

Habitat for Pollinators and Natural Enemies

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Photo credit: Liz Robertson, Xerces Society

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 Env.* 221: 198-204.

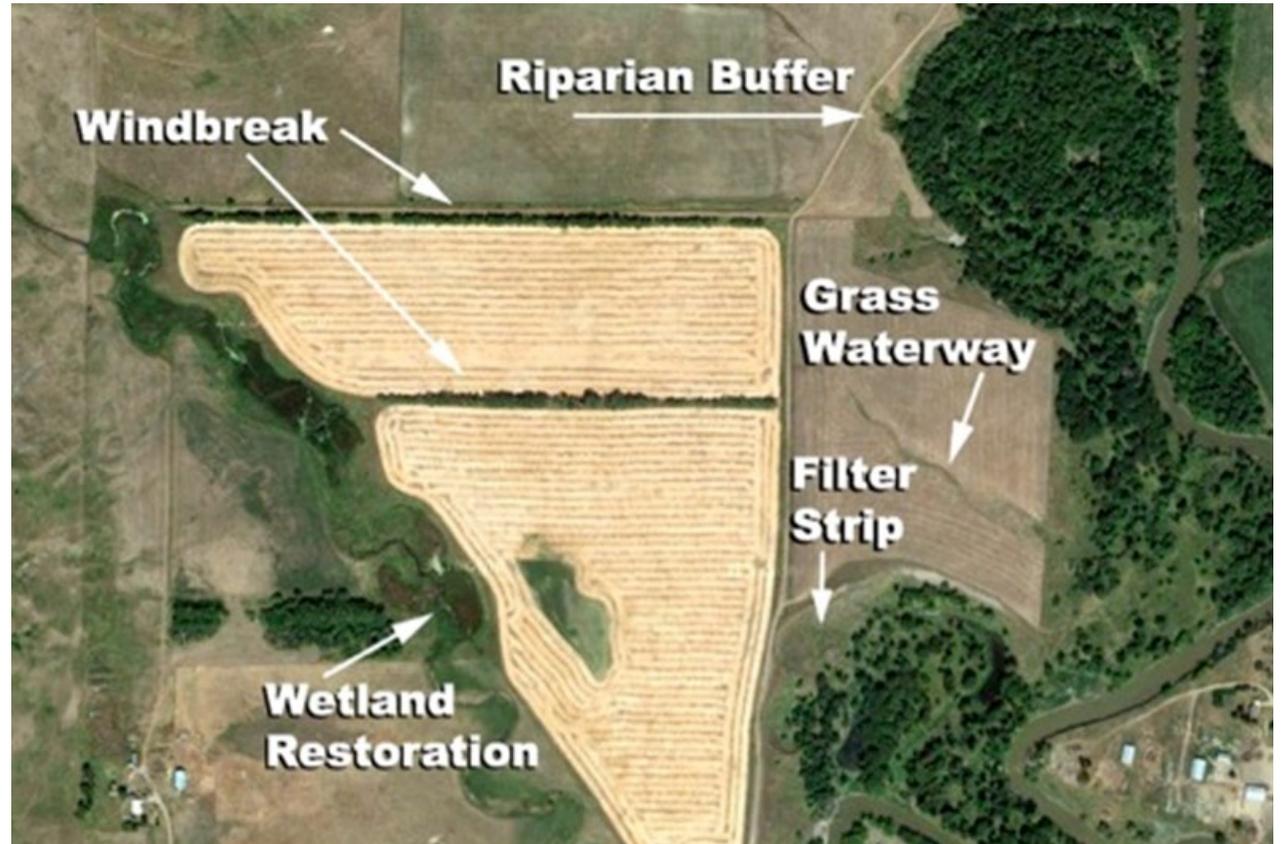


Photo: Great golden digger wasp sipping wingstem nectar, by Nancy Adamson

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



Corin Pease

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 Sigmund 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

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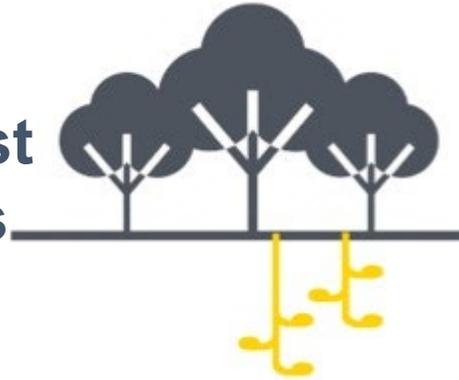
Creating Better Places for Bees

Habitat Areas
on the Farm



5%

Protected Nest
Sites for Bees



Protection
from
Pesticides



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Questions?