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APRIL–MAY 2020

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COVER: Perched on a barberry branch, a Baltimore oriole begins her nest building with a delicate strand of horse hair. Photographer Sandra Rothenberg caught the moment near her rural Pennsylvania home.

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CLOCKWISE LEFT TO RIGHT: CUM OKOLO (ALAMY STOCK PHOTO), GRANT PUCKETT, SKIP MOODY (ALAMY STOCK PHOTO)

EDITOR'S NOTE

LISA MOORE
Editorial Director

A Not-So-Silent Spring

NWF

Can we have a heart-to-heart? Sometimes the wildlife conservation biz feels like one step forward, two steps back. And sometimes even the most optimistic among us (like me) can feel a bit dispirited. Recent news reflects proposed rollbacks of protections for our air, water and public lands. Western monarch butterfly populations are on the brink, and the litany of dire warnings about climate change throbs like a migraine. All that stuff is true. And yet (cue the happy music) ...

Behold our annual Garden for Wildlife™ issue, a source of inspiration we love bringing you each year. I defy you to feel anything but unmitigated delight when you look at our cover of a Baltimore oriole dangling a strand of horse hair to begin her nest. What could be more hopeful than a nest for new life? Witness a crane couple raising the chick of a different species (page 20), see the fragile beauty of endangered plants (page 22), marvel at the magic of hummingbirds (page 28) and dragonflies (page 38) or celebrate how gardeners can take simple steps to help save wildlife (page 32). As most of you already know, the small actions each person takes to help wildlife can make a huge difference. More butterflies, more bees, more habitat, more life. That's possible when each of us—whether in an inner city or rural outpost—digs in the dirt and believes. So go dig. And relish the sounds of spring.

SHARE YOUR VIEWS: **nweditor@nwf.org** or **@MooreWildlife**

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COLLIN O'MARA
President & Chief Executive Officer of the National Wildlife Federation

The Power of One Plant at a Time

Last fall, I had the honor to attend the opening of the Smithsonian Institution's new exhibit called "Habitat," an incredible display of wildlife gardens at 14 different sites in Washington, D.C. The National Wildlife Federation was proud to designate the gardens as Certified Wildlife Habitat® because they incorporate four essential elements of our Garden for Wildlife™ program—food, water, cover and places for wildlife to raise young.

Gardening for wildlife is more important than ever. A recent study in *Science* reported that North America is home to 3 billion fewer birds than it was just 50 years ago—a 29 percent decline. And that's just a slice of the biodiversity crisis now threatening one-third of U.S. plant and animal species—and people as well.

Rather than wringing our hands, we're taking action through innovation and partnerships. More than 240,000 homes, schools and other sites are now NWF Certified Wildlife Habitats. Nearly 600 mayors have taken our Mayors' Monarch Pledge, and 235 municipalities are participating in our Community Wildlife Habitats™ program. We're also partnering with the Taylor Morrison homebuilding company to incorporate wildlife gardening and habitat conservation into their communities. These green-thumbed heroes are making a profound difference for wildlife.

You can, too. To overcome the biodiversity crisis, we want to help every American garden for wildlife. Our goal for 2020 is to certify our 250,000th wildlife habitat. If you haven't certified your garden, join us by visiting nwf.org/garden. If you have, encourage a neighbor!

We want to make it as easy as possible. To help more communities participate, we've just launched our Garden for Wildlife Spanish-language website, Jardín Silvestre. You can identify wildlife-friendly plants in your zip code through our Native Plant Finder (nwf.org/nativeplantfinder), based on the work of our longtime partner, Doug Tallamy (author of *Nature's Best Hope*). You'll find sustainable wildlife-gardening products at shopnwf.org. Our 2020 Habitat Champion, Wild Birds Unlimited, will be spreading the word about wildlife gardening through its stores nationwide. And this spring, our new nature and wildlife field-guide apps will be available through the Apple Store, helping you learn about wildlife in the palm of your hand.

Each of these efforts is like planting a single seed destined to bear fruit for generations—so help us transform gardens into wildlife havens!

JEFFREY MCMILLAN

Collin O'Mara and then Smithsonian Gardens Director Barbara Faust display an NWF Certified Wildlife Habitat sign newly installed last fall at one of 14 sites in the Smithsonian's new D.C. exhibit called "Habitat."

SHARE YOUR VIEWS. Follow Collin O'Mara on Twitter at twitter.com/Collin_OMara. To share your thoughts and opinions, email president@nwf.org.

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NEWS OF THE WILD

By Mark Wexler

Visit *National Wildlife* online (www.nwf.org/nw) to read the complete digital edition.

The benefits of 4 billion pollinators

MALCOLM SCHUYL (FLPA/MINDEN PICTURES)

■ Every year, as winter transitions into spring, swarms of insects begin flying to the United Kingdom from Europe. Now, for the first time, scientists at the University of Exeter have quantified the sheer scale of this migration and the benefits it provides farmers. Using a radar system that detects small insects flying at high altitudes, the researchers focused their studies primarily on two common hoverfly species, the marmalade hoverfly (right) and the vagrant hoverfly. Writing in *Current Biology*, they estimate that as many as 4 billion of these insects fly between continental Europe and Britain annually, producing larvae that consume up to 10 trillion plant-destroying aphids and pollinating billions of plants, including crops. The scientists calculate that the insects also are capable of shuttling billions of pollen grains back to Europe. "Hoverflies are generalists that feed on many kinds of pollen and on many aphid species," says lead author Jason Chapman, noting that the flies' numbers have remained steady since the study began a decade ago. "Considering that many beneficial insects are seriously declining," he adds, "our results demonstrate that migrant hoverflies are key to maintaining essential ecosystem services."

Listening in on the world's loudest bird

ANSELMO D'AFFONSECA

■ A team of U.S. and Brazilian scientists report that they have recorded the loudest bird calls ever documented. The source: dove-size male white bellbirds (left) that sing during mating rituals in the northern Amazon. The birds' calls reach volumes as high as 125 decibels, louder than a jackhammer. Reporting in *Current Biology*, the researchers note that they observed females closely approaching these males, which then swivel dramatically and blast the sounds directly at them. "We would love to know why females willingly stay so close to males as they sing so loudly," says co-author Jeff Podos of the University of Massachusetts–Amherst. "Maybe they are trying to assess males up close, though at the risk of some damage to their hearing systems." In previous work, co-author Mario Cohn-Haft of Brazil's Instituto Nacional de Pesquisas da Amazônia found that bellbirds have unusually thick ribs and abdominal muscles, most likely tied to their loud calls.

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Halfway into our ambitious trek through the rain forest I had to remind myself that "Nothing good comes easy." These days it seems that every business trip to Brazil includes a sweltering hike through overgrown jungles, around cascading waterfalls and down steep rock cliffs. But our gem broker insisted it was worth the trouble. To tell you the truth, for the dazzling emeralds he delivered, I'd gladly go back to stomping through jaguar country.

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Native forest plants rebound

■ Pennsylvania State University scientists have discovered that removing invasive shrubs to restore native-forest habitat can yield surprisingly strong results. In their study, published in the journal *Invasive Plant Science and Management*, the researchers removed 18 invasive shrub species from five plots in a 42-acre mature, deciduous woodland on the university's campus. Seven years after the removal, native plants, including hepatica (right), had regenerated and filled in the gaps on their own. The researchers also found a significant increase in species abundance and diversity among both native understory plants and small trees.

"Natural regeneration in the areas where invasive shrubs had been removed actually exceeded the growth of native cover in unmanaged forest control plots, even those where no invasive shrubs were found," says Penn State ecologist Erynn Maynard-Bean. The results, the scientists write, "suggest that invasive-shrub removal can make sense, even when active steps to restore the native-plant community aren't possible." The research is significant at a time when eastern deciduous forests are becoming increasingly fragmented due to urban and suburban expansion, which enables invasive plants to easily move into associated edges and open spaces.

MARK GRAF (ALAMY STOCK PHOTO)

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BILL LATKA (STORYLICIO.US)

BEATRICE MIRINGU

Marilyn DuFour works in the garden at Monroe Street United Methodist Church in Toledo, Ohio (left), and tours the Islamic Center of Greater Toledo (above) after a Sacred Grounds workshop.

Sacred Grounds

How places of worship are gardening to benefit wildlife

By Delaney McPherson

Marilyn DuFour, an environmental specialist for the city of Toledo, Ohio, first heard about the National Wildlife Federation's Sacred Grounds™ program through a documentary about how native plants can benefit wildlife. Inspired, DuFour decided to bring the program to her hometown congregation, the Monroe Street United Methodist Church—a step that she says has "built community" while supporting the local wildlife.

For a place of worship to be designated as a Sacred Grounds site, it must complete a series of steps, which are outlined in the program's online resources. The steps include creating a native-plant garden at the house of worship. In addition, participating congregations must somehow connect that habitat to their faith, such as by incorporating it into a worship service or prayer walk.

Walking a spiritual path

In the Great Lakes region, Sacred Grounds sites may be chosen to receive a small grant and technical help from NWF's program team and on-the-ground partners, who can help a faith community plan their garden and learn how to maintain it. "Our selection process is about ensuring we're representing the diversity of the community," says Habitat and Education Manager Manja Holland, who helps coordinate the program. "That means diversity of faith, racial diversity and socioeconomic diversity."

To date, the program has designated 18 Sacred Grounds sites in five states, including a Native American Haseya site, a Muslim mosque, a Hindu temple, some Jewish synagogues and several Christian churches. Holland hopes to have 60 sites certified in the Great Lakes region by 2021.

Involvement in Sacred Grounds also helps worship leaders engage their communities both spiritually and physically. The Islamic Center of Greater Toledo, for example, created a prairie with milkweed that connects with a local trail system. And the People's Missionary Baptist Church in Toledo acquired a nearby abandoned property and turned it into a "prayer park," a safe and beautiful gathering place for anyone who needs it.

"This has been a wonderful opportunity to intersect in our faith journeys," says DuFour, "and to nurture our call to care for creation regardless of our faith."

Delaney McPherson is National Wildlife *magazine's editorial assistant.*

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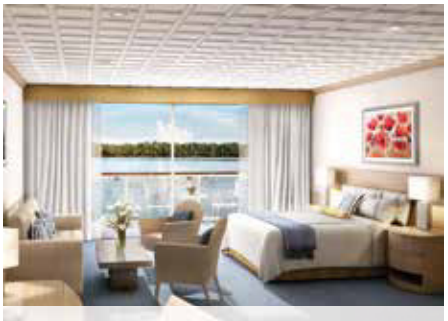

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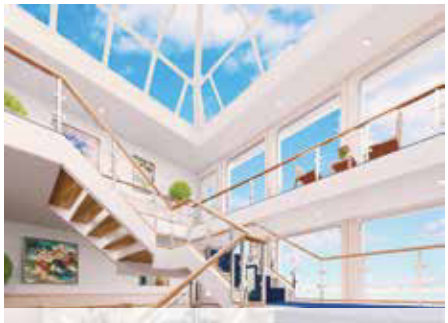

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COURTESY TAYLOR MORRISON

KHUSHAL HABIBI

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Partners, Naturally

A leading homebuilder joins forces with NWF to create new wildlife habitat nationwide.

By Doreen Cubie

Just about every morning, Khushal Habibi walks along the banks of Walnut Creek, a small stream that runs through Skyestone, a 500-home development in Broomfield, Colorado. "It's a great place for wildlife watching," says Habibi, a retired U.S. Department of Defense biologist who is originally from Afghanistan. He has seen 84 species of birds on his strolls, including belted kingfishers, western kingbirds, snowy egrets, Swainson's hawks and great horned owls, along with coyotes, skunks and red foxes. "I really enjoy going out there," Habibi says, "and so do a lot of other people."

Not long ago, Walnut Creek was nothing more than a degraded area used for cattle grazing and to contain stormwater runoff. But in 2014, Skyestone's developer, Taylor Morrison, began restoring the tract along with two adjacent ponds. "Today, this open space has native grasses and plants that attract butterflies, pollinators, birds and other wildlife," says Phillip Cross, the company's Denver vice president of land. Last year, after verifying the 7-acre space was 100 percent native and pesticide free, the National Wildlife Federation designated it a Certified Wildlife Habitat®—the first step of an innovative new partnership between NWF and Taylor Morrison, the country's fifth-largest homebuilding company, with 430 communities in 11 states.

At Skyestone, a Colorado housing community built by Taylor Morrison, a traditional herb and ornamental garden (left) flourishes near more-natural habitats (top right) that are home to red foxes (bottom right) and other wildlife.

Under the partnership, Taylor Morrison will work with NWF to certify as wildlife habitat more than 8,000 acres of open space in its developments. It will also design and plant butterfly gardens, build nature-oriented playgrounds and draft wildlife-friendly habitat management plans. Building on its reputation as an environmentally friendly developer,

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— J. Fitzgerald, VA

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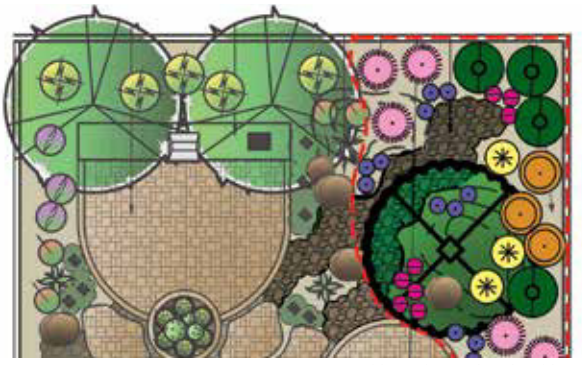

COURTESY TAYLOR MORRISON

With input from the National Wildlife Federation, Taylor Morrison has designed butterfly gardens (above) for new homes in Arizona's Victoria Heights community. Beyond butterflies, such gardens nurture bees, caterpillars and other insects, which in turn provide food for songbirds such as the western tanager (right).

KHUSHAL HABIBI

"Taylor Morrison was looking to take their conservation efforts to the next level," explains Carey Stanton, NWF's senior director for education and partnerships. "This partnership with the Federation has given them the opportunity to do that."

"It all started out with shared values," Darrell Sherman, executive vice president and chief legal officer for Taylor Morrison, says of the NWF partnership. "We build thousands of homes every year, and we want to respect the environment."

Wherever Taylor Morrison builds homes, it works with natural features that already characterize a region. In Sky Crossing, a community outside Phoenix, Arizona, for example, the company was careful to preserve existing wash, or flood, corridors. In

addition to maintaining drainage, these intermittent waterways allow wildlife to move through the community. "And they are pretty," adds Colin Phipps, Taylor Morrison's director of land acquisition. "They are natural deserts flowing through the neighborhoods." In three other Arizona communities—Copper Sky, Ironhorse and Andaluza—builders enhanced open areas to connect with surrounding desert by cultivating native plants ranging from cottonwoods and desert willows to saguaro and hedgehog cactus.

Branching out

Since teaming up with NWF, Taylor Morrison has committed to establishing butterfly gardens in many of its communities, including one recently completed at its Esplanade Golf and Country Club in Naples, Florida. The company also is encouraging communities to help monarch butterflies by planting native milkweed in common areas and educating residents about what they can do in their backyards.

Plans are underway as well to build NWF Early Childhood Health Outdoors (ECHO) playscapes in select Taylor Morrison neighborhoods. In contrast to traditional playgrounds, ECHO spaces foster children's imaginations, encouraging them to explore nature by getting their hands dirty and investigating rocks, leaves, insects and more.

At three new Taylor Morrison developments, the Federation is even participating in the design of the communities' master plans. At Skye Ranch near Sarasota, Florida, for example, "we are reviewing all of the plants going into this community and seeing where we can increase the number of native species," says Patrick Fitzgerald, NWF's senior director of community wildlife. "Even small changes in a master plan can really benefit wildlife."

Bigger changes are expected as the partnership matures. "More and more land will be dedicated to protecting wildlife," says Stanton. "And these natural spaces have the potential to be there for many generations, not only helping wildlife but also giving people an opportunity to connect with nature in their own communities."

Nowhere is that more evident than at Skyestone. Habibi, who moved to the community four years ago, has written a book about Walnut Creek illustrated with his own photographs. Soon he plans to start taking out small groups of neighbors to enjoy the new NWF-certified open space. "It will be a good way to get people to appreciate the environment," he says.

Doreen Cubie covered drought gardening in the August–September 2019 issue.

An Eye for Delightful Detail

Winners of the 2019 Garden for Wildlife photo contest reveal nature's subtle grace.

By Lisa Moore

Photographers sent more than 4,800 entries to the National Wildlife Federation's 2019 Garden for Wildlife™ photo contest, which invites images of animals that are thriving thanks to human efforts to provide food, water, cover and places for wildlife to raise young. "It helps showcase the conservation impact of people who garden for wildlife and also connects that community," says Erin Sweeney, the program's manager. Two winners appear here. To see them all, visit www.nwf.org/gfwphotocontest.

GRAND PRIZE A male prothonotary warbler gets relief on a hot summer day by gulping water droplets from a mister that photographer Randy Streufert placed in his Virginia backyard to benefit birds. "He seemed to especially enjoy it," says Streufert, whose Certified Wildlife Habitat® includes feeders, pollinator plants and a pond that lures crowds of mating tree frogs. "Given the loss of habitat," says Streufert, "I do whatever I can to help the creatures that are here."

FIRST PLACE Winning in the category that celebrates close-ups of native plants and their wildlife visitors, this artful composition captures the moment an eastern tailed-blue butterfly perches on a white heath aster and opens its wings, almost as if in a pose. "Usually when they're stationary, they have their wings closed," says Arthur Hass, a self-described hobbyist who photographs wildlife near his Virginia home.

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Constantine the Great was the world's first Christian Emperor. But he didn't start out that way...

Ruling from A.D. 307 to 337, Constantine began as many of his reign as a worshiper of Sol Invictus, "The Unconquerable Sun." But after a vision of the Cross led to his victory at the legendary Battle of the Milvian Bridge, and later to him being crowned sole Emperor of the Roman Empire, Constantine shifted his beliefs.

Believing that Sol Invictus and Christ were one and the same, Constantine legalized Christianity, allowing it to flourish. He merged the worship of Sol Invictus and Christ, creating religious practices still observed by modern-day Christians. And he authorized the striking of this Nummus coin—the first true coin of a Christian Empire, and thus the most important coin of Christian history.

Two Religions Become One

To help convert the Romans, Constantine associated Sol Invictus with Christ:

- On December 25th, the Romans honored Sol with a winter solstice feast. Under Constantine, this became a celebration of Christ (Christmas).
- In A.D. 321, Constantine declared "Sun Day" as a day to rest and worship Sol Invictus. Upon converting, Constantine kept Sunday as the new Christian day of rest (instead of Saturday).
- Constantine merged the celebration of Christ's resurrection with that of the vernal equinox, moving Easter to the Sunday after the first full moon of the equinox.

From "Sun God" to "Son of God"

We recently located a cache of these 1,600-year-old coins, each featuring Sol Invictus on its obverse. This was a savvy move by Constantine, who was converting the Roman Empire to Christianity with a merging of religions.

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Blended Family

PHOTOGRAPH BY NICOLE SUDDUTH

NICOLE SUDDUTH

A charming mix-up evolved last spring in a Michigan park, where photographer Nicole Sudduth was documenting a pair of nesting sandhill cranes. To her surprise, when the first of their two eggs hatched, out popped a Canada goose gosling, its yellow fluff and stubby beak telltale signs that it was a different species. Two days later, a reddish sandhill crane colt hatched from the second egg—and the blended family began to bond.

Sudduth thinks heavy rains flooded a nearby Canada goose nest, prompting the parents to deposit their egg with the neighbors. Whatever happened, the outcome was magical. "The crane parents didn't seem to favor one chick over the other," says Sudduth, who followed the family for several weeks. The father (background) often stood guard while the mother (far left) dug up worms and dropped them near the chicks, teaching them to forage. Though geese don't typically dig for worms, this little one got the hang of it, and the adoptive siblings rarely squabbled. Seeing such harmony "was very endearing," says Sudduth. As always, nature has much to teach us all. W

LEE CASEBERE

Rarely garnering public concern, thousands of native-plant species are at risk of extinction.

Plants in Peril

By Janet Marinelli

In late June and early July, a rare orchid of North American grasslands produces a single spike of five to 40 white flowers, each with a spectacular three-part fringed lower petal and a long, tubelike nectar spur. Called the eastern prairie fringed orchid, it is one of the most exquisite—and imperiled—of the continent's native prairie flowers.

When darkness descends on the prairie, the orchid emits an intoxicating jasminelike fragrance that proves irresistible to its only pollinators: night-flying hawkmoths, which use their long, strawlike proboscises to sip nectar from deep inside the spurs. In the process, the insects dislodge a sticky yellow packet of pollen and carry it to another orchid, leaving behind a bit of the waxy bundle to fertilize the second flower's bloom.

Less than a century ago, fringed orchids were widespread across the Upper Midwest and Great Lakes states.

EASTERN PRAIRIE FRINGED ORCHID So rare that its hawkmoth pollinators can no longer reliably find it, the eastern prairie fringed orchid (*Platanthera leucophaea*) has depended on human volunteers to hand-pollinate it for the past 28 years. These efforts are beginning to pay off: In Illinois, the number of orchids has increased from 190 individuals in 1991 to 1,910 last summer.

(In 1927, Illinois botanist Herman Pepoon called the plants a "blanket of white on the low, moist prairie.") But by 1989, the orchid was in such steep decline that the government listed it as threatened under the U.S. Endangered Species Act. Today, with all but 1 to 2 percent of the continent's tallgrass prairie destroyed by bulldozer and plow, the eastern prairie fringed orchid hangs on primarily in small, isolated habitat fragments.

Unfortunately, few if any hawkmoths find their way to these tiny pocket prairies, says U.S. Fish and Wildlife Service biologist Cathy Pollack. Even if a potential pollinator were to show up, some sites have so few blooming orchids that the insect would likely miss them and instead seek nectar from more-abundant flowers. What's more, the sheer distance between habitat fragments has made it difficult for moths that locate orchids to move freely among different plant populations to promote the cross-pollination that is needed to ensure genetic health.

Imperiled plants such as the fringed orchid rarely attract as much attention as at-risk animals, yet they actually outnumber them, with 943 U.S. plant species federally listed as endangered or threatened compared to 718 animals. Globally, Craig Hilton-Taylor, head of the International Union for Conservation of Nature's Red List Unit, says that 3,229 plants are considered critically endangered ("an extremely high risk of extinction in the wild"), 5,727 endangered ("a very high risk") and 6,817 vulnerable ("a high risk"). Because only 11 percent of known plant species have been assessed for inclusion on the Red List, these numbers are certain to rise, he adds.

Lack of urgency—and protection

In September 2019, German scientists published a report in *Conservation Letters* revealing that the majority of 355 plant species surveyed in the northeastern part of their country had suffered "significant losses" during the past two decades, with "moderately common" plants experiencing the greatest declines. Yet unlike comparable recent reports on insect and bird declines—which made headlines worldwide—the plant study was largely ignored. That troubles botanist Bruce Stein, the National Wildlife Federation's chief scientist. "If we are interested in conserving the diversity of life on Earth," he says, "we need to be very concerned about the large numbers of at-risk and declining plants."

At-risk plants also receive considerably less conservation funding and legal protection than animals. According to Abby Meyer, executive director of Botanic Gardens Conservation International in the United States (BGCI-US), plants in this country get less than 5 percent of total federal funding for endangered species recovery. And while threatened or endangered animal species are protected on both public and private property, plants are safeguarded only on federal lands. Even if the last individual of a plant species was growing on private land, the owners "could legally pull it up out of the ground and throw it in the garbage," says Johnny Randall, director of conservation programs at the North Carolina Botanical Garden.

Given this dearth of funding and legal protection, coaxing imperiled plants along the road to recovery can benefit from volunteer people power. There are many ways to engage in plant conservation, even in your backyard. "By gardening with native plants," says Mary Phillips, senior director of NWF's Garden for Wildlife™ program, "you can help prevent declining common species from suffering the same fate as endangered and threatened plants."

New York writer Janet Marinelli reported on the decline of native oaks in the October–November 2019 issue.

ZACHARY BRADFORD

SMOOTH CONEFLOWER This wildflower (*Echinacea laevigata*, above) is a close—but rare—relative of the familiar purple coneflower common in backyard gardens. Prior to European settlement, the species' native haunts—prairielike habitats and sunny oak savannas—were common throughout the southeastern United States, maintained by fire and large grazers such as bison. But agriculture, development and fire suppression have destroyed most of these habitats, and the plant now survives precariously along sunny roadsides.

SWAMP PINK Harbingers of spring, the fragrant flowers of swamp pink (*Helonias bullata*, right) are guaranteed to delight anyone willing to venture into the wet, shady and often-secluded locations where the plant grows on mossy hummocks. Like many wetland denizens, swamp pink has been decimated by the destruction and degradation of its habitat. Once found from New York to Georgia, this threatened wildflower's last strongholds today are isolated pockets of suitable habitat on the coastal plain of New Jersey, Delaware and Maryland.

CUM OKOLO (ALAMY STOCK PHOTO)

ROBERT SIVINSKI

KUENZLER HEDGEHOG CACTUS 1
Found only in the rocky central highlands of New Mexico, Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri*) is distinguished from other hedgehog cacti by its white spines and large magenta flowers. The cactus is threatened by uncontrolled wildfires, livestock grazing and poaching for sale in the horticulture trade. It is far from the only cactus in trouble: A 2015 global assessment found that 31 percent of all cactus species are at risk of extinction—making these plants more threatened than birds and mammals.

MEAD'S MILKWEED 2
Once each year, Mead's milkweed (*Asclepias meadii*) produces a single stem with an umbel of nodding, pale-green flowers. Attracted to these blooms, monarch butterflies dangle upside down from the blossoms to drink nectar, and their caterpillars feed on both flowers and leaves. Once widespread across the Midwest, Mead's milkweed has become rare as its tallgrass prairie habitats have been destroyed. Surviving plants are plagued by a litany of threats, from agriculture and urbanization to herbicides and invasive species.

WESTERN LILY 3
The United States is home to several native lilies, including the western lily (*Lilium occidentale*). This endangered wildflower grows only within a narrow, 200-mile stretch of coast between southern Oregon and Northern California, usually within sight of the sea. It is declining rapidly due to coastal development, cranberry farming, poaching for sale to plant collectors and clearing and draining of wetlands. Hummingbirds are the primary pollinators of the plant, which produces more nectar than any other U.S. lily.

STEVE ROELS

GERALD D. CARR

ALABAMA CANEBRAKE PITCHER PLANT 4

Like its relatives in the genus *Sarracenia*, Alabama canebrake pitcher plant (*Sarracenia rubra* ssp. *alabamensis*) is carnivorous, trapping insects at the bottom of its pitcher-shaped leaves where digestive enzymes dissolve the animals. This rare subspecies grows only in hillside seepage bogs and bottomland streamsides at about a dozen sites in two Alabama counties. These sites have been poached by plant collectors so often that conservationists no longer disclose their locations.

BRAD WILSON, DVM

A rufous hummingbird drinks nectar from a purple coneflower in Washington state. To fuel their high-speed lives, these birds visit hundreds of flowers a day.

Humming Along

By providing nectar and other basic needs, you can enjoy a ringside seat to the aerial acrobatics of these tiny, winged jewels.

By Mark Wexler

If you hang a hummingbird feeder or grow flowers that are attractive to the birds, you may conclude they do little more than eat—and you would not be too far from the truth. These tiny, vibrantly colored birds, which range only in the Western Hemisphere, probe hundreds of flowers for sugary nectar daily—in some cases feeding on both nectar and insects as often as 18 times an hour—and consuming the human equivalent of a whopping 150,000 calories a day.

They need to. Hummingbirds have one of the highest metabolic rates in the animal kingdom, with the fastest heartbeat of any bird species—nearly 500 beats per minute while resting and up to 1,200 beats when in action. Fleet fliers, the birds are powered by wings that beat 50 times or more per second, propelling them forward at speeds as fast as 30 miles per hour. Such a high-octane lifestyle means hummingbirds must consume as much as one-and-a-half times their body weight in nectar every day. "Being a hummingbird is like driving a car with a one-gallon gas tank," writes David Wentworth Lazaroff in his book *The Secret Lives of Hummingbirds*. "There is an almost constant need to refuel."

To meet this demanding need to feed, hummingbirds rely both on their physical prowess and impressive cognitive skills. The area of the animals' brains responsible for memory and learning is, proportionately, among the

CHARLES BERGMAN

For bathing, hummers, such as this Anna's hummingbird in Arizona, are particularly attracted to moving water. At ease in the rain, a ruby-throated hummingbird (below right) perches on a sugar-water feeder in Massachusetts.

LISA J. SWANSON

largest in the avian kingdom, and the little birds make good use of it. "They can remember not only a specific yard they visited in the past, but also which plants in it have more nectar and even where homeowners previously placed their feeders," says Sheri Williamson, director of the Southeastern Arizona Bird Observatory and author of the *Peterson Field Guide to Hummingbirds of North America*. "They might even remember you."

Recent research suggests the birds also can recall how much time has passed since they fed at a specific flower, so they know when to return for a refill after the plant generates new nectar. In a study in the Canadian Rockies published in *Current Biology*, scientists from the United Kingdom and Canada found that hummingbirds "could keep track of the time since their last visit to eight different flowers."

Unlike most insects, hummingbirds do not depend on scent to find flowers. Instead, they use their strong vision and ability to hover to locate nectar-rich plants with long tubular flowers, such as trumpet honeysuckle and columbine. "This is no accident, but rather the result of coevolution," explains National Wildlife Federation Naturalist David Mizejewski in *Attracting Birds, Butterflies, and Other Backyard Wildlife*. "Tubular flowers are perfectly shaped to transmit pollen to the foreheads of these long-billed birds as they drink nectar from deep within the bloom." Both birds and blooms, then, benefit from their relationship.

Hummers look for orange, yellow, purple and—especially—red flowers, which make up a high percentage of the plants they probe. Scientists have found that cones in the birds' retinas act as filters, intensifying sensitivity in the red and yellow color ranges while muting other hues. "Most insects do not see well, if at all, in the red spectrum, and thus red flowers are inconspicuous to them," Williamson says. "That reduces the hummers' competition and helps plants get pollinated." More than 180 North American plant species depend on hummingbirds for pollination.

How to help hummers

Of the more than 350 hummingbird species, 16 breed in the United States, with just one, the ruby-throated hummingbird, nesting regularly east of the Mississippi River. By growing hummer-friendly native plants and providing water and a handful of other resources, you can easily lure the birds to your property, helping them recharge their ultrafast metabolisms while you enjoy an opportunity to observe these winged jewels in action. It doesn't matter whether you have a large yard or just a small deck or balcony with potted plants and a feeder. Once the birds discover your nectar sources, they'll likely be back for more helpings. "One of the things I find really healing is to go into my garden and watch hummingbirds using the plants I've grown," Williamson says. "It lifts my spirits, knowing that I'm contributing in a small way to their survival."

Williamson recommends growing a mix of plant species that have overlapping blooming seasons so the birds have food throughout most of the year. Check with a local or state native-plant society to find out which nectar-rich flowering species are indigenous to your region and appropriate for your garden. Natives such as bee balm, cardinal flower, scarlet sage and trumpet vine deliver more nectar than hybrid flowers. And late-season flowering plants such as salvia will help species, including rufous and ruby-throated hummingbirds, that must double their weight before migrating south in autumn.

As another enticement, supplement natural food with sugar-water feeders. The best choices are feeders with bright red trim and no yellow parts (bees and wasps apparently are attracted to yellow). Position your feeders in the open but near trees or other protective cover and, ideally, more than 30 feet from your house to keep the birds from flying into windows. (According to research by Muhlenberg College ornithologist Daniel Klem Jr., you can also place feeders fewer than 3 feet from a window, which prevents the animals from flying fast into the glass.) Because species such as rufous and ruby-throated hummingbirds are highly territorial—and will fight to protect a feeder—add additional sugar-water feeders in different parts of your property for other hummers to enjoy.

Fill feeder cylinders with a solution of four parts water to one part sugar. "Be sure to use only white sugar," Mizejewski advises. "While not particularly healthy for humans, white sugar dissolves in water in the right concentration that is a close simulation of flower nectar fed on by wildlife." Never use honey, which promotes dangerous fungal growth, brown sugar, artificial sweeteners or red dye.

During cool weather, replace the solution every three to five days and clean the feeders thoroughly each time to prevent mold buildup. "In the heat of summer," Williamson says, "keep feeders in the shade and change the water daily, especially when temperatures approach 90 degrees F." Hot sugar water, she notes, ferments much faster than cool sugar water, creating a health hazard for the birds.

Hummers need more than food, of course. Native trees or tall shrubs provide them cover and places to perch. The birds look for safe perches particularly on cold nights when they go into a state of torpor—a type of deep sleep that enables them to save energy until they can begin foraging once it warms up in the morning.

During the breeding season, resist the temptation to knock down spider webs, which the birds use to hold together their cup nests and to probe for insects. Scientists say that a single hummingbird can eat hundreds of insects a day. In addition, hummers also need to bathe frequently and will be especially attracted to moving water such as bubblers, dripping fountains or misting devices.

Taking such small steps can benefit hummingbirds—and you—in a big way. "Hummers have a way of getting their little claws into you, and before you know it, you're hooked," Williamson says. "They have become a big part of our lives, and for that, my husband and I are grateful."

LEIGH SCOTT

Mark Wexler is National Wildlife*'s editor-at-large.*

Cultivating

Offering an abundance of food, water, cover and places to raise young, this Certified Wildlife Habitat® in Los Angeles attracts a variety of wildlife, including more than a dozen different bird species.

Change

Wildlife-friendly gardening shows promise for restoring biodiversity in our increasingly urban world.

By Jessica Snyder Sachs

Photographs by Grant Puckett

More than a dozen hummingbirds speed between the potted plants and hanging baskets that line the side of Paula Richards' Los Angeles home. "Sometimes I think I'll be impaled when I step out the door," she jokes, clearly proud of the three hummingbird species—Allen's, Anna's and rufous—that visit her profusion of flowers. In the backyard, American and lesser goldfinches share a well-stocked feeder with chipping sparrows and house finches. And in the front, warblers and wrens flutter in a stone fountain while a northern mockingbird sings from the leafy branches of a palo verde tree.

What you do not see in Richards' yard is lawn. She pulled it out to conserve water. But in a neighborhood where rock-and-gravel landscaping alternates with manicured turf grass, Richards wanted something more attractive to wildlife. To achieve that, she followed the National Wildlife Federation's guidelines for creating a Certified Wildlife Habitat®, which required her to provide food, water, cover and places for wildlife to raise young. Today, more than a dozen bird species regularly visit Richards' yard, most of them native. So do a variety of butterflies (including monarchs and swallowtails), bees, lizards, the occasional opossum, raccoon and skunk—and one morning, a great horned owl.

Fighting urban uniformity

Recently, her yard—along with 23 other NWF certified habitats across the country—became part of an ambitious four-year study, *American Residential Macrosystem: Yard Futures*, funded by the National Science Foundation (NSF). Its goal is to identify yard-management strategies that increase biodiversity: the variety of life that gives ecosystems their resiliency. While still preliminary, the study's initial findings suggest that wildlife gardening, if adopted on a wider scale, can help boost such diversity.

Mary Phillips, senior director of the Federation's Garden for Wildlife™ program, is not surprised by the results. "For more than four decades, people have joined our program because their efforts pay off with an almost immediate attraction of birds, butterflies and other wildlife to their properties," she says. "Now science is confirming that our program's gardening practices support both an abundance and diversity of wildlife species."

Greater diversity in urban landscapes is sorely needed. "From coast to coast, our cities and suburbs have become more similar to each other than to the very different natural habitats they've replaced," says U.S. Forest Service ecologist Susannah Lerman, who co-leads the NSF study with Peter Groffman, an ecosystem scientist at City University of New York's Advanced Science Research Center. "We have reason to be concerned that this growing uniformity of the American landscape is significantly reducing biodiversity."

The consequences go beyond loss of beloved wildlife species. During the past decade, research has established a strong link between biodiversity and human health. Scientists have shown how reduced diversity promotes the

Allen's hummingbird (left) is one of three hummingbird species Paula Richards (center) regularly spots in her Los Angeles certified habitat. Several years ago, Richards pulled out her turf-grass lawn and replaced it with drought-tolerant ferns (right) and other plants that have helped her conserve water in this frequently dry region.

emergence and spread of infections such as Lyme disease and West Nile virus, for example. The microbes that cause these serious illnesses multiply rapidly in disturbed habitats where their preferred hosts (such as black-legged ticks and white-footed mice) face little to no competition.

Can yards make a difference?

Historically, wildlife conservation focused on protecting large wilderness areas. Yet parklands make up a mere 3 to 4 percent of the continental United States, Lerman points out. By comparison, yards make up roughly 17 percent. "And when we zoom into cities, yards make up about 50 percent of our total green space," she adds. "That's a significant amount of land with potential to provide quality wildlife habitat."

To increase that potential, the NSF project is exploring how different styles of gardening and yard maintenance affect biodiversity, both on a yard-by-yard basis and on a neighborhood level. During the past two years, the project's investigators have looked at 157 sites in six major metropolitan areas: Los Angeles, Phoenix, Minneapolis, Miami, Baltimore and Boston. All sites included four examples each of two types of parks (fragmented patches and larger protected areas) and four types of residential yards: wildlife friendly (all NWF certified habitats), highly managed (fertilized and maintained by lawn-care companies), passively managed (no fertilizer or professional maintenance) and water conserving (xeriscaping in the West and rain gardens in the East).

In each park or yard, the researchers identified and counted species of plants, birds, bees and ground arthropods (insects, spiders, centipedes, mites and the like) and took soil samples. While still analyzing their results, the

"I like seeing people stop to look at my plants and birds. I get a lot of compliments. The kids come over, too. They're fascinated."

—Paula Richards

American and lesser goldfinches feast at a feeder (right) in Richards' backyard, where a variety of birdhouses (far right) provide places for cavity-nesting birds to lay eggs and rear their chicks. Richards' property (left) is part of a nationwide, six-city study examining how different yard-management strategies impact the diversity of species that can thrive in the nation's urban areas. So far, wildlife gardening has shown the most promise.

scientists presented their first findings—on bird diversity—at the 2019 annual meetings of the Ecological Society of America and the American Ornithological Society.

According to Lerman, the study's relatively small sample size—just four of each yard type per city—prevented the researchers from identifying a statistically clear-cut "winner." (The average number of bird species was slightly higher in wildlife-friendly versus manicured yards, she explains, but that difference lay within the realm of chance.) Sophisticated analysis of the data, however, revealed some important patterns.

Promising patterns

First, the highly maintained lawns tended to host "generalist" birds such as house sparrows, house finches, crows and grackles. As their name suggests, these generalists are not particularly picky when it comes to their needs for food and nesting. That means they can survive, even thrive, in disturbed areas. By contrast, wildlife-habitat yards tended to host more "specialist" birds that have evolved specific needs for resources most likely to be found in their native habitats. Examples in the study included curve-billed thrashers in Phoenix and great crested flycatchers in Minneapolis, which feed on specific types of insects and have special nesting needs such as cacti or natural cavities in dead trees.

In addition, *different* bird species tended to show up in each wildlife-habitat yard. Statistically, this suggests that surveying a larger number of wildlife-friendly yards would turn up additional species, increasing the overall biodiversity "score" of wildlife gardening, Lerman says.

Highly maintained lawns, on the other hand, yielded similar collections of bird species across most of any given city—and to some extent across the country. Sampling more of these yards, therefore, would likely result in more of the same, with no increase in biodiversity.

That there wasn't a more-dramatic difference in total bird species numbers, Lerman suggests, may reflect the reality that wildlife-friendly yards remain isolated patches of habitat in lawn-dominated neighborhoods. (On a national level, they represent fewer than 5 percent of residential properties.) It may be that these yards need to reach some critical mass to deliver on their greater promise. "Birds are highly mobile," Lerman notes. "One yard with quality habitat isn't enough. Some birds may need 20."

Yet even isolated wildlife-friendly yards can provide connectivity to parklands, she adds. Across each of the six cities studied, parks—especially those with intact natural habitat—housed the highest number of bird species of "conservation concern." These include species whose populations have declined and those facing significant threats such as the wood thrush and alder flycatcher.

In an effort to boost the number of wildlife-habitat yards across the country—and ultimately urban biodiversity—Lerman is working with sociologists to explore ways to increase their acceptance and popularity. One lesson: "If a yard looks messy, it may be fantastic for wildlife, but it's not going to fly" with the public, she admits. "First, it needs to look nice."

Wildlife gardener Paula Richards agrees. Whether working or relaxing in her tidy, eye-catching certified habitat, she says, "I like seeing people stop to look at my plants and birds. I get a lot of compliments. The kids come over, too. They're fascinated." In walks around her Los Angeles neighborhood, Richards is always on the lookout for additional wildlife-friendly yards. "Recently, I found one," she says hopefully. "It would be wonderful to see more neighbors restoring this closeness to nature."

Jessica Snyder Sachs is a New Jersey–based science writer. Grant Puckett is a freelance photographer in Los Angeles, California.

Eat, Fly, Love, Die

Dragonflies' brief but glorious life on the wing

By Jennifer S. Holland

In the beginning, long before dinosaurs roamed or birds flew, an ancestral dragonflylike insect with a nearly 2.5-foot wingspan swooped over swamps nabbing other insects in the air and amphibians on the ground. *Meganeuropsis americana* graced the skies starting some 290 million years ago. Its fossilized wing, discovered in 1940 in an Oklahoma prairie, was the largest of any insect ever found.

Today, the likely descendants of these ancient fliers are much shrunken (modern dragonfly wingspans average about 3 inches), but these animals are just as astounding as their prehistoric kin—as new science reveals.

Publishing in late 2018 in the journal *Biology Letters*, a team of researchers, for the first time, described the complete life cycle and multigenerational migration of the common green darner (*Anax junius*), the first dragonfly species in the Western Hemisphere to yield the full story of its enigmatic life. Its baton-passing marathon involves at least three generations and an average of 825 miles round trip between ponds within the species' range, which extends from Central America into Canada. Though that's not a record distance for dragonflies (the globe skimmer's jaunt between India and Africa can top 10,000 miles), the green darner's North American passage teaches much about the vital importance of aquatic and terrestrial habitats to the health of migratory insect species—key indicators of ecosystem health.

Born to fly

Of course, nailing down data on a famously fleet insect is no easy feat. Catching one means "chasing little rockets," says Kent McFarland of the Vermont Center for Ecostudies, a coauthor of the study. Among the fastest of flying insects, dragonflies are masters of the dodge-and-weave. Two sets of swiveling wings allow them to hover motionless, fly upside down or backwards and change tack in a blink. And huge, multifaceted eyes allow for nearly 360-degree vision. To nab one, "you have to bring the net up from behind, sweeping in from the back," says McFarland.

Fortunately, there are easier ways to spy on the insects' movements. For their comprehensive study, McFarland and colleagues

ABOVE: ALEXANDRE ALBORE (WIKIMEDIA COMMONS), RIGHT: STEVE GETTLE (MINDEN PICTURES)

The mold of a fossilized *Meganeura monyi* dragonfly (left) hints at the prehistoric roots of these vivid fliers, which date back some 300 million years. One of 3,000-plus dragonfly species today, the green darner's massive, multifaceted eyes and maneuverable sets of wings allow it to easily track and ambush prey in midair.

consulted 21 years of observations logged online by dragonfly enthusiasts and citizen scientists, which revealed clues about natural cues that prompt the insects to emerge and migrate. The biologists also analyzed wing samples of 852 dragonfly specimens from museum collections and recent field captures in eight countries, with some specimens dating back 140 years. Those wing bits yielded research gold.

Dragonfly eggs hatch in water, where the larvae, or nymphs, begin to develop what will later emerge as wings. Those wings pick up stable hydrogen isotopes—chemical signatures that are specific to the waters where the tissue develops. These isotopes help experts map an insect's birthplace. It's not as precise as a GPS tracker, says McFarland. "But we get regional information—this one came from the Gulf Coast or the mid-Atlantic, say—which is better than we had before."

Birthplace is just the first piece of the puzzle. Turns out, the ratio of three forms of hydrogen in the atmosphere shifts with latitude, a clue that allowed the dragonfly researchers to piece together the green darner's three-generation migration life cycle.

PETER RILEY

A twelve-spotted skimmer (above) soars like a biplane on its hunt for insects in Vermont. As a male common green darner grips his mate's head, she deposits her eggs in a Montana river (right). The hatchlings, or nymphs, live aquatic lives for months or years, eating mosquito larvae and other prey before emerging as adults, soon to fly.

Long-range nomads

The darner family trip typically goes like this: As early spring temperatures hit 48 degrees F—"a seemingly magic number," says McFarland—dragonflies born in the Caribbean, Mexico or southern United States emerge from natal ponds, unfurl their wings and fly an average of 400 miles north. There, that first generation mates, lays eggs in wetlands and dies—a total adult lifespan of less than two months. Once the nymphs of this second generation reach adulthood, they'll swarm south again, mate, lay eggs and die. Those eggs become the third generation, which typically stays put, a resident population whose own offspring will eventually zoom northward, following in the wingbeats of their great grandparents.

Shedding additional light on the dragonfly's migration, Samantha Knight, Ryan Norris and colleagues at the University of Guelph in Ontario glued raindrop-size trackers to the underside of 38 green darners (the only species large enough to handle them) to find out how environmental conditions might affect their flight. As the insects migrated from southern Ontario into the northern United States, satellites pinged back data on temperature and precipitation, plus the insects' flight speed and distance flown.

Not surprising, "tailwinds positively influenced migration speed, as did warmer temperatures," says Norris. Light rain didn't trouble the insects. Their study yielded two new records: a darner that flew more than 30 miles an hour (and, without the transmitter, likely could have flown

Being a dragonfly champion

Efficient and voracious ambush predators, dragonflies can devour as many as 100 mosquitoes a day. They also munch on gnats, black flies and other peskies that can ruin your afternoon. So how can you lure these beautiful, water-dependent fliers to your yard?

Install a fish-free pond. Give it shallow sides and a center depth of about two feet. Place it in partial sun and add a mix of submerged, floating and emergent plants such as wispy grasses where dragonflies can roost and lay eggs.

Leave ponds messy. Netting out pond debris can disturb dragonfly eggs, and leaf litter on the bottom gives aquatic dragonfly nymphs a place to hide and hunt.

Add nearby plants and avoid chemicals. Near the pond, plant flowers and shrubs where dragonflies can rest or hunt for insects. Add some flat, light-colored rocks where dragonflies can warm themselves in the sun. And avoid using chemicals—a gift to all wildlife.

PHIL SAVOIE (NPL/MINDEN PICTURES)

faster) and traveled 75 miles in a single day, nearly the distance between New York City and Philadelphia.

A dragonfly's speed, agility and superhero vision make it a lethal ambush predator, able to track, nab and devour insect prey in midair, often sneaking up from below. Studies show that dragonflies successfully catch their targets more than 95 percent of the time, and their prey includes many insects that transmit disease or ruin picnics, including mosquitoes, gnats, horseflies, midges and flying ants and termites.

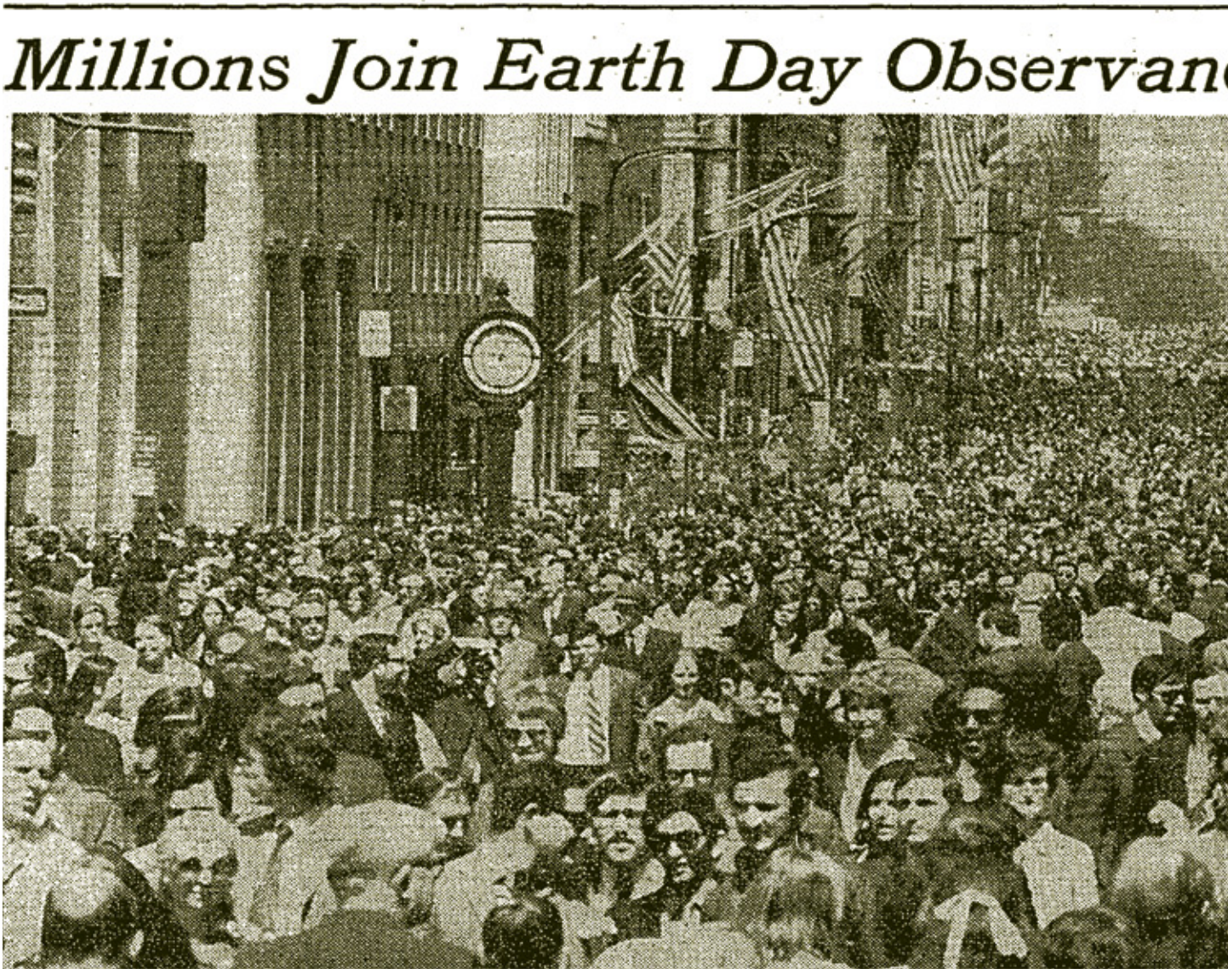
The dragonfly's voracious appetite for insects has long piqued interest in the pest-management industry. "Since the 1960s, people have tried to use dragonflies as biological controls for malaria and dengue vectors," says entomologist Jessica Ware of the American Museum of Natural History. That effort had limited success. Gardeners have more luck enlisting dragonflies as pest managers by building ponds for nymphs, then enjoying the adults' aerial antics.

Riding high, or fading out?

Though researchers are figuring out the dragonfly's story, much remains unwritten, particularly about the animal's ability to cope with environmental change. Found on every continent but Antarctica, dragonfly species face a litany of human-driven assaults across their range. Experts believe at least one in 10 species is at risk, particularly as the water bodies they depend on become degraded. Fluctuations in climate especially worry some experts. For green darners, "northward migrations are limited by temperature, and nymph development in the aquatic environment is also temperature dependent," says Michael Hallworth of the Northeast Climate Adaptation Science Center, who led the stable-isotope study. "It means they could be impacted by climate change during one or more stages of their life cycle."

Across the globe, we are in the midst of what some call an "insect apocalypse," with an estimated 40 percent of all insect species at risk of extinction in coming decades due to habitat loss, pesticide use, shifting temperatures and other factors. "We don't know whether the rate of dragonfly decline is similar to that of other insects," says Ware. But she cautions researchers to "pick up the pace" in learning the secrets of this remarkable, ancient group of fliers.

Jennifer S. Holland explored oil impacts on deep-sea corals in the Gulf of Mexico in our February–March 2020 issue.


NEW YORK, THURSDAY, APRIL 23

Millions Join Earth Day Observan

HAPPY BIRTHDAY*

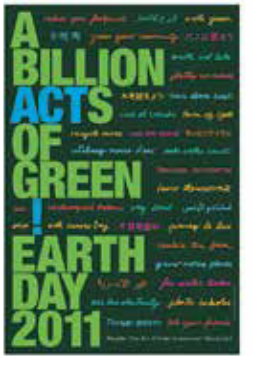
Observing 50 years of enduring stewardship for the planet

In many ways, Earth Day was born in the muck of an oil spill. After an oil-well blowout offshore from Santa Barbara caused devastation along the California coast in 1969, U.S. Senator Gaylord Nelson of Wisconsin worked with environmentalist Denis Hayes to organize and launch the first Earth Day on April 22, 1970—an event that drew some 20 million people into the streets from New York to San Francisco. And so began a new conservation movement, with an emphasis on "human health and the environment," says Earth Day Network President Kathleen Rogers. Over time, the Earth Day celebration has become an international movement, inspiring the creation of scores of environmental groups and prompting legislation to protect the Earth. — *Joshua Rapp Learn*


, 1970

ces Across the Nation

EARTH DAY



More than 100,000 people marched in New York City on the first Earth Day in 1970 (above), the event's largest U.S. gathering that year. Annual posters promoting Earth Day have featured famous artists such as Peter Max (left) and Ivan Chermayeff, and also have urged action on behalf of the planet.

1970s When the first Earth Day in 1970 drew millions of people into the streets, "it was such a shock to President Nixon and to Congress that they did a lot right away," says Kathleen Rogers of Earth Day Network. They created the U.S. Environmental Protection Agency in 1970 and began developing landmark laws such as the Clean Water Act of 1972 and Endangered Species Act of 1973.

1980s Discovery of a giant hole in the ozone layer over Antarctica in 1984 prompted creation of the Montreal Protocol of 1989. This international agreement led to the phaseout of a number of chemicals responsible for ozone depletion such as chlorofluorocarbons (CFCs) and related compounds.

1990s In 1990, Earth Day went global, with events in more than 140 countries drawing hundreds of millions of people. In 1992, the United Nations held the Rio Earth Summit in Brazil, with a focus on global production of toxic waste and addressing the need for finding alternatives to fossil fuels for energy.

2000s International treaties such as the Stockholm Convention (adopted in 2001) and the Kyoto Protocol (brought into force in 2005) drew commitments from scores of nations to limit the use of harmful chemicals and reduce greenhouse gas emissions, respectively. In 2007, Al Gore and the Intergovernmental Panel on Climate Change jointly won the Nobel Peace Prize for their efforts to inform people about the dangers of a rapidly shifting climate.

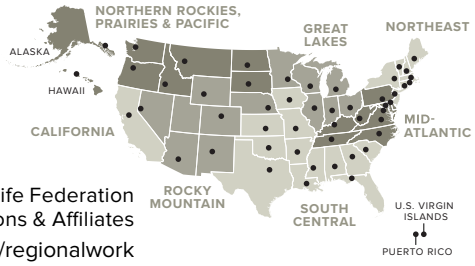
2010s The 2015 United Nations Climate Change Conference prompted 174 countries and the European Union to sign the Paris Agreement on Earth Day 2016. Signatories agree to limit total anthropogenic global warming to less than 2 degrees Celsius.

2020s Going strong at 50, the Earth Day movement includes campaigns to reforest the globe, reduce plastic pollution, promote sustainable eating, conserve endangered species and engage people in environmental education. "Problems have snowballed so our efforts must, too," says Rogers.

TOP: THE NEW YORK TIMES, POSTERS COURTESY OF EARTH DAY NETWORK

WORKING FOR WILDLIFE

By Delaney McPherson



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www.nwf.org/regionalwork

JEFFREY MCMILLAN

JEFFREY MCMILLAN

A NEW SMITHSONIAN DESTINATION

"Habitat" exhibit creates urban wildlife haven.

The sounds of a waterfall and chirping birds in Washington, D.C., drowned out the noise of traffic on a bright September day last fall during a dedication ceremony for the Smithsonian Gardens' Certified Wildlife Habitat®. Called "Habitat," this new offering, which will run through the end of 2020, includes 14 exhibits spread throughout the Smithsonian campus's 45 acres of gardens.

At an exhibit tour, National Wildlife Federation President and CEO Collin O'Mara joined then Smithsonian Gardens Director Barbara Faust to plant the CWH sign (right) at the National Museum of Natural History's Pollinator Garden. All sites in the exhibition use plants, natural structures and water features to help wildlife, and signs to educate the public.

JEFFREY MCMILLAN

A "Bug B&B" in the pollinator garden, for example, provides habitat for insects in the form of wooden sculptures (top right) filled with natural materials for shelter. The "Dead Wood is Life" exhibit outside the National Museum of American History highlights the benefit of dead wood and leaves to provide habitat and cover for insects, and the Moongate Garden outside the Smithsonian Castle (top left) features metal dragonflies flying over a fountain and signs that explain the role of dragonflies to indicate wetland health.

In an urban area such as D.C., these gardens provide much-needed biodiversity. "It's amazing how many birds find this tiny one-third of an acre," says Janet Draper, head horticulturist of the Mary Livingston Ripley Garden, one of the 14 sites.

"Habitat" is the first campus-wide exhibition for the Smithsonian, a huge win for Faust's team as they strive to make their presence known. "We wanted to show we are a force to be reckoned with, just like any museum," says Faust. "I want us to be a destination just like going to see the dinosaurs and the rockets."

Visit: gardens.si.edu

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TEXAS CONSERVATION ALLIANCE

Fifty years of conservation

As Texas Conservation Alliance (TCA) enters its 50th year, this NWF affiliate has a lot to celebrate. In 2019 alone, it saw two of its long-term projects come to fruition.

In August, TCA oversaw the public-access grand opening of the Neches River National Wildlife Refuge in East Texas, a 7,000-acre sweep of bottomland hardwood trees and wetlands that provides important wintering grounds for waterfowl. TCA began its campaign in 2004, eventually soliciting 20,000 signatures showing public support for the refuge designation. Since then, the group has built public-access trails and regularly works to maintain them.

TCA also oversaw the opening of the Sabine Sandbar Paddling Trail in East Texas, a 15-mile haven for kayakers, anglers and sightseers. This effort involved a three-year collaboration with the Texas Parks and Wildlife department, community partners and others. "The trail has gorgeous, gleaming sandbars," says Janice Bezanson, executive director of TCA. "And the sandbass run in the wintertime is a really big deal for fishermen."

Another big win: Due to a ballot initiative TCA helped organize in 2019, sales tax from sporting goods will now go to public-lands agencies, helping TCA continue its work protecting habitat. On a broader scale, as Texas is a migration corridor for monarchs (right), TCA works closely with NWF to promote monarch habitat, generating hundreds of Certified Wildlife Habitats a year. Visit: tcatexas.org

AUDREY WOOD

NWF

ON THE GLOBAL STAGE

Giving youth a voice

In 2019, Will Charouhis of Miami, Florida, (left, age 13), created his own climate movement called Forces of Nature after seeing the effects climate change could have on his hometown and feeling frustrated by inaction from local and national leaders. "I started this not by choice but by necessity," he says. "Adults need to realize that climate change is an issue, and they have to do something."

Charouhis's work inspired NWF to bring him with their team of 10 to the COP25 climate conference in Madrid, Spain, last December. The NWF delegation hosted a workshop for governments to learn how to integrate nature-based solutions into their climate plans, and supported events such as the youth and indigenous people panel, where Charouhis spoke. "We like to include different voices at negotiations as a reminder of what's at stake," says Nathalie Walker, NWF director of tropical forests and agriculture. Visit: international.nwf.org

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JUSTIN SHAPIRO (NWF)

NEIGHBORHOOD GREENING

Turning vacant lots into beautiful parks

■ Community collaboration and vision came to life in August 2019 as NWF and the Druid Heights Community Development Corporation proudly unveiled a new public park in Baltimore, Maryland, built on what used to be a vacant lot. The NWF Mid-Atlantic team worked with local partners to turn the area into a nature-based playground filled with native pollinator plants, a rain garden and two murals by artist Dalvin Wade Byron (above).

At a regional scale, NWF is also working with the Pennsylvania Horticultural Society in Philadelphia to transform 50 vacant lots into parks and pollinator habitats. The sites were planted in October 2019, and each park has a different combination of plants, which the University of Maryland will study to determine which variety is most effective for climate-smart urban conservation.

"Programs creating pollinator habitat help not only to increase biodiversity," says Holly Gallagher, senior manager of education and community conservation at NWF, "but also benefit communities by helping them become resilient to climate change." Visit: druidheights.com

NEW NWF PARTNER

Wild Birds Unlimited

■ In 2020, the National Wildlife Federation and national retailer Wild Birds Unlimited (WBU) signed a two-year agreement to collaborate on promoting NWF's Certified Wildlife Habitat® program in WBU's 338 retail outlets and online. As a seller of birdseed, feeders, bird baths and nest boxes, WBU can help wildlife gardeners provide food, water, cover and places to raise young—the four core requirements for NWF habitat certification. This collaboration will help WBU deliver on its mission to "bring people and nature together," says company CEO and founder Jim Carpenter. "We'll also be helping our customers create a better place for birds and wildlife to live."

Visit: wbu.com

KAREN CHASE

Cool Customer

PHOTOGRAPH BY DENNIS QUINN

Diving for a drink during a drought, a Cape dwarf chameleon gulps from a backyard birdbath in Cape Town, South Africa. "It's rare to see them submerge their heads," says herpetologist Dennis Quinn, who caught this moment in his mother-in-law's garden. Home to some 30 chameleons and many other animals, the garden is packed with native flowers, shrubs, trees and water features that benefit wildlife. "Everything is arranged to provide optimal thermoregulation and foraging," says Quinn, whose delightful image was grand prize runner-up in NWF's 2019 Garden for Wildlife™ photo contest.

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