully diagnose your pest problem, and, before you apply a pesticide, make sure the pest population has reached a level where control is necessary.

POLLINATOR
PARTNERSHIP



Use Integrated Pest Management (IPM) around the home.

- Carefully evaluate your pest control options, and use a combination of pest control techniques if appropriate – these may include beneficial insects, manual removal, traps, a pesticide, etc.
- Plant native flowering plant species to support pollinators, choosing species that are naturally resistant to insect pests.

POLLINATOR
PARTNERSHIP



Avoid Drift and Runoff

Keep the pesticide on the pest problem:

- don't spray when it is windy;
- don't spray when rain is in the forecast;

and

- spray only the pest-infested area, avoiding hard surfaces such as sidewalks or your driveway.

POLLINATOR
PARTNERSHIP



Avoid Spraying Pollinators

If the pesticide label contains a caution to avoid "actively visiting" bees, apply before dawn or near sunset.


POLLINATOR
PARTNERSHIP



Avoid Subsequent Pollinator Damage

- If the pesticide label contains a caution to avoid "visiting" bees, do not apply the pesticide on blooming flowers.
- Pesticides with this caution last longer than 8 hours.

POLLINATOR
PARTNERSHIP



Pollinators make great pets, so get some today!

www.pollinator.org

415-362-1137

vw@pollinator.org

POLLINATOR
PARTNERSHIP