

Promoting Agricultural Sustainability: Creating Habitat for Native Bees



Presented by Jessa Guisse
Pollinator Habitat Restoration Specialist
The Xerces Society Pollinator Conservation Program

Photo: Edward S. Ross



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What is the Xerces Society

The Xerces Society

An international non-profit that works to protect wildlife and biodiversity through the conservation of invertebrates.

Photo: © Edward Ross



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What is the Xerces Society

The Xerces Society Agricultural Pollinator Program

Mission: Support the sustainability and profitability of farms, while conserving habitat for pollinators and wildlife.



Talk Outline

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- Importance and diversity of pollinators
- Bee declines
- Native bee contributions to crop pollination
- Native bee biology and lifecycle
- Habitat for pollinators and beneficials





Importance of Bees

Pollinators provide an ecosystem service that enables plants to produce fruits and seeds.

- About 70% of the world's plants require a pollinator
- Fruit and nuts are food for wildlife
- 35% of crop species, worldwide
- One in three mouthfuls of food and drink we consume
- Value of crops in U.S.: \$18 to \$27 billion





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Importance of Bees: California Agriculture

Value of Pollinator-Dependent Crops
in CA: \$11.7 billion (Chaplin-Kramer 2011)





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The Value of Other Beneficial Insects

Wild natural enemies
estimated to protect more
than \$4.5 billion in crop
production

(Losey and Vaughan 2006)



Photo: Mace Vaughan



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Diversity of Native Bees

North America: 4,000+ species

California: 1,500 species



Photo: Edward S. Ross



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Diversity of Native Bees

Honey bee (*Apis mellifera*)



Cactus bee (*Diadasia* sp.)



Bumble bee (*Bombus edwardsii*)



Leafcutter bee (*Megachile* sp.)



Photos: James Cane; Robert Parks; Edward S. Ross



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Diversity of Native Bees

Metallic sweat bee (*Agapostemon* sp.)



Yellow-faced bee (*Hylaeus* sp.)



Mason bee (*Osmia* sp.)



Sweat bee (*Halictus* sp.)



Photos: Bruce Newhouse; Edward S. Ross; Mace Vaughan; USDA-ARS/Jack Dykinga



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Diversity of Native Bees

Sunflower bee (*Svastra* sp.)



Long-horned bee (*Mellisodes* sp.)



Carpenter bee (*Xylocopa* sp.)



Photos: Bob Hammond, Colorado State University Cooperative Extension



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Diversity of Native Bees



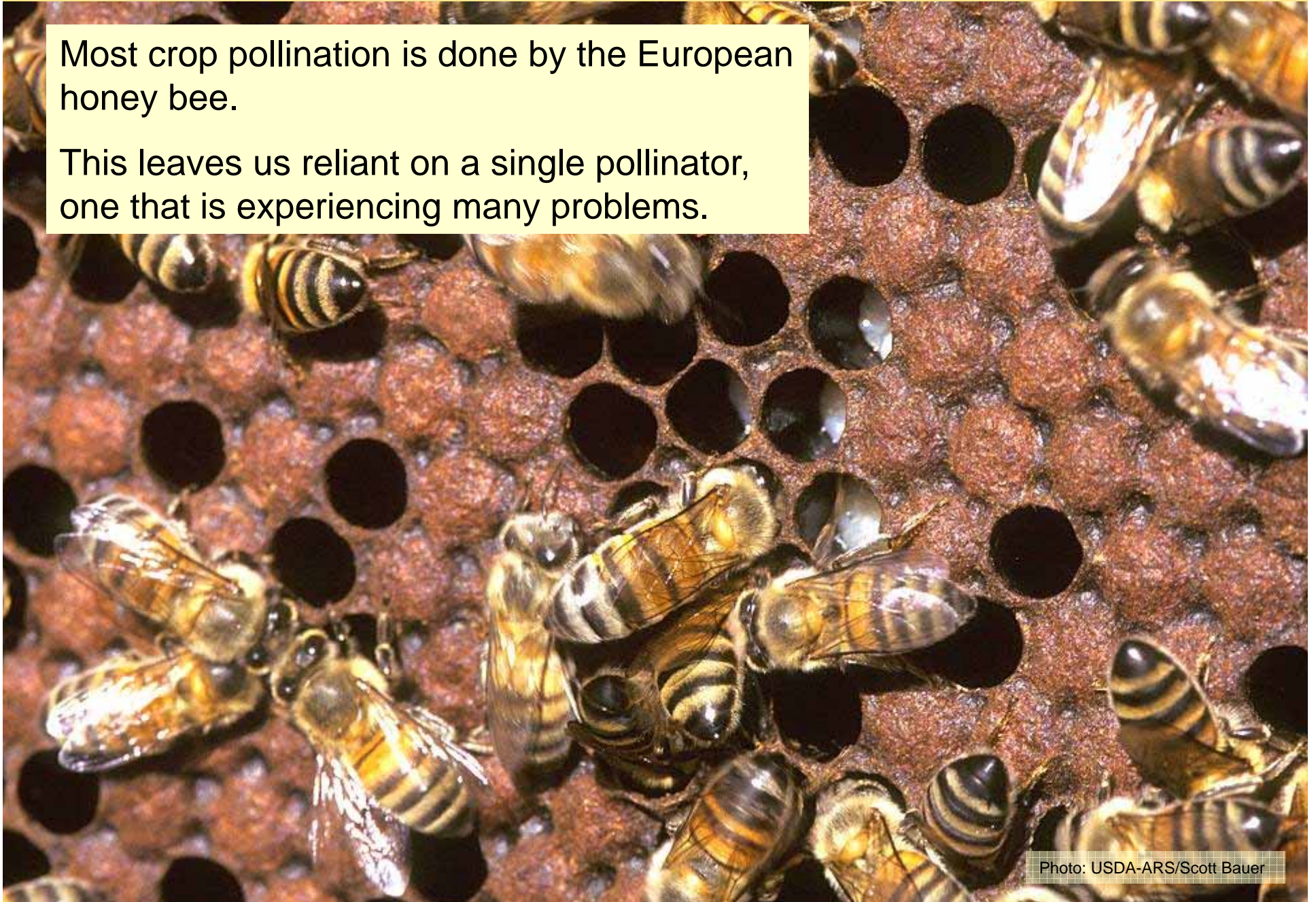
Photo: Stephen L. Buchmann



Bee Declines

Most crop pollination is done by the European honey bee.

This leaves us reliant on a single pollinator, one that is experiencing many problems.





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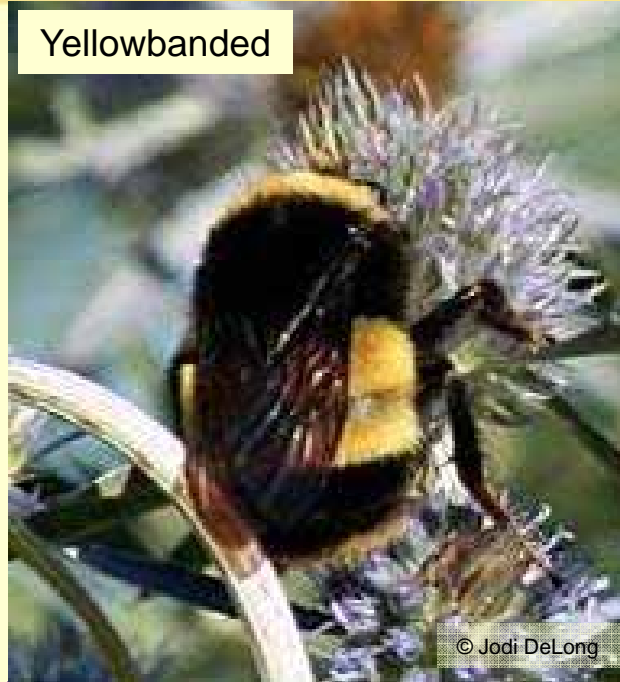
Bee Declines

Native bees also in decline:

Four sister species of
bumble bees:
96% decrease in
population

(Cameron et al 2011)

Yellowbanded



Franklin's



Rusty patched



Western





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Native Bees and Crop Pollination

What does all this mean for the sustainability of crop pollination?



Photo: Mace Vaughan



Native Bees and Crop Pollination

Fewer honey bees available

- Important to diversify pollinators for production agriculture
- Practices that support native bees also support honey bees and other beneficial insects





Native Bees and Crop Pollination

Native Bees Keep Honey Bees Moving: example of sunflower pollination

When native bees were present, the seed set in hybrid sunflower fields more than doubled.

(Greenleaf and Kremen 2006)



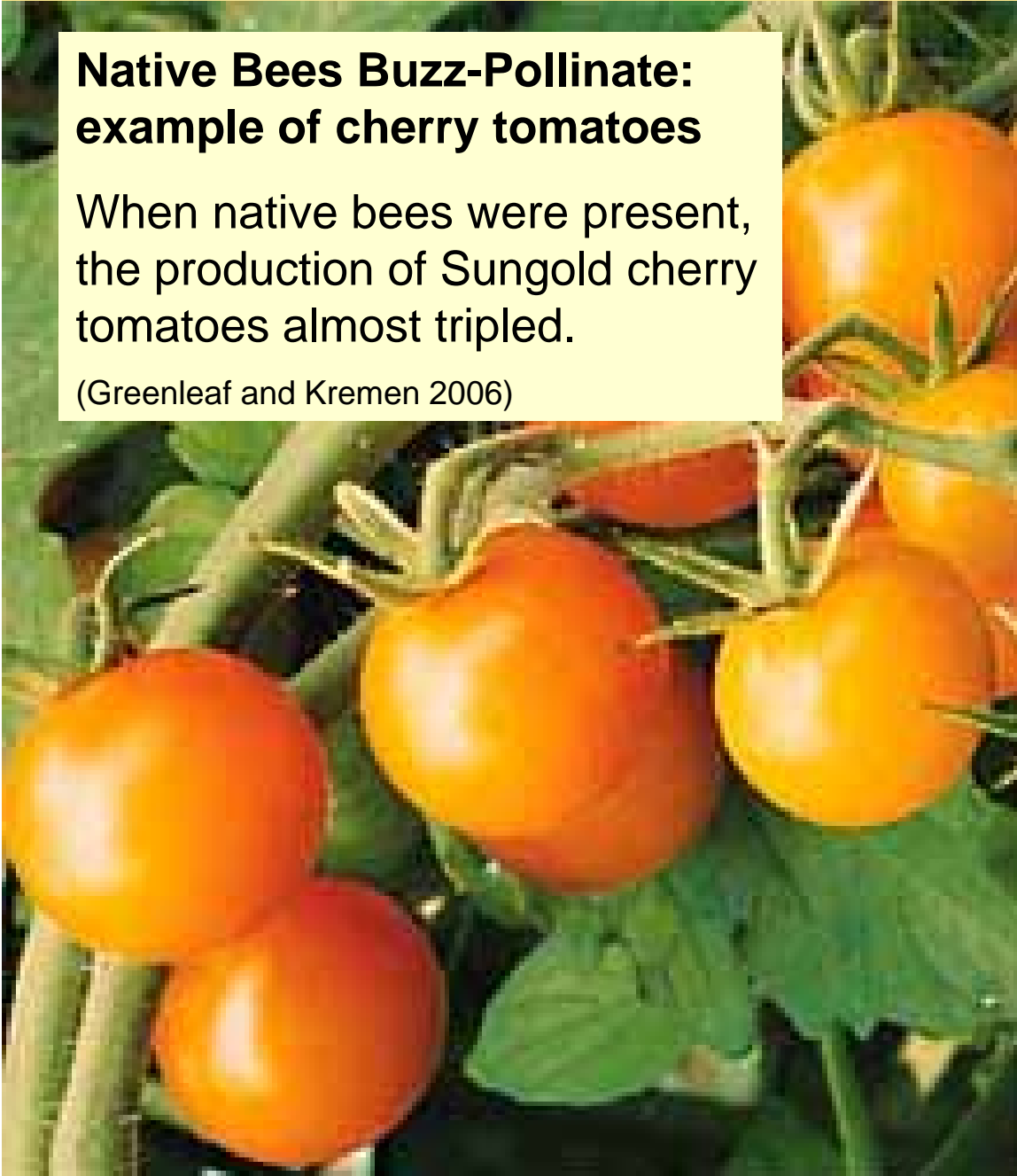


Native Bees and Crop Pollination

Native Bees Buzz-Pollinate: example of cherry tomatoes

When native bees were present,
the production of Sungold cherry
tomatoes almost tripled.

(Greenleaf and Kremen 2006)





Managed Native Bees: the blue orchard bee

- 300 individual females for an acre of almond orchard compared to 1 to 2.5 hives of honey bees (10,000 to 25,000 bees)
- Also pollinates apples and cherries
- Active at cool temperatures



Photo: Stephen Buchmann




Three Broad Groups of Native Bees



**Ground-nesting bees
(solitary)**



**Tunnel-nesting bees
(solitary)**



**Bumble bees
(social)**



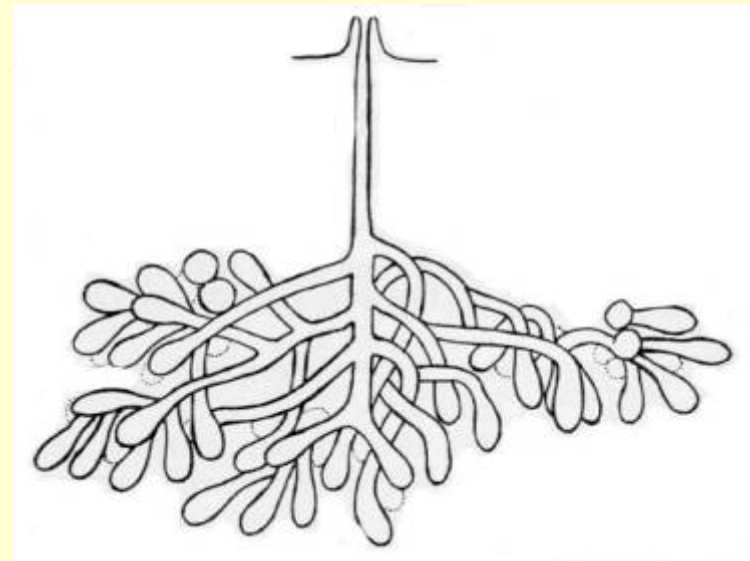
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Solitary Bees

Ground-nesting (~70%)



Photo: Matthew Shepherd



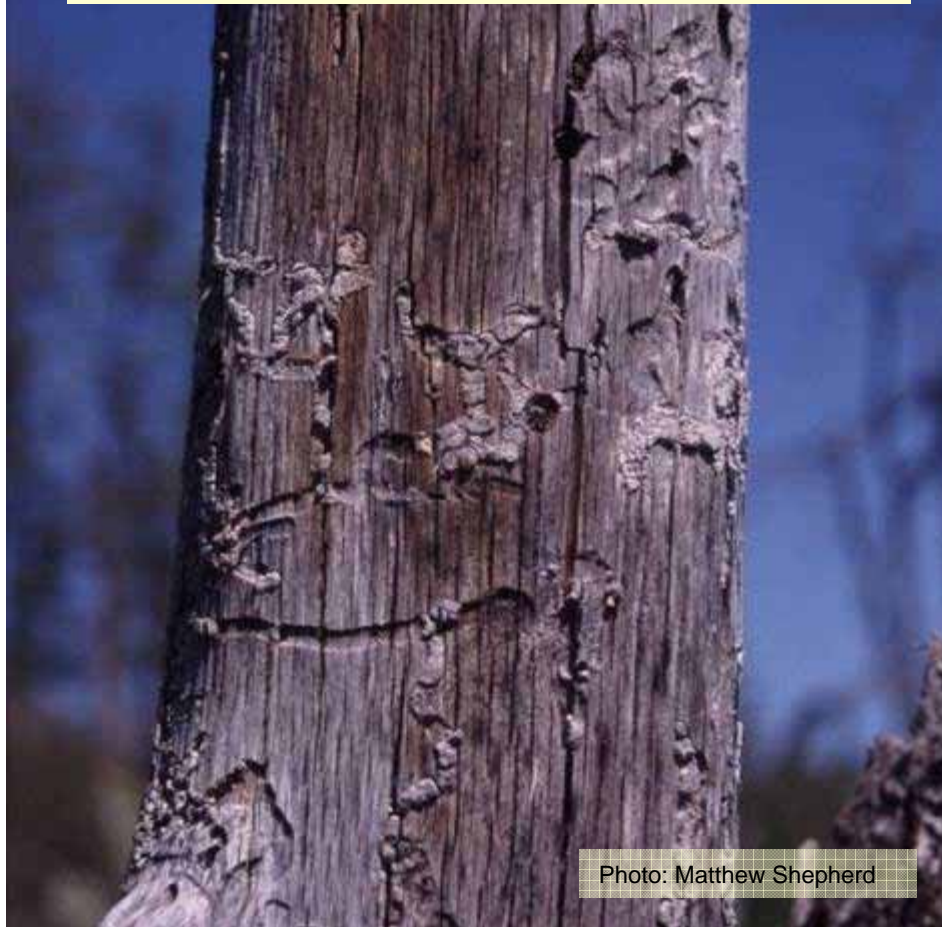
Source: Stephen, Bohart, and Torchio, 1967



Solitary Bees

Tunnel-nesting bees:

- Approximately ~30% (or almost 1,000 species in North America)
- Hollow stems and beetle-borer holes





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Nest Sites for Solitary Bees



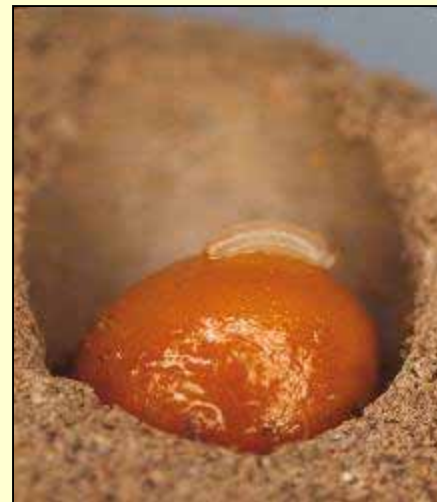
Photos: Matthew Shepherd, Mace Vaughan, Bob Hammond (CO Coop Ext.)



Bee Basics: Life cycle of a solitary bee



Mining bee (*Andrena* sp.): a year in its underground nest as egg, larva, and pupa before emerging to spend a few weeks as an adult.





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Social Bees: Native Bumble Bees



Photo © Edward Ross



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Nest Sites for Bumble Bees



© Mace Vaughan



© NRCS Lynn Betts



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The Value of Natural Areas and Biodiversity

The amount of natural area on or close to the farm is a major influence on the diversity and abundance of bees.



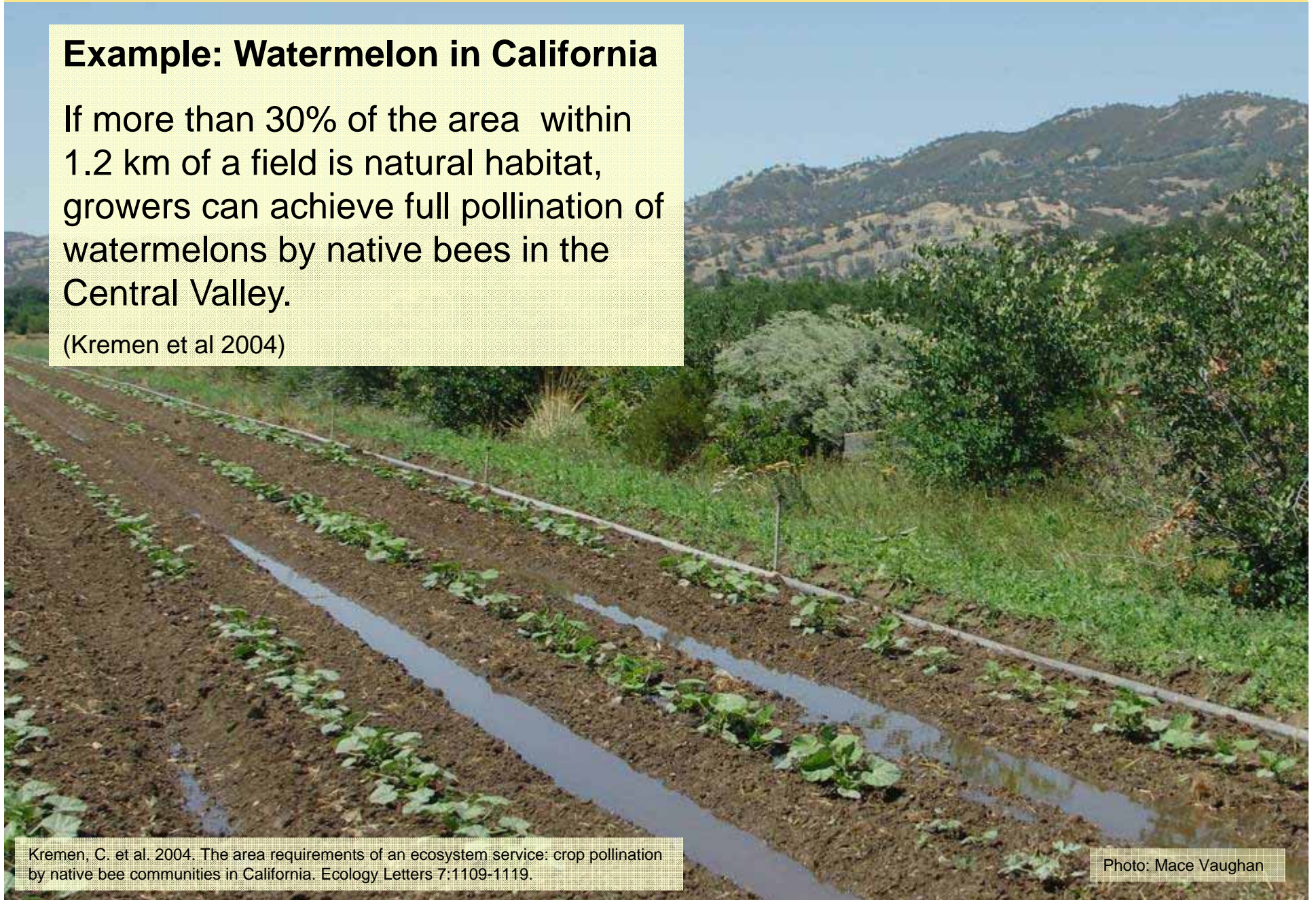
Photo: Edward S. Ross



Example: Watermelon in California

If more than 30% of the area within 1.2 km of a field is natural habitat, growers can achieve full pollination of watermelons by native bees in the Central Valley.

(Kremen et al 2004)



Kremen, C. et al. 2004. The area requirements of an ecosystem service: crop pollination by native bee communities in California. *Ecology Letters* 7:1109-1119.

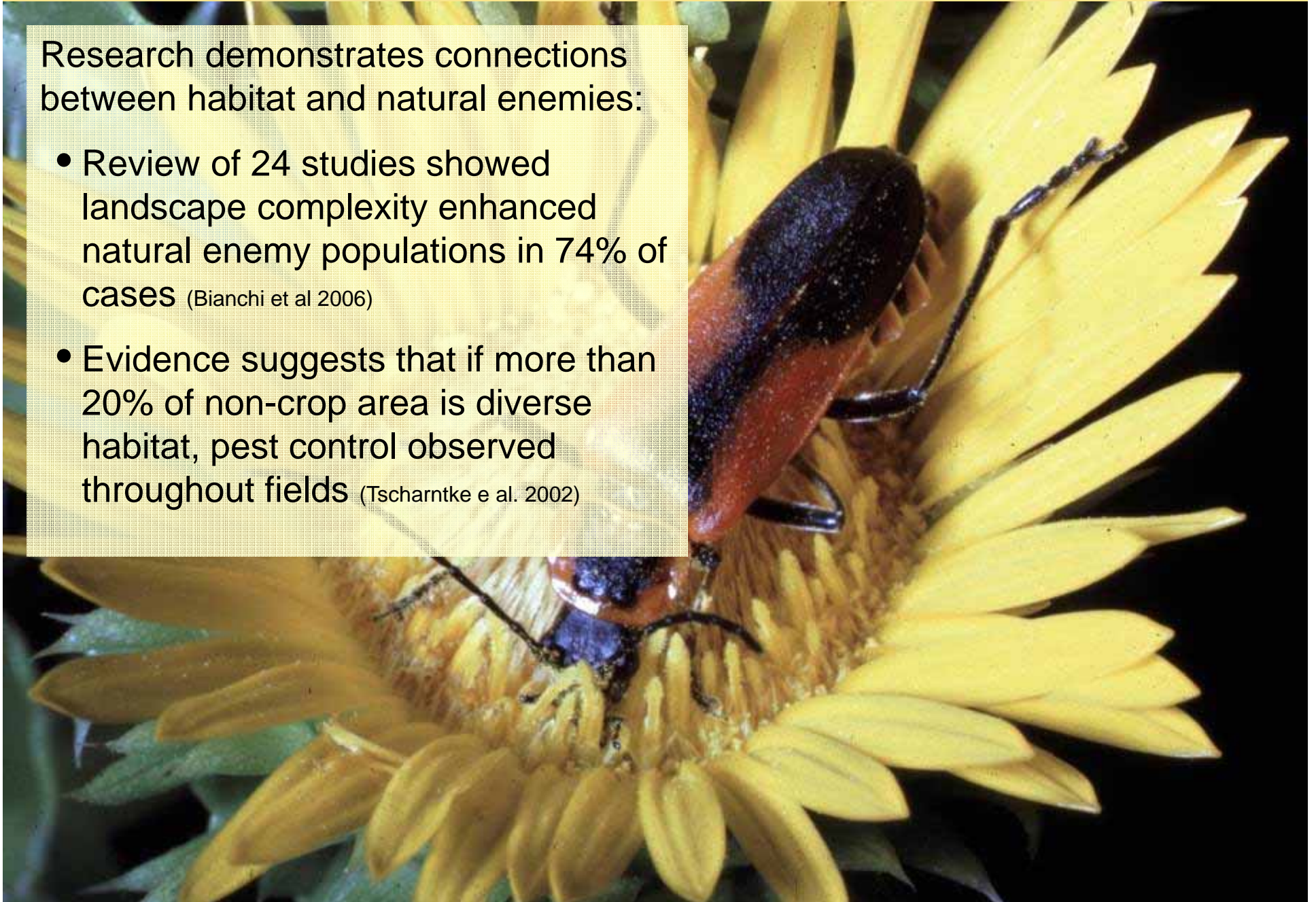
Photo: Mace Vaughan

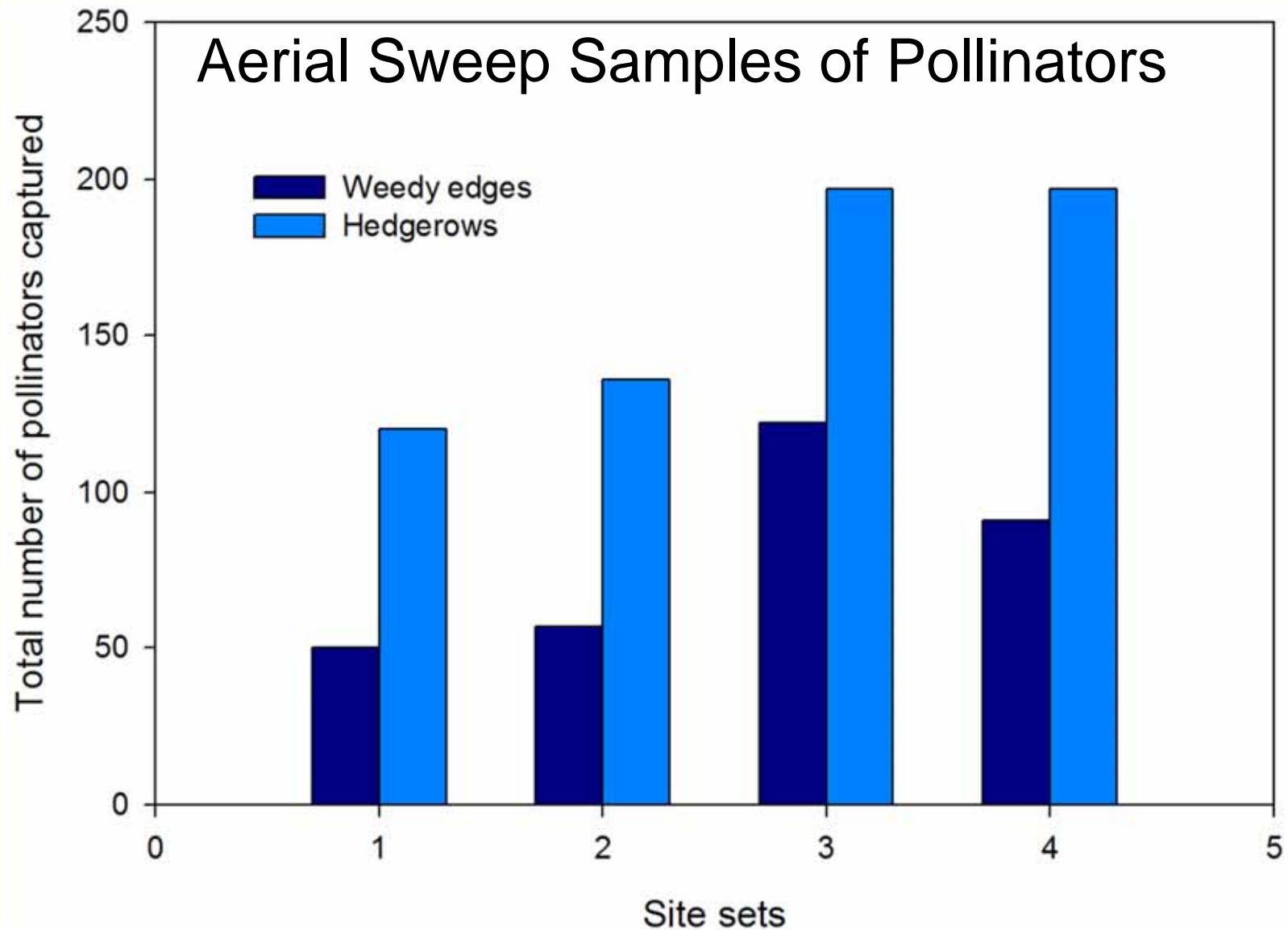


The Value of Habitat

Research demonstrates connections between habitat and natural enemies:

- Review of 24 studies showed landscape complexity enhanced natural enemy populations in 74% of cases (Bianchi et al 2006)
- Evidence suggests that if more than 20% of non-crop area is diverse habitat, pest control observed throughout fields (Tscharntke et al. 2002)

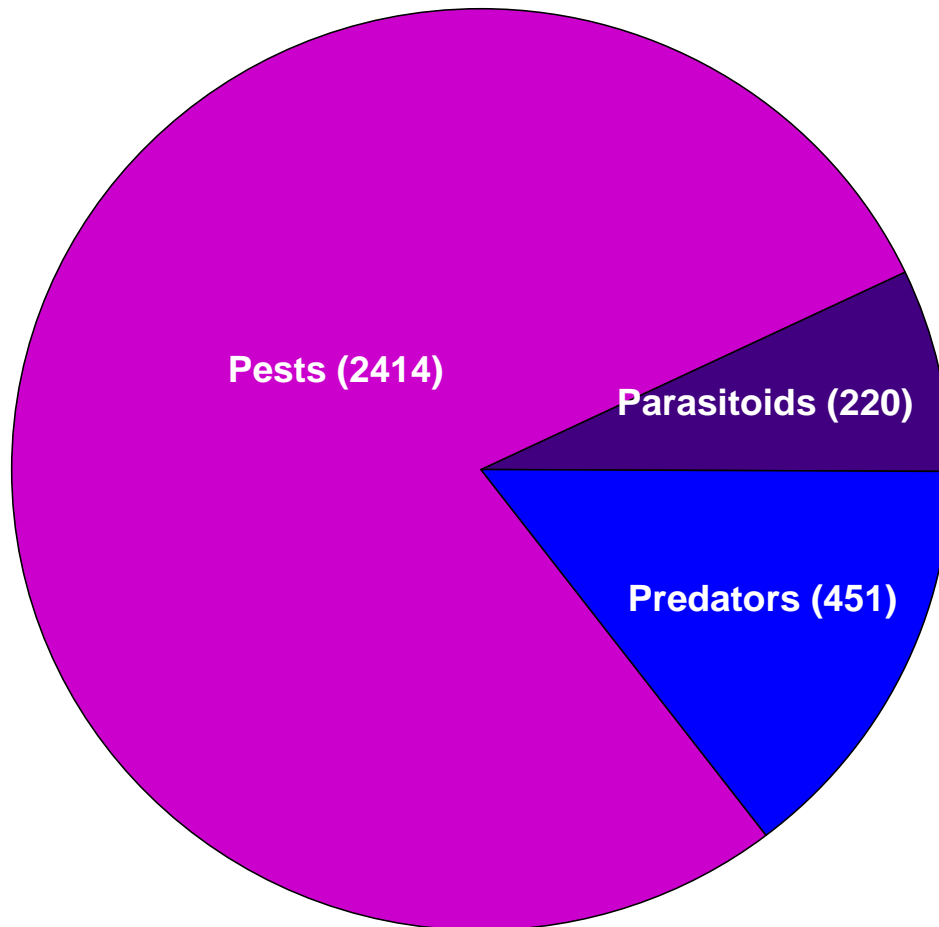




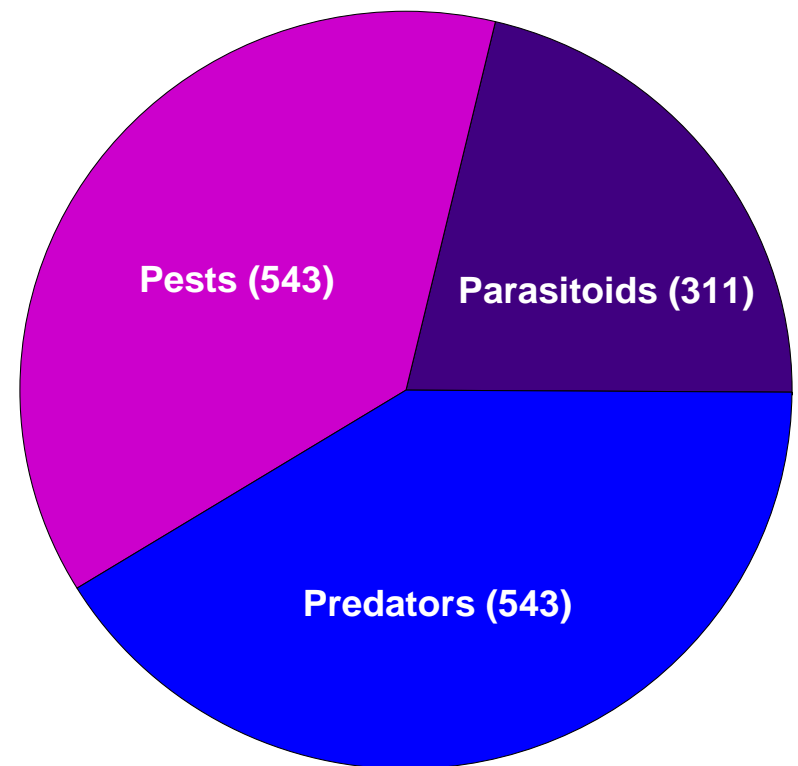


Pest and Beneficial Insects

Weedy edges



Mature Hedgerow edges





Creating Habitat



The Challenge: how to bring this habitat into heavily managed landscapes...



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Creating Habitat

In space-limited
agricultural areas,
getting creative and
adding habitat
anywhere and
everywhere...





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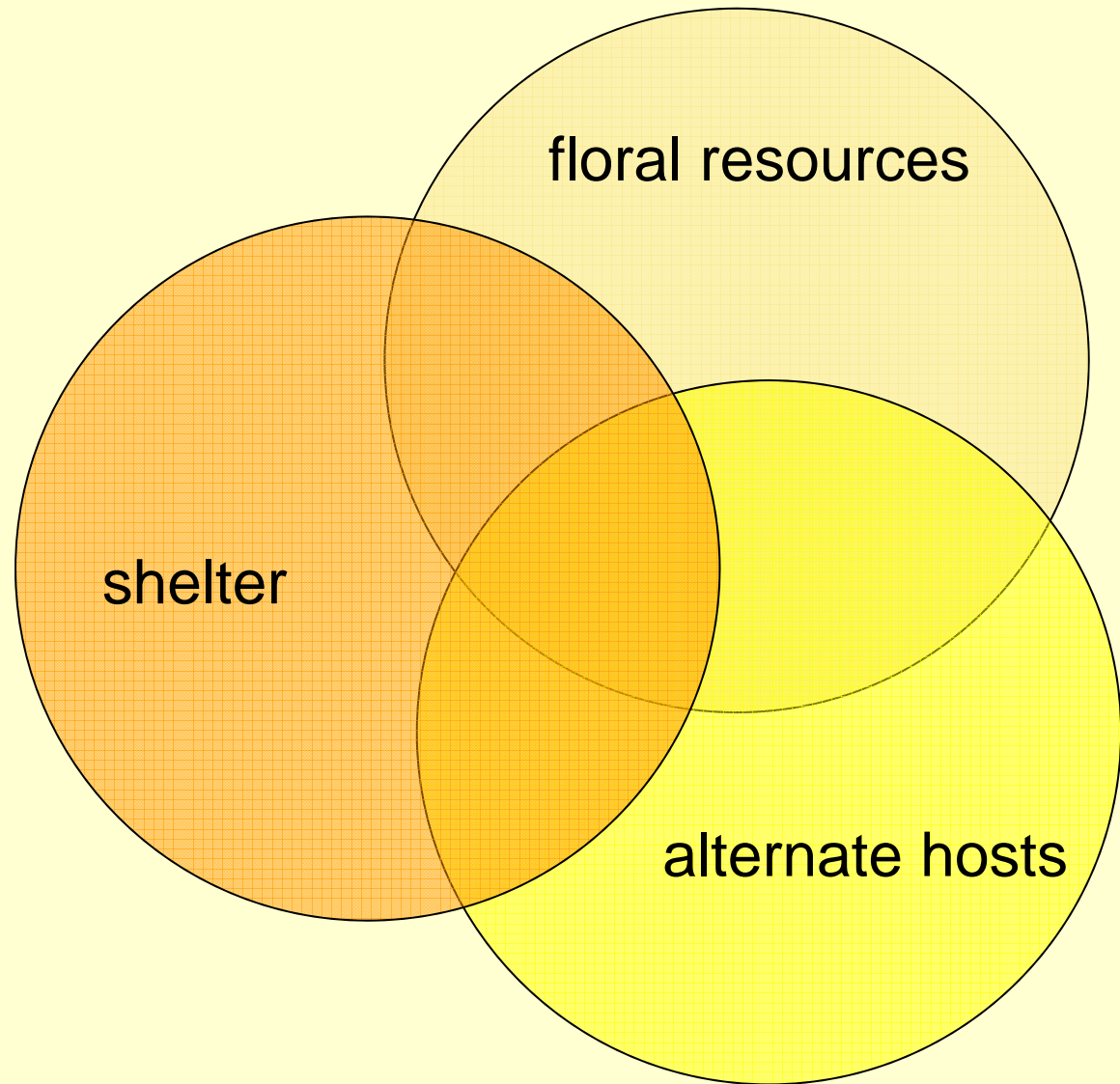
Creating Habitat





Beneficial Insects: habitat needs

Diverse and overlapping resource and habitat needs of various natural enemies



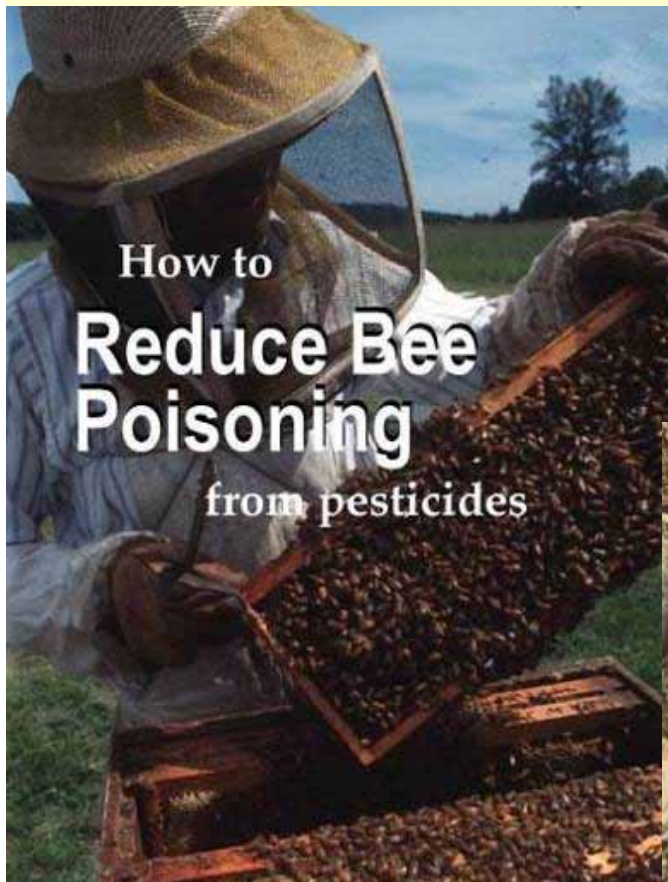


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Creating Pollinator Habitat

Bees Need:

- Floral Resources
- Nesting & Overwintering sites
- Pesticide Protection





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Pollinator Habitat





Special Considerations

Including Forbs in Hedgerow Plantings:

- Providing abundant resources quickly

New Challenges:

- Formulating forb mixes
- Methods of establishing forbs





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Additional Resources



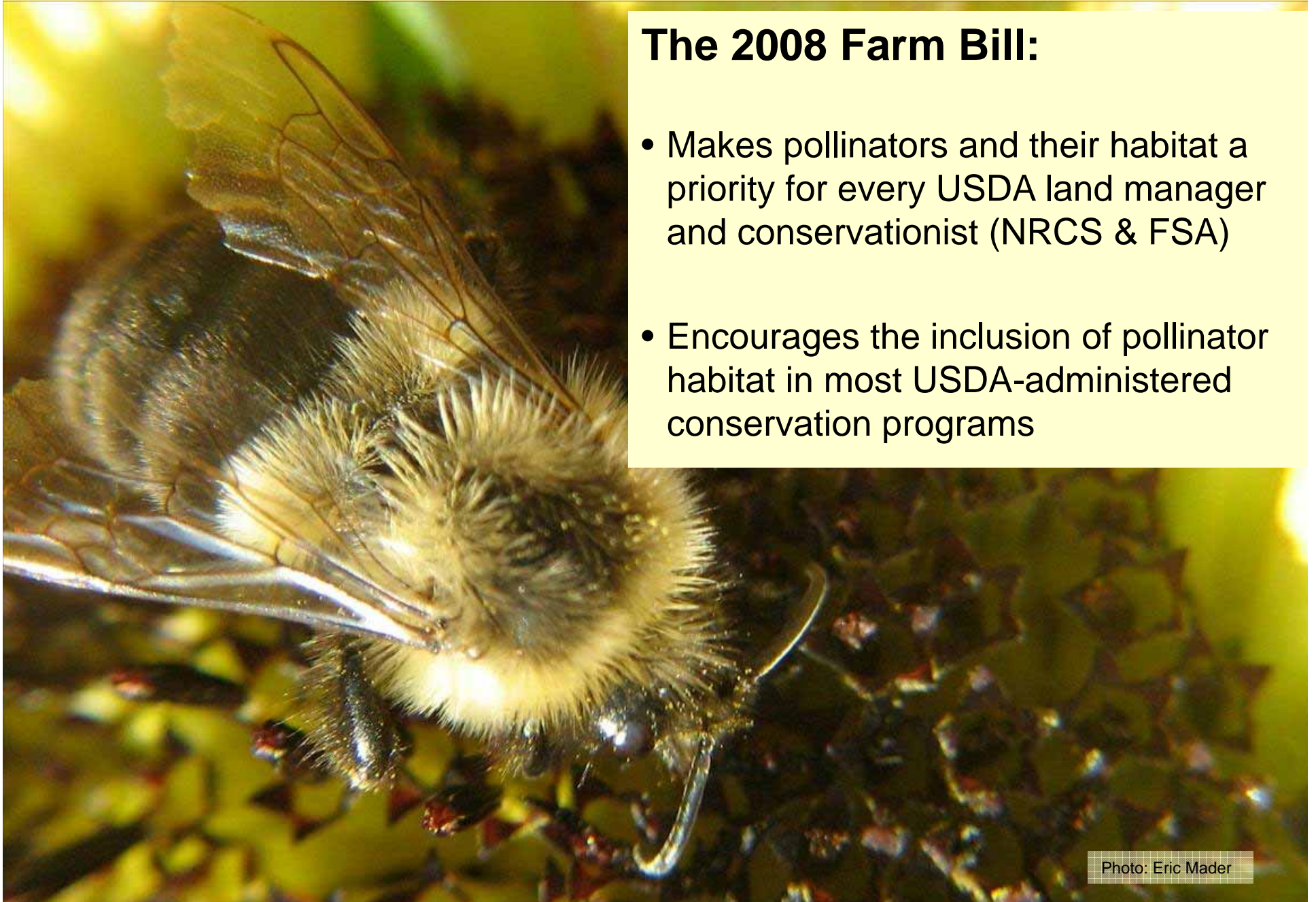
Photo: Rollin Coville



New Pollinator Conservation initiatives

The 2008 Farm Bill:

- Makes pollinators and their habitat a priority for every USDA land manager and conservationist (NRCS & FSA)
- Encourages the inclusion of pollinator habitat in most USDA-administered conservation programs





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Information: Xerces Society web site

- www.xerces.org

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Pollinator Conservation Resource Center

Welcome to the Pollinator Conservation Resource Center, where you can find regional information about plant lists, habitat conservation guides, and more. Scroll over the map below and click on your region of the country. For questions or comments about the Resource Center, or to suggest additional content, please contact [Eric Holter](mailto:Eric.Holter@xerces.org), Xerces' Assistant Pollinator Program Director.

[Click here to donate](#)

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Program Highlights

- [On-line presentation](#) on pollinator conservation basics in farm landscape
- The Xerces Society works with congressional staff to include [pollinators in the Farm Bill](#)
- Xerces organizes a [briefing to D.C. legislators](#) on honeybees, Colony Collapse Disorder and native pollinators
- The National Research Council issues a [report](#) on the status of pollinators in North America
- Agriculturally important [bumble bees in decline](#)

This resource center is a collaboration of the Xerces Society and [Irene Williams at the University of California, Davis](#). Significant funding was provided by a grant from [NSARE](#). Additional funding was provided by the [USDA Natural Resources Conservation Service](#), the [Columbia Foundation](#), [Turner Foundation](#), [Panta Rhea Foundation](#), [Disney Wildlife Conservation Fund](#), [CS Fund](#), [Wildwood Foundation](#), [CERES/Greater Milwaukee Foundation](#), [Bullitt Foundation](#), [Organic Valley](#), [Organic Farming Research Foundation](#), [The White Pine Fund](#), [The Hawklyn Foundation](#), and Xerces Society members.

National Resources Conservation Service

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Pollinator Conservation: Agriculture

The diversity and abundance of native bees on a farm, and subsequently their ability to serve as crop pollinators, are strongly influenced by two factors: suitable habitat on the farm and in the surrounding landscape, and pesticide use on the farm. The basic habitat needs of native pollinators in any location are the same - nesting or egg-laying sites, flowers on which to forage, secure overwintering sites, and a refuge from pesticides. We engage in education, outreach, research, advocacy and policy to achieve pollinator conservation. This work is done on a national level, as well as in the targeted regions of [California](#), the [Upper Midwest](#), the [Pacific Northwest](#) and the [Northeast](#).

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How to Farm for Pollinators

Know the habitat on your farm
Look for areas on and around your farm, such as old meadows, bare soil, fallow fields and weedy road edges, that can support native bees. [Read more](#)

Protect flowering plants and nest sites
Once you know where native bees are living and foraging, do what you can to protect these resources from disturbance and pesticides. [Read more](#)

Enhance habitat with flowering plants and additional nest sites
Adding native flowering plants that bloom throughout the growing season, leaving some areas of soil untiled, and providing nest sites can increase the number of native bees on your farm. [Read more](#)

Ways to manage habitat to protect pollinators
We provide recommendations on how to protect, enhance and attract pollinators to anyone managing large areas of farmland and other habitats. [Read more](#)

photo: long horned bee (Halictus) on 1 on sunflower by Mike Vaughan

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Information: Publications

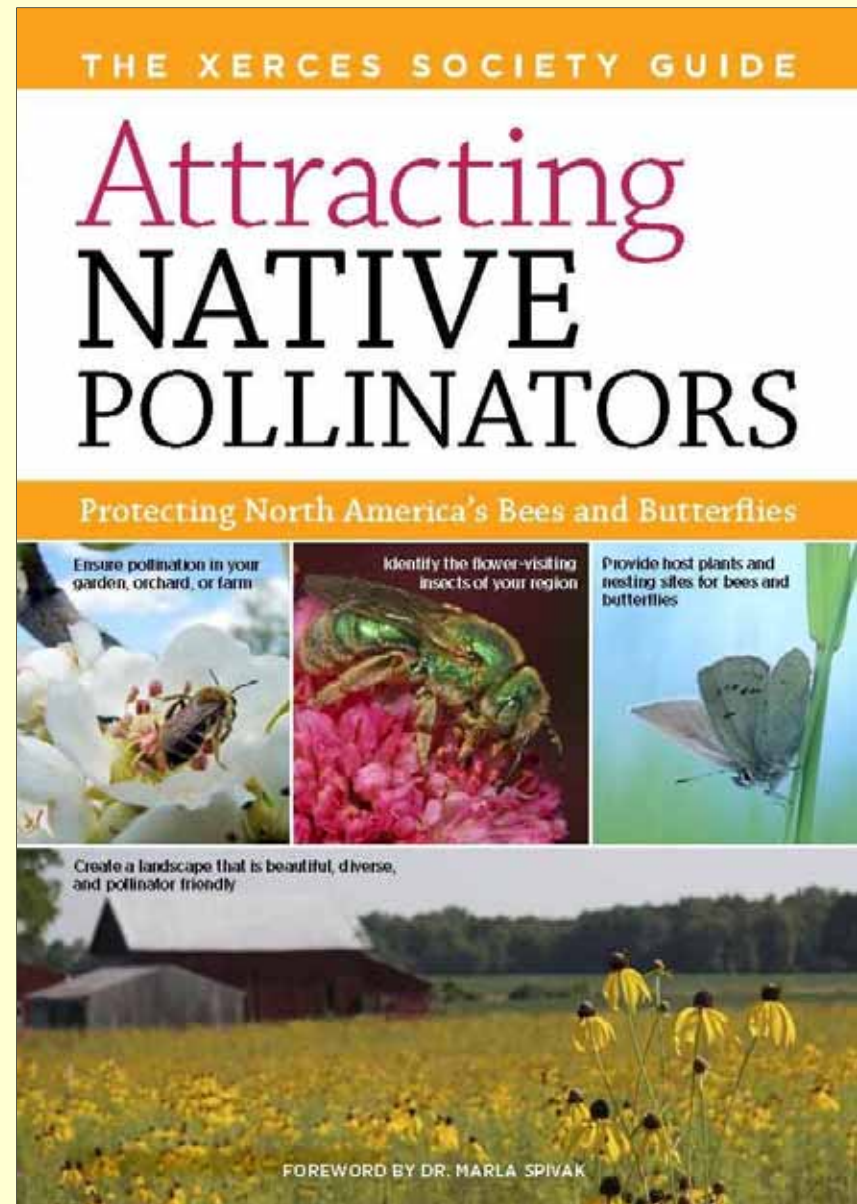
Published in February 2011

“*Attracting Native Pollinators* belongs on the bookshelf of everyone who values the future of the natural world.”

- Douglas W. Tallamy, researcher and author of *Bringing Nature Home*

“Precise, elegant and thoughtful, the recommendations offered by the Xerces Society will become essential to advancing a healthy and diverse food production system.”

- Gary Nabhan, author of *The Forgotten Pollinators* and *Renewing America's Food Traditions*





Thanks: UCCE, RCD and FFFP

Many excellent scientists,
conservationists, and farmers

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Wildlife Conservation Center
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Photo: Mace Vaughan