

**Planting for  
Pollinators:  
Who are they  
and what do we  
do about it?**

**Jen Hayes &  
Nicole Bell**



Photo by Devon Johnson

**Jen Hayes**  
PhD Candidate



**Nicole Bell**  
M.S. Student



# Outline

- Introduction to Native Bees
- Urban Garden Bees with Nicole
- Native Plants with Jen
- Key Takeaways
- Walkabout! Netting, talking plants, etc.
- Q&A



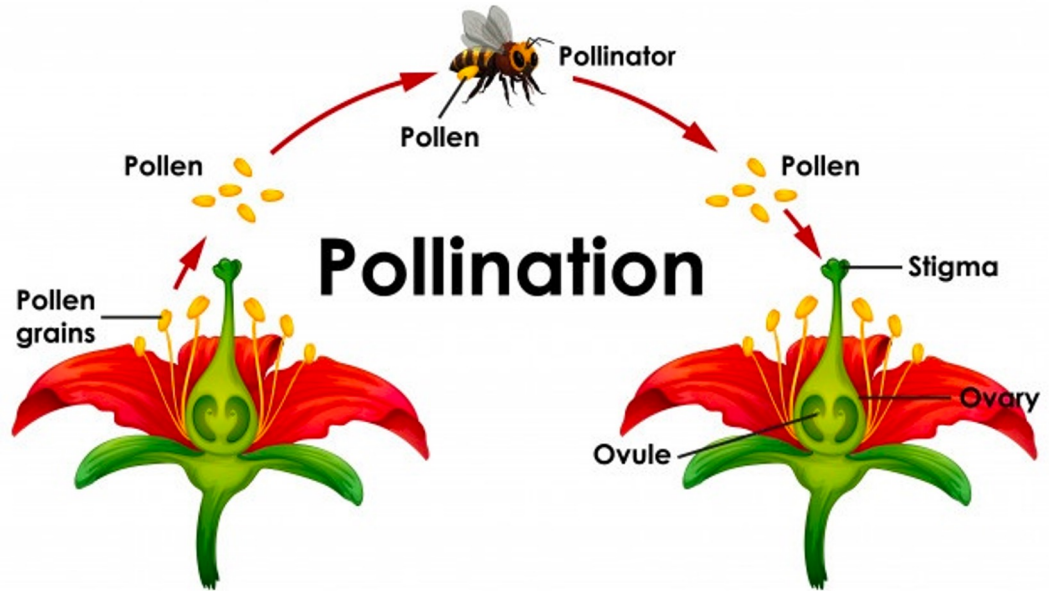
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# Pollination is important!

- Animals pollinate 87% of flowering plant species<sup>1</sup>
- Majority of this animal-mediated pollination is conferred by bees<sup>2</sup>
- Other insect pollinators (butterflies, flies) make relatively little contribution to pollination services<sup>3,4</sup>



1. Ollerton et al. 2011
2. Christmann 2019
3. Barrios et al. 2016
4. Földesi et al. 2021

# What makes bees such great pollinators?

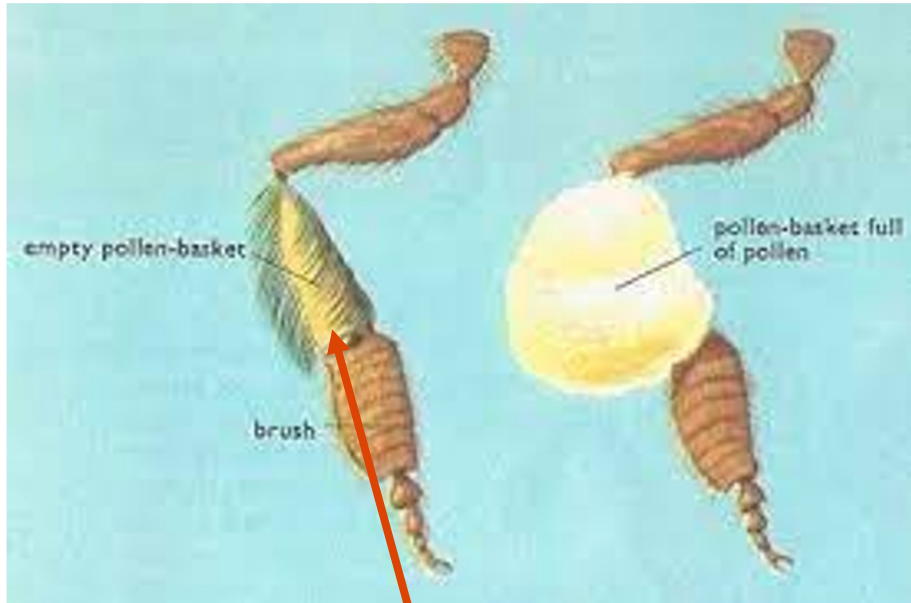


Photo: Exotic Bee ID

**Corbicula**



Photo: Florida Wildflower Foundation

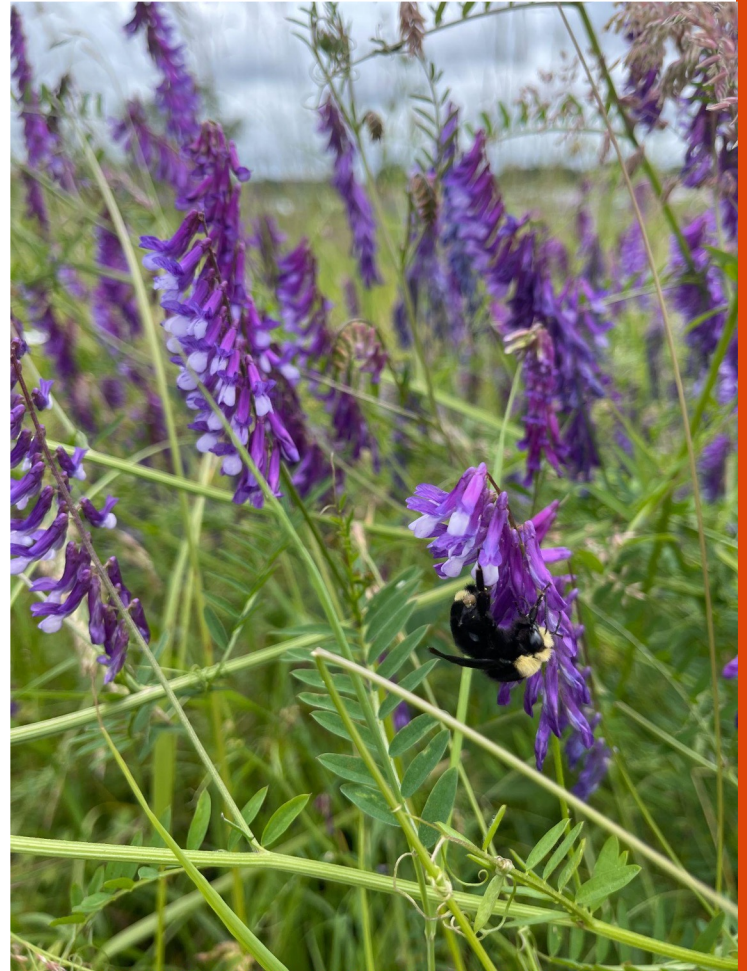
**Scopa**

# Some bee populations are declining

- Substantial losses of bees widely reported<sup>1,2,3,4</sup>
- Most evidence is for bumblebees<sup>5</sup> and mason bees<sup>6</sup>
- Not much known about other bee species

1. Biesmeijer et al. 2006
2. Potts et al. 2010
3. Goulson et al. 2015
4. Zattara & Aizen 2021
5. Bartomeous et al. 2013
6. LeCroy et al. 2020

Photo by Nicole Bell.



# Causes of bee decline?

- Habitat loss
- Habitat fragmentation



Photo courtesy of Gail Langellotto.



# Gardens as refuge for bees

- Diverse floral resources
  - (*Tommasi et al. 2004, Burdine and McCluney 2019, Lanner et al. 2020*)
- Nest sites
  - (*Cane 2001, Tonietto et al. 2011*)
- Small gardens may host as much diversity as large urban parks and adjacent natural areas
  - (*Fetridge et al. 2008, Normandin et al. 2017, Baldock et al. 2019*)

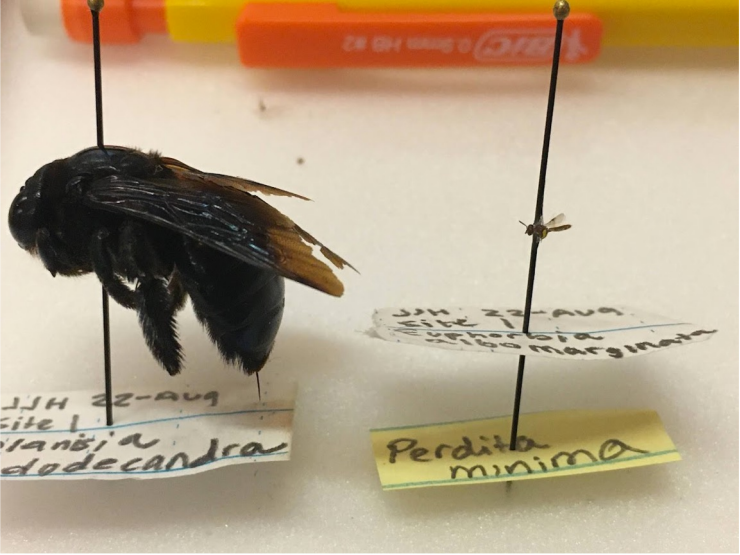
Photo courtesy of Gail Langellotto.



# What can gardens look like?



# Bee Diversity



# Oregon Bee Diversity

- 500 - 800 species estimated in OR
- 70 species found in Portland gardens<sup>1</sup>

## Bees of Oregon

A selection from the more than 500 species found in Oregon



<sup>1</sup> Langellotto et al (2018) *Sustainability*.

# Oregon Bee Diversity

<b>Kingdom</b>	Animalia
<b>Phylum</b>	Arthropoda
<b>Class</b>	Insecta
<b>Order</b>	Hymenoptera

*Superfamily Apoidea*



7 different families of bees  
(6 present in Oregon)

## Bees of Oregon

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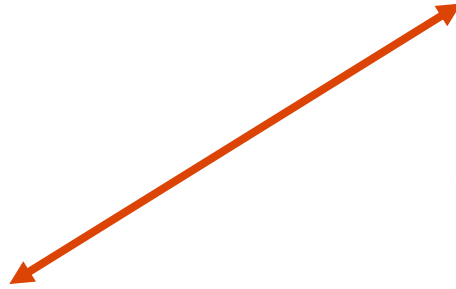
# Bees of Oregon

A selection from the more than 500 species found in Oregon

## A note about honey bees...

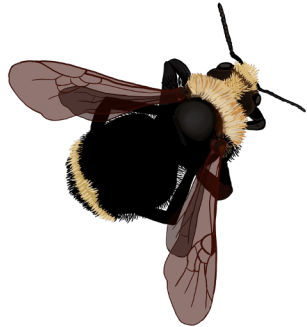


- Family: Apidae
- *Apis mellifera*
- Social
- Form hives



# Bumblebees

- Family: Apidae
- *Bombus spp.*
- Social
- Form colonies



## Bees of Oregon

A selection from the more than 500 species found in Oregon



European Honey Bee



Red Nomad Bee



Longhorn Bee



Nevada bumblebee



Metallic Sweat Bee



Blue Orchard Bee



Cuckoo Bee



Vermont's Bumblebee



Large Sweat Bee



Digger Bee



Pugnacious Leaf-cutter Bee



Mining Bee



Small Carpenter Bee



Wool-Carder Bee



Hoplitis Leaf-Cutting Bee



Small Sweat Bee



Cuckoo-leaf-cutter Bee



Green Leaf-Cutting Bee

# Bees of Oregon

A selection from the more than 500 species found in Oregon

## Solitary Apid Bees

- Family: Apidae
- Many genera
- Solitary



European Honey Bee



Red Nomad Bee



Longhorn Bee



Nevada Bumblebee



Metallic Sweat Bee



Blue Orchard Bee



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# Mining Bees

- Family: Andrenidae
- Many genera
- Solitary
  
- Early spring

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# Cellophane Bees

- Family: Colletidae
- Many genera
- Solitary



Photo by iNaturalist user bufface



Photo by iNaturalist user lisahopprobinson

# Bees of Oregon

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## Sweat Bees

- Family: Halictidae
- Many genera
- Solitary or social



European Honey Bee



Red Nomad Bee



Longhorn Bee



Nevada Bumblebee



Metallic Sweat Bee



Blue Orchard Bee



Cuckoo Bee



Vosnesenski's Bumblebee



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Cuckoo-leaf-cutter Bee



Green Leaf-Cutting Bee

# Bees of Oregon

A selection from the more than 500 species found in Oregon

## Leafcutter Bees

- Family: Megachilidae
- Many genera
- Solitary



Not restricted to leaves!



European Honey Bee



Red Nomad Bee



Longhorn Bee



Nevada Bumblebee



Metallic Sweat Bee



Blue Orchard Bee



Cuckoo Bee



Vosnesenski's Bumblebee



Large Sweat Bee



Digger Bee



Pogonichus Leaf-cutter Bee



Mining Bee



Small Carpenter Bee



Wool-Carder Bee



Hoplit's Leaf-Cutting Bee



Small Sweat Bee



Cuckoo-leaf-cutter Bee



Green Leaf-Cutting Bee

# Bees of Oregon

A selection from the more than 500 species found in Oregon

## Parasitic Bees

- Present in almost every family of bees
- Many genera
- Two types:
  - Kleptoparasitic (brood parasites)
  - Social parasites



European Honey Bee

Red Nomada bee

Longhorn Bee



Nevada Bumblebee

Metallic Sweat Bee

Blue Orchard Bee



Cuckoo Bee

Vosnesenski's Bumblebee

Large Sweat Bee



Digger Bee

Pugnacious Leaf-cutter Bee

Mining Bee



Small Carpenter Bee

Wool-Carder Bee

Hoplitis Leaf-Cutting Bee



Small Sweat Bee

Cuckoo-leaf-cutter Bee

Green Leaf-Cutting Bee

# Outline

- Introduction to Native Bees
- **Urban Garden Bees with Nicole**
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- Key Takeaways
- Walkabout! Netting, talking plants, etc.
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# Research Questions

- **What bees are found in urban gardens?**
  - *Sociality*
  - *Nesting strategy*
  - *Diet breadth*
  - *Native status*
- **What bees are most dominant in urban gardens?**
- **What bees are most abundant in urban gardens?**

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# Sociality

- **Eusocial**

- *Cooperative brood care, overlapping generations within a colony of adults, division of labor*
- *e.g. Apis mellifera*

- **Non-eusocial**

- *Single female builds & provisions nest*
- *Also includes communal species*

- **Parasitic**

- *Enter nests of pollen-collecting bees and kill host egg/larvae to raise their own offspring*

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# Nesting strategy

- **Soil**
- **Cavity**
  - *Pre-existing cavities (dead wood, pithy stems)*
- **Hive**
  - *Lives in eusocial colony (may nest in soil or cavity)*
- **Wood excavator**
  - *Excavates tunnel in wood*
- **Aerial**
  - *Constructs free-standing nest out of resin*

# Nesting strategy

- **Soil**
  - *Species that primarily nests in the soil*
  - **Species example: *Andrena (Melandrena) commoda***

**\*\* MOST bees are soil nesters! \*\***



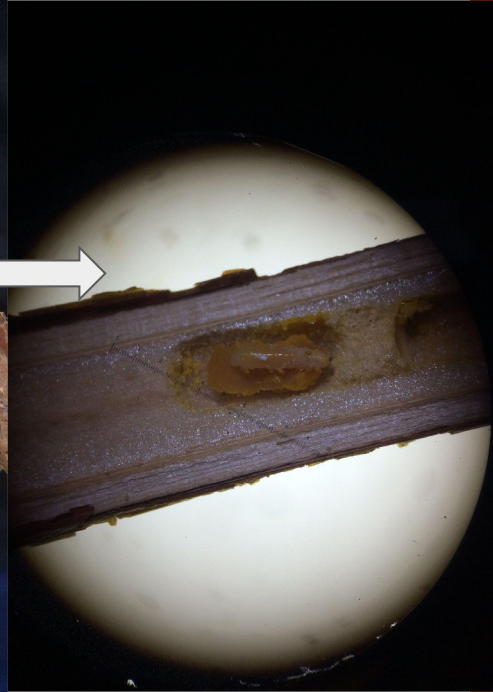
"bees nesting in the ground" by minicooper93402 is licensed under CC BY 2.0.

# Nesting strategy

- **Cavity**
  - ***Pre-existing cavities (dead wood, pithy stems)***
  - **Species example: *Megachile (Eutricharaea) rotundata***



Photo by Nicole Bell.



# Nesting strategy

- **Hive**

- *Lives in eusocial colony (may nest in soil or cavity)*
- **Species example: *Apis (Apis) mellifera***



Photo by Nicole Bell.



"Cape Honeybee hive in hollow" by Discott is licensed under CC BY-SA 4.0

# Nesting strategy

- **Wood excavator**
  - *Excavates tunnel in wood*
  - **Species**  
example:  
*Xylocopa*  
*(Xylocopoides)*  
*virginica*  
*virginica*



Photo by U.S. Forest Service.



# Nesting strategy

- **Aerial**
  - ***Constructs free-standing nest out of resin***
  - **Species example: *Anthidiellum (Loyolanthidium) notatum***



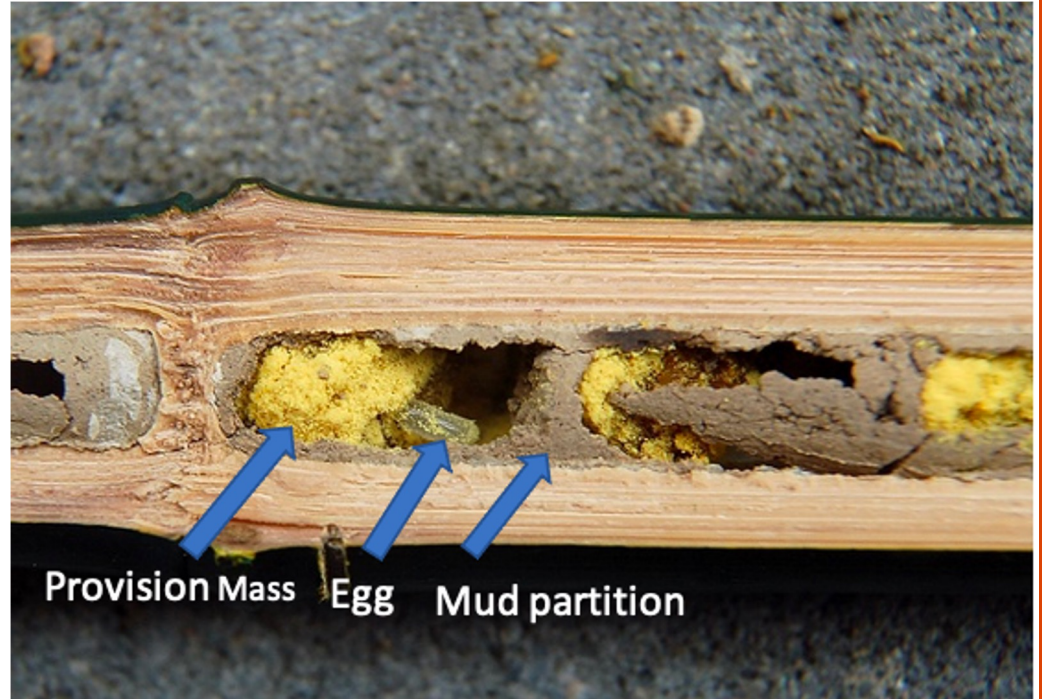
Photo from BugGuide.net

# Research Questions

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# Diet breadth

- **Polylectic (generalist)**
- **Oligolectic (specialist)**
- **No pollen (parasitic bees)**



# Research Questions

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# What bees do we find in gardens?

- **Between 674 and 830 species**
- **Functional traits fairly well represented for what we would expect**

# Research Questions

- **What bees are found in urban gardens?**
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# Dominant Bees: Common across garden habitats

Dominant bee species: 5 most frequently reported bee species across ALL studies

EXOTIC

- *Apis mellifera* (Western honeybee)
- *Megachile rotundata* (Alfalfa leafcutter bee)
- *Anthidium manicatum* (Wool-carder bee)
- *Halictus ligatus* (Ligated furrow bee)
- *Halictus rubicundus* (Orange legged furrow bee)



Photo courtesy of Gail Langellotto.

# Research Questions

- **What bees are found in urban gardens?**
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# Abundant Bees: Common within garden habitats

- Most abundant bee species: 5 most abundant bee species in EACH study
- List created of around ~70 bee species
- 3 abundant specialist bees
  - *Colletes daviesanus* (Asteraceae)
  - *Melissodes robustior* (Asteraceae)
  - *Megachile flavipes* (Verbenaceae)



Photo courtesy of Gail Langellotto.

# Conclusions

- **Specialist & parasitic bees well-represented when we consider all species**
  - Specialist & parasitic bees underrepresented when we examine the most dominant/abundant bee species in urban gardens
- **Native bees are well-represented when we consider all species**
  - Percentage of exotic bee species increases as we examine most dominant bee species
- **Halictid bees overrepresented**
- **Andrenid bees underrepresented**
- **Common specialists found often specialize on Asters**

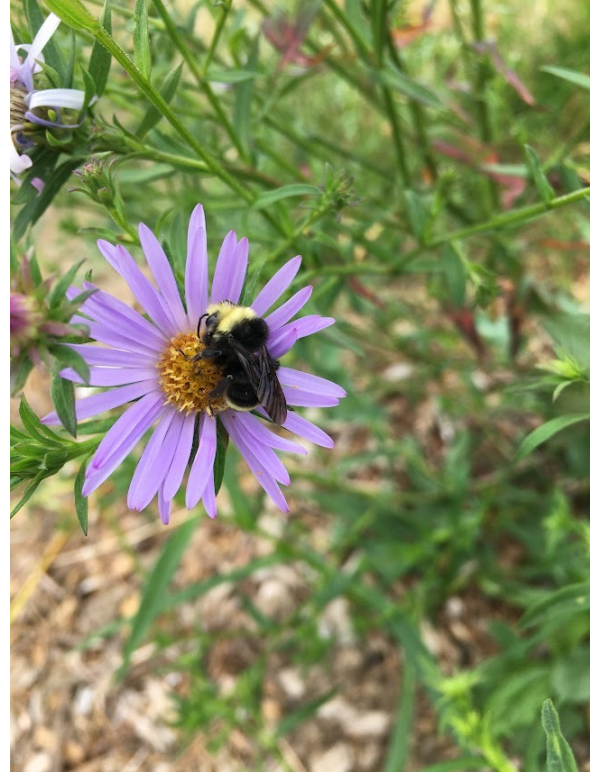
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## 23 Native Plants for Pollinators

- Aaron Anderson
- 2017-2019
- Full sun
- Drought tolerant



## 23 Native Plants for Pollinators

- Douglas' Aster
- *Symphotrichum subspicatum*
- Perennial



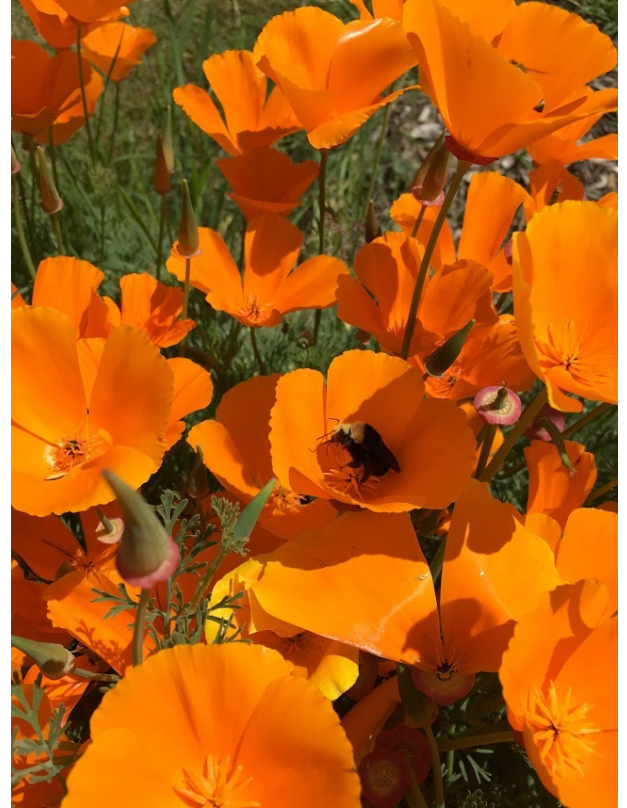
## 23 Native Plants for Pollinators

- Farewell-to-spring
- *Clarkia amoena*
- Annual



## 23 Native Plants for Pollinators

- California Poppy
- *Eschscholzia californica*
- Annual



## 23 Native Plants for Pollinators

- Globe Gilia
- *Gilia capitata*
- Annual





## 23 Native Plants for Pollinators

- Rosy Checkermallow
- *Sidalcea asprella* ssp. *virgata*
- Perennial



# Honorable Mentions



COMMON MADIA  
*Madia elegans*  
Annual



CANADA  
GOLDENROD  
*Solidago  
canadensis*  
Perennial



OREGON  
SUNSHINE  
*Eriophyllum  
lanatum*  
Perennial



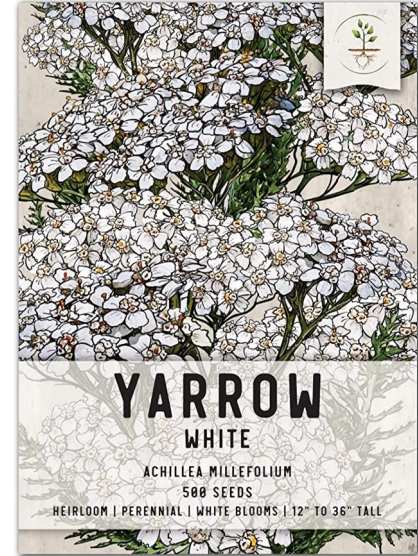
YARROW  
*Achillea  
millefolium*  
Perennial

# Native Plants

- **Native plant**
  - A plant that is part of the balance of nature, that has developed over hundreds or thousands of years in a particular region or ecosystem - USDA NRCS
- **Why native plants??**
  - Native plants for native pollinators
  - Often better adapted climatically

## Native Plants & Native Cultivars

- **Quick way to find out native status of a plant**
- [Plants.usda.gov](https://plants.usda.gov)
- Or, your local flora!
  - [Oregonflora.org](https://oregonflora.org)



## Native Plants & Native Cultivars

- **Native plant**

- A plant that is part of the balance of nature, that has developed over hundreds or thousands of years in a particular region or ecosystem - USDA NRCS

- **Cultivar**

- Cultivated Variety = Cultivar
- A plant variety that has been produced in cultivation by selective breeding. Cultivars are usually designated in the style *Taxus baccata* 'Variegata'. – Oxford Dictionary



*Camassia cusickii*

x



*C. leichtlinii* 'Caerulea'



*Camassia* 'Caerulea Blue Heaven'



*Camassia cusickii*

x



*C. leichtlinii* 'Caerulea'

***Camassia leichtlinii* 'Caerulea'**

Cultivar of *C. leichtlinii*

***Camassia* 'Caerulea Blue Heaven'**

Hybrid Cultivar of 2 *Camassia* species



*Camassia* 'Caerulea Blue Heaven'

# Native cultivars?

Farewell-to-Spring  
AKA Godetia



*Clarkia amoena*  
(wild type)



# Native cultivars?

Farewell-to-Spring  
AKA Godetia



*Clarkia amoena*  
(wild type)

*Clarkia amoena*  
'Maiden Blush Pink'

*Clarkia amoena*  
'Scarlet'

*Clarkia amoena*  
'Strauss White'

Cultivated varieties of *Clarkia amoena*

*Photos from Silver Falls Seed Co.*

# Study Plant Groups



***Achillea  
millefolium***



'Calistoga'



'Salmon  
Beauty'



'Moonshine'



***Aquilegia  
formosa***



*Aquilegia*  
x 'Xera  
Tones'



***Camassia  
leichtlinii***



'Caerulea  
Blue  
Heaven'



'Sacajawea'



***Symphyotrichum  
spicatum***



'Sauvie  
Sky'



'Sauvie  
Snow'



***Clarkia  
amoena***



'Aurora'



'Dwarf  
White'



'Scarlet'



***Eschscholzia  
californica***



'California  
Mikado'



'California  
White'



'Purple  
Gleam'



***Nemophila  
menziesii***



'Penny  
Black'



'Snow  
White'

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**Achillea  
millefolium**



'Calistoga'



'Salmon  
Beauty'



'Moonshine'



**Aquilegia  
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Aquilegia  
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leichtlinii**



'Caerulea  
Blue  
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'Purple  
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**Nemophila  
menziesii**



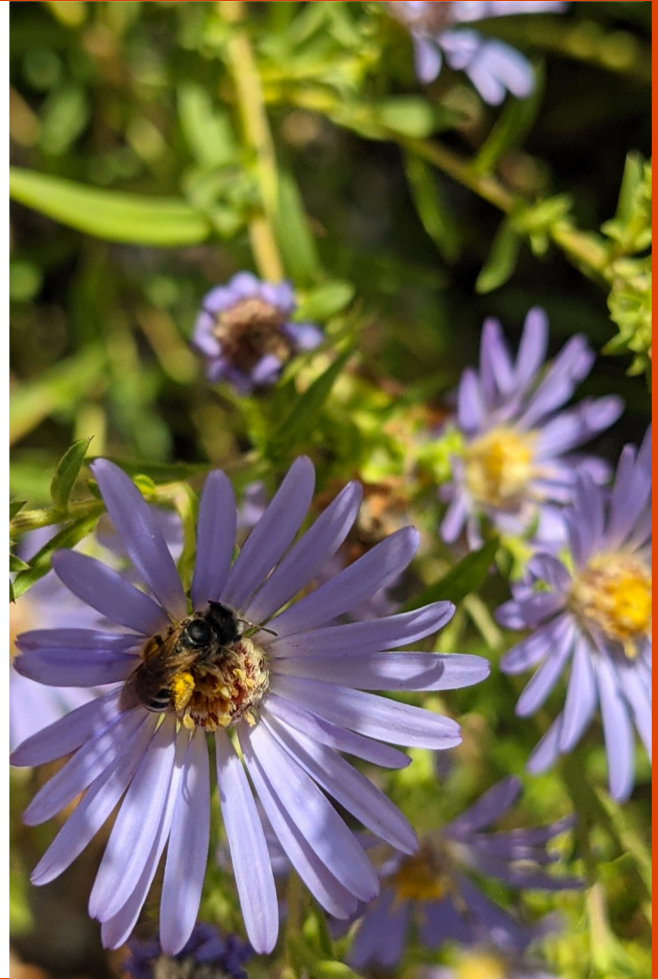
'Penny  
Black'



'Snow  
White'

# Conclusions thus far?

- Preference for native plants and cultivars depends on the pollinator group and plant traits examined
- Other studies have found similar results, though there tend to be a greater number of pollinators preferring native plants, with preferences for cultivars only occurring in a couple instances.



# Thoughts on cultivars....

Why might someone want to plant a cultivar?



**Variety!**  
**Fun!**



**Resistance Traits**

*Photo from Chestnut Hill Outdoors*



**Spatial Constraints**



**Beauty** (aesthetic value)  
*Photo by Devon Johnson*

**Environmental Tolerance**



**Tradition**

*Photo by Michelle Hayes*

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# Conclusion: Key Takeaways

- Bees come in all shapes, colors, and sizes and have diverse life history traits
- Gardens, even in urban landscapes, can support diverse bee communities
- Native plants are not universally preferred to native cultivars, but should be prioritized when establishing resources for native pollinators.
- Gardeners should consider forage that blooms in shoulder seasons
- Consider flowering plants, but also nesting sites: bare patches of soil, maintain some “messy” spaces in your garden
- Do LESS! Less disturbance, less cleaning of dead materials, etc.



# Acknowledgements



**The Garden Ecology Lab and our research is supported by Sherry Sheng and Spike Wadsworth, as well as grants from the Oregon Department of Agriculture, the Native Plant Society of Oregon, and the Garden Club of America.**





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