Mainland Pollinator Conservation

Case Studies and Questions for the Pacific Region

Eric Mader, Assistant Pollinator Program Director
The Xerces Society for Invertebrate Conservation

Photo: Rollin Coville

What is the Xerces Society?

THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

Since 1971, the Society has worked to protect wildlife through the conservation of invertebrates and their habitat.

Major Programs:
- Endangered species
- Aquatic invertebrates
- Pollinator conservation

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

What is the Xerces Society?

The Xerces Society Agricultural Pollinator Conservation Program

- Habitat Restoration on Farms
- Documenting At-Risk Pollinators
- Applied Research

Joint Staff Biologist Positions

•USDA-Natural Resources Conservation Service (NRCS)

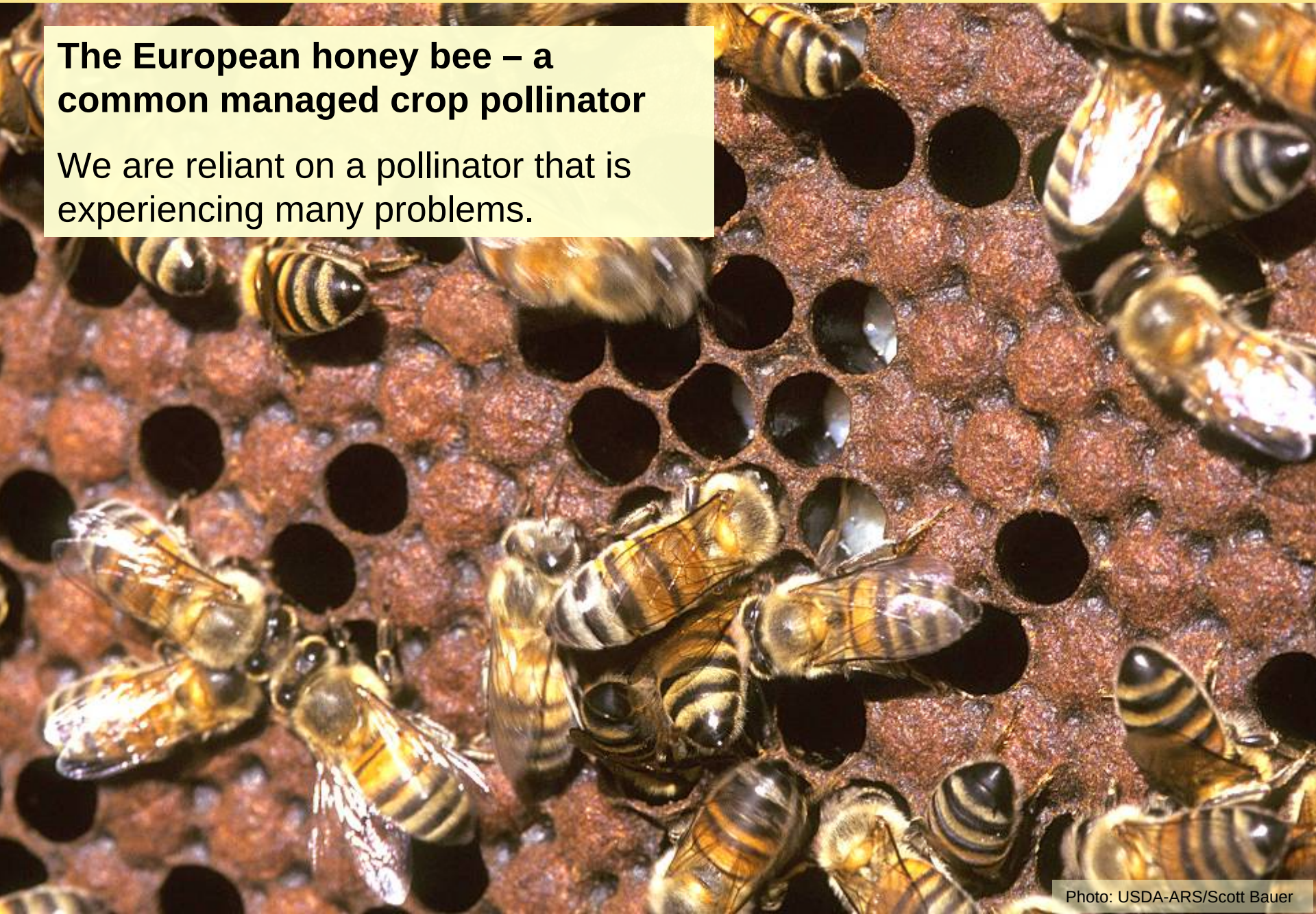
•University of Minnesota Extension

Staff Backgrounds

•Farming, wildlife conservation, beekeeping, native seed production

Photo: Eric Mader

Mainland Crop Pollination by Bees



The European honey bee – a common managed crop pollinator

We are reliant on a pollinator that is experiencing many problems.

Photo: USDA-ARS/Scott Bauer

Crop Pollination: Mainland Honey Bees in Decline

Fewer honey bees available

- 50% decline in managed hives since 1950

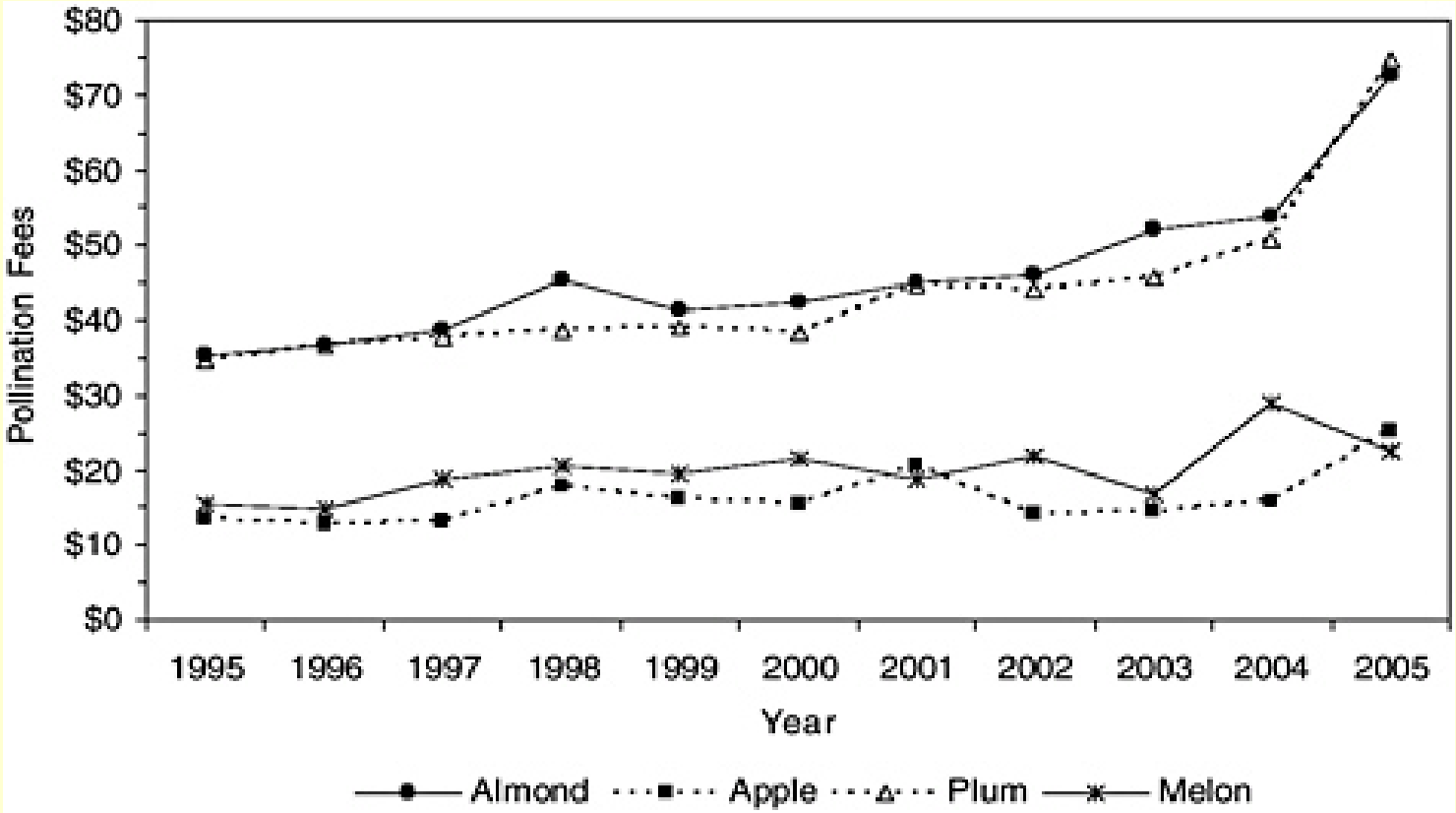
Causes: Disease, pests, honey prices, and…

National Research Council. 2007.

Photo: USDA-ARS/Scott Bauer

Crop Pollination: Mainland Honey Bees in Decline

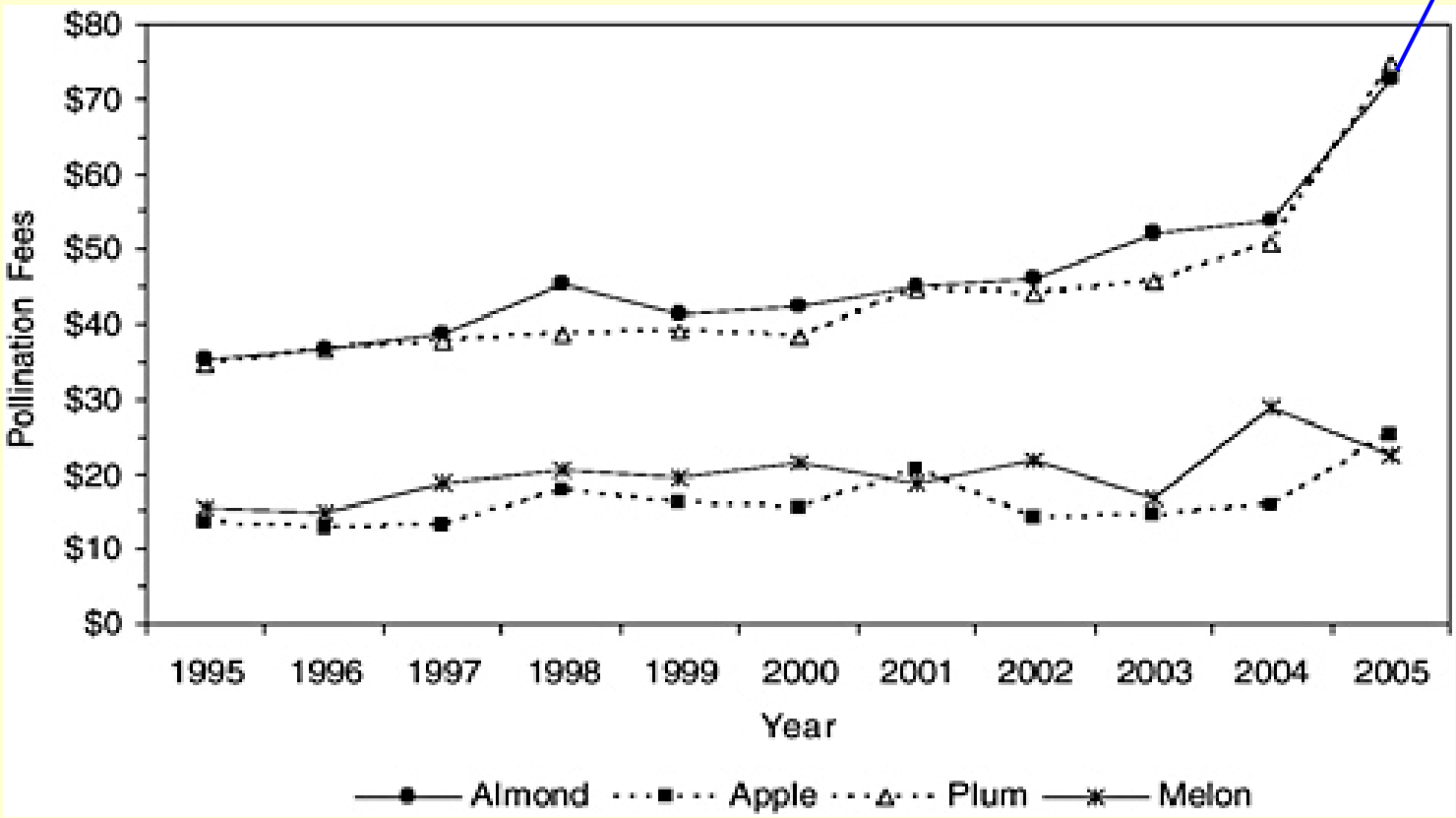
Honey bee colony rental rates for selected California crops, 1995–2005.



Crop Pollination: Honey Bees in Decline

Honey bee colony rental rates for selected California crops, 1995–2005.

Plus almonds, 2006-2008



2006

2007

2008

Other Important Mainland Bees in Decline

Honey bee declines are only part of the story

Native bees also in decline

Imperiled bumble bees

Some teetering on the brink of extinction

Evans, E.,R. Thorp, S. Jepsen, and S. Hoffman Black, 2009. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus *Bombus.* Xerces Society.

Cameron et al. 2011. Patterns of widespread decline in North American bumble bees. PNAS

Other Important Bees in Decline

Hawaiian yellow-faced bees (*Hylaeus* spp.)

- *Hylaeus* are the only bees native to Hawaii
- At least 31 of 60 species are declining, endangered or extinct
- Threatened by habitat loss and non-native species

Loss of Hylaeus may be catastrophic for the survival of native plant species in low shrub communities
(Koch and Sahli 2009)

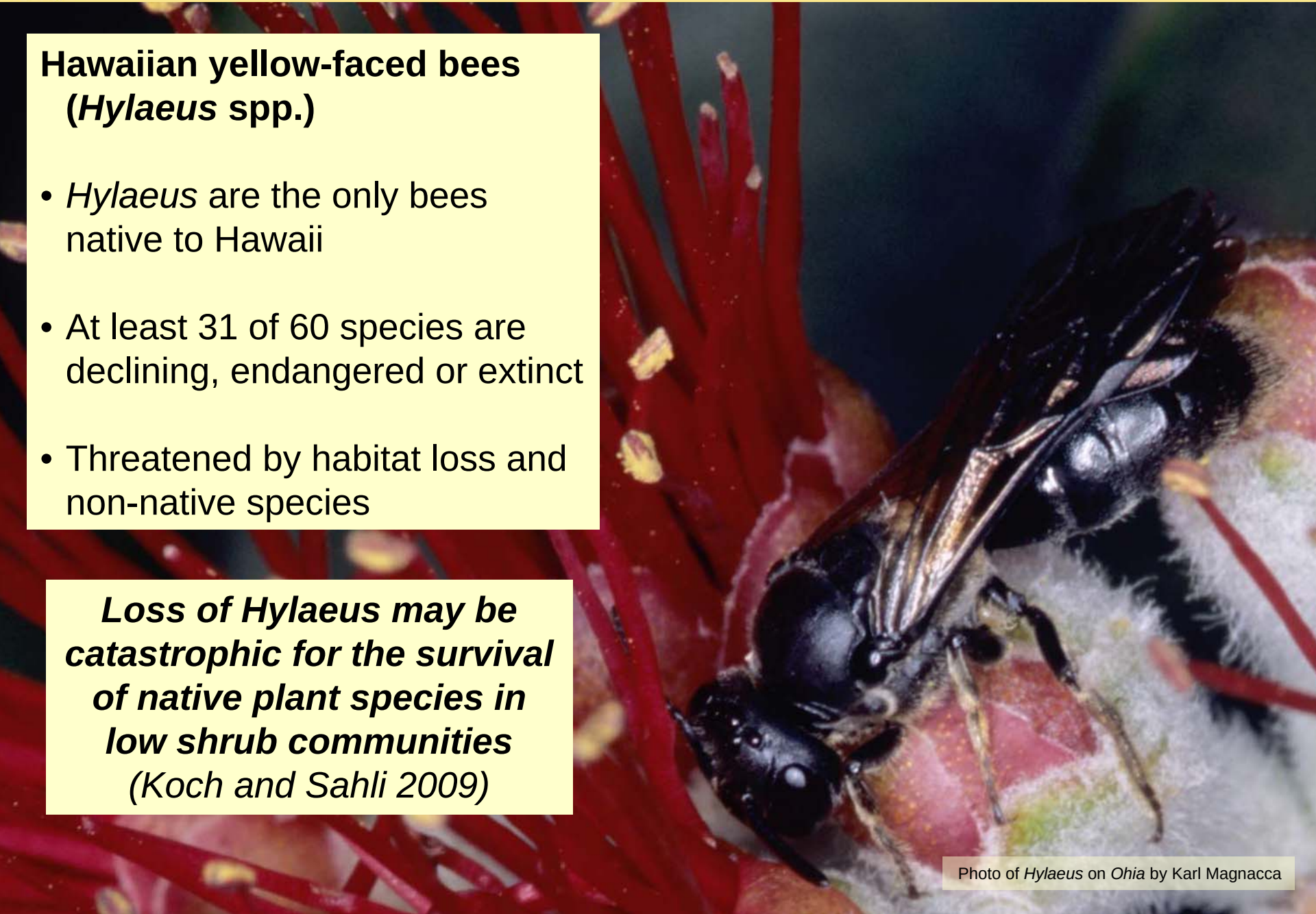


Photo of *Hylaeus* on *Ohia* by Karl Magnacca

Pollination and Crop Security

Even as bees decline, crop acreage requiring bee pollination grows

- 300% increase in global cropland requiring bee pollination since 1960[1]

[1] Aizen MA, LA Garibaldi, SA Cunningham, AM Klein. 2008. Long-term global trends in crop yield and production reveal no current pollination shortage but increasing pollinator dependency. *Current Biology* 18:1572-1575

Pollination and Crop Security

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

Photo: Business Week

Crop Pollination: Important to Diversify

Fewer Honey Bees Available

- Important to diversify pollinators for agriculture
- Important to improve habitat for bees

Native Squash Bees (*Peponapis pruinosa*)

Photos: Jim Cane, USDA-ARS; Bob Hammond, CSU Coop Ext

Mainland Native Bee Diversity

The Mainland is home to approximately 4,000 species of native bees

Native longhorn bee (*Svastra* sp.)

Photo: Rollin Colville

The Critical Importance of Native Bees

Native Bees and Mainland Agriculture

- Contribute $3+ Billion/year to U.S. economy
- 50 to 100+ Native species found in crops like sunflower or cranberry
- Specialized for specific crops (berries, squash, apples, alfalfa)

Native bees can supplement honey bees if they are hard to acquire.

Tri-color bumble bee (*Bombus ternarius*)

Photo: Eric Mader


Habitat is the Critical Ingredient
Photo: Nancy Adamson

Habitat is the Critical Ingredient for Native Bees

Example: Farms in Mid-Atlantic region

New Jersey and Pennsylvania: Native bees provided all pollination needed for watermelon. (In 90% of farms studied)

Winfree, R. et al.. 2008.

Photo: Rachael Winfree

Habitat is the Critical Ingredient for Native Bees

Example: Canola in Canada

In the absence of honey bees, canola growers make more money on their land if 30% is in natural habitat, rather than planting it all.

Morandin, L., and M. Winston. 2006.

Photo: Mace Vaughan

Habitat is the Critical Ingredient for Native Bees

Example: Watermelon in California

Native bees fully pollinate Central Valley watermelons when more than 30% of the area within 1.2 km of the farm is natural habitat.

Kremen, C. et al. 2004.

Photos: Mace Vaughan, Laurie

Habitat is the Critical Ingredient for Honey Bees

Example: Honey Bee Health

- Honey bees also need habitat

- Diverse wildflower diets enhance honey bee disease resistance

Alaux C., Ducloz F., Crauser D., Le Conte Y. (2010)
.

Photo: Eric Mader, Toby Alexander

Habitat is the Critical Ingredient for Honey Bees

Example: Honey Bee Profitability

- Native wildflowers like Dotted Mint (*Monarda punctata*)

- Potential honey yields of 500 lbs./acre[1]

1. Ramsay, J.1987.

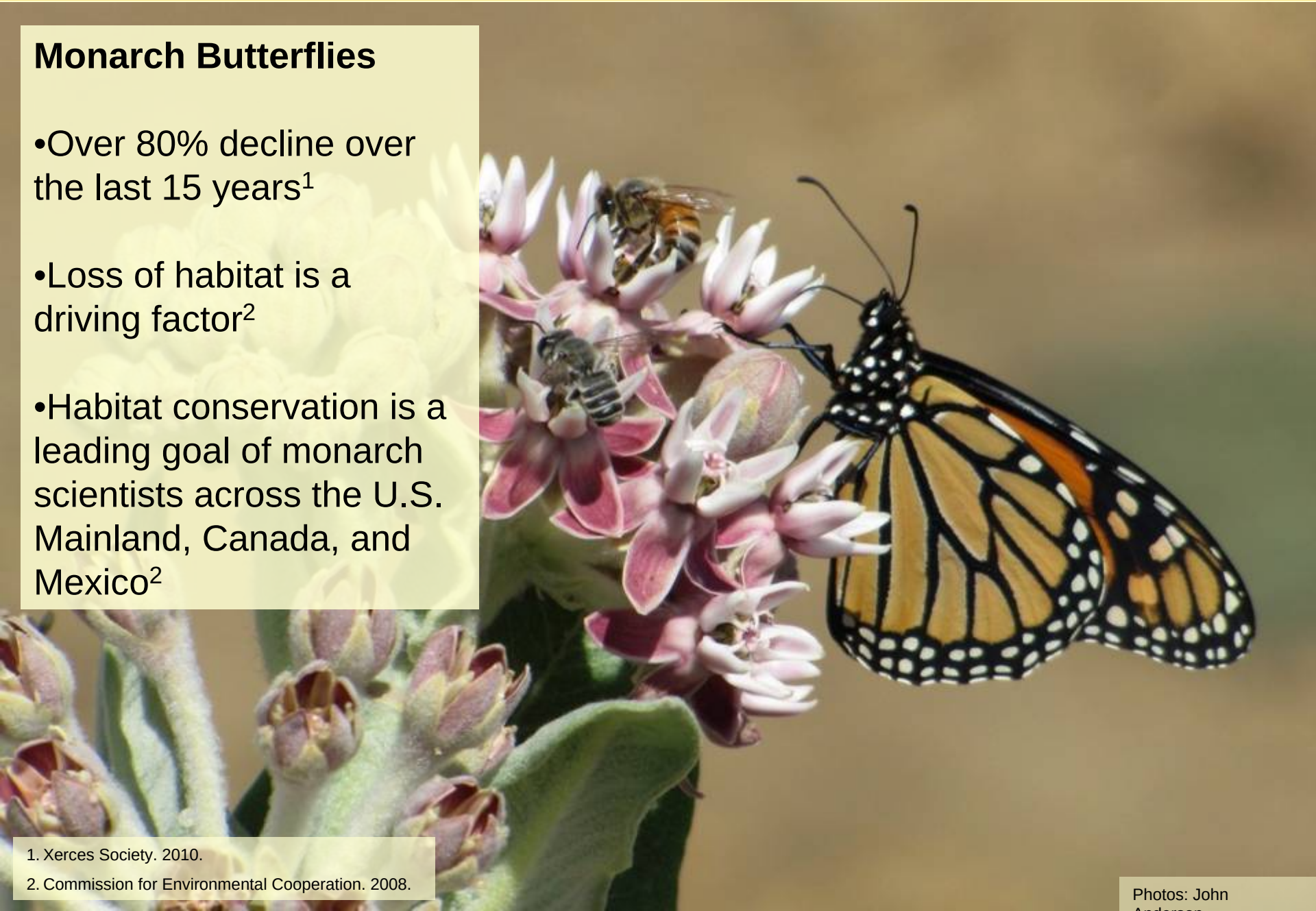
Photos: Don Keirstead


Win-Win Pollinator Conservation Outcomes
Photo: Eric Mader

Benefits to Other Pollinators (Butterflies)

Monarch Butterflies

- Over 80% decline over the last 15 years[1]
- Loss of habitat is a driving factor[2]
- Habitat conservation is a leading goal of monarch scientists across the U.S. Mainland, Canada, and Mexico[2]



1. Xerces Society. 2010.
2. Commission for Environmental Cooperation. 2008.

Photos: John

Benefits to the Environment

Protecting Soil and Water Quality

- Pollinator plants incorporated into farm buffer systems

Pollinator filter strip on California farm

Photo: Mace Vaughan (Xerces Society)

Benefits to Wildlife

Food for Wildlife

- Pollinator-produced fruits and seeds comprise 25% of the global bird and mammal diets
- Pollinators are food for wildlife
- Pollinator habitat is directly compatible with the needs of other wildlife.

Photos: Sierra Visiona Stock, Marie Read, and Missouri Extension

Benefits to Pest Control

Conservation Biological Control

The same efforts that support pollinators also support predatory and parasitic insects.

- If more than 20% of a farm is diverse, non-crop habitat, pest control is observed throughout fields[1]

Syrphid fly

Assassin bug eating stink bug pest

1. Tscharntke, T., Steffan-Dewenter, I., Kruess, A., Thies, C., 2002. Contribution of small habitat fragments to conservation of insect communities of grassland-cropland landscapes. Ecol. Appl. 12, 354– 363.

Photos: Mace Vaughan, Nancy Adamson

Benefits to Crop Productivity

Improving Soil Fertility

- Flowering cover crops rotations used on fallow fields: green manure, smother crop (for weed control), and nectar source
- Buckwheat, crimson clover, lacy phacelia

Photo: Mace Vaughan (Xerces Society)

The Xerces Society Case Studies:

Restoring Pollinator Habitat on Mainland Farms

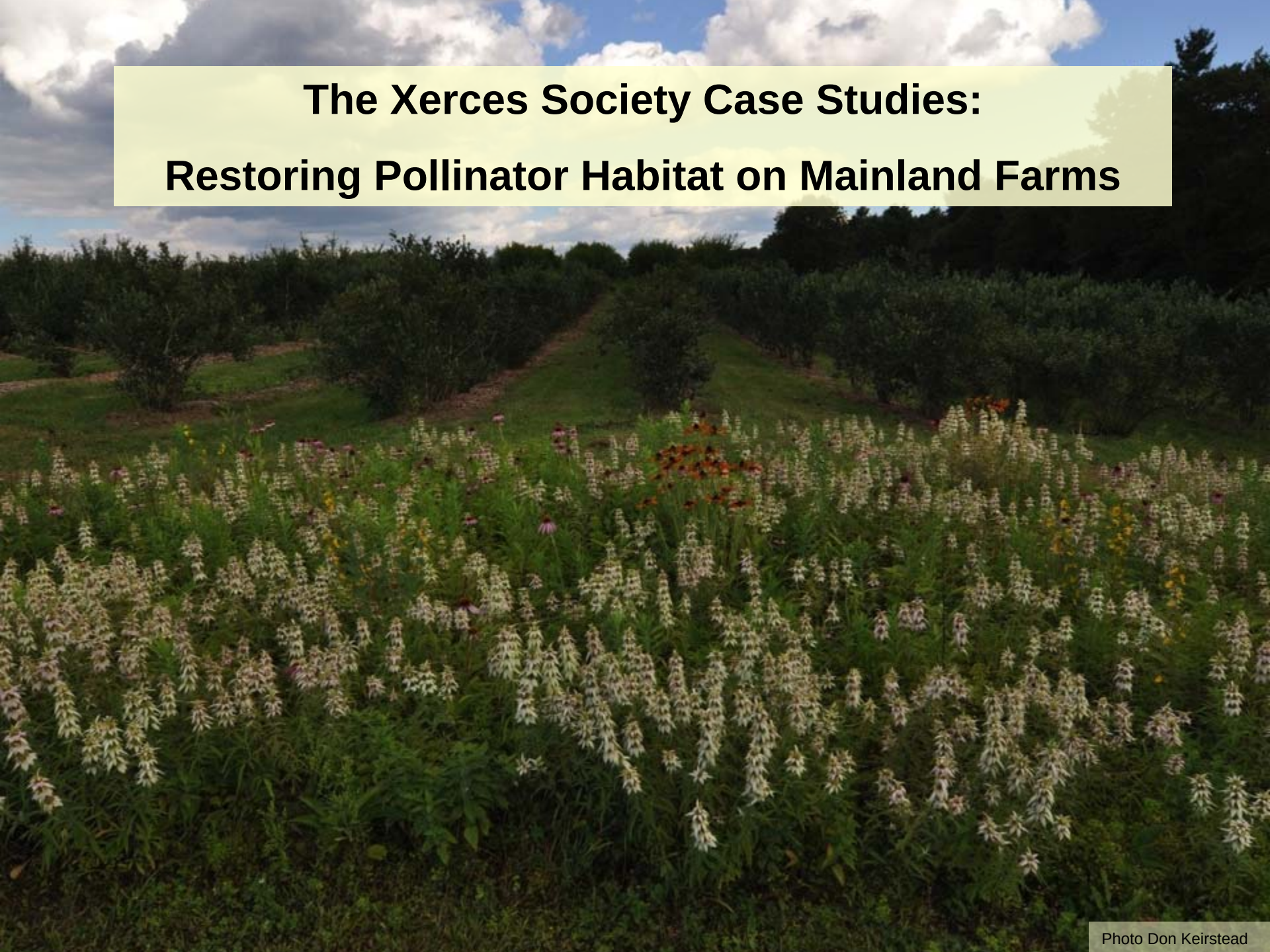


Photo Don Keirstead

2008 Farm Bill: Pollinator Habitat Provisions

The Current Farm Bill

- Makes pollinators a priority for every USDA land manager and conservationist
- Encourages the inclusion of pollinators in all USDA Natural Resources Conservation Service (NRCS) programs

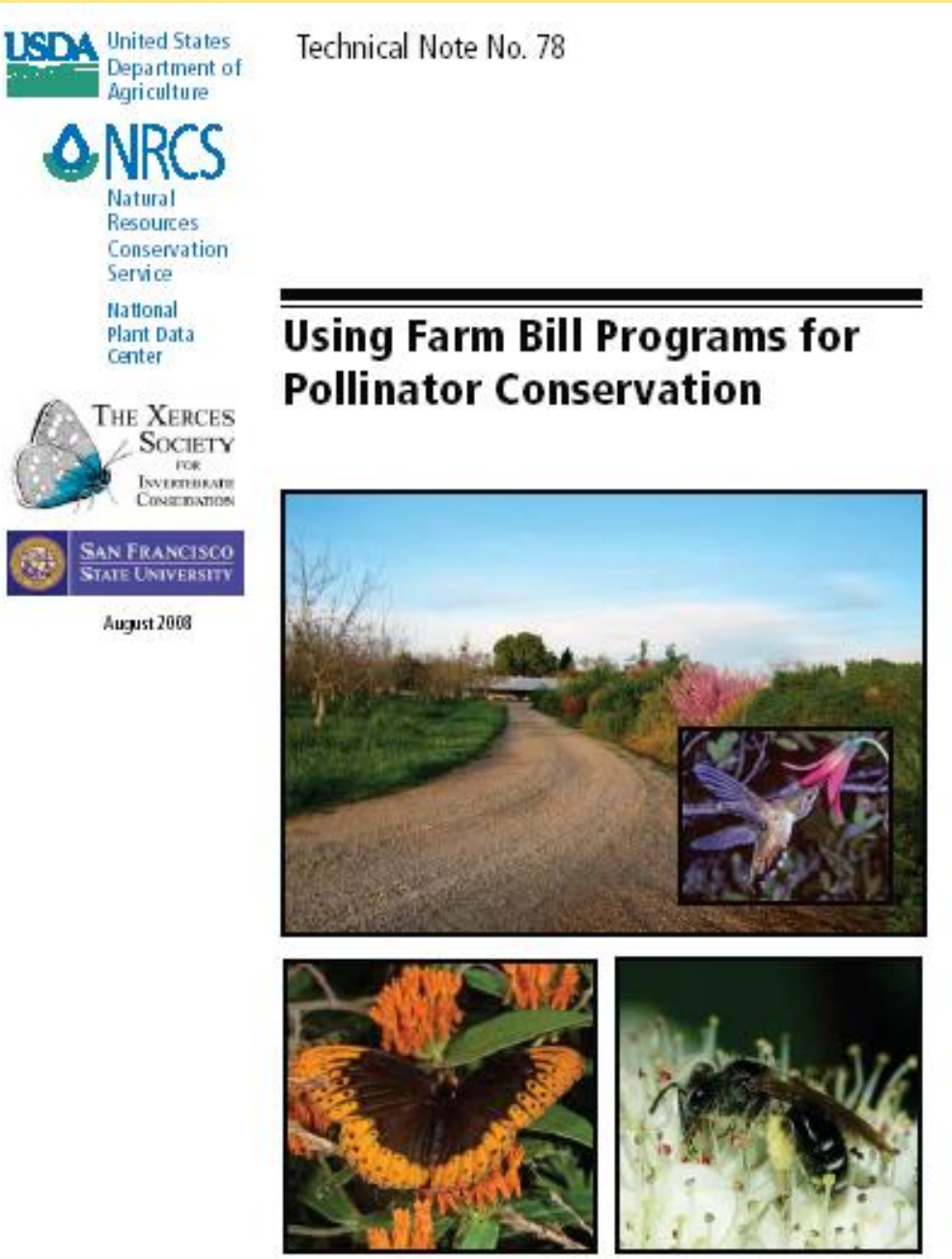
Photo: Mace Vaughan (Xerces Society)

2008 Farm Bill: Pollinator Habitat Provisions

USDA-NRCS Resources

- Cost-share grants and financial assistance for pollinator habitat
- Technical documents developed on how to integrate pollinator habitat into farm systems
- Pacific region guidance in development

Photo: USDA-ARS



Xerces Society: Consulting to the USDA

Farm Bill Conservation Programs

•Xerces provides pollinator conservation training to USDA Natural Resources Conservation Service (NRCS)

Photo: Mace Vaughan (Xerces Society)

Direct Habitat Restoration

Restoration Support to Farmers

- From Maine to Florida to California
- Supporting habitat restoration on 60,000+ acres

Xerces Publications

- Plant selection
- Site preparation and planting techniques

Photo Don Keirstead

Case Study: Native Plant Field Border

New Hampshire Apple and Blueberry Farm

- Pollination by wild bees alone

Pre-Planting: 2009

Post-Planting: 2011

Photos: Don Keirstead

Case Study: Native Plant Field Border

Massachusetts Cranberry Farm

- Weedy slope stabilized with native wildflowers

Post-Planting: Summer 2011

Hydroseeding Native Wildflowers: Fall 2010

Photos: Plymouth County NRCS

Case Study: Native Plant Field Border

Oregon Cherry Orchard

- Wildflowers planted for pollinators and beneficial insects that control pests

Xerces and USDA staff with farmer Mike Omeg.

Photos :Mike Omeg, Mace Vaughan (Xerces Society)

Case Study: Native Plant Field Border

Oregon Pear Orchard

- Native wildflowers planted to out-compete weeds

Pre-Planting: Fall 2010

Post-Planting: Summer 2011

Photos: Eric Mader (Xerces Society)

Case Study: California Rangeland Planting

California Cattle Ranch

- Wildflowers that support bees and cattle grazing

April 2010

May 2010

August 2011

Photos: Claudia Street (Glenn County RCD)

Case Study: Native Plant Hedgerow

California Central Valley

- 60+ miles of pollinator hedgerows being established in the Central Valley

Case Study: Native Shrub Hedgerow

California Central Valley Farm Hedgerow

- Fewer pest insects than weedy field edges

June 2007 (Looking East)

November 2010 (Looking West)

Questions for the Pacific Region

- How do we balance the needs of farmers, beekeepers, and native biodiversity?
- Are there other undocumented bee fauna native to the broader Pacific region (how do we establish baseline conditions)?
- How do we create affordable sources of native plant materials for habitat enhancement efforts?
- How do we foster greater dialog between Pacific region and mainland pollinator specialists?

Photo: Eric Mader

Further Information: Xerces Society Website

- Xerces Society publications
- www.xerces.org

Xerces Society: Conservation Training

Pollinator Conservation Short Course for Farmers and Farm Educators

- Nationwide training for farmers and farm agencies
- Thousands of participants in 2010-2011
- Average participant influences at least 100 acres
- Hawaii Short Course: 2012

SARE Sustainable Agriculture Research & Education

Take Home Message: What's Old is New?

In 1938, Dr. Patch predicted that by the year 2000

…the President of the United States would issue a proclamation claiming that land areas at regular intervals throughout the U.S. would be maintained as "Insect Gardens," under the direction of government entomologists. These would be planted with milkweed, hawthorn, and other plants that could sustain populations of butterflies and bees. She predicted that some time in the future, "Entomologists will be as much or more concerned with the conservation and preservation of beneficial insect life as they are now with the destruction of injurious insects."

Dr. Edith Patch (1916)
President, Entomological Society of America

Photo:The Friends of Edith Patch (www.edithpatch.org)

THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

Thank You!

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United States Department of Agriculture
Natural Resources Conservation Service

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Gaia Fund
Bill Healy Foundation
Bradshaw-Knight Foundation

www.xerces.org
(follow links to pollinator program)

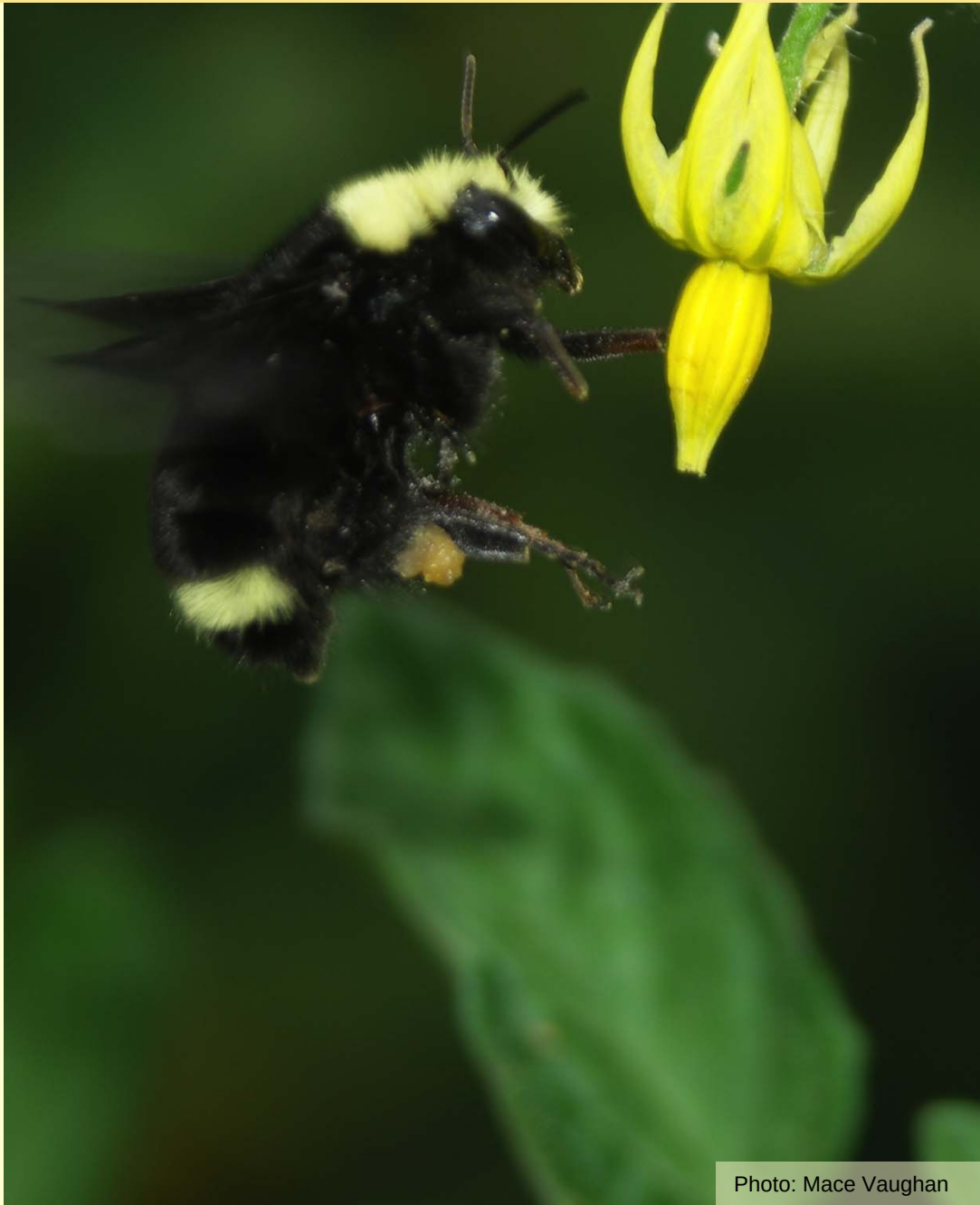

Photo: Mace Vaughan