

Why do we need pollinators?



➤ Since plants are rooted to the ground they require a vector to move pollen between flowers.



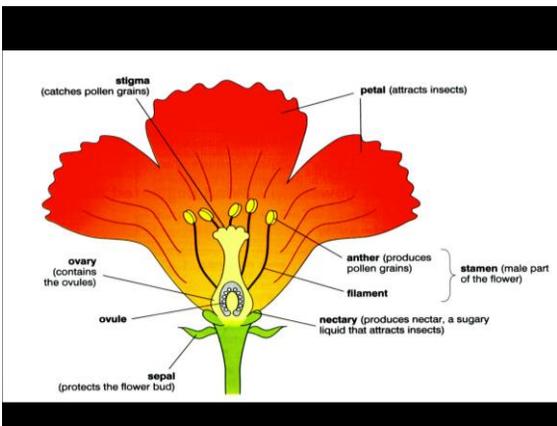
Wind:

Not precise; requires lots of pollen

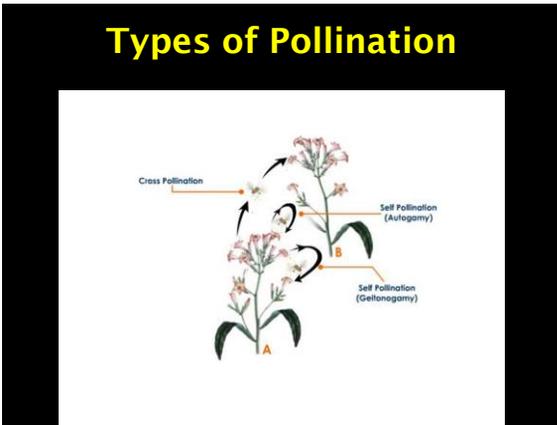


Animal:

Directed movement, but requires motivation







Pitahaya Flowers

- Most pitahaya varieties require CROSS Pollination
- Their flowers attract night pollinators
 - Bats
 - Moths
- Pollination could be a problem for growers



- Need to either hand pollinate or increase pollinators in your area & save you the work.



Bees keep the world turning

- ~90% of all flowering plants require animal pollination
- Bee's are regarded as 'keystone organisms'
- Bees are also the largest group of pollinators



Bees as crop pollinators

- Honey bees are the more commonly used bee ...



Bees as crop pollinators

- Honey bees are the more commonly used bee ...but they are not always the best pollinators for all crops



- Bumblebees are commonly used in greenhouses to pollinate tomatoes & peppers.
- They are also better pollinators for solanaceae & vaccinium
- These plants require "buzz pollination"



Buzz Pollination

- Technique used by some bees to release pollen firmly held by anthers of some plants
- Vibrate their flight muscles rapidly to dislodge the pollen
- Honey bees DO NOT buzz pollinate



- Alkali bees (*Nomia melanderi*) & alfalfa leaf-cutting bees (*Megachile rotundata*) are used for pollinating alfalfa
- Honey bees do not like the flower trip and learn to rob instead of pollinate



- Mason bees (*Osmia sp.*) are used in small orchards & fields for pollination of:
 - Apples, Apricots, Peaches, Plums, Cherries & Pears
 - Raspberries & Blackberries
- Currently used in CA almond pollination alongside honey bees.
- Research into mass rearing being conducted by several companies/organizations



Pollinator Diversity in California

- ~1,500 native bee species  ★
- >117 butterfly species 
- >55 moth species  ★
- 14 species of hummingbirds 
- 27 species of bats  ★

Bee Diversity

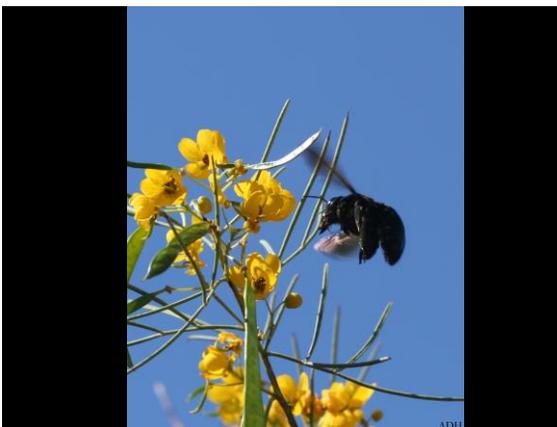
- > The honey bee is the most commonly recognized bee
- > How many bee species in the world?



Bee Diversity

- > The honey bee is the most commonly recognized bee
- > There are ~25,000 species of bees in the world
 - > ~1,500 species in California alone!

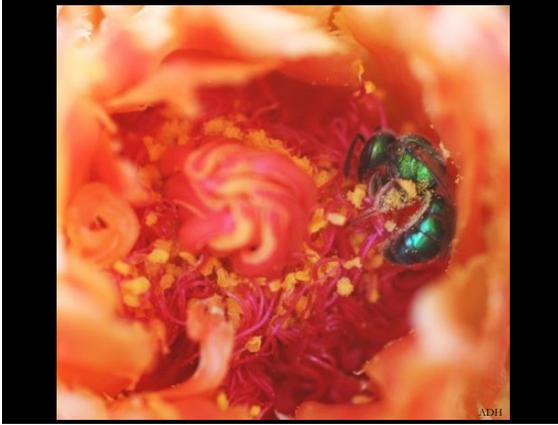










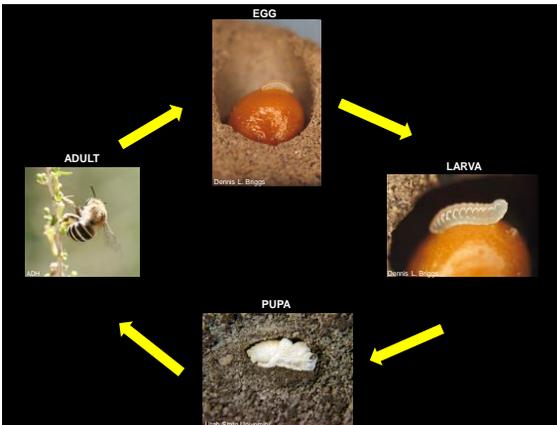








What's a bee's Lifecycle?



What's the difference between native & honey bees?

Lifestyle...

Honey bees

- Social
- Division of labor within the colony
 - Queen (egg layer)
 - Workers (sterile daughters)
 - Drones (males)
- Honey production



Natives

- Most are not social
 - No queen
 - No workers
 - No cooperation
- Each female bee constructs her own nest, searches for food, and provisions her own offspring
- No honey production



- **Honey bee colonies** are active year round
 - Reduce activity during the winter
 - Overlapping generations
- **Native bees** are seasonal
 - Generations differ depending on species
 - Univoltine (1 per year)
 - Bivoltine (2 per year)
 - Semivoltine (1 every 2 years)



Living space...

- Honey bees live in a hive & construct a comb



- Natives don't live in hives
- 70% nest in the ground



- 30% nest above ground in cavities
 - Dried plant stems/stalks
 - Wood
 - Logs
 - Dead branches
 - Artificial nests



What can you do to increase native bees in your gardens?

- Food



- Shelter & nesting material



Nesting Material For Cavity Nesting Bees

- Logs or dead branches



Nesting Material For Cavity Nesting Bees

- Wooden block with drilled holes
- Directions on the handout



Nesting Material For Cavity Nesting Bees

- Reed or straw bundles



Nesting Material For Cavity Nesting Bees

- Leaves for leaf cutter bees



Nesting Material For Cavity Nesting Bees

- > Mud for cell divisions & to cap nests
- > Small pebbles for cell division & to cap nests



Nesting Material For Ground Nesting Bees

- > Bare ground
- > Sand-Loam
- > A few feet across
- > Sunny location



- > Use Integrated Pest Management (IPM) when dealing with garden pests

Establish Native Gardens!

- > Native bees have a long history with local plants
- > Some can only use specific pollen



- > Plant native shrubs, trees, and annuals!



Native Wildflowers



Yarrow



Pacific Bleeding Heart



Silver Lupine



California Poppy



Dwarf Checkerbloom



Mountain Blue Penstemon

Native Tree's & Shrubs



Blueblossom



Black Sage



California False Indigo

Good Habitat

- Habitat patches that are closer to each other are more attractive
- Full sun is best
 - 1/2 full sun can also work
- Caution with pesticide applications
- Cover crops also work as pollinator forage (clover, phacelia, buckwheat, etc.)

4 Steps to Success

- Recognize existing pollinator habitat that is already present
- Protect that habitat
- Provide new habitat
 - Choose plants that need minimal maintenance
- Manage the land in ways that mitigate pollinator disturbance

Thank you for your attention!



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