Bring Back the Pollinators

Annual Report

2017

XERCES SOCIETY
for Invertebrate Conservation

Protecting the Life that Sustains Us

The Xerces Society for Invertebrate Conservation is a nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. Established in 1971, the Society is at the forefront of invertebrate protection, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs worldwide. The Society uses advocacy, education, and applied research to promote invertebrate conservation.

The Xerces Society for Invertebrate Conservation
628 NE Broadway, Suite 200, Portland, OR 97232
Tel (855) 232-6639 Fax (503) 233-6794 www.xerces.org

Regional offices in California, Connecticut, Iowa, Maine, Minnesota, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Oklahoma, Pennsylvania, Washington, and Wisconsin.

The Xerces Society is an equal opportunity employer and provider.

Front Cover Photograph © Preston Wilson, Preserve Manager, Paunacussing Preserve, New Hope, Pennsylvania

This year staff at Paunacussing Preserve, a historic farm site in southeastern Pennsylvania, witnessed a satisfying burst of blooms after partnering with the Xerces Society over the last several years to plan and install pollinator habitat.

Bring Back the Pollinators
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The Xerces Society for Invertebrate Conservation

www.xerces.org

Overview

Thanks to your support, the Xerces Society has helped steer the national conversation about bringing back the pollinators. Engagement and interest have built to unprecedented levels among farmers, the food industry, government agencies that support farmers and their counterparts that manage public lands, grocery store customers, gardeners, and essentially anyone who's heard about the plight of bees and butterflies. We are not the only voice, but we continue to be recognized as the leader on these issues. During the last year, you have helped make the following milestones possible.

- 436,000 acres of pollinator habitat restored or protected since 2008
- 21 new demonstration farm sites in development that showcase methods for supporting native bees and monarch butterflies, attracting beneficial insects for natural pest control, and improving soil health, carbon sequestration, and drought resilience
- A series of publications on creating, maintaining, and enhancing pollinator habitat based on the results of multi-year field trials conducted on farms across the country
- Launch of Bee Better Certified™, a first-of-its-kind certification program that incentivizes the large-scale adoption of pollinator conservation methods
- More than 14,000 people over the last year learning about how to protect pollinators and how to take advantage of beneficial insects as pest control
- Numerous tools for multiple sectors of society to help protect, restore, and create habitat for pollinators, including guidance for farmers and other land managers that is specific to bumble bees and to monarchs, ground-breaking publications on pesticide use risk mitigation, cutting edge guidance for roadside and utility right-of-way managers, and a new book for gardeners on plants for pollinators
- A new citizen science project, the Western Monarch Milkweed Mapper, which will help answer key research questions and identify where conservation efforts are most critical for the monarch butterfly's recovery
- Protection for the rusty patched bumble bee under the Endangered Species Act—the first bee species in the continental U.S. to be listed as endangered
- 22 local governments around the country have developed pesticide policies that are better for pollinators with our help, since 2014, including four policies passed in the last year

In this report, we provide additional details about these accomplishments and more from the past year.

Thank you for joining us in protecting the life that sustains us.

Pollinator Habitat on the Ground

Collaborating with farmers to protect and restore high-quality habitat for pollinators is a core part of the work of the Xerces Society. We have long realized that, because farming encompasses nearly half of the U.S. land base, we must work with farmers if we want to provide for a long-term future for pollinators. We employ multiple strategies to create pollinator habitat on the ground in collaboration with farmers and other land managers, farm agencies, and food companies. Over the last year, we began developing a series of new farm demonstration sites in the West, Midwest, Northeast, and mid-Atlantic regions that will help farmers learn from each other to create habitat for pollinators and other beneficial insects. In addition, this summer we launched our newest effort to engage farms and food companies in providing healthy places for bees to live via a third-party certification program for pollinator conservation.

These wildflowers provide habitat for pollinators in between rows of almond trees. In combination with hedgerows and plantings along field edges, blooming plants like these offer food and shelter from spring through fall. Photo: The Xerces Society/Jessa Kay Cruz.

Six More Miles of Hedgerow Habitat for Pollinators

Building off our previous work to establish large-scale pollinator habitats within California almond orchards, in 2016, we partnered with Häagen-Dazs and Harris Family Farm to plant over six miles of flowering hedgerows in the heart of California's Central Valley. The goal of this hedgerow project is to provide habitat for both honey bees and native bees within and around the almond orchards.

Almonds are one of the many crops that rely on bees for pollination. To meet the pollination demands of the billions of blooms at California almond orchards, farmers import over one million honey bee hives: Nearly 90% of all the honey bee colonies in the U.S. journey to California every February. Yet, honey bees are facing numerous threats that cause beekeepers to routinely lose over 30% of their hives annually.

This new pollinator hedgerow will provide native bees with forage and habitat when almond orchards aren't in bloom. Photo: Gani Pinero Photography for Häagen-Dazs.

Fortunately, flower-rich habitat can help support ailing honey bee populations by providing additional nutrition, and at the same time sustain wild, native pollinator populations. Most almonds are grown in a monoculture, leaving little for bees to forage on before or after bloom. When farmers provide habitat within and around orchards, bees have a buffet of options that keep them healthy during almond pollination and until they are moved to the next crop that requires their services.

In addition to the hedgerows of flowering native shrubs that provide bee habitat around farm perimeters, a flowering understory is being installed between the rows of almond trees, extending habitat deep into the orchards and making them more hospitable to bees. In order to protect this new habitat from exposure to high risk pesticides, the Xerces Society has helped the farm assess their pesticide use and adopt pesticide mitigation strategies.

New Demonstration Habitats

Habitat demonstration projects are one of our most powerful tools for motivating farmers to create habitat for pollinators and other beneficial insects. Networks of demonstration farms are currently being developed in California, Iowa, New Hampshire, North Carolina, and other states.

Demonstrating Natural Pest Control on Organic Farms

By increasing beneficial insect populations on organic farms and protecting them from pesticides, farmers and wildlife can both benefit. While organic farming can provide significant environmental benefits, a number of organic farms still rely on organic-approved insecticides, which can have detrimental impacts on beneficial insects. Additionally, in some cases, the pest management practices of neighboring conventional farms can impact local beneficial insect populations.

New Hampshire

In 2015, we launched a project to increase beneficial insect populations for natural pest suppression on New Hampshire vegetable farms. Approximately 30 acres of beneficial insect habitat have been planned and are currently being installed on six farms that grow mixed fruits and vegetables with biodynamic, organic, or no-spray methods. These farms are serving as demonstration sites for other nearby farms and hosted more than 150 people at field days and workshops in 2016.

At each demonstration site we developed custom pesticide risk mitigation plans to reduce the non-target impacts of pesticides through practices such as drift reduction, increased scouting and monitoring to trigger earlier (and less intensive) pest management actions, and buffer systems intended to reduce the movement of insecticides into near-farm natural habitats. We are also developing new guidance for farmers and agriculture support staff that goes beyond pesticide risk mitigation, and provides comprehensive, accessible guidance on preventative strategies for pest management.

North Carolina

We are also collaborating with two farms in North Carolina to create demonstrate habitats that will engage and educate new audiences. At an incubator farm for new and beginning organic farmers, a new habitat demonstration area is in the planning stages that will increase diversity on the farm and improve understanding of farm management techniques that support beneficial insect diversity to enhance crop pollination and reduce pest problems. Educational materials will also be developed for distribution during farm field days and other outreach events for new farmers.

In partnership with North Carolina A&T State University, a public, coeducational, historically black, research university located in Greensboro, North Carolina, we will demonstrate how native habitat can support beneficial insects for organic production while also helping to reduce wind speeds. The University Farm is a working farm with active livestock and horticultural production. At the farm, students, faculty, and the campus Cooperative Extension Program conduct research and demonstrate sustainable agricultural and resource conservation practices to the state's farming community. New hedgerow habitat is in the planning stages, to be installed between the farm's pond and an organic horticulture research area, and will become part of annual farm field tours.

Quantifying Conservation Benefits of Pollinator Habitat

Our habitat systems offer a proven solution to address pollinator declines, but other important resource concerns also demand attention, creating potentially competing priorities for conservation-minded farmers and the agencies that support them. These concerns, such as water availability, climate change, pest management, and more, require all of us to work toward conservation practices that can provide multiple resource benefits.

California

We have begun to establish demonstration sites at five farms in California, representing a range of farm sizes and cropping systems. Custom seed mixes for cover crops and insectary strips have been developed for each farm site, consisting primarily of diverse native species, with an emphasis on drought-tolerant

and nitrogen-fixing species that have the ability to re-seed. Site preparation at all five farms is currently underway with habitat installation planned for the fall of 2017.

As these habitats mature, we will quantify how this pollinator habitat can provide "multi-resource" benefits, including improvements in carbon sequestration, soil health and water-holding capacity, and natural pest suppression.

Iowa

A new series of demonstration farms in Iowa will also showcase the benefits pollinator habitat can provide for soil health and nutrient management, erosion mitigation, and water quality protection as well as benefits to other wildlife such as songbirds, pheasants, amphibians, and fish. Our goal is to foster a diverse range of practices among a network of farms that are optimized for pollinators, monarch butterflies, and predatory insects according to the goals and priorities of each participating farm and the opportunities presented by each location.

(Left) This California mixed vegetable farm will feature demonstration habitat consisting of cover crops and native plant insectary strips designed to provide benefits to pollinators, soil health, and beneficial insects that prey upon crop pests. Photo: The Xerces Society/Jessa Kay Cruz.

(Below) Hedgerow planting at an organic vegetable farm in Iowa. Photo: The Xerces Society/Sarah Foltz Jordan.

Making a Flight Path for Pollinators

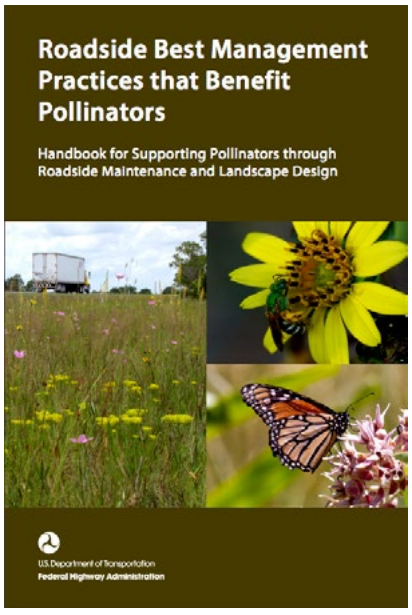
In 2015, the Port of Portland and the Xerces Society capped off two years of planning and site preparation by creating a 50-acre native wildflower meadow for bees on an island in the middle of the Columbia River. This site is in the flight path of the Portland International Airport, and thanks to the seed mixes we designed to support dozens of local species of bees and butterflies, this landscape has been transformed into thriving habitat for pollinators. Xerces Society biologists are currently sampling the grassland restoration areas to monitor post-restoration diversity and abundance of bee and butterfly communities on the island.

Lupine in bloom at the Port of Portland habitat restoration site in June 2017. Photo: The Xerces Society/Rich Hatfield.

Helping Pollinators on the Road to Survival

An immense amount of land is dedicated to roadsides, which form one of the most extensive networks of linear habitats on earth. Roads cross natural areas and pass through urban areas and intensely farmed landscapes, where they are often the only natural or semi-natural habitat available to pollinators.

An estimated 17 million acres of roadsides are in the care of state transportation agencies in the United States. These lands can support a diversity of flowers, may have reduced exposure to pesticides, and have soil which is rarely disturbed—a boon to ground-nesting bees. From the perspective of a pollinator, roadsides can serve as a place to refuel, to reproduce, and to overwinter. Pollinators might visit roadsides to sip nectar from wildflowers or may be just passing through, using them as corridors between fragments of other habitat. Roadsides can support entire life cycles of pollinators, from egg to adult.



However, not all roadsides are equally valuable habitat for pollinators. Roadsides that are mown frequently, broadly treated with herbicides, converted to turf grass, or planted with introduced grasses such as brome or fescue support far fewer pollinators than roadsides with native plants.

Roadside managers, maintenance staff, and landscape designers can all take steps to improve the quality of roadside vegetation to benefit pollinators; steps that can also reduce costs, maintain public safety, and improve public good will. Over the last year, in conjunction with ICF International and the Federal Highway Administration, the Xerces Society developed new guidance on how to plan and implement changes in roadside vegetation management that will benefit pollinators. *Roadside Best Management Practices that Benefit Pollinators: Handbook for Supporting Pollinators through Roadside Maintenance and Landscape Design* identifies key steps that state departments of transportation can take to improve the quality of roadside habitat for pollinators by 1) adjusting roadside vegetation management techniques to accommodate pollinator resource needs, 2) enhancing and restoring native roadside vegetation with plants that improve pollinator habitat, and 3) incorporating native plants and pollinator habitat needs into roadside landscape design. In addition, we worked with our partners to create

two new resources for roadside restoration practitioners: a manual to roadside revegetation that describes the process of establishing native plants for pollinator habitat, and an online tool for locating commercially available native plants by ecoregion or by state.

Meeting the Need for Local Native Plants

Restoring habitat for pollinators means using the native plants on which native bees and butterflies depend. As interest grows in pollinator habitat restoration, the supply of key plant species has not always kept up with the demand, especially for milkweed seed.

Milkweeds are the required host plants for monarch butterfly caterpillars and their flowers provide nectar for bees, butterflies, and other beneficial insects. Through Project Milkweed, our work with the native seed industry to increase the supply of these essential plants, we learned that pest control is a major issue for commercial milkweed production. Responding to this situation, we created a first-of-its-kind, reduced-risk IPM system for the management of several broadly distributed milkweed pests. This IPM system 1) provides the first-ever standardized methodology for estimating milkweed crop damage through formal crop scouting protocols, 2) establishes recommended economic thresholds for crop damage, and 3) provides a system of recommended treatments to reduce herbivore damage while at the same time increasing protection for monarchs, crop pollinators, and predatory and parasitoid insects in milkweed seed production fields. The IPM system is detailed in our publication, *Managing Milkweed Crop Pests: A Native Seed Industry Guide*. The guide was made available publicly during a webinar this spring and can be downloaded from xerces.org/milkweed.

Xerces Society Plant Ecologist James Eckberg visits a seed production plot for thistle in Minnesota. Photo: Cassandra Bush, Minnesota Native Landscapes, Inc.

Native milkweeds are not the only plants with high value to pollinators but limited commercial availability. After identifying overlooked species and the barriers to increasing seed supply, we partnered with native seed producers to collect wild seed; establish production plots and monitor them for seed predation, disease, and insect damage; and document propagation practices. This effort resulted in new commercial sources for 10 wildflower species that had been completely absent from the market or in limited supply. By focusing on overcoming the production challenges for these species, we have helped boost yields, with nearly 250 pounds of seed produced for this group of species. Four additional species are currently in the early stages of production and will be harvested in the coming years. In 2016, we also developed two guides related to our native seed production work: *Collecting and Using Your Own Wildflower Seed to Expand Pollinator Habitat on Farms* and *Increasing Seed of Wildflowers Valuable to Pollinators*.

We have also identified several species of native thistles that are valuable pollinator plants. The benefits of these plants are not well recognized and they are often confused with invasive non-native thistle species. To encourage their conservation and use in pollinator plantings, we developed the guide, *Conserving and Growing Native Thistles.* This publication describes their pollinator value and conservation status, and provides information about thistle propagation, seed production, and ways to manage non-native thistle species.

Creating a Marketplace Incentive Program for Pollinator Conservation

In June 2017 we launched a new farm and food certification program, Bee Better Certified™—the first third-party certification program in the world focused specifically on pollinator conservation.

The goal of Bee Better Certified is to give bees a healthy place to live. With continued decline of pollinator populations worldwide, the Bee Better Certified program will promote the adoption of agricultural practices proven to benefit pollinators. At the heart of Bee Better Certified is a set of standards, developed from a thorough review of scientific literature and rigorous vetting by a panel of experts, that establish a high bar for habitat restoration and pesticide risk reduction. These habitat standards draw on our experience of a decade of farm-tested habitat establishment and maintenance techniques, and will enable growers to create high-value habitat that not only supports beneficial insects, but also bolsters crop pollination.

Bee Better Certified can be adopted by growers of all types: large or small, organic or conventional, and everything in between. Implementing the production standards can enhance any operation, but in particular they help move conventional growers towards more sustainable practices. Bee Better Certified also complements organic certification requirements on natural resource protection released by the National Organic Program.

With this new certification program, farmers can now be recognized for their conservation efforts and businesses have the opportunity to market products using a packaging seal that demonstrates they work with conservation-minded growers—and consumers can shop with confidence, knowing that what they are purchasing benefits pollinators and the farmers working to protect them.

Bee Better Certified received startup funding through the Conservation Innovation Grant program of the U.S. Department of Agriculture's Natural Resources Conservation Service. We are partnering with Oregon Tilth, one of the largest organic certifiers in the U.S., as the first Bee Better Certified accredited certification body. Learn more at beebettercertified.org.

Farmers such as Doug Crabtree of Villicus Farms in Montana are working to meet the Bee Better Certified standards. Photo: The Xerces Society/Jennifer Hopwood.

Conservation Tools and Training

The Xerces Society builds the base of pollinator allies by working with many audiences to spread the word about the importance of pollinators and their habitat needs, as well as to convey concrete steps that people can take to protect these animals. Through trainings, customized support, and publications, we encourage farmers to adopt sustainable agricultural methods that benefit pollinators and restore biodiversity to farming landscapes. We also engage the public and agencies that manage public lands.

Since 2008, through workshops, farm field days, short courses, webinars, presentations at conferences, and other events, we have reached over 90,000 agricultural professionals and other interested audiences across the nation and internationally. Thousands of people attend our educational events and presentations each year; during the last year, we reached more than 14,000 people. Our train-the-trainer educational model and comprehensive conservation guides extend our impacts even more broadly.

Highlights of these trainings and educational events include:

- **Women in Farming:** At two events focused on women in farming, in Wisconsin and Missouri, Xerces Society staff made presentations to more than 100 people. Topics covered included pollinators, other beneficial insects, and federal programs that can support conservation efforts for these animals on farms. These events complement our growing relationship with the Iowa-based Women, Food and Agriculture Network.
- **Pollinator Advocates:** We helped facilitate and deliver the first Bee City Certified Pollinator Advocate Course, a three-day course where advocates learned about the importance of pollinator conservation and reducing pesticide use in urban areas, on campuses, and in communities. This was a pilot course and will be used to design future courses for advocates across the country.
- **Food and Farm Conference:** Senior Pollinator Conservation Specialist Jennifer Hopwood was a keynote speaker at the 2016 Annual Food and Farm Conference in Kansas. Attendees ranged from conventional and organic farmers to beginning and established farmers, conservationists and environmentalists, and local food advocates and community leaders, and 250 people attended her presentation "Pollinators, Plants, and People: What pollinators do for us and what we can do for pollinators."
- **Bumble Bee Surveys with Citizen Scientists:** In partnership with Great River Greening, the Xerces Society taught six bumble bee survey and training events for citizen scientists. At these events, 125 volunteers learned how to distinguish Minnesota's native and exotic bee groups and conduct "catch and release" bee surveys at restored prairie sites. Data collected by participants are helping the Xerces Society and Great River Greening evaluate the relationship between restoration practices and pollinator management.
- **Organization for Refugee and Immigrant Success:** We partnered with the Organization for Refugee and Immigrant Success, a community-based organization located in Manchester, New Hampshire, to deliver two trainings to Somali-Bantu, Bhutanese, Burundi, and Congolese refugee farmers. We presented a conservation biocontrol workshop in December 2016 and a cover cropping for pollinators and beneficial insects workshop in March 2017. These trainings were simultaneously translated into multiple languages.
- **March for Science:** The Xerces Society was a national partner in the March for Science, a co-sponsor of the Portland, Oregon march, and endorser of the Sacramento, California march. Xerces Society

staff delivered presentations underscoring the importance of biodiversity and conservation science at marches in Portland, Oregon; Omaha, Nebraska; and Sheboygan, Wisconsin, reaching thousands of marchers.

- **Webinar on Multiple Benefits from Habitat Installation:** The Xerces Society was invited to be one of four presenters during the NRCS Webinar "Designing Habitat for Multiple Benefits"; 730 people attended the webinar including staff from NRCS and other agricultural agencies, farmers, nonprofits, educators, and researchers. The webinar centered on a farm case study of a Xerces-led restoration project at an almond orchard in California's Central Valley. The Xerces Society and other speakers discussed how this habitat was designed to improve soil health, prevent run-off into waterways, be attractive to pollinators and other beneficial insects, and sequester carbon.
- **Oat Farmers in the Great Plains:** In partnership with General Mills and Cheerios, we are recruiting farmers to plant habitat for pollinators on farms that grow oats. This year alone 10 farmer outreach events were held in Manitoba, North Dakota, and South Dakota, focusing on the value of pollinators and practical ways to integrate habitat back into farms. This included presentations for farmers at the Northern Plains Sustainable Ag Winter Conference, Paterson Grain, and Canadian conservation district offices.

Comments from Event Participants

"Thanks so much Nancy for this resources treasure trove! Your presentation was illuminating. I really appreciated learning about the wild pollinators and how to encourage them. I am very grateful to you!"

– Attendee, *Enhancing Farm Diversity to Support Pollinators, Predators, & Parasitoids* presentation

"Great information for producers on alternatives besides using pesticides."

– Agricultural support staff, after New Hampshire short course

"Excellent—very knowledgeable presenter—communicated science very well in layman's terms."

– Land trust representative, after Conservation Planning for Pollinators and Beneficial Insects Short Course

"Many thanks for a great day of excellent useful information. Fantastic speakers. Bravo!"

– Participant, after Pennsylvania Conservation Biological Control Short Course

"This was a wonderful seminar—informative and pithy. One of the best I've attended!"

- Landscape designer, after Conservation Planning for Pollinators and Beneficial Insects Short Course

"Great workshop! This could go on for a week!"

–NRCS staff, after Rhode Island Conservation Biological Control Short Course

Promoting Ecological Pest Management

Working with the USDA and university research entomologists, the Xerces Society has been developing model pest management systems for multiple crops that reduce pesticide impacts to bees, other pollinators, and beneficial insects such as predators of crop pests. Because pests tend to be specific to a particular crop, pest management strategies are also crop specific.

Beneficial insects like this green lacewing can help control pests, but they also need shelter and supplemental food. Photo: The Xerces Society/Sarah Foltz Jordan.

Corn and Soybean

In 2016, farmers planted more than 177 million acres of corn and soybean in the United States. Reducing the amount of insecticides used on these acres would have a profoundly positive impact for pollinators and other beneficial insects. To this end, we developed a reduced-risk pest management model for soybean and corn, emphasizing reduced reliance on neonicotinoid insecticides to minimize impacts to bees and beneficial insects. Our crop scouting and integrated pest management guidelines are designed to help growers reduce pesticide impacts to bees and other beneficial insects while still effectively controlling crop pests. We have reached out to the Practical Farmers of Iowa (PFI) to explore promoting this model within their network of farmers. PFI is very interested, and this topic will likely be included in their annual conference in 2018.

Almonds

Another primary initiative is the development of a model IPM system for almonds and an effort to work with a growing number of orchards in California to implement reduced-risk plans. This model pest management system incorporates multiple elements including habitat creation and management for predatory insects that attack crop pests, feedback on the risks of insecticides currently in use, pesticide risk mitigation strategies such as drift barriers or buffers, and implementation of non-chemical pest-management and decision-making tools that emphasize crop scouting and monitoring. Over the past year, we have greatly expanded our outreach and technical assistance to both large- and small-scale almond producers throughout California's Central Valley, and to both organic and conventional growers. We are currently engaged in ongoing IPM-related projects with seven almond producers in the Central Valley, and have provided technical assistance and general recommendations to many others.

Increasing Adoption of Conservation Biological Control

Predatory insects were the primary means of pest control on farms in the past and they remain critically important today. With the advent of chemical insecticides, pest problems have not disappeared; in fact, crop losses due to pests have increased during the past 40 years.

Attendees at a Nevada conservation biological control short course learn about ways to attract beneficial insects on their farms for natural pest control. Photo: The Xerces Society/Jessa Kay Cruz.

In order to integrate beneficial insects back onto farms for natural pest control, we developed a series of short courses on conservation biological control. This science-based pest management strategy incorporates farm habitat that attracts natural predators of crop pests, reducing or eliminating the need for pesticides. Modeled on our successful pollinator conservation short course, our conservation biological control short course covers beneficial insect biology, habitat design to attract beneficial insects, pesticide risk mitigation, financial support available through USDA programs, and real-world case studies. Since 2015, we have delivered the course 29 times in 24 states, reaching more than 950 attendees.

Farming and Agroforestry Practices to Reduce Risks of Pesticides

As part of the Xerces Society's commitment to creating high-quality habitat for pollinators we ensure that the habitat we restore is protected from pesticides that are toxic to bees and other beneficial insects. The Xerces Society has developed two new publications to help farmers, foresters, and farm educators identify practices to safeguard pollinators when pesticides are present.

This year we collaborated closely with the USDA National Agroforestry Center to update an issue of the publication *Agroforestry Notes* on the topic of pesticide risk reduction. "Using Agroforestry Practices to Reduce Pesticide Risks to Pollinators & Other Agriculturally Beneficial Insects" assembles the latest information on how to implement practices like hedgerows and windbreaks to capture pesticide drift, and how to create habitat for pollinators and beneficial insects.

We also recently released a new guidance document designed to help growers, land managers, and others safeguard pollinator habitat from harmful pesticide contamination. *Creating and Maintaining Healthy Pollinator Habitat: Guidance to Protect Habitat from Pesticide Contamination* includes information on selecting habitat sites protected from pesticide exposure as well as ways to maintain clean habitat by limiting and carefully managing pesticide use.

Consulting on the Farm

In addition to conducting trainings and participating in outreach events, Xerces Society staff members also provide one-on-one conservation support to farmers and other agricultural professionals. Providing this direct individual support helps landowners and conservation planners address the unique opportunities and challenges associated with individual farms. Over the last year, we provided technical assistance and advice to over 180 farmers across the country and completed comprehensive farm conservation plans for sites

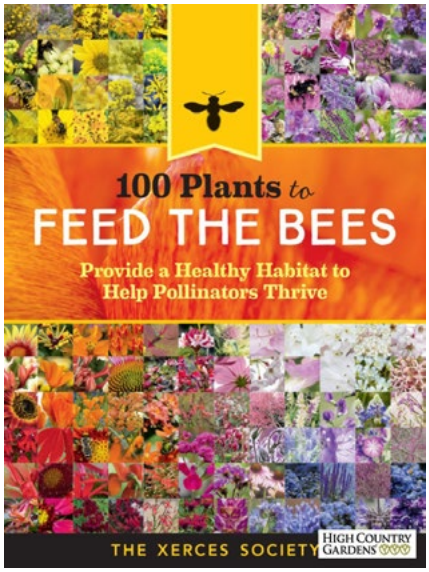
ranging from cattle ranches, organic walnut orchards, and mixed vegetable farms. Our conservation plans provide a blueprint for improving pollinator habitat, enhancing crop pollination, and/or increasing natural pest suppression. Once a plan is complete, an eligible farmer can apply for financial support from the NRCS to implement the plan's recommendations.

We were able to accomplish this work in large part through our partnership with the USDA NRCS. That partnership expanded greatly in the past year thanks to a new agreement with General Mills, the U.S. Department of Agriculture, and the Xerces Society. Through a five-year, $4 million financial commitment from General Mills and USDA's Natural Resources Conservation Service (NRCS), the Xerces Society added six new joint Xerces/NRCS biologist positions based in rural NRCS field offices. This new team of biologists is supporting farmers with one-on-one pollinator conservation consulting, and function as advisors to NRCS staff in the regions they serve. The biologists are based in California, Iowa, Maine, Minnesota, Nebraska, and North Dakota, and serve a network of surrounding states. Over the five-year agreement, the partnership will result in the planting of thousands acres of new pollinator habitat.

Recruiting New Pollinator Conservationists

More than 7,300 people have signed onto the Bring Back the Pollinators pledge, committing to providing flowers and nesting habitat, as well as eliminating pesticides in their yards, gardens, farms, or in nearby natural areas or public spaces. In total, they have pledged to create or protect over 80,000 acres of habitat for the benefit of pollinators.

To support people in their pollinator conservation efforts, this year we added a new feature on our website which informs and engages individuals in conserving pollinators and other invertebrates in their own backyard and beyond. Our Conservation Comes Home blog presents a series of ideas, resources, and personal stories intended to inspire action.



In addition, our most recent publication, *100 Plants to Feed the Bees: Provide a Healthy Habitat to Help Pollinators Thrive*, offers browsable profiles of 100 common flowers, herbs, shrubs, and trees that attract bees, butterflies, moths, and hummingbirds. With simple recommendations, *100 Plants to Feed the Bees* empowers homeowners, landscapers, apartment dwellers—anyone with a scrap of yard or a window box—to protect pollinators.

Spreading the Word

Our media reach keeps growing and growing, with millions of people learning about our work online and in print. Already, in 2017, we've been part of more than 2,500 news items, which have reached an estimated 1.2 billion people. For the entire year in 2016, we were mentioned if not featured in over 2,100 pieces, reaching 1.4 billion people. The surge in coverage in early 2017 is largely due to the volume of stories published about the rusty patched bumble bee's listing as an endangered species.

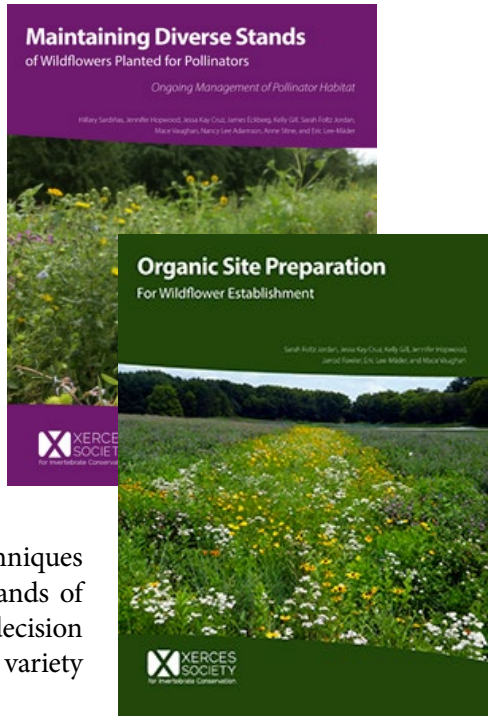
Advancing the Science of Pollinator Conservation

Science is the foundation of our work. We undertake applied research to determine the extent of decline for bumble bees, butterflies, and other pollinators, and work with landowners and land management agencies to determine where these at-risk species occur. We monitor habitat restoration sites to make sure that our efforts produce effective results. Beyond our own studies, we collaborate with scientists at universities around the world to advance the science of pollinator conservation. More and more, we are also relying on a growing base of citizen scientists who contribute valuable on-the-ground information about the pollinators in their area.
In the conservation world, we are the go-to source for reliable and accurate information on pollinators. We document the results of our research and that of our partners, and create accessible guides and resources that reach thousands of farmers, land managers, and conservationists, and provide practical solutions to pollinator declines.

Pollinator Habitat for the Long Term

The Xerces Society uses scientific approaches to test effective on-the-ground methods for habitat restoration. In 2016, we completed a multi-year project in eight states that evaluated management methods influencing the longevity of pollinator habitat.

At almond and apple orchards, cranberry bogs, and farms in the Northeast, Midwest, and West, we tested weed management strategies for wildflower meadows, techniques for regaining wildflower diversity in meadows when it declines, and methods for expanding habitat with additional plant materials—including plant materials propagated from already restored habitat. We identified weed management strategies that minimize harm to pollinators, through techniques such as mowing, hand-weeding, spot spraying, applying grass-selective herbicide, weed removal around site edges, conservation haying, irrigation, prescribed fire, and grazing.



Our findings from these farm field trials were incorporated into a technical guide that will help growers perform maintenance and operations on existing pollinator plantings. *Maintaining Diverse Stands of Wildflowers Planted for Pollinators: Ongoing Management of Pollinator Habitat* outlines management techniques that sustain and increase diversity of wildflowers in existing stands of vegetation, and contains case studies from across the country and decision trees to help identify appropriate management technique(s) for a variety of conditions.

Restoration Practices for Organic Producers

It's difficult to overstate the importance of site preparation for a habitat restoration project. With good site preparation, weed management over the long term is easier and pollinator plantings can thrive. In recognizing

the willingness of organic growers to provide pollinator habitat, the Xerces Society identified a need for organic site preparation techniques (instead of the standard techniques, which emphasized herbicides). Over the past four years, we evaluated a range of organic site preparation practices in California, Minnesota, Montana, New Hampshire, and Oregon. We found that solarization consistently outperformed other methods and that organic herbicides were the least effective.

Our results are described in our new publication *Wildflower Establishment: Organic Site Preparation Methods*. This guide summarizes the primary organic site preparation techniques, including timelines for completion, and highlights the situations in which each technique is most effective.

Efficient Habitat Establishment

From years of real-world testing, we know that soil solarization and cover cropping are two of the most promising methods for establishing pollinator habitat. Soil solarization is a weed control strategy that involves placing a clear plastic sheet on soil during summer months to take advantage of solar radiant heating. Cover crops can have multiple conservation benefits; as a site preparation method, temporary cover crops can crowd out weeds before more permanent pollinator habitat is installed.

Our applied research efforts helped identify these two strategies as reliable ways to minimize weed growth in new pollinator habitat. With further refinements, we can make these techniques easier to adopt. In 2016, we began working with 12 farms in California, the Midwest, and the Northeast. With our farmer-partners, these field trials will help us develop recommendations on how to reduce the costs and time required to create pollinator habitat, while still achieving the full benefits for these animals.

Options for Pollination Services

Over the past several years we have partnered with a coalition of researches in the U.S. and Canada to investigate the performance, economics, and farmer perceptions of different pollination strategies in various fruit and vegetable crops. This collaboration, the Integrated Crop Pollination (ICP) Project, defined integrated crop pollination as the use of managed pollinator species in combination with farm management practices that support, augment, and protect pollinator populations to provide reliable and economical pollination of crops.

After years of research and feedback from farmers, this project culminated in a series of publications and resources for growers. Through ICP, we published 14 fact sheets on bee pollinated crops that encompass seven cropping systems in multiple states and describe ways to support on-farm pollinators; an overarching guide on integrated crop pollination as well as pollinator habitat establishment guides for Michigan and California; and several bee monitoring tools for blueberry farms. We also collaborated with research partners on the beta version of the Pollination Mapper, an interactive decision tool to help inform growers' choices of pollination strategies for their farms. Through this online platform, a grower can model different approaches to pollination on their farm such as adding habitat features or incorporating managed pollinators, and see projected impacts to crop yield.

To share what we'd learned with farmers, we hosted nine field days and workshops at farm sites in California, Florida, Michigan, and Pennsylvania, with presentations from ICP research partners, local university extension agents, and NRCS staff. In order to reach a wider audience, Project ICP launched a webinar series in January 2017 in collaboration with eXtension.org, the online arm of Cooperative Extension. This six-part webinar series explored integrated crop pollination for almonds, blueberries, tree fruit, and cucurbits; provided practical guidance on crop pollination using alternative managed bees and planting wildflowers for bees; and created an opportunity for participants to ask questions about specialty crop pollination. On average, over 150 people registered for each webinar, including growers, extension agents, crop consultants, government agency staff, and researchers from 18 countries. Project results were also disseminated through a series of 11 ICP videos, available through their website: icpbees.org.

Data from Citizen Scientists

We harness the power of thousands of citizen scientists across North America to gather valuable conservation data. Engaging participants in this essential work is vital to our conservation success, as it vastly increases the amount of data available and helps build a larger constituency for pollinator conservation. In the last year, we launched our newest citizen science project, the Western Monarch Milkweed Mapper, and enhanced our existing projects for bumble bees and monarchs with new tools and opportunities for people to participate.

Citizen scientists of all ages participated in "catch and release" bumble bee surveys in Minnesota where they learned to identify species endemic to the area. Photo: The Xerces Society/Sarah Foltz Jordan.

Bumble Bee Watch

In 2014, in collaboration with several partners, we launched Bumble Bee Watch, a citizen science project to track and conserve North America's bumble bees. At this state-of-the-art web portal (bumblebeewatch.org), participants can check their bumble bee observations against online identification guides and submit photos to a network of bumble bee experts that have been enlisted to help verify the accuracy of bumble bee identifications.

This growing community of citizen scientists now has over 14,000 registered users who have submitted over 20,000 bumble bee observations in the U.S. and Canada. This data is essential for bumble bee conservation. It has helped us uncover new findings, from understanding where endangered species currently exist to the tracking of an introduced species in areas where it has previously not been found.

In order to continue to increase participation in Bumble Bee Watch and make the submission process more user-friendly, we recently completed the development of a field guide-based app for iPhones and iPads. This app will make it easier for participants to photograph bumble bees, submit images to Bumble Bee Watch directly from their phones, and utilize the resources available on Bumble Bee Watch. During the first two months since the app's release, it has been downloaded by 3,275 people. In addition to the app, we've recently added more tools on the Bumble Bee Watch website that allow users to explore the data that they've contributed.

Western Monarch Counts

The Western Monarch Thanksgiving Count (westernmonarchcount.org) is one of our longest-running projects. The count has engaged volunteers in data collection about the status of monarch populations overwintering along the California coast since 1997.

Each year, monarchs from as far away as Idaho and Arizona converge on tree groves along the California coast to spend the winter. Because so many monarchs from the western United States are clustered together on the coast, the Xerces Society's Western Monarch Thanksgiving Count provides one measurement of the health of western monarch populations. During our November 2016 count, volunteers visited 253 sites (up from 187 sites in 2015) and tallied a total of 298,464 monarchs—a fraction of the 10 million monarchs that occupied these sites in the 1980s.

Monarchs seen overwintering at Pacific Grove Monarch Sanctuary. One of the top 50 priority sites for overwintering monarchs, the site currently supports an average of 11,914 monarchs during the winter months. Photo: USFWS Pacific Southwest Region.

To better understand overwintering monarch clusters' persistence during the overwintering season, the Xerces Society and Western Monarch Thanksgiving Count volunteers launched a New Year's Count in January 2017. Comparing data from the two count periods will help us begin to answer questions about winter mortality, differences among sites, and site management.

The first New Year's Count took place in January 2017 at 44 overwintering sites throughout the monarch's core overwintering range including key sites such as the Monarch Grove Sanctuary in Pacific Grove, Lighthouse Field State Beach in Santa Cruz, and the Monarch Butterfly Grove in Pismo Beach. In the period from Thanksgiving Count 2016 to New Year's Count 2017, monarch numbers at monitored sites decreased by an average of 43%. With only one year of data, we do not know if 43% is typical. To that end, the Xerces Society is looking for additional volunteers to expand the New Year's Count in January 2018 to more overwintering sites in order to better understand the extent of overwintering mortality, as well as gain additional information about population trends and site-level differences.

Data gathered by citizen scientists through the Western Monarch Thanksgiving Count enabled us to determine the levels of decline affecting the western monarch population and has allowed us to work with researchers to evaluate the western monarch population's viability and extinction risk. It also helped us make a scientific case for protection under the Endangered Species Act for the monarch butterfly in our 2014 petition to the U.S. Fish and Wildlife Service.

These data were essential for a new research paper that analyzes the population viability of western monarchs. Dr. Cheryl Schultz of Washington State University, Emma Pelton of the Xerces Society, and coauthors used Thanksgiving Count data, along with other data compiled by the Xerces Society, and some sophisticated math to understand population trends for monarchs in the West and make projections into the future. Among the key findings, this analysis shows for the first time that the western population of monarchs is at a higher risk of extinction than the eastern population. The paper also demonstrates that there were at least ten million western monarchs as recently as the 1980s, a much higher estimate than has been previously verified.

Western Monarch Milkweed Mapper

Very little is known about where the western population of monarchs disperses in the spring and summer to breed; the presence (or absence) of milkweed, the key plant for monarch caterpillars, is a primary indicator for breeding locations of monarch butterflies. To help address this data gap, we initiated a program to gather information on milkweeds and breeding monarchs in the western United States in partnership with the Idaho Department of Fish and Game and the Washington Department of Fish and Wildlife.

In December 2016, we launched the Western Monarch Milkweed Mapper (monarchmilkweedmapper.org), a new website to engage people in documenting the locations where milkweed and monarch caterpillars occur in western states. This tool will help us identify existing monarch breeding habitat and understand where conservation efforts are most critical for monarch recovery. This website's data collection tool includes an online portal for anyone, from professional scientists to amateur naturalists, to submit photos of milkweeds and monarch breeding observations. Website users can access regional milkweed identification guides and monarch conservation information, general information on monarch biology and the importance of milkweeds to monarchs, and photography tips. As of July 2017, we have received 260 submissions of milkweed and monarch observations in western states, and over 500 people have registered as site users.

Documenting the locations of milkweed and monarch caterpillars like these is helping the Xerces Society better understand the western monarch's breeding range. Photo: The Xerces Society/Scott Hoffman Black.

Extinction Risk Evaluations

The Xerces Society collaborates with scientists to address the worldwide issue of pollinator decline, and is an active member in both the Bumble Bee and Butterfly Specialist Groups for the International Union for Conservation of Nature (IUCN). The IUCN Bumble Bee Specialist Group is currently completing a global assessment of bumble bees that will allow us to focus conservation efforts and call attention to the plight of at-risk species. The IUCN Butterfly Specialist Group is completing assessments of species throughout the Mediterranean and endeavoring to better understand species status in the tropics of Africa and South America. Together with our international partners, we are assessing the species at most risk across the globe and prioritizing actions for their conservation.

Confirming the Bad News: Neonicotinoids Are Killing Bees

In December 2016, we released an updated version of our groundbreaking 2012 publication, *Are Neonicotinoids Killing Bees?*, which had been one of the most comprehensive reviews of neonicotinoids and their effects on pollinators. New research makes the link between pollinator declines and these insecticides even clearer, as reflected in our 2016 report, *How Neonicotinoids Can Kill Bees: The Science Behind the Role These Insecticides Play in Harming Bees*. Among other things, the new findings shed light on the risks that neonicotinoids pose to native pollinators. This report presents the available research on the effects of neonicotinoids in a way that allows a non-specialist to understand it—and take action.

This new publication has been well received by state agencies, university staff, and activists. Within a few weeks of the report's release, state agencies in Vermont and Minnesota already used it to inform their efforts to develop comprehensive plans for pollinator conservation. In the words of one local activist from Idaho: "I read this report with great interest and excitement! What a great tool for those of us who are trying to educate the general public about the threats to our pollinators and what we can do to help."

Impacts of Pesticides on Invertebrates Database

In an effort to keep up with the constantly expanding information available about pesticides and their impacts on pollinators and other invertebrates, the Xerces Society created the Impacts of Pesticides on Invertebrates (IPI) database (pesticideimpacts.org). The database is a collection of summaries of recent research articles, with links to the published versions.

Most studies included in the IPI database are focused on the effects that pesticides have on invertebrates, primarily pollinators and aquatic species. While many of the articles discuss neonicotinoids, research about other pesticides is also included. For example, we included articles that have expanded our understanding of the risks that fungicides (generally considered practically non-toxic to bees) pose to both native and managed bee populations.

We will update the IPI database with new articles frequently as relevant research is released. This project grew out of our report *How Neonicotinoids Can Kill Bees* to serve as an extended bibliography and as a way to keep the public updated on the latest science.

Jacquelyn Albert, Graduate Research Assistant at the Michigan State University Department of Entomology, let us know how important this resource is: "I am really happy that this database is being developed and I feel it will be beneficial to my research, as well as to the overall scientific understanding of pesticide impacts on bees. Having these easily accessible summaries of current research is vital for making sense of this vast and complex issue."

Promoting Policies for Pollinators

The Xerces Society helps ensure that existing conservation laws and programs fully account for pollinators. Our national reputation as an authoritative, science-based voice for pollinators helps us establish relationships at the state and local levels. At the same time that we work with government agencies, we also join forces with local activists that seek to protect their communities from pesticides and with a coalition of nonprofits advocating for pesticide reform nationally.

Federal Policy

During the Obama Administration, pollinators became a federal priority like never before. In 2016, we helped the White House's Office of Science and Technology Policy understand how to accomplish meaningful conservation for these animals. When federal agencies were charged with incorporating pollinator conservation into their programs, we provided guidance, technical support, and pollinator expertise to the USDA Natural Resources Conservation Service, U.S. Forest Service, U.S. Fish and Wildlife Service, U.S. Geological Survey, National Park Service, and the U.S. State Department. With the change of administration, we are continuing to support these federal partners and ensure that the federal government remains engaged with the issue of pollinator conservation.

At the national level, the Xerces Society is a leading voice for pollinators. Over the last year, our accomplishments at the federal level included achieving the first-ever Endangered Species Act protections for bees and continuing our partnerships with the USDA so that farmers can access programs that support pollinators.

Landmark Endangered Species Act Protections for Bee Species

The rusty patched bumble bee was formerly an important crop pollinator but is now an endangered species. Photo: The Xerces Society/Sarina Jepsen.

The Endangered Species Act (ESA) is the most effective species conservation law in the world, and now, this law has been extended to bee species for the first time. In September 2016, in response to petitions from the Xerces Society, the U.S. Fish and Wildlife Service listed seven species of Hawaiian yellow-faced bees as endangered species under the ESA, making them the first bees to gain federal protection in the United States. This was followed in March 2017 by the final listing of the rusty patched bumble bee (*Bombus affinis*) as an endangered species. Once common from Minnesota to Maine, and south through the Appalachians, this species has been lost from 87% of its historic range since the late 1990s. This species is not only an important pollinator of prairie wildflowers, but also of cranberries, blueberries, apples, alfalfa, and numerous other crops.

As attention shifts to the recovery of the rusty patched bumble bee, the Xerces Society expects that our existing partnerships with farmers in the Upper Midwest and the Northeast will provide extensive opportunities for conservation. We have already created multiple tools to aid in the recovery of the species, including a rusty patched bumble bee habitat assessment guide which is being used by the U.S. Fish and Wildlife Service, scientists surveying for these animals, and land managers who want to understand whether their properties have suitable conditions for the rusty patched bumble bee.

USDA Conservation Programs

The Farm Bill contains a broad range of incentive-based conservation programs on agricultural land, including several programs that farmers rely on to create wildlife habitat for pollinators and other beneficial insects. For the 2018 Farm Bill, we are focusing on maintaining the specific pollinator-protection language in the current Farm Bill. We are also working to bring back some of the 9 million acres of Conservation Reserve Program lands that were removed during the last Farm Bill negotiations, and seeking opportunities to insert incentives for pollinator conservation and research.

By participating in the Conservation Reserve Program, farmers can access financial and technical assistance to preserve crucial wildlife habitat. Photo: The Xerces Society/Sarah Foltz Jordan.

As part of this effort, we have been working with Oregon's Senator Merkley on legislation that would require federal agencies to coordinate efforts to expand the acreage of beneficial forage and habitat for pollinators by a total of 3 million acres. The Pollinator Recovery Act would also increase funding for research into pollinator habitat and protection, expand incentives for conservation biological control and reduced risk pest management practices, and dramatically expand efforts to monitor the health of native pollinator populations. We anticipate that this legislation will be considered for incorporation in the 2018 Farm Bill, and will serve as the basis for continued debate in Congress about impactful, long-term policy solutions that protect vulnerable pollinator species across America. Note: no lobbying is funded by our foundation supporters.

Protecting Pollinators at the State and Local Levels

There are significant opportunities to promote pollinator-friendly practices and policies within state, county, and municipal governments, as well as among private landowners and everyday people. And broad interest in

pollinator conservation continues, with state and local agencies, cities, farmers, gardeners, and concerned individuals seeking information from us on how they can create pollinator habitat and protect it from pesticides. These audiences have always been essential to our success, and we are increasingly focusing on policy changes at the state and local levels to make important gains for pollinators.

Pesticides continue to be a central focus for our policy work, especially at the local level. Among the causes of pollinator decline, pesticide use is a key factor. Research continues to show the ways in which neonicotinoids, the most widely used group of insecticides in the world, are having devastating effects on pollinator species. To end reliance on toxic pesticides, we provide support to individuals and organizations who are taking action to protect pollinators in their communities.

Pollinator Protection Plans

In response to an EPA mandate in 2015 directing states to create pollinator protection plans, the Xerces Society wrote a summary set of recommendations for states to use when creating these plans. We sent our recommendations to key staff at over 30 state agriculture departments as well as 25 tribes and many partner organizations across the country. To date, we have provided technical support, guidance, and substantive input to state planning processes in twenty-five states. Wisconsin, one of the first states we worked closely with to develop a pollinator protection plan, now has a final plan that addresses most of the Xerces Society's key issues and serves as a model for other states to help ensure native pollinators are better protected from pesticide exposures. We expect the majority of the state and tribal plans to be completed by late 2017.

State Legislation

The Xerces Society has supported pollinator protection legislation in a number of states. Most notably, with technical support from the Xerces Society, Maryland successfully passed Bill 211 this spring, limiting the use of neonicotinoids by the general public. We submitted comments in support of bills in California, Minnesota, and Oregon that would curtail neonicotinoid use. While not all of these bills were successful, we were able to reinforce our relationships with state-level contacts (within government and among other nonprofit and community organizations) and help build momentum for pollinator protection efforts in these states. Note: no foundation funds are used for lobbying purposes.

Local Policies to Halt Neonicotinoid Use

In the past year, we assisted dozens of individuals and local government staff from numerous communities in their efforts to protect pollinators from highly toxic, long-lived, systemic insecticides. In total, since we started working on local policy change in 2014, the Xerces Society has helped 22 cities and counties enact policies to protect pollinators from neonicotinoids and other pesticides.

In some of these communities, the Xerces Society's staff helped craft the policies and actively worked for their passage. In other cases, local decision makers and activists used our materials to move their efforts forward. In every instance, we provided scientific information as well as other technical assistance to activists, organizations, and decision makers in their efforts to protect pollinators from pesticides.

In order to assist additional individuals and groups in urging their city to adopt practices to protect pollinators, we prepared a model policy to serve as a framework for developing meaningful protections. Our model policy is research-based and addresses critical issues to protect pollinators from harmful pesticide exposures, including:

- Eliminating the use of neonicotinoid insecticides and other highly toxic, systemic insecticides
- Restricting the purchase and use of products that contain neonicotinoids and seeds or plants that have been treated with neonicotinoids

- Implementing integrated pest management on municipal property that relies on non-chemical options first
- Avoiding cosmetic pesticide applications
- Engaging residents through education about pollinators and pesticides

Building an Activist Network for Pesticide Reform

The Xerces Society is part of a network of more than 30 organizations that is mobilizing a wide range of organizations and businesses that have a stake in pollinator protection. As a founding and guiding member, the Xerces Society helps organize the two network meetings held each year, and regularly provides technical support to ensure the members strengthen their scientific understanding of the issues faced by native pollinators. We also help guide some of the policy and strategy decisions of the network.

When the network began, the focus was on honey bees; part of our role has been to broaden that conversation to include all pollinators. To that end, in 2016 we provided a training to more than 40 network members on native bees and the unique pesticide risks they face. Since that training, it is common to hear other network members discussing the risk to solitary bees and how bumble bees are different than honey bees. We also provided the network members with written background into the unique risks that bumble bees face from pesticide exposure. This overview was very well received. A staff person from Toxic Free North Carolina expressed his appreciation for the information by stating "Excellent! Thank you Aimee! You're always such a valuable source of knowledge when it comes to native pollinators". He went on to use our information to craft comments to the North Carolina Pesticide Board outlining the unique risks faced by bumble bees. The comments, which Xerces reviewed, clearly refuted erroneous arguments made by Bayer CropScience, the largest global maker of pesticides.

Related to our work to promote ecologically sound pest management in corn and soybean production, in early 2017, along with the Kansas Rural Center and Practical Farmers of Iowa, we initiated a new farm-focused workgroup for the network. The first charge of the work group is to determine what steps are needed to help farmers be able to stop planting neonicotinoid coated soybean seeds. To this end, we organized a call with three farmers that have transitioned away from planting neonicotinoid coated soybean or are attempting to do so. The call was very educational and provided network members with significant background on the challenges farmers face as they attempt to transition away from planting seeds treated with neonicotinoids.

Monarch Conservation Spotlight

One of our most iconic and widespread pollinators—the monarch butterfly—has undergone startling declines in recent years. Recent surveys show that monarch populations have declined by over 80% in the last 20 years, and as a result monarch conservation has taken on a heightened importance. Although monarchs are not important for agricultural pollination, they can serve as a flagship species for the protection, restoration, and management of pollinator habitat in a variety of landscapes and for improved pesticide regulation on agricultural lands.

With decades of experience in monarch conservation, the Xerces Society is contributing a rigorous scientific approach as well as expertise in habitat restoration and conservation education to cooperative efforts for monarch recovery. Through our involvement in the Federal Monarch Butterfly High Level Working Group, the National Monarch Conservation Science Partnership, the NRCS Monarch Butterfly Habitat Development Project, and the Monarch Joint Venture, we are advancing the science and practice of monarch conservation, and shaping state, national, and international monarch conservation priorities. We have formed a group of western monarch scientists that has identified key monarch conservation areas including overwintering sites along California's coast and breeding habitat in agricultural areas and rangelands of the West. We are providing scientific support to the effort to recover essential monarch habitat by coordinating and aligning research, monitoring, information sharing, and the development of tools throughout the range of the monarch butterfly.

Conserving the charismatic monarch butterfly will also help other species that benefit from the same habitat considerations. Photo: The Xerces Society/Jennifer Hopwood.

Supporting the USDA's Promotion of Monarch Habitat on Farmlands

In 2015, we helped the NRCS develop an initiative for monarch conservation on private farmlands. The resulting NRCS Monarch Butterfly Habitat Development Project aims to increase monarch habitat in 10 states within the core of the monarch's migration corridor (Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Ohio, Oklahoma, Texas, and Wisconsin). As follow-up to this work, we are providing support to the NRCS and landowners on issues such as the best species of milkweed and nectar-producing plants for use in habitat projects, as well as the development of training materials for agency staff, and the creation of a monarch habitat assessment tool to track success. Efforts in 2016 focused on the Midwest and southern Great Plains, and we continue to collaborate with the NRCS Plant Materials Program to finalize and publish lists of important nectar and host plants for monarch butterflies across the country. This effort is especially important since agricultural intensification has been identified as a major factor in the butterfly's decline.

In addition to milkweed, monarchs also need access to high-quality nectar plants such as ironweed (*Vernonia* spp.) as well as other regionally native wildflowers. Photo: The Xerces Society/Justin Wheeler.

Planning for Monarch Recovery

We were invited to be a part of strategy development for monarch recovery in multiple states in the central U.S. monarch flyway. Xerces Society staff served on the steering committee of the Oklahoma Monarch and Pollinator Collaborative and planning committees for the Texas and Oklahoma Monarch Symposium, and participated in Monarch Summits in Kansas, Michigan, and Oklahoma. We also contributed data, revisions, and expertise to the Oklahoma Monarch Plan and the Nebraska pollinator and monarch conservation plan, and to monarch protection plans and other state monarch planning processes in California, Iowa, Michigan, Minnesota, and Wisconsin.

We are also participating in the development of the Mid-America Monarch Conservation Strategy which includes representatives from 16 states. This strategy aims to provide a coordinated and unified approach to monarch conservation activities in the mid-America region, which comprises the core breeding and migratory range of the eastern monarch butterfly.

Demonstrating the Possibilities for Monarch Habitat on Farms

The Xerces Society continues to partner with the Tallgrass Prairie Center and the Monarch Joint Venture to install a series of monarch habitat demonstration sites in one of the areas that needs it most: the agricultural Midwest. The Xerces Society has already worked with four organic farms in Minnesota and Wisconsin to create plots of quality habitat for monarchs, providing concrete examples that pollinator conservation is an accessible, successful, and beneficial activity for farmers to engage in. We have started working with three additional farms to showcase opportunities for on-farm monarch habitat. We engaged Midwest farming communities surrounding our demonstration farms by hosting field days at each of the participating farms where we not only motivated farmers to take action for monarchs and other pollinators, but also gave them the technical information needed to make their future habitat installations succeed.

Xerces Society publications and adjacent demonstration monarch habitat at a field day. Photo: The Xerces Society/Thelma Heidel-Baker.

Informing the U.S. Fish and Wildlife Service's Monarch Status Assessment

As part of reviewing a petition for listing under the Endangered Species Act, the U.S. Fish and Wildlife Service can conduct a species status assessment (SSA). An SSA follows a rigorous, standardized process for gathering all pertinent information that is available regarding the biological status of the species that has been suggested for listing. In June 2017, Sarina Jepsen, the Xerces Society's Endangered Species Program Director, joined a dozen other monarch scientists in providing expert input for the monarch SSA. The USFWS is developing a model to project extinction risk under varying scenarios, and they elicited input from monarch experts to identify the parameters of the model. The June meeting focused on the eastern population of monarch butterflies, and in October 2017, the USFWS will host a second meeting of monarch experts to elicit input for western monarchs. After legal action by other nonprofit organizations, the USFWS is subject to a court-ordered agreement to decide by June 2019 whether or not to list the monarch butterfly. Because of the pending petition and the fact that the USFWS is actively considering it, states and private interests are already bringing significant dollars to the table to support monarch conservation in an effort to avoid listing.

Restoring Monarch Overwintering Sites

In 2016, we released the *State of the Monarch Butterfly Overwintering Sites in California* report which describes the top 50 critical areas for conservation of the imperiled monarch butterfly. Based on overwintering site data collected by citizen scientists and other records dating back to 1970, the report includes an analysis of monarch overwintering population trends in California, a list of the top 50 priority sites for active management and

restoration, profiles of the top 25 sites, conservation issues, management recommendations, and more. At two of these high-priority sites—Ardenwood Historic Farm and Lighthouse Field State Beach—we have developed site management plans, partnered with the landowners on restoration, and provided training to managers of overwintering sites who wish to restore habitat. During the trainings, participants learned about monarch habitat requirements, population status, overwintering site management, monitoring, and conservation.

Western Monarch Conservation Science

In December 2016, the Xerces Society and the U.S. Fish and Wildlife Service (USFWS) convened a meeting of western monarch conservation scientists to set research and management priorities for conservation of western monarchs via a collaborative and integrated research and modeling framework. The meeting included staff from USFWS, U.S. Geological Survey, California Department of Fish and Wildlife, and Southwest Monarch Study, as well as five university researchers conducting research on western monarchs and/or milkweed.

After the meeting, Xerces Society staff established a listserv and invited the involvement of a broader audience of western monarch researchers, NGOs, state and federal agency staff, and others who are working to advance knowledge about monarch populations in western states. This newly formed forum will facilitate communication and coordination of research focused on western monarchs and will be administered by Xerces Society staff.

Monarch Conservation Workshops

Because the Great Basin and Intermountain West host many important breeding areas for the western monarch population, we are conducting outreach to land managers in these regions and training them in conservation methods that benefit monarchs. In 2016, the Xerces Society held four workshops on milkweed and monarch monitoring, management, and conservation for USFWS staff and other state and federal land management agency staff. These workshops were held on National Wildlife Refuges in California, Idaho, Nevada, and Washington and collectively reached over 80 land managers. During the workshops, participants learned how to identify naturally occurring stands of milkweed, conduct targeted surveys, tailor management practices to be compatible with monarch breeding activity, and enhance or restore stands of native milkweed.

Research on Monarch Habitat on Public Lands in the West

With heightened attention on monarchs and the habitat that has been lost, many people are eager to restore milkweed stands. However, existing habitat also needs our attention, especially in the western United States where relatively little has been known about where milkweeds and monarchs occur. Working with multiple partners, the Xerces Society conducted milkweed surveys in seven states beginning in 2015 to better understand the timing of monarch breeding and distribution of key breeding areas for the declining western population of monarch butterflies. In the Pacific Northwest alone, Xerces Society biologists and the USFWS staff they trained surveyed over 3,500 acres of public lands. In the summer of 2017, Xerces Society biologists intensively surveyed monarch breeding sites in California, Idaho, and Nevada.

These data have been included in a joint USFWS/Xerces Society western monarch habitat suitability model. This modeling effort identifies the specific areas of the western U.S. that are most important to monarch butterflies in order to prioritize monarch management and restoration lands. In May 2017 the preliminary model results were presented to a select group of researchers who provided feedback. Dissemination of and communication about habitat suitability modeling will be coordinated by Xerces Society staff via the Western Monarch Milkweed Mapper website and the Western Monarch Conservation Science group. In addition, these data are being used to better understand when and where monarch butterflies breed in the West—information that is essential to developing meaningful conservation management guidance for this species.

Evaluation

We use multiple types of evaluation to assess our impact. When testing and refining habitat installation and maintenance techniques, we often work with academic researchers who are applying standardized protocols that allow for objective assessment of results. These partnerships with researchers often lead to articles in scientific journals, providing a layer of peer review as well as a method for disseminating results. For all of our trainings and educational events, we distribute a standardized evaluation form that helps us assess the effectiveness of our materials; for short courses, we also conduct a one-year follow-up survey to gauge participants' adoption of course topics and techniques.

With all of our work, we fine-tune our approaches and priorities on an ongoing basis. We assess our effectiveness internally and rely on input from our many partners.

Looking Ahead

Over the next year we will be continuing our existing efforts and launching several new projects that will help us broaden the movement for pollinator conservation and agricultural biodiversity. These new initiatives include:

- **Heightened focus on California's Central Valley**. The Xerces Society has been active in this region for years, and we see boundless opportunities for agricultural areas of the Valley to incorporate habitat for pollinators, beneficial insects, and other wildlife. Climate resilience, habitat connectivity, and restoration of breeding and overwintering habitat for monarchs are among our priorities.
- **Capitalizing on the historic ESA listing of the rusty patched bumble bee.** To ensure this species avoids extinction, we will continue to push for meaningful protection of remaining rusty patched bumble bee populations and work toward recovering this species' populations to historical levels.
- **Urban engagement strategies.** Our efforts to change the way our food system affects pollinators have caught the attention of people who live in urban areas. In response to numerous requests from home gardeners and local activists interested in pollinator protection, we will create and deliver an education program in least three cities that will provide information and support to this audience in creating healthy, safe pollinator habitat in urban and suburban communities.

In all of this work, we are grateful for the support that you have provided to make it possible. Thank you for joining us in the Bring Back the Pollinators campaign.

Partnerships

There are many organizations and scientists with whom we partner on a regular basis. These include scientists from Rutgers University, Pennsylvania State University, University of California (at both Berkeley and Davis), University of Minnesota, Michigan State University, Iowa State University, University of Florida, Simon Fraser University, Franklin and Marshall College, University of Vermont, Washington State University, staff from the USDA Natural Resources Conservation Service, USDA Farm Service Agency, Soil and Water Conservation Districts, the U.S. Fish and Wildlife Service, U.S. Forest Service, the Commission for Environmental Cooperation, the Monarch Joint Venture, World Wildlife Fund Mexico, United Nations Food and Agriculture Organization, International Union for Conservation of Nature, ICF International, County of Boulder, Colorado, Portland Parks and Recreation, Metro (the metropolitan planning organization for the Portland region), native seed companies in multiple regions, Wild Farm Alliance, Community Alliance with Family Farmers, the Midwest Organic and Sustainable Education Service, Practical Farmers of Iowa, Kansas Rural Center, Women, Food and Agriculture Network, Tallgrass Prairie Center, Cape Cod Cranberry Growers Association, Great River Greening, Groundswell Coastal Ecology, Oregon Tilth, and the National Sustainable Agriculture Coalition, among many others.

We also work with a broad coalition of more than forty businesses and brands to make pollinator conservation an increasingly mainstream practice. These businesses encompass a diverse set of organic, natural, and sustainability leaders, including General Mills, Endangered Species Chocolate, and many more.

Bring Back the Pollinators Supporters

Our accomplishments are only possible because of generous financial supporters like you. In addition to the thousands of Xerces Society members and donors, we would also like to thank the following organizations for their commitments to pollinator conservation during the past year.

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The Edward Gorey Charitable Trust
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Protecting the life that sustains us

628 NE Broadway, Suite 200, Portland, OR 97232
Tel (855) 232-6639 Fax (503) 233-6794
www.xerces.org

Regional offices in California, Connecticut, Iowa, Maine, Minnesota, Nebraska, Nevada, New Jersey, North Carolina, North Dakota, Oklahoma, Pennsylvania, Washington, and Wisconsin

2017-038