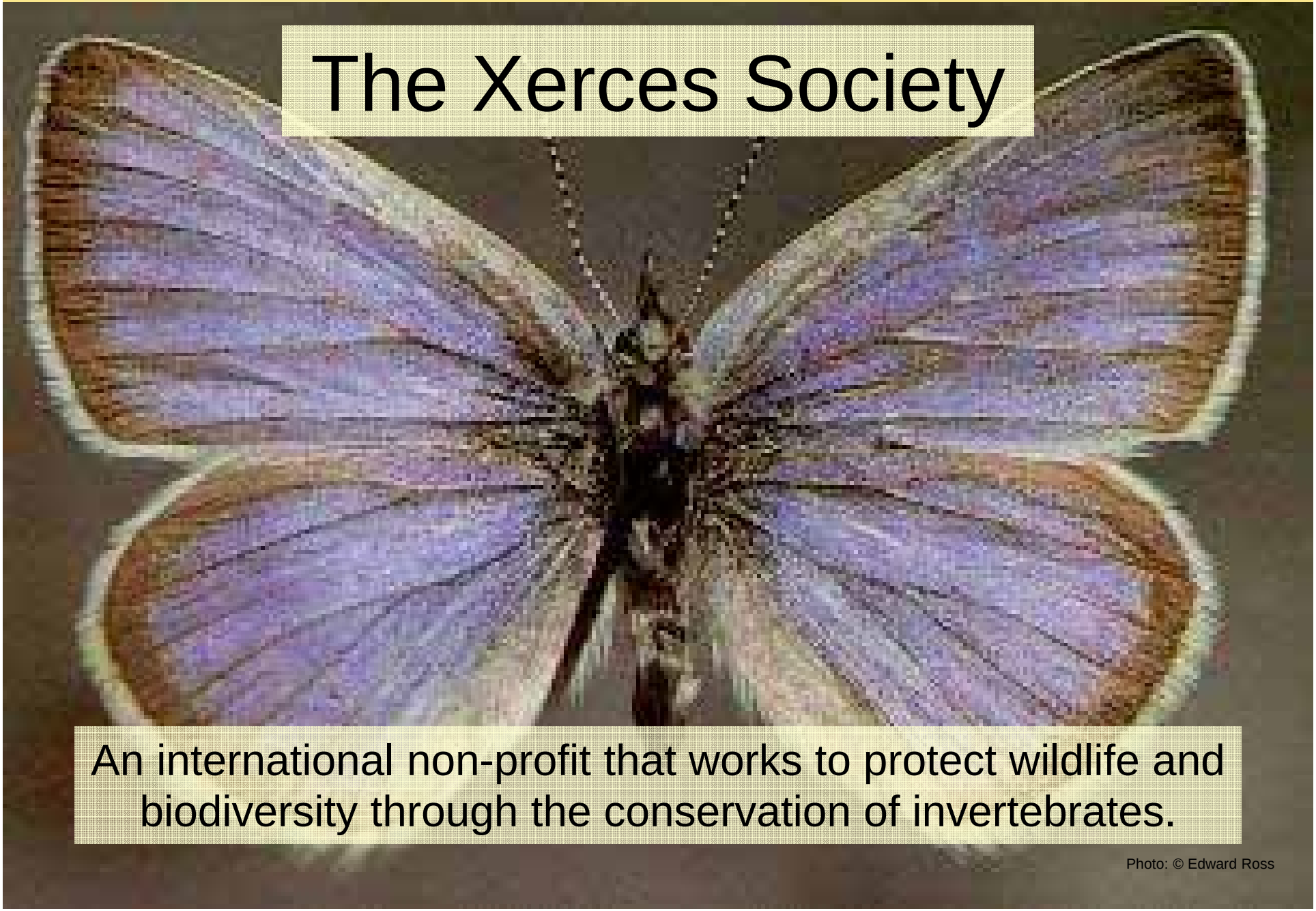
Promoting Agricultural Sustainability: Creating Habitat for Native Bees

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

Photo: Edward S. Ross

The Xerces Society



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

Photo: © Edward Ross

The Xerces Society Agricultural Pollinator Program

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

Talk Outline

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

Photo: Bruce Newhouse

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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

Photo: USDA-ARS/Peggy Greb

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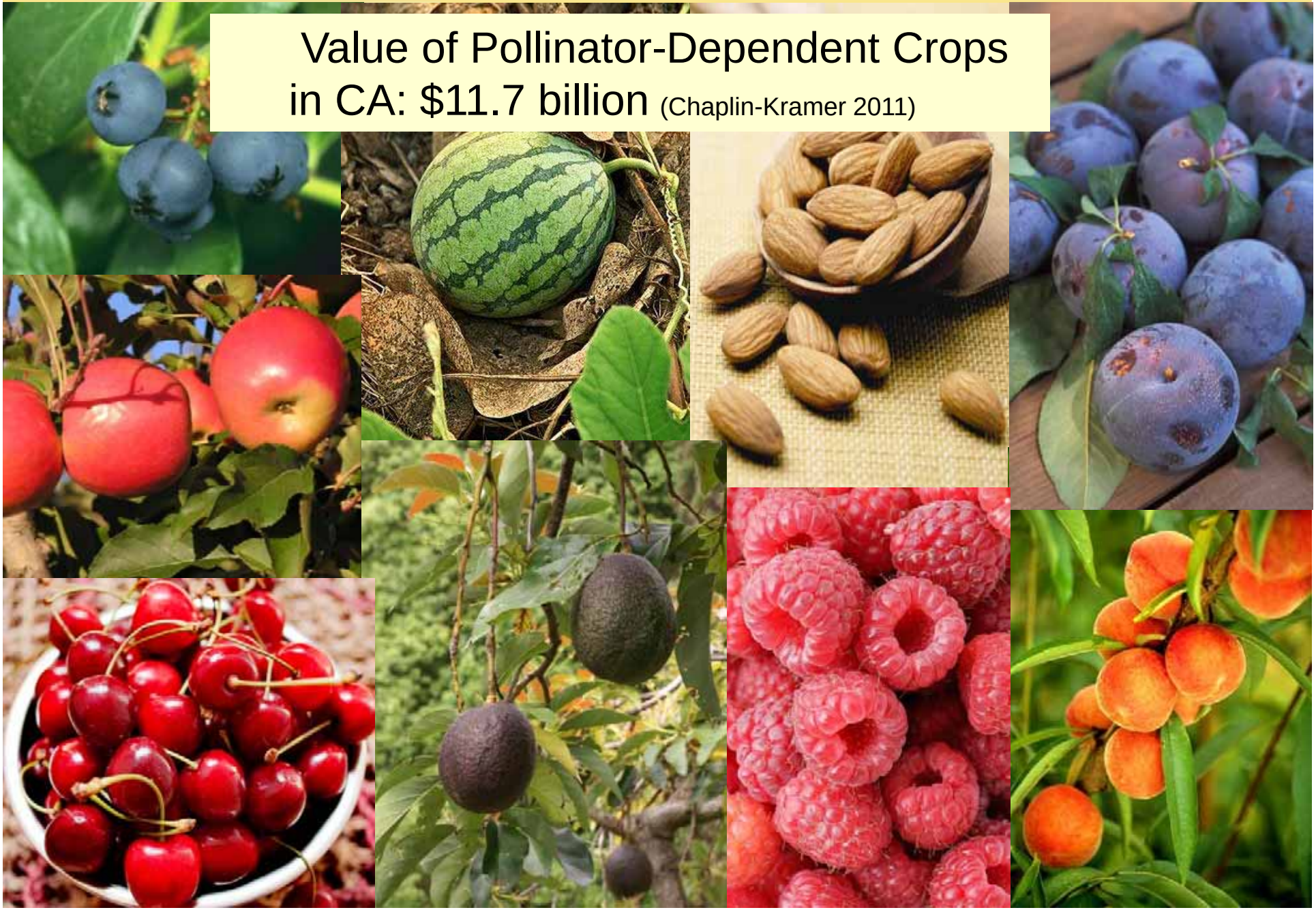
Importance of Bees: California Agriculture

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

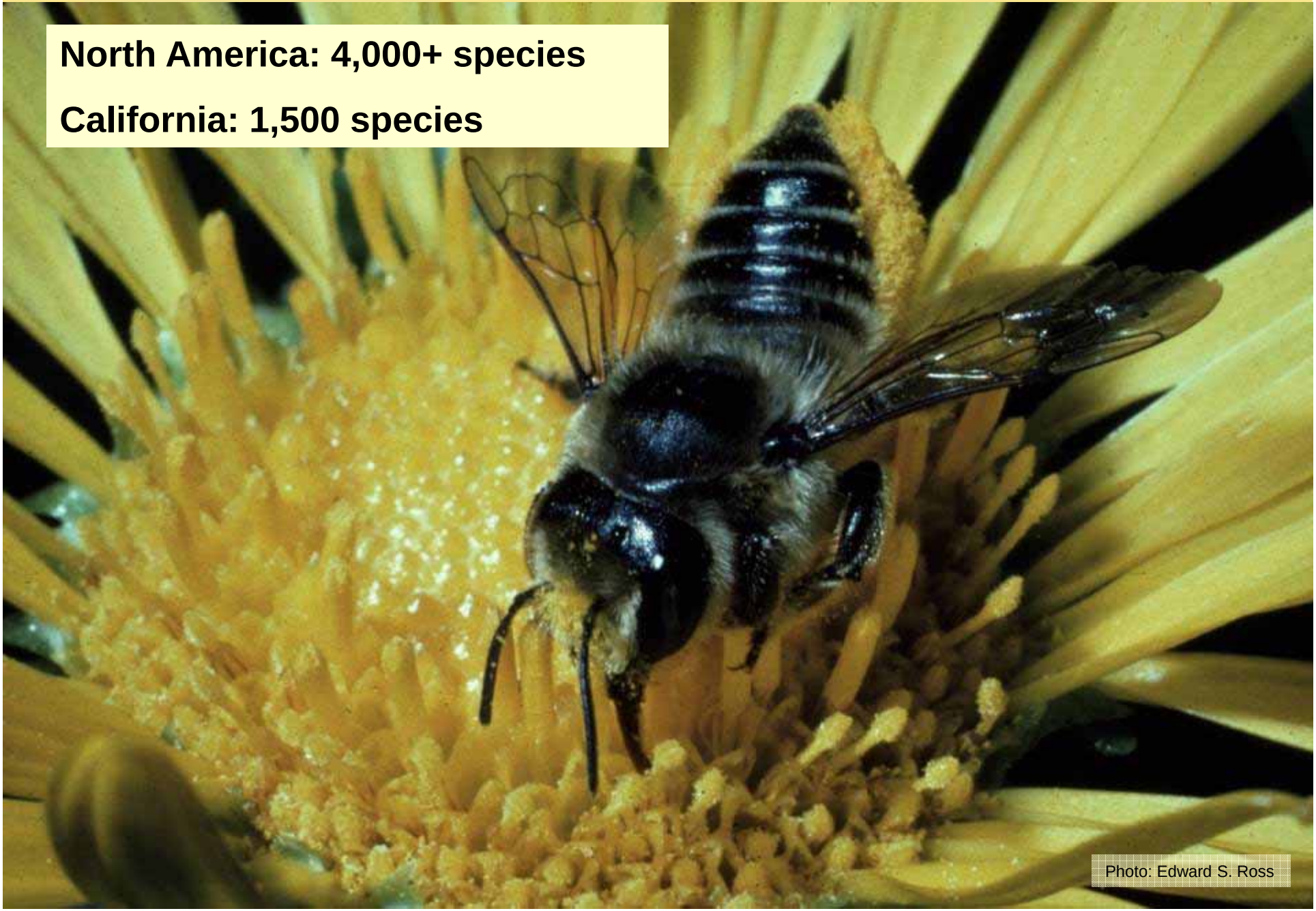

Photo: Edward S. Ross

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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

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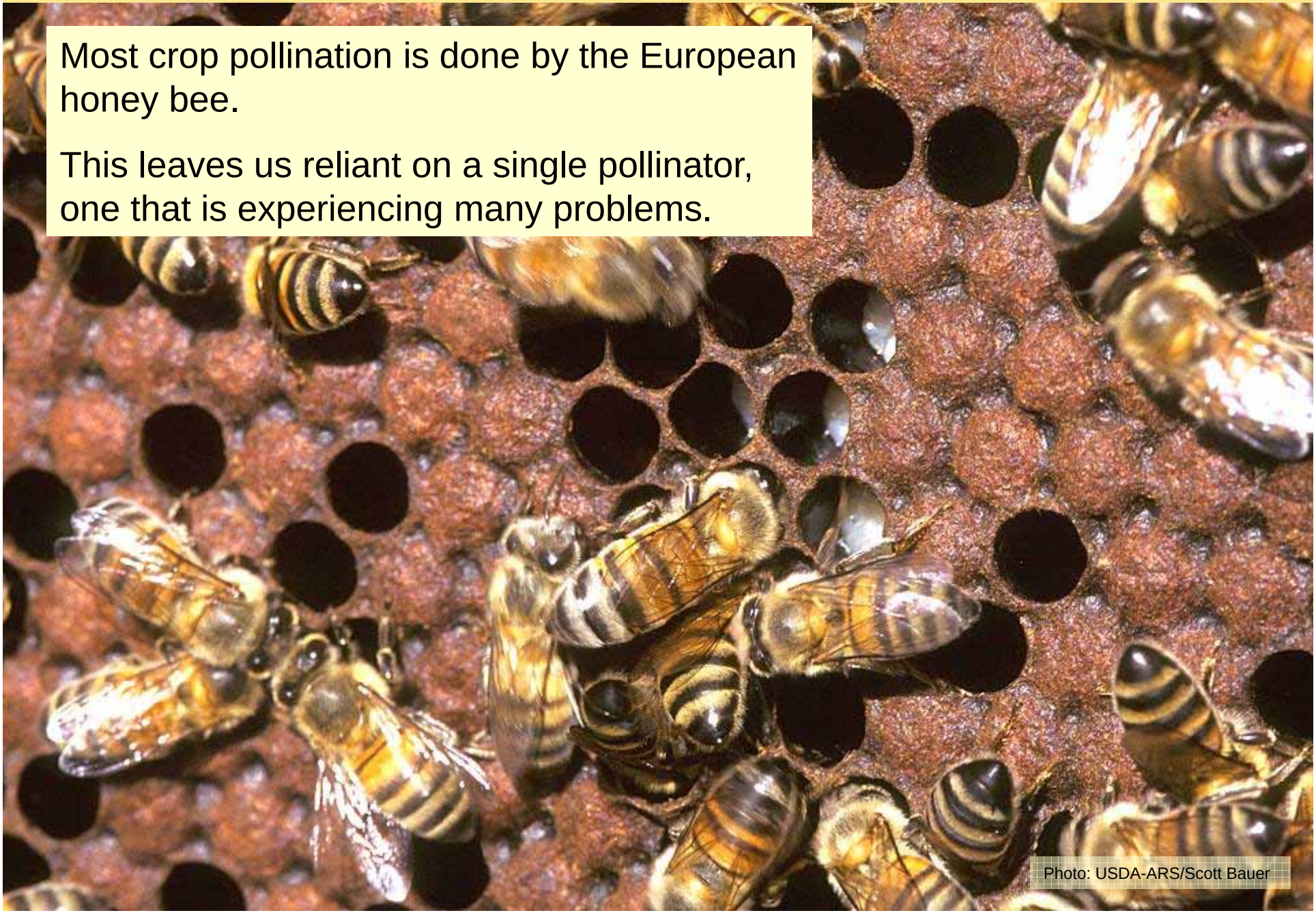
Bee Declines



Most crop pollination is done by the European honey bee.

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

Photo: USDA-ARS/Scott Bauer

Bee Declines

Native bees also in decline:

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

(Cameron et al 2011)

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Native Bees and Crop Pollination

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

Photo: Mace Vaughan

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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

Photo: Bob Hammond, CO Coop Ext

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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)

Photos: Sarah Greenleaf

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)

Native Bees and Crop Pollination

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

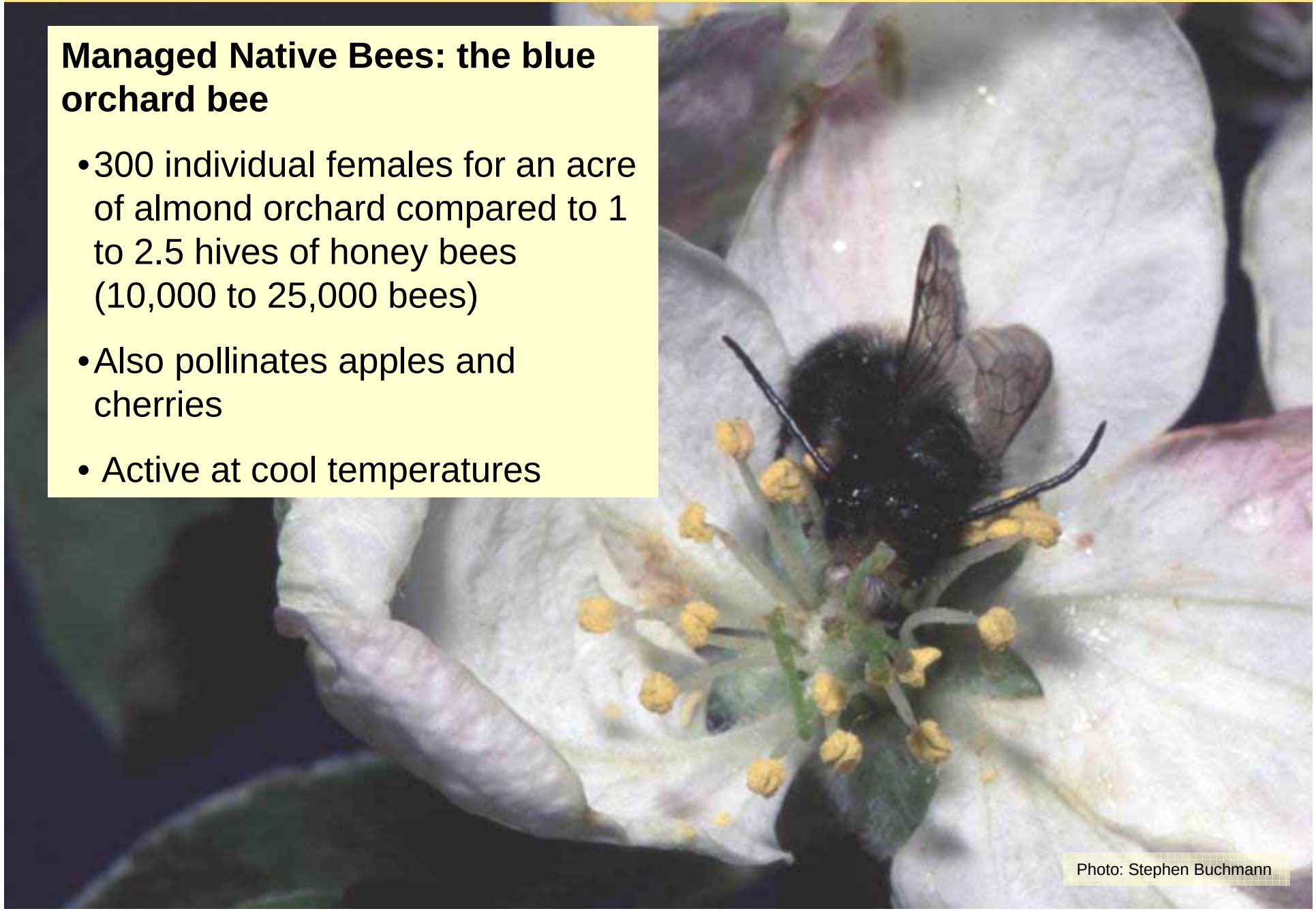

Photo: Stephen Buchmann

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Three Broad Groups of Native Bees

Ground-nesting bees (solitary)

Tunnel-nesting bees (solitary)

Bumble bees (social)

Photos: Matthew Shepherd, Eric Mader, SA Cameron

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Solitary Bees

Ground-nesting (~70%)

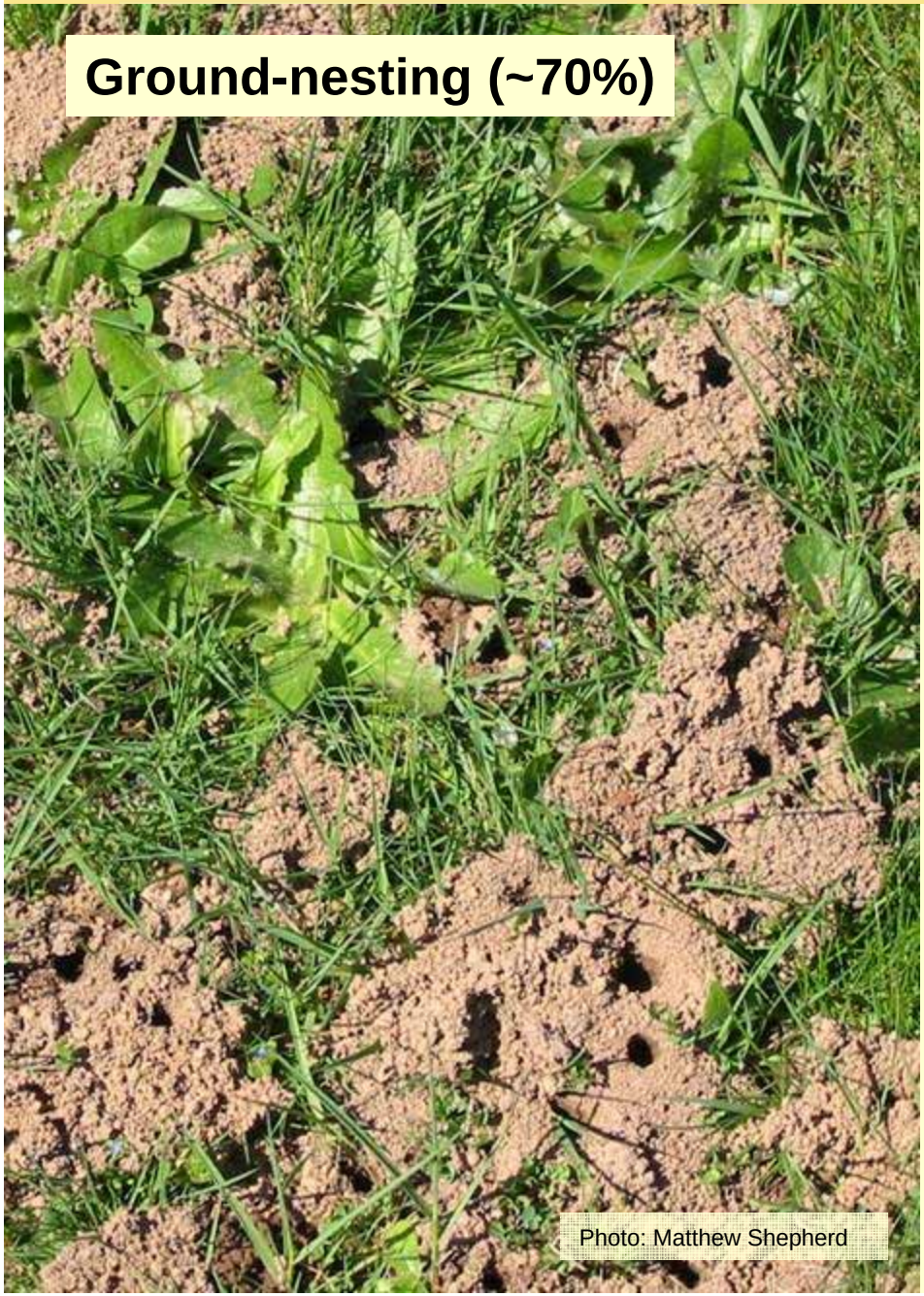
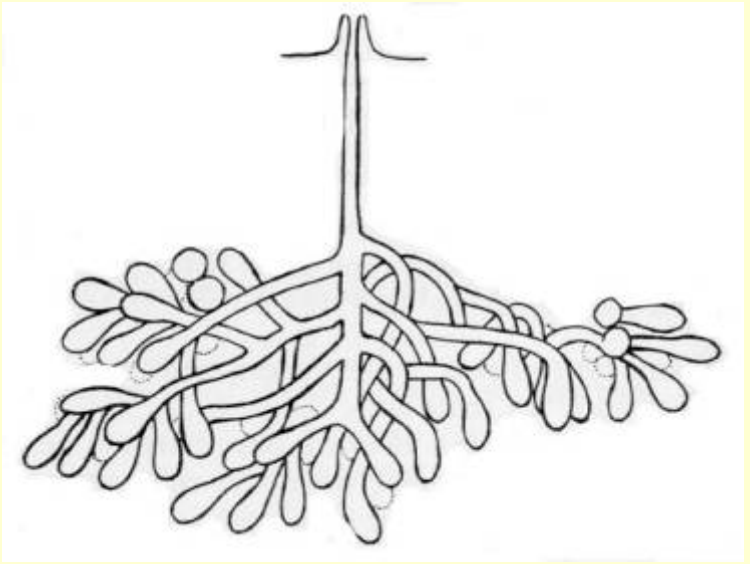


Photo: Matthew Shepherd



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

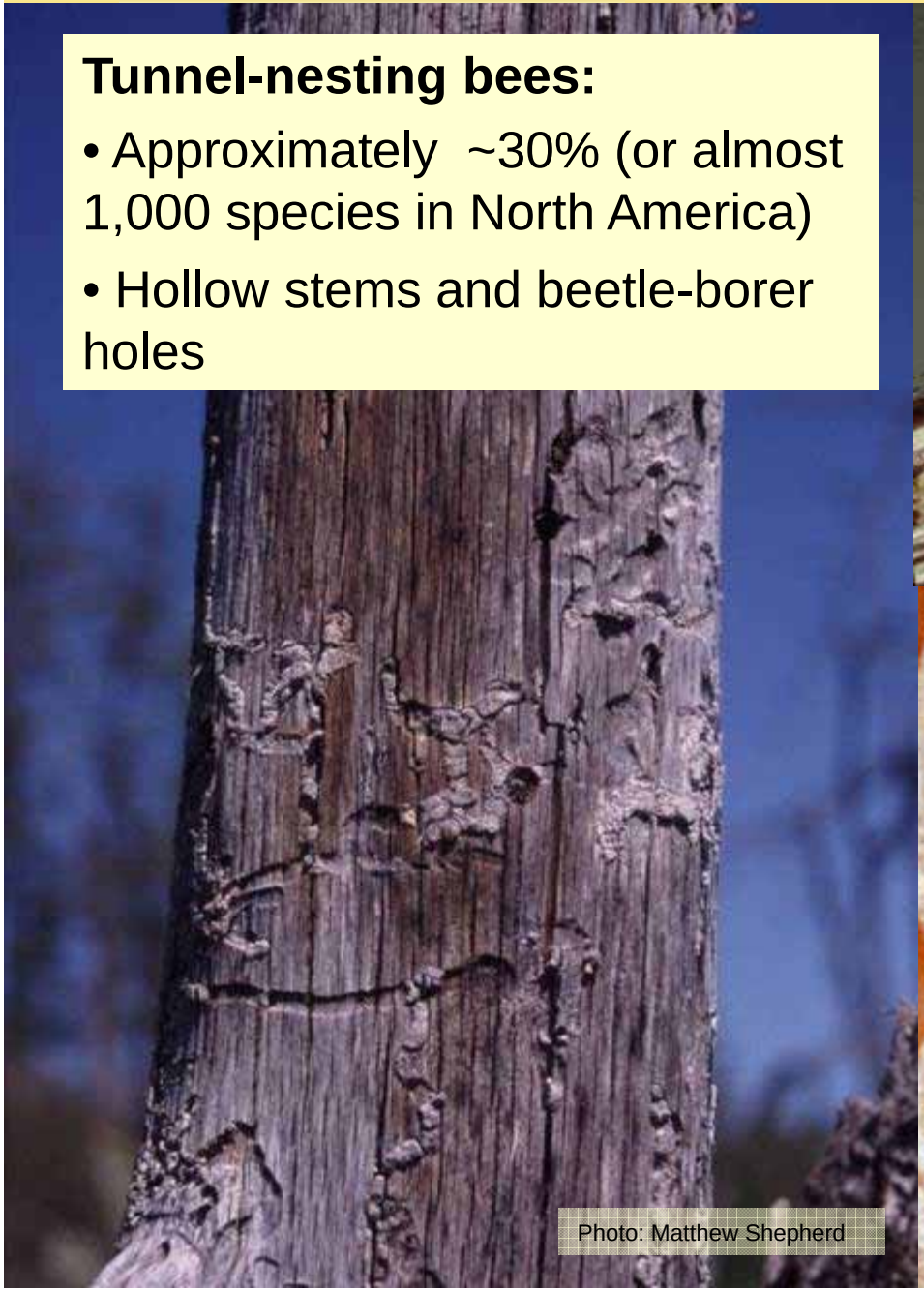


Photo: Matthew Shepherd

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Photo: Mike Carter

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Nest Sites for Solitary Bees

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

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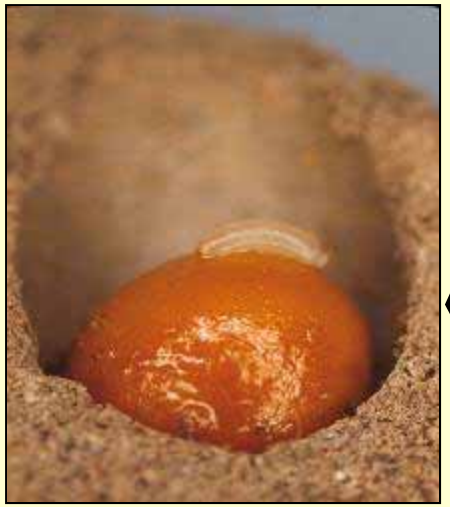
Bee Basics: Life cycle of a solitary bee

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.



Photos: Dennis Briggs

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Social Bees: Native Bumble Bees

Photo © Edward Ross

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Nest Sites for Bumble Bees

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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

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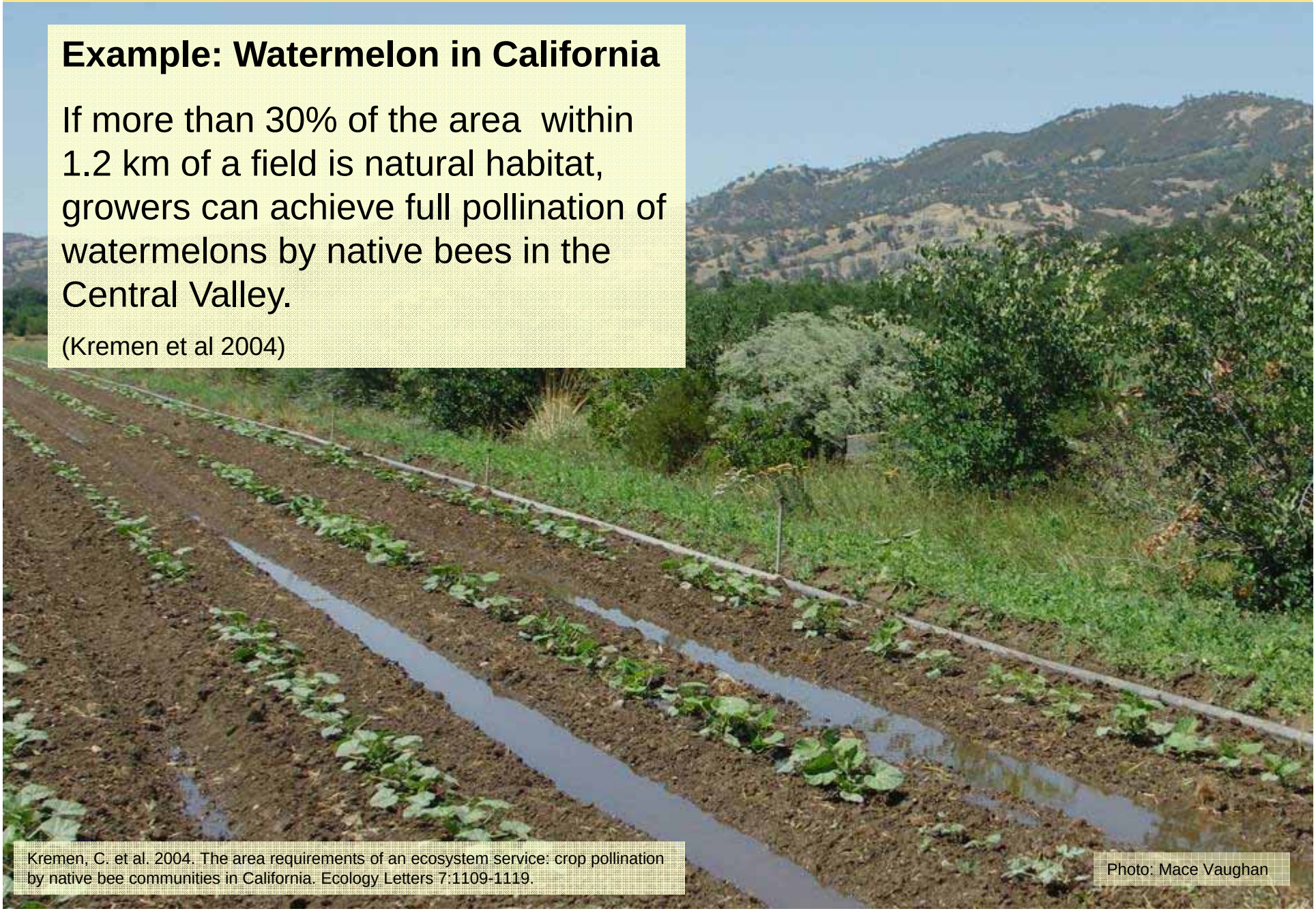
The Value of Habitat



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

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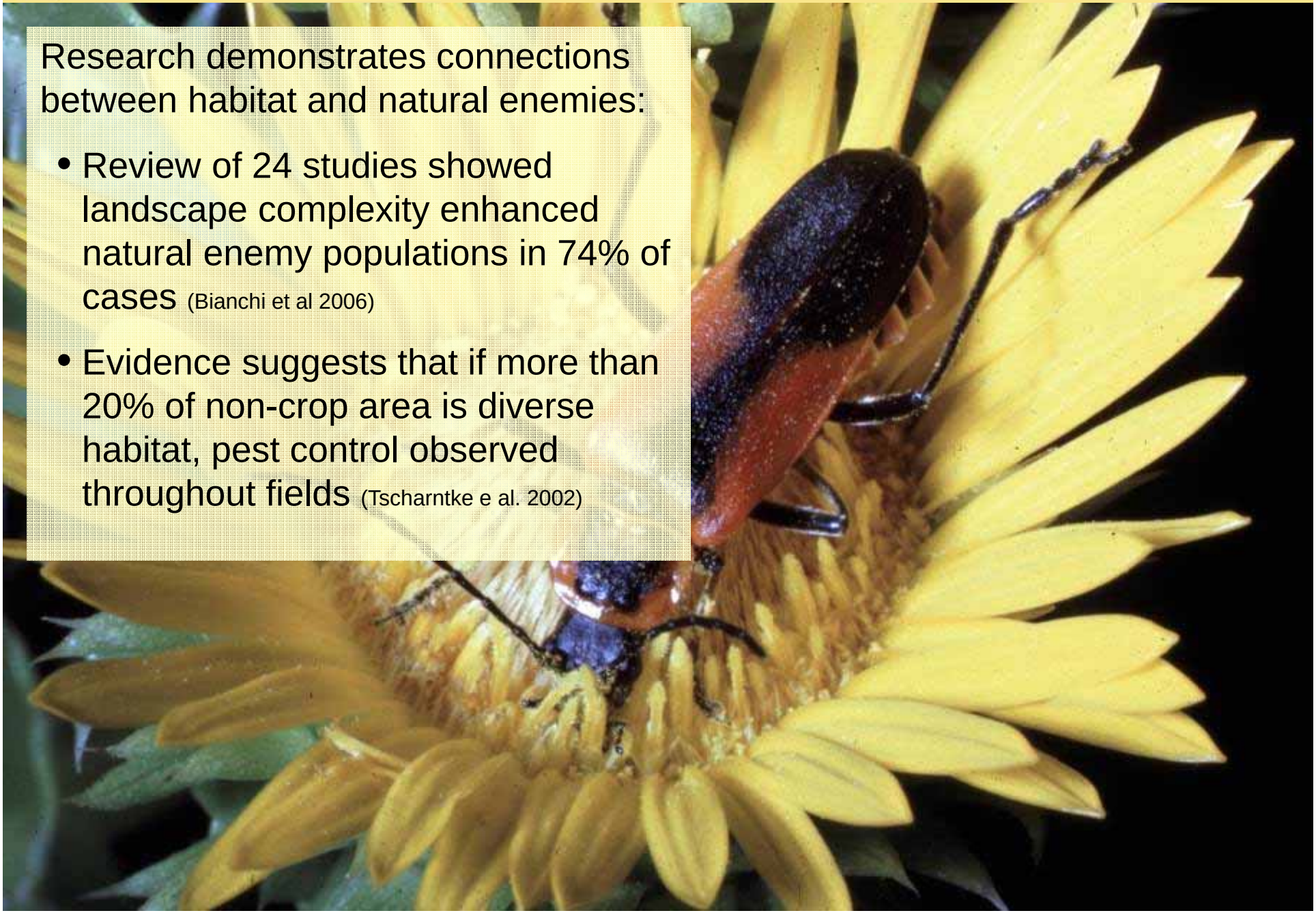
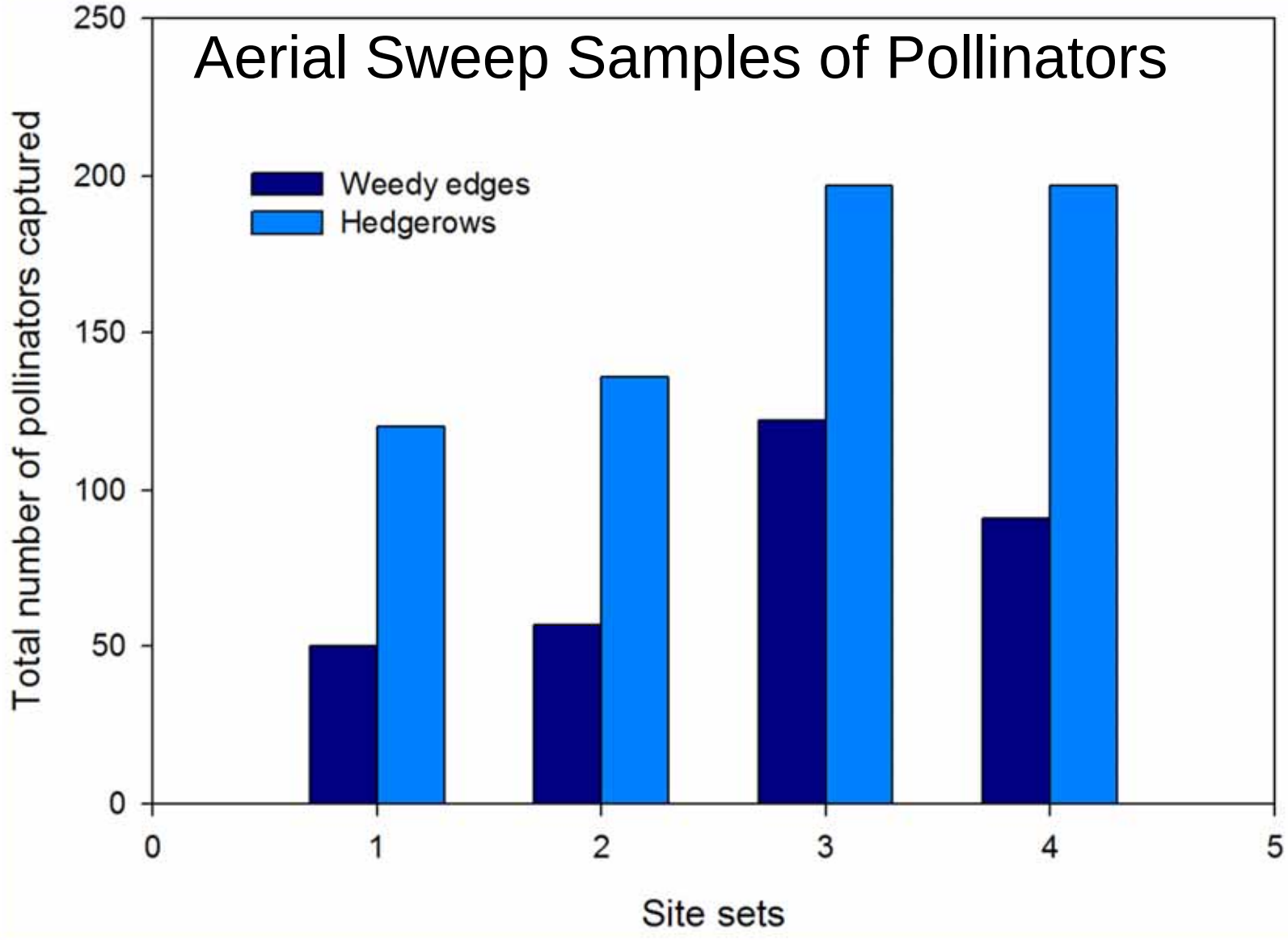
The Value of Habitat



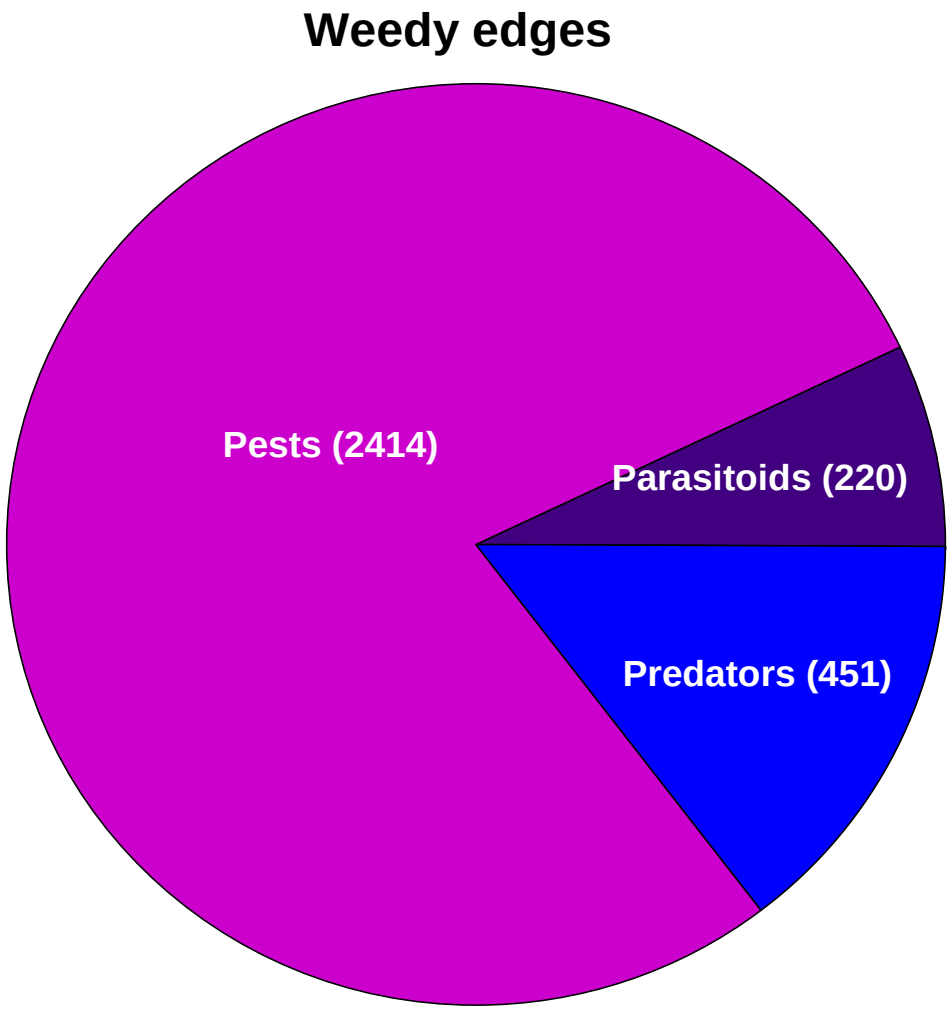
Research demonstrates connections between habitat and natural enemies:

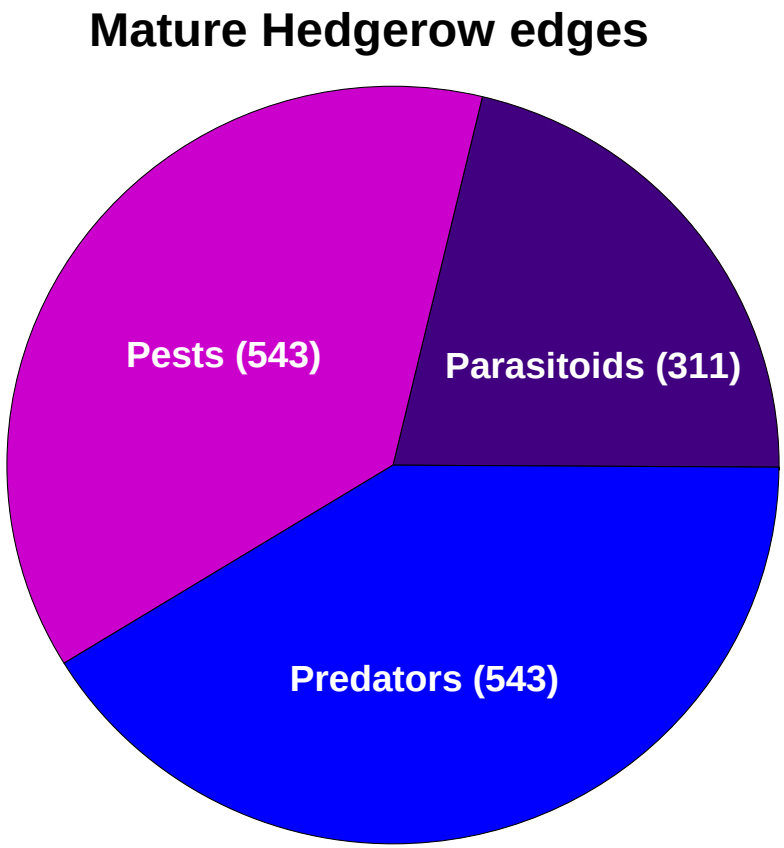
- Review of 24 studies showed landscape complexity enhanced natural enemy populations in 74% of cases (Bianchi et al 2006)
- Evidence suggests that if more than 20% of non-crop area is diverse habitat, pest control observed throughout fields (Tscharntke e al. 2002)

Creating Habitat



Pest and Beneficial Insects





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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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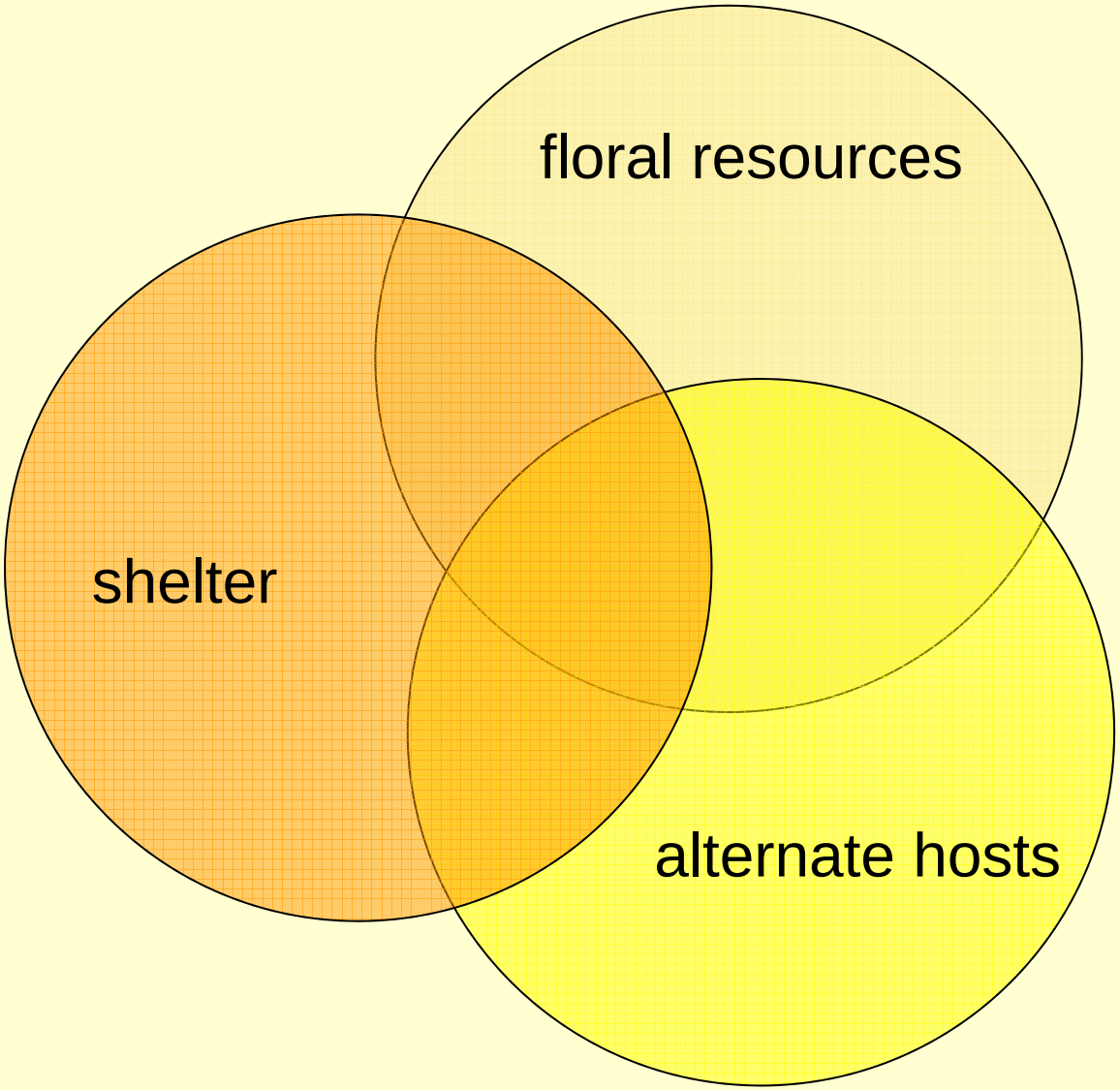
Creating Habitat

Beneficial Insects: habitat needs

Diverse and overlapping resource and habitat needs of various natural enemies



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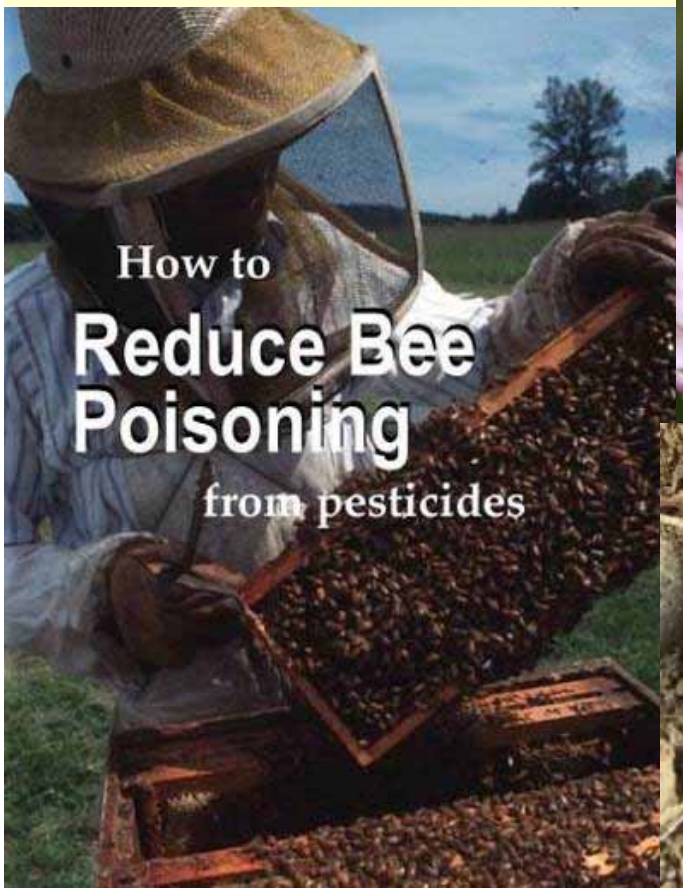
Creating Pollinator Habitat

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

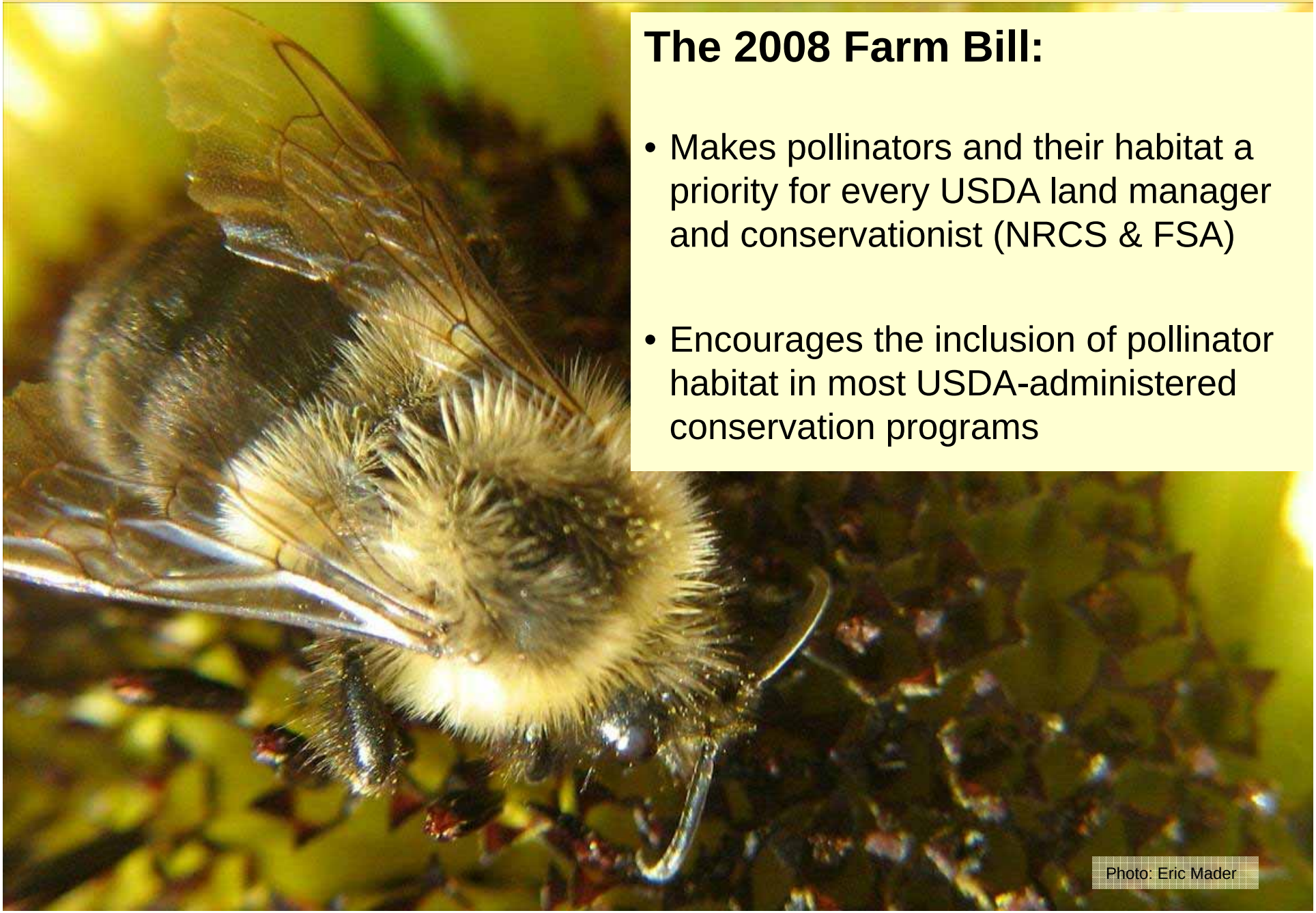
New Challenges:

- Formulating forb mixes
- Methods of establishing forbs

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

Photo: Eric Mader

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Information: Xerces Society web site

- www.xerces.org

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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*

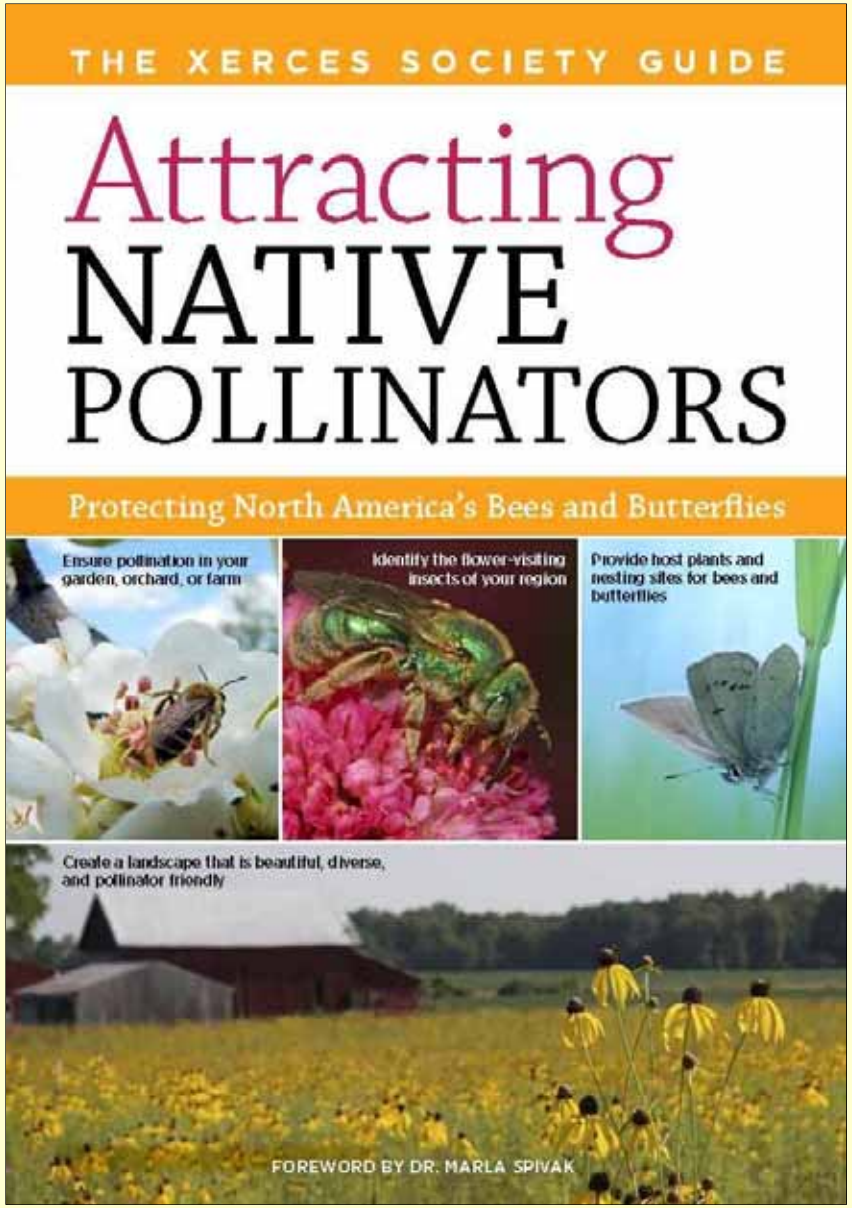

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Photo: Mace Vaughan