Understanding and sustaining insect pollinators in your garden

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Presented for EMSWCD

Yellow-faced bumble bee; C.A.S. Mazzacano © 2017 C. A. Searles Mazzacano

Insect Pollinators

A. Importance of pollinators
B. Cast of characters
C. Creating habitat
D. Sustaining habitat
E. Projects & resources

Why are pollinators important?

• pollination: transfer of pollen within or between flowers for fertilization, seed & fruit set
• wind, insects, birds, mammals

Why are pollinators important?

• 70% of flowering plants pollinated by insects
  - most pollinated by bees
• 87 of 115 leading US food crops depend on insect pollinators

Importance of bees to food production
(from Wilson & Carrill, 2016)
Who pollinates?

More than insects!!!!!

- Bats
- Hummingbirds

Who pollinates?

More than bees!!!!!

- Wasps
- Flies
- Beetles
- Moths & butterflies

Who pollinates?

More than European honey bees!!!!!!

- > 4,000 spp. of native bees in North America
  - bumble, mining, mason, leafcutter, orchard, sweat, digger, and carpenter bees

Who pollinates?

“Managed” bees are economically important

- honey bees, bumble bees, orchard mason bees, alfalfa leafcutter bees
Challenges for pollinators

Many stressors

- habitat loss
- pesticides
- diseases (viruses, fungi, bacteria)
- parasites (varroa mite, tracheal mite)

Challenges for pollinators

- Colony Collapse Disorder (2006) in managed honey bee hives
- many bumble bees are also declining
- much less known about status of other wild bees

Challenges for pollinators

- managed bees may spread & intensify disease in wild bees
- wild bees pollinate many plants more efficiently than honey bees

Challenges for pollinators

Center for Biological Diversity (2017)

- 749 of 1,437 native bee species assessed are declining (52%)
- many more species lacked population data to assess
- habitat loss, pesticides, climate change, urbanization
Types of flowers pollinated vary
- short- vs. long-tongued bees
- generalist vs. specialist foragers

Not all bees are pollinators
- nest parasites (cuckoo bees)
- “nectar robbers”
Social vs. solitary bees

- **solitary**: each female builds & provisions own nest
- **social**: shared nests, castes with different roles

Social (honey bees, bumble bees, some sweat bees)

- several generations at one time in colony or nest
- members care for offspring that aren’t theirs
- division of labor

Bees

- Carpenter, bumble, squash, long-horned, and honey bees (Apidae)
- Sweat bees (Halictidae)
- Mining bees (Andrenidae)
- Mason, carder, leaf-cutter bees (Megachilidae)
- Polyester & yellow-faced bees (Colletidae)
- Oil-collecting bees (Melittidae)
Bees

Honey bees (*Apis mellifera*)
- medium size; hairy body & eyes
- brown/black with golden bands
- visit a variety of flowers
- carry pollen in corbiculae
- less effective pollinators for some crops than many native bees

Bumble bees (*Bombus*)
- medium to large; robust, hairy
- yellow, black, orange, white, or brown hair bands
- carry pollen & nectar mix in stiff hairs (scopa) in concave basket on hind legs (corbiculum)
Bees

Bumble bees (*Bombus*)
- visit wide range of plants
- active in cooler, wetter weather than honey bees can tolerate
- buzz pollination

Sweat bees (Halictidae)
- range of sizes & colors
- may be metallic, striped
- short-tongued
- carry pollen on hind legs
- most are ground-nesting; varying sociality
Bees

• Mining bees (Andrenidae)
  - range of sizes & colors
  - red, orange, cream, dark blue, striped
  - short-tongued
  - carry pollen on hind legs
  - ground-nesting

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Perdita minima; Jillian Cowles, Discover Life
Proturaea picta; Robert Behrstock, Discover Life

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Bees

• Leafcutter, carder, mason, and resin bees (Megachilidae)
  - small to medium
  - moderately hairy head & thorax
  - robust, cylindrical; yellow & black stripes/spots, brilliant metallic colors
  - long-tongued

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Anthidium; Anita Gould, iNaturalist
Atoposmia copelandica; Laurence Packer, Discover Life
Ashmeadiella xenomastax; Hartmut Wisch, Discover Life

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Bees

• Leafcutter, carder, mason, and resin bees (Megachilidae)
  - carry pollen beneath abdomen
  - solitary nesters in existing tunnels in soil, wood, stems

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Megachile rotundata; spider-bite, iNaturalist
Mason, carder, resin, & leafcutter bees

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**Wasps**

**Wasps vs. bees**
- less hairy
- more pronounced “waist”
- brighter color patterns
- most are predators, but some types feed young on pollen & nectar

**Flies**

**Flies vs. bees**
- only 1 pair of wings that stick out to side when perched
- big round eyes dominate head
- shorter, thinner antennae
- may be bare or hairy

**Wasps**

**Pollen wasps (*Pseudomasaris*)**
- black or brown; yellow, white or red bands; clubbed antennae
- pollen & nectar in internal crop
- solitary nesters

**Flies**

**Flower flies (Syrphidae) & bee flies (Bombyliidae)**
- bee & wasp mimics
- adults eat nectar, pollen, honeydew
- larvae predators (flower fly) or parasites (bee fly)
Beetles

- adults eat nectar, pollen, and often other insects
- bright colors & patterns
- larvae may be predators, wood-borers, or parasites

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Beetles

- Soldier Beetles (Cantharidae)
- Long-horned Beetles (Cerambycidae)
- Blister Beetles (Meloidae)
- Flower Scarabs (Scarabaeidae)

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Beetles

- Checkered Beetle (Cleridae)
- Soft-winged Flower Beetle (Melyridae)
- Tumbling Flower Beetle (Mordellidae)

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Moths & Butterflies

Butterflies

- perch with wings held vertically
- sip nectar with long, straw-like proboscis

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Moths & Butterflies

Moths
• feathery antennae; wings rooflike or flat when perched
• often night-flying
• can be important pollinators of night-blooming plants

Creating habitat

Planting for pollinators

• Nectar & pollen sources
  - diverse
  - long bloom time
  - native plants
  - species groupings
  - low & tall plants

Planting for pollinators

Flowers for bees
• purple, yellow, blue flowers; often sweet-scented
• nectar-rich
• landing platform
Planting for pollinators

Flowers for bees

- may reflect UV light
- can have nectar guides
- often with bilateral symmetry

Flowers for beetles

- long-tongued bees can access tubular flowers (penstemon, foxglove)
- dull white, green, or reddish flowers; can smell fruity, spicy, or bad
- often with open bowl shape; may lack nectar
- magnolia, aster, sunflower, rose, goldenrod, Spirea
Planting for pollinators

Flowers for flies
- small shallow flowers
- drab; pale or brown/purple
- bad odor
- elderberry, skunk cabbage

Flowers for butterflies
- composite flowers; orange, yellow, pink, blue
- perching platform
- light scent
- sages, manzanita, trumpet flower, rock cress

Flowers for moths
- white or pale flowers in clusters
- open late afternoon or night
- strong sweet smell
- pink honeysuckle, evening primrose, yucca

Spring bloom with natives
- red-flowering currant, vine maple, western crabapple, Scouler’s willow, red twig dogwood, Oregon grape, kinnikinnik, camas, globe gilia
Planting for pollinators

Summer bloom with natives

- mock orange, twinberry, salal, lupine, Douglas & birch-leaved spirea, native roses and berries, showy milkweed, Oregon sunshine, penstemon

C.A.S. Mazzacano

Penstemon; Portland Nursery

C.A.S. Mazzacano

Oregon sunshine; Portland Nursery

C.A.S. Mazzacano

Planting for pollinators

Late summer/fall bloom with natives

- Douglas’ aster, Canada goldenrod, coyote brush, pearly everlasting, seaside daisy, Oregon stonecrop

Douglas’ aster; nwplants.com

Canada goldenrod; Univ. of Waterloo

Coyote brush; calflora.net

Beyond the bloom

- water & nutrients
  - safe access for small insects
  - “puddling” sources for butterflies
- sun
  - warming in the morning, refuge in the afternoon

Western Tiger Swallowtails “puddling” for minerals; C.A.S. Mazzacano

Beneficial insect “bath”

Beyond the bloom

- shelter & nesting sites
  - dead snags (mason & leafcutter bees)
  - rotting logs (sweat bees, flower flies)
  - old rodent burrows (bumble bees)

Standing snag; C.A.S. Mazzacano
Beyond the bloom

- shelter & nesting sites
  - rock & brush piles (beetles, caterpillars, pupae)
  - undisturbed soil (ground-nesting bees, beetle & fly larvae)
  - grass clumps (nesting & overwintering)

Sustaining habitat

Integrated pest management (IPM):

- ecosystem-based strategy
- long-term prevention of pests/damage using multiple techniques
  - biological control, habitat manipulation, planting & watering practices, pest-resistant varieties
  - preserve natural system as much as possible

Beyond the bloom

- Nesting & egg-laying sites
  - stem bundles & bee blocks
  - open at 1 end only
  - tunnels <1/4” diameter, 3-5” deep; if >1/4”, then 5-6” deep

Sustaining habitat

- build healthy soil
- proper plant placement & irrigation
- plant mostly natives
- “scout” your gardens
- tolerate some damage
Sustaining habitat

- Reduce/eliminate pesticides
  - disrupts natural enemies
  - pests faster to disperse & re-colonize treated areas than natural enemies

Creating & maintaining habitat

- IF pesticides used, treat to suppress target organism only
- minimize risks to human health, non-target organisms, & environment
- use least toxic alternative (insecticidal oils & soaps, microbials)

Creating & maintaining habitat

- can plant as seeds or starts
- soil preparation & weed control important during establishment

<table>
<thead>
<tr>
<th>Common name</th>
<th>Bloom Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>meadowfoam*</td>
<td>summer</td>
</tr>
<tr>
<td>globe gilia*</td>
<td>spring</td>
</tr>
<tr>
<td>meadowfoam*</td>
<td>spring</td>
</tr>
<tr>
<td>farewell-to-spring*</td>
<td>early summer</td>
</tr>
<tr>
<td>Phacelia</td>
<td>late summer</td>
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<tr>
<td>yarrow</td>
<td>summer</td>
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<td>Oregon sunshine</td>
<td>summer</td>
</tr>
<tr>
<td>showy milkweed</td>
<td>summer</td>
</tr>
<tr>
<td>lupine</td>
<td>summer</td>
</tr>
<tr>
<td>Douglas aster</td>
<td>fall</td>
</tr>
<tr>
<td>Canada goldenrod</td>
<td>fall</td>
</tr>
<tr>
<td>blue wild rye</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*annual
Creating & maintaining habitat

Laren Leland, Portland OR

- create planting plan
- prepare planting area
- plant, mulch, water, monitor

Creating & maintaining habitat

Laren Leland, Portland OR

- exhaust weed seed bank
  - till-water-mow-weed
    (hand pull, spot-treat)

Fabian Menalled, MSU Extension, MT

Creating & maintaining habitat

Prepare planting area

- sheet composting, a.k.a. “lasagna bed”
- solarization
  - clear plastic = soil sterilization
  - black plastic = kills grass

Sustainable Living Center Oregon

Creating & maintaining habitat

Seeding

- aerial/broadcast or seed drill
- even distribution, good contact with soil
- mix with bulking agent (sand, sawdust)
- seed from 2 different directions

Texas A&M Univ.

UC Master Gardener-Sonoma Co.
Creating & maintaining habitat

Seeding

• sow perennial seeds in early fall in PNW (Sept. to mid-Oct.)

• 2 oz wildflower seed per 1000 sq. ft

Texas A&M Univ.

wildflower seed mix;
Central Coast gardening
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Creating & maintaining habitat

pollinator demonstration garden

spring

early summer

late summer

Creating & maintaining habitat

native pollinator garden, Los Angeles CA; Carol Bernstein

OSU Extension

Pollinator pathway; Kim Smith Design

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Creating & maintaining habitat

central CA pollinator garden; Megan O’Donald

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Creating & maintaining habitat

bee blocks; Oregon Metro

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Resources

- **Great Sunflower Project**
- **Encyclopedia of Life**
- **Koch, Strange, & Williams; USFS**

Resources

- **Pocket Field Guide: Native Bees of the Willamette Valley**
- **Common Bee Pollinators of Oregon Crops**
- **Wild Bee Gardens**

Resources

- **California Natural History Guides**
- **Great Sunflower Project**
- **Encyclopedia of Life**

Resources

- **Meadworscaping**
- **Bringing Nature Home**
- **Attracting Native Pollinators**
- **Pollinator Friendly Gardening**

Resources

- **Gardening for Birds, Butterflies & Bees**
- **OSU**: entomology.oregonstate.edu

Resources

- **www.oregon.gov/ODA**
- **$3.99; iOS only**
Resources

Visit emswcd.org to find more workshops and resources!

* annual plant sale!

Questions?

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