WINGS

ESSAYS ON INVERTEBRATE CONSERVATION

THE XERCES SOCIETY FALL 2017

CONTENTS

Conservation is sometimes seen as taking place in a distant wilderness or requiring a lot of time. In this issue of *Wings* we look at conservation in urban areas and how you can take action in your own neighborhood to make a difference.

Addressing Conservation in Urban Areas

Scott Hoffman Black

During my life I've had the good fortune to have worked on a broad range of conservation issues—canvassing to stop a dam on Nebraska's Niobrara River when I was a teenager; seeking to limit the impact of off-road vehicles on national forests; participating in large landscape-scale conservation of old-growth forests in the Sierra Nevada; and working to protect and conserve habitat for many rare and declining species, including spotted owls, wolves, and a wide variety of invertebrates.

Although the prospect of grappling with such problems can be daunting, the best solutions often entail place-based conservation efforts, focused on protecting landscapes and wildlife that hold particular significance for a region or community. Inspiring and empowering individuals to take action in their own immediate community, perhaps even just in their own backyards, can be the best way to effect lasting change, and we at the Xerces Society have long held this as a goal.

Creek corridors, powerline easements, parks, wetlands—such areas as these can provide good habitat and should be part of the "green infrastructure" supporting wildlife in urban and suburban communities. Photograph by Matthew Shepherd.

This issue of *Wings* is about making such changes at the local level. Xerces staff members have provided three essays that focus on urban and suburban areas: how actions in your own yard have wider impacts; the many ways in which people can effect change either as individuals or by banding together with their neighbors; and the natural history of a suburban garden. We hope you will find inspiration in these articles to help you protect the small creatures in your own community.

I am also very excited to share with you the news that we are expanding our efforts to promote invertebrate conservation in towns and cities. The Xerces Society manages the largest invertebrate conservation program in the world, and over the years we have worked extensively with farmers, ranchers, and the managers of public lands and wild areas. We've also worked with park managers and golf course superintendents to incorporate habitat into the urban landscapes in their domain, but, despite the obvious enthusiasm and demand, we haven't had a focused program that allows us to provide ongoing support to urban and suburban communities.

The fate of bees has captured the attention of many people, and this concern has translated into tremendous momentum to restore the health of pollinators and other beneficial insects. But a recent study published online in *Frontiers in Ecology and the Environment* shows that the conservation community has more work to do. Joseph Wilson, Matthew Forister, and Olivia Messinger Carril undertook a survey to assess public understanding of bees. While 99 percent of respondents knew that bees are ecologically important, the great majority estimated that there are a few dozen bee species in the United States, a tiny fraction of the thirty-six hundred species that are actually here. Furthermore, more than a quarter of the respondents who chose to take the survey could not tell a bee from a fly. You don't need to be an entomologist to help pollinators, but there is clearly more that we can do to offer people a better understanding of the natural history of bees and butterflies, and thus to make sure that they have the knowledge to help them support these important animals.

Urban and suburban areas are important for invertebrate conservation. Research shows that urban greenspaces can provide valuable habitat for invertebrates. Not only do studies suggest that more biodiversity is maintained in some developed areas than in farmed landscapes, but densely populated areas can mean that there are many people keen to do something to help. From parks and campuses with significant acreage to small yards and gardens, providing flowers and nesting sites has been shown to increase both the diversity and the abundance of invertebrates in built environments. In urban areas, with their many impervious surfaces, it is also important to limit pesticide use, because these chemicals find their way into local streams and harm aquatic life.

Across the country and around the world, people are increasingly troubled by the loss of bees, butterflies, and other pollinating insects. The Xerces Society is uniquely positioned to partner with communities in creating urban and suburban havens for dwindling invertebrate populations. If we all work together we can make the world a better place—wherever we live.

How Our Gardening Choices Affect the Health of Our Waterways

Aimee Code

"Why do you have so many animals in your yard?" Curious who was speaking, I looked up from weeding to see a small boy standing on the sidewalk watching bumble bees collect pollen from the California poppies. I smiled and replied, "I created this garden for them." He smiled back and said, "It looks like a forest." For a person barely two feet tall, it *would* look like a forest. My yard has towering mock orange and red flowering currants, intermixed with yarrow, lupine, poppies, asters, herbs, and other flowers planted to attract bees and butterflies.

With his mom's okay, Sammy began to explore my "forest." It was a delight to watch him crawl between daylilies seeking hidden strawberries, and chase after a western tiger swallowtail (*Papilio rutulus*) that had been nectaring on the mock orange. Even the cabbage white butterfly (*Pieris rapae*) resting on a dan-

The peaceful seclusion of a back garden can be an oasis for both people and wildlife. Thoughtful design of flower borders helps to ensure that they provide an abundance of bloom to support a diversity of insects. Photograph by Aimee Code.

delion inspired squeals of joy. Yet, it was the dragonfly that most excited Sammy. His eyes grew almost as large as the dragonfly's when I explained that it was a real live transformer, spending most of its life in water before sprouting wings to take to the air.

Sammy's enthusiasm for the dragonfly made me realize that my garden can illustrate the connections within urban areas, especially the movement of stormwater, better than any PowerPoint presentation. The visiting dragonfly acted as an emissary for our local stream system, reminding me of how my decisions flow away from my garden and affect the larger ecosystem in which I live. The runoff from my property goes directly into Tugman Creek, which flows into the Willamette River, which provides habitat for wild salmon and drinking water for thousands of Oregonians. It ends up in the Columbia River, home to still more native fish populations, on its way to the Pacific.

Similar to the way that your house's roof is designed to shed rain, our towns and neighborhoods have been gradually engineered so that stormwater is channeled and diverted to avoid flooding. This efficient system of moving water away from buildings also provides a conduit for the chemicals used in and around our homes to move directly into local streams, creeks, ponds, and rivers. The U.S. Geological Survey's most

Development adds acres of hard surfaces to a watershed. The runoff from rainstorms carries residues of garden chemicals—as well as roadway pollution—into creeks and wetlands, where they are harmful to aquatic life. Photograph by Matthew Shepherd.

How we garden has a direct influence on the health of the water bodies that dragonflies rely on for breeding. Striped meadowhawk (*Sympetrum pallipes*), photographed by Matthew Shepherd.

recent national analysis of urban waterways found that almost every single sample of surface water contained at least one pesticide and generally two or more. When people water their gardens or summer rainstorms hit, runoff from yards carries pesticides into local streams, where they may harm aquatic life and contaminate drinking-water supplies.

Pesticides, by definition, include insecticides, herbicides, fungicides, rodenticides, and other "cides." There are more than six hundred active ingredients registered for use in pesticides in the United States, and more than twenty-five thousand different products on the market. The chemicals in these products all have distinct characteristics, that, in part, determine risk. For example, neonicotinoid insecticides—best known for the significant risks they pose to pollinators—are hydrophilic, or water loving, and thus move readily into both surface and ground water. Most neonicotinoids are also persistent, meaning that they continue to be toxic, and thus liable to contaminate water, for weeks to months after they are applied.

Given the potential threat that neonicotinoids pose to water, the Xerces Society performed a preliminary risk assessment on imidacloprid, the oldest neonicotinoid and, until recent years, the one most widely employed. Using extensive water quality monitoring data from the California Department of Pesticide Regulation, we were able to compare the levels of imidacloprid detected in the state's waters with the levels that cause harm to such species as caddisflies and mayflies, which, along with insects such as stoneflies and dragonflies, are vital to healthy streams. These insects are predators of many species, including mosquitoes and other pests, and are important as prey for fish and even songbirds. Because their presence is di-

The red-shouldered ctenucha (*Ctenucha rubroscapus*) is a day-flying moth found along the West Coast. Photograph by Matthew Shepherd.

rectly tied to clean water, they are also very good indicators of water quality, which is why they are used in research.

Our assessment found that current contamination levels in California can harm and even outright kill these sensitive invertebrates. The potential risks from this disruption to our aquatic systems include upsurges in pest species such as mosquitoes when predators and competitors are killed; increased methane production when microbes replace invertebrate decomposers; and declines in songbirds and fish due to the loss of their main food source.

It is often assumed that the worst pesticide pollution comes from farmland, but years of research by the U.S. Geological Survey tells us that urban and suburban pesticide application—including use on lawns, flower beds, and street trees—is also a significant source of water contamination. In fact, the highest level of imidacloprid detected in California was in urban stormwater, where it was well above the concentration that kills mayflies.

While the widespread environmental assault by neonicotinoids must be addressed, limiting or even eliminating their use won't solve the problems of pesticide contamination. History shows that when one pesticide is removed from the market, people often just use whatever new pesticide is offered, and the unfortunate fact is that substituting one group of pesticides for another invariably leads to a new set of environmental problems. Case in point: before neonicotinoids were in wide use, pyrethroids were some of the most commonly applied insecticides in urban environments. Unlike neonicotinoids, pyrethroids are hydrophobic and do not readily dissolve in water. Instead, they are more likely to bind to soil particles.

That characteristic doesn't limit their movement into water, however; they simply move with soil particles suspended in runoff. Even though pyrethroids are generally short-lived, they can persist in sediment where the sunlight that helps break them down doesn't penetrate. Pyrethroid contamination was so bad in California that the state completed a re-evaluation of their use that resulted in regulations restricting whether and how seventeen different pyrethroids can be used in urban areas. Neonicotinoids were presented as replacements for many urban pyrethroid uses; now these substituted chemicals are commonly found in California's urban waters.

Even herbicides, often considered benign and frequently used in urban gardens, can be problematic. For example, 2,4-D (a common ingredient in "weed and feed" products) and some glyphosate compounds (the active ingredient in many products, including Roundup) are toxic to early life stages of freshwater mussels. These shellfish provide valuable ecological services to humans because they filter water as they eat. Unfortunately, many freshwater mussel populations are in decline or have already been lost, in part due to the presence of chemicals in the waterways in which they live.

While this may seem like a lot of bad news, understanding the risks that pesticides pose can help inform our decisions. In a home garden it can be relatively easy to avoid using them altogether, or at least to consider using them only as a last resort. Moreover, understanding the hazards can inspire us to share this information to begin healing our environment. For example, concerned about the risks of pesticides, another of my young neighbors—an eight-year-old budding entomologist—asked everyone on the block to stop using them, and to seek out garden plants that haven't been treated with long-lived neonicotinoids. Because of his simple request, the whole block pledged to be pesticide-free. I am thrilled by this neighborhood pact, which on a small scale helps protect pollinators from being exposed to toxic substances and reduces the amount of pesticides making their way into our urban waterways. Plus, here in my yard, Sammy can crawl around and enjoy the

The tall stems of mock orange (*Philadelphus*) might seem like a forest to a small child, but to a passing swallowtail butterfly they offer a refueling station. Photograph by Aimee Code.

Blanketflower (*Gaillardia*) is a drought-tolerant perennial native to the United States and Canada. Its eye-catching, showy flowers are a magnet for bees, such as this leafcutter (*Megachile*). Photograph by Mace Vaughan.

edible plants in the garden, without being exposed to harmful chemicals.

My neighborhood is not unique. Across the country people are pledging to reduce their use of pesticides and to increase habitat for pollinators and other beneficial insects. At Xerces, we get many questions about how to make communities more pollinator-friendly, and now, thanks to several recent grants, we are newly able to expand our urban and suburban outreach efforts. This spring, Xerces' program directors came together to discuss how best to accomplish this. We are creating a set of trainings to introduce people to the amazing diversity of native bees and butterflies found around our homes, share specific and simple ways to create healthy habitat in both yards and parks, and highlight citizen-science opportunities such as Dragonfly Pond Watch and Bumble Bee Watch.

Knowing that you, our members, have a vast array of knowledge and expertise in insect conservation, we are also excited to create a speakers bureau, which brings a train-the-trainers element to this work. This group of Xerces Society ambassadors will grow the number of people able to provide trainings and share the marvels of the insect world with new audiences.

As Sammy left that afternoon, with thyme and rosemary scrunched in his strawberry-stained hands, I imagined him joining the Xerces speakers bureau in a few years. With his infectious energy, he could easily transform a room full of individuals into an organized group of bug enthusiasts. One boy's sense of wonder, inspired by a small urban garden, can go a long way toward saving the world.

Aimee Code, director of Xerces' pesticide program, is an avid gardener. She finds great pleasure in sharing her garden with vertebrate and invertebrate communities.

Bringing Conservation Home

Justin Wheeler

If you are reading this, it is likely that you are well-versed in the many challenges facing invertebrates in the modern world. Habitat loss and degradation, climate change, and the impacts of widespread pesticide use are ever-present threats to the species we care about. In the face of such perils, it's easy to become overwhelmed, and to feel a paralyzing sense of powerlessness.

We at the Xerces Society believe that the antidote to this feeling is action. There are things in your direct control that can make a difference, even if they seem small or inconsequential: add a few flowers to your yard; write a letter to your local paper; talk to friends about buying organic produce. We have long worked to provide the information, tools, and resources necessary to empower everyone to help make the world a better place for invertebrates.

In support of this mission we've recently added a variety of new resources to the Xerces website, including offering suggestions and inspiration on our recently launched blog, *Conservation Comes Home*. Here are just a few of the ideas we're exploring in the effort to inspire everyone to become invertebrate conservationists in their backyards and beyond.

Neighbors are an influential voice in shaping community attitudes. In the Sabin neighborhood of Portland, Oregon, gardeners join together to inspire others to create pollinator gardens. Photograph by the Xerces Society / Margo Conner.

Speak up for those without a voice. With few exceptions, the small creatures that we seek to protect lack the visibility of larger species. People can be more receptive, though, to protecting invertebrates than may be obvious; often it's the case that the thought just hasn't occurred to them. Getting folks thinking about animals they may never have noticed, combating myths and fears, and sharing your enthusiasm for your favorite invertebrates are all valuable ways to build awareness. Building that awareness may not seem as powerful as creating habitat or passing laws, but it's a critical first step toward those outcomes, and for gaining support from your community when it comes time to take concrete action.

On our blog we've offered several thoughts about how to build awareness. Are you an extrovert who loves engaging with people? Talk to friends, neighbors, and community groups and become an advocate for invertebrates. Even small cities typically host at least one farmers market, where you can engage with food producers and ask what they are doing to protect pollinators on their lands. Consider hosting the screening of a documentary at your local garden club, school, or library, and include a Q & A session afterward. You may even earn a new nickname as "the butterfly lady" or "the bee guy" in the process!

For those who are more comfortable with quieter endeavors, write a letter to the editor of your local paper extolling the virtues of gardening for pollinators or warning against the use of pesticides in the home landscape. Are you an avid nature photographer? Consider sharing your photographs on social media through Facebook or photo-sharing sites such as Flickr, or contributing them to citizen-science projects. Photographs can be a meaningful way of making observations about a species as well as helping to raise the visibility of creatures that are otherwise largely unseen.

Act locally. It may seem that the issues facing the animals we care about are so big they can be addressed only from the top, through governmental policy and by the actions of politicians, conservation groups, and scientists. But change often happens from the ground up, as new practices, first introduced on a local level, become national trends. Local action has the added benefit of building support among neighbors and community members, whereas legislation, mandated from on high, often meets with resistance and skepticism. These days "act locally" might feel as though it has become a cliché, but for insects and other invertebrates—tiny animals that can thrive in small spaces—local action can make a direct impact.

For individuals or community groups, working with local governments and officials is typically more accessible and effective than trying to influence policy at the state or federal level. Across the country dozens of cities have passed policies to stop the use of pesticides that are toxic to bees. In many cases these policies were introduced by citizens, and serve as models for other communities to demonstrate that common-sense pesticide policy can be implemented in municipalities of all sizes. Your efforts might begin with a letter-writing campaign to your county or state roadside management agency asking them to adopt mowing and management practices that protect pollinators. Roadsides

A volunteer planting event is a tried-and-true conservation activity that draws together people of all ages, creates connections between community members, and has a direct impact for wildlife. Photograph by Katie Hetrick / UC Davis Arboretum.

have the potential to support a diversity of wildlife, provide milkweed critical to monarch populations, and support native insects of all kinds.

Through such grassroots efforts it is possible to change local policies to support pollinators while also reducing operational costs, which many cash-strapped communities and fiscally conservative elected officials can get behind. In order to assist you in urging your city to adopt practices to protect pollinators we've prepared a model policy, available on our website, to serve as a framework for developing meaningful protections in your community. Our "Model Policy to Protect Pollinators from Harmful Pesticide Exposures" is research-based and addresses key issues.

Get your hands dirty. Of course, there are many hands-on ways in which you can improve the environment around you to make it a better place for invertebrates. Perhaps it's time to extend your garden out to the sidewalk strip where it will be visible to neighbors and encourage them to do the same, or to work with your city or local businesses to incorporate pollinator-friendly selections into their plantings. Through our Bring Back the Pollinators campaign, we provide information that will enable you to plant a pollinator garden wherever you may live.

Other ways that you can improve habitat beyond your backyard include volunteering with your local watershed council or water authority to plant

By partnering with organizations such as Xerces, community groups and local agencies can present workshops to build knowledge of conservation issues and solutions. Photograph by the Xerces Society / Matthew Shepherd.

streamside vegetation and remove invasive plants to benefit aquatic invertebrates. A similar effort on behalf of pollinators might be working with a local adopt-a-road initiative to go beyond picking up litter to planting milkweed and pollinator-friendly plants and removing invasive weeds along roadsides.

If you're out and about with your camera, you can become a bumble bee watcher and contribute to Bumble Bee Watch (bumblebeewatch.org). Observations added to Bumble Bee Watch helped to get the rusty patched bumble bee listed as endangered. If you're in the western United States, you can participate in our Western Monarch Milkweed Mapper project (monarchmilkweedmapper.org), which aims to document monarchs and their breeding habitat. There are also citizen-science efforts managed by other organizations for the purpose of observing fireflies, ladybugs, moths, and more. Seek them out—they're a great way to connect with nature in a mindful way and excellent for getting kids interested in invertebrates.

Don't lose heart. At Xerces, our approach remains the same, rooted in the values that have successfully guided us for forty-six years. While we will continue to work at every level to effect change, it will take all of us to protect invertebrates and their habitat. We hope to continue to inform and inspire you in your own conservation efforts.

Justin Wheeler works as the website and communications administrator at the Xerces Society. He is a certified Master Gardener in Pennsylvania and volunteers at the Snetsinger Butterfly Garden.

Life in the Suburbs

Matthew Shepherd

With their manicured lawns and neat houses, the suburbs may not seem like welcoming places for wild creatures. Given a chance, though, wildlife will find a way to coexist with people. Suburbs are often less densely developed than older urban centers, and such neighborhoods can be home to a surprising diversity of life thanks to stream corridors, parks, and even yards and gardens. This is the story of one suburban yard, located on a fifty-by-hundred-foot lot, a typical size for the suburbs that have spread westward from Portland, Oregon, across Washington County in recent decades.

When we moved in, the yard was largely grass. At the front of the house there were a handful of azaleas and barberry shrubs in bark chips, along with two oddly placed arborvitae trees, one blocking a window, the other obscuring

Gardens are an important component of the network of wildlife habitat in suburban areas. The author's garden is home to a host of pollinators and other insects. Photograph by Matthew Shepherd.

the front steps. Elsewhere, grass struggled to grow in the shadow of trees or of the house, and in places didn't grow at all, with the dirt turning to muck in the fall rains. Over time, we've gradually created a garden, and in doing so have discovered a diversity of wildlife with which we share our residence.

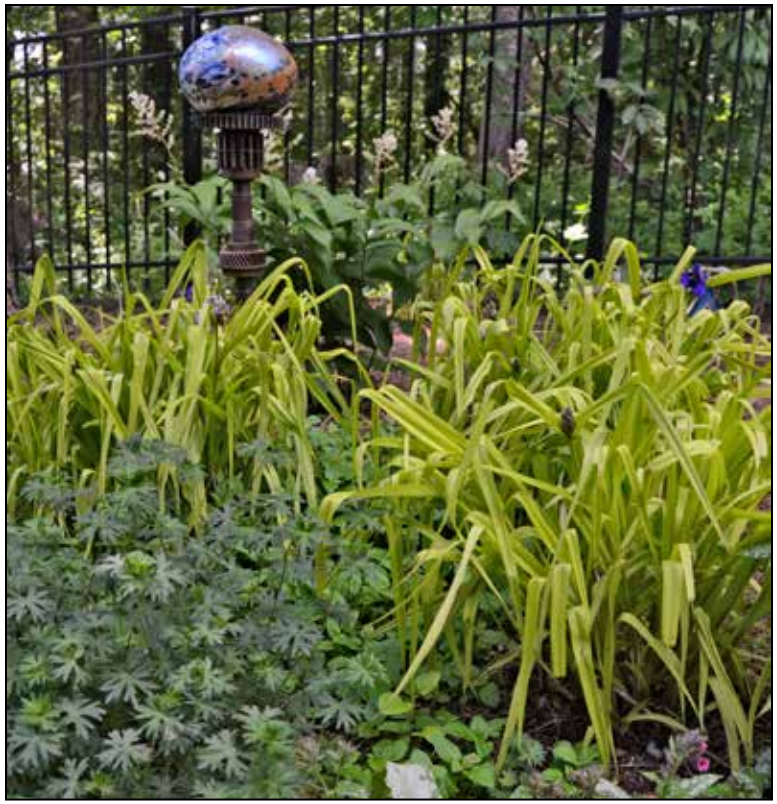
Our house sits in the middle of the lot, separating it into four distinct sections. The front garden faces east; mostly open and sunny, it's the best area of our yard for flowers. We've gradually reduced the amount of grass, replacing it with perennials and shrubs—aster, coneflower, milkweed, goldenrod, California fuschia, blanketflower, phlox, coreopsis, lavender, Oregon grape, wild indigo—a mixture of native and garden varieties that can cope with both wet winters and dry summers with minimal attention, and that offer bloom from late winter to late fall.

The European praying mantid (*Mantis religiosa*), often released for pest control, has become widespread in North America. Photograph by Matthew Shepherd.

Connecting the front garden to the back along the north side of the house is a narrow, shady, damp side yard. For the longest time this was a sheltered spot to store plants waiting for their permanent home, and it was also where we dumped things: the sod removed from the front and back, construction materials for paths, sacks of compost. This passageway has been tidied up in the last couple of years and is now lush with ferns (sword, deer, maidenhair), hellebores, bleeding hearts, and snowberries.

The back garden is very different from the front, tucked under the edge of an acre of Douglas-fir forest. This patch of forest is zoned as neighborhood open space, so is protected from development, and is a remarkable survivor in a region that continues to experience the rapid growth of both housing and business developments. The trees provide the rear of the house with a sense of seclusion. In the heat of summer, the pitchy smell during the day and the rhythmic chirping of tree crickets at night gives it the feel of a wilder place, beyond the suburbs.

Despite those delights, the forest makes this a tough place to establish plants. Its trees compete for light and moisture in different measures along the back of our small area, part of which is sunny for a few hours, the rest in deep shade. We've tried forest plants that found it too sunny and dry, and we've tried sun-loving plants that found it too shaded. Through trial and error, we've arrived at a selection of plants that can cope with these conditions, and this



Establishing a plant community in the forest shade took several years, but this part of the yard is now an attractive place for both insects and people. Photograph by Matthew Shepherd.

area, like the front garden, now has a mix of native and garden species. Sword ferns, some self-sown, some planted, lend structure. Color and texture are provided by false Solomon's seal, wintergreen, yellow wood violet, foam flower, trillium, spiderwort, wild geranium, tiger lily, lungwort, lady's mantle, lupine, aster, red flowering currant, and Nootka rose. We've also got some plants that many people might consider weeds—Siberian miner's lettuce, wood avens, woodrush, soft rush—forest natives that began growing once we removed the grass.

The fourth section of our garden is the southern margin, isolated from the rest of the front garden by the driveway and extending from the sidewalk to the side of the house, where we keep recycling carts. This strip, in the shelter of a maple tree and shaded by our neighbor's arborvitae hedge, seldom sees direct sunshine. During the fall, leaves from the maple are raked to the base of the hedge and left to decay. That pile is its own little world, a home to the pillbugs and millipedes that you'd expect, as well as to slugs and snails. As is typical of disturbed areas, the majority of

This dark-bodied glass snail (*Oxychilus draparnaudi*) was an unexpected find in this Oregon garden. Unlike most other species, it is carnivorous. Photograph by Matthew Shepherd.

the gastropods in our garden are nonnative; most common are the European red slug (*Arion rufus*), a rather handsome brown-and-orange beast, and the great grey slug (*Limax maximus*). The leaf pile, though, is also where we encountered dark-bodied glass snails (*Oxychilus draparnaudi*), another nonnative species. The glass snails are carnivorous, mainly preying on other invertebrates, although on this occasion a trio of snails were feeding on a dead mouse.

The first bee we see in our garden each year has typically been a black-tail bumble bee, though sometimes a yellow-faced bumble bee will show itself earlier. Whichever, these normally appear between the fifteenth and twentieth of February, although in warm winters they have been seen in January. They forage on the flowers of Oregon grape and lungwort, which fill the gap until French lavender begins to bloom in April. We now have six species of bumble bees (*Bombus*) recorded for our garden—those two plus black-faced, fuzzy-horned, yellow-headed, and brown-belted. Other bees we find through the year include mining bees (*Andrena*) alongside the early bumble bees, and mason bees (*Osmia*) that show up when the pears and apples blossom. Later in spring, sweat bees in the genera *Halictus* and *Lasioglossum* arrive, and in June long-horned bees (*Melissodes*) appear as the black-eyed Susans come into flower.

Of the more than two dozen species of bees we've seen, only two of them are nonnative, the European honey bee (*Apis mellifera*) and the European wool carder bee (*Anthidium manicatum*). The wool carder has a close association with one plant, lamb's ears (*Stachys byzantina*), a patch of which grows near our front steps. The females nectar on the flowers and collect the downy hairs from the leaves to form their nest cells. The males patrol the lamb's ears, and chase away any potential competitors for the females. These males will even confront people; they have no stinger, so pose no threat, though if you don't know this it can be unnerving to have a seemingly aggressive bee hovering in front of your face!

The garden has places without plants, but this bare ground is not barren. Mining bees excavate nests in the plant-free areas. We've also watched *Nomada* cuckoo bees flying to and fro a few inches above the soil in search of mining bee nests in which to lay their eggs. There is a similar pairing of *Halictus* sweat bees nesting in the ground, and *Sphecodes* cuckoo bees locating those nests for their own egg laying. Higher up, mason bees and leafcutters (*Megachile*) occupy bee blocks and other nest structures that we've made, and small carpenter bees (*Ceratina*) have nested in stems of black-eyed Susan left during through the winter.

The bare ground has also hosted solitary wasps in the genus *Astata*, which stock their nests with stink bugs; and spider wasps (family Pompilidae) scamper frenetically across the dirt, flicking their blue-tinted wings as they hunt for spiders to feed the offspring in their ground nests. Other wasps in the garden include black-and-yellow mud daubers (*Sceliphron caementarium*), whose nests look like fist-sized lumps of dirt on a wall, and paper wasps (mostly the European species *Polistes dominula*), which make small nests dangling from the house's eaves like upside-down mushrooms. Evidence of *Polistes* nest building is usually more obvious than the wasps themselves. The wasps gather wood fibers from snags or their functional equivalent in the garden landscape—fences, gates, deck rails—leaving tiny scrape marks an eighth of an inch wide and an inch or so long. After chewing those fibers into pulp they use it to form cells with paper-like walls.

Long-horned bees (*Melissodes*) are ground-nesting. The bees that forage on asters and other flowers in the front garden nest in exposed soil along ditches in a nearby creek corridor. Photograph by Matthew Shepherd.

Western Oregon is not known as a butterfly hotspot, and this is reflected in the paucity of species in our yard. So far, we have seen only six—as many as we have species of bumble bees—western tiger swallowtail, painted lady, woodland skipper, satyr anglewing, grey hairstreak, and the inevitable cabbage white.

We've identified many more moths, and there are certainly a significant number of species that could be added to our garden list; my mothing skills are not great. But because moths are generally an understudied group, even with modest ability there is the chance of significant discoveries. Recently, I found a species of plume moth by the porch light that I'd not seen before. It's likely either a geranium plume moth (*Amblyptilia pica*) or an artichoke plume moth (*Platyptilia carduidactyla*). This sighting has been submitted to Butterflies and Moths of North America, and when its identity is confirmed it could be a new county record.

We haven't done away with the grass entirely. Some of the front lawn remains as a place for kids to play, for adults to drink coffee in the morning sun, or for both young and old to sit and watch insects with field guide in hand. The lawn has diversified, benign neglect allowing violets, selfheal, and clovers to spread, one more resource for bees. The lawn also provides forage for grasshoppers—red-legged (*Melanoplus femurrubrum*) in the early summer, and later, when the grass is strawlike, road-dusters (*Dissosteira carolina*), looking like butterflies as they flit around before abruptly disappearing into the brownness.

We have seen a reasonable number of species in our yard (I admit that I'm geeky enough to keep lists!) but we are well aware that the richness of insect life, birds, and mammals is only partly

Although urban and suburban areas are greatly removed from their natural state, wild creatures such as this woodland skipper (*Ochlodes sylvanoides*) find areas that provide the conditions they need. Photograph by Matthew Shepherd.

Encouraging wildlife into your garden creates the opportunity for memorable encounters. Photograph by Matthew Shepherd.

because of our efforts. Everything links with something else over space and time. The acre of Douglas-fir across the back fence, in addition to sheltering us from winter storms, offers host plants for the caterpillars that become the swallowtails that nectar on our tiger lilies, as well as habitat for some insects that we've found on our side of the fence and that may not be expected in a typical suburban yard, such as golden jewel beetles (*Buprestis aurulenta*), snail-hunting *Scaphinotus* beetles (whose heads and thoraxes are distinctively narrow to enable them to reach inside snail shells), and night-stalking tiger beetles (*Omus*). The bigleaf maples in the forest support the life cycle of the western boxelder bugs (*Leptocoris rubrolineatus*) that cluster on the house to warm themselves on sunny winter days.

A few houses away is a stream corridor. There beavers create ponds and wetlands where dragonflies such as the common green darner and striped meadowhawk that hunt over our flowers develop as aquatic nymphs. Ditch sides provide nesting sites for the long-horned bees that forage in our yard. The mining bees that nest in our bare patches forage on the bloom of the creekside willows.

In your own neighborhood, you probably have similar gaps that support wildlife in the midst of development. Even if those less cultivated areas are not immediately over your back fence, you can create the conditions in your garden that will draw wild creatures in and allow you the opportunity for close-up encounters with beautiful—and possibly unexpected—animals.

Matthew Shepherd, a nature watcher and a gardener, is the Xerces Society's communications director.

Soleil Gaylord, Youth Leader for Pollinator Conservation

In the spring of 2016, Xerces' executive director Scott Black gave a talk at the town library in Telluride, Colorado. Afterwards he was approached by a high-school student, who wanted to know more about Xerces' work in pollinator conservation. This was our first encounter with Soleil Gaylord, but as we discovered, she was a remarkable young woman who was already doing much to help pollinators.

Soleil's efforts began with an interest in wildflowers. Since second grade she's been collecting seeds and planting them—even launching her own business, Soleil's Seeds, while still in grade school. In 2014, wanting to do more, she approached the Telluride Open Space Commission with a plan for a habitat project on the edge of town, which the commission approved. The project has involved planting native grasses and flowers, all germinated and grown in Soleil's own starter greenhouse.

By the time Scott Black was in Telluride, the plot was well established and Soleil found herself wanting to learn about the bees and other insects that were attracted to the plants and what more she could do. She invited Scott to visit her project, which he did the next day. Since then, Soleil has been using photographs to catalogue insect flower visitors, and has been reporting bumble bee sightings to Bumble Bee Watch.

The revegetation plot has been the catalyst for a growing interest in pollinator conservation in the Telluride area. Soleil has given several talks of her own and was also asked to help with a second habitat project, a Pollinator Garden created by San Miguel County's Open Space Program. She has been supplying milkweed starts and penstemon seedlings as well as inspiration.

This summer, Soleil came up with the idea for SNAP—the Student (her) Nonprofit (the Xerces Society) Art Project—an exhibition of photographs to promote the importance of pollinator gardens. The show was quite a success, raising $700 for the Xerces Society and stimulating great conversations—and also making the cover of the regional paper, the *Telluride Daily Planet*.

Photograph by Ramona Gaylord.

Native vs. Nonnative Plants in Pollinator Gardens

It seems these days that questions about butterfly and pollinator gardens have moved on from "why?" to "what shall we plant?"—with the conversation often turning to whether or not it is better to plant native species than nonnative ones. Led by Andrew Salisbury of the Royal Horticultural Society, a team of researchers in Britain undertook a four-year study to try to provide an answer. Their work was published in May in the journal *Biodiversity Conservation*.

The research was done using a series of study plots, each three meters square, the typical size of a flower border in a United Kingdom garden. The plots were planted with a collection of species that were categorized as "native" (naturally occurring in the British Isles), "near native" (from the Northern Hemisphere), or "exotic" (from the Southern Hemisphere). Over the course of the study, above-ground invertebrates were sampled in each plot and a number of variables were measured for the plants, including vegetation density and canopy cover.

Overall, the abundance of invertebrates was higher on the plots with native plants, and increased with canopy cover in all three plot categories, although neither was consistently true for all species. Invertebrates such as spiders, which are less specifically reliant on particular plants, were equally abundant across the plots irrespective of plant origin, while all herbivores were more abundant on plots of native plants.

The authors conclude: "We therefore advise gardeners and managers of cultivated green spaces who wish to provide maximum resources for invertebrate abundance to select plantings biased towards native and near-native plants, managed to provide dense vegetation cover."

Are Pesticides Adequately Regulated?

A thought-provoking article published in *Science* highlighted the weakness of current pesticide regulation, which the authors say does not address the impacts of pesticides used at industrial scales.

Alice Milner of the University of London and Ian Boyd of the University of St. Andrews compare the use and regulation of pesticides with those of pharmaceuticals, particularly antibiotics. Both pesticides and antibiotics are in wide use, are used prophylactically as a treatment of first resort, and are vulnerable to the development of resistance. The regulation of antibiotics, however, is different from that of pesticides. Although both must undergo testing for effectiveness, safety, and side effects, antibiotics also have ongoing safety monitoring, and their regulation is guided by the international oversight of the World Health Organization. In contrast, other than monitoring residue levels in food, regulation of pesticides ends after they

reach the market, and there are no internationally accepted standards.

Although some countries gather such data about pesticide use as the amount sold and the land area or crops treated, there is no framework for assessing the impacts of large-scale pesticide use in the environment. The European Union and the United States require manufacturers to report new information on potential hazards, but it is often not clear what should be measured and reported, and the reporting requirement is not effectively enforced.

Milner and Boyd argue that current regulation is inadequate for assessing safe pesticide limits, allowing the total environmental dose to be "governed by market demand rather than by a limit on what the environment can endure."

Book Review

Watching butterflies and moths as a child first piqued Michael McCarthy's interest in wildlife, leading to an abiding affinity with the natural world. As an environmental writer, McCarthy has witnessed and catalogued a steady decline in the abundance of wild creatures, epitomized by the contrast between nighttime driving now and childhood memories of moths filling the headlight beams "like snowflakes in a blizzard."

In *The Moth Snowstorm: Nature and Joy* (New York Review Books, 2015), McCarthy shares his experiences and reflects on how his profound, almost spiritual relationship with nature helped him through periods of personal loss.

The book also provides a survey of the ways our environment has changed in the last half century: enclosure and development of coastal wetlands, loss of hedgerows and woodlands, ever-greater use of pesticides. In that respect it seems like many other books; what makes this volume stand out, though, is that McCarthy writes with a beauty and lyricism that draws you to his side as he explores places that he so clearly loves, leading to an impassioned plea for transformation that would allow us once again to experience moth blizzards.

The subtitle spells out what it is that motivates him to want to save our planet—a love of nature and the joy it brings—which some may dismiss as naïve in an era of data and dollars and ecosystem services. But in the end, isn't it a love for nature that inspires us all?

STAFF PROFILE

Alex Charlap, Assistant to the Director / Office Manager

What got you interested in invertebrates? Although I have felt a deep connection to growing things since childhood, it was when I started working at Descanso Gardens and later Rancho Santa Ana Botanic Garden (both in the Los Angeles area) that I truly discovered the critical importance of insects to the plant world.

How did you hear of the Xerces Society? I saw an ad for my position on a nonprofit job board. I knew that I wanted to move to Oregon, and couldn't pass up the opportunity to submit my résumé. I was just delighted to be offered the position; three weeks later I was living in Portland and working at Xerces. The past four years have been an amazing experience!

What's the best thing about your job? What I enjoy most is being able to work with staff across the organization as well as with our board of directors and our external partners. It is an honor to join forces with so many incredible people passionately committed to the conservation of invertebrates.

Who's in your family? I have three grown children. My son Ryan lives in San Francisco and my son Brandon and daughter Amanda both live here in Portland. My granddaughter, Aurora, just turned nine. The four of them are my greatest joy!

What book are you currently reading? Doris Brumbach's *Fifty Days of Solitude*. At the age of seventy-four she decided to live in her coastal home in Maine without speaking to anyone for fifty days. The result is this meditative book about spending time alone, writing, and coming to terms with mortality.

What do you do to relax? My relaxation tools are my morning meditation and journaling, disciplines that I have kept up for nearly two decades. I'm a self-taught mixed-media artist and also love to paint. I can't imagine life without these practices.

What music do you have on your iPod? I have an eclectic collection but my favorite genre is disco music from the 1980s. I had a lot of fun in my twenties dancing in New York City nightclubs and love to dance and sing out loud, even if I don't really know the lyrics to a song. My kids use to tease me about this; now they just sing along and smile.

Bee Better Certified: Creating Better Places for Bees

Collaborating with farmers to protect and restore high-quality habitat for pollinators is a core feature of the Xerces Society's work. In June, as part of our conservation efforts for agricultural pollinators, we launched a new farm and food certification program, Bee Better Certified™—the first third-party certification program in the world focused specifically on pollinator conservation.

The goal of Bee Better Certified is to give bees a healthy place to live. At its heart is a set of science-based standards that establish a high bar for habitat restoration and pesticide risk reduction. To be certified, growers are required to dedicate at least 5 percent of their land to flower-rich habitat that provides pollen, nectar, and nesting sites. In addition, pesticide exposure is mitigated through a combination of preventive pest-management techniques and the elimination of high-risk pesticides.

Bee Better Certified's focus on habitat is unique among farm certification programs, and is compatible with any kind of operation. The program can assist organic growers in meeting the biodiversity guidelines of the National Organic Program, but its standards can be adopted by any and all types of growers, helping conventional farmers also move toward more-sustainable practices.

Bee Better Certified has been a long

Providing safe habitat for bees is the goal of Bee Better Certified, a food and farming certification program launched by Xerces in collaboration with Oregon Tilth. Photograph by Sarah Foltz Jordan.

Widow skimmer (*Libellula luctuosa*), photographed by Bryan E. Reynolds.

Protect the Life that Sustains Us with a Monthly Gift

Invertebrates are an essential part of all ecosystems, contributing to the survival of wildlife, the pollination of crops, and the health of our environment. Please consider making a monthly gift today to support the advocacy, applied research, outreach, and education needed to protect these vital creatures. Monthly donations deliver a reliable and predictable source of funding to our programs, which allows Xerces to best plan for the future and implement thoughtful and strategic action to protect the life that sustains us. You can start your monthly gift today at xerces.org/donate.

time in development and we've entered into the program with the support of many fantastic farmers and progressive food industry advisors. To help guide us, we recruited an advisory board comprising experts in the fields of agriculture, certification, pesticide risk mitigation, pollinator research, retail marketing, and sustainable sourcing. Bee Better Certified received startup funding through the Conservation Innovation Grant program run by the U.S. Department of Agriculture's Natural Resources Conservation Service. We are partnering with Oregon Tilth, one of the largest organic certifiers in the United States and now the first accredited certification body for Bee Better Certified.

Learn more about Bee Better Certified and join the movement to provide pollinators with a healthy, sustainable environment at beebettercertified.org.

Encomium for Larry Orsak, Third President of the Xerces Society

On July 6, 2017, at the age of sixty-four, Dr. Larry Joe Orsak died of a heart attack at the University of Technology, Lae, Papua New Guinea, where he was an associate professor and the head of the Department of Forestry. These bare facts only hint at the remarkable qualities of this scientist, entomologist, conservationist, social reformer, and lover of people and other species, who had an enormous impact upon the early development of the Xerces Society.

Larry grew up an avid naturalist in southern California, publishing *The Butterflies of Orange County* in 1977, at the age of twenty-four. With similar gusto he pitched in to early Xerces campaigns, notably for San Bruno Mountain, south of San Francisco, and for the El Segundo blue butterfly. This led to his being recruited—while still a graduate student in entomology at the University of California, Berkeley, where he would receive his doctorate in 1988—to serve as president of the Society.

Hallmarks of the Orsak presidency (1977–1979) included engagement in a growing number of conservation issues, primarily in California (such as Lange's metalmark, for which Larry had a beautiful postcard published); initiation of the Society's self-help sheets, species profiles, and other publications for members, many of them written by him; and the expansion of our remit from Lepidoptera to terrestrial arthropods, setting the stage for ultimately championing all invertebrates.

Larry hosted the 1978 annual meeting of Xerces in Berkeley. I like to think it was my presentation there, on my work for the Wildlife Department of Papua

New Guinea, that first gave him the PNG bug. After visiting himself in 1985, he returned for research, to lead Earthwatch institutes based on the diversity of rainforest moths, and finally for the duration of his adventurous career.

Larry strenuously fought corruption, thereby gaining some enemies and many more friends and followers. He saved land, wildlife, and livelihoods, and did all this while educating cadres of indigenous conservation professionals. Following a bountiful outpouring of traditional ceremony and tearful remembrance, the much-loved "Dr. Larry" was laid to rest in his adopted village of Baitabag, near Madang. A beautiful shrine has been built in his honor, and a library and museum are planned.

Much more can be read about Larry, along with many colorful pictures and personal stories of ceremony and life, at https://lifeworklarry.wordpress.com.

—Robert Michael Pyle

Declines in Freshwater Mussels Confirmed by New Research

Freshwater mussels play a critical role in maintaining the health of freshwater ecosystems, filtering water and keeping it clean and clear for salmon and other aquatic wildlife. Despite their importance, they are often overlooked in conservation plans, in part because information on their distribution and status has been difficult to access. Beginning nearly a decade ago, the Xerces Society has joined with the Mussel Project of the Confederated Tribes of the Umatilla Indian Reservation to change this situation for the species that occur in western North America.

Researchers have compiled a comprehensive database of mussel records from research and museum collections, historical publications, and public agency and personal records dating as far back as 1834. More than 160 people and nearly a hundred institutions generously provided their observations or collection information to the Western Freshwater Mussel Database. Members of the Pacific Northwest Native Freshwater Mussel Workgroup have contributed thousands of records to the database, often revisiting mussel populations repeatedly over many years to document their observations.

The database has allowed scientists to understand for the first time the true picture of mussel distribution in the western region. The results were published in October in the journal *Freshwater Mollusk Biology and Conservation*. What the researchers found was not good news: freshwater mussels are being lost from Mexico to Alaska. They have disappeared from 18 percent of the watersheds they once inhabited, and fewer species are now found in an additional 35 percent of watersheds.

The scientists also assessed the health of individual species, using the criteria of the IUCN Red List. The western ridged mussel and winged floater are "vulnerable" to extinction; they have disappeared from more than 30 percent of their range. The western pearlshell is "near threatened," having disappeared from more than 15 percent of its range and suffered large declines in abundance elsewhere. The Oregon floater and western floater appear to be faring better, and are together classified as of "least concern."

Freshwater mussels are at risk in western North America. The western pearlshell (*Margaritifera falcata*) has disappeared from 15 percent of the watersheds in which it previously occurred. Photograph by Roger Tabor / USFWS.

Overwintering sites in California are essential for the long-term survival of the western monarch population. Photograph by the Xerces Society / Candace Fallon.

Western Monarchs at Greater Risk of Extinction

Many scientists and policy makers, as well as the general public, have been focused on the dramatic declines in monarch butterflies in eastern North America, but a new study reveals that western monarchs face a greater risk of extinction than do eastern monarchs.

Xerces Society scientists joined with university researchers Cheryl Schultz (Washington State University, Vancouver), Elizabeth Crone (Tufts University), and Leone Brown (University of Georgia, Athens) to conduct an assessment of the status of the monarch population in western North America.

The results of the study, published in the journal *Biological Conservation* in September, showed that the number of monarchs has fallen by 95 percent since the 1980s. Previously, ten million monarchs spent the winter in coastal California. Today there are barely three hundred thousand. This is a significantly more dramatic decline than was previously known, and the authors predict that migratory monarchs in the West could disappear in the next few decades if steps aren't taken soon to recover the population.

The researchers combined data from hundreds of volunteers who have participated in the Xerces Society's Western Monarch Thanksgiving Count since 1997 with earlier monarch counts conducted by amateur and professional butterfly enthusiasts in the 1980s and early 1990s.

The U.S. Fish and Wildlife Service, which funded the study, is currently considering whether to list the monarch butterfly as a threatened species under the Endangered Species Act.

New Guidelines for Protecting California's Butterfly Groves

Scattered along the California coast are groves of eucalyptus, cypress, and pine, in which hundreds of thousands of monarch butterflies from across western North America shelter during the winter. Some groves are senescing as drought and age take their toll, and in others changing conditions make the butterflies susceptible to storms and disturbance. Protection and management of these sites is essential if we hope to recover the western monarch population.

The Xerces Society, in collaboration with Stu Weiss of Creekside Center for Earth Observation, has developed guidelines to managing overwintering sites for land managers, landowners, and community groups. *Protecting California's Butterfly Groves: Management Guidelines for Monarch Butterfly Overwintering Habitat* can be downloaded from our website, www.xerces.org.

The guidelines provide an overview of the biology and conservation of western monarchs; step-by-step guidance for developing a site-specific management plan; and overall guidance on such topics as tree management, shrub and forb management, and issues of public access. The document also includes a list of monarch-attractive native nectar plants suitable for coastal areas.

This project benefited from the review and input of many knowledgeable biologists, including Mia Monroe (who initiated the Western Monarch Thanksgiving Count and still works with the Xerces Society to coordinate the annual event), Francis Villablanca (a professor at Cal Poly and director of Monarch Alert), and Dan Meade (who has studied overwintering monarchs for decades).

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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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This plume moth (*Emmelina*), also known as a T-moth, was spotted on a house wall near a porch light. When open, its wings appear like a fan of feathers. Photograph by Matthew Shepherd.

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

On the cover: The giant robber fly (*Promachus hinei*) uses its heavily spined legs to grab prey in midair. Photographed in Oklahoma by Bryan E. Reynolds.

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