

WINGS

ESSAYS ON INVERTEBRATE CONSERVATION



THE XERCES SOCIETY

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Xerces Society staff share a passion for protecting insects and other invertebrates, but also a fascination with the diverse and intriguing behaviors of the animals that we work with. This issue of *Wings* looks at some of the ways in which we interact with insects, as well as ways that we collaborate with individuals and communities to make conservation a success.

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We Know How to Save Insects— We Just Need to Do It

Scott Black

Sometimes when I get down about the state of the world I go outside—into my garden, to a local natural area, or to our closest national forest—seeking respite in nature. What I see still astounds me. If I pause and look, I can discover biodiversity all around. Multiple species of birds at my bird feeder all at one time. A beaver swimming in a pond it has created at my local park. A giant cedar tree so large my wife, kids, and I cannot wrap

our arms around it—even all together. I also always see insects and other invertebrates: banana slugs slide across the path; butterflies sip from wet soil to get nutrients; and I can find caddisflies and mayflies if I turn over a rock in a nearby stream.

Robert Michael Pyle said, in Xerces' fiftieth-anniversary video, "People wonder, are we really losing all insects? Really losing the food for the trout, losing



Seeing butterflies, such as these anise swallowtails, puddling for nutrients is the kind of encounter with wildlife that we can all enjoy. Photograph by Candace Fallon.

our pollinators? It is all too easy to get depressed by that and give up. The fact is it is not everywhere, it is not all insects, and it is not too late!” I agree, but would add that we have the solutions to this crisis, and that we need to act now.

Recently, I was asked to be on a panel to review a large compendium of studies detailing how interventions such as habitat restoration and management, habitat protection, and pesticide reduction impact butterflies and moths. It was a daunting task—more than four hundred pages of peer-reviewed articles—but well worth the effort. What it brought home to me were two things. The first is that we know how to maintain biodiversity. The articles contained plenty of evidence about providing habitat (native plants, cover, and shelter) and making sure that animals are not poisoned by pesticides or other pollutants. It is clear that we need to protect nature that remains, restore nature that is degraded, and replicate nature (as best we can) in as many places as possible.

Second, the articles showed that by taking the right steps we can successfully help these animals in all landscapes, and that most actions can be tailored to also capture carbon and provide for climate resilience. In doing so, we maintain the fabric of life.

Protecting large blocks of natural or semi-natural land is vital. We must maintain national forests and national parks, rangelands and prairies, and even smaller wildlife areas in and close to centers of human population. We also must change how we grow our crops. Fencerow-to-fencerow farming and the widespread use of pesticides are two leading causes of insect decline. There are ways to grow our food and at

the same time provide for insects and other animals that need habitat shielded from pesticides. Xerces’ Bee Better Certified program is a great example. By maintaining 5 percent of the farm as habitat for insects and using organic or integrated pest and pollinator management techniques to minimize pesticide impacts, farmers can grow food in a way that meets both their bottom line and the bottom line for the planet.

We cannot ignore developed areas. Careful management of roadsides—more than ten million acres of land in the United States alone—can provide diverse habitat and picturesque flowers for people to enjoy along our highways while maintaining a safe environment for drivers. Towns and cities are home to many greenspaces that offer opportunities for conservation. Communities increasingly look to parks to provide multiple benefits, and local parks can be managed for recreation while also helping to maintain biodiversity and supporting the health of local residents.

As individuals, we can each do our part through the choices we make at the grocery store or the candidates we vote for. More directly, if we have even a small yard, we can move away from a manicured landscape that provides nothing for insects. Plant native flowers and allow a little messiness to give these small animals a place to live. Do not use pesticides—they are not needed—and encourage your friends to do the same. Visit the Bring Back the Pollinators pages on our website to find simple solutions that will help you change your yard into a haven for insects and all the other animals that need them to survive. Together, we can have a large and positive impact.

Insects Are a Lot Like Us

Sarah Foltz Jordan

What's the best thing to do with a banana peel? According to my Grandma Foltz: set it out on the front stoop for a few days to feed the ants. Same story for bread crumbs, apple cores, and pretty much every other kitchen scrap. While I don't exactly follow that prescription in my own home (we feed our leftovers to our chickens rather than our ants), I think often of my grandma's tenderness toward these small creatures. She passed away almost thirty years ago, presum-

ably unaware of insect decline or insect-conservation strategies, yet still, she understood these basic facts: insects (like us) deserve attention, and insects (like us) need to eat.

Here at Xerces, helping people address the dietary needs of invertebrates is, in fact, a very large part of what we do, particularly when it comes to our work with bees, butterflies, and other insect herbivores. We design habitat projects that support the foraging needs



Female wasps in the genus *Myzinum* drink nectar to fuel them in their hunt for soil-dwelling beetle larvae, the essential food for their offspring. Photograph by Sarah Foltz Jordan.

of at-risk species, and that have enough diversity to be climate resilient and resistant to competition with weeds. We work with farmers, foresters, and fellow community members to create green spaces that aren't just green, but are *the right kinds of green*: flourishing with native plant communities that our insects, songbirds, and other wildlife have co-evolved to coexist with.

We gather information on the feeding preferences of endangered bees and use this to inform our work. We remind our audiences that while some bees are generalists and you may see them flitting about any number of ornamental flowers, many others are specialists, and able to collect pollen from only a limited number of native plant taxa alongside which they have evolved. Although the number of bees exhibiting this “picky eater” syndrome varies regionally, often the number can be quite high. In

the central United States, roughly 30 percent of the approximately eighteen hundred bee species that can be found in the region are specialists on particular pollens.

For example, females of the pale fairy bee (*Perdita pallida*), one of the smallest bees here in Minnesota, collect pollen to feed their offspring from nothing but *Dalea*, a genus of native plants in the legume family generally known as prairie clover. At least two of our plasterer bees (*Colletes*) collect pollen specifically from *Physalis* ground cherries, unassuming little plants that also support specialist leaf-miner moths, who in turn feed specialist parasitoid wasps.

Even insects without highly specific dietary requirements often have preferences. Thanks to a robust database managed by our bumble bee team, we know that the rusty patched bumble bee (*Bombus affinis*), a species federally listed



Although rusty patched bumble bees have been recorded foraging on more than a hundred plant species, the bees have a distinct preference for bee balm. Photograph by the Xerces Society / Sarah Foltz Jordan.



Tiger beetles are high-speed predators, outrunning their prey in bursts of sprinting that, size-for-size, would be the equivalent of a human running 480 miles per hour. Big sand tiger beetle with dung beetle prey, photographed by Sarah Foltz Jordan.

as endangered, has been documented on at least 138 different plant genera over the years, but roughly a fifth of the known occurrences, including the only one I've ever seen, have been on bee balm (*Monarda*).

Moving beyond bees, these types of dietary specializations are the norm rather than the exception. The vast majority (roughly 90 percent) of plant-feeding insects are specialists, adapted to digest only a limited suite of plant chemistries, often corresponding to a particular plant family or genus. Milkweed longhorn beetles (*Tetropes* spp.), beautiful insects that I appreciate for their uncanny tendency to look right at my camera rather than hide or fly off or play dead, have a larval stage that feeds strictly on the roots of milkweed (*Asclepias* spp.). Forked fungus beetles (*Bolitotherus cornutus*) spend their entire life on *Ganoderma* mushrooms, the

familiar rounded shelf or bracket fungi seen growing on trees. The beetles use these fungi for virtually everything: egg-laying substrate, larval and adult food, pupation sites, overwintering protection, location of prospective mates, and (my favorite) a nice flat stage for their courtship behaviors and displays. The Oregon plant bug (*Lygus oregonae*), a rare and declining species in the West, is known to feed on just two unrelated plants, silver beachweed (*Ambrosia chamissonis*) and coastal sand verbena (*Abronia latifolia*), both of which are limited to coastal sand dune habitat. Xerces' surveys for this bug in 2009 documented the species at just one of forty-nine beaches visited, even though thirteen of the sites had appropriate food plants present.

Which reminds us: the occurrence of suitable and abundant food is, unfortunately, usually not enough to support



By combining native flowers with vegetable and orchard crops, the owners of this garden have created a home that supports a diversity of wildlife while putting food on the family table. Photograph by Sarah Foltz Jordan.

the long-term persistence of a sensitive species. In addition to the loss of food plants, many insects are threatened by regular encounters with pesticides in the places where they eat, drink, swim, fly, and nest. In our increasingly developed and ecologically degraded landscapes, many insects struggle to meet their basic needs for shelter—including sites for nesting, overwintering, oviposition, and protection from weather and pesticides. And many insects, particularly those with limited dispersal abilities, require some degree of habitat connectivity in order to find appropriate mates, to maintain genetic resilience, to respond to climate change, and ultimately to sustain or expand their populations.

The Xerces Society recently passed the milestone of half a century dedicated to invertebrate conservation, and we continue to move forward on all of these fronts, using our approaches of research and community science, outreach and education, habitat restoration and management, and policy and advocacy to foster a safer world for invertebrates. Our guidelines on pollinator nesting and overwintering demonstrate the value of “messier” spaces in our yards, parks, and farms. Our support to local communities has reduced pesticide use in hundreds of towns and cities, and our engagement with gardeners to promote pesticide-free bee-safe plants is helping to create safer environments for pollinators. Our advocacy for rare species has

led to protection and improved management of more than a million acres. Our partnerships with local farmers have resulted in a further million and a half acres of restored habitat that is helping to build more robust habitat connectivity from coast to coast.

When Xerces celebrated its fiftieth anniversary late last year, I was asked to give a toast to recognize the contributions of our staff and provide some thoughts on what it is like to work for this organization. Reflecting on this reminded me of one of the first things I noticed when I started working at Xerces thirteen years ago: how *collaborative* our team is. Although we have different knowledge and backgrounds, we have a common goal, and we support—and rely upon—each other. This approach does so much to increase the efficiency and quality of our work, and the joy that we all find in it.

In chatting with other staff members about this topic, I was also reminded how fortunate we feel to be spending our time on a mission that we believe

in wholeheartedly. Our staff are driven to work hard because we can see firsthand the importance of the work we are doing and the effects we are having in our world. When policy changes for the better, we can see the difference in the funding that becomes available for conservation efforts. When a weedy field is transformed to a native wildflower meadow, we can hear the difference in the buzzing, humming, clicking, and clacking of insects announcing their arrival. When farmers learn about the astounding benefits of insects, we can see the light in their eyes as we work together to provide more space for them on their land.

One thing I really appreciate about working for Xerces is our commitment to prioritizing projects based not on the money they bring in, nor on how flashy the project may be, but on the impact of the work proposed, *from the perspective of the animals we are working to protect*. We continue to learn as much as we can about insects—where they live and what they need to persist—and to share what



Like people, leafcutter bees are homemakers, creating a protected space for their offspring. Whereas we might use sheetrock, they use carefully trimmed leaf pieces. Photograph by Clay Bolt.



Banded hairstreak sipping from butterfly milkweed, one of its preferred nectar sources. Hairstreak caterpillars feed on oak, walnut, and hickory. Photograph by Sarah Foltz Jordan.

we know with others, with an emphasis on translating scientific knowledge into effective conservation action.

My introduction to the Xerces Society many years ago was through this very magazine, *Wings*. What drew me in were the fantastic photographs and stories about obscure insects with behaviors that are sometimes so bizarre (like tortoise beetle larvae carrying their own excrement above their head all day to deter predators!), and sometimes so familiar (like leafcutter bees creating bedrooms for their offspring, and with lovely wallpaper, even!). All of these years later, I still find it wonderful that there are so many ways we humans can relate to insects. Think of the care a bumble bee queen takes in selecting her new nest site, sometimes checking out dozens of potential options before settling on the perfect place to call home. Think of the ingenuity of leafcutter ants who not only cultivate their own fun-

gus for their colony to feed on, but also utilize antimicrobial bacteria for pest control and nitrogen-fixing bacteria for fertilizer in their mushroom-farming endeavors. Think of the creativity of a male dance fly bringing silk balloons (sometimes with a little edible treat inside) to his prospective lover.

Like us, insects are parents, siblings, homemakers, farmers, community members, and innovators. Like us, they can be resourceful, insightful, decisive, and prone to copy their peers. To take this notion still further, recent research on fruit flies and other groups suggests the unsurprising but long-denied potential for insects to have feelings, including fear, anxiety, excitement, and motivation. Does a caddisfly, for instance, feel frustration when exposure to pesticides in a stream causes her to have difficulty building and repairing her ornate underwater home? Or perhaps a better question is, “How could she not?”

As we continue to energize more people to act on behalf of insects, these similarities matter. The stories and struggles of insects can help us to recognize their inherent value, regardless of their relationship to us—sometimes useful, sometimes inconvenient. When we understand more about the day-to-day lives of insects, we see them with greater interest, admiration, and concern, and ultimately we are more inspired to help out—even if that simply means feeding our resident ants.

Sarah Foltz Jordan has worked for the Xerces Society since 2008. She is based in Minnesota, where she leads Xerces’ Upper Midwest restoration projects for native bee and monarch habitat.

Partnering with Communities To Protect Pollinators

Matthew Shepherd

These days it seems that everyone is talking about bees, but it hasn't always been like this. When I joined the Xerces staff in 1999, pollinator conservation was not something that attracted widespread interest. At that time, bees were not in the news, and indeed were barely on the radar of most conservationists. I understood that situation, as I had once been similarly unaware. Before coming to the Xerces Society, I'd been working in conservation for more than a decade. In Britain, I had helped farmers plant hedgerows, advised local groups on the renovation of ponds on village greens, led volunteer events to restore ancient woodlands, and created gardens at schools. I had also spent some time in Kenya working with agencies and communities to set up new ways to manage a forest and develop ecotourism. A lot of this work had revolved around insects—butterflies, beetles, dragonflies, ants—but in those days I wasn't particularly thinking about bees or other pollinators.

My interest in bees was sparked in the mid-1990s when I was managing a nature park on the south coast of England that had a notable population of nationally rare early spider orchids. While researching how to best manage for these flowers I discovered that they were pollinated by bees—but not honey bees or bumble bees, the ones that, like so many people, were the only bees I

knew. The orchids were pollinated by solitary, ground-nesting mining bees that were active only during the period when the orchids flowered. Intrigued, I began searching the area near to the orchids and sure enough, there they were.



The author's discovery that mining bees were the pollinators of early spider orchids opened his eyes to a hidden world, and indirectly to a career working with communities to protect pollinators. Photograph by Matthew Shepherd.

A few feet up a steep bank at the base of a cliff was a patch of bare ground dotted with small tunnel entrances and alive with the constant movement of mining bees going to and from their nests. This opened up a whole new world to me. Soon after that, I also learned about bee declines at another site with a different species of rare orchid, but one at which the bees were missing. Those orchids were sustained by hand pollination accomplished with an artist's paintbrush.

When I arrived in Oregon a few years later, a chance meeting with Xerces' then executive director, Melody Mackey Allen, allowed me to convert my own awareness of bees into an involvement with the nascent pollinator-conservation movement. The Society had a multi-year project working on golf courses, and Melody invited me to

take responsibility for this project over its last year, doing bee surveys and providing advice to golf-course superintendents on how to plan and create pollinator habitat. From that small beginning, our pollinator conservation program has steadily gained strength. We now have the largest pollinator team of any nonprofit, and our work has resulted in more than a million and a half acres of new or restored pollinator habitat on agricultural land. In parallel, our endangered species program has achieved legal protection for several at-risk bees—the best known is the rusty patched bumble bee—and our pesticide-reduction team has worked to limit the use of bee-killing insecticides in both urban and rural landscapes.

Although relatively few people were interested two decades ago, the news of



There are almost forty million acres of mown grass and lawns in the United States. Converting some of those acres to habitat such as this pollinator meadow in a park will bring wildlife back into our neighborhoods. Photograph by Matthew Shepherd.



Tufts University Medford-Somerville is a Bee Campus USA affiliate, part of a network of nearly three hundred communities across the United States. Photograph by Nick Dorian.

pollinator declines has resonated over the intervening years, leading to a huge growth in awareness of and enthusiasm for protecting bees and other pollinators. Bees can be found anywhere—in parks, community gardens, backyards, abandoned lots, creek corridors—and effective conservation actions can be carried out in any greenspace. In recent years, Xerces staff have expanded our involvement in towns and cities, particularly through efforts to reduce pesticide use, collaborations with local groups and park managers on habitat projects, the Bring Back the Pollinators campaign, and Bee City USA and Bee Campus USA, the last two of which have become major conduits for our work with local communities.

The Bee City USA initiative was founded by Phyllis Stiles in 2012; the first affiliate was her home town of Asheville, North Carolina. Affiliates make a commitment to create habitat,

reduce pesticide use, and do outreach. When Ashland, a city in southwest Oregon, became an affiliate in 2015, staff at Southern Oregon University saw what was happening and asked whether the college could join. With their assistance, Phyllis developed the framework for Bee Campus USA. Campus affiliates have the same requirements as those for cities, but with the addition of community-service projects and the incorporation of pollinators into the curriculum. In 2018, Bee City USA and Bee Campus USA became part of the Xerces Society.

There are now almost three hundred city and campus affiliates, forming a network that reaches forty-five states and the District of Columbia. The combined efforts of these communities result in real change for pollinators. In a typical year, thousands of acres of new habitat are created, varying from school gardens and pocket parks to extensive meadows. Affiliates also work to reduce



Pollinators are essential for food harvests. Increasingly, community gardens are incorporating habitat for bees and other beneficial insects. Photograph by the Xerces Society / Matthew Shepherd.

pesticide use by adopting an integrated pest management plan, sometimes with citywide bans on particular insecticides. In addition, hundreds of thousands of people are reached through volunteer activities, talks, tabling at public events, and social-media campaigns.

Xerces provides information and guidance, but it is the creativity and energy of the affiliates that drives the program's success. In Decatur, Georgia, for example, the Bee City committee launched a broad-based initiative to help educate city residents about the dangers posed to bees and other pollinators by insecticides used in mosquito management. In Davidson, North Carolina, Nature WOW-NOW kits, which include fun outdoor craft materials and science activities about pollinators, were created and distributed. Several affiliates have developed their own local pollinator-garden certification programs to educate people about the components of

pollinator habitat, and to inspire them to create or enhance their gardens.

The list of examples could go on, but one that illustrates the impact of dedicated Bee City volunteers is the partnership between two affiliates in Wisconsin—the city of Appleton and Lawrence University. Inspired by No Mow May, a movement that began in Britain, residents of Appleton decided to encourage gardeners to let their lawns grow during the month of May, allowing dandelions and other “weeds” to bloom and thus to provide foraging resources for early-season pollinators. The city’s weed-control ordinances meant that this would be no simple task, and in 2019 the first attempt to change the rules failed. Determined residents tried again in 2020, and this time persuaded the City Council to agree to suspend its weed ordinance. In response, well over four hundred property owners participated in No Mow May. In tandem with

that initiative, researchers from Lawrence University undertook a study to assess its impact. They collected data on both the abundance of individual bees and the number of bee species found in the unmown yards of participating properties, and then compared those numbers to the abundance and species richness of bees found in nearby city parks that were mowed regularly. Participating yards had three times as many species and five times the abundance of bees as the mowed sites. This success led not just to Appleton again hosting No Mow May in 2021 and 2022, but to the campaign spreading to cities across the country.

Efforts like this are inspiring, and, as the Lawrence University study shows, they bring tangible benefits to bees. Even so, letting lawns grow is just a starting point for changing neighborhoods into places that will support bees and other wildlife. To truly have a lasting impact, we need to reduce the area

devoted to grass and replace lawns with native plantings, provide for the whole life cycle of bees, and reduce or eliminate the use of pesticides. To this end, Xerces' work in towns and cities goes far beyond the Bee City / Bee Campus network and includes collaborating with community groups and other organizations to plan and implement projects. We have worked with community gardens to install pollinator plantings in unused plots or shared spaces, and have supported urban farms in the planting of hedgerows and insectary strips that bring habitat into densely developed landscapes. We have also collaborated with city-park managers and golf-course superintendents to design and install habitats as varied as meadows and riparian buffers.

Supporting this work, we have produced guidance documents such as plant lists, and we recently released a new version of *Pollinator-Friendly Parks*. These conservation guidelines delve



Bees need flowers on which to forage, a place to nest, and protection from insecticides. Thoughtfully maintained urban areas can provide all of these. Leafcutter bee, photographed by Bryan E. Reynolds.

deeply into the ways that greenspaces can be managed to bring the greatest benefit to bees and butterflies.

Individual homeowners and gardeners can't be ignored in a broader effort to transform our domesticated landscapes to be more nurturing for pollinators. We help gardeners by offering information through talks, workshops, webinars, and outreach campaigns such as Bee-Safe Nursery Plants and Bring Back the Pollinators. The Covid pandemic greatly curtailed our in-person presentations, abruptly bringing to a halt the day-long workshops we had been putting on, as well as preventing us from attending meetings of garden clubs and other community groups. We hope to return to those soon, but one positive consequence of the lack of in-person workshops is that we have greatly expanded our online offerings. We

are now able to give talks to garden clubs remotely and have been presenting regular webinars that are freely accessible to anyone with an internet connection. Meeting face-to-face is always a pleasure, but webinars have the advantage of allowing many more people to join and, because they are recorded, they can be viewed on our YouTube channel at any time. We have heard from supporters across the United States that they are excited to finally be able to join a Xerces event—even if over video.

An unexpected dilemma facing gardeners is finding pollinator-friendly plants that are safe for bees. Although a growing number of plants in garden centers are marketed as being good for pollinators, many of them are treated at the nursery with insecticides that are harmful to bees. These chemicals remain in the plants while they're at the



Over the last two decades, pollinator conservation has gone from a fringe interest to a central concern of many communities. One reason for its popularity is that habitat can be created anywhere there is room. Photograph by Matthew Shepherd.



Pollinator conservation is ideally suited to small spaces—and the results are easy to see. Photograph by Matthew Shepherd.

garden center and then travel with them to your garden. The Bee-Safe Nursery Plants campaign provides gardeners with information that enables them to engage with garden-center staff to learn which chemicals the plants have been treated with and to let the retailers know that they want bee-safe plants.

Bring Back the Pollinators, which was launched more than a decade ago, is our longest-running outreach campaign. It is built around four principles, adaptable to any location: grow pollinator-friendly flowers; provide nesting and egg-laying sites; avoid pesticides; and share the word. Individuals can easily apply this framework to their backyards, park managers to city parks, business owners to their landscaping. It is backed by the Pollinator Protection Pledge, with which people publicly commit to adopting these four principles. More than twelve thousand people have made this commitment.

My role within Xerces has taken a few twists and turns, including many years focused on publications and com-

munications. Pollinators have remained a constant in my work, however, and I now find myself turning again, this time toward community engagement and conservation in towns and cities. Personally, I'm excited about this new direction. I've had the good fortune to work in some beautiful places, but some of the most satisfying and enjoyable times of my career have occurred in the seemingly mundane surroundings of parks, community gardens, school grounds, disused railways, and similar locations—places that provide important space for wildlife in disturbed landscapes, and that, for me, offer the joy of engaging with people to protect the places they value and the tiny creatures that live in them.

Matthew Shepherd has worked at the Xerces Society for twenty-three years. He is fascinated by the diversity, beauty, and behaviors of bees, and gets great pleasure from working with communities to protect their environment.

Women and Agriculture in the Midwest

Sarah Nizzi

The first female landowner I ever met was my great-aunt Alice, with whom I spent seven wonderful, close years. She was eighty-four years my senior and the firstborn child of Italian immigrants in 1905. Coal mines influenced where my ancestors traveled to call home, and the Shuler Mine in Waukee, Iowa, encouraged the Nizzis to relocate nearby to start their new life. As a female and the oldest of five children, Alice paved the way for prosperity. She was our matriarch. She purchased forty acres of land where she and her husband had a small farm, growing hay, corn, livestock, and poultry. In 1947 she also opened her own Italian restaurant, Alice's Spaghettiland, which remained in operation for more than fifty years, and which employed countless local women as well as generations of Nizzis. During my childhood, the land Alice owned no longer was home to livestock or poultry, but hay production was still active. I thoroughly enjoyed the privilege of exploring the grasslands, woodlands, and creek.

Despite the fact that Alice is my number-one role model, I never considered how fortunate we were to have this piece of paradise until it was gone. She passed away in 1997, and a few years later the farm was sold to a development company. The land is now a residential neighborhood. This was immensely difficult for me to accept, and to say that this experience motivated me to become a conservation professional would

be an understatement. I have often reflected on this period of my life and the land that shaped me, but I certainly did not recognize how monumental it was at that time for a woman to own land and to be the sole decision maker of the farm and property for so many years, on top of owning a thriving business. Now, with more than four years of working on private lands under my belt, I have a better understanding of these concepts, and I realize that my great-aunt Alice's story continues to be relatable for women today.

Many women play a major role in agriculture and land stewardship, and do so with a strong conservation ethic. According to the most recent USDA Census of Agriculture, female producers are the fastest-growing demographic in agriculture, with a 27 percent increase from 2012 to 2017. More than half of the farms in the United States are owned or co-owned by women, translating to more than three hundred million acres.

Although women have key decision-making roles on farms, they often confront gender barriers that affect their ability to manage land for their conservation goals. Some may also face obstacles such as not having access to equipment or not having support from family, friends, neighbors, and other community members. Incidents of women's knowledge, expertise, and ideas not being taken seriously by male peers and contractors also add to the already challenging task of getting every-

one involved working together. There are women owners who simply do not know what is available to them—or if they do know, are not supported by family or community, and feel overwhelmed by the task at hand, whether that be the implementation of sustainable practices or the process of signing up for technical and financial assistance for conservation work. For those non-operating landowners who do not directly farm their land, complicated social dynamics may mean that family, tenants, cooperatives, or others delay their conservation efforts and desires. And, in common with women everywhere, they are also often juggling multiple tasks and priorities at once: some are working away from the farm full or

part time, while others are caretakers for their own children or grandchildren, or those of others.

To help address some of these issues, the Women, Food, and Agriculture Network (WFAN) was established in 1997 for the purpose of bringing together as a community conservation-minded women in agriculture. The organization's mission is to “engage women in building an ecological and just food and agricultural system through individual and community power.” Since its inception, WFAN has launched three major programs: Harvesting Our Potential, Plate to Politics, and Women Caring for the Land. The last of these organizes women-only events designed to bring women in agriculture together to learn



Women have become increasingly influential in land stewardship and conservation decisions on farms, although not without obstacles. Insectary strip on mixed-vegetable farm in Minnesota, photographed by the Xerces Society / Sarah Foltz Jordan.

about technical conservation topics and conservation program opportunities. Most important, these events provide a space for women to connect with and learn from one another, and a great deal of time is spent in what is known as “learning circles,” in which each participant is encouraged to open up about herself, her operation, her hopes and struggles, and her conservation goals. Following the learning circle, attendees have the opportunity to hear about various aspects of agriculture-related conservation from resource professionals. A field component is also available for women to gain personal experience in sustainable agriculture and to learn directly from their female peers.

The Women Caring for the Land program has grown and been adopted

in a number of states over the years, and many organizations have created their own versions to offer to their local communities. The groups differ slightly in their approaches, such as some of them allowing men to participate in some capacity outside of the learning circles. These occasions can also include such activities as making baked goods, working on crafts, sharing recipes, and flower arranging. No matter the hosting organization, the gender of some of the participants, or their history and experience, the critical goals of these gatherings remain the same: to help women gain the tools, abilities, and resources they need to achieve their goals and aspirations on the lands they steward.

Xerces staff based in the Midwest have had the opportunity to host or



The Women, Food, and Agriculture Network pioneered learning circles and other women-only events to help women landowners and land stewards gain the knowledge and confidence to undertake conservation projects. Photograph by the Xerces Society / Jennifer Hopwood.



Making farm landscapes more supportive of crop pollinators like this sweat bee is frequently the focus of habitat improvements. Photograph by Bryan E. Reynolds.

participate in more than a dozen learning circles and other women-focused events in Indiana, Iowa, Minnesota, and Wisconsin. These have been conducted in partnership with WFAN as well as with Women 4 the Land, Pheasants Forever, the USDA, the Wisconsin Farm Bureau, and the Wisconsin Farmers Union. Our role as resource professionals is to offer presentations to the attendees and to answer questions throughout the event. We bring another facet to these occasions, however, because several of our female (and male) staff are personally involved in agricultural work. Outside of our day jobs, we are managing vegetable farms, orchards, and native-plant seed production; other staffers are undertaking prairie restoration on their own lands. In these efforts we apply the habitat practices we often speak about professionally, such as planting native insectary strips, hedgerows, and flowering cover crops. Thus our work with land stewards

comes very naturally, and we attend these meetings as both peers and resource advisors, bringing our real-world skills and personal experiences to share.

Participating in such events has been particularly enjoyable. It has been enlightening to hear the many stories and to be immersed in an environment in which vulnerability is welcomed and accepted. Evaluations from these gatherings have shown that the vast majority of attendees are very likely or extremely likely to sign up for a USDA conservation cost-share program, for example, or to contact a resource professional who was present. Xerces staff know this to be true, as we have been invited to provide technical assistance for multiple women after these events.

There is one example that for me demonstrates the value of our work, and that also highlights the obstacles women can face in bringing their conservation dreams to fruition. I was contacted by a woman landowner, who,



Even such relatively small projects as creating a wildflower insectary strip may require significant resources and equipment that some women land stewards lack. Photograph by Kathleen Holman.

having thoroughly enjoyed the joint WFAN-Xerces workshop and being inspired thereby to take action, was interested in converting about six acres of crop ground to pollinator habitat. I made a field visit to the site soon after and we began the planning process. As we walked the property, we discussed the current operation and history of the site, future life plans, the process of habitat restoration, and, lastly, financial assistance. She was taken aback by the amount of work required to create pollinator habitat, and for a single woman and non-operating landowner without her own equipment and lacking connections to local contractors or family for help, it became increasingly clear that she was not ready to take this step. Despite the inspiration that had sparked within her, and notwithstanding her best intentions, she ultimately decided to hold off.

It can be easy for us to lose sight of the difficulty of this work and disregard

our own experiences and the question of who is footing the bill, and to unintentionally push clients towards taking action without considering whether it makes sense for them to do so. I would much rather have a client pause and think more about their particular situation than rush into a project and feel overwhelmed and ultimately unhappy with the results. We do not want to set anyone up for failure. I am grateful to have had this experience early in my Xerces career, since it has improved my ability to help others as I'm now more likely to recognize when an individual may be in over their head. I think these experiences are worth sharing, and even though this project did not go through, that is okay. When, down the road, this landowner is ready to take that big step, she will know where to turn and who to talk to for assistance, confident that the advice will be trustworthy.

Xerces staff work with many female land stewards—more than two-thirds

of the Midwestern farms we have partnered with in recent years have owners or conservation decision makers who are women. It is important for us to understand the technical, cultural, and social needs of this demographic, and we continue to seek women-focused opportunities, to connect with diverse groups of women operators and non-operators, and to expand this effort beyond the Midwest. We acknowledge that events like learning circles don't meet the needs of all women, and that not all of us enjoy crafts, baking, and flowers—nor do we all feel comfortable sharing our stories with people we don't know. But incorporating conservation practices is no easy task, especially single-

handedly, and for us it is paramount to take the time to listen, recognize, and engage with people as individuals. Connecting people with one another can be equally valuable, since community helps build relationships, knowledge, and empowerment. The more that conservation-minded individuals unite, the more positive change we can make for sustainability and biodiversity.

Sarah Nizzi works as a pollinator conservation planner in her home state of Iowa, where she provides assistance to farmers and landowners, and trains staff from the NRCS and other organizations on pollinators and pollinator habitat.



Despite various challenges, many women farmers successfully create habitat to enhance their land. Photograph by Karin Jokela, Xerces conservationist and farmer.

STAFF PROFILE

Deborah Seiler, Director of Communications

What got you interested in insects? It was the ants. I took a tropical ecology course in Panama while I was attending UC Davis. Walking into the rainforest for the first time was a complete sensory overload. Intellectually I knew that the tropics had extravagant biodiversity, but experiencing it was bewildering in the truest sense of the word. The ants were everywhere: leafcutter highways in the forest, strange ants in strange nests in the trees, bullet ants with their steady, solitary plodding. The ants weren't the most beautiful or colorful thing I saw, but their impact was undeniable.

What made you want to work at Xerces? The dream is to do the type of work that you're good at for the cause that you love. I have the deepest love for invertebrates. They are gorgeous, diverse, overlooked, imperiled, resilient, colorful, and necessary to life. They are myriad and undiscovered, so we'll never run out of new things to learn. They are beloved, so there's a dedicated base of scientists, gardeners, bee and butterfly groupies, and conservationists to work with.

What's your favorite place to visit? Since I grew up in the Sierra Nevada foothills, that landscape is rooted in my heart. I remember long runs in dusty canyons, jumping off hot rocks into cold rivers, cutting through blackberry vines behind the house with my brothers, and eating my mom's blackberry cobbler. I feel grateful to have grown up in such a beautiful place.



Who is (or was) your environmental hero? We should all be listening to Greta Thunberg. I'm a millennial who grew up knowing about climate change. Ironically, I actually decided against doing my Masters' research on climate change communications because I thought the urgency and solutions were so glaringly obvious that it wouldn't make for a sustainable career. (Called that one wrong.)

I'm embarrassed to be an adult now who hasn't solved the problem, and I think Greta speaks so well to the outrage and urgency we should all be feeling: "Some people say that I should study to become a climate scientist so that I can 'solve the climate crisis.' But the climate crisis has already been solved. We already have all the facts and solutions. All we have to do is to wake up and change."

Good News Mixed with Caution for Monarch Butterflies

The Xerces Western Monarch Thanksgiving Count for 2021–22 tallied nearly a quarter of a million monarch butterflies overwintering in California, a more than hundredfold increase from the fewer than two thousand counted in the previous year, and the highest total since 2016. This is a remarkable one-year change, giving hope for a struggling population.

We are still waiting for results of the survey of overwintering monarchs in Mexico, which have typically been released in February. Returning monarchs have already reached northern states.

While this year's bounce in the numbers from California is a step in the right direction, the evidence we have indicates severe declines in eastern and

western populations over recent decades. Western monarchs have declined more than 95 percent since the 1980s, and the eastern population by at least 70 percent since the 1990s. We have a long way to go to recover this species, and many unresolved challenges.

Much of the monarch's eastern range is now dominated by fields of corn and soybeans genetically modified to allow large-scale herbicide use, which eliminates milkweed, the monarch caterpillars' host plant. Additionally, insecticides are implicated in monarch decline, with research by the Xerces Society and the University of Nevada at Reno documenting high levels of pesticide residue in milkweed collected from wildlands, farms, and locations in cities



Monarch butterfly nectaring on swamp milkweed. Continued conservation effort is needed to help monarch populations recover. Photograph by the Xerces Society / Stephanie McKnight.

and towns. Loss of overwintering sites is also a threat, with logging encroaching into sites in Mexico and development pressure along the California coast.

Federal and state agencies, tribes, and many nonprofit organizations are working to protect and restore habitat for these butterflies. The Xerces Society has been leading efforts to implement habitat projects with partners in communities across the migration routes and breeding areas of both the eastern and western monarch populations. Our applied science and community science efforts provide vital information that allows us and our partners to make informed conservation decisions.

In California, our work has led to restoration at overwintering sites along the coast, while inland we have worked with farmers and others to install almost eighty miles of hedgerows that contain nectar plants and milkweed. Through our habitat kit program, in the past three years we have distributed more than 105,000 pollinator plants

(including nearly 44,000 milkweeds) for projects in areas of importance to monarchs. Our work in the Midwest and in eastern states focuses on providing breeding and migratory habitat.

Outreach to engage farmers and technical assistance to support on-the-ground conservation are vital. In 2021 alone, Xerces staff presented 111 outreach events attended by more than 29,500 people, and provided technical support to 408 growers, agencies, conservation organizations, and other landowners in 39 states. Our policy work includes helping draft and pass legislation such as the Monarch and Pollinator Highway Act of 2021, which was successfully attached to the Infrastructure Investment and Jobs Act of 2021.

The good news from California shows that the concerted conservation effort is having an impact, but we know that for the current populations to be sustained and grow further, closer to recovery, requires continuing work. We're here for the long haul.

2022 Joan Mosenthal DeWind Awards

Every spring, the Xerces Society gives awards to students engaged in research related to Lepidoptera conservation. These grants, made possible through the Joan Mosenthal DeWind Awards program, were established by Bill DeWind in his wife's honor. We are thrilled to announce this year's two awardees, both PhD candidates: Chris Cosma and Brendan Carson.

Chris Cosma, based at the University of California–Riverside, is studying moth pollen-transport networks in dryland habitats of southern California. Research has shown that moths are

generalist pollinators of entire plant communities, playing a crucial role in pollen-transport networks. Chris aims to increase understanding of the structure and stability of these networks in the Southwest, particularly in light of climate change. His work can inform conservation strategies by identifying species at risk and those that are particularly important for community stability.

Brendan Carson, who is at Tufts University, is investigating how a novel densovirus (known as JcDNV) is spreading among Baltimore checkerspot butterflies (*Euphydryas phaeton*) in New Eng-

land. This particular virus was recently found in a number of Baltimore checkerspot populations. The butterfly is of conservation concern in some parts of its range, and there is speculation that

this virus could be a factor in large population fluctuations that have been documented. Brendan's research may help to predict how the virus might spread in a population.

***X Kids*: Our New Children's Activity Book is a Hit!**

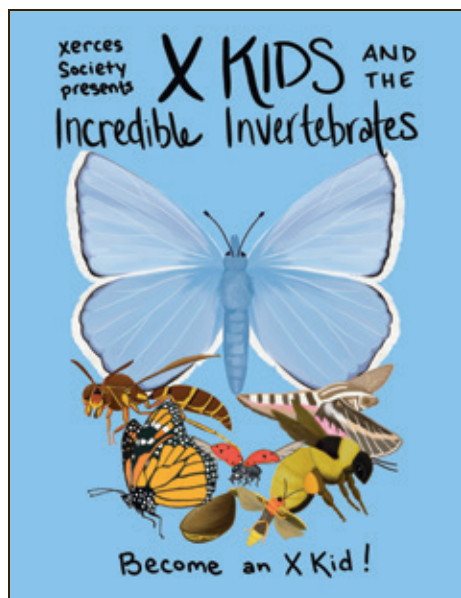
In late February, we announced the release of *X Kids*, a new activity book that uses storytelling and science-based activities to help children discover the environment around them. Led by Blue, a lovable butterfly, children learn about the invertebrates in their own neighborhood and the "superpower" of each of those species, including buzz pollination, water filtration, predation, and communication. When they have completed all the activities, children can receive a wooden *X Kids* badge to proudly wear or display.

X Kids was designed for children in grades three through five and is avail-

able in English and Spanish. The activities can be done individually—are you looking for a summer activity for your children?—but can also easily be done in a classroom or in a group. Although they reach national science standards, they do not require any materials beyond what can be found at home.

Despite being launched in winter, a poor time to see invertebrates in much of North America, *X Kids* has already been a hit! The PDF versions of the booklet have been downloaded more than two thousand times from our website and hundreds more printed copies have reached the hands of children at events and via nature centers and other organizations. We know of schools that are using *X Kids* in the classroom and of individual families in the United States and Mexico that have spent happy hours with it, and, in Canada, *X Kids* has been adopted as a troop activity by Girl Guides in British Columbia, Ontario, and Newfoundland. And this is just the beginning: many copies are waiting to be used this spring and summer at after-school programs, nature camps, library activity days, and other events.

X Kids was created by a team of Xerces staff and our volunteer Ambassadors, with support from LandPaths. Thank you to Indiana 4-H Youth Development and the many individuals who tested the activities. To download the activity book, please visit xerces.org/xkids.





Support Xerces Through Our Online Gift Center

Support conservation and spread the word about the importance of pollinators by displaying this sign—available in either Spanish or English—in your yard. Unique to the Xerces Society, this durable and sturdy sign is designed for outdoor use, and has two holes for attaching to a fence or post. You can place it in your garden, on your farm, or in a park, or give it to a friend.

“I want to tell you how much I love it! It is absolutely beautiful and right on the mark in every way—size, number of words, colors, selection of pollinators and plants. I will be proud to display it in my garden.”—*Xerces Member*

You can find the pollinator habitat yard sign, along with *100 Plants to Feed the Monarch* and our other books, available for a donation in our online gift center: xerces.org/gifts.

Xerces Gains Accreditation from BBB Wise Giving Alliance

We’re proud to announce that the Better Business Bureau Wise Giving Alliance has accredited the Xerces Society. The BBB WGA is the nation’s only comprehensive charity evaluator, assisting donors in making sound giving decisions. Its rigorous evaluation goes beyond legal requirements and it dives deeper than other charity-monitoring organizations, ensuring that charities meet key standards for board oversight,

finances, results reporting, and fundraising appeals.

“The public can be assured that every evaluation is completed with careful, objective analysis of charity information,” said Art Taylor, president and CEO of the BBB WGA. “The Xerces Society has earned public trust, having demonstrated its commitment to sound governance, transparency, and achieving its mission.”

REMEMBRANCES

We have recently lost two significant friends of the Xerces Society, both of whom were giants in the field of biological conservation, and both well remembered elsewhere.

Following are some personal recollections and thoughts by Xerces founder Robert Michael Pyle on each of the men, their confluence, and how they both influenced the work of the Society.

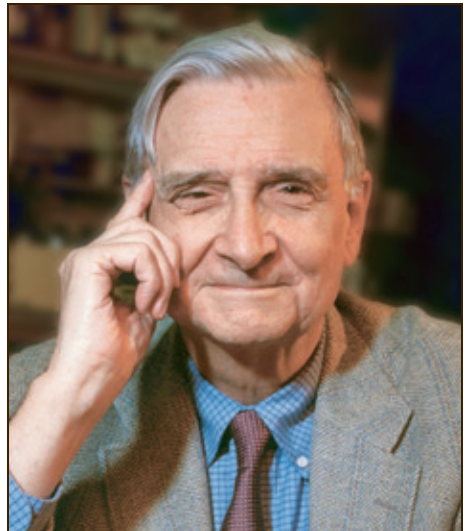
Edward Osborne Wilson (June 10, 1929–December 26, 2021)

Best known as a myrmecologist, E. O. Wilson possessed a curiosity and brilliance that spanned the intellectual spectrum. He received two Pulitzer Prizes: one for a book on human beings, the other on ants. I don't know of anyone other than Charles Darwin (of whom Wilson is commonly considered the only real modern counterpart) who had so much influence on so many different areas of life science. Besides being the "king of the ants," he founded several whole branches of biology, among them the theories of biophilia and (with Robert MacArthur) island biogeography. Later he became the world's primary spokesman for the conservation of biodiversity, constantly innovating new ways to advance that agenda.

I met Wilson during the earliest years of Xerces. My trips from New Haven to Boston to conspire with Xerces co-director Jo Brewer would often include a side jaunt to the Museum of Comparative Zoology at Harvard, where Wilson taught for more than forty years and curated insects even longer, to seek his advice on our plans and schemes for the young society—much of which we followed. His door and lab were always open to me. I remember one visit in particular that I followed with

one of the last concerts of Rod Stewart and the Faces at the Boston Garden, shortly before Ronnie Wood became a Rolling Stone. A huge fan, I pondered on the train home who had made the greatest impression on me—and I had to conclude it was Wilson.

Many years later, he and I comprised the biological contingent at a conference on biophilia and the built environment in Rhode Island. The unusual opportunity to hang out for a couple of days gave me the chance to plumb his thoughts on how we were doing on



invertebrate conservation. His irrepressible optimism, faith in nature, and bottomless well of ideas gave me a strength I hadn't felt for years.

But my keenest recollection of the man comes from a ferry ride to Martha's Vineyard for his investiture with the John Hay Medal from the Orion Society, along with longtime Xerces advisor and my mentor, Charles L. Remington of Yale. I count that hour, listening to the free, witty interplay of two of the greatest entomological minds of our time, as one of the most charmed and meaningful afternoons of my life.

As the Xerces Society's first executive director, Melody Mackey Allen recruited the very best insect scientists and spokespeople as the organization's

presidents. This was enormously important. The fact that E. O. Wilson took on the office made all the difference in the world to the Society's acceptance, respect, reputation for reliability, and ultimately prestige among the entomological and conservation establishments. Nor was he a figurehead—when the situation called for it, E. O. was personally involved.

In a word, absent Wilson, Xerces might not be anything like the organization we know today. It is largely due to Ed that the phrase he uttered and we so often use — “the little things that run the world”—has come to be so highly respected, along with the name “The Xerces Society,” throughout the conservation community.

Thomas Eugene Lovejoy III (August 22, 1941–December 25, 2021)

Tom Lovejoy died just one day before E. O. Wilson, on Christmas. Tom was the final Yale graduate student of Evelyn Hutchinson, the originator of the

theory that became known as “the ecological niche.” His PhD thesis concerned warbler migration, and during his studies of these birds in Latin America, he was smitten by tropical biology. In 1979, Lovejoy founded the Biological Dynamics of Forest Fragments Project near Manaus, Brazil, to investigate the effects of the fragmentation of tropical rainforests on ecosystems and wildlife. This was one of the first, and is still the largest and longest, experimental test of MacArthur's and Wilson's theory of island biogeography, which it has largely borne out. In this way Wilson and Lovejoy combined theory and practice so as to create one of the most important measures and models for tropical-forest conservation anywhere.

Tom also put on (with Bruce Wilcox, another friend of early Xerces) the First International Conference on Research



in Conservation Biology, held in La Jolla, California, in September 1978. The famous “brown book” that came from this meeting became the initial operating handbook for this new field. I was present for that meeting, and can vouch for its impact on both the theory and practice of everything Xerces does.

Even earlier, during the World Congress of Entomology in Washington, D.C., in June 1976, Tom hosted the first meeting of the IUCN Lepidoptera Specialist Group in his capacity as chief scientist for the World Wildlife Fund–U.S. This meeting boosted both the Lepidoptera Specialist Group and Xerces, and established the migratory monarch phenomenon as the first priority in butterfly conservation. Five years later, Tom and I traveled with Lincoln Brower and Melody Allen to Mexico to assess

the status of monarchs and negotiate with Mexican authorities, including Michoacán Gobernado Cuauhtémoc Cardenas, over their future. On our first visit, a blizzard overtook our encampment, my luggage didn’t arrive, and I had to borrow long underwear from Tom; that was only one of his many contributions to monarch conservation.

On another trip together, we descended a deep mine in the Sierra Nevada to see and champion a millipede that was at risk of being the first rare invertebrate knowingly extirpated by a development project. That dam was never built.

These examples only hint at the many ways Tom Lovejoy helped to bring invertebrates to the fore, in the course of one of the most distinguished careers in all of conservation biology to date.

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For information about membership and about our conservation programs for native pollinators, endangered species, and aquatic invertebrates, as well as our efforts to reduce the impacts of pesticides, please visit our website.

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THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

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The banana slug is commonly seen in forests along the Pacific Coast from central California northward. Photograph by Matthew Shepherd.

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On the cover: While feeding, the milkweed longhorn beetle often appears to be peeking at passersby. Photograph by Sarah Foltz Jordan.