# *WINGS*

## ESSAYS ON INVERTEBRATE CONSERVATION

THE XERCES SOCIETY FALL 2016

# CONTENTS

This issue of *Wings* presents a series of articles by Xerces staff members describing some of the work we do, from local efforts to ones that are international in scope.

# Dispatches from the Field

*Scott Hoffman Black*

During our annual retreat early this fall, the Xerces Society staff spent several days talking about what we have accomplished over the last year, which projects have worked well and why, where we can make improvements, and what direction we should take in 2017 and beyond. Planning ahead has always been an essential part of ensuring that Xerces' work remains effective, but it has become more important as the organization continues to grow.

Growth is important, but it is not the most important measure of success. The metric that counts is what we have achieved—and by this measure, Xerces has had its best year yet, including:

- Seven species of Hawaiian yellow-faced bees were protected under the Endangered Species Act.
- One species of bumble bee, the rusty patched, was proposed for ESA protection.
- Thirteen communities across the country adopted policies to protect pollinators from pesticides.
- More than 150,000 acres of habitat were created, enhanced, or restored for pollinators.
- More than nineteen thousand people were reached through workshops and other events.

In addition, we are playing a leading role in protecting the monarch butterfly in the United States, Mexico, and Canada—working with multiple city, county, state, province, and national agencies, as well as with nonprofits and individuals, to push for monarch conservation at all levels.

Theoretically, conserving invertebrates should be simple: provide the habitat that they need and in most cases they will thrive. But, in practice, our work has shown us that conservation is hugely complex. We are grappling with some of the biggest problems of our time, including habitat loss and degradation, invasive species, pesticides, wildlife diseases, and climate change. The invertebrates of streams, meadows, and forests don't need just habitat, but they need habitat that is connected across the landscape to allow for adaptation to climate change, and that is sufficiently resilient to provide sanctuary from pesticides and disease. Our efforts necessarily include science, politics, outreach, and education, and our organization must have the ability to understand, and adapt to, a constantly shifting conservation landscape.

This issue of *Wings* offers a series of short articles—dispatches from the field—illustrating the ways in which Xerces staff are addressing some of these important issues: protecting habitat from pesticides, surveying for rare invertebrates, fostering pollinator conservation in urban areas, assessing the health of bumble bee populations across the Americas, and researching monarch migration in the western United States.

# Conserving Pollinators on Farmland

*Scott Hoffman Black*

There is a growing conversation in conservation circles about the role that agriculture plays in the health of pollinator populations, and for good reason. About half of the U.S. land base is in agriculture, and if we truly want to ensure a long-term future for pollinators, then conservationists and farmers must find ways to work together.

Farms come in a wide range of shapes and sizes, from small, family-run enterprises to huge operations managed by equally huge corporations. They also have widely varying impacts on pollinators. While many farmers are leading voices for environmentally responsible management, it is unfortunately the case that large, homogeneous agricultural landscapes are often devoid of habitat for pollinators, and the large-scale use of pesticides has been implicated in both honey bee kills and the decline of our native bees and butterflies.

**Providing habitat for bees and other pollinators is increasingly challenging due to the presence of pesticides in many landscapes. Photograph by Bryan E. Reynolds.**

A recent study—titled "A horizon scan of future threats and opportunities for pollinators and pollination," and published in the journal *PeerJ*—identified "corporate control of agriculture at the global scale" as a top risk to pollinators. On the more positive side, the authors also found significant opportunities within large-scale agriculture for protecting pollinators in the future.

Anyone who works on these issues will easily recognize the truth of both conclusions. In the conservation world, most of us realize that success in protecting and restoring pollinator populations can be achieved only if farmers are part of the solution—although it is still not clear how we can best work with the largest farms to accomplish this. Two things, however, are certain. The first is that large farms have a negative impact on the environment and are a major driver of pollinator decline. The second is that they do not have to be.

Two of the crops with the largest acreages in the United States are corn and soy, and the way that these crops are currently managed is enormously destructive of pollinator habitat. There are more than ninety million acres of corn in the United States, mostly grown in vast monocultures of genetically modi-

**This Pennsylvania apple orchard has installed the habitat in the foreground to support bees that will pollinate the springtime bloom. Careful planning is required to minimize risk from pesticides applied to the trees. Photograph by the Xerces Society / Kelly Gill.**

fied plants that are treated with systemic insecticides and repeatedly sprayed with herbicides that kill all non-crop plants, including those that would otherwise sustain pollinators.

In one particularly notable example, the impact on monarch butterfly populations has been devastating. It is estimated that since the early 1990s more than 1.3 billion milkweed stems have disappeared in the Midwest, primarily from agricultural and grassland habitat. Approximately 75 percent of this loss is attributed to use of the herbicide glyphosate on corn and soy. The removal of milkweed plants on this scale has contributed to a greater than 80 percent decline in monarch butterflies and a greatly increased risk that their migration will disappear in our lifetimes.

The harm to pollinators is not coming just from corn and soy, of course. Many other crops are similarly grown in large monoculture stands and with the heavy use of pesticides, including 1.1 million acres of almonds in California alone. Although they provide a massive burst of bloom in late winter, most almond farms are devoid of natural habitat, and more than 80 percent of the commercially managed honey bees in the entire country are brought to California each year just to pollinate this crop. This is simply not sustainable in the long term.

Obviously each farmer and farm is unique, and promoting conservation requires a variety of approaches. In many cases, individual farmers are embracing conservation practices even though

they may not have been adopted by the industry as a whole. Some large, innovative almond growers, for example, are working with Xerces to add habitat that is safe for honey bees and native pollinators. We helped one almond farm put in more than five miles of pollinator-attractive hedgerows and plant acres of flowering meadows, and worked with the farm manager to develop overall strategies to protect these habitat areas from pesticides.

And this brings us to a point that cannot be stressed strongly enough: to truly protect bees and butterflies, agricultural producers need to be willing to make real, substantive changes to the way they operate. Incorporating elements of pollinator habitat, while important, is not enough in and of itself. Farmers also must commit to protecting these areas from toxic pesticides.

Insecticides, herbicides, and other pesticides don't stay put. Through drift and runoff they can be transported into areas far from where they are applied. This critical issue has to be addressed with all habitat restoration projects in agricultural landscapes. A variety of studies from the United States and Europe show that habitat adjacent to fields where insecticides are applied may be toxic to pollinators and other beneficial insects that rely on that habitat for food and shelter. Projects that place habitat within areas where insecticides are used can have an effect opposite to what is intended, drawing pollinators and other wildlife to what seems to be a place they can thrive, only to poison them. On top of the devastating effects on pollinators, installing habitat that is exposed to pesticides is a waste of limited resources. Restoration is expensive,

**Flower-rich, native plant habitat is best for native insects, and should be protected from pesticides to ensure their survival. This Montana farm is organic, reducing the risk. Photograph by the Xerces Society / Jennifer Hopwood.**

and we should prioritize areas where we know that the habitat will be protected from pesticides, thus offering the most benefit to pollinators for the long term.

To achieve a secure future for pollinators, though, it won't be enough to have isolated patches of habitat, even if they remain pesticide-free. To do the job right, we must change the way we approach food production altogether. We need to move away from the "silver bullet" mentality—the belief that we can solve any agricultural problem by resorting to some chemical or another. As things stand now, chemicals are applied in many cases even when there is no actual problem to be addressed. It has been estimated that up to 44 percent of soybean seeds and nearly 100 percent of corn seeds are coated with insecticides prophylactically, that is, treated regardless of whether or not pests are present. Researchers at multiple universities and the U.S. Environmental Protection Agency have concluded that there are very few pest problems solved by the application of systemic insecticides to the seeds of soybeans. The data also show, moreover, that the insecticides used as seed treatments are likely harming bees, birds, and aquatic organisms.

The common sense approach would be to stop using pesticides that do not solve a problem and that do, in fact, create harm in the environment. Protecting and restoring our bee and butterfly populations will require us to move to a more sustainable farming approach, employing Integrated Pest Management and using insecticides only when other methods are not feasible or effective—and, even under those circumstances, adopting appropriate, pollinator-safe methods for their application.

Unfortunately, some members of the agricultural community, including, not surprisingly, the chemical companies that produce the pesticides, have been resistant to eliminating prophylactic use. For large chemical companies, their profits are dependent upon how much pesticide they sell, and an approach that is beneficial for pollinators will inherently entail the use of lower amounts of pesticides, applied in a far more targeted manner. With the pesticide industry responding primarily to shareholders—who tend to care most about increasing financial returns—pollinators will continue to lose out.

If we cannot get pesticide manufacturers to agree to eliminate pesticides when they are not needed, I do not see how we bring these same people to the table to help solve the large problem of pollinator declines. Even the prospect that the monarch butterfly might be listed as a threatened species has not substantively altered the dynamic at these large chemical companies. Their public relations staffs have been changing their messaging, but we are not seeing any changes in the way their products are marketed and used.

Yet, in the face of this challenge, many farmers are stepping up to make significant changes. The farmers we work with have a strong environmental ethic: they love their land and their way of life, and they have no desire to harm the environment. Hundreds of farmers, with acreages of all sizes, are working with us to implement pollinator habitat projects. From farms in the Northeast with crops such as blueberries and cranberries, to farms in California growing

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# On Being an Invertebrate Conservation Detective

*Candace Fallon*

"So, what exactly is it that you do?" I get this question pretty frequently from friends and family members who are perplexed by my career or envious of my time spent outdoors. In that moment, it is very easy to romanticize my work life. The vision of the conservation biologist in pursuit of a butterfly through a flower-filled meadow or snorkeling through crystalline mountain streams searching for rare aquatic snails is not that far from the truth—and I admit that I've had the pleasure of doing both. But there is, of course, so much more. This, also, is the biologist's realm: entering data and maintaining databases, working on large research and writing projects, collaborating with coworkers and researchers from around the country, connecting with volunteers and citizen scientists, and providing advice on conservation or research needs to decision makers and land managers.

At its core, conservation biology is the study and protection of biodiversity. I work in our Endangered Species Program, which means that I focus on invertebrate species that are rare or declining, or that are not understood well enough to determine their status. Most of the work I do at Xerces revolves around mapping the distributions of such species, understanding their habitat and life history needs, determining threats to their wellbeing, and working with a wide group of people—from public agencies to private land owners, from research specialists to the general public—to advocate for and protect imperiled species and their habitats.

Every spring and summer, I head out to the field to monitor and collect baseline data on a number of these animals, including snails, butterflies, caddisflies, and beetles. Much of this baseline data collection takes the form of simple presence/absence surveys. The Xerces Society has an ongoing contract with the U.S. Forest Service and the Bureau of Land Management in Oregon and Washington to survey for invertebrate species that they have designated either "sensitive" or "strategic." These agencies want to know whether or not a species occurs on lands they manage, and, if so, what its distribution is, what habitats it needs, and whether there are any related management concerns.

In doing this type of work, I feel like I'm taking on the role of an invertebrate detective. Take, for example, the northern forestfly (*Lednia borealis*), a species of stonefly known only from snow- and glacier-fed streams, seeps, and inlets to alpine lakes in Washington. At the moment, we have verified records of this species only from Mt. Rainier National Park and several locations in the North Cascades. We do not know very much about what this stonefly eats, how abundant it is in the landscape, or even where else it may occur.

Does the northern forestfly live in other regions of the state? Given its association with cold, glacier-fed waters and the fact that Washington, with 173

square miles (449 square kilometers) of permanent ice or snow, is the most glaciated state in the lower forty-eight, it certainly seems possible that the species might be more widespread than we know. Pretend for a moment that you are a conservation biologist working to understand this species' distribution. What if you had just four days of funding to search for this animal? Where would you go? Would you visit a lot of easily accessible sites to maximize your geographic coverage? Or would you focus on just a few high-promise but less-accessible areas? How would you time your surveys? Are you searching for a particular life stage? What about site access? Who manages the land you wish to survey? Do you need permits? What are the road conditions? Are there wildfires in the area? Do you need to backpack in and camp overnight in order to survey your sites? What equipment will you need for the trip?

This question-and-answer process can take a while. It involves searching the literature, scouring museum records, and talking to experts with knowledge of the group to which your target species belongs. Once you have done your homework and set a general plan in place, it's showtime. Just keep in mind that the plan may very well end up having to be drastically modified on the fly. Over the years, I have found that two critical components of a successful field survey are flexibility and a good sense of humor. Lose the sole of your shoe eight miles in? Not in the plan. Discover that your field site is on fire? Also not in the plan. Wake before dawn to drive seven hours to a site for stream surveys, only to find yourself in the middle of a lightning storm? Definitely not in the plan.

**Many of the rare species that Xerces staff search for and survey live in remote locations such as the Goat Rocks Wilderness in southern Washington. Even the "morning commute" requires careful planning. Photograph by the Xerces Society / Candace Fallon.**

**Time spent undertaking surveys in the field is just one small part of most projects involving rare species, although probably the most idyllic. It is followed by long hours at the desk and computer, identifying specimens and compiling data. Photograph by the Xerces Society / Candace Fallon.**

To deal with some obstacles, you can get creative. With others, you just have to laugh and move on to Plan B (or C, or D).

But back to the task at hand: trying to find an obscure stonefly. Assuming that all goes well and you find yourself standing at your field site, take a few minutes to observe the location and write down notes about the habitat, weather conditions, and any other pertinent details. Look at the landscape as a whole and then home in on features specific to your area. Based on what you know about this species, what microhabitats look especially promising? What other species and resources are present? Are there any unique features that seem to be closely associated with the target species? Start turning over rocks and sweep-netting the vegetation. Do you see any adults flying around or nymphs scurrying in the creek? Because stoneflies can be extremely difficult to identify in the field, you will need to collect a small representative sample of the population to check under a microscope later on.

After all of your surveys are complete and you are back in the office, take some time to review your notes. Fill in any missing details while the experience is still fresh in your memory. Then enter all the data into the appropriate database, download and organize your photographs, and check on your specimen vials. If you have a contract in place with a taxonomic expert, send out your collections with your tentative IDs and prepare to wait a few weeks. Getting the results back always feels like opening a present. What did you discover? Did you find the target species? What other spe-

cies were there? Are any of them new to science? How do these new records add to the overall picture we have of this species? If the species was not found, why do you think this was the case? What implications do your findings have for land managers? What additional research and monitoring are needed to characterize the biology of this species, and, ultimately, to protect it?

These are just some of the things I want to tell someone when I'm asked what I do. I want to explain that crawling around the forest looking for snails under logs is actually just one small part of the much bigger effort to understand and protect the incredible biodiversity all around us. It's not always possible to take the time to spell all this out, so if you ask me whether I actually get paid to swing butterfly nets and climb mountains, I may just flash you a huge grin and say, "Why, yes. Yes I do." But now you'll know more of the story.

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*Candace Fallon is a conservation biologist with Xerces' Endangered Species Program.*

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tomatoes and almonds, farmers are taking action. We are also working with large commodity growers of wheat, oats, and corn. Since 2008, the Xerces Society has been partnering with the USDA Natural Resources Conservation Service and farmers on a joint effort that so far has resulted in the implementation of pollinator habitat improvements on almost four hundred thousand acres of American farmlands. Even some cattle ranchers are acting to help pollinators by changing rangeland management to allow wildflowers to flourish.

Some food companies are stepping up as well. Xerces is working with corporations such as General Mills and Whole Foods Market to encourage their supplier farms to incorporate pesticide-free habitat. Through these changes, our partners are on track to fully integrate healthy habitat and reduced-risk pesticide practices into hundreds of thousands of acres of agricultural land over the next decade.

Given that more than 40 percent of the land area of our planet is in some kind of agricultural production, the way in which that land is managed has to be part of the solution. Can we really expect to persuade the majority of agricultural producers to do what is needed to protect pollinators, water quality, and the other ecosystem resources that are important to life on Earth?

Although that jury is still out, I do have hope, because the farmers and the companies we partner with are demonstrating that the necessary steps can be taken. I believe that we should let these innovative farmers, together with the companies that buy their products, help to show others the way to produce the food we need while at the same time providing a nurturing environment for all of the animals that share this planet.

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*Scott Hoffman Black is the executive director of the Xerces Society. He has more than three decades of experience with protecting insects from pesticides.*

# Ecosystems at Our Doorsteps: Protecting Urban Pollinators

*Aimee Code*

Growing up as a city kid in Pittsburgh, I was fortunate that my parents made sure I had a healthy dose of outdoor fun. I spent my summers roaming the neighborhood, climbing trees, creating worm farms, and exploring Frick Park, where I could follow butterflies through dappled sunlight (only occasionally landing myself in stinging nettles).

My urban adventuring taught me the importance of experiencing nature close to home. As an adult I chose a career in conservation to protect the ecosystems that feed our souls and provide for our survival. Researchers recently announced that more than half of the land on Earth has crossed the "safe" limit of biodiversity loss, compromising the planet's resiliency and putting it at risk of ecosystem collapse. The foundational species that serve vital ecological functions such as pollination, pest control, and regulation of the global carbon cycle are dwindling. In North America, more than 17 percent of the butterfly species and 28 percent of native bumble bee species are at risk of extinction.

The Xerces Society works to reverse the troubling trend of species loss. One component of this work is focused on protecting pollinators in urban areas. Since 2014, Xerces has helped eighteen communities and thousands of individuals from across the United States to create gardens, parks, and open spaces that are safe for pollinators and other wildlife. A main thrust of these efforts is to halt the use of neonicotinoid insecticides, which are both highly toxic and long-lived. Beyond removing these bad actors, we work more deeply to provide native pollinators the three things they need to survive: a diversity of flowers to supply nectar and pollen throughout the growing season; places to nest, such as undisturbed bare ground; and areas safe from pesticide exposure.

On the surface these urban campaigns are relatively simple. Habitat is enhanced and pesticide use is reduced. But, in practice, these efforts require a thoughtful approach to pest management that recognizes the value of insects and seeks long-term sustainable solutions to pest problems. In many ways, we're asking for a paradigm shift that breaks the reliance on pesticides.

First, reconsider what constitutes pest damage. Holes in the leaves of a plant aren't necessarily signs of a problem but possibly an indicator that your garden is a haven for a multitude of insects. Caterpillars generally feed on the host plant where they were born, and many native bees cut pieces from leaves and petals with which to line the cells of their nests. Even if the holes were made by a pest, it can actually be helpful to have a few in the garden to provide food for beneficial insects and songbirds, which in turn help keep the overall pest populations in check. Furthermore,

low-level pest populations are unlikely to cause irreparable damage, since plants can survive a modest amount of insect feeding without adverse effects. If we think about the value of insects in our world, a garden without any indication of their presence is cause for alarm.

Second, when an insect or other pest problem does warrant intervention, don't immediately reach for a pesticide. Rather, consider what factors are allowing the pest to thrive. Pests are most often just the symptom of a problem, and using a pesticide won't fix the underlying issue. For example, when garden plants suffer from the fungal disease powdery mildew it might be due to insufficient airflow, inadequate sunlight, or too much fertilizer. Providing air circulation and sunshine and being careful not to over-fertilize will help avoid or eliminate the disease, while applying a fungicide would alleviate the symptoms only temporarily and could have unintended consequences. A growing body of research has shown that, despite most fungicides being classified as practically non-toxic, their use can harm pollinators.

Third, support a variety of beneficial insects in your garden. Xerces promotes conservation biological control, a strategy that seeks to integrate native insects back into systems to provide natural pest reduction. In their juvenile form, insects such as lacewings and hoverflies are voracious eaters of pests. Unfortunately, like pollinators, many predatory insects are also in decline, and pesticides are likely a contributing factor. Many commonly used insecticides are broad-spectrum, as harmful to beneficial insects as they are to the target pests. Fortunately, conservation biological control can be incorporated into efforts to bring back pollinators, since healthy pollinator habitat is also hospitable to numerous beneficial insects.

**A green oasis amidst Pittsburgh's urban bustle, Frick Park offers the chance to observe and interact with wildlife. Photograph by Tianming Chen / Flickr.**

By providing the food and places to live that insects need, and by tolerating some blemishes on your plants, you can help create intact ecosystems right at your doorstep. These flowering landscapes will not only provide a hospitable environment for wildlife, they will also bring beauty and wonder into your neighborhood.

The neat thing is that as you make these changes your neighbors might notice what you are doing and be inspired to take action as well. This is also true at a larger scale. Many communities are looking over at what a neighboring community is doing and seeking to follow suit. One example comes from Oregon, where the City of Milwaukie recently enacted a resolution to both expand habitat and protect pollinators from harmful pesticides. Within weeks of that decision, two neighboring cities contacted Xerces wanting to know how they, too, could protect pollinators.

It is infinitely rewarding to be a part of the movement to transform pest management from reactive methods that rely on pesticides to thoughtful techniques that create thriving gardens buzzing with life. With each new pollinator garden we are breaking away from the unthinking acceptance that insects are the problem and pesticides the solution. And with that change our children's children will be given the opportunity to enjoy the magic of whiling away an afternoon chasing butterflies.

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*As director of the Xerces Society's Pesticide Program, Aimee Code works with communities nationwide to reduce dependence on pesticides.*

*For more information on this topic see the "Bring Back the Pollinators" pages on the Xerces Society website.*

**Although urban and suburban environments are generally greatly disturbed, they offer many opportunities for invertebrate habitat. Photograph by Matthew Shepherd.**

# Protecting Bumble Bees Across the Americas

*Rich Hatfield*

As a scientist deeply involved in the conservation of bumble bees, I'm often asked how they are doing and whether things are getting better for them. Thanks to the hard work of the Xerces Society and our many scientific partners in the international research community, it is getting easier to respond to these questions.

For years we have known that many of our bumble bees were declining and some were at risk of extinction. A decade ago, we launched an effort to gather records of and survey for three species of particular concern. Using this information, in 2013 Xerces submitted a petition to the U.S. Fish and Wildlife Service to have the rusty patched bumble bee (*Bombus affinis*) listed as an endangered species. That effort paid off, and the bee is now proposed for listing.

We've also been active participants in the International Union for Conservation of Nature's effort to assess the status of the world's roughly 250 bumble bee species in order to determine which ones should be placed on the IUCN's Red List of Threatened Species. This task has been undertaken by the IUCN's Bumblebee Specialist Group, for which I serve as the Red List Authority.

The global review is still a work in progress, but an important milestone was reached this past June, when Red List assessments of all eighty species of bumble bees in the Americas were completed. This was achieved with the participation of leading bumble bee researchers from three continents, along with scores of individuals who have donated their time or allowed access to their research collections.

To undertake this major effort we divided the fauna into three geographic regions: North America, Central America (including Mexico and extending south to Panama), and South America. For North American bumble bees we had the advantage of a very large database, compiled by Leif Richardson of the University of Vermont, of nearly three hundred thousand records dating to the early 1800s. This allowed us to compare historical data with more contemporary data and to develop an analytic process consistent with IUCN methodology.

Recent work by a team led by Remy Vandame of Mexico's ECOSUR (El Colegio de la Frontera Sur) built a significant database for this project in Central America, but in South America many areas lack historical or current data on the distribution of bumble bee species. To address the challenges with some of these data, and to combine local knowledge with the analytic methods we had developed for North American bumble bees so that the information could be vetted by the Bumblebee Specialist Group experts, we gathered in Chiapas, Mexico, during the 2015 Mesoamerican Congress on Native Bees. Participants included research scientists and graduate students from Mexico, Brazil, Argentina, Guatemala, and the United States, along with Dr. Paul Williams from the

**Living at the southern tip of South America, *Bombus dahlbomii* is the world's largest bumble bee, with queens up to an inch and a half (four centimeters) long. Photograph by Victor Raimilla.**

Natural History Museum in London and Jennifer Luedtke of the IUCN. Over a three-day period we reviewed the tools and methods for determining the extinction risk for bumble bees, and the group began its Red List assessments.

One meaningful outcome of the workshop was the discussion of bumble bee conservation across political borders. Unsurprisingly, the issues that these bees face are shared throughout the Americas. They are threatened, sometimes to the brink of extinction, by diseases from commercially managed bumble bees, by pesticide use, and by human development, which is fragmenting and destroying habitat. There are also large swaths of land, particularly in South America, that are understudied, making evidence-based assessments difficult.

There are some species whose conservation status is notable. The world's largest bumble bee, *Bombus dahlbomii*, inhabits the southern tip of South America in Chile and Argentina. It has several common names. One, *abejorro colorado* (ginger bumble bee), references the bee's distinctive color; another, *la hada del bosque* (fairy of the forest), refers to the habitat where the bee is usually found and hints at a folk tale in which it plays a feature role. The myth tells of *la hada del bosque* banishing an evil spirit from the forest, a spirit that would return if the bee were to depart.

Sadly, there is a chance that local communities may lose the protection of their fairy. In the 1980s and '90s two European species of bumble bees, *B. terrestris* and *B. ruderatus*, were introduced to South America for crop pollination. These two alien species have become established and are expanding southward. They are rapidly displacing *la hada del bosque*, likely by introducing or spreading pathogens to which the native bees have little immunity and by out-competing them for floral and nesting resources. Outside its stronghold

near Tierra del Fuego, where the invasive bumble bees have not yet arrived, *B. dahlbomii* is now restricted to isolated populations. Is it a matter of time before this species goes extinct, or will scientists and policy makers find a way to work together to ensure that *la hada del bosque* lives on beyond fairy tales?

There are signs that the Chilean government may take protective action. *La hada del bosque* has been included on the Chilean Red List, and is being considered for classification by the Ministerio del Medio Ambiente (the ministry of environment). The extent of the conservation benefits these classifications can provide is unclear, but acknowledgment of the bee's decline and recognition of the threats are important first steps.

In response to this and other similar situations related to the commercial bumble bee industry in Japan, Mexico, and North America, the IUCN Bumblebee Specialist Group has developed a policy statement to help protect these important animals. The most substantive part of the statement urges adhering to the precautionary principle to prevent undue harm to wild bumble bees by, among other things, using only local native species as commercial pollinators, and screening those bees for pathogens. Although so far no governments have adopted this policy, there are efforts underway to develop local sources of commercial pollinators in a growing number of countries.

Red List assessments are already influencing policy in North America. Xerces has used them in reaching out to U.S. federal agencies and to wildlife agencies in more than forty states. This effort has contributed to the listing of bumble bees as sensitive species by two U.S. Forest Service regions and the inclusion of bumble bees in at least twenty-six state wildlife action plans. Information from the IUCN Red List has also had an effect in Canada, where two bumble bees have been added to provincial lists of at-risk species; these policy changes have led to new conservation opportunities.

We've made great strides in bumble bee conservation, but much work lies ahead. Making the case for bees has never been hard. Thanks to their pollination activity, bees are essential to a nutritious diet, they nourish our wildlife, and they help maintain healthy plant populations. And we know what to do: years of research show that increasing habitat, reducing the use of toxic insecticides, and protecting wild bees from pathogens spread by commercial pollinators all support healthier bee populations.

What remains to be accomplished, both here and abroad, is the implementation of large-scale programs to protect these vulnerable wild species in a truly meaningful way by creating habitat that supports their entire life cycle and protects them from pesticides, while reducing the risk of large-scale disease transmission from managed bumble bee colonies. Although by no means complete, this process has begun in North America. Our hope is that the advances achieved here are observed—and improved upon—in the rest of the hemisphere.

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*Rich Hatfield is a senior conservation biologist at the Xerces Society who works primarily on issues related to bumble bee conservation.*

# Monarchs in Nevada?

*Emma Pelton*

Nevada may best be described as a "black hole" when it comes to our understanding of monarch butterflies. The most mountainous state in the contiguous United States, Nevada is an insular pocket where rains, rivers, and lakes drain internally or evaporate before ever reaching an ocean. Geological forces have folded the earth's crust into more than a hundred mountain ranges, which run north–south and are characterized by steep canyons connecting the sagebrush lowlands to higher elevations where junipers and pinyon pines flourish. While the natural history of the larger animals that call the area home—including mule deer, mountain lions, sage grouse, and pygmy rabbits—is generally well known, where and when monarchs find their way through the state has remained a mystery.

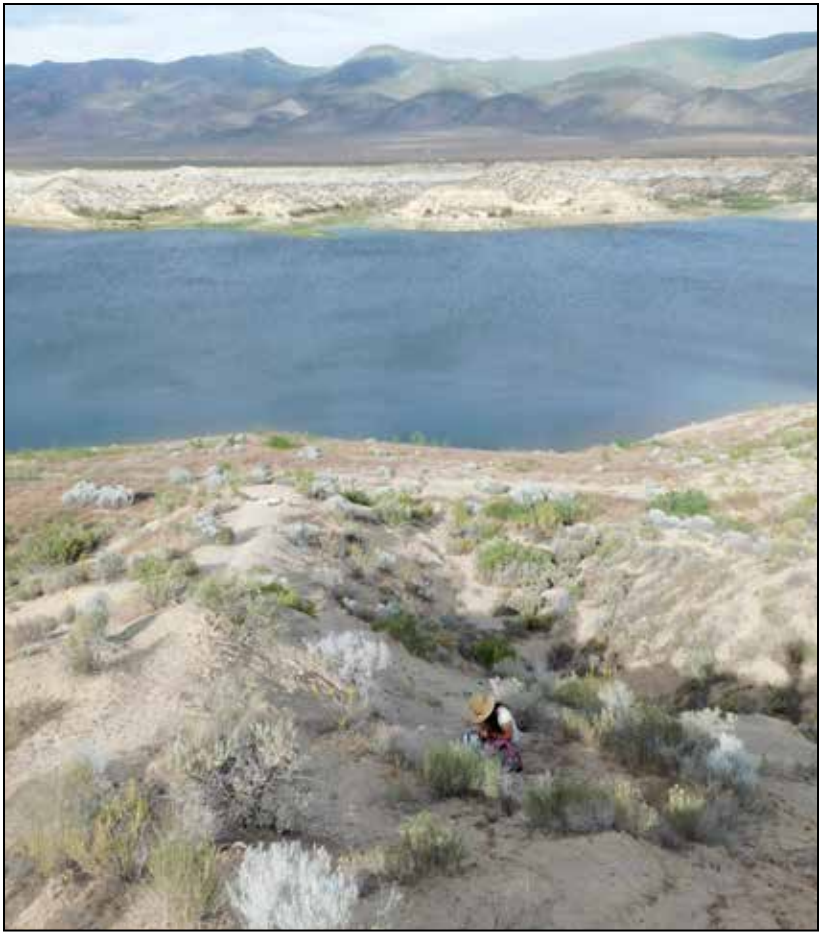
Over the past five years, the Xerces Society has been gathering records of monarchs and milkweeds in order to understand where the butterflies breed and how they move through the western states. Relying on herbarium records, museum specimens, and the knowledge of biologists and citizen scientists, Xerces has amassed more than twenty-five thousand records. These documents show that monarchs breed extensively along the Snake River in Idaho, around Salt Lake City in Utah, and throughout Arizona—and yet there are only a handful of recorded instances of monarchs breeding in Nevada. Are these butterflies really skirting the state?

Nevada has a human population density hovering around one person per square mile outside of its major cities, so it is likely that there are not many people exploring the state's canyons and rivers with monarchs in mind. And milkweed, the only host plant that monarch caterpillars eat, has long been associated with productive agricultural areas and prairies rather than arid basins, meaning that we often heard variations of "We don't have milkweed; we don't see monarchs," when we sent inquiries asking where in the state monarchs might be found. Nonetheless, from our scant understanding of monarch migration routes in the West, Nevada seems as though it would be a crucial stepping-stone for the butterflies to reach other interior western states.

Each spring, usually around Valentine's Day, overwintering monarchs begin to stir from their winter torpor. The warming temperatures and lengthening days bring a flurry of activity as they mate and start dispersing in search of nectar for energy and milkweed for egg-laying. Monarchs in North America overwinter in large numbers in the oyamel fir forests of central Mexico and in groves of eucalyptus, pine, and cypress along the California coast. Regardless of their origin, monarchs are found throughout the West by May or early June, with many presumably having flown across Nevada to reach their destination.

To fill in the blank patch of Nevada

on our monarch maps, two Xerces staff members took to the unpaved roads, rivers, and mountain canyons this summer in search of butterflies. With one full-time staff person based in Reno and a second joining in for periodic weeklong stints, it was a daunting amount of area to cover in a single summer. Nevada has fourteen species of milkweed, found in a wide range of habitats. For example, showy milkweed (*Asclepias speciosa*) prefers moist soils near rivers and irrigation ditches, while pallid milkweed (*A. cryptosarus*) is found on exposed outcroppings of chalky grey soil that are reached by scrambling up steep hillsides. But even if we found milkweed, its presence was no guarantee that monarchs would have also managed to find it, and then to succeed in laying their eggs.



**Challenging though it is to find milkweed plants in the vastness of Nevada's landscapes, Xerces researchers crisscrossed the state on gravel roads and scrambled up hillsides to search for milkweeds and the monarchs that breed on them. Photograph by the Xerces Society / Emma Pelton.**

So we started small. We began by monitoring milkweed patches on hiking and biking trails near Reno to get an idea of when monarchs arrive. By the last week of May, we had found both adults and eggs on showy milkweed and narrow leaf milkweed (*A. fascicularis*). Eager to discover whether monarchs would show up elsewhere, we took off in the first week of June, heading southeast on Highway 50, "the loneliest highway in America," toward the small, unincorporated town of Austin and the looming mountains of the Toiyabe Range.

After winding through salt flats and passing Sand Mountain—a six-hundred-foot-high sand dune used by recreationists and home to the rare Sand Mountain blue butterfly (*Euphilotes pallescens arenamontana*)—we found a canyon to explore, which had a small stream but turned out to have no sign of either milkweed or monarchs. We backtracked until we came across another canyon with a passable road and encountered a helpful U.S. Forest Service employee who suggested we try the east side of the range instead. After looping back on Highway 50 through Austin, it was late afternoon by the time we found another publicly accessible road leading up into the mountains. We drove until a flash of bright orange crossed before our windshield. We stopped quickly and scrambled out of the rental car, and there was our first monarch—quietly sunning himself on a pine. Searching up and down the canyon on foot, we located at least three more, all flitting between flowers. Later that evening, on our way back to our campsite, we also found signs of breeding—glistening eggs hidden under the scruffy leaves of desert milkweed (*A. erosa*) growing in a nearby ditch.

Over the following weeks, we con-

**The first monarch spotted during the surveys, this male was found late in the afternoon of a day spent traversing gravel roads in canyons of the Toiyabe Range. Photograph by the Xerces Society / Emma Pelton.**

tinued to find surprising numbers of monarchs in the mountains and basins—eggs and caterpillars on seven species of milkweed, as well as many adults. We now have ten times the number of breeding records that we started with, from areas all over Nevada. We also revisited historical records of milkweed and found it persisting along roadsides and in ditches, often with signs of monarch activity. At other times during our surveys, however, we were thwarted. After climbing a steep, rocky road up a canyon that looked promising—water, blooming nectar plants, shade, everything that would attract monarchs—we found the vegetation heavily grazed, the stream banks trampled, and neither milkweed nor monarchs in sight.

While milkweed is generally avoided by livestock due to its toxicity, sheep and cattle may eat it when other forage is unavailable. Overgrazing, together with drought, development, changes in fire regimes, and the overuse of herbicides and insecticides, may be reducing available monarch breeding habitat throughout the West, and, indeed, studies show that monarch numbers in both eastern and western North America have sharply declined in the past twenty years. A new groundswell of support for recovering the population is emerging among grassroots groups and citizen scientists, as well as government agencies, tribes, and corporations.

Understanding where monarchs are breeding and migrating, particularly in "black holes" such as Nevada, will help us better target conservation efforts for the butterfly and its amazing journey. Peviously there had been little tagging of monarchs in Nevada to tell us whether they are flying south to Mexico, or west to California, or both. If we are lucky, one or two of the monarchs we tagged during our fieldwork will be spotted at one of the overwintering sites this winter, linking Nevada's sagebrush country to the groves of California or even to Mexico. When the butterflies leave their overwintering sites and once again embark upon their spring migration, we'll resume our search for monarchs in the Great Basin, seeking to unravel a little more of the mystery.

**Milkweeds are enormously important for the health of monarch populations. In addition to being the main caterpillar host plant, milkweed is an excellent source of nectar. Photograph courtesy of the U.S. Fish and Wildlife Service, Pacific Region.**

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*Emma Pelton is a conservation biologist with the Xerces Society whose work is focused on the western population of monarch butterflies.*

# CONSERVATION SPOTLIGHT

## Cheryl Schultz, Standard Bearer for Endangered Butterflies

Dr. Cheryl Schultz studies some of the world's rarest butterflies and the remnant habitat that they need for survival. Her research focuses on the ways that landscape-level processes affect both individual butterflies and butterfly populations, and on understanding how these interactions can be affected by conservation management. She is a scientist who understands what questions need to be asked and how best to design a study to answer those questions. And, once the study is complete, she is able to translate the research into practical steps that can be taken to manage habitat on behalf of these insects.

Dr. Schultz has contributed greatly to our understanding of dispersal biology and the demography of at-risk butterflies, and the use of such data to design conservation strategies. She is a leading voice on the impacts that fire, mowing, and herbicides have on butterfly populations, as well as how these tools can be used effectively to the butterflies' benefit. Her studies and those of her students have informed prairie management for many Pacific Northwest butterflies, including Fender's blue (*Plebejus* [=*Icaricia*] *icarioides fenderi*), Taylor's checkerspot (*Euphydryas editha taylori*), and the Oregon silverspot (*Speyeria zerene hippolyta*), but her research has implications for butterfly species across the United States and around the world.

Cheryl serves as a scientific advisor to the Xerces Society, and that relationship recently led to a unique opportunity when she took a sabbatical from her position as an associate professor at Washington State University. She spent several months working at our main office in Portland, Oregon, arriving as our effort to conserve the western monarch population was really taking off. Compared with what is known about the eastern population of monarchs, little is known about the most important breeding areas in the western United States. This information is crucial for effective conservation and successful recovery, so being able to interact closely with Cheryl and have her help in informing the science behind our work has been extremely helpful.

There are three main projects in which Cheryl has been involved at Xerces. She initially provided input to habitat suitability models for monarchs and key milkweed species, which are guiding decisions about where conservation, management, and restoration efforts are likely to be most effective. The creation of these models is a partnership between the U.S. Fish and Wildlife Service and the Xerces Society.

Cheryl also assisted with the analysis of data gathered through the Western Monarch Thanksgiving Count since 1997, and she is a co-author of the resulting report, *State of the Monarch Butterfly Overwintering Sites in California*, released this summer. This work showed a 74 percent decline in the California overwintering population in less than two decades, comparable to declines ob-

served in the monarch population that overwinters in Mexico.

Third, Cheryl is working with Xerces staff on an analysis of threats to monarchs in an effort to better understand what is driving population declines in the western states. And she has also, of course, provided feedback on a variety of our other projects.

Beyond her work with the Xerces Society, Cheryl's expertise is recognized through her involvement in a broad range of conservation work. She was appointed as the leader for the U.S. Fish and Wildlife Service Recovery Team for Western Oregon and Southwest Washington Prairie Species. In that capacity she oversees recovery of the endangered Fender's blue butterfly, five threatened and endangered plants species, and five plant species of concern. She also works with biologists and land managers at other federal and local agencies (the U.S. Bureau of Land Management, the U.S. Army Corps of Engineers, the U.S. military's Joint Base Lewis–McChord, the Washington Department of Fish and Wildlife, and Benton County Parks and the City of Eugene in Oregon) and several nonprofit agencies (the Nature Conservancy, the Center for Natural Lands Management), in addition to private landowners.

With her commitment to applied research, her ability to translate science into action, and her willingness to work with land managers and nonprofits to facilitate effective action on behalf of rare species, Cheryl Schultz is the epitome of a conservation biologist. As Xerces moves forward with the conservation of monarchs and other butterflies, she will continue to play an essential role in ensuring our scientific integrity.

**Dr. Cheryl Schultz, at the Baskett Slough National Wildlife Refuge in Polk County, Oregon. Photograph courtesy the Crone Lab, Tufts University.**

## Future Threats and Opportunities for Pollinators

An international team of scientists and conservationists from leading research institutions and NGOs has crafted a study to look into the future threats and opportunities facing pollinating species. The results appeared in "A horizon scan of future threats and opportunities for pollinators and pollination," published in the journal *PeerJ* on August 9.

The horizon scan methodology calls for determining what is constant, what changes, and what constantly changes, in order to generate a fuller picture of the issue under examination. The authors (among them Xerces staff member Sarina Jepsen) identified sixty issues facing pollinators, of which the highest-priority concerns include the consolidation of agriculture under global corporate control, systemic insecticides, new viruses, and climate change. Prospects for improvement include the reduction of chemical use in non-agricultural settings.

One significant conclusion is that "Big Ag" will play an outsized role in determining the fate of pollinators. As agri-food companies continue to grow and consolidate, their choices and practices will have far-reaching implications. The authors conclude that to address threats to pollinators globally,

**In a recent study looking at the future health of pollinator populations, agriculture was identified as posing a major threat but also offering a significant opportunity for conservation. Photograph by C. W. Wycoff Photography.**

large agricultural producers will need to make major changes in how they operate, including incorporating pollinator habitat into farmland and protecting habitat areas from pesticides. (See https://doi.org/10.7717/peerj.2249.)

## Dying to Be on the Endangered Species List

Two decades after being identified as in need of federal protection, Stephan's riffle beetle (*Heterelmis stephani*) and the Tatum Cave beetle (*Pseudanophthalmus parvus*) have been declared extinct by the U.S. Fish and Wildlife Service.

Stephan's riffle beetle was known to exist in two springs in Madera Canyon in southern Arizona's Santa Rita Mountains. The streams were degraded by livestock grazing in the 1800s and were further impacted when water was pumped from the main spring in the 1930s. Still, the beetle managed to persist until 1993, when the last one was sighted. It is believed that drought induced by climate change may have been the beetle's final obstacle to survival. (See http://bit.ly/2dUVfHW.)

The Tatum Cave beetle, found in a single cave in Marion County, Kentucky, was abundant when first discovered in 1957. Species decline was noted in 1965, and eight surveys since then have failed to locate the beetle. The USFWS cites pollution from urbanization and cave alterations as the causes of extinction. (See http://bit.ly/2f9enOu.)

## Book Reviews

A much-loved contributor to *Wings* and other Xerces publications, Robert Michael Pyle has written hundreds of essays, stories, papers, and poems, as well as twenty books. His latest volume, *Through a Green Lens: Fifty Years of Writing for Nature* (Oregon State University Press, 2016) draws upon the best of this body of work, starting with his first heartfelt essay, written in 1965 (longhand, on motel stationery). Whether or not you're familiar with Pyle's writing, you'll find pleasure in *Through a Green Lens*, in which he explores a range of subjects and landscapes, each entry ringing with the clarity, conviction, and wit that characterize his unique voice.

Given the rancor of the recent political season, it would seem a lesson in democratic debate and collective decision making might be in order. Thomas D. Seeley gives us just that in his book, *Honeybee Democracy* (Princeton University Press, 2010), pulling together sixty years of research from disparate sources to illuminate how honey bees reach one of the biggest decisions of their lives: where to move to. When a hive splits, two-thirds of the workers will depart with the old queen to start a new colony. This though, is not a dictatorship; scouts are sent to evaluate the real estate options and share news of their findings through dance. Honey bees "vote" by synchronizing their dancing until a consensus is reached. But that is only half of the plot in *Honeybee Democracy*. Equally compelling are the intricacies of how this process was discovered, and the stories of the many experimenters who've investigated a subject that has long been a great mystery to beekeepers.

# STAFF PROFILE

## Suzanne Granahan, Membership Director

*What got you interested in invertebrates?* As a child growing up in a small former farming town in New England I was routinely exposed to insects and other wildlife. Free to explore, I often ventured off in search of butterflies, toads, chipmunks, turtles, dragonflies, fireflies, and other denizens of the woods and ponds near our home. Seeing these creatures in their natural environment would later help me understand the importance of protecting their habitat.

*How did you hear of the Xerces Society?* When Sarina Jepsen and I first became friends she told me about her work here. It sounded so interesting that I went to the website to learn more.

*What made you want to work here?* I've always worked in the nonprofit sector and have always been interested in protecting the environment, and my job here is the perfect pairing of these two interests.

*Who's in your family?* My husband, Steve, and my two-year-old son, Oscar. Steve teaches sixth-grade science and likes to run long distances. Oscar is an adorable independent adventurer and is obsessed with trains, trucks, and big puzzles. The rest of my family all live back in Massachusetts, where I love to visit.

*What book are you currently reading?* I have been reading *Sex and the Sea*, a nonfiction book that discusses the challenges that creatures from copepods to blue whales face while searching for a mate in the vast three-dimensional sea.

*What music do you have on your iPod?* These days, a whole lot of "family indie-rock," because Oscar loves to boogie. We have been searching for new bands to listen to and going to a lot of family concerts. Red Yarn and Lunch Money are our two favorite bands.

*Who is (or was) your environmental hero?* My friend Amy Harwood, who dedicates just about every fiber of her life toward protecting the environment. Amy co-founded Signal Fire, a nonprofit that provides opportunities for artists and activists to engage in the natural world.

*Which college(s) did you attend?* I completed my undergraduate degree at Lewis & Clark College with a major in international relations, and received a master's degree in public administration with a focus in nonprofit management at Portland State University.

## Freshwater Mussel Rescue in Portland

This summer, the Xerces Society collaborated with a local watershed group and city, state, and federal agencies to rescue more than two thousand freshwater mussels from a stretch of Crystal Springs Creek in Portland, Oregon. Two culverts were being replaced with a bridge to improve fish passage, a project that would have destroyed the mussel beds.

Xerces scientists worked with volunteers from the Crystal Springs Partnership to relocate mussels found in the creek, moving them upstream—out of the project area, and out of harm's way. Each mussel was also measured and tagged, a nonintrusive way to monitor the population and allow the gathering of data on the age, health, and mobility of mussels in the creek.

Freshwater mussels are experiencing a dramatic decline: 71 percent of North American species are considered endangered, threatened, or of special concern, making freshwater mussels one of the most at-risk groups of animals in the United States.

The relocation project was supported by the Oregon Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the Portland Bureau of Environmental Services, and Portland Parks & Recreation, with Xerces' participation made possible by funding from the Oregon Watershed Enhancement Board.

**Donning safety equipment, volunteers rescue freshwater mussels during a pause in construction work. Photograph by the Xerces Society / Justin Wheeler.**

## The Western Monarch Thanksgiving Count Turns Twenty

Thanks to the effort of a cadre of remarkable volunteers, a count is made each year of the monarch butterflies overwintering in California. This fall marks the twentieth year in which this count has been done!

The Western Monarch Thanksgiving Count—so named because it happens during a three-week span centered on the Thanksgiving weekend—was initiated in 1997 by Mia Monroe, Dennis Frey, and David Marriott. Mia has continued her involvement and now coordinates the count in partnership with the Xerces Society. During the three-week period, volunteers and biologists fan out to locate and count monarch clusters along the California coast, from Marin County to the Mexican border.

**Every year at Thanksgiving, hundreds of volunteers count monarch butterflies in California. Photograph by the Xerces Society / Carly Voight.**

The importance of the count cannot be overstated. By standardizing the period in which they are monitored, the count provides a useful metric of the size of the monarch population in the western states, which can be analyzed to detect trends. For example, seventy thousand monarchs were counted at one overwintering site in Santa Cruz in 1997. In 2015, numbers at that site were down to just twelve thousand, and indeed monarchs overwintering in California have undergone a 74 percent decline since the late 1990s. This population loss mirrors that of monarchs overwintering in the oyamel fir forests of central Mexico, and underscores the need for conservation efforts to sustain the species' migratory phenomenon.

Such long-term datasets as the one produced by the Western Monarch Thanksgiving Count allow researchers and conservationists to better understand what strategies to pursue in preserving the species. For example, data from this count was used by the Xerces Society to identify the sites with the highest need for active management and protection, as listed in our report *State of the Monarch Butterfly Overwintering Sites in California*. If it weren't for the hundreds of biologists, researchers, and volunteers who have contributed to the count and kept it going over the years, we might have little understanding of the degree to which this once-common butterfly has declined in the West.

Thanksgiving is all about traditions—your grandmother's stuffing, Aunt Lilly's cranberry sauce—and we

hope that, at least for those who live in California, the Western Monarch Thanksgiving Count may become as ingrained a tradition as eating too much and still finding room for pie. It's a great chance to walk off those extra calories!

## Petitions to List Key Species as Endangered Finally Bear Fruit

A series of decisions announced by the U.S. Fish and Wildlife Service during a two-week period in September and October constitute major steps forward for the protection of insects in the United States. Seven species of Hawaiian yellow-faced bees (genus *Hylaeus*) were given protection under the Endangered Species Act, and two other species, the rusty patched bumble bee (*Bombus affinis*) and the western glacier stonefly (*Zapada glacier*), were proposed for protection. All of these came as the result of work by the Xerces Society.

For the Hawaiian *Hylaeus* bees, the final ruling to grant these species endangered status was the culmination of a multi-year effort by Xerces to gain recognition and protection. The Society submitted petitions to the USFWS in March 2009, but the bees were not proposed for listing until 2015. This ruling makes them the first bees in the United States to be federally protected.

At almost the same time, the USFWS proposed endangered status for the rusty patched bumble bee. This bee has experienced a precipitous decline since the mid-1990s: it has disappeared from 90 percent of its historical range, and its remaining populations are greatly reduced. Over the last decade the bee has been the subject of much attention by Xerces and our conservation partners; it also captured the hearts of tens of thousands of people thanks to the film *A Ghost in the Making*, produced by Clay Bolt and Neil Losin. All of this led to our submitting a petition in 2013, which reulted in the USFWS proposal.

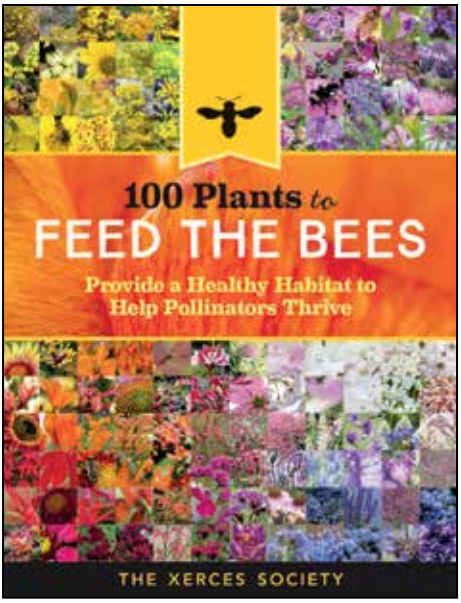
**Seven species of Hawaiian yellow-faced bees (*Hylaeus*) have been protected under the Endangered Species Act. Photograph by John Kaia.**

The proposed listing of the western glacier stonefly came less than a week after the listing of the Hawaiian yellow-faced bees. In December 2010, the Xerces Society and the Center for Biological Diversity petitioned the USFWS for listing of the species as threatened under the Endangered Species Act. The USFWS subsequently funded a study of the species by the U.S. Geological Survey, which found the stonefly in just one previously occupied stream and in two new locations at higher elevations. While certainly more obscure than the rusty patched or yellow-faced bees, the western glacier stonefly inhabits a rare and fragile ecosystem that may be on the verge of collapse due to climate change.

As you can see, these decisions came about only after years of devoted effort. Much must be done at the outset to make a strong, scientifically sound case, followed by additional work to assess and prove the claim; and sometimes further legal action must be taken to force a ruling. Although this is a lengthy process, protection under the Endangered Species Act is one of the strongest tools we have to conserve a species and the effort to achieve these rulings is well worth it. Listing under the ESA can help spur funding for further studies to better understand the biology and needs of a species and support habitat protection, and can lead to the development of a recovery plan to guide conservation work. And it is meaningful simply for the federal government to declare: "This species matters, and we as a nation believe in protecting this life."

**The western glacier stonefly (*Zapada glacier*) is losing its glacial habitat due to the warming climate. Photograph courtesy U.S. Geological Survey / Joe Giersch.**

## The Perfect Gift: *100 Plants to Feed the Bees*




We're very pleased to announce the arrival of our newest book, *100 Plants to Feed the Bees*. Creating a pollinator garden should not be complicated, and this book introduces you to the most important first step: just plant flowers.

Beginning with an overview of the relationship between plants and bees and brief notes on selecting and growing pollinator plants—including the importance of keeping them free from pesticides—the book quickly moves on to profiles of one hundred plants that are great for bees (as well as for butterflies, moths, and hummingbirds).

The focus is on native flowers, shrubs, and trees to enhance your garden, farm, or meadow, but we also include some nonnative plants suitable

for gardens. Each profile is accompanied by multiple photographs and provides planting tips, ways to use the plant, its range, and its bloom time, as well as notes on which pollinators will visit it.

This book affirms Xerces' position as the go-to organization for information on what people can do to help our beleaguered pollinators. Released by Storey Publishing, it is available just in time for the holiday season! Inquire at your local bookstore or shop online (including on our own website, www.xerces.org/store) for this and our other books, including *Attracting Native Pollinators*, also from Storey Publishing, and *Gardening for Butterflies*, published by Timber Press.

## We've Grown, Again—Thanks to You!

The introduction to this issue of *Wings* mentions our recent staff retreat. Taking time to step away from our typical work schedule is important and, as the organization grows, the value of taking stock and looking ahead grows right along with it.

For us, this growth is never more visible than at our retreat, because it is the one time each year that our staff all gather together in one place. We have added seven new positions in 2016 (including two since the retreat), bringing our staff to forty-four full-time employees, and there are plans to add several more during the coming year.

We want to express our gratitude for your support, without which Xerces would not enjoy this continued success. We are honored that you share our commitment to invertebrates, and that you have such confidence in our work.

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For information about membership and to learn about our conservation programs for native pollinators, endangered species, and aquatic invertebrates, as well as our efforts to reduce the impacts of pesticides, contact us:

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**Green lynx spiders (*Peucetia viridans*) rely on their keen eyesight to stalk and capture prey. These predators are good creatures to have in gardens or crop fields. Photograph by Bryan E. Reynolds.**

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**A $35 per year Xerces Society membership includes a subscription to *Wings*.**

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**On the cover: The rusty patched bumble bee (*Bombus affinis*) was recently proposed for Endangered Species Act protection. Photograph by Clay Bolt.**

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