

# Habitat for Pollinators and Natural Enemies

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# The Xerces Society for Invertebrate Conservation

Founded in 1971, the Xerces Society is a science based nonprofit organization that engages in education, outreach, applied research, policy, and restoration to protect invertebrates and their habitats.



Xerces blue butterfly (*Glaucopsyche xerces*), the first U.S. butterfly to go extinct due to human activities



Photos: 2018 Xerces staff by Matthew Shepherd/Xerces Society. Blue butterfly by Dana Ross.

**Main Office:** Portland, Oregon

**Regional Offices:** California, Connecticut, Iowa, Maine, Minnesota, Nebraska, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Washington, Wisconsin





Photos: Xerces Society / Matthew Shepherd, Justin Ross, USDA NRCS

# Introduction to the Xerces Society

## Xerces Pollinator and Agricultural Biodiversity Team

- Staff in 13 states across the U.S.

## Conservation Education

- Outreach to over 120,000 farm and agency professionals since 2008
- Training events in all 50 states, Europe, Asia, Latin America

## Habitat Restoration

- Supported creation of more than 690,000 acres of pollinator and beneficial insect habitat since 2008



# Importance of Pollinators

More than 85 percent of flowering plants require an animal, mostly insects, to move pollen.

Ollerton et al. 2011. How many flowering plants are pollinated by animals? *Oikos* 120: 321-326.



Photo: Rollin Coville



# Main Groups of Pollinators





# Importance of Natural Enemies

- Control populations of pest insects in crops

The estimated value of pest control by wild natural enemies is \$4.5–12 billion annually for U.S. crops, and \$100 billion worldwide.

- Play an important role in natural ecosystems



Photo: Susan Ellis / bugwood.org

Losey & Vaughan. 2006. Bioscience 56 (4).  
Pimental et al. 1997. BioScience:47 (11)



# Diversity of Natural Enemies



Photo credits: Sarah Foltz Jordan; John Roberson; squamatologist via flickr; Russ Ottens and David Cappaert (Bugwood.org) , , Thelma Heidel-Baker; Katja Schulz via flickr



# Importance of Habitat

## Habitat Elements for Beneficial Insects

### Food

- Nectar, pollen, alternative prey, host plants

### Shelter

- Nest sites, overwintering sites, larval host plants

### Refuge

- Protection from pesticides



Photo credit: Mike Omeg, Omeg Orchards



# What Habitat Provides: Floral Resources as Food

Necessary for certain life stages  
e.g. Protein for egg development



Alternate food  
source

Increases  
reproduction and  
longevity



Photos: Predatory wasp on apple, Xerces Society/Nancy Adamson; Syrphid fly, Adam Varenhorst; Lady beetle eating pollen, Thelma Heidel-Baker



# Habitat Provides Alternate Food Sources

Habitat can  
provide alternate  
prey when crop  
pests are absent



Photo: Lady beetle eating non-pest aphids on showy tick-trefoil, rockerBOO, flickr Creative Commons 2.0



# Shelter and Overwintering Sites

Habitat provides shelter and egg-laying sites

Brush Piles



Rock Piles

Woody and Pithy Stems



Photos: all by Sarah Foltz Jordan



# Habitat is the key ingredient

Studies show direct link between habitat and beneficial insect abundance and diversity

Begg et al. 2017. A functional overview of conservation biological control. *Crop Protection* 145-158.

Rusch et al. Agricultural landscape simplification reduces natural pest control: A quantitative synthesis. *Ag, Ecosys and Envt.* 221: 198-204.



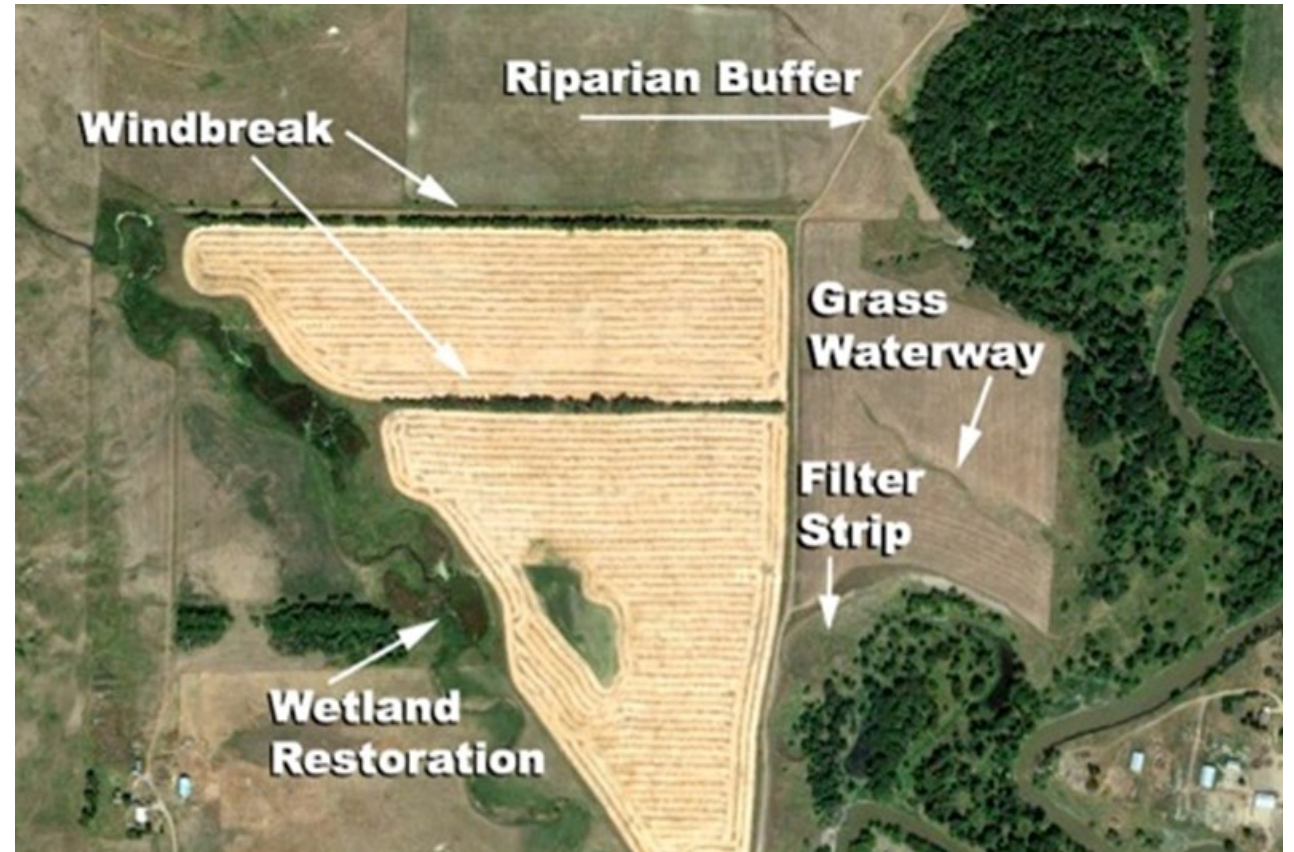
Photo: Great golden digger wasp sipping wingstem nectar, by Nancy Adamson



# Habitat Features

## Other Benefits of Conservation Buffers

- Water quality protection
  - Sediment capture
  - Nutrient capture
  - Stream shading
- Buffer against adjacent pesticide use
- Screening, noise reduction
- Wildlife corridors
- Weed seed capture





# Habitat Opportunities

## Irrigation Ponds



Photos: Zirkle Irrigation Ponds by Corin Pease(Xerces Society)



# Habitat Examples

## Hedgerows

Ellensburg, WA

- (Morandin et al, 2014)
- Higher rates of predation and parasitism on insect pests
- Pests reached treatment thresholds less often adjacent to hedgerows



Photo: Corin Pease(Xerces Society)



# Habitat Examples

## Hedgerows

(Long et al., 2017)

- “Hedgerows can enhance pest control and pollination in crops, resulting in a return on investment within 7 to 16 years, without negatively impacting food safety”



Photo: Corin Pease (Xerces Society)



# Habitat Examples

## Hedgerows

- Hedgerow in The Dalles, OR
- Plantings of Woods' Rose significantly increased parasitism of leafrollers in adjacent Apple orchards in WA (Unruh et al., 2012)



Photo: Hedgerow by Mace Vaughan (Xerces Society), Rose by Brewbrooks (Flickr, CC)



# Hedgerows



Photo: Matthew Shepherd/Xerces Society

## Roses provide alternate hosts in vineyards

- Roses at ends of rows supported alternate hosts for parasitoid wasps that needed leafhoppers in which to overwinter



# Opportunities for Habitat



## Riparian Areas

- Willow plants (male) provide early season pollen for native bees early in the season.
- Milkweed, Spirea and provide pollen and nectar later in the season

Photo credits: Creek Photos by Timmie Mandish (NRCS); Peachleaf Willow by Andrey Zharkikh (Flickr CC); Spiraea douglasii by Joe Mabel (Creative Commons); Asclepias speciose at Hedgerow Farms by Brianna Borders (OA)



# Opportunities for Habitat



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## Irrigation Canals

Showy Milkweed and Goldenrod thrive in this environment



# Habitat Examples

## Cover Crops

- Low stature
- Tolerant of tractor traffic
- Reseeding annuals
- Herbaceous perennials



Photo: Jessa, Xerces



# Habitat Examples

## Native Plants in the Vineyard

### Klickitat Canyon Vineyard, Washington

- Native grass / wildflower  
understory



Photo: Eric Mader (Xerces Society)



# Habitat Examples

## Native Plants in the Vineyard

### Klickitat Canyon Vineyard, Washington

- Native grass / wildflower  
understory



Photos: Eric Mader (Xerces Society)

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# Hedgerow Plants: Early Bloom



Photo: Xerces Society

## Willow(*Salix spp.*)

- Mature Height: 20+ ft
- Water Needs: High
- Attracts:
  - bumble bees
  - lady beetles



# Habitat Plants: Early Bloom

## Golden Currant *Ribes aureum*

### Attracts:

- Diversity of bees
- Parasitic wasps including *Anagrus*
- Lacewings
- Lady bugs



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# Hedgerow Plants: Early to Midseason Bloom



Photos: *Sambucus racemose* by Walter Siegmund GNU Free Documentation License

## Blue Elderberry (*Sambucus nigra*)

- Mature Height: 12 ft
- Water Needs: 10 inches
- Attracts:
  - hoverflies
  - lacewings
  - parasitic wasps
  - minute pirate bugs
- Pests: SWD
- Hollow stems provide nesting sites for stem nesting bee species.



# Hedgerow Plants: Early to Midseason Bloom

## Mock Orange (*Philadelphus lewisii*)

- Mature Height: 10 ft
- Water Needs: 15 inches
- Attracts:
  - Bees
  - Butterflies



Photos: Mock Orange and Mock Orange with Mining Bee by Mace Vaughan, Xerces Society



# Hedgerow Plants: Early to Midseason Bloom



Photo: Rosa nutkana (Nootka rose) by brewbrooks, Flickr Creative Commons

## Wood's Rose

(*Rosa woodsii*)

Mature Height: 6-8 ft

Water Needs: 15 inches

Attracts:

- Diversity of bees
- lacewings
- Ladybeetles
- Syrphid flies
- Parasitic wasp including Anagrus
- Hollow stems for stem nesting bees



# Habitat Plants: Early to Mid Season Bloom



Corin Pease Xerces

Purple Sage

*Salvia dorrii*

Mature Height: 3ft

Water Needs: low

Attracts:

- Diversity of bees
- Lady beetles
- Lacewings
- Syrphid flies
- Parasitic wasps



# Habitat Plants: Early to Midseason Bloom

## Mallow-leaf Ninebark (*Physocarpus malvaceus*)

- Mature Height: 3-6 ft
- Water Needs: 18 inches
- Attracts:
  - Wide variety of bees
  - butterflies



Photos: *Physocarpus capitatus* by Walter Siegmund Creative Commons: Mallow Ninebark by Corin Pease, Xerces Society



# Hedgerow Plants: Early to Midseason Bloom



## Wild Lilac

(*Ceanothus spp.*)

Mature Height: 8-13 ft

Water Needs: Low-Medium

### Attracts:

- A wide variety of native bees
- Hoverflies
- Tachinid Flies
- Lacewings,
- a variety of butterflies

Photos: habitat\_CA almonds by Jessa Kay-Cruz, Xerces Society; *Bombus melanopygus* on *Ceanothus* by Mace Vaughan, Xerces Society



# Hedgerow Plants: Midseason Bloom



Photo: Spiraea douglasii by Joe Mabel, Creative Commons

## **Douglas Spirea** (*Spiraea douglasii*)

Mature Height: 6 ft

Water Needs: Medium

Attracts:

- bumble bees
- sweat bees
- minute pirate bug
- rove beetles
- lady beetles
- Spiders
- hoverflies



# Hedgerow Plants: Midseason Bloom

## Ocean Spray (*Holodiscus discolor*)

Mature Height: 12 ft

Water Needs: Medium

Attracts:

- native bees
- Honey bee
- Wasps
- Hoverflies
- lady beetles
- Spiders
- other beneficial insects

Pests: Fire Blight



Photo: Holodiscus discolor by Doug Murphy, Creative Commons



# Hedgerow Plants: Midseason Bloom



## Yarrow

(*Achillea millefolium*)

Mature Height: 2 ft

Water Needs: Medium

Attracts:

- sweat bees
- polyester bees
- Minute Pirate Bugs
- Big eyed bugs
- Hoverflies
- predatory and parasitic wasps
- lady beetles

Photos: *Achillea millefolium* in the Wenatchee foothills by Thayne Tuason, Creative Commons;  
*Hippodamia convergens* visiting yarrow flowers by Sara Morris, Xerces Society



# Hedgerow Plants: Midseason Bloom

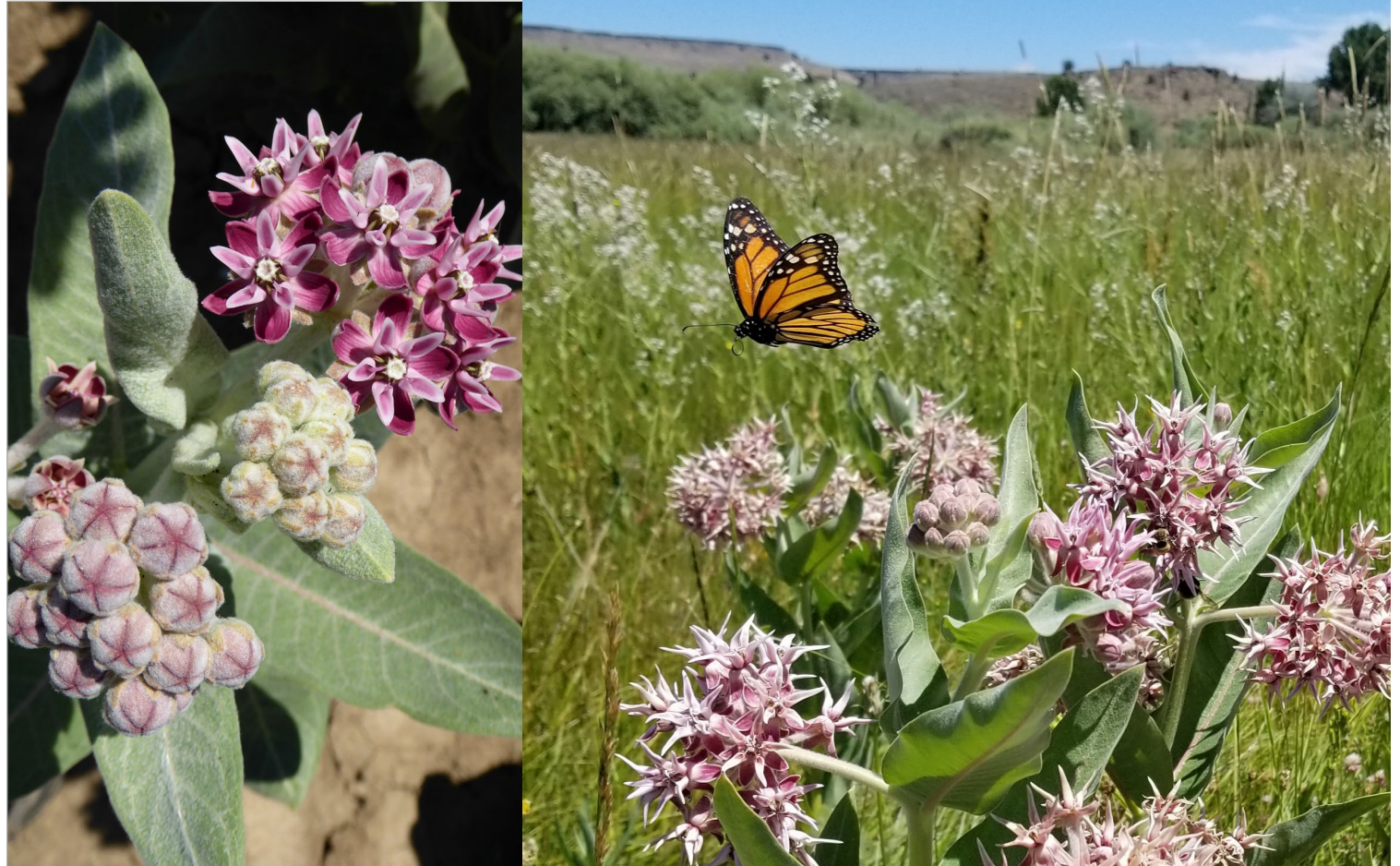
## Showy Milkweed (*Asclepias speciosa*)

Mature Height: 3 ft

Water Needs: Medium

### Attracts:

- Monarch butterfly
- Variety of bees
- Hoverflies
- Tachinid Flies
- Minute pirate bugs
- Lady beetles
- Wasps



Photos: *Asclepias speciosa* Hedgerow Farms\_Brianna Borders; Monarch flying over showy milkweed by Stephanie McKnight, Xerces Society



# Hedgerow Plants: Late Season Bloom

## Goldenrod (*Solidago spp.*)

Mature Height: 3 ft

Water Needs: Medium

Attracts:

- bumble bees
- sweat bees
- leafcutter bees
- mining bees



Photos: Goldenrod Corin Pease, Xerces Society



# Habitat Plants: Late Season Bloom



Photo: Fireweed by Mace Vaughan

## Fireweed

(*Chamerion angustifolium*)

Mature Height: 6 ft

Water Needs: Medium

Attracts:

- Bumble bees
- Other native bees
- Parasitic wasps
- Syrphid flies



# Habitat Plants: Late Season Bloom



## Rabbitbrush

(Ericameria and Chrysothamnus)

Mature Height: 3ft

Water Needs: low

Attracts:

- Bees
- Parasitic wasps
- Lady bugs

Photo: Rabbitbrush by Corin Pease, Xerces



# Native Plants for Vineyard Alleys

Anaphalis margaritacea,  
Achillea millifolium  
Astragalus spp.  
Chaenactis angustifolium  
Eriophyllum lanatum,  
Erigeron spp.  
Eriogonum spp.,  
Gaillardia aristata,  
Lupinus spp.,  
Machaeranthera canescens,  
Phacelia hastata,  
Sphaeralcea munroana,



Photos: Pearly Everalsting, and heartleaf buckwheat by Corin Pease, Xerces, Blanket flower by Kitty Bolte, Xerces, Yarrow by Kathryn Prince, Xerces



# Bee Better Certified

A first of its kind pollinator-focused food and farm certification program.



BEE BETTER  
CERTIFIED  
XERCES SOCIETY





# Creating Better Places for Bees

**Habitat Areas  
on the Farm**



**Protected Nest  
Sites for Bees**



**Protection  
from  
Pesticides**



**Third-Party  
Verified**



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A close-up photograph of a bumblebee on a purple flower. The bee is positioned on the right side of the frame, facing left, with its head buried in the flower's center. The flower has numerous long, thin, white stamens extending from its purple petals. The background is a soft, out-of-focus green, suggesting foliage. A white rectangular box with the word "Questions?" in black text is overlaid on the left side of the image.

Questions?