

Inviting Pollinators into Your Garden

Presented by Kelly Gill

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East Region

Photo: The Xerces Society/Kelly Gill

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Importance of Invertebrates

Insects are the most diverse group of animals

- ~1,053,578 described species
- By abundance, there are ~1.4 billion insects per person on Earth
- Essential to biodiversity and maintaining healthy ecosystems

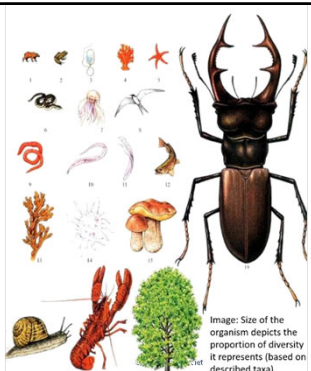



Image: Size of the organism depicts the proportion of diversity it represents (based on described taxa)

Source: Wilson 2012, UNEP Global Biodiversity Assessment 2019

About The Xerces Society

Protecting The Life That Sustains Us




Xerces blue butterfly
Glaucopsyche xerces


Photo: Ed Ross

Mission
The Xerces Society for Invertebrate Conservation is an international nonprofit organization that protects wildlife through the conservation of invertebrates and their habitats.

Our Work
The Xerces Society is a science-based conservation organization, working with diverse partners including scientists, land managers, educators, policymakers, farmers, and citizens. By using applied research, engaging in advocacy, providing educational resources, and addressing policy implications, we endeavor to make meaningful long-term conservation a reality.

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Importance of Invertebrates



Ecological services provided by insects

Decompose over 90% of human and animal waste


Support the recreation industry (fishing, hunting, birding) as food for wildlife

Biological control of crop and garden pests

Pollination of wild and cultivated plants

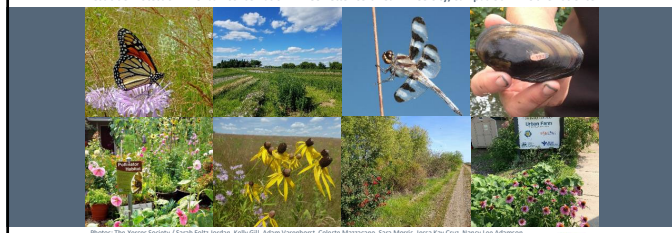
Estimated value of \$57 billion per year in the U.S.

Photos: NAS, Courtesy of Gary Casbono (NRCS), Nancy Lee Adamson (Xerces Society), Debbie Ross (NCJU-CES), Source: Losey and Vaughan (2005)


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On The Ground Conservation

Pollinators • Conservation Biocontrol • Agricultural Biodiversity • Endangered Species • Aquatic Invertebrates
Pesticide Protection • Urban Conservation • Bee Better Certified • Bee City/Campus USA • Citizen Science



Photos: The Xerces Society / Sarah Potts Jordan, Kelly Gill, Adam Varenhorst, Gabriela Mazzacano, Sara Morris, Heiza Kay Cruz, Nancy Lee Adamson

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The Need for Conservation Action

Pollinators are experiencing alarming and rapid declines

At least 28% of bumble bees are threatened

Rusty-patched bumble bee endangered listing

Over 17% of N. American butterflies are at-risk

Eastern monarch populations declined 90% since 1990's



Hultman et al. 2021, Loner and Garcia 2018, Sánchez-Bayo and Wyshopy 2016, Thomas et al. 2015, Saunders 2019, Forister et al. 2019, van Klink et al. 2020

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Widespread Habitat Loss

Only 3-5% of the American landscape is undisturbed habitat for plants and animals



Photos: The Xerces Society / Kelly Gill, Kat Prince, Wikimedia Commons (right)



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Understanding Pollinator Diversity

Recognizing native bees
Plants require a diversity of pollinators for effective and sustainable pollination



Photos: Rollin Coville, Betsy Betros, Mace Vaughan



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Basic Pollinator Biology




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Native Bee Groups

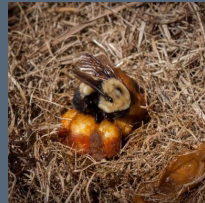
~70% Solitary
Ground Nesting




~30% Solitary
Stem/Wood Nesting



~1% Social Nesting
(Bumble Bees)



Photos: Kent McFarland-Ridov-CC, Kelly Gill, Nancy Lee Adamson



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Understanding Pollinator Diversity

Pollinators are keystone species

Nearly 3,600 species of native bees in the U.S., 5,000 species in North America

Over 800 butterfly species occur in North America north of Mexico



Other flower-visiting insects contribute to pollination including flies, beetles, wasps

Vast majority of described species are invertebrates, with insects topping the list



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Photos: Bryan E. Reynolds (2); Sarah Foltz Jordan; David Inouye; Bruce Newhouse; Mace Vaughan

Pollinators Need Landscape-Scale Conservation

Only 3-5% of American landscape is undisturbed habitat for plants and animals
Unless we modify the places we live, work, and play, we will lose biodiversity



Photo: Jennifer Hopwood
Source: Rosenzweig 2003.

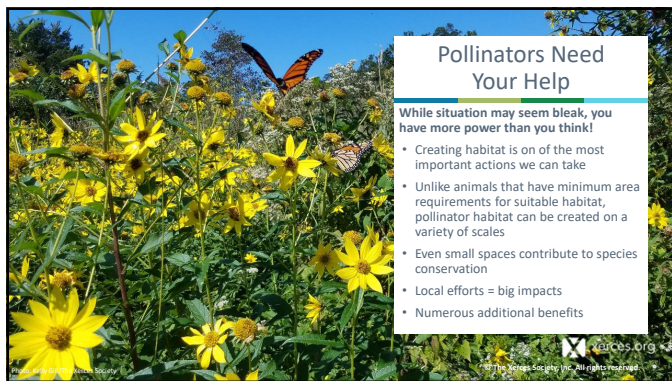


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Pollinators Need Your Help

While situation may seem bleak, you have more power than you think!

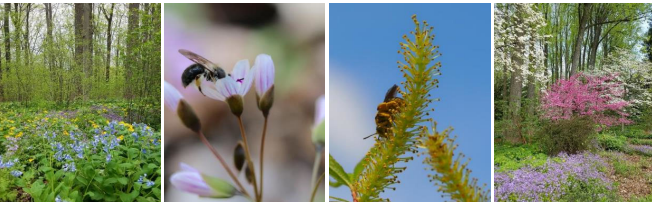
- Creating habitat is on of the most important actions we can take
- Unlike animals that have minimum area requirements for suitable habitat, pollinator habitat can be created on a variety of scales
- Even small spaces contribute to species conservation
- Local efforts = big impacts
- Numerous additional benefits



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Plant Selection

Season-long bloom: Early spring



Examples: Virginia bluebells, golden ragwort, spring beauty, wild columbine, dutchman's britches, hepatica, bloodroot, bellwort, trillium, trout lily, willow, redbud, dogwood, serviceberry, red maple

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Habitat Requirements

Whether you are working in the backyard or the back-forty, pollinator habitat must provide:

- Food:** Nectar, pollen, host plants
- Shelter:** Nest sites, overwintering sites, refuge
- Protection:** Protection from pesticide risk, habitat disturbance

Supporting pollinators throughout their life cycle is critical




Photo: Justin Wheeler

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Plant Selection

Season-long bloom: Mid/late spring-early summer



Examples: Crabapple, blueberry, beach plum, chokecherry, black cherry, hawthorn, huckleberry, New Jersey tea, inkberry, holly, zizia, penstemon, spiderwort, coreopsis

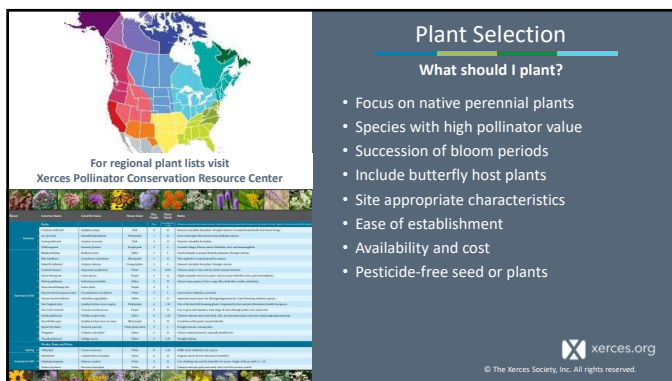
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Plant Selection

What should I plant?

- Focus on native perennial plants
- Species with high pollinator value
- Succession of bloom periods
- Include butterfly host plants
- Site appropriate characteristics
- Ease of establishment
- Availability and cost
- Pesticide-free seed or plants

For regional plant lists visit Xerces Pollinator Conservation Resource Center



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Plant Selection

Season-long bloom: Early-mid summer



Examples: Elderberry, buttonbush, sumac, wild rose, clethra, spiraea

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Pollinator Seed Mixes

Seeds per square foot vs. pounds per acre



Black-eyed Susan (*Rudbeckia hirta*)
1,472,000 seeds/lb
~5 lbs of seed/acre = 169 seeds/ft²

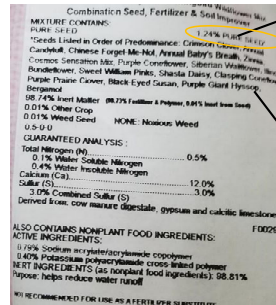


Partridge pea (*Chamaecrista fasciculata*)
43,200 seeds/lb
~5 lbs of seed/acre = 5 seeds/ft²

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Low Value for Pollinators

In order of predominance:
Crimson clover
Annual candytuft
Chinese forget-me-not
Annual baby's breath
Zinnia
Cosmos sensation mix
Purple coneflower*
Siberian wallflower*
Illinois bundleflower*
Sweet William pinks
Shasta daisy*
Clasping coneflower
Purple prairie clover*
Black-eyed Susan*
Purple giant hyssop*
Bergamot*



Caution:
Only 1.24% pure seed
98.74% Inert matter

- Most species are introduced, annuals
- Low pollinator value
- A few are native perennials, but at lower "predominance"
- How much of each species?
- Seed tag does not give % of each species or other required info. for tags

Plant Selection

Plants bloom everywhere, but pollinators need the right type of flower

- Many ornamental do not have much habitat value
- Showy (double) petals in place of anthers have little or no pollen; nectar inaccessible
- Not locally adapted
- Make sure plants are not pretreated with insecticides!



Photo: Xerces Society/Matthew Shepherd

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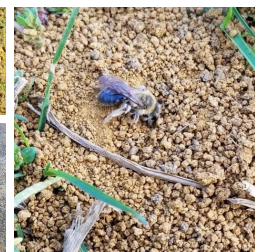
Ground Nest Sites

70% of native solitary bees nest underground

- Protect nest sites
- Avoid plastic, landscape fabric, heavy mulch
- Avoid tillage or other ground disturbance
- Pebbles/light rock mulch encourage nesting of some species
- Not aggressive, don't defend nests



Photo: The Xerces Society/Kelly Gill



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Pollinator Seed Mix?



Photo: Kelly Gill

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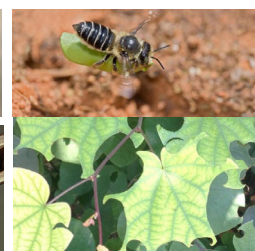
Stem/Wood Nest Sites

~30% of native bee species nest stems, wood tunnels

- Hollow or pithy stems, old beetle borer holes, snags, rotting wood, crevices, snail shells
- Nest tunnel partitions constructed of mud, leaf or petal pieces, resin, sawdust, pebbles, or plant hairs



Photo: Photos: Edward S. Ross, Darro O'Brien, Clay Robinson, Sarah Foltz Jordan



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Stem/Wood Nest Sites

Protecting nest sites

- Plant species with hollow or soft pith stems
- Leave flower stalks intact over the winter
- Prune to create nest sites in early spring
- Cut at a variety of heights ~8 to 24 in.
- Watch for activity!
- No clean-up necessary; stems will break down
- Snags, logs, stumps

Graph: Sara Morris / The Xerces Society
Photo: Sarah Foltz Jordan / The Xerces Society (A), Heather Holm (B)

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Moving from Lawn Care to Land Stewardship

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Bumble Bee Nest Sites

Social Nesting

- 45 species in U.S.
- Nest in existing insulated cavities
- Annual colonies, founded by single queen

Nest Sites Include

- Underground cavities
- Overgrown areas
- Bunch grasses
- Bush piles
- Old rodent burrows
- Under vegetation on the ground surface
- Tree cavities, hollow logs
- Rock piles and walls

Smaller colonies vs. honey bees

- Nests may contain 25-400 workers
- Depending on the species

Photos: Edward Ross (left), Bryant Dixon-Rickr CC (center), Kent McFarland-Rickr CC (right)

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Meadow Habitat

Native Wildflower and Grasses

Photos: The Xerces Society/Sarah Foltz Jordan, Kelly Gill

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Photos: Sarah Foltz Jordan

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Meadow Habitat

Native Wildflower and Grasses

Photos: Mahan Rykoff Associates ©

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You Don't Need Large Acreage to Make a Difference

Building Pollinator Habitat In Small Spaces

- Same big-picture concepts apply
- Native plants with a range of bloom times
- Non-native naturalized species – **do not plant invasive species**
- Nesting features
- Multi-purpose
- Some different design considerations vs. large plantings





Photo: The Xerces Society/Kelly Gill



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Lawn Conversion

Over 40 million acres of lawn in U.S (turf is the single largest irrigated "crop" in the country)
Lawns support far fewer pollinators, beneficial insects, and songbirds than flowering native plants




Photo: Matthew Shepherd

Miloi et al. 2009. Mapping and modeling the biogeochemical cycling of turf grasses in the United States. *Environ Manag* 36: 426-438.



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Photo: Jennifer Hopwood

Guidelines for Small Spaces

You do not need large acreage to help pollinators

Planting design and structure:

- Select a few of the best species
- Increase visibility (clump species)
- Native bunch grasses for structure
- Flowers 2-5 plants; grass/sedges 2-3 plants (depending in spread)
- Locally-sourced open-pollinated seed-grown plants
- Make sure your plants are not pre-treated with insecticides
- IRRIGATION!



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Photo: Jennifer Hopwood

Lawn Conversion

Other Garden Considerations

Fruiting and flowering trees and shrubs:

- Blueberry
- Raspberry
- Elderberry
- Currants
- Serviceberry
- Apple

Garden herbs:

- Mint
- Cilantro
- Dill
- Lovage
- Oregano
- Borage



Photo: Sarah Foltz Jordan



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Photo: Kelly Gill

Guidelines for Small Spaces

You do not need large acreage to help pollinators

Planting design and structure:

- Select a few of the best species for your site
- Consider shrubs, and trees for structural diversity and more habitat niches
- Lower growing plants along walkways, driveways, etc.
- Keep some lawn or ground cover if desired
- Have some negative space
- Maintain borders and edge
- Other "people" features (benches, sitting areas, etc.)



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Photo: Jennifer Hopwood

Pocket Meadows






Photo: The Xerces Society/Jennifer Hopwood, Kelly Gill



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Climate-Smart Yards for Pollinators

Native plants that are drought tolerant
Increasing resilience to climate change and conserving water resources



Photo: Jessa Kay Cruz



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Rain Gardens and Bioswales

Provide nectar, pollen, and nest sites
Captures runoff and reduces water pollution

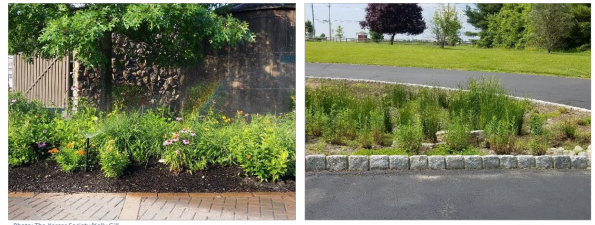


Photo: The Xerces Society/Kelly Gill



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Climate-Smart Landscaping for Pollinators

Including native plants in urban and residential landscaping
Species that tolerate fluctuating conditions and extremes



Photo: The Xerces Society/Kelly Gill



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Detention Ponds and Basins



Photo: The Xerces Society/Kelly Gill



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Office Gardens

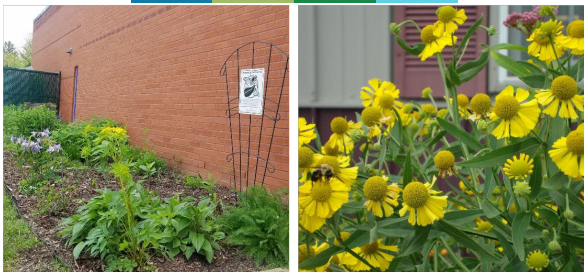


Photo: The Xerces Society/Kelly Gill



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Sidewalk Strips



Photo: The Xerces Society/Kelly Gill



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Hedgerow Planting

Trees and shrubs are valuable components of pollinator habitat



Photo: Tim Dunne (NRCIS)



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Include Nesting Habitat

Stems, snags, logs, stumps, and brush piles



Photos: The Xerces Society/Kelly Gill, Sara Morris



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Hedgerow Planting

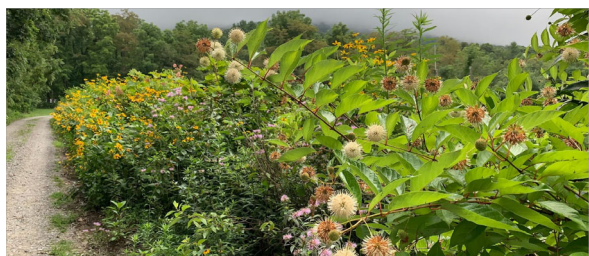


Photo: Van Burnette 2019 (c)



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Include Nesting Habitat

Stems, snags, logs, stumps, and rocks



Photos: The Xerces Society/Kelly Gill



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Multi-Story Hedgerows

Native Flowering Trees and Shrubs

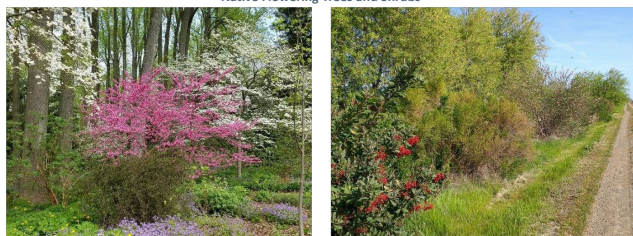
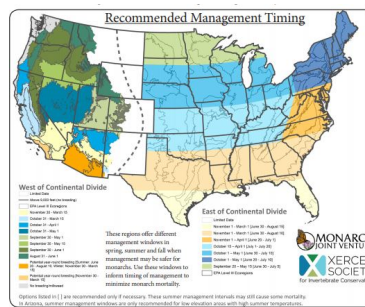


Photo: The Xerces Society/Kelly Gill, Jessica Kay Cruz



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Adjust Mowing Practices to Benefit Monarchs



Available online at:
<https://monarchjointventure.org/images/uploads/documents/MowingForMonarchs.pdf>



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Leave the Leaves

Or at least some of them!

- Great spangled fritillary caterpillars tuck themselves into a pile of leaves for protection
- Red-banded hairstreaks lay eggs on fallen oak leaves
- Luna moths and swallowtail butterflies disguise their cocoons and chrysalises as dried leaves
- Insulation for bumble bee queen's hibernaculum
- Leave a thin layer of leaves on grassy areas
- Spread on vegetable or flower beds for soil building and weed protection
- Add a layer to trees, shrubs, and perennials for much
- Avoid shredding leaves



Photo: Matthew Shepherd

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Leave the Stems




Photo: Jennifer Hopwood

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Leave the Leaves

Overwintering for beetles, butterflies, moths, and more



- Caterpillars of fritillary butterflies overwinter in fall leaves – so please Leave the Leaves
- Many butterflies and moths overwinter as chrysalis or cocoons disguised as dried leaves. Don't blow away their cover!
- The red-banded hairstreak lays its eggs on fallen oak leaves, which become the first food for hungry caterpillars when they hatch.

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Habitat Signs




Photo: Jim Gille/NRCS PA, The Xerces Society/Sara Morris

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Leave the Leaves

Soft Landings

- Many butterflies and moths use trees as their larval host plant
- Then complete their life cycle in the duff and leaf litter beneath trees or below ground
- Spread on vegetable or flower beds for soil building & weed protection
- Avoid mowing these areas, shredding leaves, using landscape fabrics



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Bee City USA, Bee Campus USA



Photo: Xerces Society/Mace Vaughan

Get Involved — Make changes in your own community

Mission:
To galvanize communities to sustain them with healthy habitat, rich in a variety of native plants and free to nearly free of pesticides.

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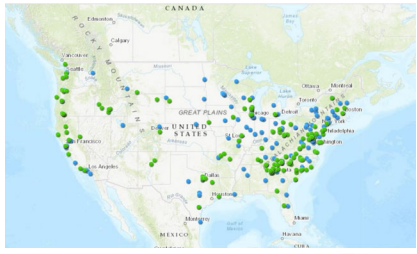
Current Bee Cities and Campuses


Over 240 affiliates in 43 states

Green dots = Bee City
Blue dots = Bee Campus

For more information, visit the Bee City website at beecityusa.org

Map displays the location of certified Bee Cities and Bee Campuses, overlaid with Bailey's ecoregion map (data as of Sept. 2021).



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Pollinator Conservation Resource Center

National and region-specific resources to aid in the planning, establishment, restoration, maintenance, and protection of pollinator/beneficial insect habitat. Plant lists, habitat installation guides, monitoring protocols, fact sheets, and more!





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Community Science and Engagement

Get involved in existing conservation efforts and programs





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Webinars & Online Learning

Check out Xerces' comprehensive library of publications, blogs, videos, webinars, project ideas, and more!

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- Invertebrates for youth
- Webinars on monarchs, fireflies, bumble bees, freshwater mussels, and other important invertebrates
- Pollinator conservation "how-to" for working lands, gardens, cities & towns, roadsides & ROW, parks, natural areas, and more
- Habitat Restoration
- Reducing pesticide use & impacts
- Community science programs
- Bee City and Bee Campus
- Featured videos

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Parks and Community Spaces




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Need More Ideas?

Visit xerces.org

- Go to our library for more resources
- Click "Get Involved" to explore community science projects and other opportunities
- Support our work – become a Xerces Member!

There are small actions that we can take every day to

MAKE A DIFFERENCE and, over time, our **SMALL ACTIONS**, combined with those of our neighbors,

ADD UP to become **SUBSTANTIAL.**

— Angela Lopez, Xerces Society Member & Pollinator Advocate





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Thank You



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