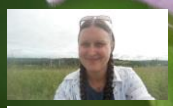
# Conservation Practices for Pollinators



XERCES SOCIETY for Invertebrate Conservation

Kelly Gill
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Photo: Mace Vaughan

## Acknowledgements

**Thank you for attending today's webinar**

Thank you to these Xerces Society supporters:

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Photo: Kelly Gill, The Xerces Society

## Introduction to the Xerces Society

XERCES SOCIETY for Invertebrate Conservation

Xerces blue butterfly (*Glaucopsyche xerces*)

**Protecting the Life that Sustains Us**

The Xerces Society is a nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. For over forty years, the Society has been at the forefront of invertebrate protection worldwide, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs.

**Learn more about our work at www.xerces.org**

Photo: Ed Ross

## The Xerces Society: Protecting the Life that Sustains Us

**Xerces' major programs**

- Butterfly conservation
- Aquatic conservation
- Endangered species
- Pollinator conservation
- Conservation biocontrol
- Pesticide protection
- Citizen science

www.xerces.org

Photos: Adam Varenhorst, Tim Menard, Sarina Jepsen, Bruce Newhouse

## The Value of Pollinators: Ecological Keystone

**Natural ecosystems depend on pollinators**

- About 85% of the world's flowering plants need animal pollinators, mainly insects
- Open pollination promotes genetic diversity in plants
- Fruits and seeds are a major part of the diet of ~25% of birds, and many mammals
- Insects are food for wildlife, including 89% of birds
- Pollinator-friendly landscapes support a variety of wildlife
- Intrinsic value of nature, part of our natural heritage

Photos: Nancy Adamson, USDA-NRCS, Jeff Vanuga, Mace Vaughan

## Main Groups of Pollinators

Photos: Sarah Foltz Jordan, The Xerces Society

## Insect Pollinators: Bees

**The most important pollinators**

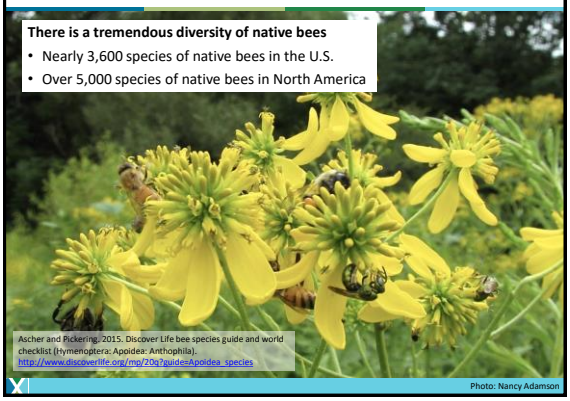
- Bees provide for their young
- Bees actively collect and transport pollen
- Bees exhibit flower constancy
- Bees regularly forage in area around nest

Photo: Nancy Adamson

## Insect Pollinators: Native Bees

**There is a tremendous diversity of native bees**

- Nearly 3,600 species of native bees in the U.S.
- Over 5,000 species of native bees in North America



Ascher and Pickering. 2015. Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila). http://www.discoverlife.org/mp/20q?guide=Apoidea_species

Photo: Nancy Adamson

## Insect Pollinators: Native Bees

**Tremendous diversity of native bees**

- Wide range of shapes, sizes
- Many are small, easily overlooked or mistaken for other insects

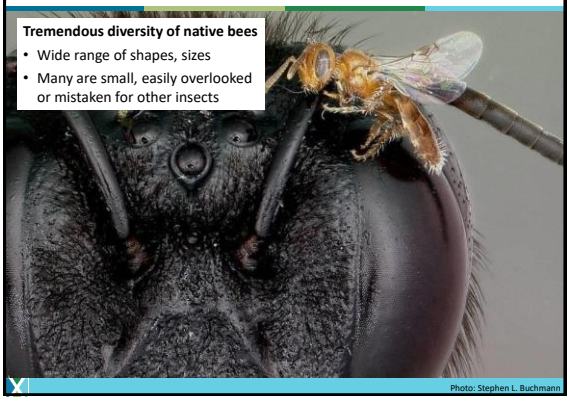


Photo: Stephen L. Buchmann

## Insect Pollinators: Native Bees

**Tremendous diversity of native bees**

- Wide range of shapes, sizes
- Vastly different colors, patterns

Photos: Nancy Lee Adamson, Rollin Coville

## Insect Pollinators: Native Bees

**Recent study of 41 crops around the globe:**

- Wild pollinators improved fruit set at ***twice*** the rate of honey bees
- **Better quality pollination** relates to cross-pollination, ability to buzz pollinate, and other foraging behaviors

Garibaldi et al. 2013

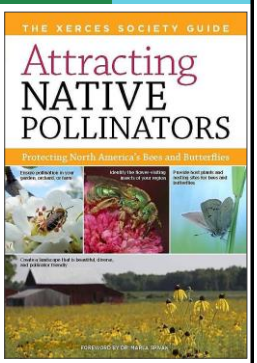
Photo: Nancy Lee Adamson

## Learn More About Native Pollinators in Your Landscape!!

**Available at Longwood Gardens gift shop or Xerces website www.xerces.org**

- Bees, butterflies, and other native pollinators and how to protect them.
- Identification of common bee groups and their habitat needs.
- Recommendations for creating habitat on farms, gardens, parks, roadsides, schoolyards, public lands, and more
- Case studies
- Beautiful photographs and images

***"Attracting Native Pollinators belongs on the bookshelf of everyone who values the future of the natural world."*** -- Douglas Tallamy, researcher and author of *Bringing Nature Home*



## European Honey Bees (*Apis mellifera*)

**Honey bees**

- Introduced species, managed for crop pollination and honey production
- Social behavior: Cooperative brood care, reproductive caste, division of labor, overlapping generations
- Experiencing many problems (50% decline in managed hives since 1950)
- Causes: Disease, pests, poor nutrition, pesticides, genetics, high winter loss…
- Become reliant on a pollinator that is facing many challenges

National Research Council. 2007. National Academies Press; vanEngelsdorp et al. 2007. Am. Bee Journal 147:599-603.

Photos: Eric Mader, Rollin Coville, Marlin Rice

## Pollinator Declines: Bumble Bees

**Not just honey bees…**

- Widespread declines in bumble bee populations
- At least 25% of North American species at risk of extinction
- Threats: Disease spread by commercial bees, habitat loss, pesticide use, global change

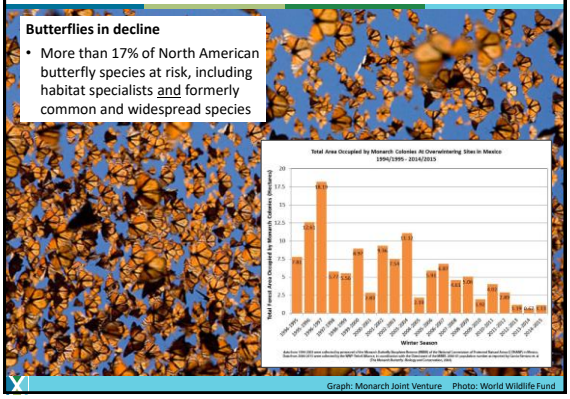
Hatfield et al. 2014 Xerces Society-IUCN status review; Cameron et al. 2011. PNAS

Photo: Jennifer Hopwood

## Pollinator Declines: Butterflies

**Butterflies in decline**

- More than 17% of North American butterfly species at risk, including habitat specialists and formerly common and widespread species

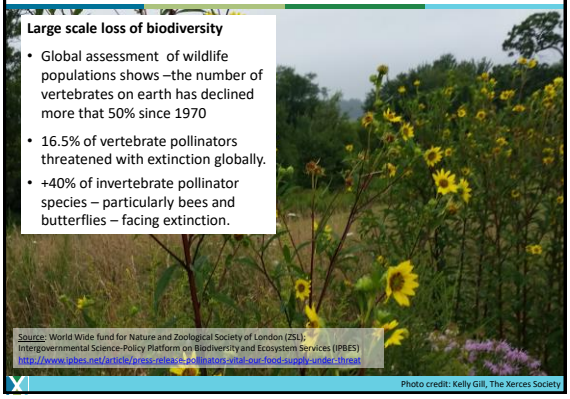



Graph: Monarch Joint Venture  Photo: World Wildlife Fund

## Decline in Wildlife Populations

**Large scale loss of biodiversity**

- Global assessment of wildlife populations shows –the number of vertebrates on earth has declined more that 50% since 1970
- 16.5% of vertebrate pollinators threatened with extinction globally.
- +40% of invertebrate pollinator species – particularly bees and butterflies – facing extinction.



Source: World Wide fund for Nature and Zoological Society of London (ZSL), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) http://www.ipbes.net/article/press-release-pollinators-vital-our-food-supply-under-threat

Photo credit: Kelly Gill, The Xerces Society

## Threats to Pollinators

- **Habitat Loss**
- Land-use change
- Agricultural intensification
- Land management impacts
- Widespread pesticide use
- Invasive species
- Pathogens and disease

Photos: Howard F. Schwartz, Colorado State University, Bugwood.org

## Pollinator Conservation: Understanding Pollinator Biology

Photo: Nancy Lee Adamson

## Honey Bees: Not Your Average Bee

Photo: Robert W. Matthews, University of Georgia; Bugwood.org

## Ground-Nesting Solitary Bees

**Roughly 70% of native bee species nest underground**

- Very common bees
- Resemble ant-nests
- Lined with waxy glandular secretions, resist flooding

Photos: Eric Mader, Rollin Coville, Dennis Briggs

## Tunnel-Nesting Solitary Bees

**Roughly 30% of native bee species nest in tunnels**

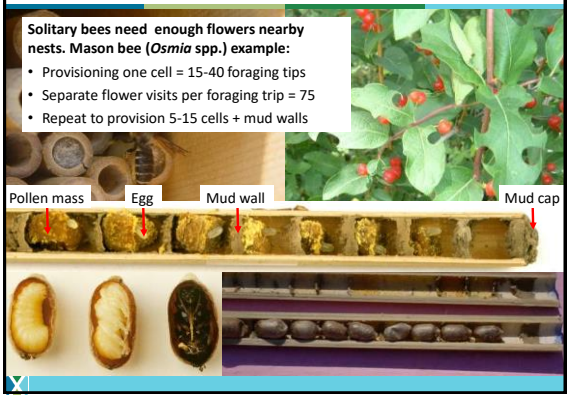
- Hollow stems, beetle borer holes, tunnels in snags, rotting wood
- Nest tunnel partitions constructed of mud, leaf pieces, or sawdust
- Artificially managed for some crops

Photos: Edward Ross, Darrin O' Brien, Matthew Shepherd

## Tunnel-Nesting Solitary Bees

**Solitary bees need enough flowers nearby nests. Mason bee (*Osmia* spp.) example:**

- Provisioning one cell = 15-40 foraging tips
- Separate flower visits per foraging trip = 75
- Repeat to provision 5-15 cells + mud walls




## Bumble Bees (Social)

**45 species in U.S.,~26 in East**

- Social colonies founded by single queen
- Annual, last only one season
- Nest may contain 100-300 workers
- Nests in abandoned rodent burrows, brush piles, tussocks, tree cavities

Photos: Elaine Evans, Nancy Adamson, Eric Mader

## Pollinator Conservation: Understanding Habitat Needs

Photo: Brianna Borders

## Pollinator Conservation: Create New Habitat

**Whether you are planting for pollinators in the backyard or the back forty, habitat must include:**

- **Shelter**: nest sites, refuge, overwintering sites
- **Food:** nectar, pollen, caterpillar host plants
- **Protection:** best management practices and pesticide risk mitigation

Photo: Jennifer Hopwood

## Pollinator Habitat: Bumble Bee Nests

**Protect bumble nests**

- Maintaining field borders, un-mown areas
- Establishing bunch grasses
- Leaving brush piles, piles of leaves
- Reduce ground disturbance when queens are overwintering

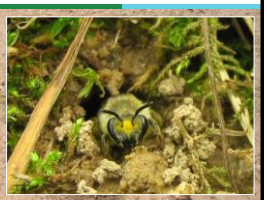
Photos: Mace Vaughan, Edward Ross

## Pollinator Habitat: Bumble Bee Nests

## Pollinator Habitat: Ground Nests

**Protect ground nests**

- A lack of nest sites is a major constraint on bee populations
- Recognize and protect existing nesting habitat

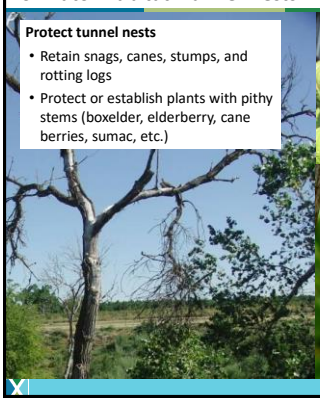


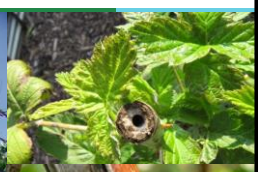
Photos: Jennifer Hopwood, Eric Mader

## Pollinator Habitat: Tunnel Nests

**Protect tunnel nests**

- Retain snags, canes, stumps, and rotting logs
- Protect or establish plants with pithy stems (boxelder, elderberry, cane berries, sumac, etc.)





## Pollinator Habitat: Plant Selection

**Planting for pollinators and other beneficial insects:**

- Focus on native perennial plants
- Species with high pollinator value
- Succession of bloom periods
- Site appropriate characteristics
- Availability and cost
- Pesticide-free seed or plants

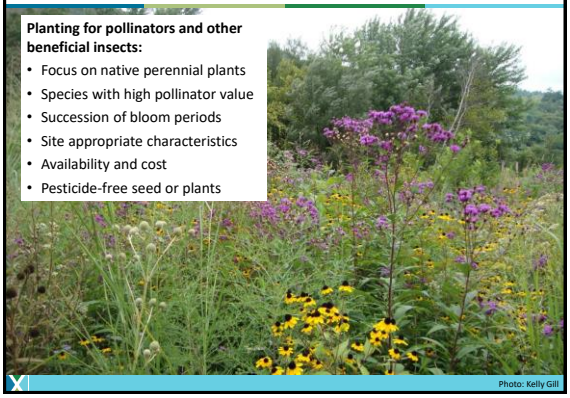


Photo: Kelly Gill

## Pollinator Habitat: High-Value Wildflowers

**Pollinators need a succession of bloom: spring, summer, and fall**

Photos: Elaine Haug NRCS, Matthew Shepherd; Mace Vaughan, Eric Mader, Jeff McMillan NRCS, Berry Botanic Garden, Nancy Adamson

## Pollinator Habitat Through the Seasons

Photo: Gary Casabona

## Pollinator Habitat Through the Seasons

**Leave the seeds**

Photo: Kelly Gill, The Xerces Society

## Pollinator Habitat Through the Seasons

**Pollinators need more than just a flower-weather friend**

- Habitat must support entire life cycle
- Need your help to survive winter and sustain future generations

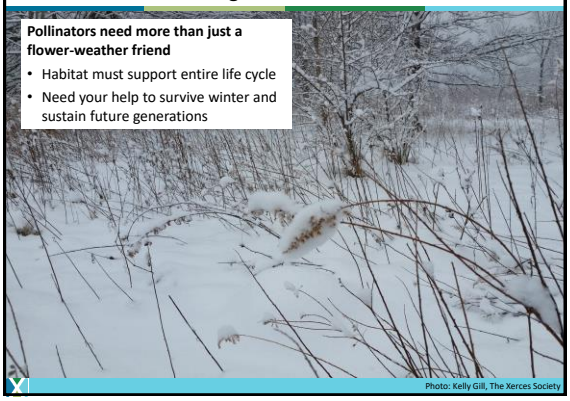
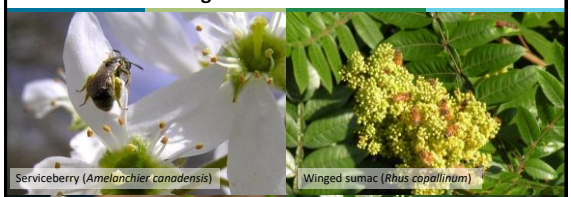


Photo: Kelly Gill, The Xerces Society

## Pollinator Habitat: High-Value Trees and Shrubs



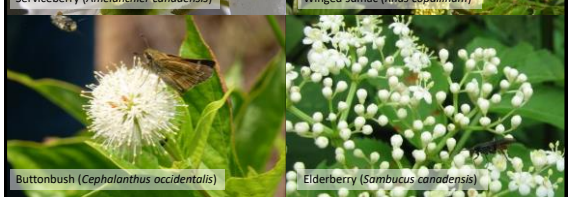




Photo: Nancy Adamson, Gary Casabona

## Pollinator Habitat: High-Value Trees and Shrubs

**Pollinator habitat benefits to other wildlife**

- 96% of birds rear young on insects, mostly caterpillars
- Native trees and shrubs support ~14x more caterpillars than exotic species
- Over 200 species of birds are at risk of extinction
- 50% fewer birds today than 40 years ago

**WITH SIX HUNGRY HATCHI FOR FOOD**, the Carolina chick some nourishment fast. A fem scientists as "Aluminum/Green flew from her cavity nest to fo for caterpillars and other insec bypassed nearly a dozen leafy myrtle trees located a few hun nest. Instead, the bird made a oak on a busy street half a cit

Apparently, she knew what sh "**Native trees such as oak p insect prey than do non-nat** crape myrtle and gingko," biol Rajbhandary told me as we ra bird. An intern for the Smithso Center (SMBC), Rajbhandary Narango, a doctoral student w Delaware and SMBC who is co year study to learn how nonna in cities and suburbs affect the birds need during the breeding

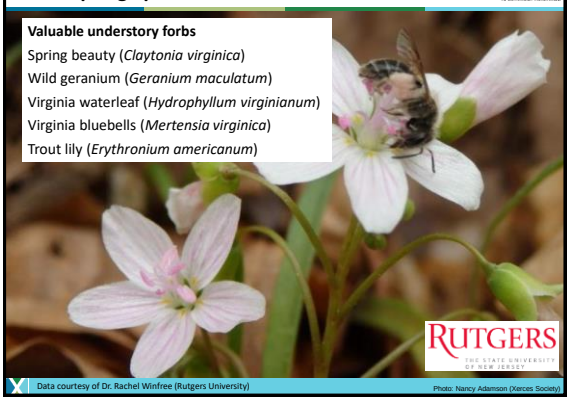
"We're focusing on the chickad common backyard species that, like most birds, feeds insects to its young," N Because chickadees are cavity nesters, and tree cavities are limited, it's also build nests in inexpensive PVC-pipe birdhouses that mimic natural cavities. L installed one of these houses in my backyard in Washington, D.C.—providing opportunity to observe field biologists at work without having to leave home.

**Habitats For People and Wildlife**

## Forest Spring Ephemeral Wildflowers

**Valuable understory forbs**

Spring beauty (*Claytonia virginica*)
Wild geranium (*Geranium maculatum*)
Virginia waterleaf (*Hydrophyllum virginianum*)
Virginia bluebells (*Mertensia virginica*)
Trout lily (*Erythronium americanum*)




Data courtesy of Dr. Rachel Winfree (Rutgers University)
Photo: Nancy Adamson (Xerces Society)

## Protection from Pesticides

**Neonicotinoid insecticides**

- Increasingly used on crops, ornamental plants and lawns
- Systemic mode of action: residues in pollen and nectar
- Can persist for long periods of time in plants and soil
- Harmful to pollinators, even in small doses
- Lack warning labels about hazards to bees / pollinators
- **Avoid use on pollinator-visited plants** (e.g. maple trees, linden trees, roses, sedum, etc.)

Photo: Matthew Shepherd

## Protection from Pesticides

**Organic Approved Pesticides**

TOXIC to bees (avoid)

- Pyrethrins: plant-derived, broad spectrum poison, long residual
- Spinosad: bacterium-derived nerve and stomach poison
- *Beauveria bassiana*: pathogenic fungus, extremely virulent

HARMFUL ON CONTACT

- Insecticidal soaps, horticultural oils

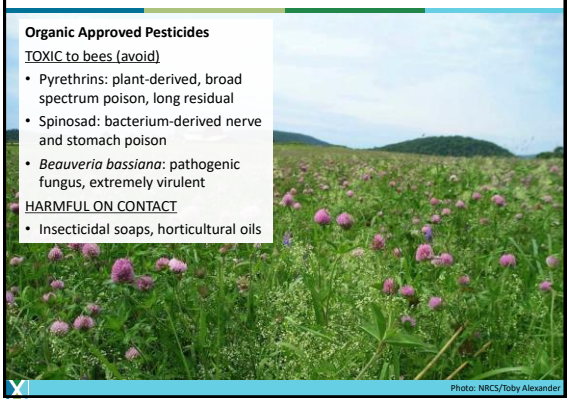


Photo: NRCS/Toby Alexander

## Examples of NRCS Conservation Practices for Pollinators and Beneficial Insects

Photo: Kelly Gill, The Xerces Society

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Herbaceous Weed Control (315)**

- Remove herbaceous weeds and replant with a diversity of native forbs

**Before**: Non-native grasses killed along fence line

**After**: Replanted with native forbs

Photos: Brianna Borders- Xerces Society

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Conservation Cover (327)**

- Establish permanent cover with forbs and bunch grasses adjacent to crop fields or beneath perennial crops.

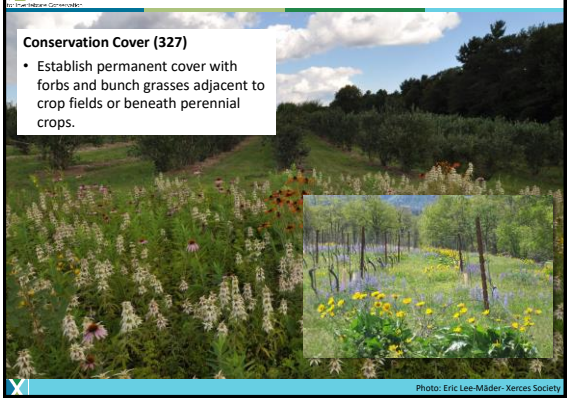


Photo: Eric Lee-Mäder- Xerces Society

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Hedgerows Practice Standard (422)**

- Plant in a succession of flowering shrubs
- Design for multiple benefits

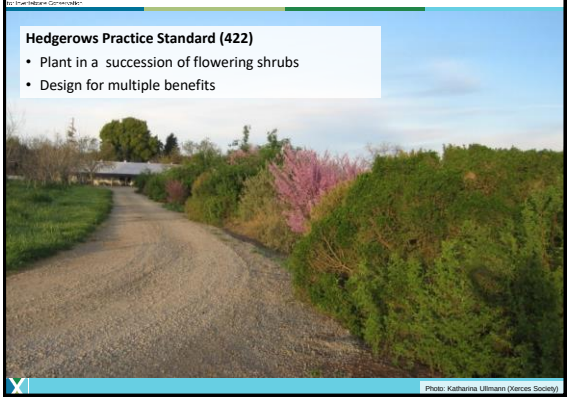


Photo: Katharina Ullmann (Xerces Society)

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Cover Crop Practice Standard (340)**

- Can include diverse flowering forbs such as clover, mustard, buckwheat, phacelia, oilseed radish

Photo: NRCS/Toby Alexander

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Cover Crop Practice Standard (340)**

- Can include diverse flowering forbs such as clover, mustard, buckwheat, phacelia, oilseed radish

Photo: Eric Lee-Mäder- Xerces Society

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Critical Area Planting (342)**

- Establish permanent cover on highly erodible sites
- Include species that stabilize soil and provide forage for pollinators

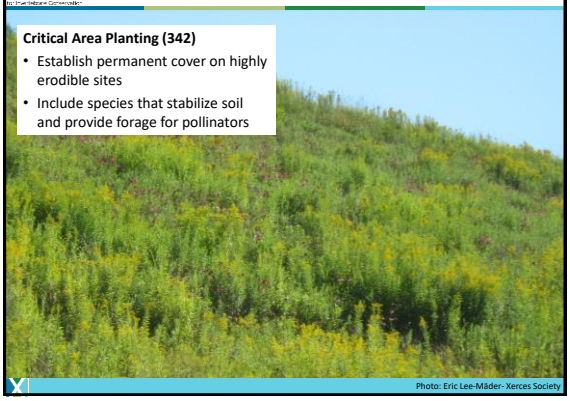


Photo: Eric Lee-Mäder- Xerces Society

## EQIP Conservation Practices for Pollinators and Beneficial Insects

**Field Border (386)**

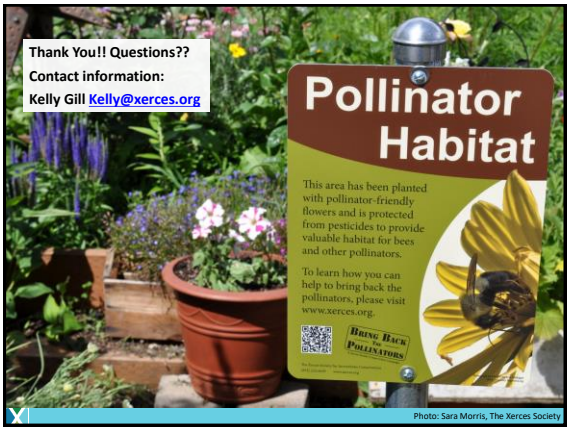
- Includes a diverse mix of native and low cost non-native (non-invasive) plants
- Protects habitat from pesticide drift

Photo: Eric Lee-Mäder- Xerces Society

## Additional Resources and Guidelines

www.xerces.org

That's an old photo
whyatt
whyatt.com.au
© Tim Whyatt


Thank You!! Questions??
Contact information:
Kelly Gill Kelly@xerces.org
Pollinator Habitat
This area has been planted with pollinator-friendly flowers and is protected from pesticides to provide valuable habitat for bees and other pollinators.
To learn how you can help to bring back the pollinators, please visit www.xerces.org
Bring Back the Pollinators
Photo: Sara Morris, The Xerces Society