Welcome

Photo: Matthew Shepherd

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Gardening to Support Pollinators and Soil Health

Matthew Shepherd

Director of Outreach & Education
The Xerces Society for Invertebrate Conservation

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The Xerces Society

The Xerces Society for Invertebrate Conservation protects the natural world through the conservation of invertebrates and their habitats

Named for the Xerces blue butterfly

Last seen flying in 1943

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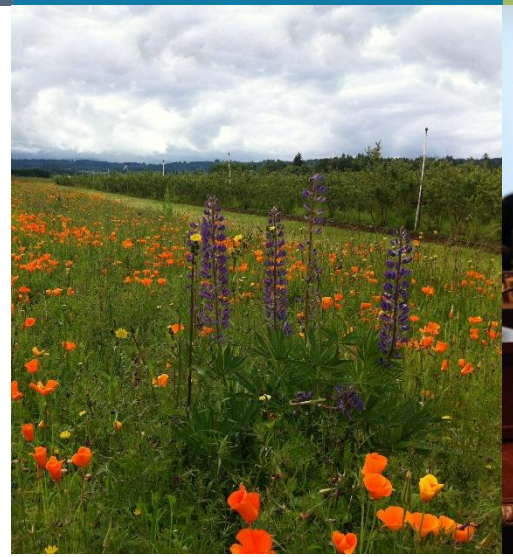
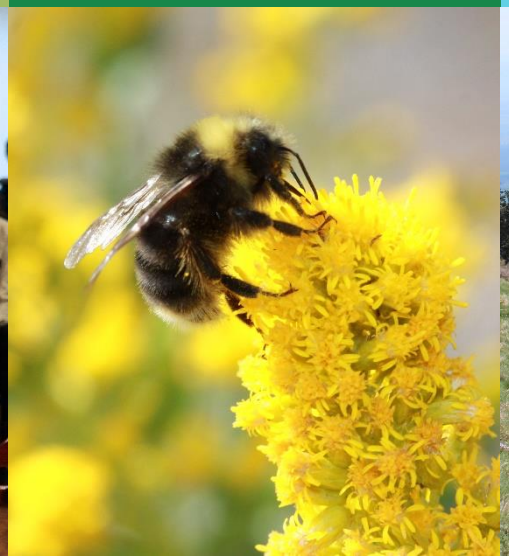
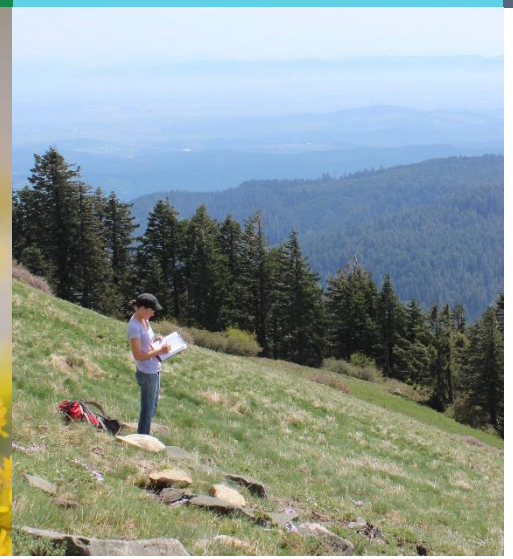
Protecting the Life That Sustains Us

Habitat Creation	Pesticide Reduction	Species Protection	Research



Photos: Xerces Society

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Thank You to Our Partners and Collaborators

- Xerces Society members and individual donors
- Private foundations and business partners who support our work
- Ambassador outreach volunteers
- Community science volunteers
- Bee City USA & Bee Campus USA affiliates
- Scientists at universities around the world
- Federal, state, and local agencies, farmers, neighborhood groups, and many others
- People who act to protect invertebrates in their neighborhoods

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Photo: Clay Bolt

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Pollinator Diversity

Photo: Mace Vaughan

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Bees are the Most Important

Three distinct behaviors:

- Collect and transport pollen
- Forage in area around nest
- Exhibit flower constancy

Photo: Mace Vaughan

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Honey Bees are Not Typical Bees

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

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Honey bees

European honey bee is hugely important for crop pollination

Beekeeping industry is afflicted by diseases, pests, insecticides, nutrition, and low honey prices

Honey bees are not endangered

- 2.92 million hives in US in April 2022

Photo: Xerces Society / Matthew Shepherd

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Bee Diversity

Photos: Xerces Society / Mace Vaughan [2]; Xerces Society / Matthew Shepherd [2]; Rollin Coville [3]; Sara Morris

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Bee Diversity

Photos: Rollin Coville [6]; Mace Vaughan; Matthew Shepherd

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Number of Species of Bees

USA	Oregon	Portland	In a single garden
> 3,600	650 (800?)	100–150?	30–40 (80?)

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Natural History

Photo: Rollin Coville

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Life Cycle

Up to a year to develop before emerging to spend a few weeks as an adult.

Mining bee

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Photos: Xerces Society/Mace Vaughan; Dennis Briggs (3); Robbin Thorp.

Bees Need Flowers

- Drink nectar from any accessible flower
- May be more particular about where they collect pollen
- Native plants are better for native bees

Photo: Matthew Shepherd

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Bees Need Access to Soil

Roughly 70% of native bee species are ground-nesting

- Resemble ant-nests from above ground
- Conserve sandy soil, bare ground

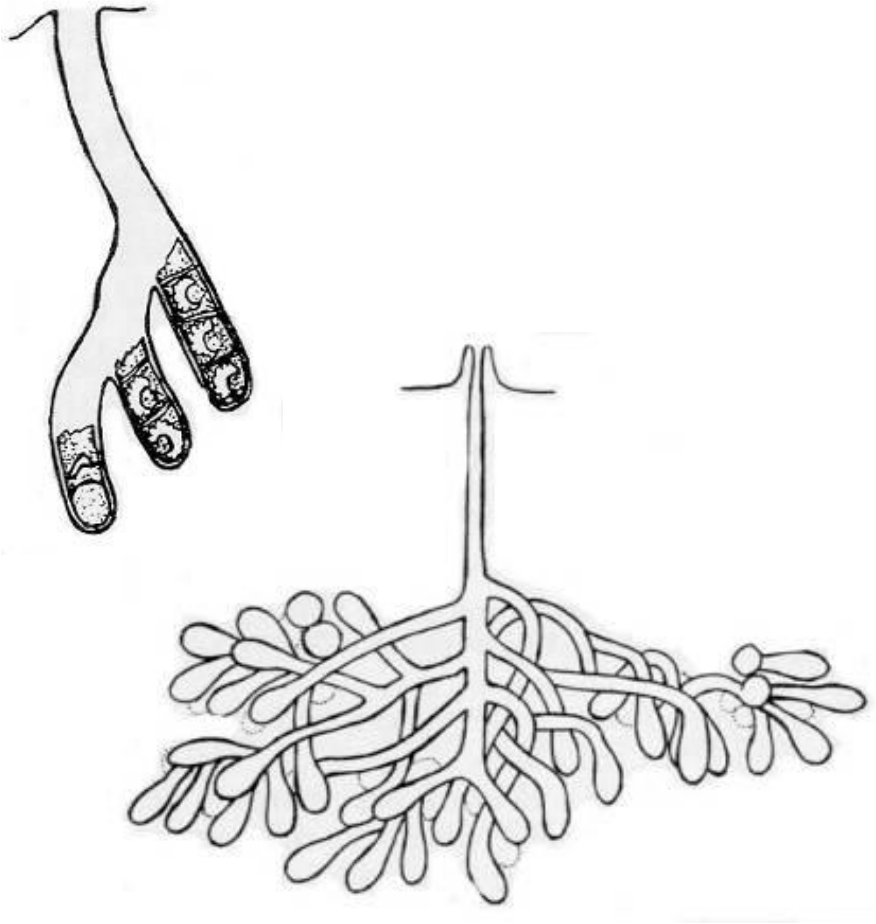

Photo: Xerces Society/Matthew Shepherd.
Drawings from Stephen, Bohart, and Torchio, 1967

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Bees Need Dead Trees, Branches, and Stems

Roughly 30% of native bee species are tunnel-nesting

- Keep dead trees
- Don’t trim all dead twigs and branches
- Retain plant stems through winter

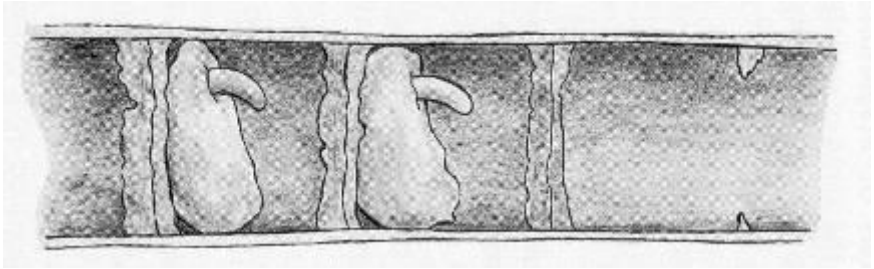

Photo: Xerces Society/Matthew Shepherd.
Drawings from Stephen, Bohart, and Torchio, 1967

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Bees Need Nest Materials

Some species collect leaf pieces, resin, soil, etc. for constructing nest cells

Photo: Clay Bolt

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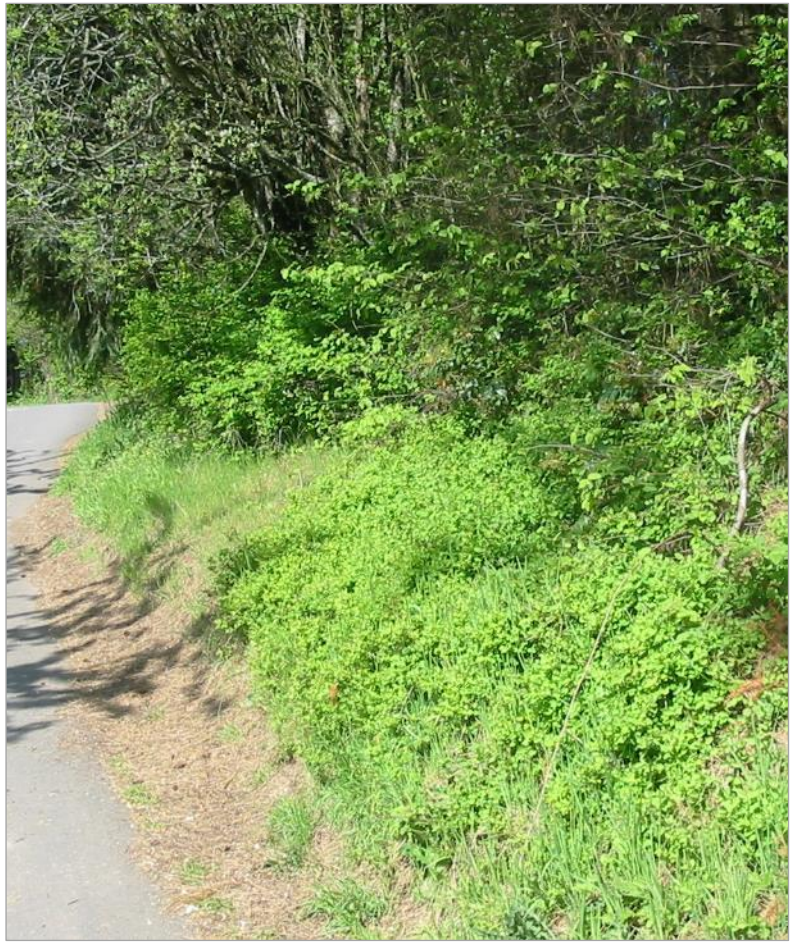
Bees Need Untidy Areas

Bumble bees nest in existing cavities such as old rodent holes

- Don’t tidy all areas
- Have long grass and overgrown places

These places can also provide winter shelter for butterflies



Photos: Matthew Shepherd; Bonnie Carruthers

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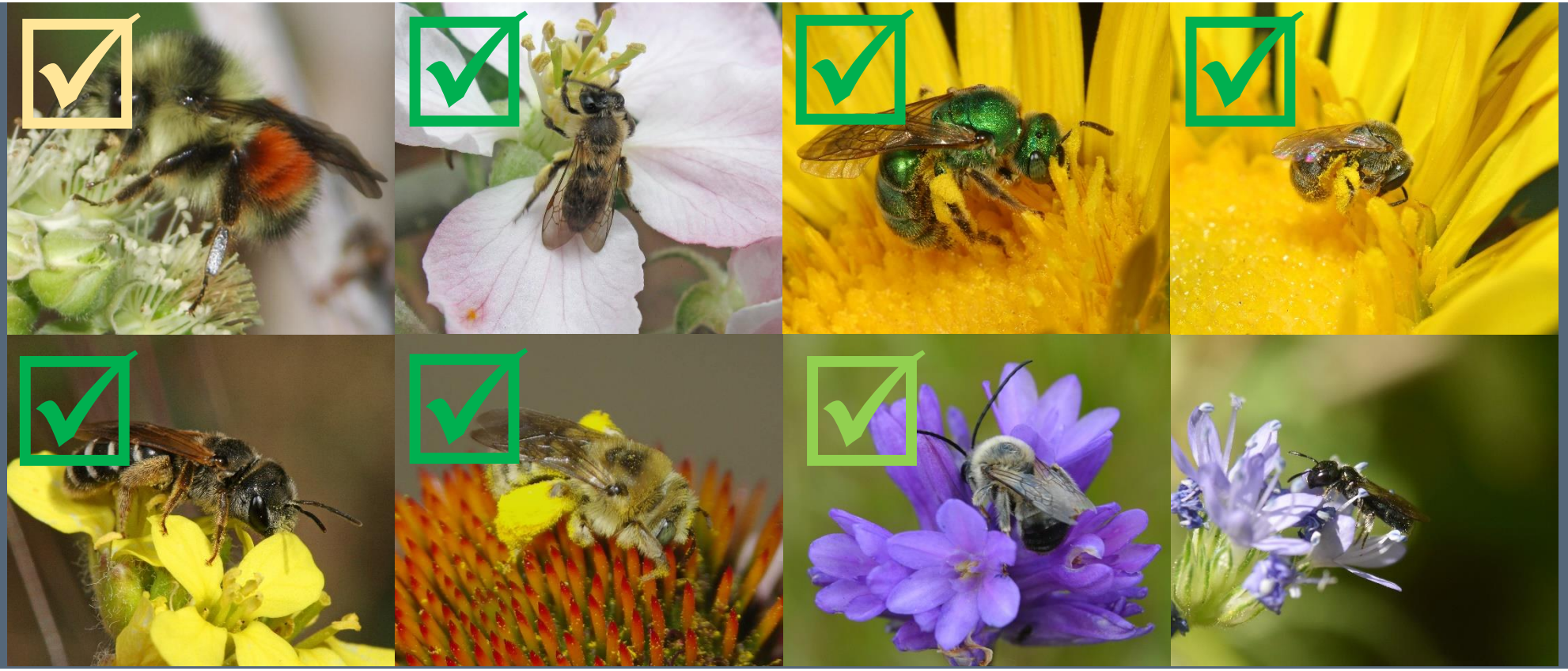
Ground-Nesting Bees



Photos: Xerces Society / Mace Vaughan [2]; Xerces Society / Matthew Shepherd [2]; Rollin Coville [3]; Sara Morris

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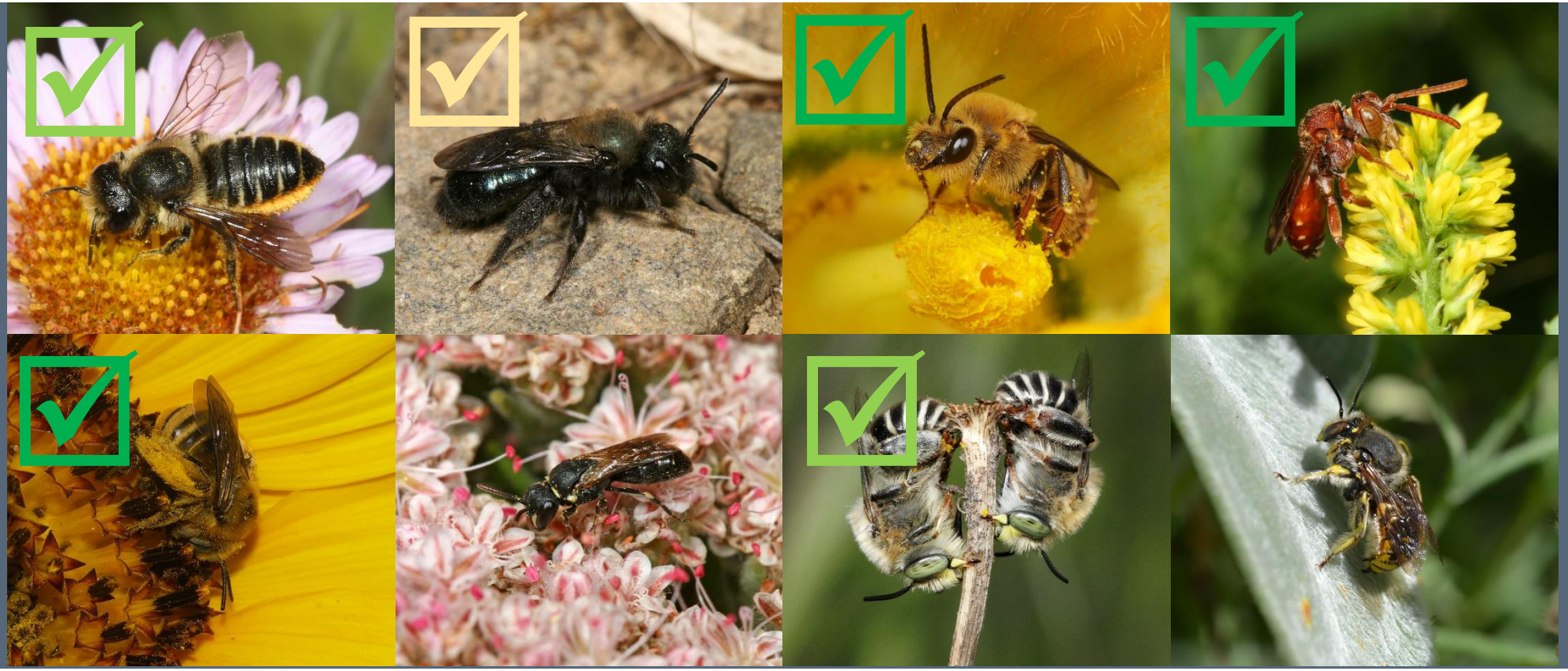
Ground-Nesting Bees



Photos: Rollin Coville [6]; Mace Vaughan; Matthew Shepherd

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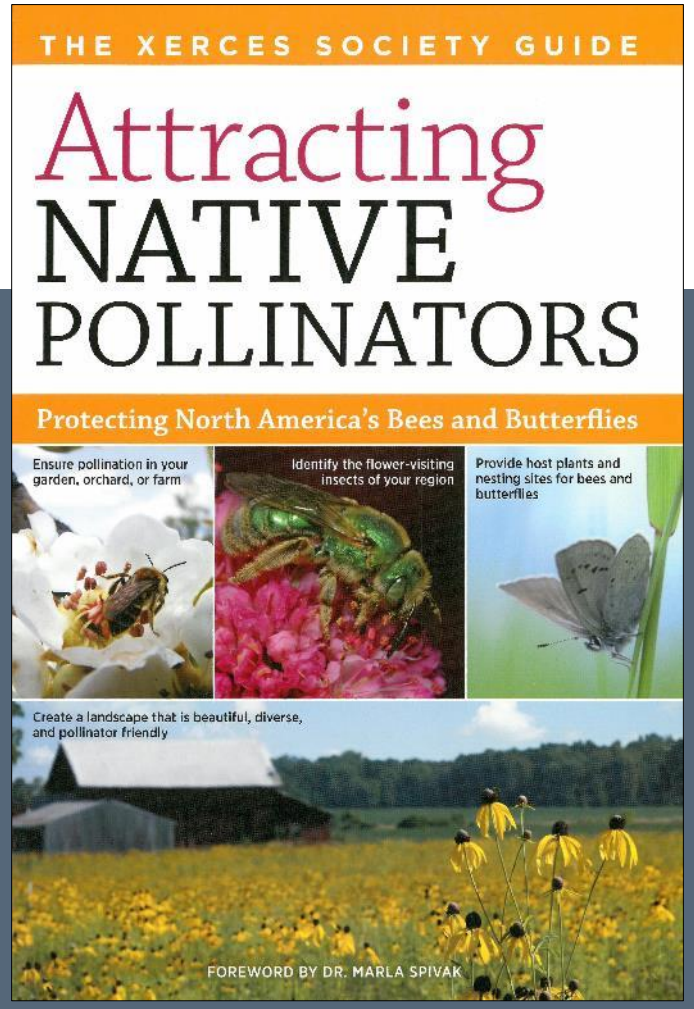
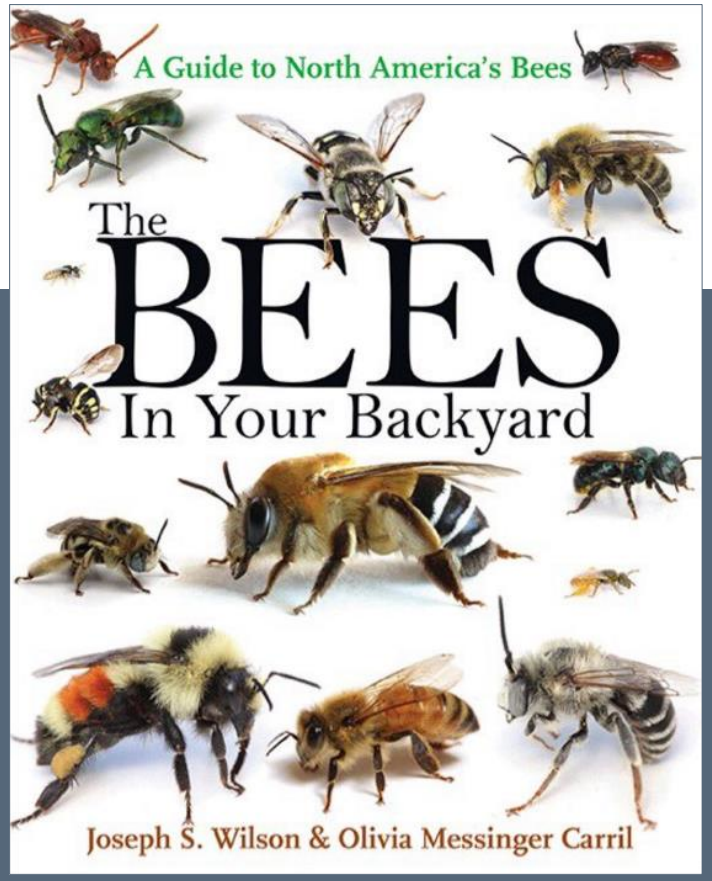
Books to Help You Understand Bees





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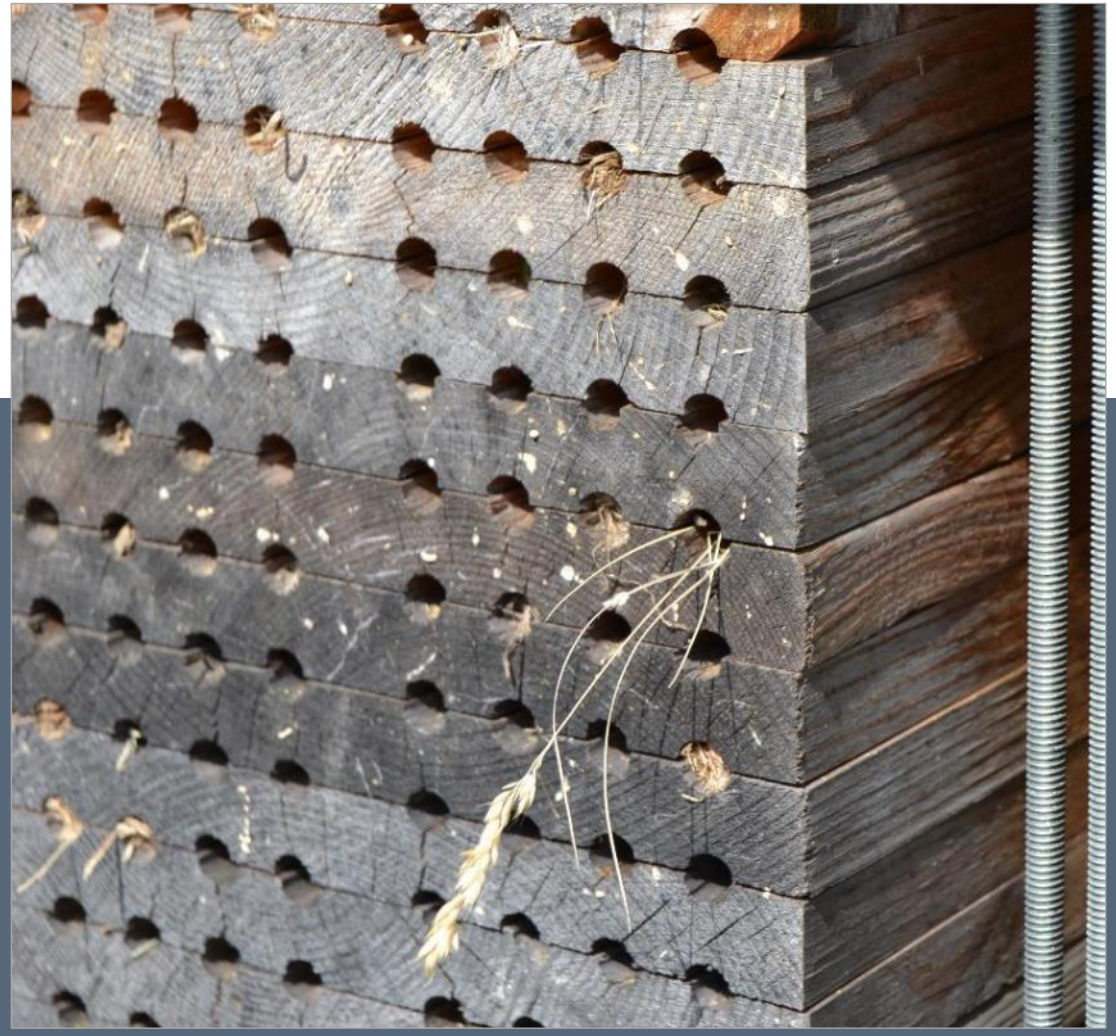
Wasps, too!



Photos: Matthew Shepherd

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Bee Conservation and Soils

Photo: Matthew Shepherd

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Photo: Matthew Shepherd

Bee Conservation

Provide habitat to support the entire life cycle

Bees need:

- Flowers for foraging
- Secure nest sites & shelter
- Pesticide-free environment

Protect existing areas, create new ones

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Photo: Matthew Shepherd

Bee Conservation

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Bees need:

- Flowers for foraging
- **Secure nest sites & shelter**
- Pesticide-free environment

Protect existing areas, create new ones

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Unnatural Areas

Piecemeal habitats in developed areas

Photos: Matthew Shepherd

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Bee’s-eye View of a Neighborhood

Graphic: Xerces Society / Sara Morris

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Provide Nesting Sites & Shelter

Photo: Sara Morris

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Photos: Xerces Society/Matthew Shepherd

Bee Nest Sites

Retain Natural or Existing Sites

Snags

Shrubs with hollow stems

Bare ground

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Bees Dig

- Nest entrances often marked by excavated soil
- Some species construct turrets

Photos: Xerces Society / Hillary Sardinas; Eric Lee-Mader

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Bees Dig

- Tumuli around nest entrances show much soil is dug out

Photos: Matthew Shepherd

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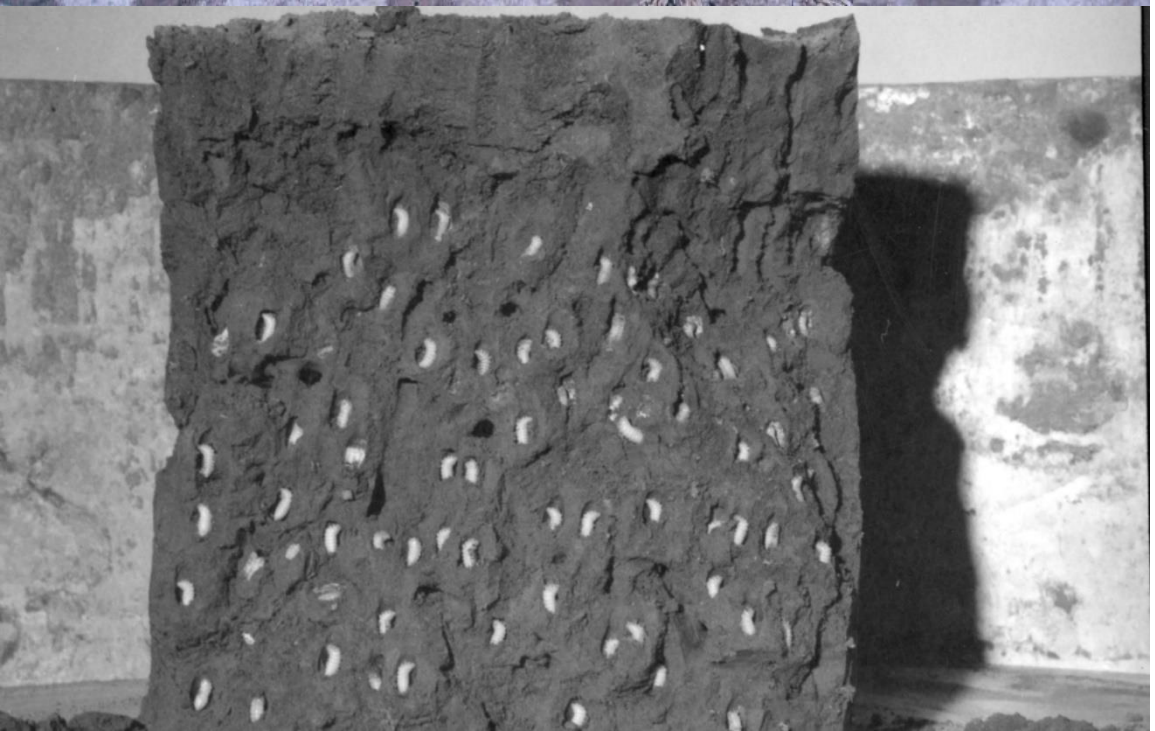

Density of Bee Nests

- 20–30 nest entrances per square foot
- 100+ brood cells per cubic foot

Photos: James Cane, USAD-ARS

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Photo: Matthew Shepherd

Ground Nests

- More species nest in sandy or loamy soils
- Bees will adapt to local soils

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Photo: Matthew Shepherd

Ground Nests

- Bare ground doesn’t need to be a large area

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Nest Blocks

Tunnel nests work!

Photos: Mace Vaughan; Matthew Shepherd

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Nesting & Overwintering Habitat

FOR POLLINATORS & OTHER BENEFICIAL INSECTS

FIGURE 1: By selecting native plants and managing habitat purposefully, even small wildflower plots (left) can provide high-quality overwintering habitat for pollinators and beneficial insects, like these small carpenter bees hibernating in a pithy stem (right).

Moving Beyond Flowers

While flowering plants provide pollinators with food, insects also require suitable shelter for nesting and overwintering. Most bees and wasps create small nests beneath the soil or within dead plant stems or cavities in wood. Other beneficial insects such as butterflies, wasps, moths, fireflies, lady beetles, and ground beetles seek shelter in places that offer protection from predators and the elements, such as leaf litter and brush piles.

The More, The Better

The primary habitat features used by pollinators and other insects for shelter include stems and branches of trees, shrubs, and wildflowers; leaf litter; undisturbed ground; bare ground; dead wood; brush piles; and rock piles. Retaining and incorporating as many of these features as possible into your landscape (rather than "cleaning" them away) will help attract and support a diversity of bees and other beneficial insects.

Why Natural Is Best

The availability of nesting and overwintering habitat is one of the most important factors influencing populations of native bees and other beneficial insects. Yet, traditional landscaping practices rarely leave enough natural resources to support pollinators and other wildlife. This guide focuses on a variety of natural nesting habitat features that can be readily incorporated into most landscapes. Compared to artificial nesting options such as bee blocks and bee hotels, natural nesting habitat features often better mimic the natural nest site density of insects, and also break down naturally with time, limiting disease and parasite issues. Moreover, natural nesting features often provide multiple conservation benefits. An appropriately managed wildflower planting, for example, can provide nesting sites, pollen, and nectar for bees; host plants and overwintering habitat for butterflies; and abundant food for songbirds.

Our **Bring Back the Pollinators** campaign is based on four principles:

1. Grow a variety of pollinator friendly flowers;
2. Protect and provide bee nest sites and caterpillar host plants;
3. Avoid using pesticides, especially insecticides; and
4. Spread the word!

You can participate by taking the **Pollinator Protection Pledge** and registering your habitat on our nationwide map at: www.bringbackthepollinators.org

BRING BACK THE POLLINATORS
A Xerces Society Conservation Campaign

XERCES SOCIETY
for Invertebrate Conservation

Natural Nest Sites are Better

Bee blocks, bamboo bundles, paper tubes, and so on are better than nothing

Artificial structures need maintenance to reduce spread of diseases, etc.

Providing natural nest sites is preferred option

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Save the Stems

Leave flower stalks intact over the winter

Prune to create nest sites in the early spring

Cut at a variety of heights ~8 to 24 in.

Watch for activity!

xerces.org/leave-the-leaves

(Or search for “save the stems”)

Photos: Sara Morris; Sarah Foltz Jordan

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Photo: Mathew Shepherd

Plants Used by Stem-Nesting Bees

Common Name	Plant Genus
Hyssop	*Agastache*
Purple coneflower	*Echinacea*
Sunflower	*Helianthus*
Blazing star	*Liatris*
Bee balm	*Monarda*
Goldenrod	*Solidago*
Aster	*Symphyotrichum*
Raspberry & other brambles	*Rubus*
Sumac	*Rhus*
Elderberry	*Sambucus*

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An eyesore?

Photos: Matthew Shepherd

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Photo: Matthew Shepherd

Leave the Leaves

Leaves have many benefits

Organic matter for soils

Mulch to retain moisture

Increases diversity of wildlife

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Leaves are not Litter

Shelter for overwintering bumble bee queens and woolly bear caterpillars

Photos: Ken Gibson (CC BY @.0); Steven Severinghaus, Flickr

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Life in the Leaves – Way More than Pollinators

Leaves are foundational to soil life and soil health

Photos: Katja Schulz, Flickr [2]; Brenda Dobbs, Flickr; Xerces Society / Jennifer Hopwood; Specious Reasons, Flickr; Xerces Society / Sarah Foltz Jordan; Even Dankowicz; D. Fletcher, Flickr

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Leave the Leaves

But not everywhere

Don’t block the drains

Don’t create a slip hazard

Photos: Matthew Shepherd

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Photos: Xerces Society / Kailee Slusser; Matthew Shepherd

Leave the Leaves

Keep them where you can

Tell people why

xerces.org/leave-the-leaves

(Or search for “leave the leaves”)

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Build a Stick Pile

Can be big or small

Size depends on space and materials you have

Stack up branches leaving gaps and spaces

Insects will occupy cut ends of hollow sticks and cavities in between

Chipmunks, etc. may nest, creating future bumble bee homes

Photos: Matthew Shepherd

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Photos: Matthew Shepherd; Jennifer Hopwood

Rock Piles

Include a diversity of rock types and sizes, and assemble with a "messy" configuration

Can be part of your hardscaping

Incorporate bunchgrasses, shrubs, or flowers around the pile to increase wildlife value

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Untidiness, chaos

Lazy gardening?

Thoughtful, caring gardening

Tuck cut stems into back of planting areas

Allow areas to become overgrown and untidy

Photos: Matthew Shepherd

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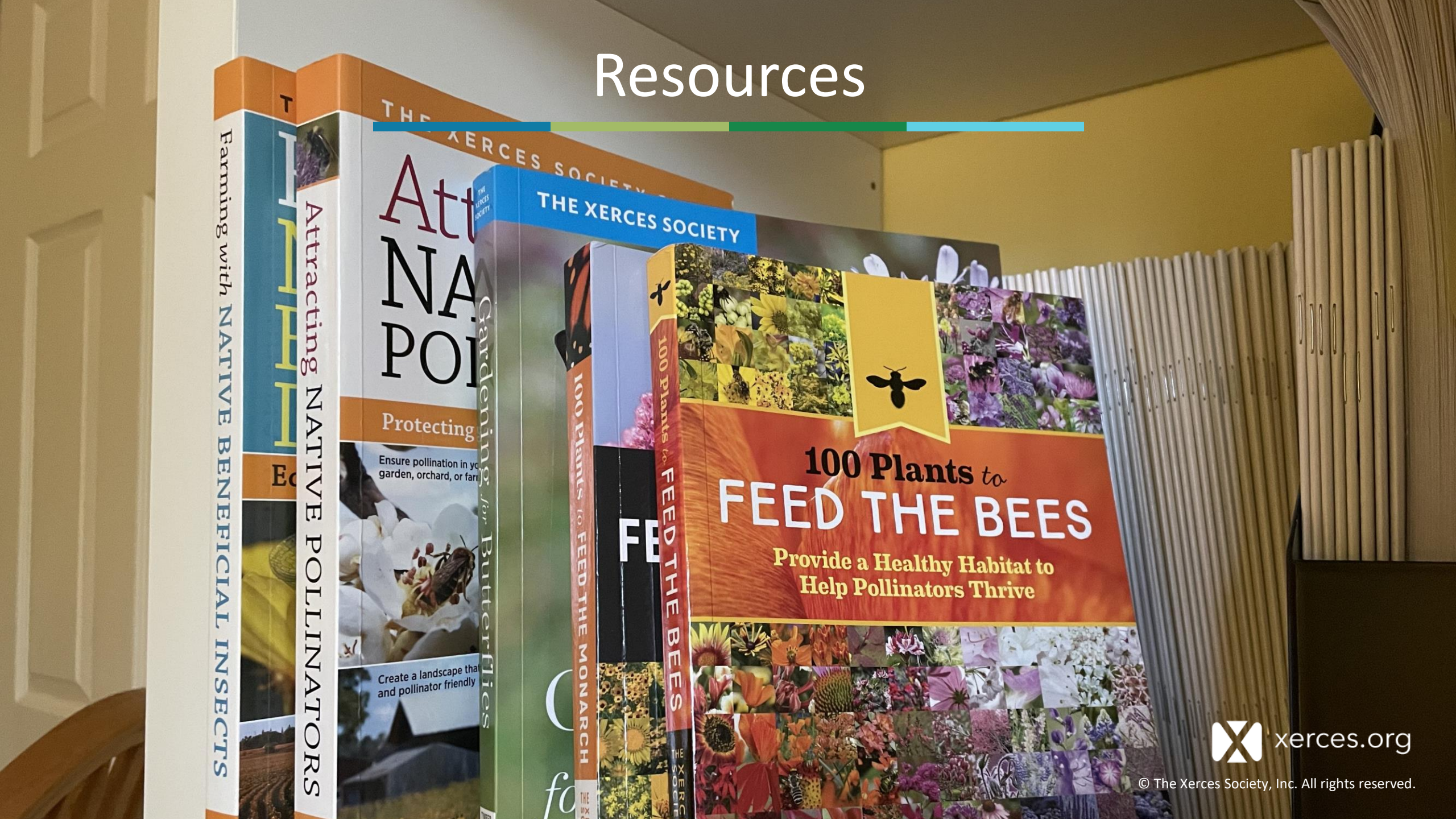
Resources



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Books by the Xerces Society

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xerces.org/bug-banter

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Photo: Matthew Shepherd

Thank you

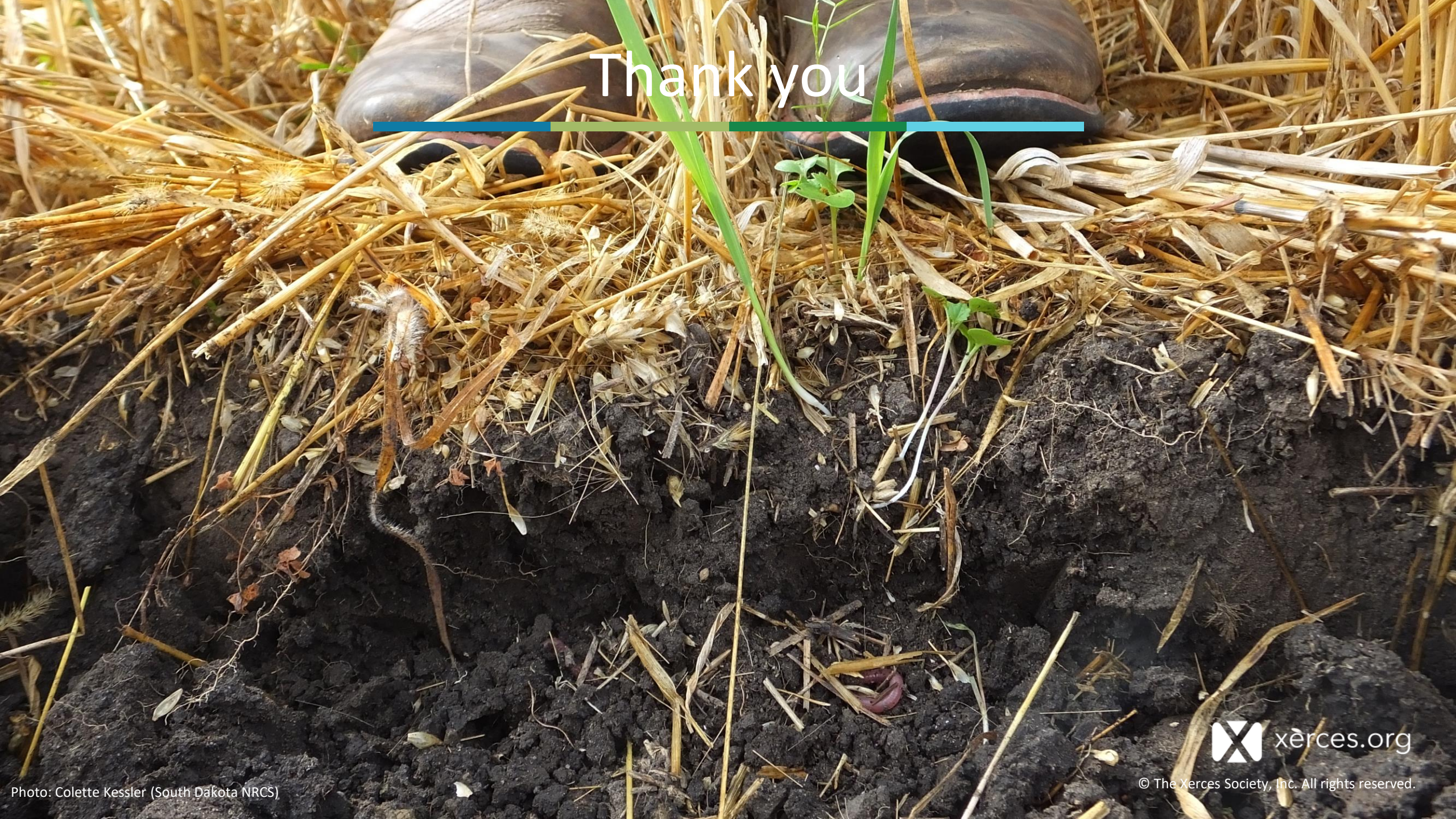

Photo: Colette Kessler (South Dakota NRCS)

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