Inventory and Design Opportunities for Pollinator Habitat on Working Lands

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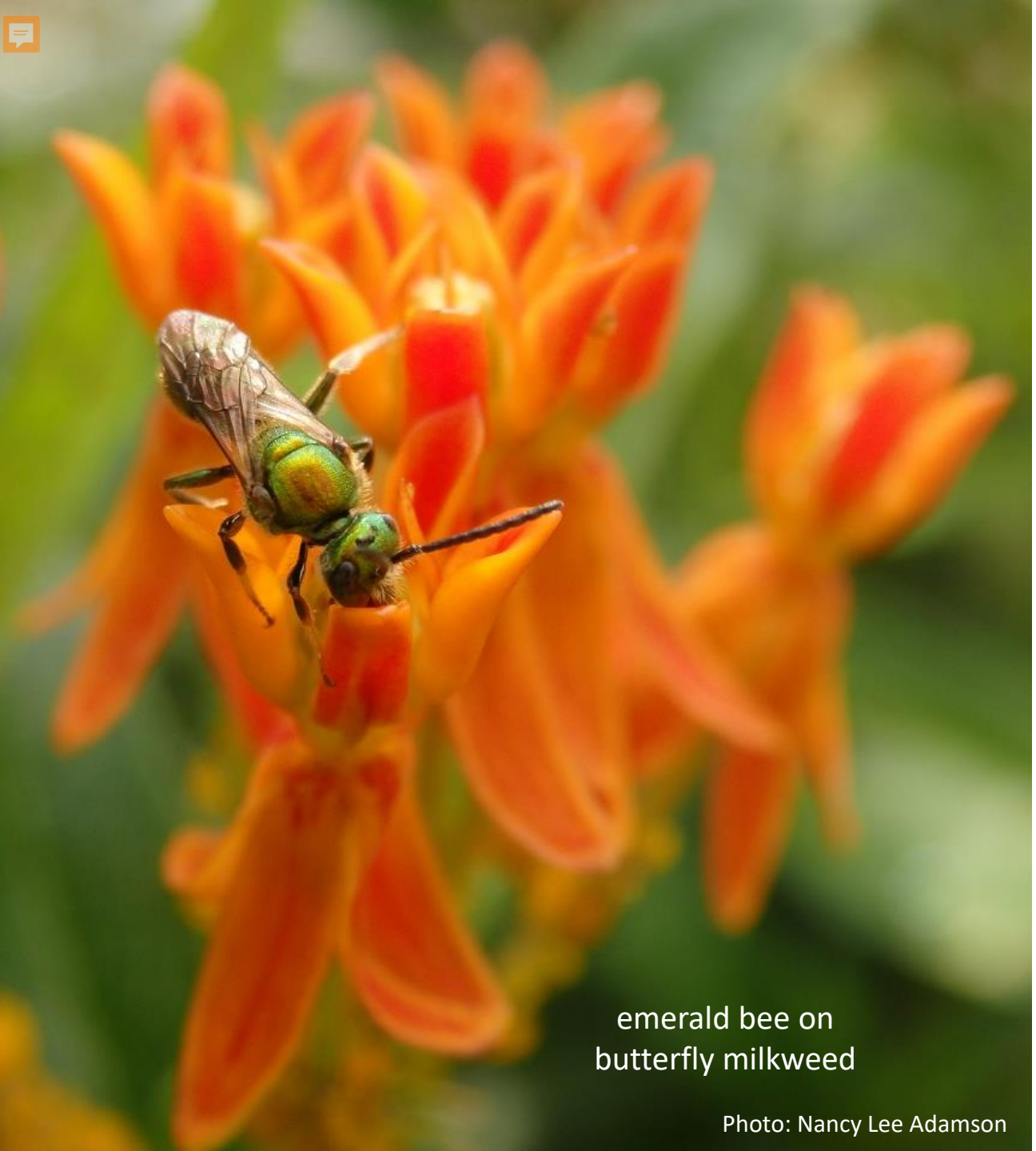
Farm photo: Chris Taliga



emerald bee on
butterfly milkweed

Photo: Nancy Lee Adamson

Inventory & Design Opportunities for Pollinator Habitat Establishment

Habitat Needs

- Food, shelter, protection from pesticides

Habitat Assessment Tools

Habitat Placement in the Landscape

- Habitat opportunities on farmlands, in woodlands, and in pasture/grazing lands
  - Key practices pollinators and other beneficial insects
  - Other wildlife or buffer practices for habitat
  - Managing existing areas to improve habitat

Additional Resources

Replay, copies of slides, additional resources, & answers to questions will be posted within 1 week.

Oct 27 webinar “Pollinator Habitat Implementation: Contracting and Maintenance” (conservationwebinars.org)

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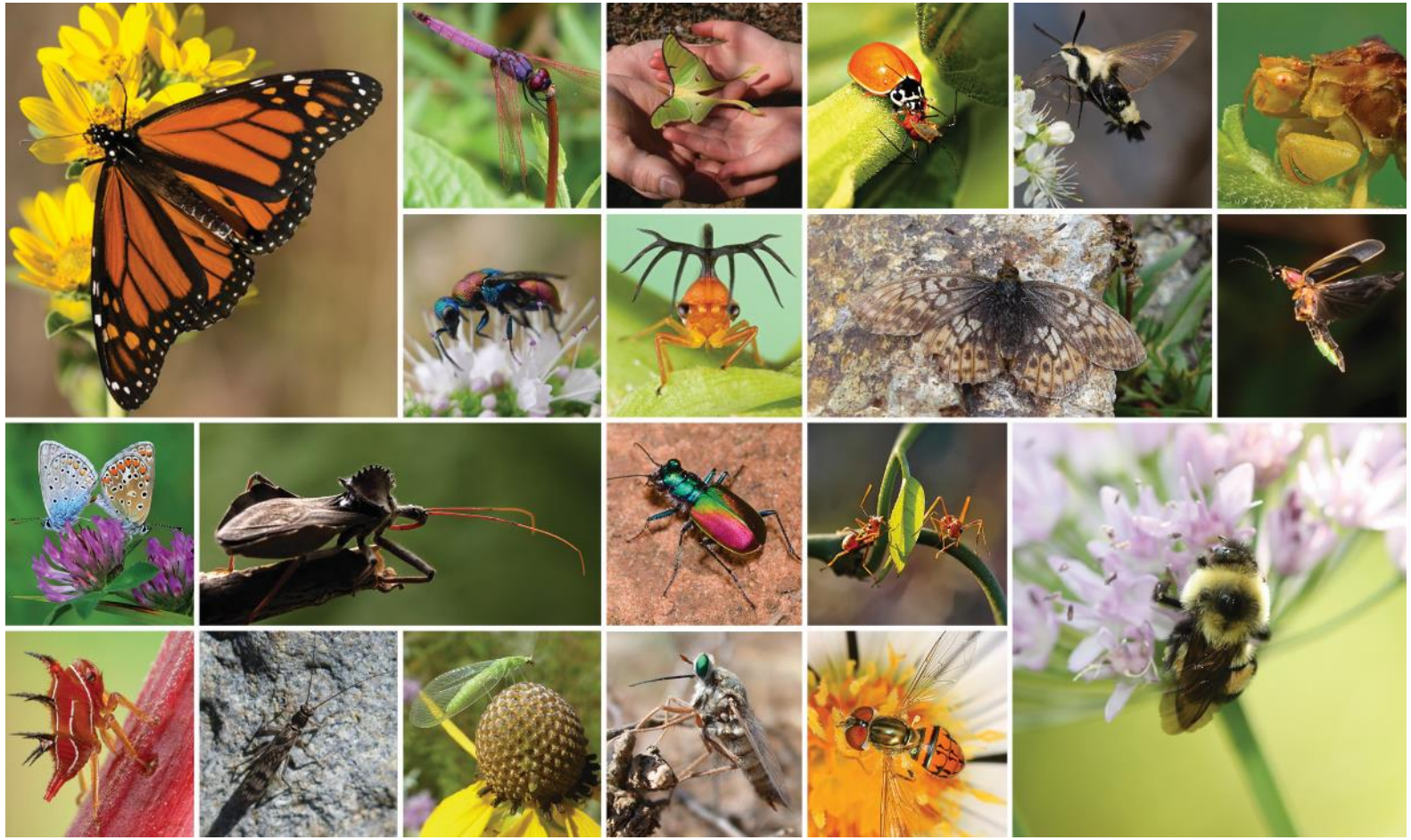
Declining Insect Diversity and Abundance

An increasing number of studies are showing declines in insects around the world.

The work you are doing supporting Farm Bill Conservation Practices on the ground is important!



Forister et al. 2019, Hallmann et al. 2017, Lister and Garcia 2018, Sánchez-Bayo and Wyckhuys 2019, Saunders 2019, Thomas et al. 2019

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Habitat Needs for Pollinators & Other Beneficials

Whether you are working on a large farm or in an urban area, pollinators need:

- **Food & Water**
  - Nectar, pollen, host plants
- **Shelter**
  - Nest sites, overwintering sites
- **Safe haven from pesticides**

Photo: Jennifer Hopwood

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Other Beneficial Insects* That Eat Insects & Weed Seeds

"Beneficial Insects"

- AKA
  - ★ "Natural Enemies"
  - ★ "Biocontrol Agents"
- Support our ecosystems
- Regulate insect pests

Many are also pollinators:

Flies, wasps, beetles

Photo: Nancy Lee Adamson

Syrphid fly on willow, *Salix* sp. Their larvae are voracious predators of aphids, white flies, and other small crop pests.

Adults depend on nectar and pollen.

*We use the term to refer to all arthropods that are beneficial for agricultural—pollinators, predators, & parasitoids—not just true insects.

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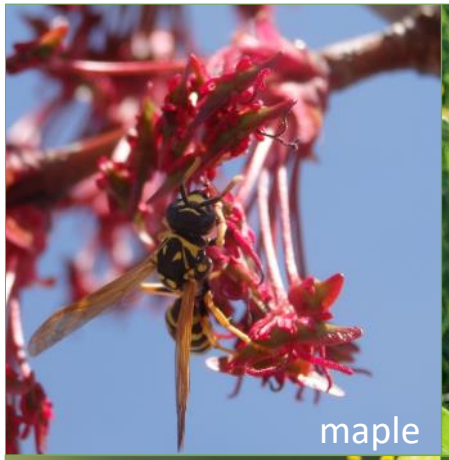
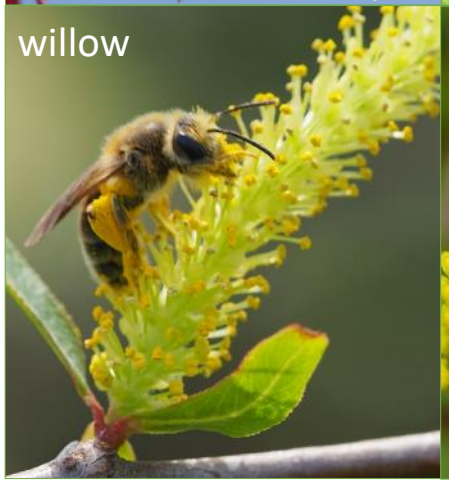
Habitat through the growing season—native trees, shrubs, wildflowers & grasses

Pollinators, predators, & parasitoids need food (nectar, pollen, or prey) & refuge*





*refuge when crops are harvested or pesticides used

Photos: Wild indigo by Christine Taliga, buttonbush and goldenrod by Dennis Burnette, others by Nancy Lee Adamson

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Plant Selection

- High value plants for pollinators
  - Perennials, biennials, annuals
  - Early, mid, and late life history stages
  - Early, mid, and late bloom periods
- Site appropriate
- Pesticide-free seed or plants
- Host plants and nesting plants

Photos: Brooks Bolyard, Ohio;
inset Barbara Driscoll

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Nesting

In the ground, in cavities/twigs/snags, below lodged grasses

Within nests, use mud, leaves, resins, oils, pebbles…

Photos (clockwise from top left: small carpenter bee and wild senna leaves with leafcutter holes by Nancy Adamson; bumble bee nest by Sarah Foltz Jordan; full ground nest by Betsy Betros, close-up pollen ball and larva by Rollin Coville; green sweat bee emerging from ground-nest by Drew Marold; scoliid wasp gathering mud and rose mallow bee peaking out of ground-nest by Nancy Adamson; and green sweat bee entering wood cavity by Colleen Satyshur.

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Bumble bee nesting and overwintering sites

Photo by Daniel Murdiyarso for Center for International Forestry Research (CIFOR). (Creative Commons)

Photo: Kelly Gill / Xerces Society

Photos: Sarah Foltz Jordan / Xerces Society

Nesting and Overwintering Habitat

Try to avoid disturbing more than 1/3 of a habitat at any one time

Photos: Beatriz Moisset; Christine Liloia/NC Botanical Garden; Sarah Foltz Jordan; Flickr/orangeaurochs

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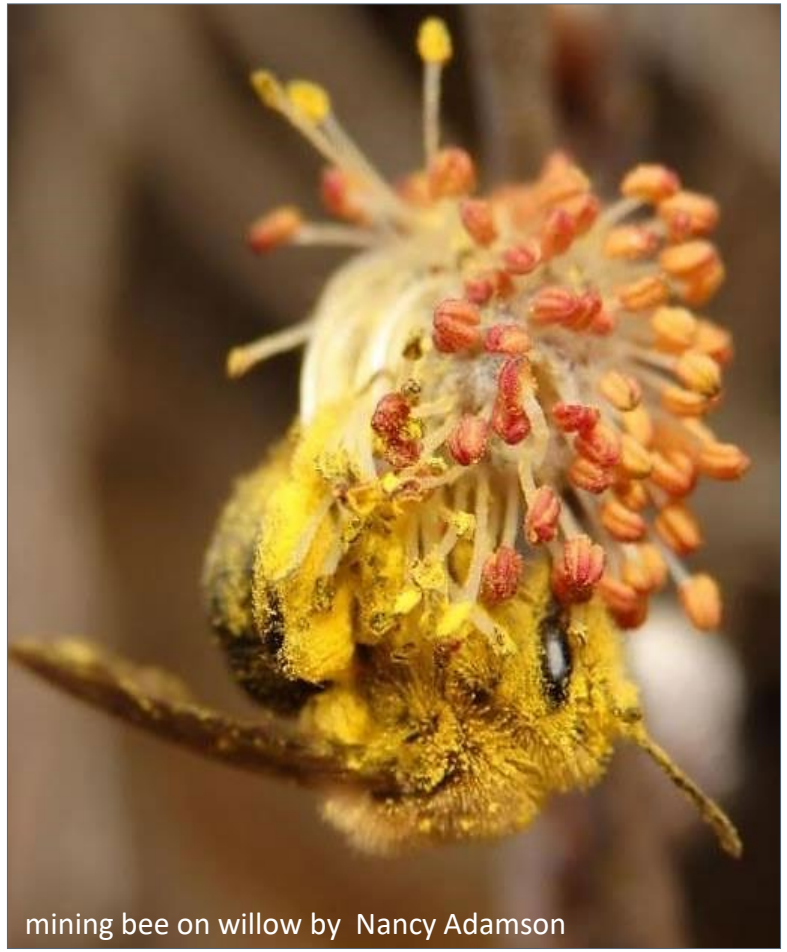
Many native bees are pollen specialists

They collect pollen only from one species, genus, or family



mining bee on willow by Nancy Adamson

hibiscus bee by Annette Meredith, NCNPS and http://www.natureonourdoorstep.com/

- asters (various genera)
- *Cirsium,* native thistles
- *Chrysopsis,* goldenaster
- *Cucurbita,* squash
- *Helianthus,* sunflowers
- *Hibiscus,* rose mallow
- *Ipomoea*, wild potato vine
- *Oenothera,* primroses
- *Physalis*, ground cherry
- *Pityopsis*, silkgrass
- *Salix,* willows
- *Strophostyles*, fuzzy bean
- *Vaccinium*, blueberry
- *Vernonia,* ironweed
- *Viola*, violet

...many more

Pollen specialist bees: http://www.illinoiswildflowers.info/flower_insects/, http://jarrodfowler.com/specialist_bees.html

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Host Plants for Butterfly Larvae

Include host plants for butterflies like **native** milkweeds (*Asclepias* spp.)

- Obligate host plants for monarch caterpillars. Nearly an 80% decline in monarch butterflies in last 20 years
- High quality nectar source for pollinators and other beneficial insects (lady beetles, parasitic wasps, pirate bugs, syrphid flies…)

Photos (left to right): Barbara Driscoll, Dennis Burnette, Annette Meredith, Nancy Lee Adamson

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Assessing habitat and designing improvements

Photo: Anne Stine / Xerces Society

Habitat planning process:

1. Recognize existing habitat
2. Identify habitat deficiencies
3. Prioritize habitat improvements

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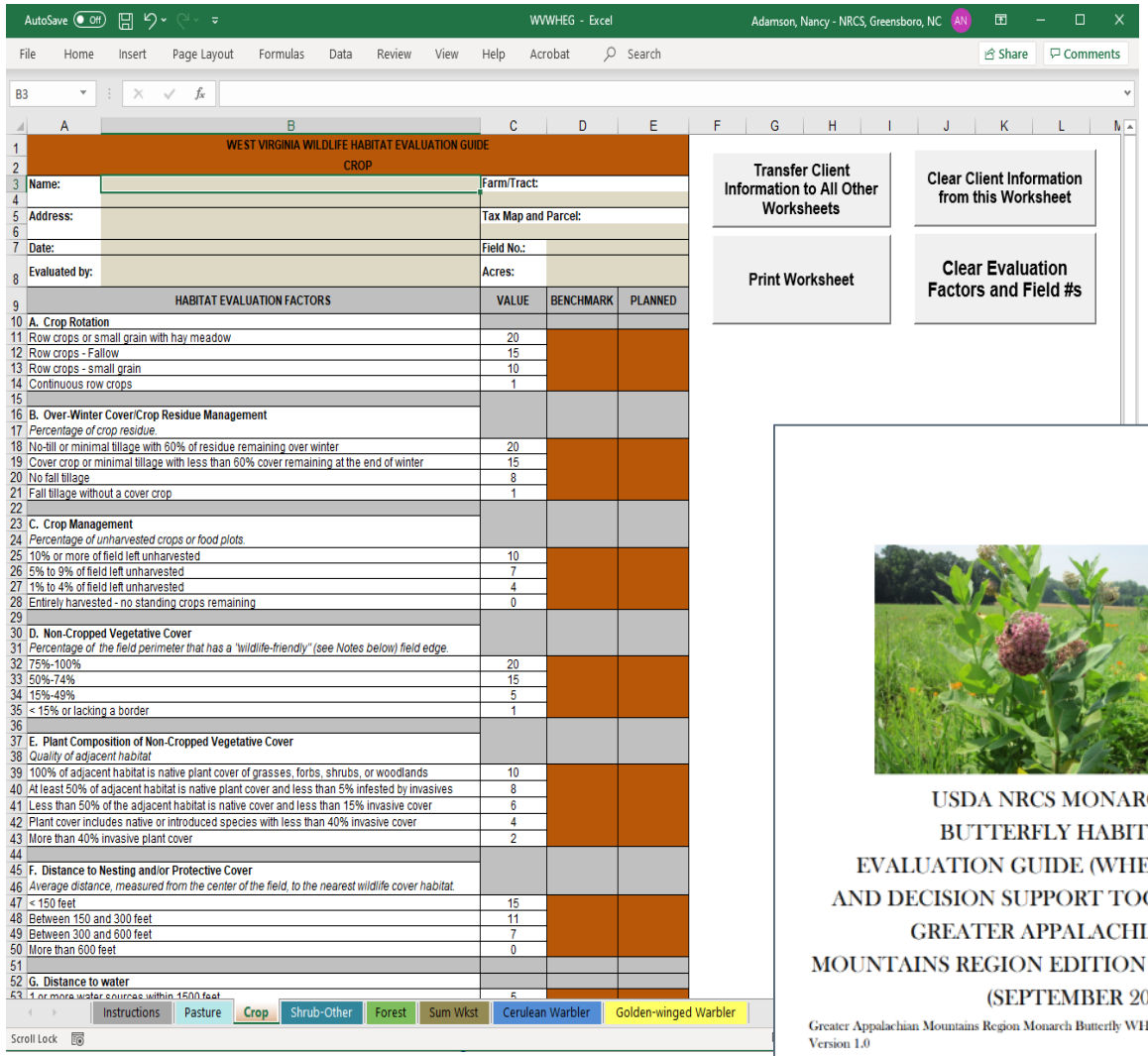
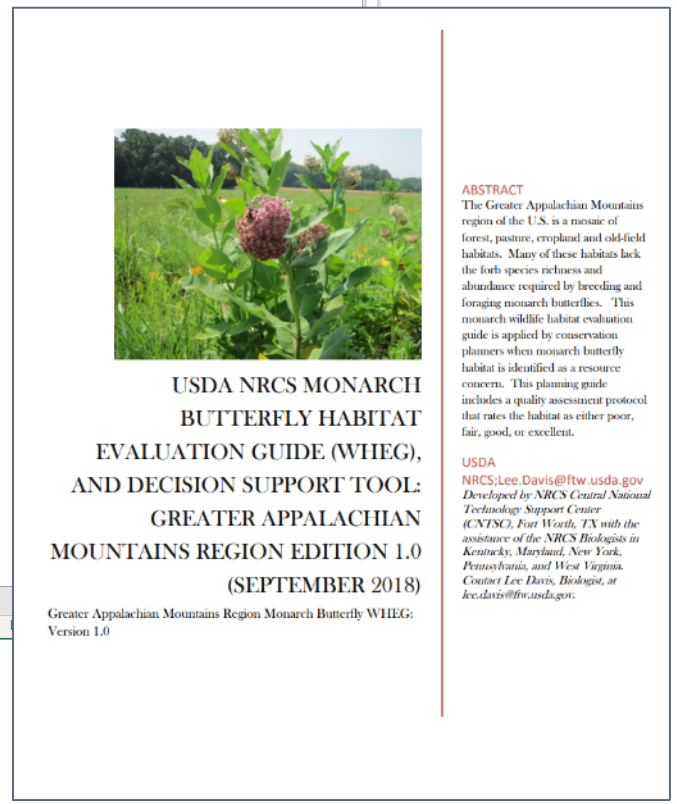
NRCS Pollinator Habitat Assessment Tools





State Wildlife Habitat Evaluation Guides (WHEGs)*

Habitat assessment tools are in each state's Field Office Technical Guide

https://efotg.sc.egov.usda.gov/

Regional Monarch Butterfly WHEGs

http://nrcs.usda.gov/monarchs

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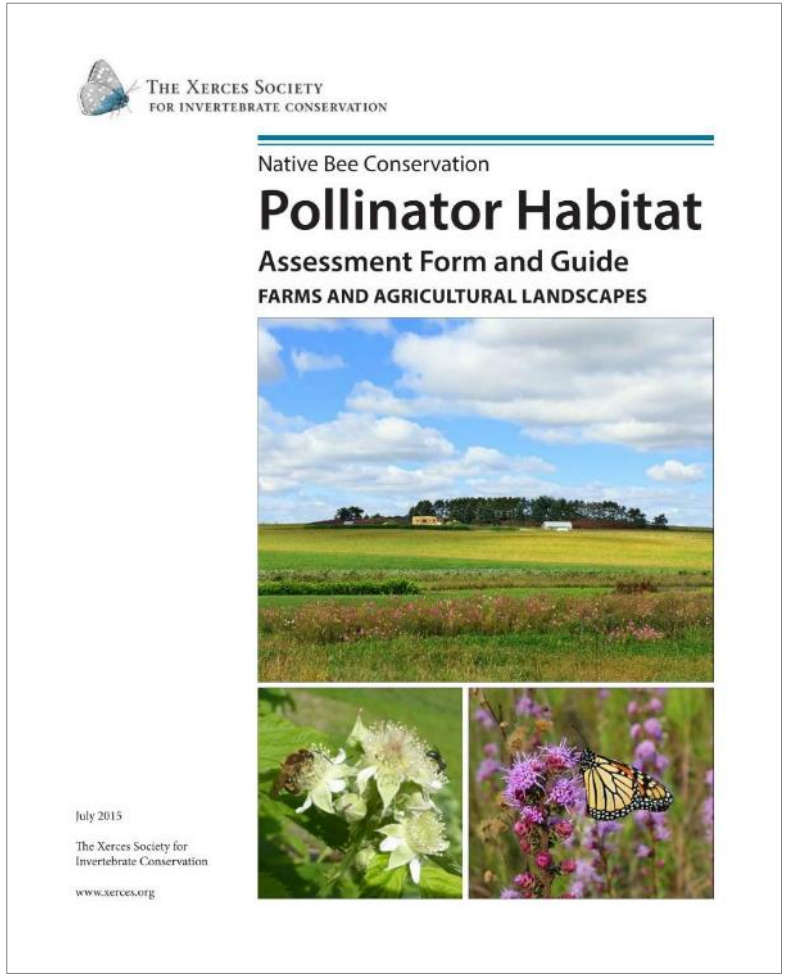
Other tools for assessing habitat, designing improvements, & educating landowners

- Xerces' Pollinator Habitat Assessment Form and Guide for Farms and Agricultural Landscapes*
- Quantify habitat characteristics
  - Landscape-level
  - Site-level

Total Score for Habitat Assessment

The figures entered into this summary table will be calculated during completion of the assessment.

	BEFORE	AFTER
Section 1: Landscape Features *(max score 20)*		
Section 2: Farmscape Features *(max score 45)*		
Section 3: Foraging Habitat *(max score 40)*		
Section 4: Native Bee Nesting Habitat *(max score 45)*		
Section 5: Farm Management Practices *(max score 105)*		
OVERALL SCORE		



*Also available for **Natural Areas and Rangelands**, as well as **Yards, Gardens, and Parks**
https://xerces.org/pollinator-conservation/habitat-assessment-guides/

xerces.org

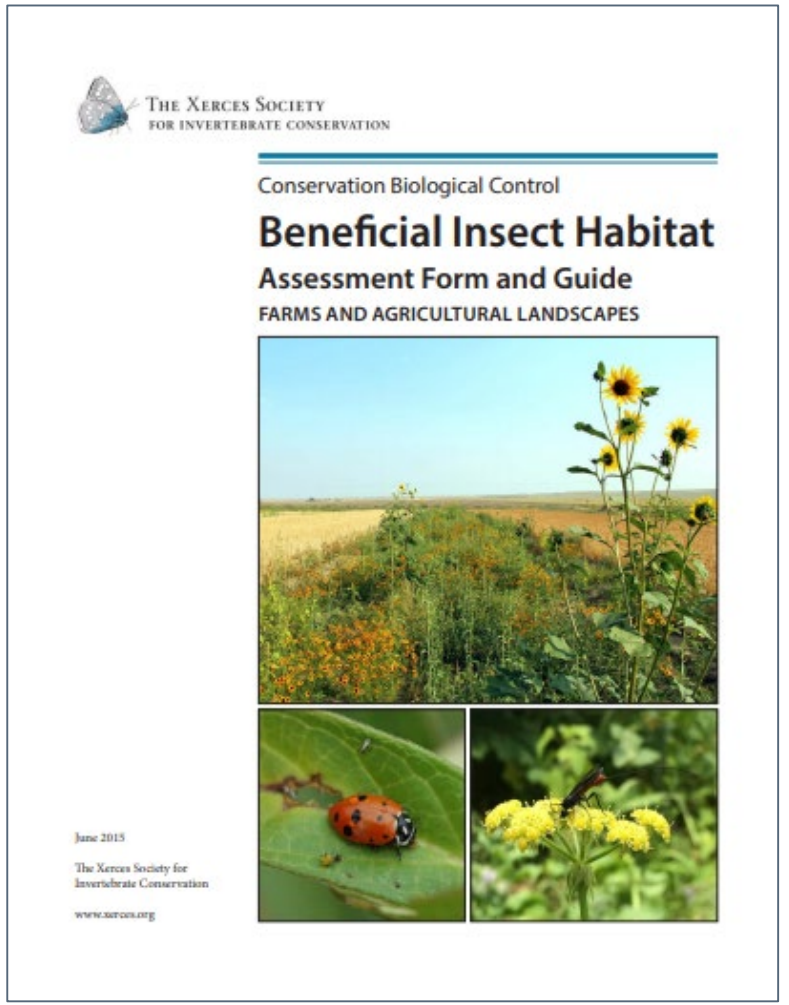
Other tools for assessing habitat, designing improvements, & educating landowners

- Xerces' Beneficial Insect Habitat Assessment Form and Guide for Farms and Agricultural Landscapes (pollinator forms also available)
- Quantify habitat characteristics
  - Landscape-level
  - Site-level

Total Score for Habitat Assessment

The figures entered into this summary table will be calculated during completion of the assessment.

	BEFORE	AFTER
Section 1: Landscape Features *(max score 20)*		
Section 2: Farmscape Features *(max score 40)*		
Section 3: Foraging Habitat *(max score 40)*		
Section 4: Shelter & Overwintering Habitat *(max score 40)*		
Section 5: Management Practices *(max score 80)*		
OVERALL SCORE *(max score 220)*		



https://xerces.org/pollinator-conservation/habitat-assessment-guides/

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Site History: Is planting appropriate?

What is the history of the site?

Was it previously cultivated?

If not, the **existing seed bank** may be the best seed source.

For help determining if planting is appropriate, see Norman Melvin's "decision sequence keys" in ***Wetlands Restoration, Enhancement, and Management***

http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010838.pdf

Cut stump of eastern red cedar with high quality native prairie uphill

Prairie violet

Wood betony

Hoary puccoon

Amethyst shooting star

Photos: Karen Jokela / Xerces Society

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Design and Planning Habitat in the Landscape

Photo: Nancy Lee Adamson

xerces.org

Pollinator Habitat Examples

Photo Credit: Jessa K. Cruz (Xerces Society)

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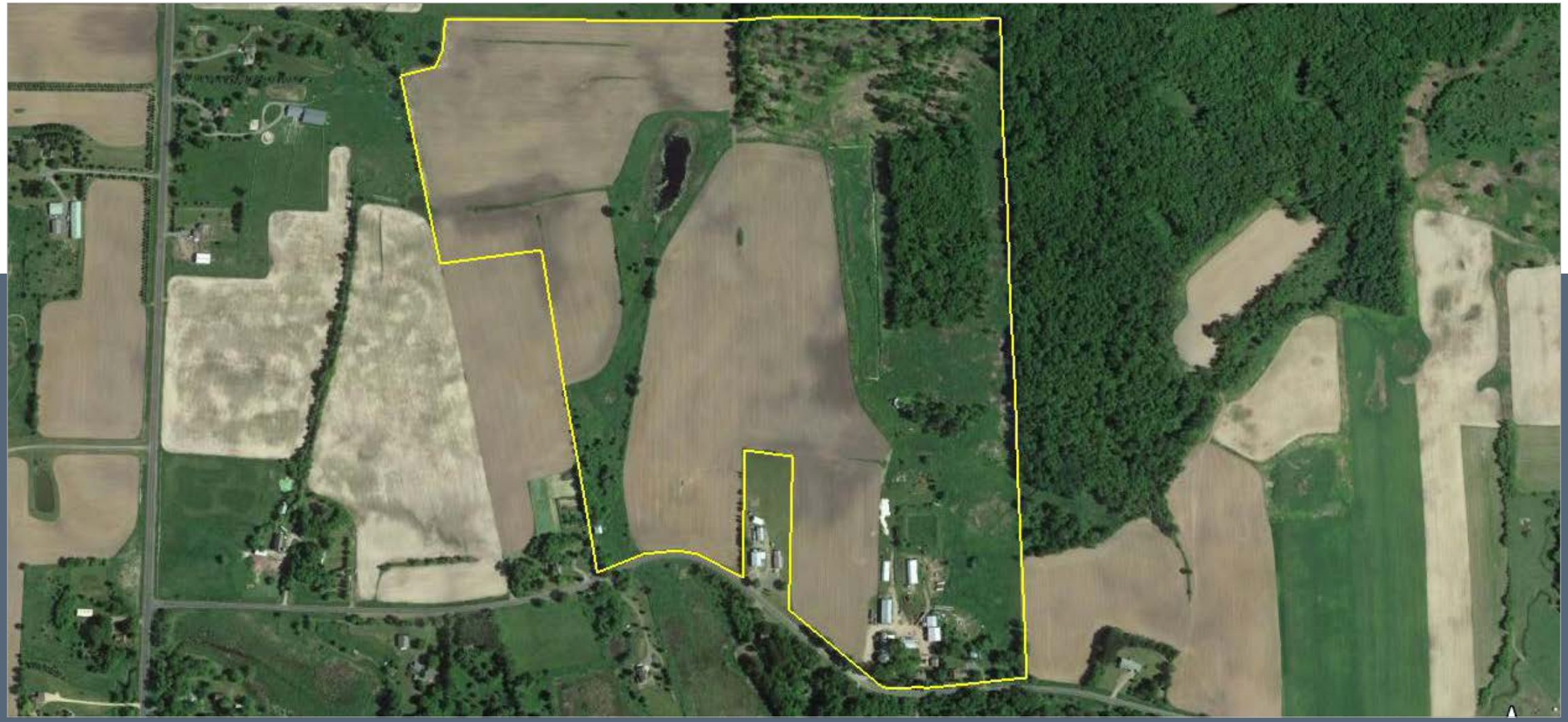
Many Habitat Options in the Farm Landscape



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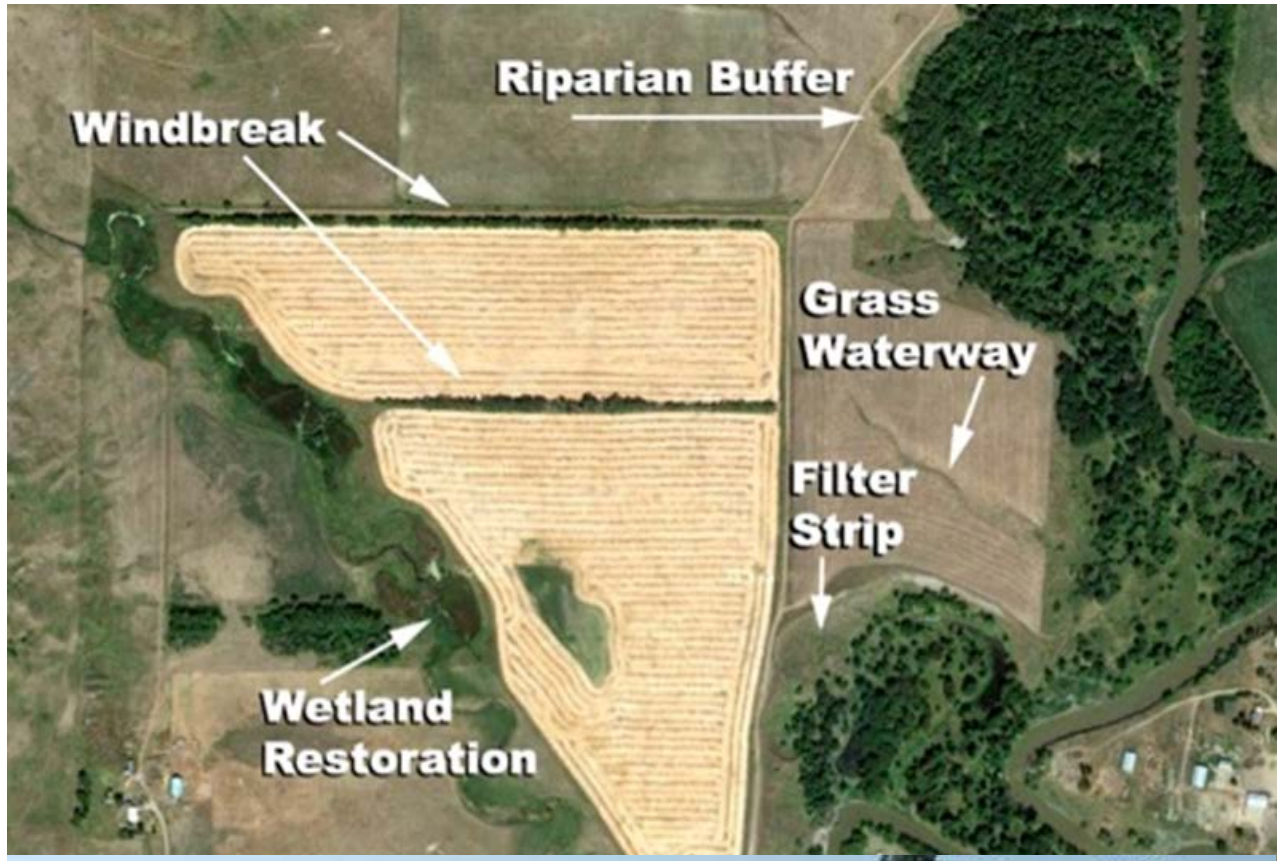
Design for Multiple Benefits

- Water quality protection
  - Sediment capture
  - Nutrient capture
- Buffer against adjacent pesticide use
- Screening, noise reduction
- Wildlife habitat and corridors
- Weed seed capture
- Increase crop isolation distances
- Beautification



Lower photo: Mace Vaughan (Xerces)

Habitat Examples: Wildlife Habitat Planting (420)

Photo by Eric Lee-Mader (Xerces Society) of University of New Hampshire habitat demonstration (Courtesy Catherine Neal)

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Habitat Examples: Wildlife Habitat Planting (420)

Photo by Justin Meissen (Flickr Creative Commons)

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Habitat Examples: Wildlife Habitat Planting (420)

Photo by Kitty Bolte (Xerces Society), Quincy, WA

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Habitat Examples: Wildlife Habitat Planting (420)

July

Photos by Eric Lee-Mader (Xerces Society)

Photos: Eric Mader, Xerces Society

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In some states…
Conservation Cover (327)

Photo by Kell Gill (Xerces Society)

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Habitat Examples: Conservation Cover (327)

Klickitat Canyon Vineyard, Washington

Photos by Eric Lee-Mader (back) and Robin Dobson (inset)

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Habitat Examples

Pivot corner planted with spirea, rose and snowberry

Photo by Corin Pease (Xerces Society)
Grande Ronde Valley, OR

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Habitat Example: Field Border (386)

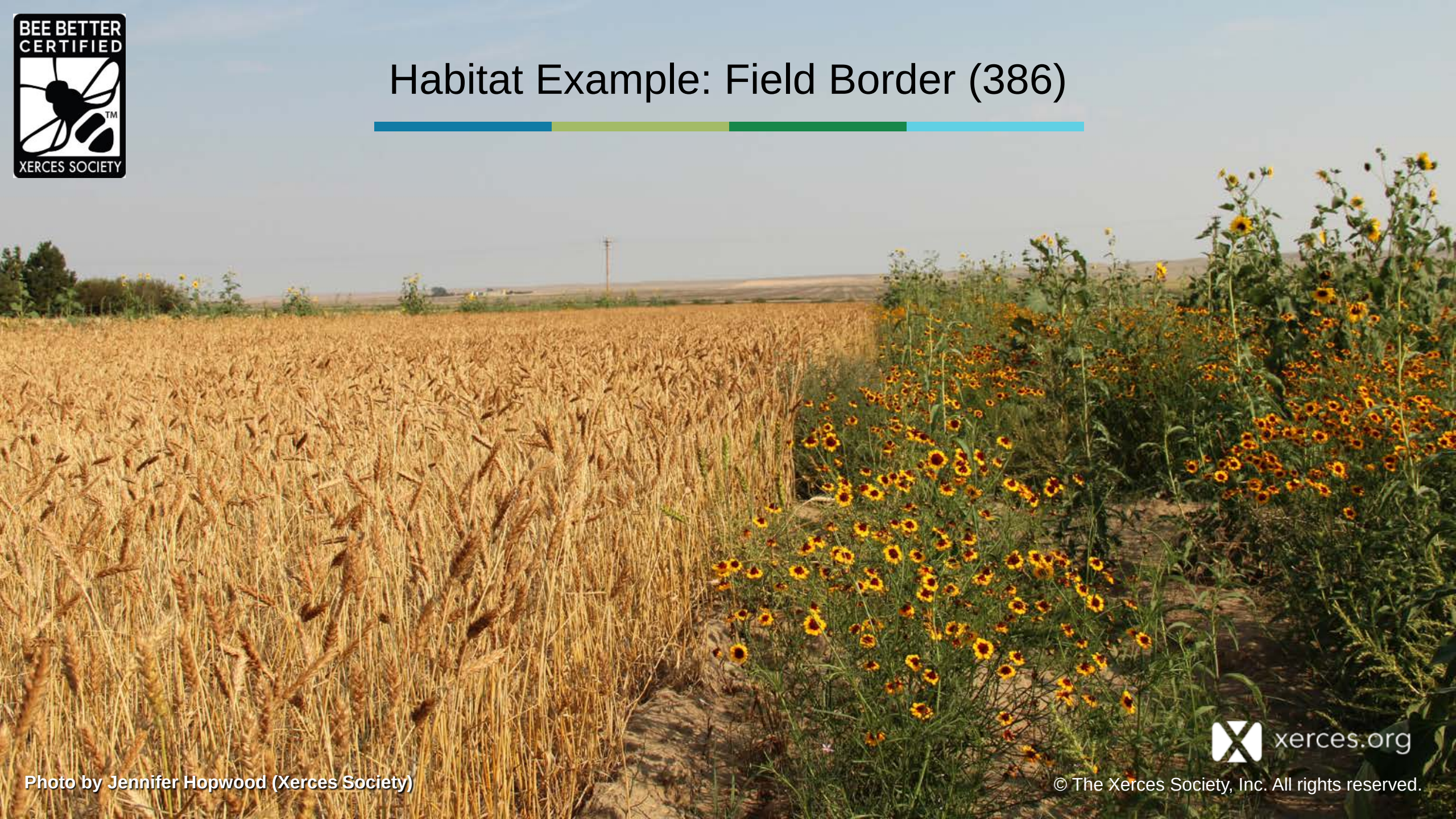

Photo by Jennifer Hopwood (Xerces Society)

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Habitat Example: Field Border (386)

Photo by Karin Jokela (Xerces Society)

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Habitat Example: Filter Strip (393)

Xerces native plant filter strip, California

Captures sediment & excess nutrients, increases infiltration to reduce flooding

Photo by Katharina Ullman

xerces.org

Habitat Example: Filter Strip

Filter Strips (NRCS 393)
Riparian Herbaceous Cover (NRCS 390)

Native plant filter strip, California

Photo: John Anderson (Hedgerow Farms)

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Habitat Examples: Hedgerows (422)

California Hedgerow

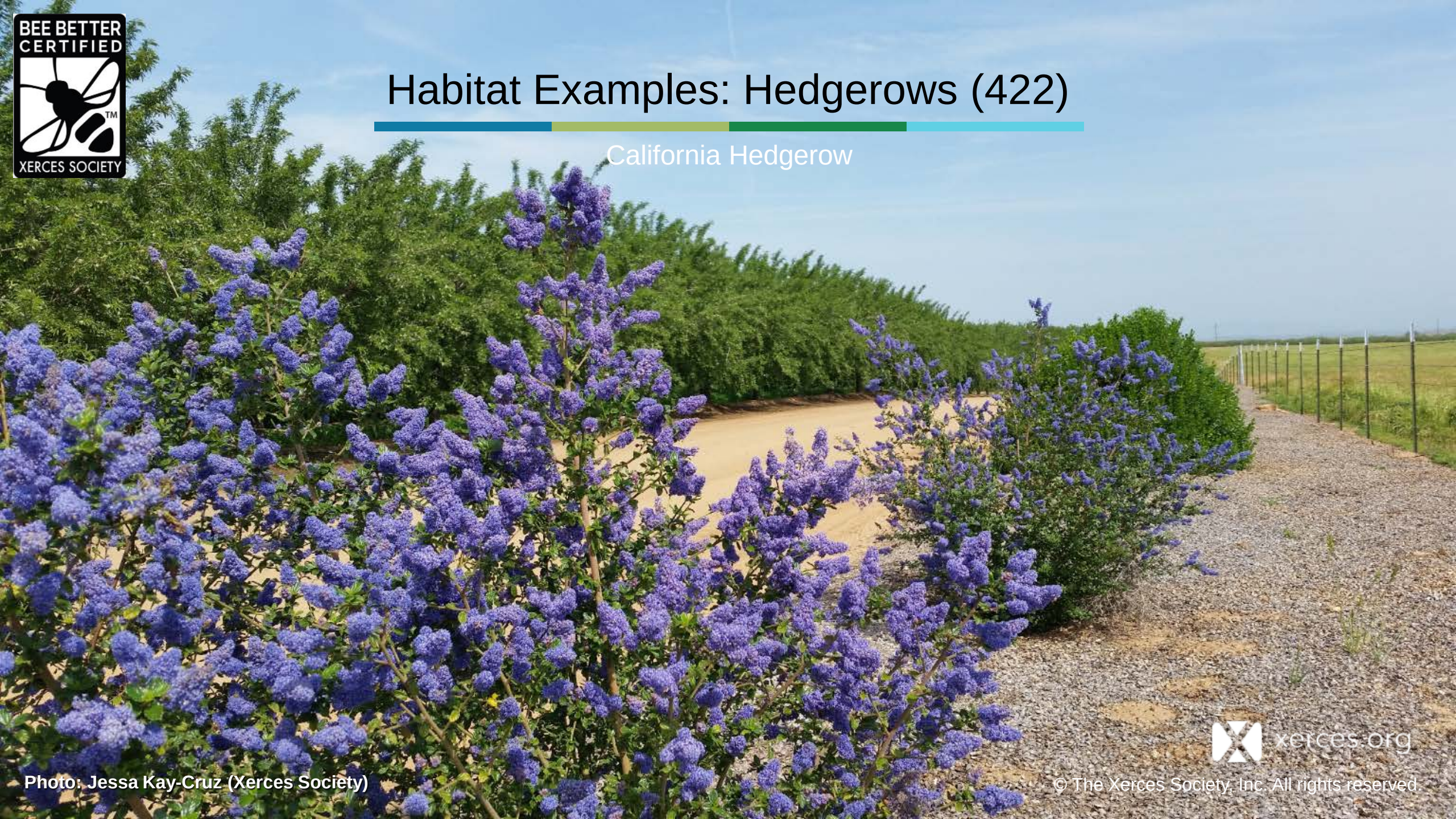

Photo: Jessa Kay-Cruz (Xerces Society)

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Habitat Examples: Hedgerow (422)

California Hedgerow

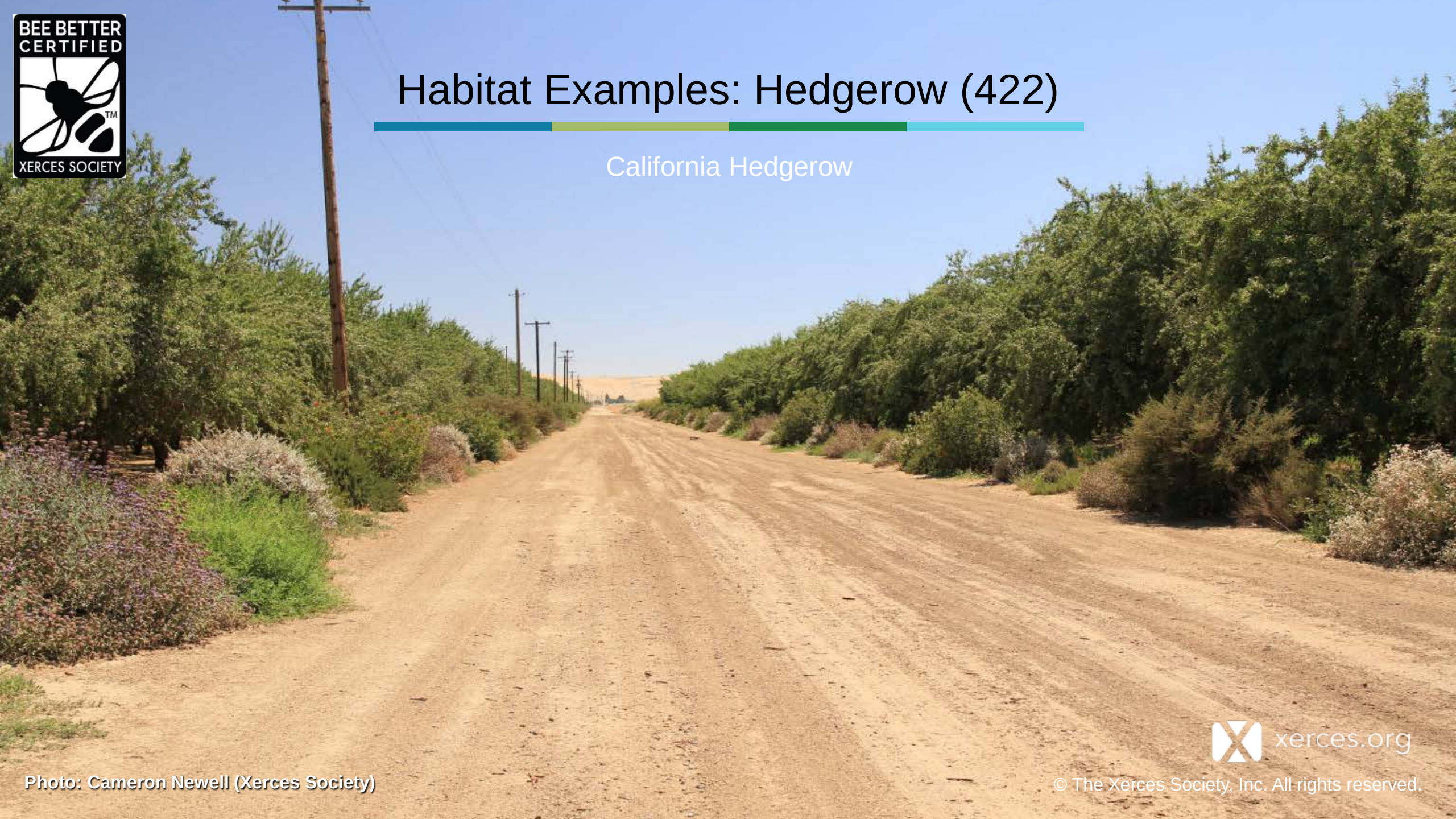

Photo: Cameron Newell (Xerces Society)

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Habitat Examples: Hedgerow (422)

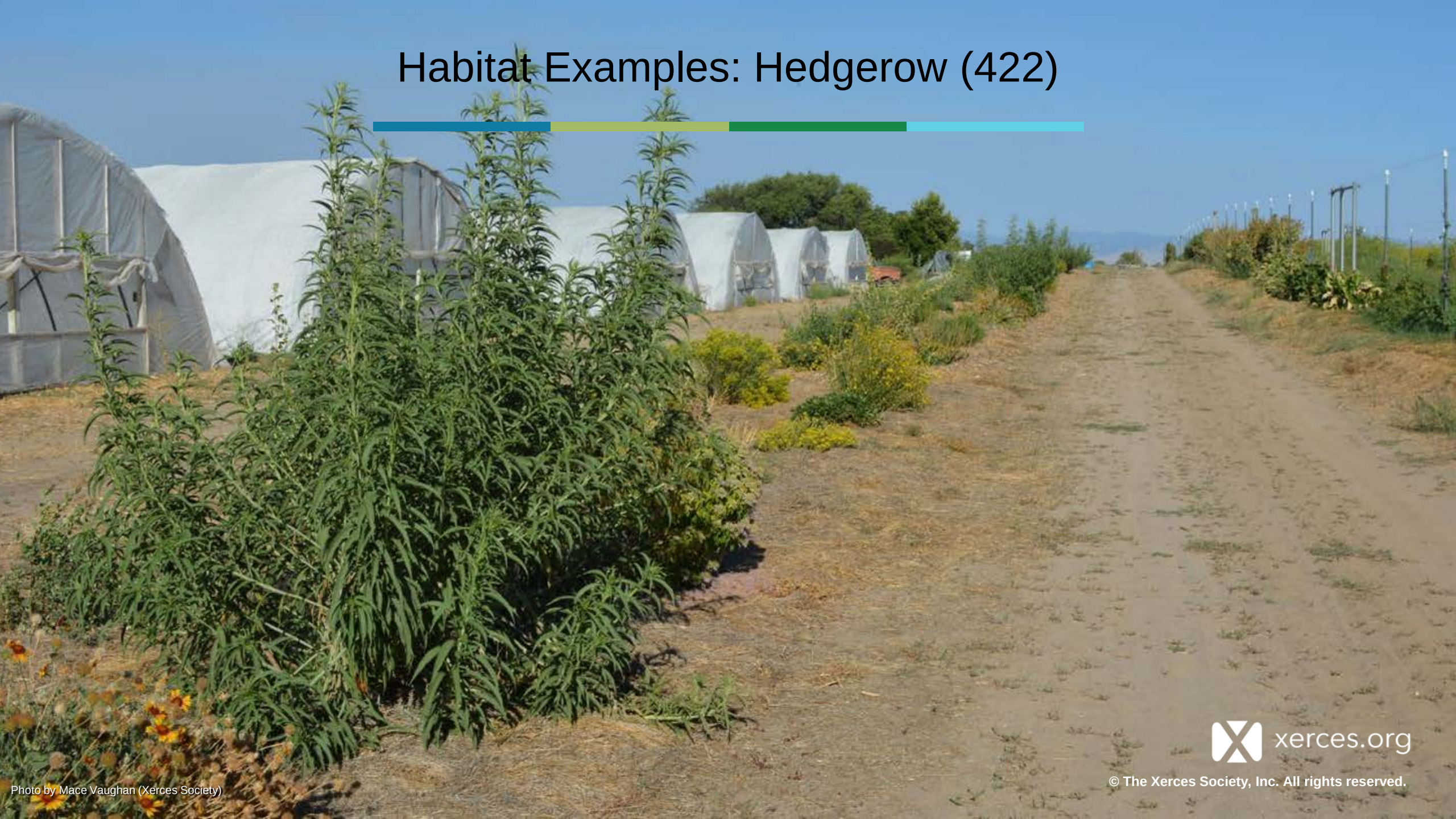

Photo by Mace Vaughan (Xerces Society)

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Habitat Examples: Hedgerow (422)

Eastern Oregon hedgerow between cherry orchard and road.

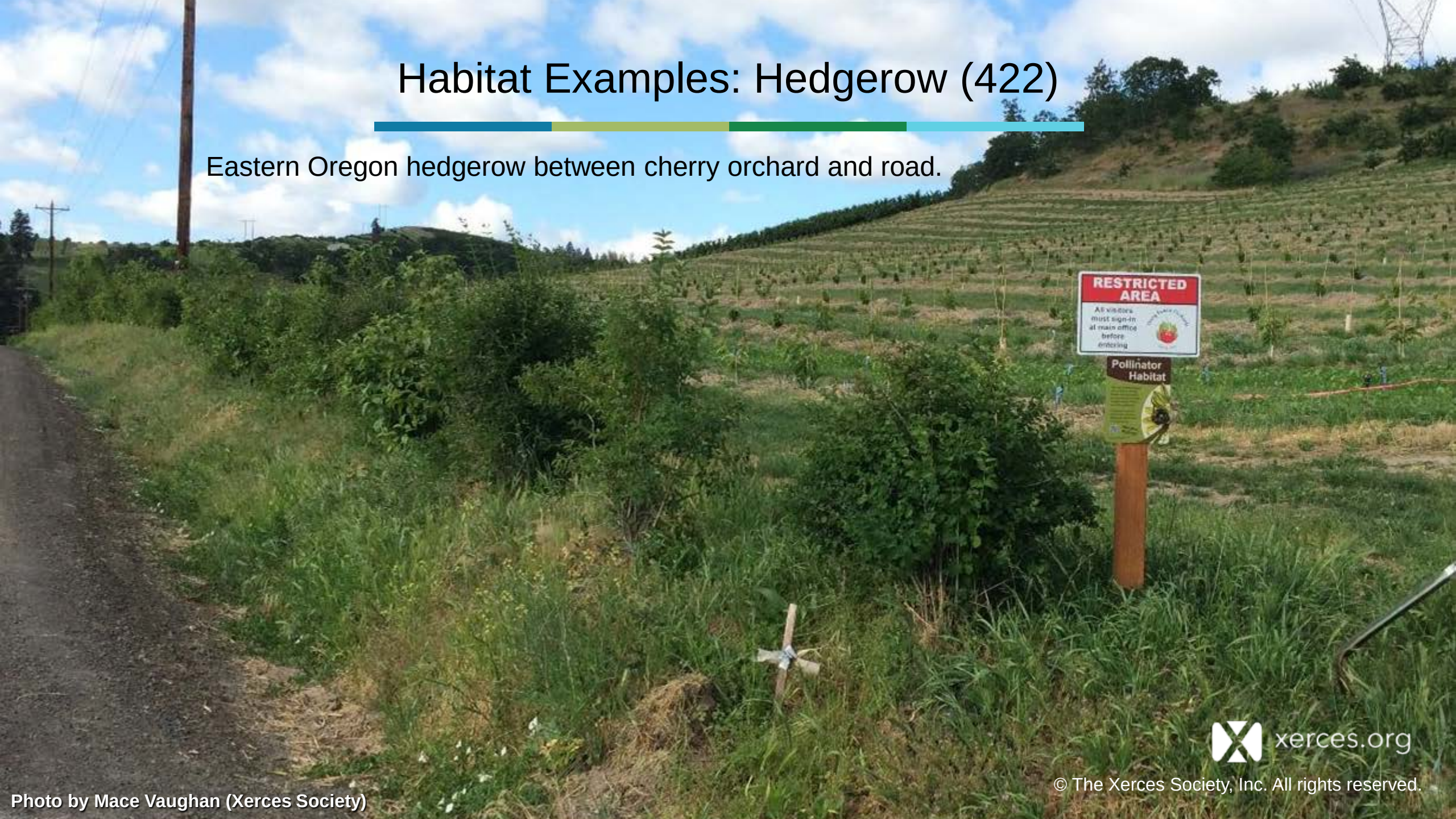

Photo by Mace Vaughan (Xerces Society)

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Habitat Examples: Hedgerow (422)

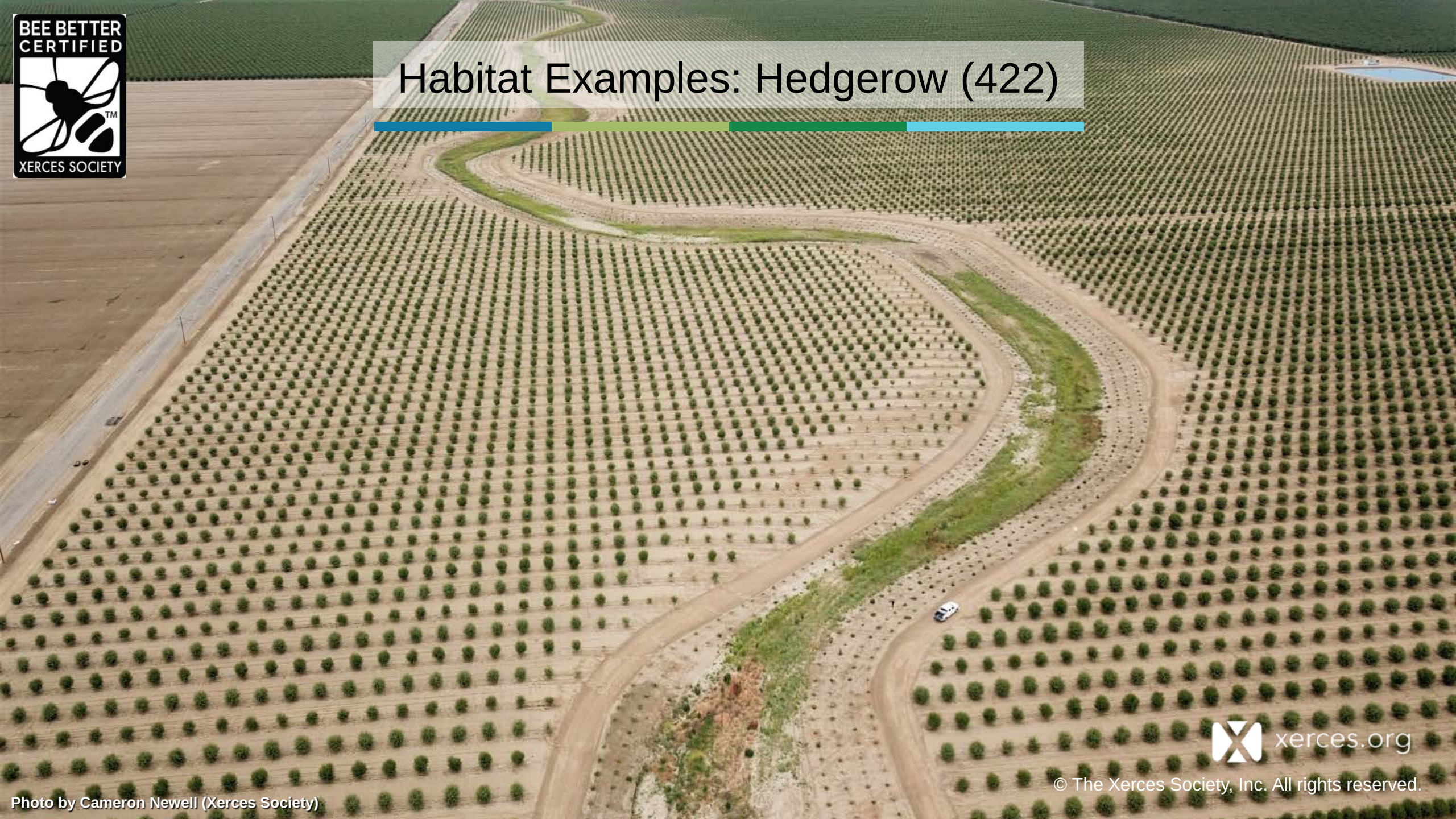

Photo by Cameron Newell (Xerces Society)

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Habitat Examples: Hedgerow (422)

Photo by Nancy Adamson (Xerces Society)

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Habitat Examples: Hedgerow (422)

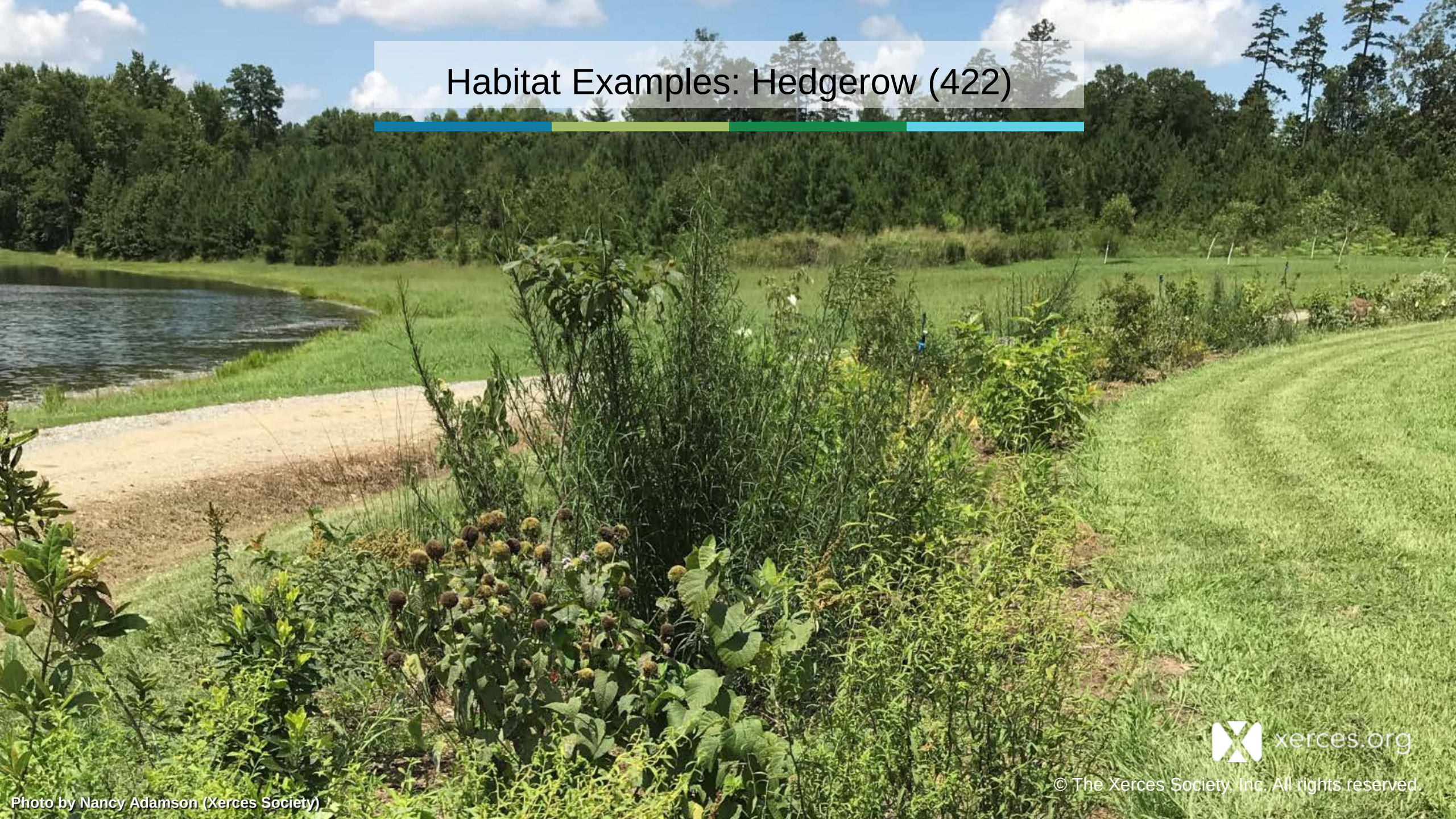

Photo by Nancy Adamson (Xerces Society)

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Riparian Cover (390, 391, or 580)

Photo: USDA

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Riparian Cover (390, 391, or 580)

Male willow plants!

Photo: USDA, Nancy Lee Adamson (inset photosof willow)

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Riparian Areas

Photos: Xerces Society / Mace Vaughan

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Habitat Example: Wetlands

Photo by Jessa Kay Cruz

Seasonal Wetland

Shoshone, ID

- Organic Farm
- Planted with grasses and showy milkweed

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Habitat Example: Wetlands

Opportunities in the surrounding uplands as well as the wetlands themselves

- Often helps with late bloom!

Photos: Matthew Shepherd, Xerces Society; Mace Vaughan, Xerces Society (inset)

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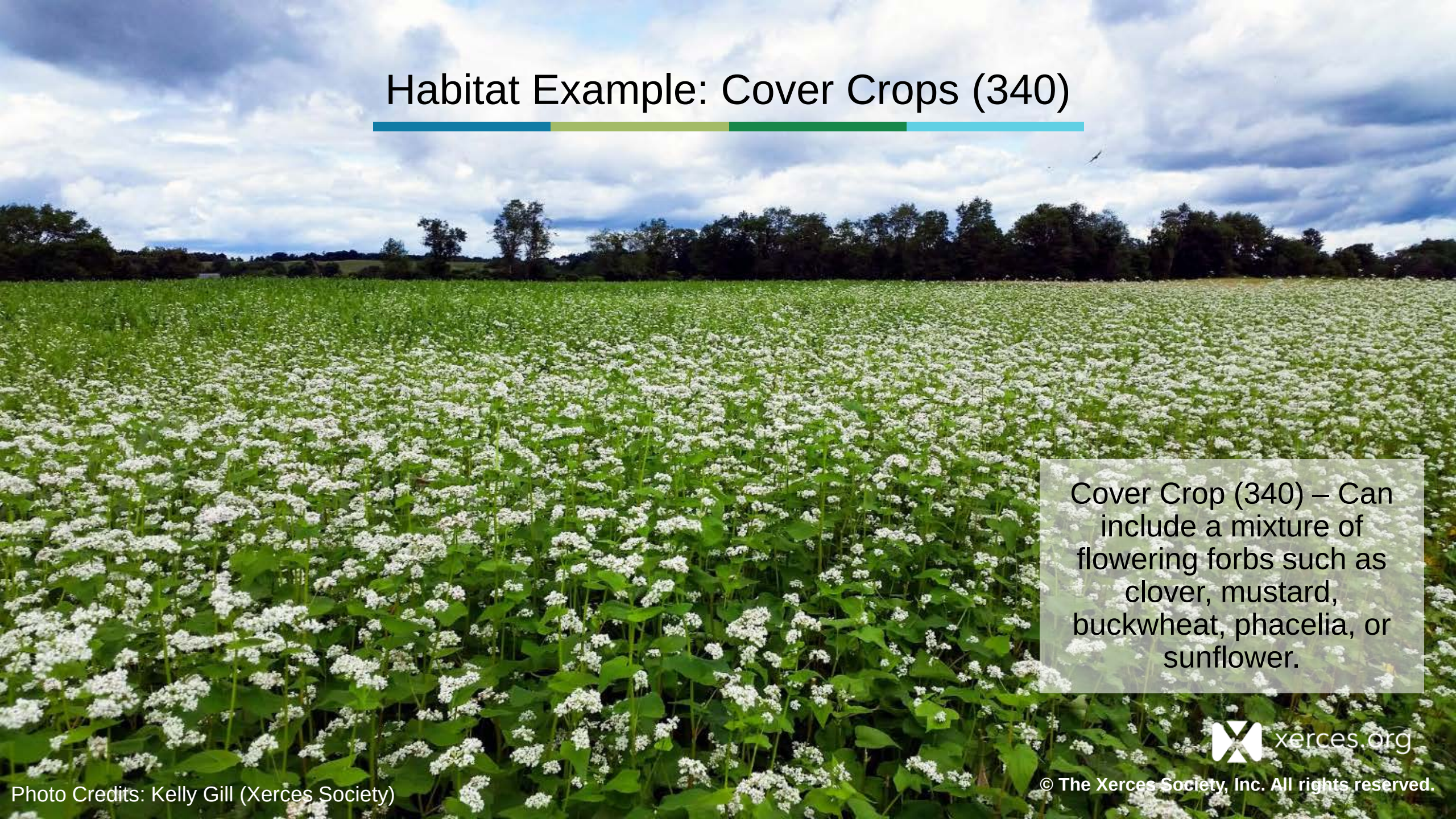
Habitat Example: Cover Crops (340)



Cover Crop (340) – Can include a mixture of flowering forbs such as clover, mustard, buckwheat, phacelia, or sunflower.

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Photo Credits: Kelly Gill (Xerces Society)

Habitat Example: Cover Crops (340)


Opportunities in Agriculture

CONTENTS

Cover Cropping for Pollinators and Beneficial Insects

SARE Sustainable Agriculture Research & Education

Clover cover crop under young orchard.

Photo courtesy of USDA Natural Resources Conservation Service. / Public Domain

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Habitat Example: Cover Crops (340)

Between row cover crop in almond orchard

Photo: Jessa Kay-Cruz (Xerces Society).

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Habitat Example: Insectary Strips

Cover Crops and Insectary Strips (NRCS: 340)

Crimson clover inter-cropping with vegetables, North Carolina

Photo: Debbie Roos (North Carolina State University)

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Habitat Example: Insectary Strips

Cover Crops and Insectary Strips (NRCS: 340)

Annual Insectary Strips

- Temporary mass wildflower plantings between row crops
- Low cost, quick-growing flowers

Photo: Jessa Cruz (Xerces Society)

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Habitat Example: Insectary Strips

Insectary Strips and harvestable flowers

Annual Insectary Strips

- Insectary plants can be used in cut flower plots

Photo: Sarah Foltz-Jordan (Xerces Society)

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Habitat Example: Alley Cropping (311)

- Diverse forbs and shrubs may be planted in rows for cut flowers, berry production, or the nursery market.
- A legume forage crop between rows will fix N and provide nectar and pollen.

Photos: Tracey Coulter, PA DCNR. Inset: Jessa Kay-Cruz (Xerces Society)

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Early Successional Habitat: Edge Feathering

Photo by Mace Vaughan (Xerces Society)

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Early Successional Habitat: "Daylight" the seed bank

Associated NRCS practices:

- 314 Brush Management
- 315 Herbaceous Weed Trmt
- 338 Prescribed Burning]*
- 409 Prescribed Forestry
- 528 Prescribed Grazing
- 643 Restoration and Management of Rare and Declining Habitats
- 647 Early Successional Habitat Development or Management
- 659 Wetland Enhancement
- 657 Wetland Restoration
- 644 Wetland Wildlife Habitat Management
- 381 Silvopasture Establishment

Carolina Bay in NC restored with thinning & burning

Photo: Nancy Lee Adamson

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Early Successional Habitat: “Daylight” the seed bank

Associated NRCS practice:
314 Brush Management

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Photo: Ray Moranz (Xerces Society)

Early Successional Habitat: “Daylight” the seed bank

Associated NRCS practice:
314 Brush Management

Oklahoma invasive eastern red cedar removal

Photo: Ray Moranz (Xerces Society)

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Habitat Examples: Silvopasture

Photo: Mack Evans

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Habitat Examples: Grazing Management (native range)

Photo: Anne Stine (Xerces Society)

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Habitat Examples: Grazing Management (pasture)

Photo: Thelma Heidel-Baker (Xerces Society)

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Habitat Examples: Protect or Manage Quality Habitat

Photo by Mace Vaughan (Xerces Society)

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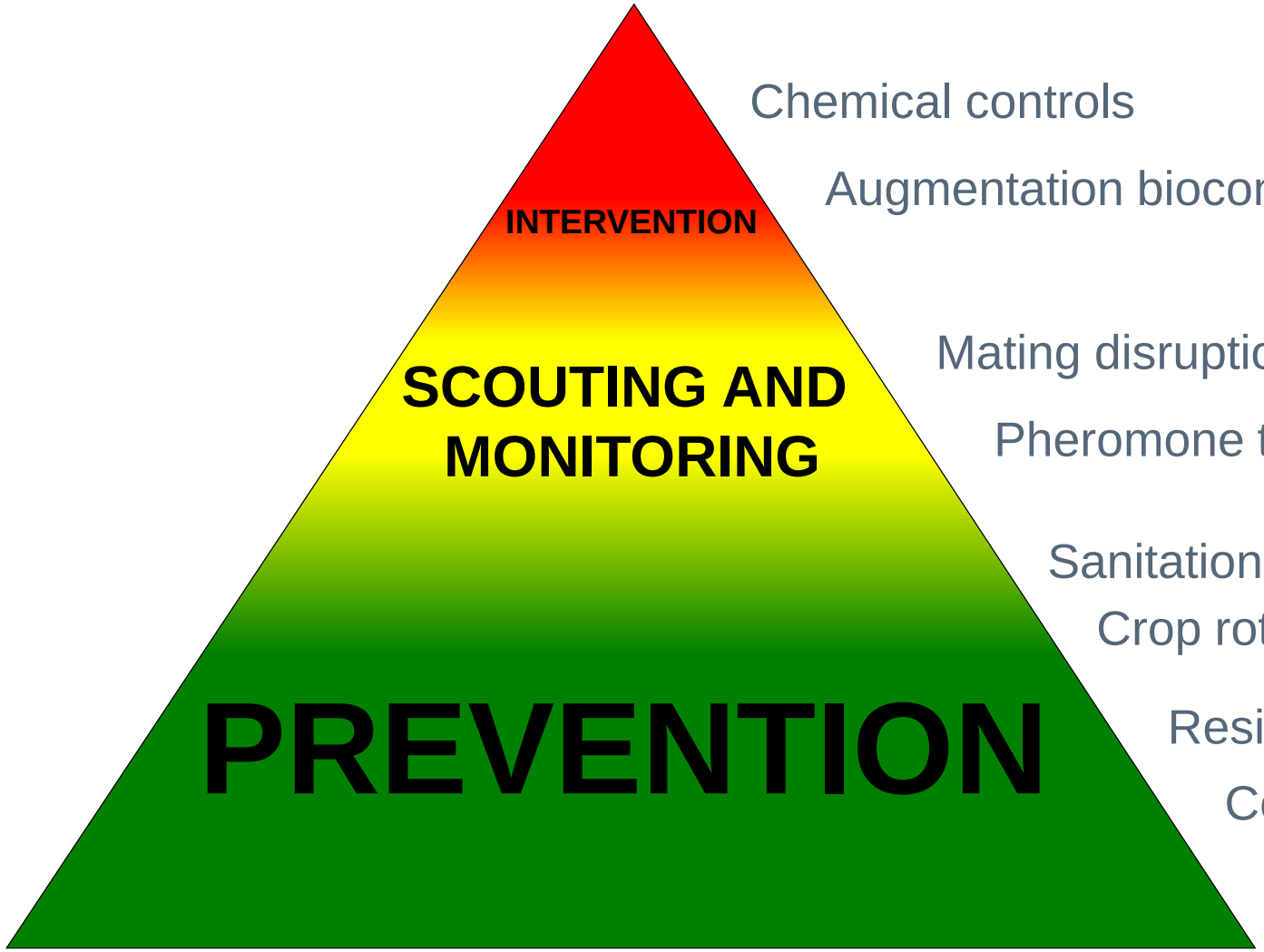
Integrated Pest and Pollinator Management (IPPM via 595)



Chemical controls

Augmentation biocontrol

Mating disruption

Pheromone traps

Sanitation

Crop rotation

Resistant varieties

Conservation biocontrol

Optimum plant health

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Managing Pesticide Risks: Protect Habitat Areas

Establish buffers or setbacks

- Unsprayed area (30’ to 60’)

Pesticide drift barriers

- ‘Non-habitat’ vegetative barriers (eg. conifers; dwarf Italian cypress)

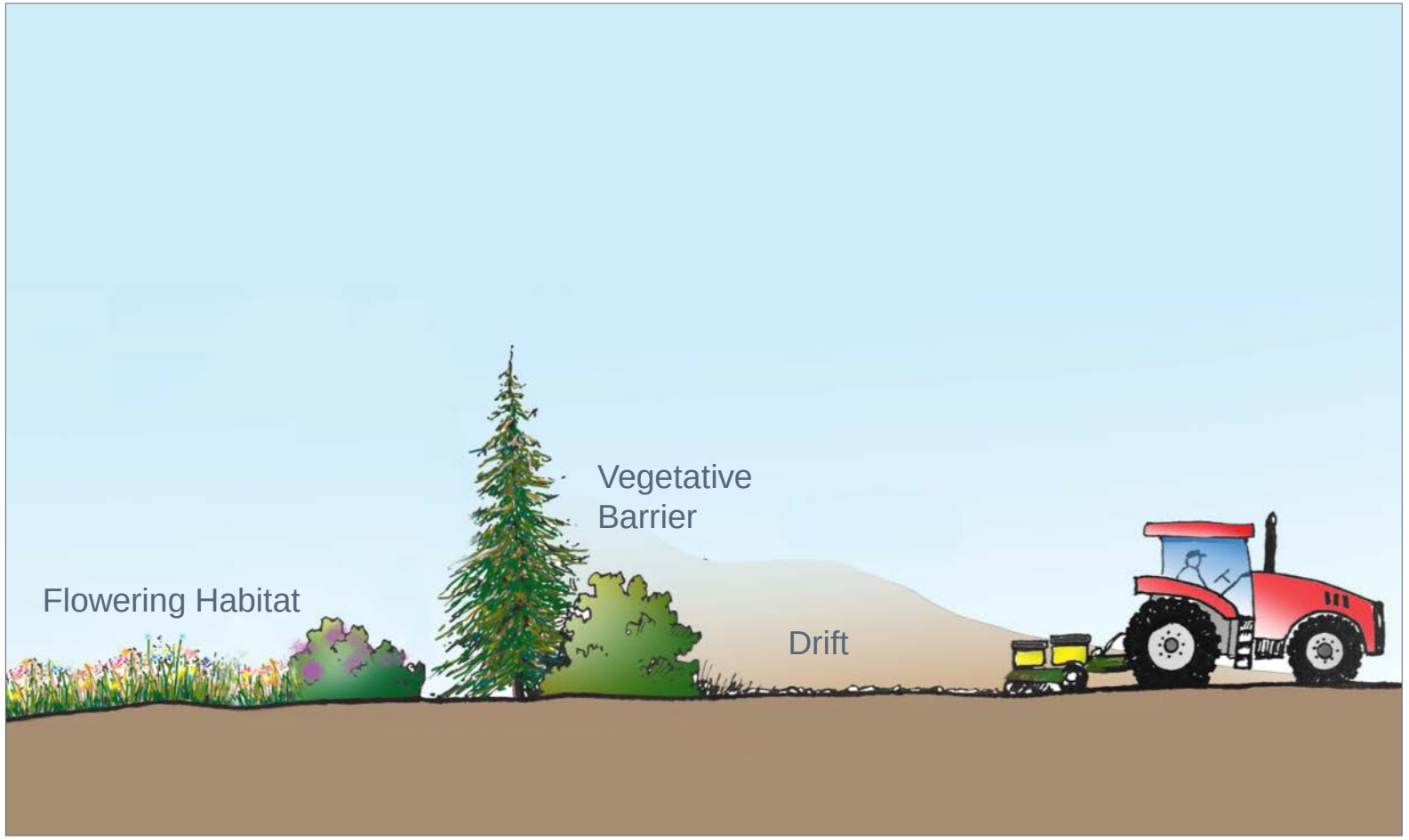

Illustration: USDA National Agroforestry Center

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Habitat Examples: Protect Quality Habitat

Adamson et al. 2012 . Windbreaks designed with pollinators in mind. Inside Agroforestry 20(1): 8-10. Available at: http://nac.unl.edu/documents/insideagroforestry/vol20issue1.pdf

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Photo by Kelly Gill (Xerces Society)

Habitat Examples: Protect Quality Habitat

Adamson et al. 2012 . Windbreaks designed with pollinators in mind. Inside Agroforestry 20(1): 8-10. Available at: http://nac.unl.edu/documents/insideagroforestry/vol20issue1.pdf

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Photo by Sarah Foltz Jordan (Xerces Society)

Habitat Examples: Manage Existing Habitat

Photos: Chris Helzer, Tim Dickson, Dave Williams, Jennifer Hopwood

Manage natural areas with pollinators in mind

- Remove invasive species
- Provide intermediate disturbance (fire, grazing, haying), balancing timing and scale with needs of the plant community and pollinators present

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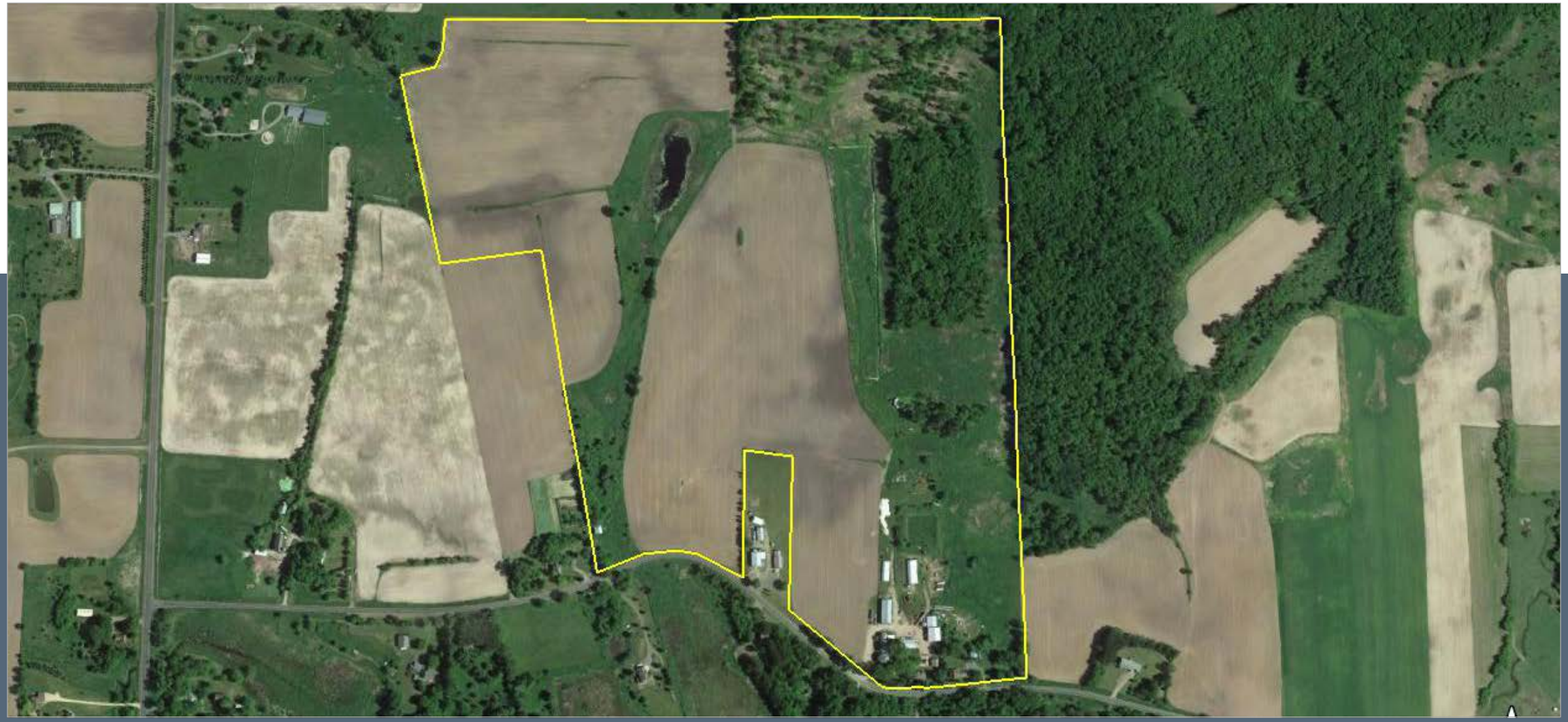
Many Habitat Options in the Farm Landscape



What did I forget?

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Resources

Photo: Rich Hatfield (Xerces Society)

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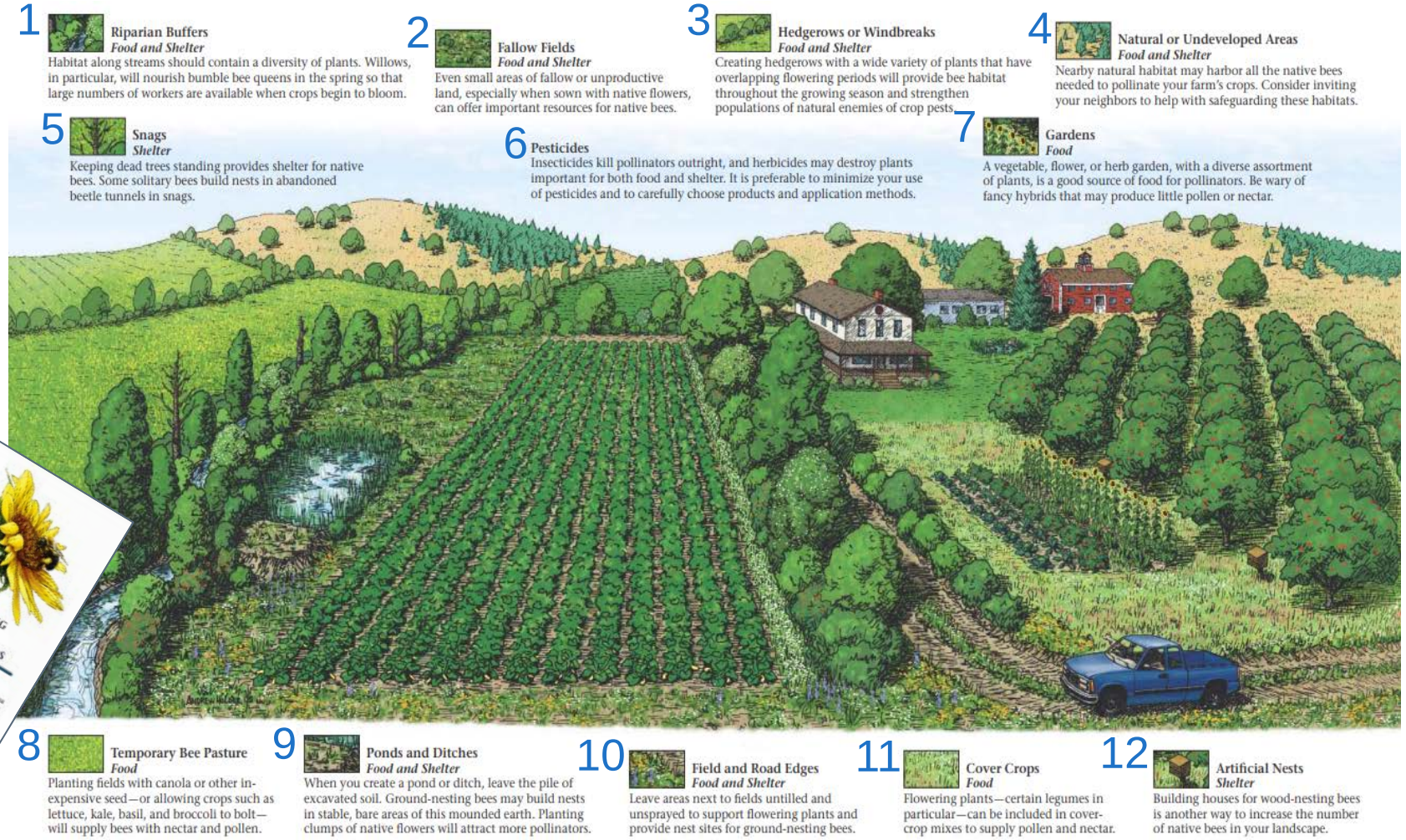
Farming for Pollinators (leaflet)

1. Riparian buffers
2. Fallow fields
3. Hedgerows/windbreaks
4. Natural/undeveloped areas
5. Snags
6. Protection from pesticides
7. Gardens
8. Temporary bee pasture
9. Ponds/ditches
10. Field & road edge
11. Cover crops
12. Artificial nests



https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_042805.pdf

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Artwork: Andrew Holder, Xerces Society

Additional Resources: The USDA-NRCS

Natural Resources Conservation Service

- Technical Assistance
- Financial Support for Conservation

Find out more at:

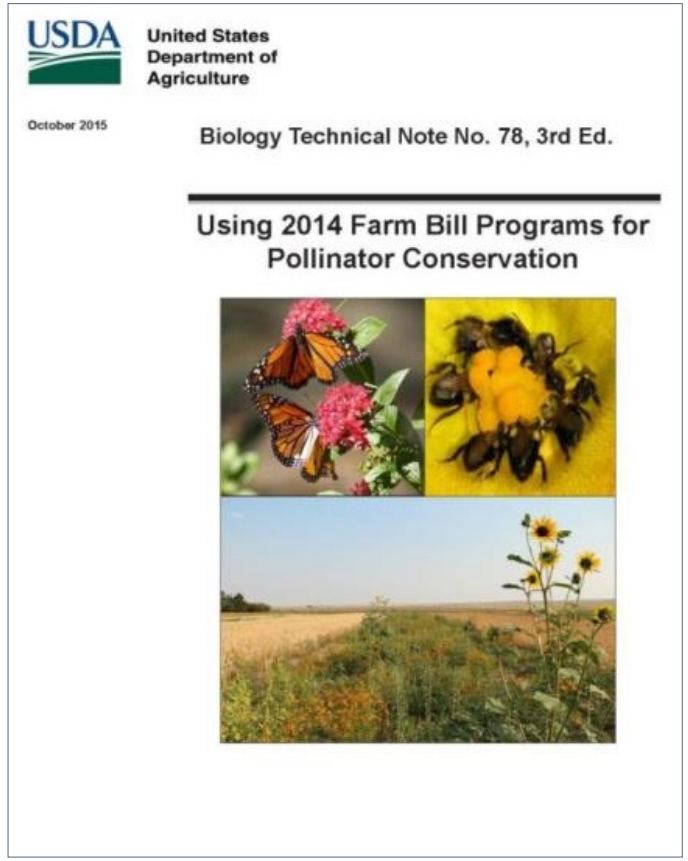
www.nrcs.usda.gov

http://plants.usda.gov/

//plants.usda.gov/pollinators/ NRCSdocuments.html

United States Department of Agriculture NRCS Natural Resources Conservation Service

- **Core Programs for Pollinators**
  - EQIP, CSP, ACEP, CRP
- **Tech Note 78**
  - Using Farm Bill Programs for Pollinator Conservation
- **Practices for Pollinators**
  - Wildlife Habitat Planting
  - Conservation Cover
  - Hedgerow Planting
  - Tree/Shrub Establishment
  - Cover Cropping
  - Forest stand improvement
  - Prescribed burning
  - Prescribed grazing
  - Early Successional Habitat Development/ Management
  - And many more…



http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=37370.wba

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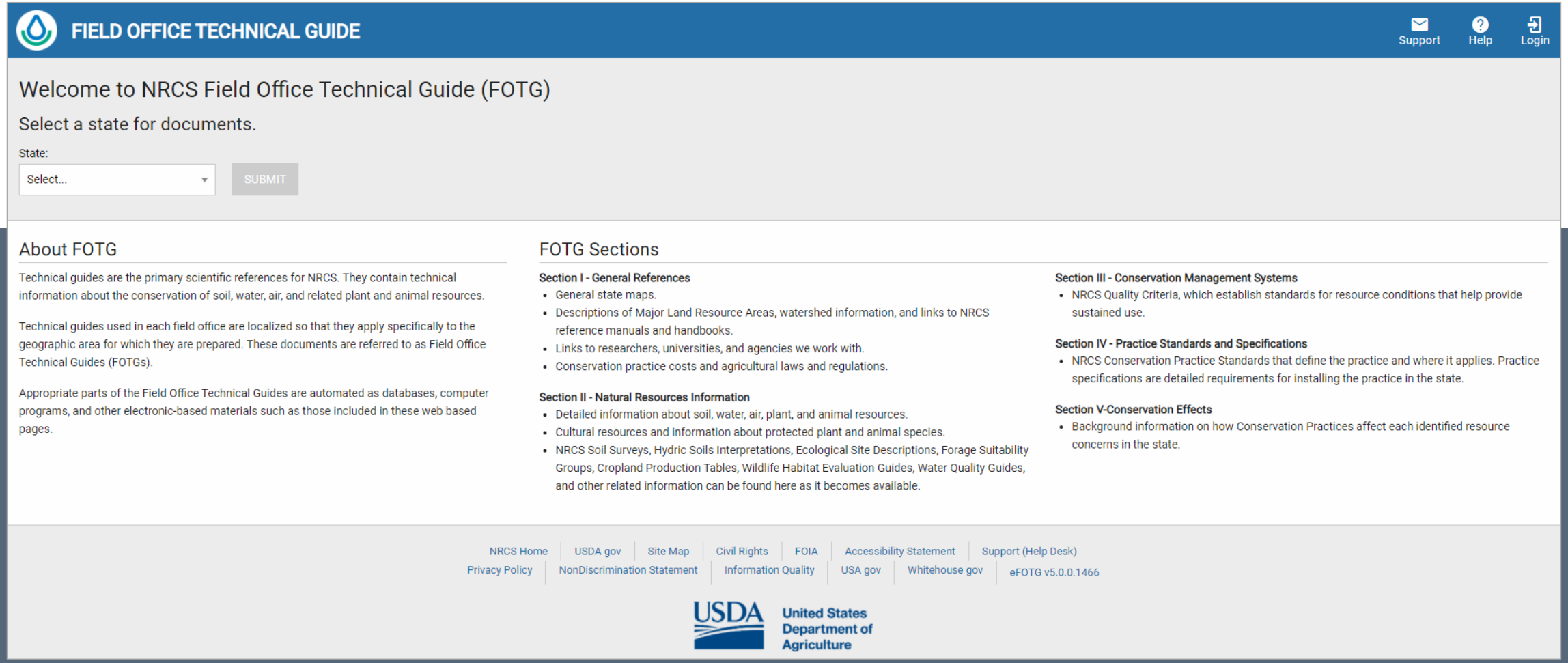
Additional Resources: The USDA-NRCS



Field Office Technical Guide (https://efotg.sc.egov.usda.gov/#/**)**

- Select your state and keyword search for pollinators, monarchs, etc.

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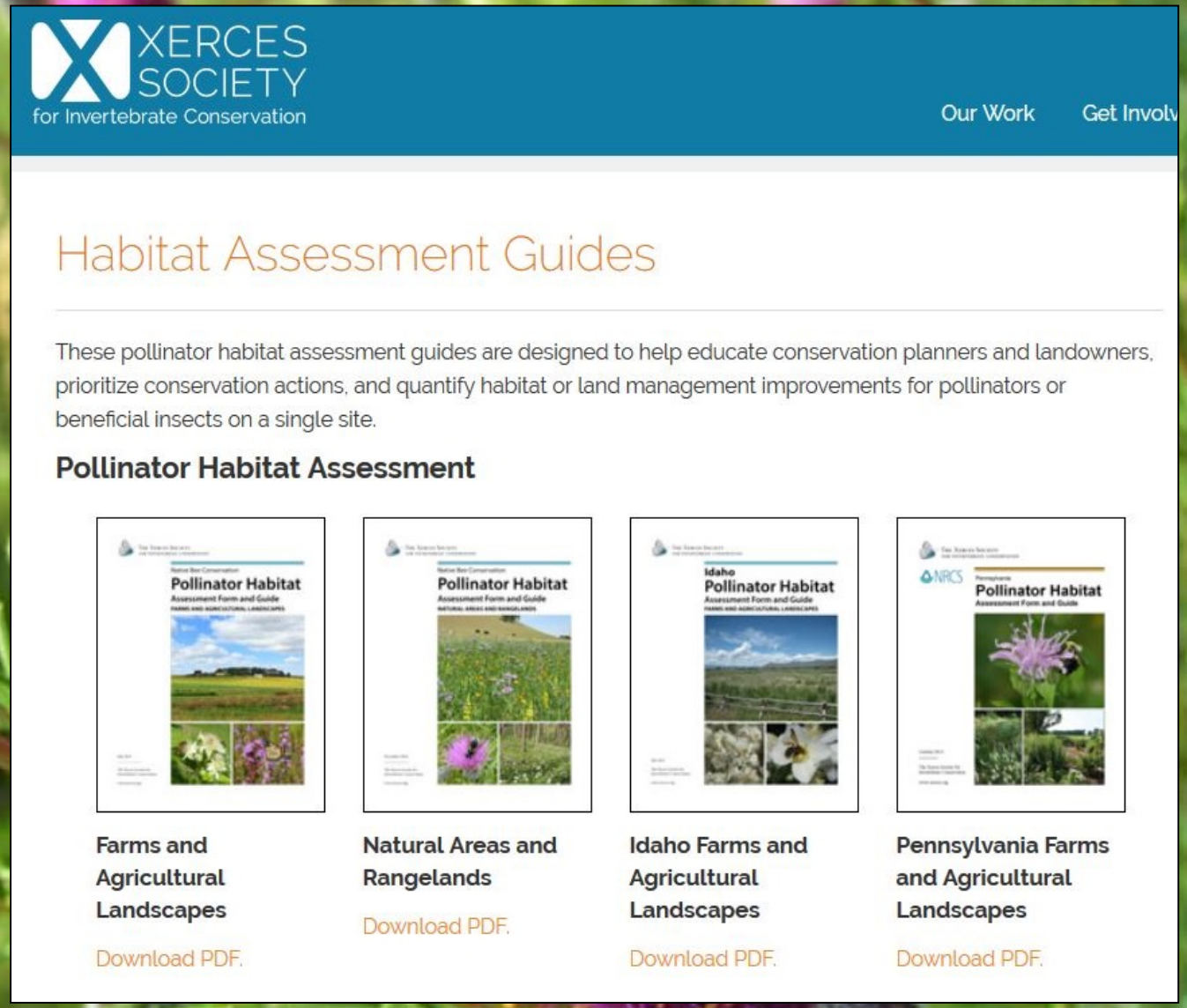
Habitat Assessment Guides



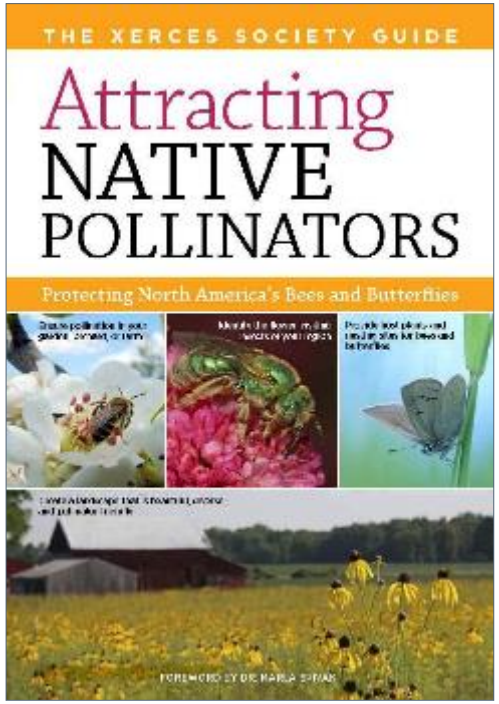
http://www.xerces.org/pollinator-conservation/habitat-assessment-guides/

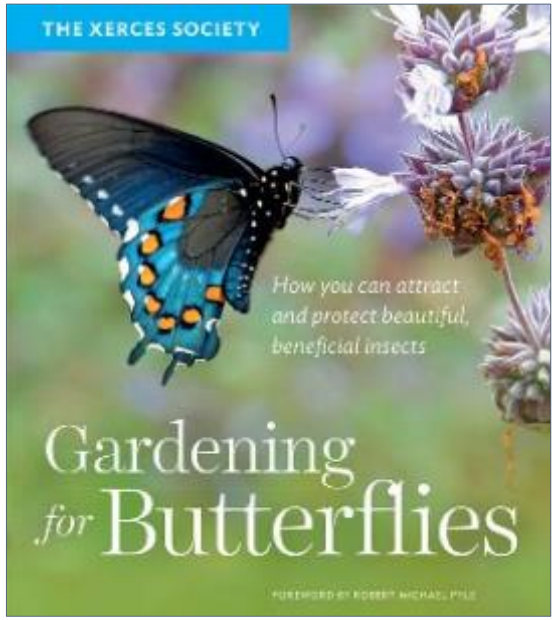
Photo: Pheasant Branch Conservancy

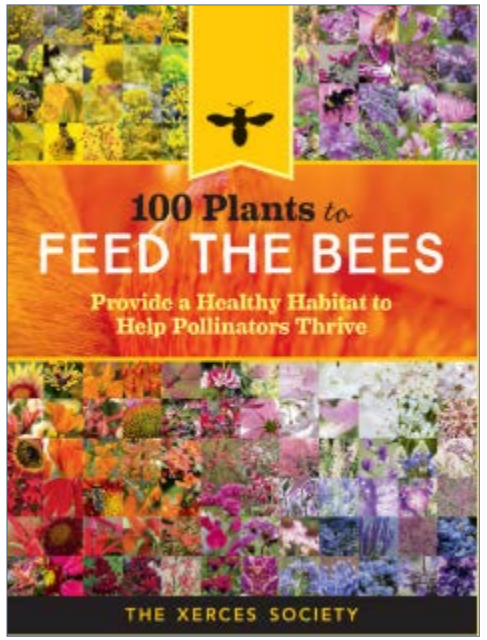
The Xerces Society: Resources

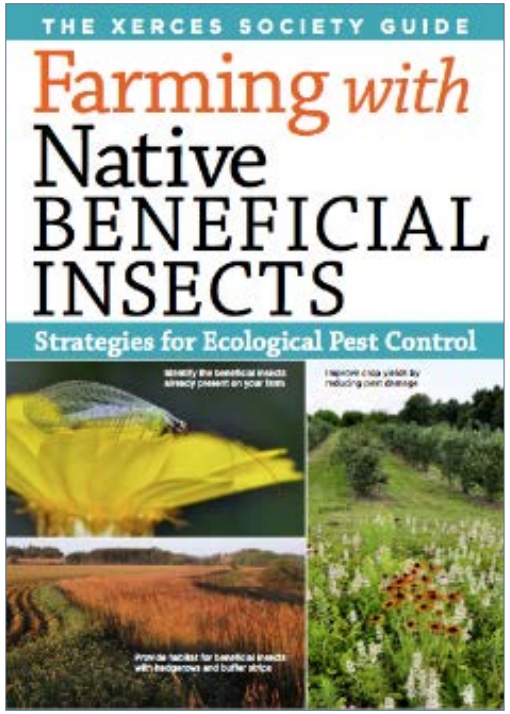
Guidance for planting and maintaining pollinator habitat

Xerces Society Books









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tortoise beetle, *Delovala guttata*, on man of the earth (aka wild sweet potato), *Ipomoea pandurata*, a native morning glory

Photo: Nancy Lee Adamson

Questions? Thoughts?

We'd love to hear from you!

NRCS policy & program related questions

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Photo: Christine Taliga

Roadsides

- Corridors and connectivity
- Narrower mowed strips, higher mowing, less-frequent mowing
- Beautification
- Climate change adaptation
- Identify and protect quality habitat areas

Photos: Xerces Society / Matthew Shepherd (left) and Washington DOT (right)

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Utility Rights of Ways

- Connectivity and corridors
- Plants of low stature to avoid growing up into lines: grasses, wildflowers, and shrubs
- Allow for overgrown areas and reduced disturbance for duff buildup
- Forest/wood edges as valuable nesting areas

Photo: Xerces Society / Matthew Shepherd

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Photos: Xerces Society / Matthew Shepherd

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Bioswales and Catchments

- Many native plants grow well in swales (e.g. spirea, rose, ninebark, cascara, milkweed, etc.)
- City planners could mandate use of well-adapted native plants that benefit pollinators
- Milkweed thrives in these habitats

Photo: Xerces Society / Brianna Borders

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