Pollinators (especially BEES) are in the News

Rusty Patched Bumble Bee Federally Listed as Threatened
What I’ll Cover:
• What is Pollination?
• What are Pollinators?
• Why are They Important?
• What do They Need?
• Why Use Native Plants to Create Habitats?
• Building Your Own Pollinator Habitats
• Seeding pollinator habitats
• A Study and Other Resources in the Community

Kathy Pendergrass
USDA-NRCS
Oregon Plant Material Specialist
(Botanist/Ecologist)
What is Pollination?

• **Pollination**: The transfer of pollen from the male **anther** to the female **stigma**

Self Pollination

Cross Pollination

SLIDE SHARE - https://www.slideshare.net/shahmirali756/pollination-reproduction-in-plants
Modes of Pollen Movement

- **WIND** – Anemophily – copious pollen!
- **WATER** – Hydrophily - rare
- **ANIMALS ~ POLLINATORS**
  - **Insects: Entomophily**
What are Pollinators?

SLIDE SHARE - https://www.slideshare.net/shahmirali756/pollination-reproduction-in-plants
Why do animals pollinate plants?

They get a REWARD: food!

- Nectar – a sugary solution produced in flower nectary's
- Pollen – is high in protein, some bees and beetles eat it.

Factoid: Flowers can produce two kinds of pollen: a normal and a sterile, but tasty, kind, for the insect.

SLIDE SHARE - https://www.slideshare.net/shahmirali756/pollination-reproduction-in-plants
Function of a flower

- To attract pollinators with colorful petals, scent, nectar guides, nectar and pollen

SLIDE SHARE - https://www.slideshare.net/shahmirali756/pollination-reproduction-in-plants
Gardening for Birds and Butterflies
Animal pollinators: Bees

• Bees – are the most important group of flower pollinators
• They feed on nectar and pollen.
• Bees are guided by sight and smell
• See yellow and blue colors, also ultraviolet light
• Flowers have “honey guides” and bee landing platforms..

SLIDE SHARE - https://www.slideshare.net/shahmirali756/pollination-reproduction-in-plants
Why are Pollinators Important?

- 75% of Flowering Plants require a Pollinator (esp. bees)
- 35% of Crop Production requires a Pollinator - $20 Billion annually in U.S.
- 1 of 3 Bites you take required a Pollinator
- Bees are the #1 Pollinator
European Honeybees

- Majority of U.S. Crops are Introduced Plants
- European Honeybee is No. 1 Pollinator - $15 Billion of the $20 Billion annually
- 50% Decline since 1950’s - 4.5 Million Hives down to 2.2 Million Hives
- “Colony Collapse Disorder” – pests, diseases, poor nutrition, pesticides
Why are NATIVE Bees Important?

- 4,000 Species in U.S.
- ~400 Species in Oregon
- Native Bees Can be More Efficient Pollinators (buzz)
- Native Bees forage in colder and wetter weather
- 95+ % are Solitary
- Most Don’t Sting!
What do Native Bees Need?

- **Clean Water**
- **Shelter**
  - Nesting sites
  - Over-wintering sites
- **Food**

Figure 1. From: Agroforestry Note – 34: “Enhancing Nest Sites for Native Bee Crop Pollinators”
What do Native Bees Need?

Soil Nest Sites – 70% of bees nest in soil

✓ **Bare Soil**
✓ **Undisturbed – NO Tillage**
✓ **Well-Drained**
✓ **Warm Aspect – South or West**
✓ **Leave Grassy clumps**

Photo by Jon Gosling
Bumble Bee Life Cycle

1. A queen emerges from hibernation in spring and finds a nest site, such as an abandoned rodent burrow.

2. She creates wax pots to hold nectar and pollen, on which she lays and incubates her eggs.

3. When her daughters emerge as adults, they take over foraging and other duties.

4. In autumn the colony produces new queens and male bees, who leave to find mates. Newly mated queens hibernate and the rest of the bees die.

From: Attracting Native Pollinators – 2011 The Xerces Society
Bees – Seasonal Duration

**Bees Need Pollen and Nectar Before and After Crop Bloom**

- Example: flight periods of native bees in relation to blueberry bloom.

<table>
<thead>
<tr>
<th>BEE GROUPS</th>
<th>APRIL</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
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<tbody>
<tr>
<td>Plaster Bees</td>
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<td>Green Sweat Bees</td>
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<td>Striped Sweat Bees</td>
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<tr>
<td>Mason Bees</td>
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<td>Bumble Bees</td>
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</tbody>
</table>

© Data from Steve Javorek, Agriculture Canada
Wood Nesters – 30% of Bees nest in wood

- Allow for more “chaos” - leave snags, dead limbs, brushy piles, herbaceous stems
- Supply “pithy” plants
- Supply nest boxes
Farmscaping for Pollinators

Fill in the GAPS on Your Property for Water, Shelter and Food

**Riparian Buffers Food and Shelter**
Habitat along streams should contain a diversity of plants. Willows, in particular, will nourish bumble bee queens in the spring so that a large number of workers are available when crops begin to bloom.

**Snags Food and Shelter**
Keeping dead trees standing provides shelter for native bees. Some solitary bees build nests in abandoned beetle tunnels in snags.

**Fallow Fields and Set-Asides Food and Shelter**
Even small areas of fallow or unproductive land, especially when sown with native flowers, can offer important resources for native bees.

**Hedgerows or Windbreaks Food and Shelter**
Creating hedgerows with a wide variety of plants that have overlapping flowering periods will provide bee habitat throughout the growing season and strengthen populations of natural enemies of crop pests.

**Temporary Bee Pasture Food**
Planting fields with clover or other inexpensive seed—or allowing crops such as lentils, kale, buckwheat, and broccoli to bolt—will supply bees with nectar and pollen.

**Ponds and Ditches Food and Shelter**
When you create a pond or ditch, leave the pile of excavated soil. Ground-nesting bees may build nests in stable, humus areas of this mounded earth. Planting clumps of native flowers will attract more pollinators.

**Field and Road Borders Food and Shelter**
Leave areas next to fields unplowed and ungrazed to support flowering plants, and provide nestsites for ground-nesting bees.

**Cover Crops Food**
Flowering plants—certain legumes in particular—can be included in cover crop mixes to supply pollen and nectar.

**Gardens Food**
A vegetable, flower, or herb garden, with a diverse assortment of plants, is a good source of food for pollinators. Be wary of fancy hybrids that may produce little pollen or nectar.

**Natural or Undeveloped Areas Food and Shelter**
Nearby natural areas may harbor all the native bees needed to pollinate your farm crops. Consider renting your neighbors to help with safeguarding these habitats.

**Artificial Nests Shelter**
Making bee blocks for wood-nesting bees is a good way to increase the number of native bees in your landscape.
Assess Existing Habitat on Your Farm

http://www.xerces.org/pollinator-conservation/habitat-assessment-guides/
Three Basics

Focus on:
1. Minimizing pesticides - IPM
2. Protecting /enhancing nest sites for pollinators (bees)
3. Providing season-long blooming plants

http://www.or.nrcs.usda.gov/technical/ecs/plants/plants-technotes.html
A Year-Long Succession of Blooming Plants
(3 blooming early, mid, late)
Many of the same flowering plants that support pollinators also support predators and parasitic insects of plant pest insects – and most other wildlife.
Plantings for Pollinators

- Crop rotations
- Annual Insectary
- Cover Crops
- Perennial Plantings
Bee-Friendly insectory/cover crops

- Common vetch
- Crimson clover
- Lacy phacelia
- Frosty berseem clover
- Fava
Configure annual/insectary plantings to fit into your farming system
What do Flowering cover crops do?:

- Improve soil fertility & health
- Conserve soil moisture
- Suppress weeds
- Reduce erosion
- Improve infiltration
- Provide seed (food, crop)
- Provide habitat for beneficial insects

Illustration: Elayne Sears
From Mother Earth News
Perennial Plantings

Benefits (esp. Hedgerows):

- Displace invasive weeds
- Prevent soil erosion esp. in riparian areas
- Prevent pesticide drift (careful!)
- Prevent weed seed migration
- Lower crop damage from wind and dust
- Provide habitat for beneficial organisms such as birds, bats, insects and pollinators
“Agriculture: the largest threat to biodiversity and ecosystem function of any single human activity”
Why Use Native Plants?

- They grew up here ;-) adapted to local climate; drought tolerant
- Less “weedy”
- Increase species of declining habitats (prairie and oak)
- Increase native habitat connections in your area
- Feed wildlife – food webs – insects, seeds, fruits, vegetation
Less than 1 percent of prairie and less than 15 percent of oak habitats remain in Willamette Valley.

Provide for travel corridors, “stepping stones”, or islands for species gene flow and dispersal.

“Live”, “Salmon Safe” and other labeling is requiring some biodiversity plantings &/or vegetation protection or restoration.

Reference: John Christy and Ed Alverson, 2011
Native bees prefer native plants over exotic weeds!

**RESEARCH ARTICLE**

**Bee Preference for Native versus Exotic Plants in Restored Agricultural Hedgerows**

Lora A. Morandin¹,² and Claire Kremen¹
Why Use Native Plants?

Prairie species richness (often >30 native plants!)
Retain Intact Wild Habitats
Bring back the hedgerows – but make them native and species-diverse this time!
Making a Plan for Plantings

1. Site Selection
2. Site Preparation
3. Plant Selection and Sourcing
4. Plant & Mulch - or seed
5. Supplemental Water 1-3 years
6. Maintenance (mow, spot-spray, weed)
1. Site Selection

- Take advantage of “un-used” land: Ditches, Field Edges, Wet swales, streams
- Consider weediness of chosen sites for plantings
- Place plantings where not susceptible to or protect from herbicide drift & can be undisturbed (ground nests for bees)
- Consider plant heights, sun orientation – adjacent crops
- Can be “dual purpose” (e.g. riparian buffer)
2. Site Preparation – money well-spent!

- Very important to eliminate weeds before planting
- May require 1-3 years for adequate site prep
- Many methods available—tillage, mowing, spraying with herbicides, solarization with plastic, lasagna mulching, etc.
2. Site Preparation – Xerces Job Sheets

http://xerces.org/pollinator-conservation/agriculture/pollinator-habitat-installation-guides/
3. Plant Selection and Sourcing

- Choose plants suitable for your objectives – aesthetics, pesticide screening, bee-friendly, drought tolerant
- Choose plants suitable for your site conditions – moisture, light, soil, and nutrient
- Choose plants suitable for your crop (not harboring crop pests/diseases)
- Consider diversity of flower colors and shapes (open flowers)
- Plan for Season-long bloom – including crop bloom
- Consider Budget, equipment, and available plant materials – plants can be costly
Some plants that harbor crop pests

<table>
<thead>
<tr>
<th>Primary Crop</th>
<th>Crop Pest or Disease</th>
<th>Known Alternate Hosts of Crop Pests or Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples, Pears</td>
<td>Apple Maggot (Rhagoletis pomonella)</td>
<td>Hawthorn (Craetagus spp.), Wild Plum (Prunus spp.)</td>
</tr>
<tr>
<td>Apples, Pears</td>
<td>Fire Blight (Erwinia amylovora)</td>
<td>Mountain Ash (Sorbus spp.), Spirea (Spiraea spp.), Hawthorn (Crataegus spp.), Cotoneaster (Cotoneaster spp.), Toyon (Heteromeles arbutifolia), Ocean Spray (Holodiscus discolor)</td>
</tr>
<tr>
<td>Apples, Pears, Cherries, Peach</td>
<td>Leafroller Caterpillars (several species)</td>
<td>Wild Rose (Rosa spp.)</td>
</tr>
<tr>
<td>Grapes</td>
<td>Leafhoppers/Sharpshooters (several species)</td>
<td>Willow (Salix spp.), Elderberry (Sambucus spp.)</td>
</tr>
<tr>
<td>Berries</td>
<td>Spotted-Wing Drosophila (Drosophila suzukii)</td>
<td>Wild Plum (Prunus spp.), Elderberry (Sambucus spp.), Wild Raspberry (Rubus spp.)</td>
</tr>
</tbody>
</table>

Farming with Native Beneficial Insects – 2014 The Xerces Society

Generally – all fleshy fruits harbor Spotted-winged drosophila
Resources for Plant Selection Information

http://www.or.nrcs.usda.gov/technical/ecs/plants/plants-technotes.html

Native plants for Willamette Valley yards

Good for wildlife. Good for gardens.

From Metro and local partners

http://www.oregonmetro.gov/native-plants-willamette-valley-yards-booklet

TECHNICAL NOTES

U. S. DEPT. OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
Portland, Oregon

PLANT MATERIALS No. 13

PLANTS FOR POLLINATORS IN OREGON

Kathy Pendergrass, Plant Materials Specialist, NRCS, Portland, Oregon
Marc Vaughan, Conservation Director, Xerces Society, Portland, Oregon
Joe Williams, Manager, NRCS, Plant Materials Center, Corvallis, Oregon

Left – honey bee on camas flower (Pendelburg)
Right – bumble bee on rabbit brush ( Vaughan)

The purpose of this technical note is to provide information about establishing, maintaining and enhancing habitat and food resources for native pollinators, particularly for native bees in Klamath buffers.

Plant introductions, hedgerows, alley cropping, fall borders, etc. NRCs practices. We welcome your comments for improving editions. Please contact us.

http://www.or.nrcs.usda.gov/technical/ecs/plants/plants-technotes.html
Cascara (*Frangula (=Rhamnus) purshianus*)

**Family:** Buckthorn (Rhamnaceae)

**Moisture needs:** wet to dry (FAC)

**Exposure:** Sun to part shade

**Flower:** Flowers in umbels, greenish with 5 petals

**Bloom period:** April-June

**Description:** Deciduous shrub or small tree up to 30’ tall; Leaves alternate, oblong-ovate to oblong-ovate, 6-13 cm. long, with 10-12 prominent, lateral veins on each side; Berries purplish-black

**Habitat:** Forest understory and margins from low to moderate elevations

**Attracts/insects found:** *bees, beneficials*

**Recommended stock:** bare-root, container
3. Native Plant Selection and Sourcing

Use local-genetics plants – at least from your ecoregion

Use general forest tree seed zones

Ecoregions

- Columbia Plateau (10)
  - > 15" rainfall / 3,500 ft
  - < 15" rainfall / 3,500 ft
- Northern Basin (80)
  - Low (< 4,500 ft)
  - High (> 4,500 ft)
- Snake River (12)
  - Upper
  - Lower
- Blue Mountains (11)
  - See Erickson et al. 2004
- Central Basin (13) (pseudo-elev)
  - Salt flats – salt desert shrub
  - Sage
  - Sage-Juniper
  - Sage-Woodland (Carbonate soils)
## Easy “A” list. Expect 90-100% success.

<table>
<thead>
<tr>
<th>Willows</th>
<th>Salix species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hooker’s = Pipers, Northwest sandbar = river, Geyers, Pacific, Sitka, Scouler’s</td>
<td></td>
</tr>
<tr>
<td>black cottonwood</td>
<td>Populus trichocarpa</td>
</tr>
</tbody>
</table>

## Easy “B” list. Expect 50-90% success without hormones. Most make good “live stakes”.

<table>
<thead>
<tr>
<th>Black twinberry</th>
<th>Lonicera involucrata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific ninebark</td>
<td>Physocarpus capitatus</td>
</tr>
<tr>
<td>Lewis mockorange</td>
<td>Philadelphus lewisii</td>
</tr>
<tr>
<td>Common snowberry</td>
<td>Symphoricarpos albus</td>
</tr>
<tr>
<td>salmonberry</td>
<td>Rubus spectabilis</td>
</tr>
<tr>
<td>Douglas spirea*</td>
<td>Spiraea douglasii</td>
</tr>
<tr>
<td>Red elderberry</td>
<td>Sambucus racemosa</td>
</tr>
<tr>
<td>Red-osier dogwood</td>
<td>Cornus sericea</td>
</tr>
<tr>
<td>Scouler’s willow</td>
<td>Salix scouleriana</td>
</tr>
</tbody>
</table>

*Use with caution...can be a bit weedy*
3. Plant Selection – Plant Stocks

**Hardwood Cuttings/Stakes**

- **dormant season**
  - here best is late fall
- **cheap, labor, easy install**
- **limited species**

- ✔ **At least 18” (3’) long; ½” diameter**
- ✔ **Leave 2-3 buds above ground**
- ✔ **don’t damage**
Woody Native Shrubs: Consider Esp. Early & Late Bloomers

Early:
- Willows
- Red Osier Dogwood
- Twinberry
- Oregon Grape
- Some Ceonothus spp.

Mid:
- Oceanspray

Late:
- Coyote brush
3. Plant Selection - Plant Stocks

**Bare-root materials**

- dormant season - here Jan-early March;
- small window,
- must keep cool, moist and plant immediately,
- harder to plant,
- lower survival
- Cheaper than containers
Planting a Bare-root Plant

1. Insert blade deeply and pull back to open hole.
2. Insert seedling.
3. Backfill gently around roots.
4. Firm soil with planting tool.
5. Pack soil firmly around seedling.
Common Planting Problems

1. Too Deep
   needles buried
   hole okay
   tree position poor

2. Too Shallow
   roots exposed
   hole too shallow

3. Air Pocket
   from improper
   tamping

4. 'L' Roots
   hole shallow
   roots often exposed to air

5. 'J' Roots

6. Compacted Roots
   hole too narrow
   not properly opened

7. Not Vertical
   shallow planting
   caused by improper
   digging of hole

8. Too Loose
   improperly
   tamping after
   planting

9. Poor Planting Soil
   planting in rotten wood,
   deep duff or debris,
   not damp mineral soil

10. Satisfactorily Planted Tree

3. Plant Selection - Plant Stocks

Containerized stock

➤ any time of year; best is fall, 2nd early spring;
➤ better survival,
➤ available,
➤ easy to plant
➤ more expense & labor than stakes/BR,
➤ Plant even with existing soil in pot – don’t plant deep!
3. Plant Selection

- Balled and Burlaped
- Bulbs (spring or fall)
- Rhizomes
- Seeds (spring or *fall)

Cheapest, BUT.....
Healthy Plants?

- 1:1 Root/Shoot Ratio
- Not root-bound
4. Plant and Mulch

How to plant a container/B&B plant

[Diagram showing planting and mulching instructions]

- Keep mulch 1-2" back from trunk
- 2-4" layer of mulch
- Cut burlap and rope away from top third of root ball
- Use two opposing flexible ties
- Gently pack back-fill, using water to settle soil around root ball
- Set ball on firmly packed soil to prevent settling
4. Plant and Mulch

- Mulching can help reduce weeds
- and hold soil moisture
- Roots need oxygen too – not deeper than 4”/application
- Mulch on the trunk causes moisture build up, creating ideal conditions for insect pests, diseases, and decay
Plant Protection

➢ Protections from animal damage (voles, deer, etc.)

➢ Options: fencing, tree guards, hardware cloth, tubing
5. Supplemental Water 1-3 years

- If at all possible – will improve survival
- Just during summer drought - ~ 1” every 2-3 weeks
- Drip or deep soak at plant base
6. Habitat Maintenance

- Mow weeds
- Spot-spray, propane burn, or hand pull weeds
- May need to invigorate plantings (tillage, burning)
SEED BANK CONCEPT
Diagrammatic Model of Plant Population Behavior

- I Seed bank
- II Environmental sieve
- III Seedlings, reproductive adults
- IV Seed production

Seeding – 5 Steps

1. Pick a good site
2. Kill the weeds
3. Choose the right seed mix
4. Seed the site well
   Rake/roll in
5. Kill the weeds
   (mow, spot-spray, or hand weed)

Five Steps to Success for Establishing Perennial Wildflower Plantings for Pollinators:
https://www.youtube.com/watch?v=ABNZo4KKaYw
Where to find Plants/Seed for Planting

PLANTS:

• Plant Material Technical Note #9 – for plants and seed

• Native Plant Sales

SEED:

• Native seed network – is a clearing house to connect native seed suppliers to buyers
  http://www.nativeseednetwork.org/

• Cover Crop Resources and Seed Vendors for Oregon and Washington
Where to find Native Plants

http://www.oregonflora.org/gardening.php
Additional Resources

The Xerces Society for Invertebrate Conservation

www.xerces.org
Field Trial: Enhancing Pollinator/Beneficial Insect Habitat in Vineyards

- Fall of 2016 installed a pollinator enhancement to create beneficial insect habitat to help control mite and aphid pests.

- Purpose: to test the establishment and success of two seeding dates (early fall and late fall) and two seed mixes (diverse vs tough) planted between the grape rows.
Upcoming Workshops

Discover ways to save time, money and energy on your property through our FREE workshops. From naturescaping to livestock management, our classes help you care for your land in ways that benefit people, water, and wildlife.

### Spring Workshops: Click on an Event Title to Register

<table>
<thead>
<tr>
<th>DATE &amp; TIME</th>
<th>EVENT &amp; LOCATION</th>
<th>AVAILABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sat, Apr. 8</td>
<td>Attracting Pollinators to the Urban Garden</td>
<td>Event full, wait list available</td>
</tr>
<tr>
<td>9:00 am - 11:30 am</td>
<td>Portland Tool Library, Portland</td>
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<tr>
<td>Wed, Apr. 12</td>
<td>Rural Weeds</td>
<td>22 seats left (of 45 max)</td>
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<tr>
<td>6:00 pm - 7:30 pm</td>
<td>Columbia Gorge, Gresham</td>
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<tr>
<td>Sat, Apr. 16</td>
<td>Beneficial Insects</td>
<td>9 seats left (of 20 max)</td>
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<tr>
<td>9:00 am - 11:30 am</td>
<td>Livingscape, Portland</td>
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<tr>
<td>Wed, Apr. 20</td>
<td>Native Plant Workshop</td>
<td>6 seats left (of 45 max)</td>
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<tr>
<td>6:30 pm - 8:00 pm</td>
<td>Clackamas County Community Center, Portland</td>
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<tr>
<td>Sat, Apr. 22</td>
<td>Naturescaping Basics</td>
<td>Event full, wait list available</td>
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<tr>
<td>9:00 am - 1:00 pm</td>
<td>Livingscape, Portland</td>
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<tr>
<td>Thu, Apr. 27</td>
<td>Urban Woods</td>
<td>25 seats left (of 45 max)</td>
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<tr>
<td>6:00 pm - 8:00 pm</td>
<td>Sherwood City Hall, Sherwood</td>
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<tr>
<td>Sat, Apr. 29</td>
<td>Beneficial Insects</td>
<td>20 seats left (of 45 max)</td>
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<tr>
<td>1:00 pm - 3:30 pm</td>
<td>Northeast Commutity Center, Portland</td>
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<tr>
<td>Wed, May 3</td>
<td>Attracting Pollinators to the Urban Garden</td>
<td>22 seats left (of 40 max)</td>
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<tr>
<td>6:30 pm - 8:00 pm</td>
<td>Livingscape, Portland</td>
<td></td>
</tr>
</tbody>
</table>
Meadowscaping Project - West Multnomah Soil and Water Conservation District, West-side Portland

- “Meadowscaping” guide
- Demo sites with different species and establishment techniques
- Focus on native plants
Perhaps a more sustainable (pollinator-friendly) agriculture could maintain biodiversity?
Questions?

Kathy Pendergrass
Plant Material Specialist (Botanist Ecologist)
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(503) 414-3266
Kathy.pendergrass@or.usda.gov