

Earth Island Journal

News of the World Environment

SUMMER 2018 \$6.00

How contributing to research can transform our
relationship with the natural world

CITIZEN SCIENTISTS



Also:
March of the Armyworm
Learning from Roadkill



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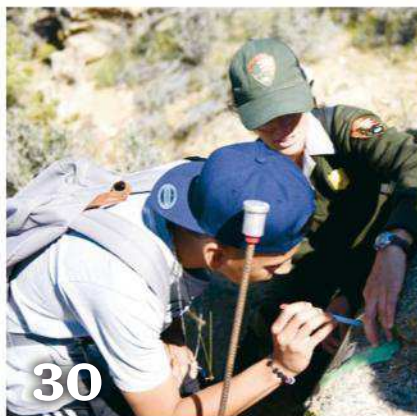


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Leave the Door Open

Here are some stats on the rewilding of the US Southwest's Mexican gray wolves — the most endangered mammal in North America — that have been rattling around in my mind for the past few days:

- 1998–2002: 110 captive-born wolves released in the wild, 58 removed from the wild to captive facilities;
- 2003–2007: 68 released and 84 removed;
- 2008–2013: 19 released, 17 removed.

This, dear readers, is what rewilding looks like, US Fish and Wildlife (FWS) style. Set them free — but lock 'em up again if they venture out of their designated free-range area too many times, or, God forbid, attack cattle.

And, by the way, these numbers don't even include the wolves killed by the feds for being "problem" animals (14 as of 2016), or those hunted by poachers (66 as of 2015). Neither do they include the many wolves that have sickened and died because they were terribly genetically compromised — the entire existing Mexican wolf population is so inbred that that most of them could be siblings.

As John Soltes reveals in "Recovery Roadblocks" (pg. 18), thanks to political pressure from the livestock and sporting industries, the FWS has been keeping such tight control over Mexican grays that the American gray wolf subspecies is barely hanging in there. After 20 years of rewilding, the total wild population of Mexican wolves in the US stands at a measly 114.

There is another, smaller wild population of these wolves in Mexico, also the product of recent reintroduction efforts in that country. Most conservation biologists agree it is vital that the US and Mexican

populations be allowed to travel freely across the border to mate and diversify their gene pool. Some wolves from Mexico have already been making that trans-boundary journey, but Trump's border wall could soon put an end to that.

What struck me as the saddest part of this story was how the FWS has, in recent years, stopped releasing these highly social animals as family groups. Instead, it has been relying on "cross-fostering" — moving very young pups from one litter into a different, similar-age litter with the hope that the receiving pack will raise them as their own. The FWS says this will help improve the genetic health of the wild population, but truth is, the practice is also partly motivated by the immense political resistance to releasing adults.

Learning about Mexican wolf families being broken up in this way at a time when the Trump administration is threatening to split up Central American families who cross the border illegally — sending children to shelters on military bases, parents to prison — it's impossible to not notice an unsettling pattern in how this nation has taken to treating the inconvenient "other," whether human or nonhuman.

Surely, when the persecuted, the endangered, the impoverished need its protection to survive, the "Home of the Free" can do better than this? It's about time we Americans took a long, hard look at ourselves and figured out what kind of nation we want to be — one that opens its doors to the vibrant, albeit messy and complex, diversity that makes life on Earth so wonderful, or one that isolates itself behind impermeable walls and arbitrary boundaries. ■



EDITOR

Maureen Nandini Mitra
maureenmitra@earthisland.org

MANAGING EDITOR

Zoe Loftus-Farren
zloftus@earthisland.org

COPY EDITOR

Catherine Carlstroem

ART DIRECTOR

Lilli Keinaenen /
Changemaker Creative

EDITOR EMERITUS

Gar Smith

COVER DESIGN

Lilli Keinaenen /
Changemaker Creative

SUBSCRIPTION is a benefit of membership in Earth Island Institute. Send \$25.00 US to:

Earth Island Institute
David Brower Center
2150 Allston Way, Suite 460
Berkeley, CA 94704 USA

FOR MEMBERSHIP INFORMATION AND ADDRESS CHANGES:

Kim Picone
kimpicone@earthisland.org
510-859-9123

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Letters to the Editor

Earth Island Journal

2150 Allston Way #460

Berkeley, CA 94704

editor@earthisland.org

Hope for the Future

Speaking as an old guy who has been in this struggle since well before the first issue of *Earth Island Journal* arrived in my mailbox, I can safely say that women like Dineen O'Rourke (Voices, Spring 2018) give me hope for a future that otherwise looks very grim. I've known and worked with her and her colleagues, and they have the intelligence, energy, and awareness that we could only hope to have had back in the day when littering, river clean-ups, and nukes were our biggest concern. Onward!

*Don Ogden
Leverett, MA*

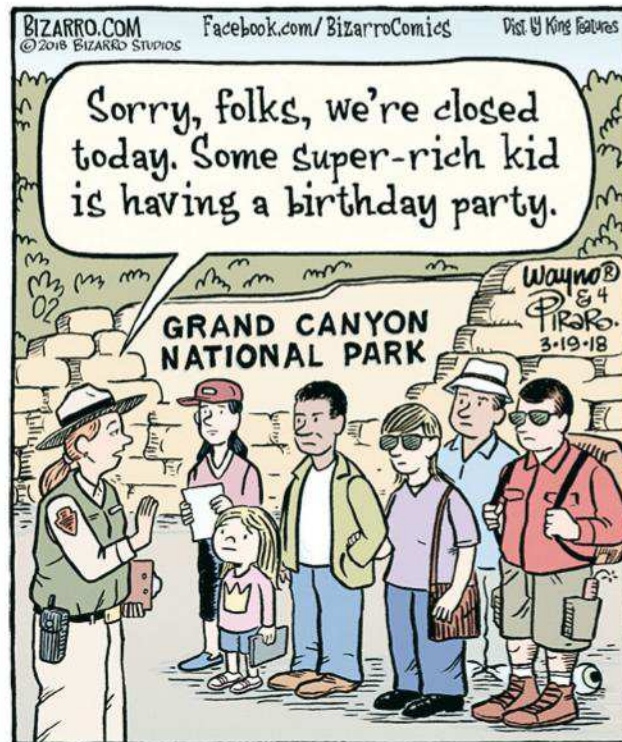
In Appreciation

Just want to tell you how much I appreciate the *Journal* — excellent articles, especially “The Long Run Home” (Spring 2018) and beautiful design/layout. I look forward to the next issue.

*Eileen Wampole
San Francisco, CA*

For the Love of Rivers

I loved the piece on canoeing in *Earth Island Journal's* Spring 2018 issue. Like the author, I too learned my love of canoeing in Iowa. I haven't been back there in 20-odd years and I suspect the rivers there are not so clean as I



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remember, especially due to massive agricultural runoff. I also loved the photos accompanying the feature. In my honest opinion, canoeing is so important for younger people in developing a love and appreciation of rivers. A primer on getting into the sport would not be out of line for the *Journal* to do. Thank you!

*David Palmer
Reno, NV*

Paddler Power

Paddling on relatively flat waters, like those of the Willamette River and Clear and Fish Lakes up in Oregon's Cascade Mountains, became an addiction for my wife and me during the past decade or so. In 2009, we moved to Oregon from the Sonoran Desert, where natural drainages are almost always dry. Living near the Willamette is kind of like hitting the Powerball for those of us who love paddling. We have kayaks, not canoes.

No matter. “The Way of the Canoe” in the Spring 2018 edition of *Earth Island Journal* still resonated deep in my bones. It is an excellent read that I will remember the rest of my life. Learning more about how paddlers help resist environmentally destructive events is helpful. It makes me want to launch more often, especially when there's another group of fellow paddlers resisting destruction. ■

*Ricardo Small
Albany, OR*

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In April, the EPA announced that it would lower Obama-era fuel efficiency standards for cars and SUVs, prompting a California-led coalition of 17 states and the District of Columbia to file a lawsuit challenging the plan.

UP IN THE AIR

Revving Up Resistance

In the latest salvo in the ongoing battle between the Trump administration and the Golden State over climate change regulations, a California-led coalition including 16 other states and the District of Columbia sued the administration in early May over its plans to scrap Obama-era fuel efficiency standards for cars and SUVs.

“The state of California is not looking to pick a fight with the Trump administration, but we are ready for one, especially when the stakes are so high for our families, our health, and the planet,” California Attorney General Xavier Becerra said at a news conference announcing the move.

The lawsuit, filed in the US Court of Appeals for the District of Columbia, called the US Environmental Protection Agency’s effort to weaken fuel efficiency standards unlawful and a violation of the Clean Air Act. The EPA had said in April that it would revise

the standards, which administrator Scott Pruitt called “too high.”

The landmark 2012 fuel economy rules were a key part of a joint effort by the Obama administration and California officials to combat global warming. Under those rules, vehicles would have to get 36 miles of real-world driving per gallon (55 miles per gallon under test conditions), about 10 miles over the existing standard, by 2025.

“These standards represent the biggest single step any nation has ever taken to tackle the problem of global warming,” Dan Barker, director of Safe Climate Campaign and a well-known clean vehicles advocate, told *Earth Island Journal*. “If not weakened by Mr. Trump and his allies, they will save 6 billion tons of CO₂ [over the life of the program]. That’s more than most countries emit in multiple years.”

Rolling back the standards would not only make it impossible for the

US to achieve its Paris Climate Accord goals, but would also set a terrible example for the rest of the world, Barker said. “Already, I’ve heard from colleagues in Europe that the German automakers are beginning to argue that because the US standards are going to be weakened, they need to weaken the European standards. So this could really create a race to the bottom that would be devastating for the climate.”

While it’s not clear whether the EPA will actually make good on its threat to change the standards, the lawsuit could strengthen California’s legal hand if that were to happen.

“This is a preliminary challenge. It’s a shot across the bow,” Jody Freeman, a professor of environmental law at Harvard University who advised the Obama administration, told *The New York Times*. “It sets the table to challenge the agency’s reasons for rolling back the rule, if they go ahead and do it.”

UPWELL

Mercury Rising

To eat fish, or not to eat fish? This question has long popped-up within public health circles as experts have weighed the benefits and detriments associated with eating certain seafood. On the one hand, fish provide a healthy and widely available protein source. On the other, fish — particularly large ones at the top of the food chain — are often packed with mercury.

New research may shift the balance in favor of avoiding seafood. According to a team from the University of Montreal's Department of Biological Sciences, the amount of mercury that industrial fishing operations are pulling out of the oceans via fish has steadily increased since the 1950s. As a result, many coastal and island nations' residents may be ingesting mercury at unsafe levels.

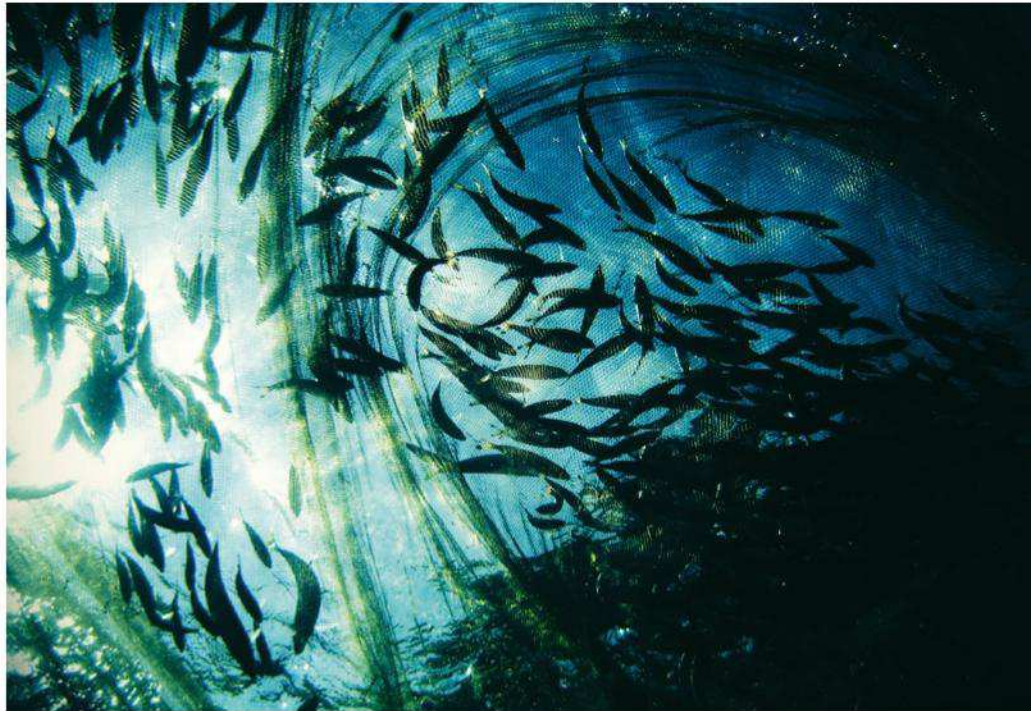
There are several threads contributing to the mercury problem. Humans have released massive amounts of mercury into the atmosphere since the Industrial Revolution. This mercury ends up in oceans and rivers where it is absorbed by sea life and bioaccumulates in creatures at the top of the marine food chain. At the same time, advances in industrial fishing technology have allowed us to pull more and more fish from the sea to satisfy growing consumer demand for seafood.

"The global marine catch totals 80 million tons of fish per year, which means that we are also pulling out increasingly large amounts of mercury," says Professor Marc Amyot, who supervised the study led by postdoctoral fellow Raphaël Lavoie and published in *Scientific Reports*.

Lavoie used data on the amount of mercury extracted by industrial fishing operations between 1950 and 2014, along with information about the weekly consumption of seafood in 175 countries between 1961 and 2011, to estimate per capita ingestion of methylmercury. Methylmercury is an especially toxic form of mercury that can penetrate the blood-brain barrier and impact cerebral development,

living in 66 of the 175 countries studied may be exposed to methylmercury levels unsafe for fetal development, and that those in the Maldives, Kiribati, Iceland, Malaysia, Lithuania, and Japan are among the most at risk. In the Maldives, mercury consumption between 2001 and 2011 was estimated at more than 14 times safe levels.

"From 2001 to 2011 the populations of 38 percent of the 175 countries



The amount of mercury pulled out of the oceans by industrial fishing operations has steadily increased since the 1950s, meaning coastal communities may be ingesting it at unsafe levels.

especially in children and fetuses.

Of the industrial fishing areas listed by the Food and Agriculture Organization, the Northwest Pacific currently exports the most fish, and the most methylmercury. The Western Central Pacific holds second place, while the Indian Ocean ranks third. "Together, these three fishing areas exported 60 percent of the mercury resulting from global seafood production in 2014," Lavoie says.

His findings indicate that people

we analyzed would have been exposed to weekly doses of methylmercury far above the maximum safe level of consumption for fetal development," Lavoie says. "Many of these populations are in coastal and island nations, especially developing countries."

Lavoie and Amyot believe that their estimates are probably conservative, and hope the research will assist with efforts to reduce mercury exposure, particularly among children and pregnant women, who are most at risk.



Researchers have found that changes surrounding food imports can have unexpected impacts on local environments. For example, as China began importing more soy from abroad, local farmers converted to growing crops like corn, which take a higher toll on the land.

TABLE TALK

Unexpected Trade Toll

Intensive food production comes with a steep environmental price tag. It can erode and deplete our soils, pollute our waterways, and encroach on important wildlife habitat. Common sense, then, would suggest that importing food from afar might protect landscapes closer to home. Soybeans produced in Brazil shouldn't take a toll on Chinese landscapes, right? Not necessarily.

Researchers with Michigan State University (MSU) have found that the type and amount of food imported to a country can impact the decisions local farmers make about what crops to grow, and that the replacement crops they opt for may be more ecologically damaging. As a result, environmental impacts associated with food production aren't so much displaced as they are exchanged, they report in the *Proceedings of the National Academy of Sciences*.

"This study underscores the need to pay attention to both sides of international trade, not rely on conventional wisdom," says Jianguo "Jack" Liu, director of MSU's Center for Systems Integration and Sustainability and lead study author.

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"Unless a world is examined in a systemic, holistic way, environmental costs will be overlooked."

In their quest to uncover the environmental impacts of global food trade, Liu's team focused on soybeans. Demand for soybeans has skyrocketed in China in recent years. But rather than increasing production at home, much of the demand is being met by Brazilian farmers, who are converting rainforest to cropland to keep pace with growing appetites, and undercutting Chinese farmers on the market. As a result, many Chinese farmers are switching from soy to crops like rice and corn that can take a higher toll on the environment, particularly in the form of nitrogen pollution.

As Betsy Von Holle, director of the National Science Foundation's Dynamics of Coupled Natural and Human Systems program, which funded the study, puts it: "If the importing country switches from a more sustainable crop, such as soybeans, to one that needs more water and nutrients, such as corn, the nitrogen pollution that results can harm the environment of the importing country."

Soybeans, of course, are just one small part of the global picture. With all types of food crops crossing our borders every day, the impact of the international food trade may hit us closer to home than we once thought.

FLIP SIDE

Climate Warriors ≠ Eco Warriors

If you had to make a guess at who your most eco-friendly friend or neighbor is, you might choose the one who understands climate science and is the strongest supporter of government action on global warming. But chances are, you might guess wrong.

A report published in April in the *Journal of Environmental Psychology* found that climate change skeptics are more likely to behave in eco-friendly ways than those who are highly concerned about the issue.

The report was based on a study by a University of Michigan-led research team that followed more than 400 Americans for a year, categorizing each participant as either “skeptical,” “cautiously worried,” or “highly concerned” about climate change, based on their beliefs. The team found that participants with the greatest concern about anthropogenic climate change were least

likely to engage in four environmentally minded behaviors: recycling, buying “green” products, using reusable shopping bags, and using public transportation. On the other hand, participants who expressed doubt in climate change “were most likely to report engaging in individual-level, pro-environmental behaviors.”

In addition to reporting on the four eco-friendly behaviors, participants were asked about their climate policy preferences, which followed more expected patterns: Those most concerned about climate change were most likely to favor policy action — like stronger fuel economy standards — while skeptics were least likely to favor policy interventions.

As *Pacific Standard* reports, the psychological phenomenon of “moral licensing” may explain the lack of pro-environment individual action by climate believers. For example,

climate advocates may be donating to climate causes or educating themselves about global warming-related issues, and as a result, may feel it is alright to engage in less-altruistic activities, like driving their cars to work or tossing their recyclables in the trash.

Another possibility is that climate-minded folks don’t equate behaviors like plastic recycling and eco-friendly product use with climate change — that they see these as distinct environmental issues.

Either way, the researchers determined that “belief in climate change does not appear to be a necessary or sufficient condition for pro-environment behavior.” Meaning that for those looking to increase use of reusable bags and public transportation, climate warriors might be the most important people to target.

CALL OF THE WILD

SHEDDING FUR

Fur may be an increasingly taboo fashion choice, but it is still a legal one across most of the world. Except in San Francisco. In March, San Francisco supervisors banned the sale of fur and fur products, making the progressive urban hamlet the largest city in the US to do so.

“The sale of fur products in San Francisco is inconsistent with the city’s ethos of treating all living beings, humans and animals alike, with kindness,” Katy Tang, the SF supervisor who led the charge for the ban, said in a statement. “There’s no humane way to raise an animal to peel its skin off.”

Animal welfare advocates, unsurprisingly, have praised the decision. “This historic act will usher in a new wave of animal rights legislation across the globe,” Wayne Hsiung,

co-founder of the animal rights organization Direct Action Everywhere, said in a statement.

The ban, which does not include second-hand fur items, takes effect January 1, 2019, though retailers will have until January of 2020 to sell their existing inventory. The regulation follows several other animal rights victories in San Francisco, including a ban on performances by exotic animals and a requirement that pet stores sell only rescue cats and dogs.

Two other California cities — West Hollywood and Berkeley — have enacted similar bans on fur sales. And in recent

In March, San Francisco became the largest US city to ban the sale of fur and fur products.

years, a growing list of high-end fashion companies — including Versace, Gucci, and Hugo Boss — have adopted fur-free policies. As real-world regulation meets runway activism, it seems faux will soon be the only fashionable way to go.



AROUND THE WORLD

Running on Empty

Cape Town captured global attention last spring when news broke that the South African city was about to run out of water in a matter of months. Since then, stringent restrictions on water usage have pushed back the crisis to 2019, but the city's plight underscored the growing pressure on our world's finite freshwater resources.

In many cities, people hardly give a second thought to how and when they get their water. Concerns about water quality notwithstanding, for the most part, people simply turn on the tap to quench their thirst, take a shower, or water their garden. But as urban populations boom and climate change alters precipitation cycles, cities and towns across the world, from North America to Africa to Asia, are watching their water reserves plummet. Some are beginning to plan for water-scarce futures, while others have already been

forced to contend with present-day water scarcity. Many are also dealing with a host of related problems, including leaking water supply systems, water theft, and even land subsidence due to over-drafting of underground aquifers.

The list of cities simultaneously contending with diminished water reserves and increasing water demand is likely to grow over the years to come. Here are a handful of the cities already on the frontlines of the global water crisis.

SOURCES: THE GUARDIAN, NATIONAL GEOGRAPHIC, REUTERS, BBC, THE NEW YORK TIMES

1 Cape Town, South Africa

Cape Town has been counting down to "day zero" — the day the city's taps will run dry — since last spring. Though the day zero estimate has been pushed back several times, in large part due to strict water-use limits, officials warn that it could still hit sometime next year. The city's water crisis has been attributed to urban population growth combined with a record drought, potentially exacerbated by global warming.

Cape Town is doing what it can to prepare. When the reservoirs serving the city hit 13.5 percent capacity, the city will shut off the taps to homes and businesses, though hospitals and schools will still receive water. Cape Town's 4 million residents will then begin lining up at some 200 emergency water stations across the city to collect water rations under watch of armed guards. In 2014, the city's six reservoirs were full, a stark reminder about how quickly water reserves can be depleted during drought.

2 São Paulo, Brazil

Before Cape Town grabbed international

headlines, São Paulo faced a high-profile water emergency of its own. In 2015, the city's primary reservoir fell below 4 percent capacity. Pipes began drawing in mud, and tap water flow was intermittently cut off in homes across the city, with some receiving just a few hours of water twice a week. At one point, the city of nearly 22 million was estimated to have just 20 days' worth of water left.

Though much-needed rain alleviated the crisis at the last minute, the city isn't really out of the woods. The metropolitan area loses some 31 percent of treated water to leaks and thefts, and experts say that climate change, pollution, and severe deforestation put the city at increased risk for drought in the future.

3 Jakarta, Indonesia

Less than half of Jakarta's residents have access to tap water in their homes, leaving many with no choice but to dig their own wells. These wells are sucking local aquifers dry. As the aquifers are drained, the city is sinking, putting it at even greater risk from

sea level rise. Currently, some 40 percent of the city lies below sea level.

4 Mexico City, Mexico

Many of Mexico City's 21 million residents are already contending with water scarcity. An estimated 20 percent of the city can access tap water for only a few hours a week, leaving many residents no option but to pay for expensive water delivery trucks.

The issues facing Mexico City are complex. The city's sprawling concrete foundation inhibits rainwater from filtering down and replenishing the underground aquifers upon which it is built. Rising urban temperatures are leading to higher water evaporation rates from its water bodies, and some 40 percent of the city's water is lost to leaks and theft. At the same time, as the city drills deeper and deeper to tap underground water stores, it is contributing to its own subsidence.

Climate change, which will mean heavier intense rains interspersed with longer droughts, adds another challenge to the city's complicated water puzzle.





5 Phoenix, Arizona

Phoenix gets less than eight inches of rainfall a year. The desert city receives most of its water from the Colorado River, via Lake Mead, but as Rocky Mountain snowfall plummets, the river is drying up. Phoenix isn't alone in its predicament: In 2017, the US Department of Agriculture estimated that two thirds of Arizona already faces severe to extreme droughts. But as Phoenix plans for continued growth in the absence of any water use restrictions or official drought response plans — and in the face of global warming — it seems to be perilously overextending itself.

6 Melbourne, Australia

Last year, water managers in Melbourne, Australia warned that population growth and drought could lead to chronic water shortages by 2028. The city is looking at increasing the capacity of its desalination plant, improving water recycling programs, and reducing water use.

HIGH VOLTAGE

The Solar State

California has been upping its renewable energy game as of late. Already a nationwide leader on solar, in May the state's energy commission took things a step further, unanimously approving new standards requiring solar panels on all new homes starting in 2020.

Some cities, including San Francisco, already mandate solar for new residential projects. But if the new regulations are given final approval by the state Building Standards Commission, as expected, California will become the first state to do so. The mandate will apply to residential buildings up to

three stories high.

“This is just a milestone. There's a hell of a lot of work to do between now and 2020,” California Energy Commission Chairman Robert Weisenmiller told KQED radio. “The bottom line is we're going to stay focused on making this happen, and happen smoothly.”

The solar requirement is expected to increase upfront building costs, but will result in long-term utility bill savings. It will also help California meet its ambitious greenhouse gas emissions reduction targets.

UPWELL

Cover Up at the Beach

For those lucky enough to visit the Hawaiian Islands, the list of essential items is normally pretty short. Most tourists can get away with as little as a swimsuit, a pair of flip-flops, and an outfit or two. And sunscreen, copious amounts of sunscreen. Sunscreen that ultimately washes off when visitors are wading, swimming, and snorkeling in Hawai'i's clear blue waters, leaving a sheen of residue in their wake.



Beginning in 2021, Hawai'i will no longer allow the sale of sunscreens containing two coral-harming chemicals.

Well, visitors will soon have to be more careful about just which types of sunscreen they are using. In May, Hawai'i passed a bill banning the sale of sunscreens containing two harmful chemicals, oxybenzone and octinoxate, which "have significant harmful

impacts" on the state's marine environment. Both chemicals are used in the majority of sunscreen brands sold in the Aloha State. Hawai'i is the first state to pass such a ban, which will take effect in January 2021.

The amount of sunscreen entering the water isn't insignificant. O'ahu's Hanauma Bay, for example, receives some 2,600 visitors every day. A 2017 study conducted at the popular tourist spot estimated that the visitors leave behind 412 pounds of sunscreen on a daily basis.

The chemicals targeted by the ban can cause significant harm to corals and other marine life. In particular, exposure to these chemicals is known to lower the temperature at which corals die, exacerbating the dangers of global warming and associated coral bleaching. Oxybenzone, an endocrine disrupter, can turn male fish into females. It can be toxic to a variety of organisms, including coral, sea urchins, and algae. Ultimately, by harming coral and algae, these chemicals can have major impacts on entire reef systems.

"This is the first real chance that local reefs have to recover," scientist Craig Downs, executive director of the nonprofit Haereticus Environmental Laboratory, whose research indicates that 14,000 pounds of sunscreen end up in the world's coral reefs annually, told the Associated Press. "Lots of things kill coral reefs, but we know oxybenzone prevents them from coming back."

While some critics have called the bill a feel-good measure that glosses over bigger threats to reefs, most others seem to think it could spur meaningful action on reef protection around the world.

"Hopefully other jurisdictions will look at this legislation and follow suit," says Donna Mercado Kim, the Democratic state senator who introduced the bill.

Coral reefs need all the help they can get these days. Grabbing a tube of nontoxic sunscreen really doesn't seem like too much to ask the millions of tropical vacationers who enjoy the islands' white sand beaches and cool waters every year.

NO COMMENT

In March, more than 350 Hindu priests gathered in the city of Meerut in northern India for a nine-day prayer ceremony asking the gods above to deliver them from the scourge of air pollution.

To propitiate the gods, the priests burned some 50,000 logs of mango wood, weighing a total of 55 tons, in large fire pits, along with 13.2 tons of sesame seeds, 7 tons of rice, and thousands of pounds of ghee (clarified butter).

"Our scriptures dictate that a *hawan* [prayer ceremony around a sacred fire] helps purify the air and if we keep doing this, air pollution will reduce considerably. We are doing our bit towards mankind, flora and fauna and the environment," Girish Bansal, vice president of the group, the Shri Ayutchandi Mahayagya Samiti, told *The Indian Express*.

Om Prakash, one of the presiding religious heads at the venue, said: "The smoke from the *hawan* is not harmful because of ingredients used — *desi* [local] ghee has come from *desi* cows ... This is not like the smoke from factories, it's pure. It's also because of the chanting."

According to the World Health Organization, 14 of the 20 most polluted cities in the world, in terms of air pollution, are in India, and a recent study in the journal *The Lancet* linked air pollution to 2.5 million deaths in the country in 2015.



Elephants vocalizations can travel longer distances through the ground than they can through the air, according to new research. The surprising finding may offer a new way to track elephant behavior from afar.

FINDINGS

Ground-Shaking Discovery

Most of us have heard the bellowing call of an elephant, if not in person, in a wildlife film or even an iconic *Lion King* scene. These calls play an important role in communication for the social animals. But as many an elephant expert might tell you, these giant mammals also communicate through low-frequency noises. New research published in *Current Biology* adds yet another dimension to our understanding of elephant communication, indicating that these vocalizations can actually travel longer distances through the ground than they can through the air.

For three weeks last year, researchers used earthquake-detecting devices to monitor wild elephants in Kenya. The geophones, as they are called, work much like seismographs, translating

vibrations into electronic signals. Placed in the field, they allowed the team to identify unique “seismic signatures” associated with various elephant behaviors, including walking, running, snorting, and grunting, and thus detect elephant activities from afar.

The researchers were surprised to find that vibrations caused by the different vocal sounds the elephants made were actually easier to pick up than those caused by movement, and that those vibrations could travel almost four miles, nearly twice as far as the two-mile range of trumpet calls.

“We found that the forces generated through elephant calls were comparable to the forces generated by a fast elephant walk,” says Beth Mortimer, a biologist at the Universities of Oxford and Bristol and lead author of the

study. “This means that elephant calls can travel significant distances through the ground and, in favorable conditions, further than the distance that calls travel through the air.”

The researchers found that by recording and categorizing the vibrations, they could figure out what the animals were doing. Because elephants often make warning calls and run in the face of danger, the new monitoring strategy might eventually lead to the development of a new alarm system for detecting elephant behaviors, such as panic calls. This information could be used as a means to catch and deter poachers. Given the pachyderm’s rapidly depleting numbers, this could be an important life-saver for the species.

CALL OF THE WILD

Beginning of the End?

Scientists are sounding the alarm for right whales. When the whales' 2018 calving season came to a close in late March, the species apparently hadn't had a single successful birth. Unfortunately, this is just the latest bad news for the critically endangered species.

"It's a pivotal moment for right whales," Barb Zoodma, who oversees the National Marine Fisheries Service's right whale recovery program in the US Southeast, told the *Chicago Tribune*. "If we don't get serious and figure this out, it very well could be the beginning of the end."

Right whales spend much of the year up north, in waters off the coast of the northeastern US and Canada. In the winter, however, pregnant whales migrate south to give birth in the warmer waters off the coasts of Georgia and Florida. Researchers tracking right whale population numbers use airplanes to survey these waters for mother-calf pairs every year. This season, for the first time since the flights began in 1989, they didn't spot a single baby whale.

There's good reason to be worried. The total number of right whales is estimated at around 450, with just 100 female whales of breeding age. Last year, the species suffered a tremendous setback, with an estimated 17 premature deaths. Several of these were linked to collisions with ships or entanglement in fishing gear. It is believed that only 5 calves

were born last year, well below the yearly average of 17.

"It is truly alarming," said Philip Hamilton, a scientist at Boston's New England Aquarium who has studied right whales for 30 years. "Following a year of such high mortality, it's clear the population can't sustain that trajectory."

Other researchers say the numbers might not be quite as bad as they seem. It's possible that calves were born elsewhere, perhaps off the coasts of Virginia and the Carolinas, an area that isn't scouted by researchers. Others say there could be a spike in births next year, making up for the low numbers, a phenomenon that has been observed following other low-birth years for the species.

Conservation groups sued the US federal government earlier this year for its failure to protect the endangered marine mammals, calling for greater regulation of the fishing industry. Advocates have also pushed for further restrictions on ship speed through the whale's range to minimize the chance of deadly collisions. And some fishermen are taking it upon themselves to test gear that might prove less dangerous, including ropeless lobster pots.

What's clear is that the clock is ticking for these marine mammals, and robust protective measures can't come soon enough. ■

Researchers didn't spot a single right whale calf during this year's birthing season, adding to alarm about the species' long-term chances of survival.



Big Soda's Sneaky Tactic Undermining Democracy

by Anna Lappé

On October 26, 2017, Michigan's governor signed into law HB 4999, which bans local governments from passing taxes on soda (or any other food or beverages). Approved without much fanfare, the bill blocks every city and county in the state from pursuing a sugary drinks tax, a popular measure that first passed in Berkeley, California in 2014 and has since been adopted in eight cities nationwide.

Faced with mounting concern about the impact of sugar-sweetened beverages — and with soda taxes proving to be a powerful tool to curb consumption and bring in much-needed revenue — Big Soda is turning to preemption to thwart community organizing.

Preemption is a time-tested industry tactic to combat citizen movements to protect our health, civil liberties, and the environment. The strategy can be traced back to nineteenth-century “ripper bills” — state laws that took away community control over finances, utilities, police, and local charters. Today's new wave of preemption, like the bill passed in Michigan and

a similar one adopted in Arizona this year, are also picking up lessons from the tobacco industry and the National Rifle Association.

In response to citizen outcry over the health impact of cigarettes that led to a wave of antismoking ordinances in the 1970s, Big Tobacco worked to pass state preemption policies that barred such community ordinances. The National Rifle Association similarly used preemption to combat strong local gun-control measures that many communities began adopting in the 1990s.

While to date only two states, Michigan and Arizona, have passed preemption bills specifically preventing cities and counties in those states from passing a tax on sugary drinks, similar policies are popping up around the country. As I was reporting on this article, news broke that a lawmaker in Pennsylvania is pursuing one there.

While none of these bills mention sugary drink taxes by name, they simply ban all local food and beverage taxes, or effectively prohibit them by requiring that *all* taxes on food products must be “uniform.” In other words, taxes cannot target unhealthy products to the exclusion of others, making them impractical. Industry spin tries to pass them off as pro-people policies. As Tim McCabe, of the industry-funded Food Marketing Alliance, said in support of the Michigan bill: It's “not government's role to use taxes to influence consumer behavior.” (I guess McCabe is unfamiliar with the taxes on booze and cigarettes that aim to do exactly that.)

Often passed behind closed doors

without public deliberation, preemption bills and amendments are a “quiet threat to public health,” write Jennifer Pomeranz of NYU and Mark Pertschuk of Grassroots Change.

“You stop Santa Fe's tax with misleading ads and money from out of state, but Santa Fe can come back. With each win, the soda industry gets weaker and the people get stronger,” Pertschuk says, referring to the city of Santa Fe's effort to pass a tax for sugary drinks that failed, thanks largely to big spending by Big Soda. But, he says, “if you pass preemption like they did in Michigan or Arizona then all progress on that issue is killed.”

So far, apart from Michigan and Arizona, similar preemption bills have been blocked in other states. Pertschuk says dozens of states would have had similar preemption laws were it not for community organizing. That's the good news. The bad news is, like the invasive kudzu, preemption keeps coming back.

In the shadow of Big Soda taking a page from Big Tobacco's playbook, health advocates can get inspired by anti-smoking crusaders who stood up to preemption policies. As Pertschuk explains: “Today, there are 1,440 strong smoke-free ordinances around the country. That's what Big Soda is afraid of: thousands of local sugar-sweetened beverage taxes funding really great programs for the community and demonstrably reducing consumption and by extension diabetes.”

State and federal policies should protect healthy communities. But cities and counties that want to take even bolder action to protect public health, and decide on what those policies are through good-old fashioned deliberative democracy, should be able to. Preemption blocks communities from doing just that — and in so doing guts the very heart of democracy. ■

PHOTO GERRY DINCHER





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ECOVET GLOBAL:

Planetary Health through Veterinary Care

A glint of sunlight shone through the clouds as Getahun, my translator, led me across the verdant landscape of Aleta Wondo. The subsistence farming community, nestled in southern Ethiopia, unfolded before us in a mosaic of green hillsides, coffee trees, and the distinctive fronds of enset, the

and out freely, while several Hadada ibis chattered from the treetops outside. Families in Aleta Wondo rarely consume animal products. More often, they sell what little their animals produce — mainly eggs and milk — to help pay for daily necessities.

Before departing, I asked the woman what her main concerns were for her animals. She replied, “theft, illness, and predation by hyenas.” Ironically, not far from the hut, I narrowly avoided a pile of white-colored scat, indicative of the bone meals consumed by hyenas. Getahun chuckled and said, “The hyenas came by last night. See, we all must live together here.”

Similar to many subsistence communities in Ethiopia and globally, the agro-pastoral community of Aleta Wondo remains intimately tied to nature. Every aspect of life — procurement of fuel and water, cultivation and preparation of food, and maintenance of health — rests on the interconnection of land, water, animals, and people. Amidst this delicate balance, small-holder livestock ownership is an integral part of life. However, disease, lack of veterinary care, inadequate access to quality feed, and poor biosecurity practices can impair animal health and production in this region.

People in Aleta Wondo also face widespread environmental pressures resulting from overpopulation, land degradation, and food insecurity. Further compounding the situation,

a legacy of civil war and human encroachment on local forests has led to significant declines in endemic wildlife and depletion of natural resources. These regional conservation challenges threaten traditional agro-pastoral livelihoods that depend on healthy landscapes and resilient ecosystems.

Ecovet Global approaches these complex issues from a veterinary perspective, in partnership with Ethiopian veterinarians and a cross-sectoral team that brings expertise in ecoagriculture, education, public health, and gender equity. The primary veterinary aim of our initiative is to improve local capacity to manage common animal health issues and incorporate eco-friendly animal production practices — such as rotational grazing and efficient use of fodder to supplement animal nutrition. In conjunction with the primary school run by Common River, Ecovet Global is also launching a conservation stewardship program that aims to increase community valuation of local wildlife as a cornerstone of livelihood security, health, and economic growth.

Ecovet Global is part of a growing coalition of health, policy, and environmental organizations that are coming together to address how anthropogenic change is affecting the health and resilience of natural systems. As veterinarians, we are accustomed to working across species and landscapes, so leaving our proverbial silos to develop collective, realistic solutions that aid people and the planet makes sense to us. This approach also resonates with our partner communities, like Aleta Wondo, where the connections between humans, animals, and ecosystems are a tangible, daily reality. ■

— KATE SULZNER

Learn more about this Earth Island Institute project at: www.ecovetglobal.org



Ecovet Global is building local capacity to manage common animal health issues in Aleta Wondo, Ethiopia.

regional food staple. I found myself in this bucolic countryside last year after Common River, a small Ethiopian-based nonprofit, invited Ecovet Global to assist the community in launching an animal health and wildlife conservation initiative. On that rain-kissed morning, I was venturing out on foot to gain a better understanding of local human-animal-environment relationships.

Midway through our walk, a middle-aged woman invited us inside her hut. Next to a modest cooking and sleeping area stood two cows tethered to the hut wall. Chickens wandered in

IMMP / EII ADVOCATES / SHARK STEWARDS:

Protecting the Pacific Remote Islands from Trump

The Pacific Remote Islands National Marine Monument (PRI Monument) lives up to its name — it comprises a series of islands and atolls in such a remote area of the Pacific Ocean that it is hard to think of another place in the world that could be farther from a human population center. Perhaps Antarctica? Unfortunately for marine life, the 9,000-plus miles between Washington, DC and the PRI Monument do not provide it protection from the Trump administration. It is among the ten national monuments the administration is considering rolling back federal protections for. Two national monuments in Utah, Bears Ears and Grand Staircase-Escalante, have already been stripped of more than half of their area and opened to uranium, coal, oil, and gas extraction, changes that are currently being challenged in federal court.

The PRI Monument was originally established by President George W. Bush in 2009 under the federal Antiquities Act in order to protect the rich biodiversity of the region's island ecosystems. The Antiquities Act has been used for more than 100 years by presidents of both parties to help protect federally owned lands and waters that contain historic landmarks, prehistoric structures, and other objects of historic or scientific interest from exploitation and destruction. At the

recommendation of leading scientists, President Barack Obama expanded the PRI Monument in 2014 to protect wide-ranging species like sea turtles, whales, and sharks.

Home to some of the healthiest coral reef ecosystems in US territorial waters, the PRI Monument is one of the largest marine protected areas in the world, encompassing 490,343 square miles of islands, atolls, reefs, and ocean area. Representing one of the last frontiers for wildlife, this sprawling monument is home to diverse populations of sharks, seabirds and shorebirds, sea turtles, endangered monk seals, whales, and dolphins. Colonies of marine birds, including the albatross, inhabit the monument's small islands, which resemble classic “desert islands” with white sand beaches and sparkling blue waters.

Palmyra Island — one of islands in the monument where Shark Stewards has been studying local shark populations and other key marine species — supports the second largest colony of red-footed boobies in the world, endemic geckos, and the largest invertebrate on the planet: the endangered coconut crab, which is over 3 feet long and weighs more than 4 pounds.

The islands, however, are only one aspect of the monument. Of more importance are the remote ocean ecosystems that are protected

from commercial fishing and other forms of degradation. The marine ecosystem here supports many critical species including the threatened green sea turtle and endangered hawksbill turtle, as well as healthy populations of several apex marine predators, such as reef sharks and tiger sharks, which are vanishing from our oceans due to overfishing and the shark fin trade.

The waters here also play host to numerous marine mammals. Humpback whales can be found during the winter months — the same population that is spotted annually around the Hawaiian Islands. During the summer months, these humpbacks head to the Gulf of Alaska and Southeast Alaska, and are also known to interact with the California population of humpbacks. Additionally, spinner and bottlenose dolphins and melon-headed whales are often spotted by researchers among the islands.

Strong science exists demonstrating that areas outside and adjacent to marine protected areas benefit from an increase in fish populations when the core sanctuary area is protected. They also serve as a source of fish larvae that can disperse to nearby areas that have been overfished, as well as reef-building coral larvae that can help restore coral reefs impacted directly by humans, climate change, or other stressors. The PRI Monument is a prime example



The PRI Monument encompasses nearly 500,000 square miles of islands, atolls, reefs, and ocean areas and provides essential habitat for a wide range of marine and terrestrial animals, including everything from the strawberry hermit crab (pictured) to sea turtles and sharks.

of how marine sanctuaries benefit not only wildlife, but also commercial fisheries outside their boundaries.

Last December, Interior Secretary Ryan Zinke released recommendations that the Trump Administration shrink the size of the PRI Monument (as well as other national monuments) and possibly open the area to commercial fishing. Although Trump has not yet taken action on Zinke's recommendation for the monument, he is expected to at any time. If Trump does go ahead and open the PRI Monument to commercial fishing, fishermen will likely be able to use longlines and tuna seiners in these waters. That would have a devastating impact on the region's fragile ecology and many protected species that have found a safe haven here. Sharks, marine mammals — including critically endangered monk seals — and sea

turtles would be especially at risk of getting entangled in longlines and tuna seiners and dying as a result.

Thankfully, the administration's plan may not hold up in court. Most legal scholars do not believe the president can unilaterally shrink national monuments, and argue that only Congress can remove or alter a national monument designation.

President Trump's December executive order shrinking the size of Utah's Bears Ears and Grand Staircase-Escalante National Monuments was immediately challenged in court by several Native American tribes and environmental organizations. That case is still pending and will have important implications for any action Trump takes to gut the PRI Monument and other areas on Zinke's hit list.

Earth Island's new legal arm, Earth Island Advocates, which is developing

WHAT YOU CAN DO:

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The PRI Monument lawsuit will cost several thousand dollars to mount. Among other things, we will need funds for travel expenses, filing fees, and expert witnesses. In addition, Shark Stewards is planning to return to the PRI Monument for further research into the shark populations there. You can help defray these costs by donating to support our marine conservation efforts.

Sign a petition

Show your support for maintaining the PRI Monument's protections by adding your voice:

bit.do/pripetition

and coordinating environmental litigation on behalf of Earth Island projects, is teaming up with Shark Stewards and the International Marine Mammal Project to challenge any action the Trump administration may take to weaken protections for the PRI Monument. If and when that day comes, we will be ready with a lawsuit that, as Earth Island General Counsel Sumona Majumdar says, "challenges Trump and his unilateral attempt to open yet another public treasure to private exploitation." And what's more, we have some heavy hitters on our side — the Stanford Environmental Law Clinic and UC Irvine Environmental Law Clinic will be representing Earth Island in this case on a pro-bono basis. ■

— MARK J PALMER AND DAVID MCGUIRE

IS THE FEDERAL AGENCY IN CHARGE OF SAVING THE MEXICAN WOLF KEEPING IT FROM THRIVING?

IN OCTOBER 2016 — JUST A FEW weeks before the Election Day upheaval in the United States, when Trump’s border wall rhetoric was at its peak — Mexican biologists released several radio-collared wolves into a forest about 90 miles south of the US border, in Chihuahua state. The release was part of an ongoing transnational Mexican gray wolf recovery effort. It’s not clear what happened to the rest of the wolves — whether they stuck close together, whether they all dispersed as this wide-ranging species often tends to do, or whether some died — but what we do know is that at least one of them, a 10-month-old female tagged F1530 by wolf managers and named Sonora by wolf advocates, decided to wander off north into the rugged borderlands terrain, most likely in search of a mate.

The last time her radio collar worked, on Valentine’s Day 2017, it placed her 21 miles south of the border. About a month later, on March 19, 2017, an Arizona Game and Fish Department wildlife manager spotted her on a private ranch near the Chiricahua Mountains in southeastern Arizona. A few days later, she was seen on the same ranch again. Ranch employees tried to scare her away, but Sonora wasn’t easy to shoo off. Born in a breeding facility in Cananea, Mexico, she had probably lost some of the instinctive fear of humans that wild things rightfully have. And that was her undoing.

The US Fish and Wildlife Service (FWS) deemed her refusal to retreat “minor problem behavior.”

Meanwhile, local ranchers reported several livestock deaths in the area, and investigations revealed that at least one of those animals had been killed by a wolf. Since there had been no other wolves sighted in the area at the time, all fingers pointed to Sonora. So on March 26, 2017, six days after she was first spotted in the US, Sonora’s all-too-brief life as a free wolf was cut short. She was captured by the Interagency Field Team in charge of Mexican wolf management and relocated to Sevilleta Wolf Management Facility in New Mexico. In November 2017, she was relocated to the Sedgwick County Zoo in Kansas, a captive breeding facility for Mexican wolves. In all likelihood, she will never be set free again.

“We were decisive in our management actions because this wolf was young, alone, genetically important, and not affiliated with another pack,” Benjamin Tuggle, Southwest regional director for FWS, said in a statement after the capture. What Tuggle didn’t mention was that the ranchers on whose property Sonora had been sighted wouldn’t let officials on his land to catch her unless the FWS agreed not to release her again.

This year, Sonora was paired for breeding at the zoo, and the FWS hopes she will produce pups to contribute to recovery efforts for the endangered wolf subspecies.

Other wolf advocates agree that Sonora’s genetics are valuable, but they believe she should be released back into the wild so that she can continue to help the struggling wild Mexican gray

wolf population recover. “It’s a tragedy that she was first of all removed from the wild,” says Bryan Bird, Southwest program director for Defenders of Wildlife. It would have been better if she could have reproduced in the wild, he says, “because wolves that are born and raised in the wild know how to be [real] wolves.”

Sonora’s cross-border journey and eventual capture underscore the many challenges facing the Mexican gray wolf, including its artificially restricted range, genetic bottlenecks, and now, the Trump administration’s border wall.

This smallest of gray wolves was listed under the Endangered Species Act more than 40 years ago. But despite its protected status and two decades of captive breeding and rewilding efforts, its numbers in the wild haven’t grown enough to be naturally self-sustaining. The Mexican gray still remains one of the rarest and most endangered gray wolf subspecies in the world. But many wildlife conservationists argue that this is only the case because the federal agency charged with its recovery is not allowing it to thrive.

THE MEXICAN GRAY WOLF (*Canis lupus baileyi*), called “el lobo” in Spanish, is the southernmost-occurring and most genetically distinct subspecies of gray wolf in North America. Identifiable by its small size and dappled gray, black, and rust coat, this wolf once used to roam the mountain woodlands of the American Southwest from Texas to New Mexico to Arizona,

RECOVERY

by John Soltes

ROADBLOCKS

even to the southern ends of Colorado and Utah, and across the border into northern and central Mexico. But at the turn of the century, as cattle ranches proliferated in the region and populations of native prey, such as deer and elk, began to fall, causing many wolves to prey on livestock, these canids began to be seen as a nuisance. This led to aggressive predator control programs by the US government.

From the late nineteenth to the mid-twentieth century, the federal government paid hunters to trap, poison, and kill the animals across the Southwest, and by the 1940s there were no breeding Mexican wolves left in the US. Still, some wolves continued to wander in from across the border, which prompted the FWS to send trappers down to Mexico to help the country get rid of the wolves as well. By 1976, when the Mexican gray was finally listed as an endangered species, it was nearly extinct in the wild.

Following the ESA listing, the very agency that had been leading the war against the Mexican gray was tasked with helping the species recover. So the FWS sent one of its trappers, Roy T. McBride, across the border again with a new mission — to capture some Mexican grays alive. Given that there were barely any wolves left alive in the wild at the time, “it took McBride four years [from 1977 to 1980] to capture six wolves,” says Michael Robinson, conservation advocate with the Center for



Biological Diversity, and author of *Predatory Bureaucracy: The Extermination of Wolves and the Transformation of the West*. One of those six died during capture, and the remaining five, one female and four males, were transferred to a breeding center in the US.

In 1982, US and Mexican wildlife agencies adopted the Mexican Wolf Recovery Plan, which called for maintaining a captive breeding program in both countries and re-establishing

reintroduction: Most local ranchers and hunters were, of course, fiercely opposed to the idea of allowing wolves back into the landscape because they prey on elk, deer, and other game that hunters value, and sometimes kill livestock as well.

Eventually, in 1998, in response to litigation against the FWS brought by seven environmental groups for its failure to implement provisions of the Endangered Species Act, the agency

each, in New Mexico and Arizona. An additional 37 or so live in the Sierra Madre Occidental Mountains of Mexico, and approximately 300 more live in captivity at more than 50 breeding facilities in the two countries.

All of the 450 or so Mexican wolves alive today trace their lineage to the seven wolves who were first bred in captivity back in the 1980s. What's more, the FWS estimates that more than half the genetic diversity of the original seven population founders has been lost through inbreeding. Robinson says the wolves in the wild are so genetically similar that they could all be siblings, which means "extinction is a looming possibility" for the wild population. The US wild population already suffers from high mortality due to its compromised genetics, in addition to killings by poachers and lawful control measures, which include removal or killing of so-called problem wolves that prey on livestock. For example, between 1998, when the first reintroductions took place, and 2016, feds shot at least 14 Mexican wolves and accidentally killed 21 while trying to capture them.

The FWS estimates that, between 1998 and 2013, the "initial release success rate" for the wolf was about 21 percent. Which means, for every 100 wolves released, only 21 of them survived, bred, and produced pups.

Wolf advocates hope that the US and Mexican populations — which are currently heavily managed as "non-essential, experimental" populations — will one day connect, expand their gene pool, and reassume their biological role in the Southwest ecosystem.

"[These] wolves need to be able to go back and forth, and mate with each other and spread genes from one population to another in the form of pups that would be born," Robinson says.

Questions about just how this

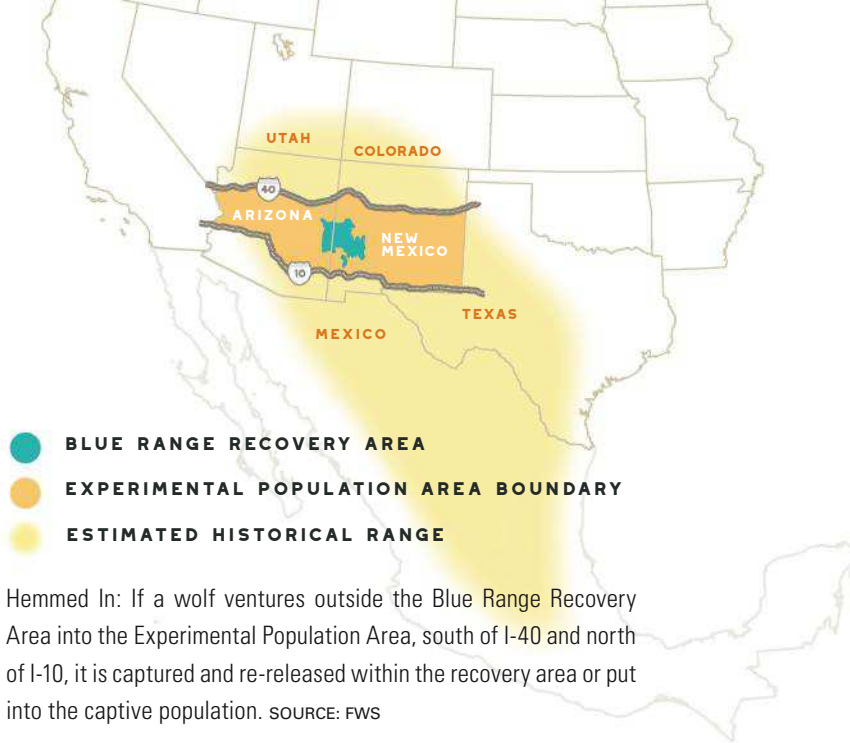


All the Mexican grays alive today trace their lineage to the seven wolves who were first bred in captivity in the 1980s.

a population of at least 100 Mexican wolves within a small portion of their historic range in the US. Biologists successfully bred three of the five wolves captured alive in Mexico, known as the McBride pack, as well as two other pairs found in zoos, known as the Aragon and Ghost Ranch packs. Over the years the captive population of the wolves steadily increased. By 1997, the population had grown to 148 wolves, but none of these animals had been released into the wild, due in large part to controversy surrounding

reintroduced the first batch of 11 captive-born wolves into the Apache National Forest in Arizona, within a "Blue Range Wolf Recovery Area" — a 6,850-square-mile stretch of primarily national forest land spanning eastern Arizona and western New Mexico. Across the border in Mexico, where surveys failed to detect any wild wolves after 1980, reintroductions began only seven years ago, in 2011.

Today there are 114 Mexican wolves in the wild in the US, comprising 22 packs of about 2 to 8 individuals



back and forth mingling of genes will be achieved, exactly how many free-ranging Mexican wolves there should be in the wild, and how far they should be allowed to roam, have been an ongoing source of conflict (and litigation) between wildlife conservation groups and the FWS. That conflict came to a head last November when the FWS released its revised recovery plan for the Mexican wolf.

THE ORIGINAL MEXICAN WOLF Recovery Plan, adopted in 1982, envisioned maintaining a captive breeding program and re-establishing “a viable, self-sustaining population of at least 100 Mexican wolves” within a small, 5,000-square-mile area of the Southwest, as more of an experiment than a full-fledged rewilding effort. At that time, the wolves were so close to extinction that agency biologists were uncertain if they could ever be rewilded successfully. The plan, therefore, didn’t include a goal to eventually remove the Mexican wolf from the endangered species list. The idea was that the recovery plan would be revised in the years ahead based on the outcomes of the initial releases.

Robinson says the FWS formed recovery plan revision teams three times in the past, but each time those teams came close to forming a new recovery plan, the agency cancelled them, citing, among other things, lack of resources, too-slow progress of a committee, and the need to obtain more data. “My guess is that the teams were coming up with population numbers for the Mexican wolves that were higher than what they wanted to fight for against the opposition of the livestock industry and state game agencies,” he says.

Indeed, the last team of independent biologists the agency had hired to draft an updated recovery plan in 2012 had recommended expanding the wolf population in the US to three connected zones with 250 wolves each — a total of 750 animals. The scientists warned that unless this was done, the current, isolated wolf populations would be vulnerable to dying out.

“The other two populations, which don’t exist at this time, would be the Grand Canyon population, which would extend north of the Grand Canyon into southern Utah, and the Southern Rocky Mountains population, which would be in southern

Colorado and northern New Mexico,” explains Bird of Defenders of Wildlife. Adding those two populations would require allowing the wolves to move north of Interstate 40. There’s another reason why this is necessary, Bird adds. “Climate change is going to be a very big concern for the recovery because habitat that might have been suitable for the Mexican gray wolf earlier may not be [so in the future],” Bird says. “It’s very likely the best habitat for this animal may shift to the north significantly.”

However, the FWS halted meetings with this team midway through the process and convened another group of state officials and their chosen biologists that came up with the final recovery plan released last November.

The new recovery plan ignores the 2012 team’s recommendations and calls for just one Arizona-New Mexico population of 320 wolves. It envisions the agency will delist Mexican wolves by around 2043, provided the US population holds steady at around 320 individuals and Mexico’s at 200 individuals for at least eight years. The plan provides for the release of only 70 wolves from captivity over this 25-year time period. It also maintains the northern boundary of I-40, thus restricting the range of the US wolf population to southern and central Arizona and New Mexico, allows problem wolves to be killed by federal agents and private landowners, and doesn’t see the need to connect the US and Mexico populations.

The agency says the plan would enable recovery of the Mexican wolf “in a manner that minimizes effects on local communities, livestock production, native ungulate herds, and recreation.” In other words, it has tried to

CONTINUED ON PAGE 24 ▶

LOBO 1676

by Paula Nixon

It is rare to get a look at a Mexican wolf in the wild. But wolf advocate Jean Ossorio says it's possible "with a little patience, plenty of time, and a bit of luck." The retired schoolteacher has had more than 50 sightings over the last two decades.

Since the spring of 1998, when the first wolves were released back into their native habitat and allowed to roam, hunt, and raise pups in a mountainous area that straddles the Arizona-New Mexico state line, Ossorio has spent 477 nights camping in the recovery area.

This year, she and her husband embarked on their annual winter trip the first week of January and pitched their tent north of the Bear Wallow Wilderness in the home range of a family of wolves named for the area. There was little snow on the ground at the time, and the coldest night was a relatively mild 21 degrees.

Over the course of three days, the Ossorios heard howls, saw tracks, and one morning spotted a young uncollared wolf that they thought was a male. For almost half an hour they watched him from a distance with

binoculars and took photos as "he hunted and moseyed around a meadow." Before he wandered out of sight into a stand of trees, he stopped and howled, but got no response. They suspected he was a juvenile from the Bear Wallow Pack.

A couple of weeks after the Ossorios' camping trip, the Interagency Field Team in charge of Mexican wolf management captured the first wolf in the 2018 Mexican wolf population survey. It was a bright, cold January morning when a helicopter carrying the darted wolf lifted off from a clearing in the Apache-Sitgreaves National Forests. The flight crew, in radio contact with the waiting ground team about 25 miles away, provided details about the wolf: Bear Wallow Pack. Male. Uncollared.

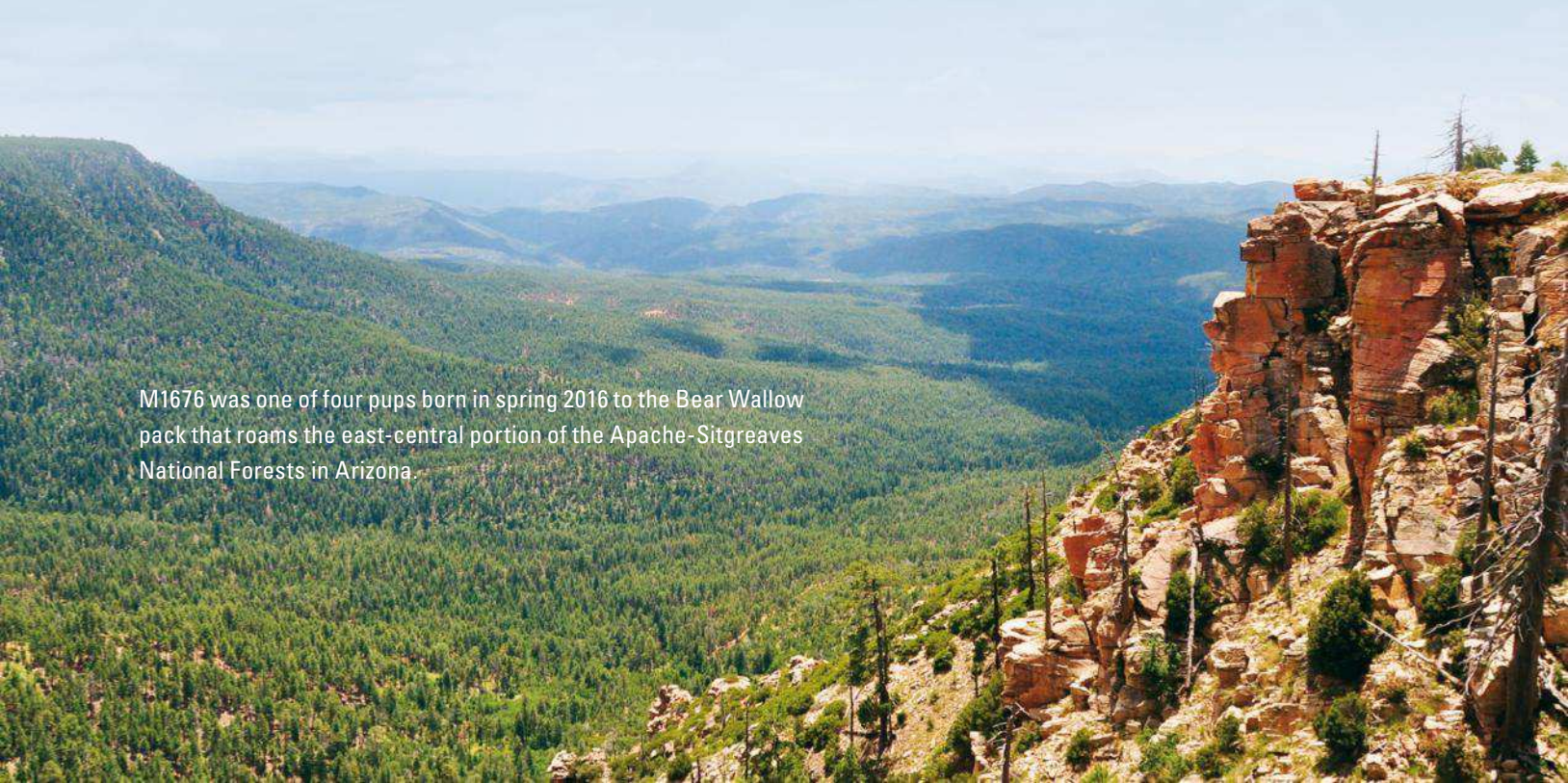
Within a few minutes a young woman in a flight suit and helmet carried the limp, muzzled, and blindfolded yearling into the double-wide trailer at a US Forest Service compound near Alpine, Arizona. The group assembled around the conference table was ready.

After a wildlife biologist weighed the wolf in at 57 pounds, two team members placed him on an unzipped, green sleeping bag spread out on the table and loosely hobbled three of his feet. A volunteer monitored his temperature with a bright green rectal thermometer. Susan Dicks, a veterinarian with the US Fish and Wildlife Service (FWS), listened to his heart with a stethoscope.

"All these things we do here today — the fluids, the vaccinations, the blood draw — are all things we do to a pet animal in a pet hospital without drugs," said Dicks. "These are not painful things, but because this is a wild animal we're more careful for human safety and for animal safety."

Quietly, the team conversed while they bolted the radio collar, wrapped with brightly colored duct tape, around the wolf's neck. Now identified by his studbook number, Male (M)1676 can be tracked along with his pack mates and other collared wolves.

It's been 20 years since the first Mexican gray wolves were released in the US, and the small population is monitored by FWS



M1676 was one of four pups born in spring 2016 to the Bear Wallow pack that roams the east-central portion of the Apache-Sitgreaves National Forests in Arizona.

with assistance from other federal, state, and tribal agencies. Each year they conduct the survey to get an official count and to radio-collar yearlings.

M1676 spent 30 minutes on the improvised exam table before being placed in a large animal crate to recover from the darting drug. He appeared to be healthy, maybe a little thin, but normal. According to Dicks, "These are wild animals working for their food." Almost full grown, he had a heavy, grizzled, multicolored coat, long legs, and big paws, built to run for miles in all types of terrain and weather.

For wolf pups, 2016 was a good year. Fifty, including M1676, survived until the end of the year, bringing the total wild Mexican wolf population up to 113 in the United States. M1676 was part of the first litter of pups born to the Bear Wallow Pack — comprised of a four-year-old female (F1335) and her three-year-old mate (M1338) who had dispersed from a pack in New Mexico. The pair had established a territory in Arizona near the home range of F1335's birth pack. Although the families of the two wolves were separated by a state line, they were closely related.

The genetic diversity of the wolves in the wild has dwindled even as their numbers have slowly increased. The public largely supports the reintroduction effort, but unyielding resistance from some ranchers and hunters has prevented what might lessen this genetic danger: the release of more adult wolves from captivity.

By the end of 2017, the Bear Wallow Pack included the two adults, M1676, and three pups born in the spring. They roam the east-central portion of the Apache-Sitgreaves National Forests in Arizona where their primary food source is elk. They have never had a reported interaction with the cows that sometimes graze in their territory.

The radio in the Forest Service trailer crackled midafternoon on the day of M1676's capture, announcing that he was "up on all fours and alert."



Members of the Interagency Field Team in charge of Mexican wolf management check M1676's vitals and administer vaccines.

The crew trucked him back out to a spot near where he had been darted, for release. His first steps, captured on video, were halting, but within seconds he disappeared from the camera's view on his way to find his pack. Ossorio watched the video of M1676's release and thought he might be the same wolf she saw earlier in the month, but there was no way to know for sure.

M1676 turned two this spring and may disperse later this year. It will be nearly impossible for him to find a mate that is not a close relative. According to the FWS 2018 release proposal, "On average, individuals within the population are as related to one another as full siblings." Even with that dire assessment there are no plans to release any adult wolves into the wild, only newborn pups from captivity that will be placed into existing packs.

The FWS published its survey results in late February — 114 Mexican wolves are living in the wild, an increase of only one wolf from last year. The number of pups, 26, was

half that of the prior year.

"Frustrating! [The] 2017 end-of-year numbers are out and they aren't pretty!" was Ossorio's response.

Though the overall increase was disappointing, Maggie Dwire, assistant Mexican wolf recovery coordinator with the FWS, says: "We have a higher percentage of sexually mature adults going into breeding season. What we hope to see is another bumper pup year."

As of March, M1676's family was still traveling together. Within weeks they may have a new litter of pups. The Bear Wallow Pack is a testament to how far Mexican wolf recovery has come in the last 20 years, but is also a symbol of the challenges that must be overcome to eliminate the threat of extinction. ■

Paula Nixon is a freelance writer who has lived in New Mexico for the last 20 years. Learn more about her work at paulanixon.com

strike a seemingly impossible balance between meeting the needs of the wolf and appeasing the people who oppose its reintroduction.

Conservationists, who had seen this coming for a while, called it a blueprint for disaster. They said the new recovery plan was so flawed that it would lead to greater inbreeding and isolation of the two wolf populations and eventually lead to the failure of the entire rewilding effort. They accused the FWS of setting aside sound science and bowing to the pressures of livestock and hunting groups that have all along tried to block the development of a robust recovery plan. “The program has been completely captured by politics, and the science has fallen to the wayside,” Bird says.

Ranching groups, too, are unhappy with the plan, but for exactly opposite reasons. They feel the population cap is too high and will lead to more wolves

on cattle, they mainly eat elk, which make up about 80 percent of their diet, in addition to deer, rabbits, and other small animals. Studies show that cattle make up anywhere between 4 to 17 percent of their diet, and that includes cattle that might have died from other causes.

On January 30, 2018, several environmental groups, including the Center for Biological Diversity, Defenders of Wildlife, and WildEarth Guardians filed two separate lawsuits against the FWS, claiming that the new recovery plan violated the mandates of the Endangered Species Act and, if implemented, would not lead to recovery of the Mexican wolf.

THE LEGAL CHALLENGE TO the new recovery plan, which is expected to be heard in the next few months, received an unexpected boost in early April when a federal judge ordered the FWS to revise its plan for the management of Mexican

wolves will be released annually, under what circumstances they would be removed from the wild, etc. It also spells out the rights of local residents with respect to their safety and protection of livestock and other property.

In 2015, the FWS revised its rule for managing Mexican wolves for the first time since the initial reintroductions in 1998. Under normal circumstances, the recovery plan for an endangered species — which lays out the goals — is updated first and then the management rule — which specifies logistics and many details of implementation — is revised according to the new goals, but “for some strange reason, USFWS in this case created the 10(j) management rule first and then the recovery plan,” Bird says. In other words, the FWS seems to have first crafted what it thought was a politically acceptable way to manage the animals, then matched the recovery goals to fit what had been deemed acceptable.

The new management rule raised the population cap from 100 to 325 and expanded the wolf’s permitted range to all of Arizona and New Mexico south of Interstate 40 (exactly the same as what the new recovery plan recommends). It also allowed more killing of Mexican wolves by federal agents and private landowners over livestock conflicts within the recovery zone and did not take into account the potential loss of genetically valuable wolves (like Sonora).

The Center for Biological Diversity and Defenders of Wildlife had filed a suit against the new rule the day it was finalized in 2015, for more or less the same reason that they would later sue the FWS over the 2017 wolf recovery plan — it put the endangered species in further peril.

The US District Court judge, Jennifer Zipp, who heard the case

In April, a federal judge ruled the FWS’s Mexican wolf management rule was “arbitrary and capricious”

attacking their cattle.

“The members within the wolf recovery area continue to have problems with depredations,” says Caren Cowan, executive director of the New Mexico Cattlegrowers’ Association. “Now in terms of our entire membership, it’s a relatively small group, but those depredations are critical to the management of their operations and their ability to remain economically viable.”

Environmentalists point out that though the wolves do occasionally prey

wolves, saying that the agency’s new management rule imposed roadblocks to the broader effort, the overall recovery of the rare species.

This gets a little confusing, so let’s back up a bit: The Mexican Wolf Recovery Plan is the big picture — it offers a guideline or roadmap for how the animal can be restored to its natural habitat. The *management rule*, a subset of this larger *recovery plan*, is a specific set of legal regulations for managing the reintroduced wolf populations. This includes decisions on how many wolves



The FWS currently reintroduces wolves into the wild via cross-fostering — adding a captive-born pup into a wild wolf den. Wolf advocates say this is an imperfect solution since mother wolves can reject the pups, and it takes at least two years for pups to reach breeding age. They say the wolves' chances of survival increase if released as family groups.

about the new management rule, agreed with the plaintiffs that it failed to further the long-term recovery of the Mexican wolf. She particularly faulted the FWS for disregarding the advice of expert scientists who warned that the new management rule would hinder the Mexican wolf's recovery, and said that the agency's refusal to consider the only wild population of Mexican wolves in the US as "essential" to the recovery of the species was "arbitrary and capricious."

"In carrying out its conservation mandate, FWS must consider the long term viability of the species. To this end, the agency may not ignore recovery needs and focus entirely on survival. Rather, recovery envisions self-sustaining populations that no longer require the protections or support of the [Endangered Species] Act," Zipp's wrote in her ruling. "The Court is not unsympathetic to the challenges the agency faces in its efforts to recover such a socially controversial species,"

she went on to add. "However, any effort to make the recovery effort more effective must be accomplished without undermining the scientific integrity of the agency's findings."

The court decision on the management rule thus bolsters the conservation groups' case against the wolf recovery plan. That the groups have also managed to move the case against the new recovery plan (which is yet to be heard) to Judge Zipp's courtroom gives them an additional advantage. "[Since] a lot of the issues she addressed in the management rule are almost identical to the issues in the recovery plan challenge, we should have a similar result; that is, the recovery plan gets invalidated, or at least the FWS is sent back to do one that uses the best available science," Bird says.

The FWS declined to comment on the ruling since it's still in litigation.

The ruling does not, however, mandate immediate wolf management adjustments, so the program will

continue as is while the FWS works on its response to the court order, which could include an appeal. This means that the limits on population numbers and the Mexican gray's movement north of the I-40 still hold.

The latter is an immediate problem because wolves are already trying to disperse north of I-40, Bird says. "There have been a couple that have gone north of I-40. One came back on its own volition, and one was picked up by FWS and brought back. We're obviously not going to reach [the population cap] in the next year or two, so that's not quite as much of a problem right now."

However, there is another immediate threat to the Mexican gray's survival — Trump's border wall. The proposed solid, impermeable wall that would run nearly 2,000 miles along US-Mexico border, from the Pacific Ocean to the Gulf of Mexico, would cut across habitats and migration pathways of at least 93 endangered and threatened species,

including jaguars, ocelots, pygmy owls, and, of course, Mexican gray wolves. It would not only have dire consequences for many of these animals, but would also undo years of environmental cooperation between the two countries to protect wildlife in these borderlands ecosystems.

For the genetically compromised Mexican wolf, a wall would block the free exchange of genes between the only two existing wild populations, further compromising a recovery that is already threatened on so many other fronts.

Oddly enough, while the new recovery plan relies on the wolf population in Mexico for nearly 40 percent of the animals it aims to recover, it also states that the wolves wouldn't travel between the US and Mexico in numbers large enough "to provide for adequate gene flow between populations to alleviate genetic threats," implying that the wall isn't much of a concern. But wildlife biologists say that assumption ignores just how wide-ranging these animals are. Sonora, they point out, isn't the only wolf to have made the cross-border journey. Last year, another wolf released in Mexico traveled almost all the way up to Las Cruces, New Mexico, some 50 miles past the border before turning back and crossing into Mexico again.

"A couple more have reached the border [on the Mexico side]; they didn't cross over, but came very close," says Carlos A. Lopez Gonzalez, a biologist specializing in large carnivores who has been coordinating the Mexican field recovery effort in the wild. "That's one of the things that the wall is basically going to have an impact on, because it's clear that there's a connectivity."

The wolf that made the cross-border round trip "crossed I-10 twice, not an easy highway to negotiate,"

Gonzalez says. "It shows that these wolves can live in human-dominated landscapes without being seen."

Under the 2005 Real ID Act, the Department of Homeland Security can waive various environmental laws that might slow down or halt construction of border walls in a sensitive area. A lawsuit challenging the waiver, filed by environmental groups and the state of California, was dismissed in February. Robinson, whose organization was one of the litigants, says the Center for Biological Diversity will appeal the decision. "There's a real tie between the border wall and the challenged Mexican wolf recovery plan," Robinson says. "In fact, even before the wall is built, the FWS is basically acting like a wall, blocking wolves from crossing by capturing the ones that are crossing over."

MOST ENVIRONMENTALISTS agree that the majority of the challenges facing the Mexican wolf are more social than anything else. As Bird says: "We have to get people that live in the places where wolves are recovering and expanding their population to be able to live peacefully with the animals."

To that end, organizations like the Defenders of Wildlife have been working to smooth relationships across the wolf-livestock divide. One of Bird's colleagues sits on the Mexican Wolf / Livestock Coexistence Council, a coalition of ranchers, conservationists, tribes, and counties that helps ranchers live alongside wolves.

The council doesn't just compensate ranchers for livestock killed by wolves, it also pays all ranchers living within the Mexican wolf recovery area territory a fee for being exposed to risk there, and funds any measures the ranchers take to reduce livestock-wolf conflict,

including having more ranch staff patrol the land.

The work the council has done is pretty good so far, but it isn't always easy given the differing interests of all the stakeholders, says council chairperson Sisto Hernandez, a member of the White Mountain Apache Tribe in Arizona. "There's a lot of strong feelings both ways," he says. "Not unlike national politics right now, extremes from both ends make it difficult for those of us who are a little more moderate to do things."

Sisto says all ranchers and hunters and even tribes want is to be able to continue to hunt and raise livestock and live the way that they have for so long. "We'd like to work toward finding out what it would be that would allow us to be able to live our lives and not have to give that stuff up."

For conservationists like Bird though, the ultimate goal of all of this work is restoring the Mexican wolf to the Southwest landscape. "There's a lot of discussion about what the goals of a recovery plan should be," he says. "Should it be numerical? Should it be genetic? Should it be distribution? But Defenders strongly believes it's ultimately whether or not the wolf population is fulfilling its ecological role." And he is optimistic that there will be a time in the future when all of the challenges that the Mexican gray faces will be overcome.

"I have hope because the wolves are really resilient animals," he says. "They are good at doing what they do, survival and dispersal, if we just get out of the way." ■

John Soltes, an independent journalist, has written about many species, especially wolves, for *Earth Island Journal*.

Additional reporting by **Maureen Nandini Mitra**.



Antholyza cunonia hybrid (detail)

Fantastical Flora

Sarah Misra always had a latent interest in botany. A self-professed “flower and tree tourist,” the young artist looks up local arboretums and botanical gardens whenever she is in a new city. But it wasn’t until three years ago when she crafted a Valentine’s Day card for her husband with cutouts of old pictures of flowering bulbs that her latent interest blossomed into inspiration for a series of fanciful collages of imagined plants — *Selections from the Herbarium*.

Using a few simple materials — thread, paper, cutouts of digitally manipulated images of pressed flowers and leaves, and the rudimentary tools of a botanist, scalpel, tweezers, and dye — Misra creates fictional hybridized plant species, which she mounts with pins in wood-and-glass box frames that resemble early specimen cases. The end results are enchantingly delicate compositions so like real plant specimens that they compel viewers to lean in for a closer look.

The flowers in most of the collages are based upon real species. That, and the taxonomy-based names of many of her pieces — *Tulipa cornuta*, *Amaryllis formosissima*

hybrid, *Ixia longiflora hybrid* — lend an extra touch of authenticity to the creations.

“Initially, I was just really enjoying the technique — it’s very meditative and you turn out these satisfyingly delicate cutouts,” Misra says. “But the whole thing really took off when I started looking at historical botanical specimens online [in search of] source materials.”

That search led her to a deeper understanding of the structure of plants, their biochemical processes, their relationship with the environment, and even the logic behind their taxonomy. “I managed to learn a great deal of science even though I wasn’t intending to,” Misra says. And it also provoked deeper questions about humans’ role in nature, about our ability to both destroy and foster biodiversity. Questions that she then began to incorporate in the artwork as well.

Though the plants in many of the pieces are brightly colored, in others they are shown fading away, the way most pressed plants and flowers tend to do over time, inviting the viewer to think about “what is gained and lost as biodiversity ceases to become a

natural phenomenon and instead becomes a man-made institution,” Misra explains in her artist’s statement about the series.

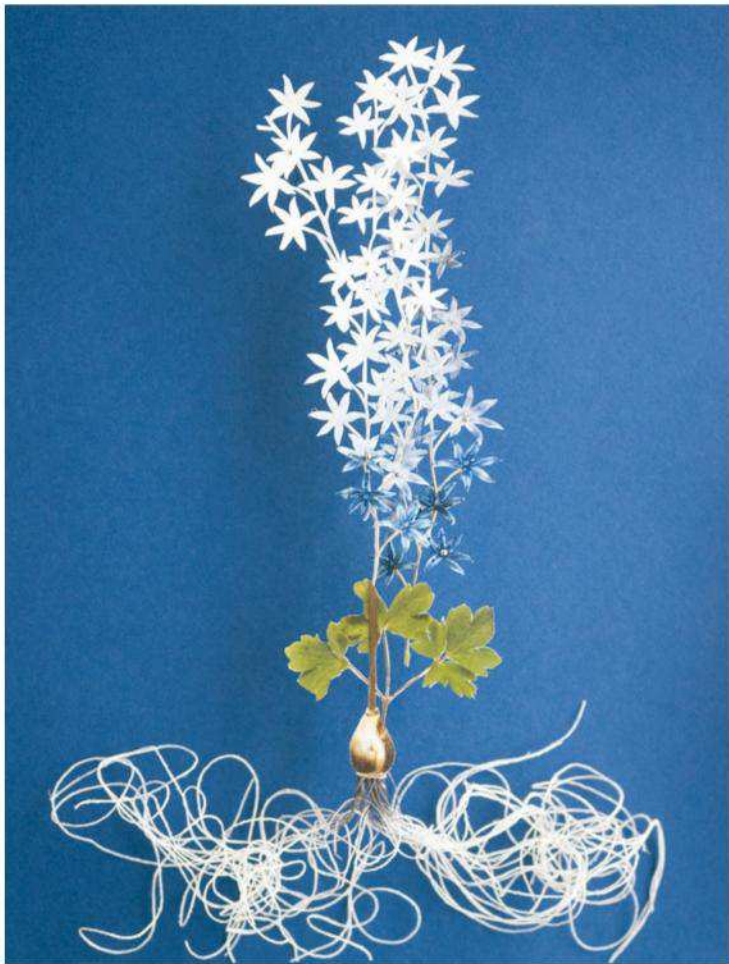
The artist’s own explorations of the botanical world have led her to conclude that human interventions in nature can result in both good and bad. They have, for example, led to the loss of many species but also the creation of some new ones that are useful and beautiful in their own right.

“It’s hard to say unequivocally that human intervention in nature is not in any way good, but it’s good to reflect on what interventions you make to what end,” Misra says. And that’s the message, she hopes, people will take away from a viewing her fanciful flora. ■

— MAUREEN NANDINI MITRA

See more of Sarah Misra’s work at sarahmisra.com.

More Online: See a slideshow of the artist’s work at earthislandjournal.org



Left: *Scilla bifolia* hybrid

Right: *Dahlia hortensis* hybrid

Opposite page: *Bonsai magnolia*





The promise of citizen science lies not only in its contributions to research, but also in its ability to transform our relationships with the natural world.

CITIZENS A FIELD

by Lucy Bryan

I WENT TO JOSHUA TREE NATIONAL Park because I was tired of despair. Not that the deserts of Southern California are particularly uplifting places as of late. During recent droughts, the vacant shells of vegetation-starved tortoises littered brittle ground. Mountain quail and American kestrels fled to higher elevations, and lizards in both low and high deserts stopped breeding. At the southern edge of the Mojave, the crooked limbs of Joshua trees sagged, and their spear-like leaves withered and bleached in the sun.

Still, I agreed to spend a week in the park with 11 students from James Madison University, where I teach science and research writing. I thought their youthful exuberance might kindle some hope in the trajectory of my planet and my country. I expected that seven days in the desert without showers, flush toilets, or cell phone service would be a grounding experience. And using my spring break to collect data on threatened plants seemed like a way to do something (albeit a small something) in response to the paralyzing force that is global climate change.

What I didn't know, when I headed west, was that the small something I'd do in Joshua Tree was part of a much bigger movement. In the park, researchers and administrators are upending the norms that

have governed the production of science for more than a century by using volunteer "citizen scientists" to monitor plants and animals that may be vulnerable to climate change. They know that understanding climate change will require large-scale, long-term research that demands huge amounts of time and funding — resources that are already in short supply, particularly within our national parks. But by inviting amateurs to assist with data collection, scientists and park staff have been able to expand their efforts and commit to decades-long projects. In the process, they're also educating and inspiring volunteers, who are eager to learn about, support, and advance some of the most important scientific research of our time. From my week in the park, I'm convinced it's a win-win-win situation for the park, the participants, and the planet.

DURING OUR STUDENT-LED, university-sponsored service trip, my group assisted with two long-term monitoring projects. The first is a collaboration between Joshua Tree National Park and the Desert Studies Initiative at the University of California, Riverside — a project that explores the effects of climate change on a variety of plants and animals in the region, including Joshua trees,





pinyon pines, ocotillo cacti, lizards, and coyotes. The second project, housed within the park's Division of Science and Resource Stewardship, aims to document and assess the health and reproductive status of the park's namesake species.

Christened by Mormon settlers who saw in its branches a prophet's hands lifted in prayer, the Joshua tree is a source of curiosity for park visitors and concern for desert ecologists. Some scientists have predicted that this giant species of yucca, which can grow more than 20 feet tall and live for 500 years, will vanish from all but a few locations by the century's end. Currently, the US Fish and Wildlife Service (FWS) is evaluating whether the Joshua tree should be added to the threatened species list under the Endangered Species Act. If it were, it would become just the second species, following the polar bear, to earn that designation due to climate change.

Joshua Tree National Park encompasses the transition zone between the Mojave Desert and its lowland southern neighbor, the Colorado Desert. Through the late Pleistocene (about 22,000-13,000 years ago), both deserts were populated by Joshua trees. At that time, Shasta ground sloths the size of grizzly bears fed on its fruit and dispersed its seeds widely. Today, the sloths are long gone, the deserts are much warmer, and the range of Joshua trees has drastically contracted northward, restricting it to the Mojave.

When I arrived in Joshua Tree in March 2017, I didn't know much about citizen science, but I took to it right away. I gladly stood as a boundary marker, GPS in hand, for the plot we surveyed on our first day in the field. As the students scurried around junipers and Joshua trees, measuring their

lengths, breadths, and heights and rating their living conditions on a scale of one to five, I absorbed the sensations of sun and dry desert wind and licked dust off my lips. In the days that followed, I took pleasure in counting the terminal branches of Joshua trees and photographing specimens with their identification numbers. All of this unfolded against a surreal backdrop — desert basins hemmed in by rugged mountains, colossal golden boulders, and sparse forests of fantastical trees, limbs akimbo.

It didn't escape me that my presence in the park was necessitated by the challenges of climate change research. After our trip, I spoke on the phone with ecologist Cameron Barrows, who directs the Desert Studies Initiative and conceived of the first monitoring project we assisted with. Several years ago, Barrows received funding from the FWS to develop a method for monitoring plants and animals in Joshua Tree, but when he sat down with park biologists to sketch out a research plan, he felt troubled. "If we're going to start a research project that necessarily needs to go a couple of decades or more, how is that going to be sustainable?" he wondered.

Barrows says he knew he wouldn't be able to find a grant that would last that long, and the National Park Service (NPS) told him they couldn't depend on their administration to continuously support the research. So, he decided to recruit citizen scientists.

The project, now in its fourth year, has sent out local volunteers, Youth Conservation Corps participants, and college students on "alternative breaks" like ours to collect data (under the supervision of experts) on plants and animals. The Earthwatch Institute, which offers scientific expeditions all



In Joshua Tree, which is home to 145 documented species of lichen, volunteers are assisting with efforts to monitor the long-term impacts of climate change on the plants.

over the world, has been instrumental in providing not only a consistent stream of citizen scientists for the project but also funding for the biologists who take them into the field. The data collected by these volunteers is establishing a baseline for species of concern and has provided some preliminary insights into what conditions might enable them to survive a changing climate.

LIKE ACADEMIC RESEARCHERS, national park administrators face budget and personnel constraints, but there are also hurdles that make it particularly difficult to research the impacts of climate change under the auspices of the NPS — including the logistical challenges of managing a major tourist attraction, legal and bureaucratic barriers, and responsibilities that compete with research agendas, like preserving historical and cultural resources, providing educational programming, and maintaining park infrastructure. Because of those hurdles, citizen scientists are, in some cases, a

prerequisite for monitoring projects, not just a way to sustain them.

At Joshua Tree, there's a \$60 million maintenance backlog — but the park's operating budget, allocated annually by Congress, barely surpasses \$6 million. The park does get a significant budget boost from visitor entrance fees, and visitation has more than doubled since it became a national park in 1994, with nearly 3 million visitors in 2017 alone. However, those visitors wear out roads and facilities and increase the need for personnel, programming, and amenities. The Federal Lands Recreation Enhancement Act, signed into law by George W. Bush in 2004, requires that the park use entrance fees for enhancing visitor services or improving visitor facilities. It expressly prohibits using "recreation fees to pay for biological monitoring of threatened and endangered species."

Joshua Tree's most recent strategic plan says the park should develop a long-term network of plots for monitoring trends in Joshua tree health and distribution. Still, when Neil Frakes

stepped into the role of Vegetation Branch Chief in 2015, he wasn't sure how to make such a project feasible. Then a high school teacher contacted him about bringing students from his school's wilderness club to the park in March 2016.

Around that time, Frakes was perusing a master's thesis written by James Hogan in 1977 that recorded the height classes and density of Joshua trees at 37 plots within the park. He decided to take the wilderness club to one of the "Hogan plots" to gather comparative data. He quickly put together a monitoring protocol and spent three days on site with the students, camping and measuring Joshua tree heights. The project went really well.

Since then, groups of citizen scientists (including mine) have continued assisting park staff in surveying Joshua trees, and Frakes expects to have data on 19 different 500-by-500-meter plots by June. All but three of those plots are based on Hogan's original survey sites, though Frakes cautions that he's found methodological and analytical errors in the thesis that limit his ability to compare the 1977 findings to current data. Over the last two years, Frakes has honed the project's protocol — improving the technique for measuring the height of trees, changing how branches are counted and damage is coded, and clarifying what counts as a sprout of an existing tree versus a new seedling. The goal is to establish a 5-year monitoring cycle for all 19 plots and to select a subset of those plots for assessing flowering and fruit production annually.

The National Park Service's resource stewardship plan promotes research that will help parks sustain biodiversity and viable ecosystems

in the face of climate change. It also lists one of its overarching goals as providing visitors “with opportunities for transformative experiences that educate and inspire.” Citizen science has provided Frakes with a way to achieve both objectives at once. It has also enabled him to obtain funding, volunteers, and institutional support for monitoring efforts that will inform how Joshua Tree manages species and ecosystems affected by climate change.

Frakes says he designed the Joshua tree monitoring project specifically “to give visitors a better experience — which is participating in the scientific process — and maybe that’s a more rewarding experience for a visitor than just driving through the park, stopping at the sites, and taking pictures.”

BECOMING A CITIZEN SCIENTIST certainly was a rewarding experience for me. I relished the chance to go to the field with park staff and scientists and to absorb some of their knowledge. I learned about the yucca moths that co-evolved with Joshua trees — how they lay their eggs in the tree’s blossoms and pollinate them so their caterpillars can later dine on its fibrous, white fruit. I learned the technical term for the barbed spines of cacti (glochids) and the name for the study of plant and animal lifecycles (phenology — not to be confused with the debunked pseudoscience phrenology). I learned how to gently cup the leaves of a creosote bush, breathe into them, and elicit the sweet, metallic tang that scents the desert before a rainstorm.

Still, a worry surfaced in my mind as our data sheets filled: What if citizen science wasn’t *good* science? If the data we were collecting wasn’t accurate, then it couldn’t help researchers determine how climate change is affecting Joshua trees.

At one point, I caught myself making a mistake while measuring the height of a Joshua tree. I hadn’t locked one level of my telescoping measuring rod into place, and that level had collapsed, compromising my measurement by several inches. I corrected the error but wondered if I’d unknowingly made the same blunder earlier. I also noticed how difficult it was to measure the height of Joshua trees. Even with

Volunteers provide more than eyes and ears — they’re able to think outside the box.

multiple observers, it was hard to tell when the tip of the rod leveled with the tallest blade on the tree.

Tyler Green, a vegetation and climate change-monitoring specialist who supervised the work we did for the Desert Studies Initiative, assured me that with good training and close supervision, citizen scientists can collect good data. He also explained that the issues I observed in the field are challenges for experts too.

“Vegetation in [the park] is so complex,” he told me. “Joshua trees are weird, and that’s why people like them — but that also makes them super hard to assign numerical values to ... Essentially, we’re trying to take a really messy, complex ecosystem and put [it] into a nice, neat, ordered data sheet. Nature, in my opinion, resists that.”

Whether or not citizen scientists can reliably collect high quality data is a question that researchers have studied and debated for years. It’s also a question that preoccupied Cameron Barrows when he started using citizen scientists in Joshua Tree, so he and a team of researchers decided to do

a comparative study. They sent two trained biologists to survey reptiles in five plots in the park. Then, within two weeks, they sent a group of citizen scientists under the supervision of one or two biologists to survey the same plots. In the end, the supervised citizen scientist teams were more successful than the two-biologist team. They spotted two to three times as many individual reptiles and about twice as

many species. “We get better data using the citizen scientists not because they are superior observers ... but because we have more eyes looking, and that makes the difference,” Barrows says.

Because of their larger group size, the citizen scientist teams also have a “beater effect,” forcing more reptiles out into the open. Barrows adds that volunteers contribute more than just eyes and ears; they’re often able to think outside the box and lend fresh perspectives that facilitate “better science.”

“Sometimes we’ll be out there, and I’ll wonder out loud why this lizard is here or not here, and the person will say, ‘What about this? What about that?’ Half the time, they’ve got good ideas and things I wouldn’t have otherwise thought of myself,” he says.

An increasing number of studies have confirmed that citizen scientists can collect data that falls within acceptable ranges of accuracy and reliability in a variety of contexts, from monitoring shark populations in coral reefs to calculating above-ground biomass in forests. That said, citizen

scientists' lack of training or expertise can limit the parameters of a study or even compromise the quality of data in certain situations. For example, one study showed that while citizen scientists can effectively identify common species in ecological communities, they are more likely to misidentify cryptic and rare species than experts. Similarly, the simplified methods used in many citizen science projects may yield data that is less fine-tuned than data collected by experts using more complicated protocols — which means it could fail to capture subtle changes or trends.

and help band songbirds in Great Smoky Mountains National Park. Butterfly lovers help document how climate change is affecting species distributions in Washington's Mount Rainier National Park and North Cascades National Park. And in Yellowstone National Park, visitors share their photos of wolves to assist researchers in studying breeding behaviors and tracking the spread of mange.

The citizen science projects in US national parks comprise a mere fraction of those unfolding across the globe.

to the crowd-sourcing capacities of modern technology. These days, anyone with a camera or a smart phone can contribute to scientific research. For example, the Bionote and iNaturalist apps allow curious people all over the world to upload photos of plants and animals, receive species identifications from experts, and, in the process, provide information about species distributions. Similarly, divers, snorkelers, and paddlers can submit information about shark, ray, and fish sightings to eOceans, an organization that uses citizen science data to analyze marine animal trends. Citizen science has allowed researchers to source and amass data on previously unimaginable scales, and it's allowed regular people to participate in processes of discovery that have largely been off-limits to non-experts since the Scientific Revolution.

Citizen science is redefining who creates science and how it happens.

Still, many researchers are finding that citizen science offers more possibilities than drawbacks — and that national parks, like Joshua Tree, can provide ideal research sites for their projects. As Lynn Sweet, a research associate at UC Riverside's Palm Desert Center, explains, identifying research plots and installing equipment is time and resource intensive, so it makes sense to conduct studies in places that won't be developed or converted for agricultural or other uses. She adds that national parks also manage pollution, fire, and human impacts — which helps eliminate variables that could skew the results of studies.

National parks also attract visitors with interests that readily lend themselves to citizen science projects, and researchers are embracing these visitors as a valuable resource. Bird enthusiasts track migratory hawks in Arcadia National Park each summer

Through these projects, volunteers are helping generate knowledge in disciplines as diverse as astronomy, public health, and archeology. In Cape Town, South Africa, citizen scientists are helping protect local biodiversity by collecting soil and root samples from plants that may be infected with dangerous microbes. In China's Hunan province, locals, in collaboration with an environmental nonprofit, are holding government and industry accountable by monitoring and publishing water pollution levels for rivers that supply their drinking water. Such projects allow concerned citizens to learn about complex problems that affect their lives, their families, and the places they call home, and also to play an active role in calling attention to those problems.

Citizen science is also redefining the boundaries of science — both who creates it and how it happens — thanks

CITIZEN SCIENCE FUELS not only scientific discovery but also social change — a necessary ingredient for slowing and, ideally, undoing the effects of climate change.

“One of the advantages of working with citizen scientists ... is that they learn and go back home to their community, and they talk to other people about what they learned and what they did,” says Neil Frakes. “They are ambassadors.”

Tyler Green echoes that sentiment, explaining that as a former Student Conservation Association trail crew member, he knows the powerful impact these experiences can have on people. Green hopes that volunteers' experiences in Joshua Tree will inspire them to advocate for action on conservation and climate change: “It's one thing to hear and to intellectually know that something is happening, but when you see it ... it becomes more real, and that enables people to act on it.”

The earlier people get involved in citizen science, the better, says Lynn Sweet, who supervises volunteer teams for the Desert Studies Initiative project. “Across the country, a lot of students aren’t getting access to natural areas,” she says. “The better we can do at exposing kids to nature ... I think that will ensure that people care, and if people care, they’ll come out and help out.”

The idea that early experiences in nature influence attitudes toward the environment, promote a conservation ethic, and encourage behaviors like recycling and volunteering has been supported by research. Even so, at the conclusion of our week in Joshua Tree, I had doubts about the impression the trip had left on the students.

Fieldwork is sometimes monotonous. It doesn’t have the emotional appeal that certain types of humanitarian projects do. And the data we collected was just a drop in the bucket of long-term research needed to understand climate change in the Mojave and Colorado Deserts. There was no final product to step back and admire, no satisfying sense of completion. I wondered: Without such gratification, would the students feel their efforts mattered? Would they be able to explain the value of citizen science to friends and family? Would they sign up for similar projects in the future?

It didn’t help that we’d been beset by unanticipated challenges. A flat tire and spotty cell phone service cost us a half-day of work. Many students were unprepared for the extreme conditions in the park. Their rented sleeping bags and cotton sweatshirts were no match for 20-degree Fahrenheit nighttime temperatures, and the black leggings worn by half the group amplified the afternoon heat and did little to protect against prickly plants. One



Across the US, researchers are embracing park visitors as a valuable resource. In Mount Rainier National Park, for example, volunteers assist park biologists in monitoring butterfly numbers and tracking flowering plant distributions.

student suffered a panic attack during a windstorm that flung sand into our eyes, flattened our tents, and whisked an aluminum pot (never to be seen again) into the crags surrounding our campsite. Another succumbed to pink eye, and yet another to hyponatremia (a sodium deficiency caused, in this case, by drinking too much water on an empty stomach). Such is the nature of fieldwork, but I worried that those problems detracted from their experiences.

Our minor disasters also interfered with our plans to have a daily time of reflection — and the loud music and idle chatter that dominated our many hours in the van indicated (to me, at least) a lack of interest in contemplating the desert or the social, political, and natural forces that threaten it. My heart sank when I learned that the trip readers I’d created — filled with the thought-provoking words of Robin Wall-Kimmerer, Rebecca Solnit, and Edward Abbey — somehow wound up in a dumpster in Redlands, California near the end of the trip.

Then, about a week after our return, Hope Barnstead, a college senior who had been on the trip, showed up in my office. She’d just learned about an AmeriCorps position that would allow her to spend six months doing trail maintenance and preservation work in the deserts of Utah. Excited by that possibility, she wanted my input about whether or not she should abandon her plan to move to New York City after graduating. I told her there was no harm in applying. Later, after she’d interviewed for and accepted the position, she said she wouldn’t have found the courage to do so were it not for our time in Joshua Tree.

“I think Neil [Frakes] is the one who said at the beginning, ‘You will never look at a Joshua tree the same way again,’” Barnstead said. “And I [thought], ‘Like, I’ll be sick of it?’ Just measuring a tree sounds boring on paper, but at the end, I remember leaving the park and feeling like, ‘It is now my duty to protect this tree’ ... You break that barrier of ‘This is a tree, and I’m a human being.’”

There were other encouraging signs that suggested the trip had struck a deeper chord than I'd thought. A handful of group members gathered for a screening of the climate change documentary *Before the Flood*. A student asked me to send her a copy of the trip reader. Another told me about her plans to write about citizen science for her environmental humanities term paper. When I posted an invitation on Facebook asking for friends to accompany me to the People's Climate March in Washington, DC in April, Julie Gentry, a student from our group, decided to tag along.

On the bus ride home from the march, we discussed what our time in Joshua Tree had meant to us. Gentry said that living in the desert for a week forced her to confront how much she consumes in her day-to-day life. She said that since the trip, "I'm taking less showers, and I'm not buying things. I'm trying to donate things that I have to thrift stores ... I want to live a simpler life because of [the trip]."

I'VE OFTEN WONDERED HOW anyone can deny that humans have contributed to climate change, given the abundance of scientific evidence that testifies to our influence. I've wondered, too, at my own unwillingness to act — my reluctance to curb my consumption, my refusal to give up meat, my attachments to air conditioning, summer vacations, and two-day shipping. How do you persuade someone to change — not just their mind, but their way of life — especially when that someone is you?

Science alone clearly isn't enough. That hockey stick graph showing the rapid rise in our planet's surface temperatures, those colorful maps



Citizen science and modern technology have allowed regular people to participate in processes of discovery that have been off-limits to non-experts for centuries.

displaying droughts, the numbers testifying to the warming, rising, and acidifying of our seas — none of those have silenced the deniers or inspired the rest of us to the kind of collective action needed to change course.

The promise of citizen science lies not only in its ability to expand the boundaries of what we know but also in its ability to beget stories, to transform the narratives people tell about the earth they inhabit and their place in it. Whether an intensive, short-term effort in a far-off place or a local, long-term commitment to collecting data, citizen science offers the opportunity to make climate change (and the science of climate change) part of our stories. The accumulating greenhouse gases in our atmosphere, the droughts that have plagued the southwestern United States, the decline of certain desert plants — those aren't just ideas for me or the students who traveled with me to Joshua Tree. They are hitched to the marvel of the sun rising over a plane of Joshua trees, to friendships forged over measuring tapes and data sheets, to conversations and grilled cheeses

shared around a campfire. And, yes, driving to urgent care and losing gear to a windstorm — those are there too. What matters is this: That incredible place, the living things that inhabit it, and the people who protect it belong to my story, and I belong to theirs.

Following my time in Joshua Tree, I decided to give up air travel for the summer, resisting the siren song of distant mountains. I know that decision was somehow caught up in the Joshua trees I touched and admired, in the sand that dusted my eyelashes and warmed beneath my sleeping body, and in the people who

shared their love of the desert with me. My choice to stay home for the summer, Gentry's choice to take fewer showers, Barnstead's choice to put her dream of moving to New York City on hold — none of those single decisions is going to reverse the course of climate change. But if a week of measuring plants can inspire such changes, just imagine what might be possible if citizen science were to become a standard component of science education, a customary experience for national park visitors, or a regular pastime parents and children practiced in backyards and city parks.

Through citizen science, we have the opportunity to transform our personal stories and the communal story of our planet, to act both individually and collectively. Through citizen science, we can begin unraveling this catastrophe of our own making. ■

Lucy Bryan is a writer, adventurer, and teacher who splits her time between Virginia's Shenandoah Valley and Ohio's Appalachian Plateau.



LEAVE NO WORKER BEHIND

WILL THE JUST TRANSITION MOVEMENT SURVIVE MAINSTREAM ADOPTION?

by Samantha M. Harvey

“**T**HERE IS A RIGHT WAY to do ‘just transition.’”

The statement echoes through the humid halls of the historic Stringer Grand Lodge Masonic Temple in Jackson, Mississippi, on an unseasonably scorching day in late February, 2018. Mingling with the ghosts of Medgar Evers, Fannie Lou Hamer, and Dr. Martin Luther King, Jr., 150 labor leaders, environmental justice activists, philanthropists, and national environmental organization staffers move from one side of the room to the other — far right for “strongly agree,” and far left for “strongly disagree.”

The group has come together to find alignment around the concept of just transition, so laughter erupts at the almost 50-50 split. But the mood soon settles. With the backdrop of a president who has filled his cabinet with oil executives, brutishly dismissed climate change, and denounced the Paris Accord, it’s hard to shake off what’s happening outside for too long: Puerto Ricans are fleeing the devastating effects of Hurricane Maria with no end in sight, #MeToo is a household term, and activists are railing against the assault on unions in the historic Supreme Court case *Janus v. AFSCME*. Those in the temple are steeped in these threats and more. But they also understand that while climate change, racism, patriarchy, and plutocracy are terrifying, they are not impenetrable, and dismantling one may lead to the unraveling of others.

Global activists share this systemic view, and around the

world, locally based, integrated models are being built to support people working and living together in community. This decarbonized vision connects jobs and environment rather than pitting them against one another; breaks down patriarchy and systems of oppression; honors caring, culture, and community leadership; and reshuffles the paradigm that hails profit as the sole pinnacle of goodness. They call it “*buen vivir*” (good living) in South America, “commons” and “degrowth” in Europe, “agroecology,” “ecofeminisms,” and “rights of Mother Earth” in Indigenous communities, and in the United States, incorporating principles of all these concepts, “just transition.”

After much debate across the temple, a woman raises her hand from a spot dead center between the two poles. “Just transition will look different in different places, because it’s place-based,” she says. “But the principles behind it have to be the same. So there is a right way, but the right way is many ways.” She doesn’t mention that some “right ways” are more “right” than others. All seem to agree just transition fundamentally requires a shift off of fossil fuels, and in a radically climate-changing world, nothing could be more urgent. But grassroots movements also demand economic, racial, and gender justice underpin that shift. In fact, they assert decarbonizing simply cannot happen exclusive of justice.



This approach has been threatened since “just transition” hit the big time, so to speak: when it appeared in the preamble of the Paris Accord in late 2015. Movement leaders fear its public adoption on a global platform threatens to dilute the concept, undermine it, co-opt it. They believe policymakers and large philanthropies are too wedded to the capitalist economy to be able to imagine anything outside of it, and the consolidation of wealth, spurred by white supremacy and patriarchy, is the foundation of a capitalist system whose growth-at-all-costs philosophy is killing the planet. To these leaders, tackling climate change without justice is a zero-sum game, a way for the wealthy to delay the catastrophic effects of fossil fuel use on themselves, perhaps, but certainly not a way to dig out the roots of the underlying systems that created resource grabs and climate change in the first place.

AND SO IT IS THAT JOSÉ BRAVO, executive director and founder of the Just Transition Alliance, finds himself in Jackson, doing his best to protect the roots of this radical alternative framework. He is inside the temple’s main room as much as he is out in the hall in off-the-cuff meetings, throwing an avuncular arm around the shoulders of passersby, and



then patiently building the case for solidarity with workers and communities. He is as comfortable cracking jokes as he is debating high-level policy, a disarming quality that has served him well through decades of movement building.

Bravo was there at the beginning of the just transition movement, a participant in the first People of Color Environmental Leadership Summit in 1991, and five years later, a co-writer of the seminal “Jemez Principles for Democratic Organizing.” The Jemez principles would later ground principles of the Just Transition Alliance, the Indigenous Environmental Network, and the Climate Justice Alliance. In today’s parlance, Bravo qualifies as a movement O.G., so in the current rush to define “just transition,” he gets asked a lot why the Just Transition Alliance never copyrighted the term.

“Because we don’t believe in that,” he says. “We believe just transition is as open-source now as it’s ever been. But we do want people to know it didn’t start today.”

The origins of this movement trace back to the early ‘90s, when Tony Mazzocchi, a labor leader and top official of the Oil, Chemical, and Atomic Workers International Union (OCAW), saw the inevitability of a labor transition away from toxic fuels and chemicals.

As Bravo remembers it, “Here you had workers who depended on 100 percent of the most vile things on the planet. The chemicals, the fuels, the artillery, the weapons ... And they said, *You know what? The stuff we produce, and many of the things we put together in these plants, probably shouldn’t be put together on the face of this planet.*” But stopping production would mean job losses.

In 1993, writing for the *EcoSocialist Review* — in a piece shortly thereafter excerpted by *Earth Island Journal* — Mazzocchi proposed a “superfund for workers” to assist those working in an era of environmental cleanup to transition to new, cleaner jobs, replete with training programs, full wages, and benefits for those who found themselves unemployed.

“We are not asking that environmentalists change their agenda,” he wrote. “However, we urge consideration of the economic impact upon workers.”

Mazzocchi started collaborating with national environmental organizations, but their prime motivation at the time was shutting down the plants, not necessarily assisting workers facing unemployment. “They kept doing actions, rappelling off smokestacks, pissing off workers,” Bravo remembers of the NGO activists. So the OCAW instead approached the environmental justice (EJ) movement, brand new at the time. The working class and communities of color represented by the movement lived in toxic neighborhoods on the fencelines of the plants, and were uniquely able to connect their own struggles to those of the workers.

The new OCAW-EJ partnership identified five sites throughout the country. From Richmond, California to Ponka City, Oklahoma, the sites shared two qualities: labor disputes requiring resolution, and strong relationships between EJ leadership and vulnerable fenceline communities. Bravo’s job was to talk to both residents and workers at these sites, connect them through shared challenges and needs, and train the now mixed groups on this developing concept of just transition — a move away from toxic production that also valued justice, transparency, and protection for both workers and communities.

For a while they were off and running, but outside those five communities were about 90,000 workers in the OCAW, which in 2005 merged with the United Steelworkers Union. With a newly ballooned, conservative-leaning membership of 800,000, what began as a groundbreaking partnership

became a David and Goliath proposition.

Joe Uehlein, former secretary-treasurer of the AFL-CIO's Industrial Union Department and founding president of the Labor Network for Sustainability, has some insight on what went wrong. "American labor is a microcosm of America," Uehlein says, "and America has a conservative streak. Here, we not only allow, but we engineer fear into the workers' kitchen tables. Fear for how they're going to provide for healthcare, pension, benefits, education, vacation ... and that's a big part of why we're so resistant to change and to the just transition framework."

Organized labor saw any shift from business-as-usual as a threat, and backed away, but the concept of systemic change beyond green jobs continued to develop over the decades within EJ and movement support groups throughout the US. At the same time, in the global policy realm, the International Labour Organization built its own platform around just transition, and in November 2015 released guidelines for transitioning to a low-carbon economy while simultaneously protecting workers.

Then on December 11, 2015, flanked by a floor-to-ceiling mural of nineteenth-century Frenchmen harpooning a dolphin, a group of the world's most influential philanthropic presidents and program officers gathered at the Institut Océanographique de Paris to celebrate the signing of the Paris Climate Accord. Filing out of the drafty lecture hall, they "high-fived" to mark not only the landmark accord to stem global warming, but also the inclusion of "just transition" in its preamble. But even as they clinked glasses, some funders surreptitiously Googled this new phrase and wondered how they would write it into foundation programs back home.

Eight metro stops away at the *Zone d'Action Climat*, global activists were sewing the final threads into a banner that read "COP 21 = +3°C," which they would set ablaze at a mass mobilization the following day on the lawn of the Eiffel Tower. They saw the recognition of "just transition" on the mainstream policy stage as oxymoronic. They worried that once taken over by philanthropies and governments entrenched in a corporate model, the principles that birthed the term — principles of bottom-up community leadership, cultural inclusion, food sovereignty, and localized economies — would be lost forever.

KANDI MOSSET, LEAD ORGANIZER for the Indigenous Environmental Network's (IEN) Extreme Energy and Just Transition Campaign, traveled to Bonn in November 2017 for the United Nations Framework Convention on Climate Change's COP 23, even though she saw little utility.

"This is the 23rd one," she says. "If they haven't figured it out by now, are they ever going to?"

Mosset hails from Fort Berthold, North Dakota, near the "head of the snake," the now infamous Dakota Access Pipeline, which in 2016 inspired the largest convening of Native peoples in generations at the Standing Rock Sioux Reservation. She certainly has enough to occupy her at home. But there were two solid reasons to represent in Bonn — first, she says, to call out leaders for promoting greenwashed tactics that hurt communities.

"If we're not there they'll just make a bunch of decisions about false solutions," Mosset says, referring to schemes like cap and trade, carbon capture and sequestration, and geo-engineering, all viewed by environmental justice

advocates as ways for corporations to rationalize polluting in low income communities, Indigenous communities, and communities of color. Or, in the case of geoengineering, to create untested and potentially destructive "fixes" so they can continue business as usual.

The second reason Mosset gave for traveling to Bonn was community. "When I was in Bonn," she says, "we were talking about just transition from an Indigenous perspective, but we were also there with La Via Campesina, the peasant farmworkers. We were there with people from African communities who were talking about agroecology, people from Puerto Rico, and so what I saw were a lot of similarities, actually, which was encouraging."

This centering of community shows up in IEN's Just Transition Principles, which assert, "We will ... address the root causes of climate change by changing the system, first within ourselves, our families, our clans, our community, our Native Nations and then radiate this power out to the world."

But if carbon taxes and geoengineering are false solutions, what are the true ones? In addition to strong community, what does a just transition look like in practice?

For activists like Mosset, just transition could take any number of forms. As one example, she mentions Lakota Solar

For movement leaders, tackling climate change without justice is a zero-sum game.

Enterprises, a local business in South Dakota that's part solar equipment manufacturer and part skills school. It's also part of the burgeoning new economy, through which proprietor Henry Red Cloud hopes his tribe, the Oglala Sioux, can break free from fossil fuels and develop a sustainable, community-focused future.

"The grid system in the US is aging; it's a Goliath," Mosset says. "To make changes to that takes a really long time. Whereas at a local scale, things can change more quickly and more efficiently." That's exactly what Red Cloud is doing. Acting at the local level, Lakota Solar has produced thousands of solar units and graduated hundreds of students from its training program. Red Cloud has also sold solar products to other tribes, assisting them in their own transition towards energy independence.



Just transition can take any number of forms, from solar endeavors that support workers and move communities away from fossil fuels, to cooperative farming programs that improve food sovereignty.

Another example emerging some 1,500 miles away is Cooperation Jackson, host of the just transition meeting in Mississippi and a groundbreaking worker cooperative with an expansive mission to build what they call a solidarity economy. Cooperation Jackson connects civic education with People's Assemblies, the construction of eco villages, and food sovereignty by way of urban farms. Members insist on incorporating everything from visual and performing arts to

a cooperative financial institution into the community's work.

brandon king, who says with the hint of a smile that he spells his name in lowercase because he doesn't believe in capitalism, is an anchor of Freedom Farms, the co-op's agricultural arm. He also works to ensure Cooperation Jackson's vision pervades all the work they do. "To be completely 100, all this stuff we're doing? We're learning while doing ... It's being the example and showing the alternative — I think when people see it, and they see how much fun we're having, that draws folks to it."

king adds that a vast economic and environmental transition requires cultural transformation. "It takes us taking steps away from the TV screen and actually seeing each other, being with each other, being in community with each other," he says. "And this is something we have to relearn."

But he's confident people in Jackson are primed for change. Jackson's population is more than 80 percent African-American, and king explains the appetite for radical politics in a Republican Southern state like so: "The Black people in Mississippi are the Black people who stayed during Jim Crow," he says, "so there's a level of resilience and there's a level of understanding around communities that stick together and help each other."

There's likely also a level of resolve that comes from simply unplugging from a historically oppressive system.

king also stresses the enduring power of small-scale farmers, who, with access to just a quarter of the world's farmlands, manage to feed more than 70 percent of the population. Putting food back into the hands of communities fosters cultural shifts and freedom from the global industrial agriculture system, which by some estimates spews more than half the world's greenhouse gas emissions via the use of nitrogen-based fertilizers, processing, packaging, transport and more. So, in his work with Freedom Farms, king seeks to learn from the success of small farmers, and to make food more accessible to those with limited resources.

"In the current economic system we live under ... it's highly improbable for farmers, especially small-scale farmers, to make a living," he explains. "And that's by design. So, when we're thinking about growing food and growing food locally, we're thinking about exchange value and trying to shift that exchange value from the monetary system we're currently under. And we're using time banking, using sweat equity, as ways for people to have access to the food, and for there not to be a barrier based on whether you've got a dollar bill or not."

And it's not just small farmers who have a role in the just transition movement. Ed Whitfield is co-managing director of the Fund for Democratic Communities, a private foundation

whose leadership is spending down capital faster than it can be replenished — essentially putting themselves out of business over time — as a way of democratizing finance, putting financial resources directly back into communities.

“The assets of foundations have ultimately come from working class people and working class communities around the world,” Whitfield says, “and they belong back there, not in the control of people who are able to control money, but with people who are within communities working to meet community needs and elevate quality of life.”

FOR GRASSROOTS ACTIVISTS STRUGGLING to transform environment, culture, and economy, there is no room for compromise. And because of that, the adoption of “just transition” in the international policy realm feels more like co-option than progress. They fear its propagation in bureaucratic policy-making circles will not only dilute the vision, but undermine it. They worry frontline communities and local labor will lose their voice in a movement meant to be driven from the ground up. And perhaps most of all, they believe a just transition requires an overhaul of business-as-usual policies — it should not be perceived or embraced as an add-on to an extractive, growth-at-all-costs economic model.

“The capitalist system makes this assumption that there’s never-ending, continual growth for ever and ever and ever,” Mosset says. “That never was and never will be sustainable. They create this false sense of, well, that’s just the way it is. Just transition would be teaching people that that’s just not the case.”

But not everyone agrees a hard, anti-capitalist line is realistic. Indeed, Samantha (Sam) Smith, director of the Just Transition Centre at the International Trade Union Confederation, believes popularization on a global scale leaves more room for a diversity of approaches.

“We’ve gone from the COP in Paris where just transition was in there, and many big governments were thinking, *What is this?* And now we have three governments right around the time of the COP [in Bonn] saying *We’re going to have a just transition commission*. And they have climate targets that back it up,” she says. Smith is referencing New Zealand, Canada, and Scotland, which each announced task forces pledging to reduce emissions without harming their economies.

As part of her work, Smith gathers concrete examples of labor-friendly shifts toward a low carbon economy and shares them widely, through convenings, videos, case studies, reports, and more. The idea is to take a concept that’s previously been aspirational and experimental, and disseminate it as a reality that trade unions worldwide can get behind.

In some cases, the dissonance between just transition at an international policy level and in grassroots movements lies not within what is said, but what is *not* said. While the Indigenous Environmental Network and its ally the Climate Justice Alliance directly call out nuclear energy as a “false solution,” and while they clearly name capitalism as a system that must be dismantled as part of a decarbonized economy, the International Labour Organization and International Trade Union Confederation do no such thing.

“I would never try to tell people what these words should mean, what kind of work you should do,” says Smith. Some union members do in fact support a system change away from capitalism, while others just want a capitalist system that’s less exploitative and extractive.

“We all want to fight corporate power and inequality and extractive systems,” Smith adds. “But at some point, the 183 million people in the International Trade Union Confederation would not all have that interest. They would still like to have companies and employers.”

In other instances, the critique of grassroots just transition principles focuses on issues of practicality. Can small-scale, local enterprises truly power, feed, and shelter the world? While local examples are still emerging across the globe, communities like Mosset’s and King’s are writing a new narrative, asserting that just transition is possible when matched with a culture shift around consumption and community power.

As Ed Whitfield says, “We will have to basically conceive of and engage in business in a different kind of way, with a different purpose. Because right now the purpose of it does tend to be growth, as opposed to the purpose of it being meeting people’s needs and elevating the quality of life.”

At the UN level, with endless cycles of receptions, meetings, and maxed-out hotels, unplugging from global systems as an answer to global problems may seem absurd. But it’s possible the new world just can’t be conceived using the same terms as the old. It’s possible our collective vision in the dawn of the twenty-first century isn’t quite making it, and the full flourishing of a justly transitioned system will look unlike anything we’ve ever imagined. It is also possible the full manifestation of this new world is a process rather than a product, that it’s steadfastly building all around us, but we just can’t quite see it. Perhaps we’ll all wake up one day and realize we’ve reached a tipping point, and the world has changed for the better. ■

Samantha M. Harvey is a writer and fellow with EDGE Funders Alliance.

LEARNING FROM DEATH

by Eric Freedman



SQUISHED SQUIRRELS. Dis-membered deer. Flattened frogs. Eviscerated elk. Mangled moose. That's roadkill — the blood, guts, feathers, and bones of animals that fall victim to our roads and highways. Motorists swerve to avoid it. Bicyclists wrinkle their noses and hold their breath when pedaling past it. Joggers veer off-course. Rats and raptors feed on it.

From deer and moose carcasses in roadside ditches to bugs and butterflies encrusted on our windshields and headlights, the mind-numbing profusion of roadkill has direct implications for everything from species survival to traffic safety. Animals are vulnerable in congested urban areas in Europe where they are squeezed into smaller and smaller tracts of open lands and woodlands surrounded by city streets. They are definitely vulnerable in rural parts of North America bisected by two-lane country roads. And they are increasingly vulnerable in developing countries in Africa, Latin America, and

Asia, where expanded road systems are revving up traffic density and allowing people to drive faster to more places, including through once-remote and protected areas.

Scientists have been collecting data on roadkill since at least the 1920s — back when collision victims were sometimes referred to as “flat meat” due to the likelihood that they would end up on dinner plates — but the research is pretty patchy. To this day, there's no precise data about just how many animals fall victim to cars and trucks across the globe. What *is* clear is that the vast scope of the death toll is almost impossible to grasp.

Take these figures for the United States. The US Department of Transportation estimates anywhere between 1 and 2 million large animals — like deer, moose, elk, and bear — are killed every year along the country's nearly 4.1 million miles of roadways. Accidents with large animals are the most commonly reported — they can

cause injury and death to drivers and passengers, as well as substantial vehicle damage, and as a result, are more likely to prompt insurance reports. But they are far from the only fatalities. The US Fish & Wildlife Service and Smithsonian Conservation Biology Institute estimate that 80 to 340 million birds also die annually on US roads. It's hard to find even a rough estimate about the combined toll for all animals — including mammals large and small, wild and domestic, as well as birds and reptiles. But the Humane Society of the United States has suggested that some 1 million vertebrates die every day on US roads.

And even that number doesn't include bugs. One team of scientists calculated that hundreds of thousands of pollinating insects such as wasps, bees, and butterflies die annually along a single two-kilometer stretch of highway in Ontario, Canada. From that, they estimated the butcher's bill at a potential hundreds of billions of

pollinating insects per year in North America alone.

“It is gloomy,” says biologist David Lesbarrères of Laurentian University, who worked on the Ontario project. “We don’t have a very good application for what is out there. Yes, it could be billions, but how many insects are out there? Is it a drop in the bucket or is it an [ecological] impact?” he says, referring to the fact that insect population estimates are scarce.

But is there an upside to all these deaths? For scientists, yes. Tragic as they are, roadkill casualties can help tell important tales. Researchers from

functioning in much the same way as do automated trail/wildlife cameras,” a Canadian-Australian research team observed recently.

But unlike cameras, using roadkill for research means getting out gathering animal carcasses. Lesbarrères has done road ecology studies for a dozen years. “I’m immune to the gruesomeness of it,” he says. “Especially after a rainy night, it’s gruesome to walk or bicycle in a relatively nice environment, but the asphalt is paved with flattened frogs and we remove them from the asphalt and find keys to identify their species and gender.”

accrued roadkill, photographer Tony Cepak and I visited the Michigan DNR facility responsible for monitoring the well-being and health of the state’s wildlife. The agency’s Wildlife Disease Laboratory is housed at Michigan State University’s Veterinary Diagnostic Laboratory. Bodies come in year-round and are frozen pending necropsy. “If someone finds a dead animal and wants to know how it died, they come here,” says Melotti, who showed us through the facility.

Through a second-floor observation window, we looked down into the lab where a pathology technician was

ROADKILL CAN BE A VALUABLE RESOURCE FOR RESEARCHERS SEEKING TO UNDERSTAND THE BEHAVIORS OF CREATURES GREAT AND SMALL.

Florida to Ethiopia are turning to traffic victims as a valuable resource, seeking out those tales to devise ways to curb the spread of diseases, better understand the behaviors of creatures great and small, and even to reduce roadway mortality.

NOBODY CLAIMS environmental research is easy, and studies using roadkill often require boots on the ground. But scientists gotta do what scientists gotta do, and roads provide a relatively uncontroversial source of study material. As Julie Melotti, a lab technician at the Michigan Department of Natural Resources (DNR) puts it, “Nobody’s going to complain if you’re collecting roadkill deer.”

Roadways also provide a ready-made survey method. “Roads themselves could be viewed as a sampling tool that operates continuously, depending on traffic volume, thus

The process can take persistence as well. For instance, Ontario researchers conducted more than 200 bicycle surveys — over four years, from 2008 to 2011 — along the 1000 Islands Parkway adjacent to the St. Lawrence River, counting dead vertebrates along a stretch that bisects an Algonquin-to-Adirondacks international conservation corridor. Some researchers get outside help. English and Welsh eco-groups collected more than 650 Eurasian otters — about 90 percent of them road-killed — put them in freezers and sent them to Cardiff University in Wales for a study of parasites. “We built a relationship with environmental organizations, as well as private individuals and conservation charities,” bioscientist Elizabeth Chadwick says of the team’s 2013 study.

What happens once animals have been collected? For a look at what researchers do with some of their

pulling lymph nodes out of a white-tailed deer’s head to check for chronic wasting disease, or CWD, a contagious neurological disease affecting deer, elk, and moose. Below us, I counted two moose heads, a table with about sixteen eagles, three dead raccoons, and a cart stacked high with more deer heads. The bird family was well-represented — crow, barred owl, Canada goose. So were mammals — possum, bobcat, gray fox, gray squirrel, woodchuck. A wolf’s feet were visible as well.

“A lot of states are looking for roadkill for CWD,” Melotti says. “We’re getting a lot of young animals and fawns. They’re young and inexperienced,” and thus less wise in the ways of avoiding cars.

Chronic wasting disease, which can devastate populations of cervids such as deer, elk, and moose by causing weight loss and death, is far from the only animal disease attracting attention among

researchers. There is a litany of diseases to study, watch for, and sometimes fear. Take avian botulism, a paralytic disease that birds contract by ingesting a toxin produced by bacteria found in the soil. Or bovine tuberculosis, a bacterial disease that primarily affects cattle but can also hit white-tailed deer, elk, fox, mink, raccoons, and bears. Mosquito-borne West Nile virus infects both birds and people. Then there's the deadly white-nose syndrome that's wiping out

In other cases, scientists are using roadkill to make the connections between disease and behaviors that might increase the risk of animal-vehicle collisions. Iranian researchers obtained the carcasses of three Persian leopards, an endangered subspecies on the IUCN Red List, killed along the Asian Highway in Golestan National Park. (That highway "has a large negative impact" on the felines' habitat and is responsible for many deaths

ROADKILL-BASED STUDIES can provide valuable insight into animal behavior, distribution patterns, population trends, and ecosystem-based threats to wildlife. Curious which animals make their home in northern Ethiopia? A survey of 330 miles of road provided a snapshot of biodiversity in the region, finding 20 species of wildlife, including laughing doves, speckled pigeons, black kites, black-backed jackals, white-tailed mongoose, and spotted hyenas. Wonder what anteaters eat in Argentina? So did scientists. Roadkill helped satisfy their curiosity and fill in some blanks about the previously unknown feeding habits of two species: the terrestrial giant anteater of the grasslands and the southern tamandua, which feeds on the ground and in trees. Examination of the stomach contents of roadkill and feces revealed dozens of species of ants, many more than those fed on by the anteaters of Brazil, Colombia, and Venezuela.

In Florida, researchers used roadkill to estimate the statewide population of Florida panthers, an endangered panther subspecies. By combining information about the number of panthers killed in car collisions with traffic volumes and data from a small number of radio-collared cats, the team found that panther numbers may be slowly increasing. But they also estimated that the population never surpassed 150 between 2005 and 2012, well below the 240 required to remove the big cat from the endangered species list.

And in western Uganda, scientists have studied roadkill to glean information about vulnerable species. "While highly undesirable, roadkills provide valuable information on the health and condition of endangered species," researchers at the Budongo Conservation Field Station in Ethiopia's Hoima District wrote after conducting

Finding ways to reduce adverse impacts of roads on wildlife is essential to species protection.

bats across North America. Add to that list rabies, which impacts animals like raccoons and coyotes, fungal diseases that impact snakes, and lead poisoning of waterfowl that ingest lead ammunition, and there's more than enough to keep wildlife managers busy.

Roadkill is helping to fill in crucial knowledge gaps with respect to many of these diseases, and more. A road-killed black howler monkey recently became the first male of its species in Mexico confirmed with a pinworm called *Trypanoxyuris pigrae*. A study of road-killed lesser grisons in Brazil identified six species of helminth parasites (parasitic worms), more than previously found in the country. And an Ontario study of kidney samples from road-killed and hunter/trapper mammal carcasses identified the first beaver and the first possum in the province that were infected with the pathogenic bacteria *leptospirosis*. *Leptospirosis* is of particular concern because it can infect people and domestic animals such as livestock.

from collisions, the researchers noted in a study reporting their findings.) They hypothesized that infectious diseases like rabies and acute toxoplasmosis in big cats contribute to collisions by blinding animals, altering their behavior, or due to neurological disturbances resulting from infection. To test their hypothesis, they dissected the leopards and tested tissue from brains, kidneys, and lungs, among other things. Two of the cats tested positive for toxoplasmosis.

In the Cardiff University Otter Project, Chadwick's team found one-quarter of the tested animals were infected with a parasitic protozoan that can harm many types of warm-blooded animals, including humans. The disease, the researchers wrote, "is notorious for its role as a host manipulator, with infected rodents and even primates becoming more risk-taking and active," including their possible willingness to take more risks in crossing roads. In other words, the disease may make otters less careful and, thus, more vulnerable to becoming roadkill.



Researchers at Michigan DNR's Wildlife Disease Laboratory study roadkill to learn more about how diseases impact wildlife. Around the globe, vehicle-collision victims are proving valuable for examining everything from what animals eat to how endangered species are faring.

a necropsy of a road-killed chimpanzee named Olive. One member of that team, Matt McLennan, told me, “While the road accident we reported was highly unfortunate — the unlucky chimp was a prime-aged breeding female with a newborn infant from a small group of just 21 chimps — it was a good opportunity to investigate the chimpanzee’s health status.”

Researchers at the University of California, Davis, are engaging citizens across California in documenting the roadkill they spot, and using this information to learn more about both native and nonnative species. Using citizen-uploaded data, they have observed that the nonnative eastern gray squirrel and eastern fox squirrel are increasingly encroaching on the native western gray squirrel’s habitat, for example. (Roadkill has similarly been used to track the spread of invasive Burmese pythons in

Florida.) They also believe that roadkill patterns hold insight into the toll of California’s recent five-year drought, capturing the movement of animals in search of water and food in the early years of the drought, and the ultimate decline in mammal and amphibian populations after several dry years.

Roadkill can also highlight species’ broader vulnerabilities to the roads themselves. In Assam, India, the discovery of a road-killed small Indian civet, a protected species, spotlighted threats posed by of habitat fragmentation. The animal died while crossing a recently constructed highway bypass from one patch of scrub forest to another. The forestland there had previously been contiguous. “Although incidents such as this may be viewed as just another road fatality, it actually presents a picture of the ground reality of the threats that the urban wildlife is facing due to habitat

fragmentation,” researchers from the Nature Conservation Foundation and Wildlife Institute of India wrote in a study.

FINDING WAYS TO REDUCE adverse impacts of roads on wildlife is essential to species protection amid the reality of ever-expanding development and road systems. When it comes to wildlife-vehicle collisions, that requires understanding how and when animals are most vulnerable, and which mitigation measures are most effective. Studies involving traffic victims help scientists and their collaborators like highway engineers, planners, and transportation agencies identify roadkill hotspots or “biodiversity collision blackspots” in manager-speak — think of them as death zones — and assess preventative measures such as wildlife underpasses

and overpasses, culverts, warning signs, roadside barriers, and lower speed limits. Findings can also inform government and public lands managers about landscape connectivity issues and other environmental challenges.

Thankfully, scientists have tackled these issues, too. Research has shown that animals are most vulnerable to roads in the early morning and late evening, likely due to high traffic volumes combined with the inability of drivers to spot animals in the dark. Vulnerability also varies with season. For example, collisions with deer — by far the most commonly hit large mammal in the US — spike in the autumn, during mating season. Certain attributes may also put animals at increased risk. For example, cold-blooded reptiles are attracted to heat-absorbing roads. They are also slow-moving, which means it takes them longer to cross a highway, and turtles' behavior of retreating into their shells when vehicles pass may increase their exposure time on the road.

There's also the matter of where animals breed and feed. In Spain, the ability of European rabbits to thrive in verges — strips of terrain adjacent to roads — is both good news and bad news for red fox and other carnivores that love to chow down on them: Rabbits provide them with an abundant food source, but also lure them close to roads, and thus closer to death-by-vehicle. Roads also often attract gulls, raptors, and members of the crow family to scavenge on roadkills, making them potential victims themselves, while white wagtails are at risk as they forage for insects next to roads.

Science has shown that some fortunate critters are smart enough, or well-wired enough by instinct, to quickly adapt their behavior and improve their odds of survival. For example, a Norwegian scientist used roadkill and

field observations to conclude that a significant proportion of hooded crows and western jackdaws started flying at higher elevations after a road was newly opened to car traffic, thus reducing the odds they'd be hit.

Other species need some assistance avoiding cars. With that in mind, researchers in Ontario set out to study roadkill reduction methods. They combined roadkill survey data with motion-activated cameras and antennas to evaluate the effectiveness of fencing along a causeway to funnel reptiles towards culverts for safe crossing under the road, thus reducing fatalities. Fencing in the study area was installed along “one of the deadliest roads in North America” for at risk species, including the endangered Blanding's turtles. The researchers found that reptiles were in fact using the culverts to safely move from one side of the road to the other, and unsurprisingly, that full fencing was much more effective at directing them towards the tunnels than was partial fencing.

The study also helped draw attention to roadway risks. Conservation biologist Chantel Markle of McMaster University, explains, “We were able to show the damage to the species [from the road], and the different populations being hit. A lot of people were concerned and wanted to do something.” While fencing and culverts are often recommended, they are “pretty costly projects,” she adds. “We want to make sure the tactics are having an effect.” Based on the findings, she says the researchers concluded that “while partial fencing is cheaper” it was also less effective, indicating that any decision about mitigation “shouldn't be strictly a monetary one.”

Transportation officials in Los Angeles, CA, plan to use roadkill information to similarly evaluate the

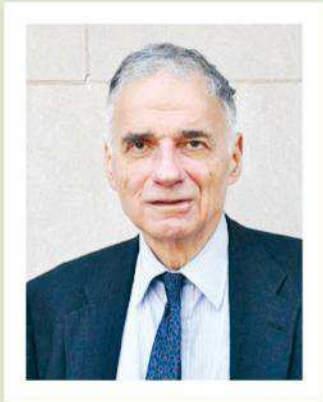
effectiveness of habitat connectivity efforts. Wildlife advocates there have been pushing tirelessly for an overpass across a stretch of the 101 Freeway, spurred by concerns over inbreeding and roadkill deaths of mountain lions living in and around the Santa Monica Mountains. If and when the ambitious project is constructed, they plan to monitor roadkill, among other things, to assess the value of the overpass to regional habitat connectivity efforts.

Meanwhile, inventors are jumping into this niche market, patenting roadside alarm systems, thermal and infrared sensors, warning lights, and guardrail designs intended to lower the traffic death toll. Elsewhere, concerned communities are getting creative, painting reindeer antlers and horse torsos with glow-in-the-dark paint to help them stand out at night. Yet high-tech wizardry is costly, and painting animals that shed their fur annually isn't quite practical on a large scale.

Roadkill ecology tales don't end with happily-ever-after. However, they may provide essential insight into how to best combat wildlife disease, protect at-risk species, and reduce carnage on the roads. They also may raise public awareness that roadkill means more than yucky, malodorous splatter, and that the sooner we figure out effective ways to reduce these tragic deaths, the better for biodiversity, our safety, and that of the many animals we share our roads with. ■

Pulitzer Prize-winner **Eric Freedman** is director of the Knight Center for Environmental Journalism at Michigan State University and co-editor most recently of *Biodiversity, Conservation, and Environmental Management in the Great Lakes Basin* (Routledge).

There's No Place for Pessimism



Ralph Nader has been speaking truth to power for well over half-a-century, and he's got a lot to show for it. He played a major role in developing the landmark environmental laws that helped clean up American air and waterways, and was instrumental in the passage of consumer safety regulations, including making seatbelts mandatory, that have saved millions of lives. Nader has run for president of the United States four times, always as a political outsider. (Full disclosure, he was the first presidential candidate I ever cast a vote for!) He helped establish a robust public advocacy system — the Public Interest Research Group, or PIRG, system — across much of the country. And he's written or co-written dozens of books on everything from corporate power to animal rights. In other words, his bragging rights are pretty solid.

For Nader, many of the seemingly distinct causes he's taken on over the years have actually been intimately connected. For example, he points out, coal mining isn't just an environmental issue, it's a money in politics issue, it's a public health issue, and it's a workplace safety issue. Or

take air and water pollution — these aren't just about contaminating the earth, they are also consumer advocacy issues. As Nader puts it: "Compulsory consumption is what pollution is all about."

The ever-energetic octogenarian says he's been motivated by a "thirst for justice" ever since he was a young boy living in Connecticut. It's this thirst that has kept him going for the past eight decades, and that promises to keep him going through challenging years to come.

— ZOE LOFTUS-FARREN

When did you first know you were going to be an advocate, if there was such a moment?

Well I always wanted to be a lawyer. From when I was four years old, my father would take me down the main street to the local county courthouse in Winsted, Connecticut. I'd watch the lawyers and the judges and the juries go at it, and I got very excited. I always attributed the word "justice" to lawyers, which is not exactly a widespread impression.

I grew up in a small industrial town — it had about 10,000 people — and it was crossed by two rivers, the Mad River and the Still River, and it had all kinds of factories. I mean, in 1900 it had 100 factories and sweatshops. So it was quite polluted. The rivers were unusable; they were all different kinds of colors from the chemicals and other things dumped in them. So, when I got to college I started looking into the whole environmental subject. I was predisposed to be very concerned.

One of your first big environmental causes was around DDT spraying at Princeton. Can you tell me about that?

To show you the lack of knowledge in an institution of higher education, every spring the groundskeepers at Princeton would have these huge hoses and they would spray trees with DDT. We would be walking between classes, hundreds

of students, and the spray would come at us. Sometimes we would have to wipe it off our forehead.

So, I began to wonder why there were dead birds on the sidewalks on the campus. And I took a couple of them once — I remember one was a blue bird and one was a robin, beautiful birds — to *The Daily Princetonian*, the daily college paper, and was ushered in to see some upper classman who had his feet on the desk, smoking. And I said, *You know, it seems there's a connection here. What's going on?* And he said, memorably, *Don't you know that at Princeton we have some of the smartest chemistry and biology professors in the world, and if there's any connection you don't think they would have said something or done something?* So, I just walked out figuring, *You know, maybe he's right.* That was a good lesson to me: It's not enough to know, you have to care. If you don't care, you're not going to know much more, because you're not going to ask the right questions.

You've mentioned that David Brower, who founded Earth Island Institute, is one of your environmental heroes. What about his approach has inspired you?

I spent a summer working in Yosemite Valley in 1955. I hitchhiked out with someone and we arrived in Yosemite when it was dark. We found a house ... and we slept on the porch. The next morning a man came out and woke us up, nicely.

And it turned out to be Ansel Adams. Then I looked up, and there was the most glorious natural splendor I'd ever seen in the world! The waterfall over the cliffs, and Half Dome, and El Capitan, and the valley, and the meadows.

With all that, it didn't take much for me to have David Brower come to my attention. He was a man of great integrity, and was way ahead of his [fellow] environmental advocates in terms of putting his foot down and saying, *Well, once you compromise on the destruction and contamination of nature, it becomes a surrender. It isn't like you are dealing with some business deal and you cut the deal at a certain price between what the two parties each wanted.*

That level of integrity and knowledge and actual living in the wilderness and hiking and climbing and loving it — he was like a modern-day John Muir.

You're probably best known for your work around consumer advocacy. How do you see that work as connected to your environmental advocacy?

Well, in many areas, there wasn't any difference because compulsory consumption is what pollution is about. You can't not breathe when you're in a polluted environment day after day. And the same with eating foods with pesticide and herbicide residues, and [drinking] contaminated water. You're doing all this as a consumer, but obviously the environmental dimension is compelling.

What has it been like for you personally to see the roll-back of so many hard-won environmental regulations under the Trump administration?

It was like a tidal wave. We are used to either holding the line or advancing it, and suddenly we were thrown on the defensive trying to keep what we achieved in the last 40-50 years from being destroyed, dismantled, or suspended. But now I think the tide is going to start to turn in the November elections. Even the Trump supporters will realize this is nuts what's going on.

How do you think we can be most effective as advocates with an anti-regulation president in office?

Just by organizing. It never takes more than 1 percent representing a majority opinion to organize Congress watchdog groups in each congressional district — and you'll win almost every battle ... When you ask yourself, *How do we get all these good things we're talking about?* chances are great that they have to go through Congress. Congress has to say either no or say yes. They can say no on behalf of the polluting class, or they can say yes on behalf of the breathing class. And we outnumber them.

What accomplishment, environmental or otherwise, are you most proud of?

To [be able to] show people what an individual can do if they want to — because a lot of people give up on themselves, they say, *Who am I? I don't count, I don't have any influence, I don't have any money, I don't matter, so I just live my private life.* When I started out I had no money, I had no influence, I had no contacts. So, I try to humbly [suggest] that one person can make a difference. The big problem is: Can many people make the difference as [a] society?

Would you say you feel discouraged or hopeful regarding the future?

Well, I abolished pessimism as a sophomore at Princeton because it has no purpose. It's part of developing a civic personality — you don't get discouraged, you don't get disillusioned, you're resilient, you share credit with others, you keep up to date on knowledge, and you work on a number of issues so if you lose some, you still win some, so it keeps you motivated.

I don't say I'm not hopeful. I *do* say that we're not using 1 percent of our civic potential in this country. We've got to not only have more people at the local level engaged, but we have to be smarter, more strategic. We are still protesting the same way they did 150 years ago. We protest, we demand, and we do it on a weekend when the legislators and members of Congress are away, and the groundskeepers pick up the debris, and then it's back to the routine. No! You've got to have fulltime watchdogs representing large numbers of supportive people who can help here and there and vote the right way.

You seem to have endless energy and drive to keep fighting the good fight. What's your secret to saying motivated and involved?

Ever since I was a young boy, there was a hunger for justice. I would go to movies, and I couldn't stand the bullies. I couldn't stand the bullies in school either, by the way. Now I have to deal with corporate bullies and their political minions. So, it's really a thirst for justice. A just society is what human beings are all about. You don't have any freedom or liberty without justice, or peace.

I had a lucky choice of parents, too. ■

Zoe Loftus-Farren is managing editor of *Earth Island Journal*. This interview has been edited for clarity and length. Read a longer version of this interview online.



**ACROSS AFRICA, A NEW
INVASIVE PEST IS DAMAGING
CROPS AT AN ALARMING RATE**

MARCH OF THE ARMYWORM

– AND IT MIGHT SOON GO GLOBAL.

by Stephanie Parker

MOHAMUD ABDU STANDS TALL in his maize field in Alaba, Ethiopia, a small agricultural district over 200 kilometers south of the country's capital, Addis Ababa. Smooth green leaves reach up to his waist. The field is off a dirt road where children ride old bicycles and the occasional wooden cart, pulled by donkeys and piled high with people, passes by.

The sea of green where Abdu stands looks lush and healthy at first glance. The maize stalks are planted closely together and the leaves rustle gently in the wind. But upon inspection, these leaves are riddled with holes and plant detritus litter the remainder. Abdu pries open the whorl of a nearby maize plant with his fingers, and takes out a small caterpillar, roughly an inch long. It squirms on his palm.

“At first I tried handpicking the worms,” he says through a translator, explaining how he would go from plant to plant to pick off the caterpillars and squish them between his fingers. “But then I saw that they had returned. The problem was out of control.”

When Abdu first noticed the extent of the damage, he went to the local

agricultural office, which gave him chemical pesticides. But, he says, the pesticides did not work. He even took the worm in his hand and sprayed it directly with the pesticide and says that still did not kill it.

That's because the caterpillar munching its way through Abdu's two-hectare farmland was the fall armyworm, a voracious crop pest that is native to the Americas but is a new arrival on the African continent. In the summer of 2017, Abdu says at least 50 percent of his maize crop was damaged by these worms that are wreaking havoc across farmlands in sub-Saharan Africa and posing a major threat to food security on the continent. And agricultural experts worry that it is a matter of when, not if, it will spread to the Middle East, Europe, and Asia. In other words — the rest of the world.

THE FALL ARMYWORM is so named because of the way it marches through crops en masse during late summer and autumn in the Americas. Its scientific name, *Spodoptera frugiperda*, refers to the grey-patterned wings of the fall armyworm moth and the

caterpillar's penchant for destroying fruits (“*frugiperda*” is Latin for “lost fruit”). African farmers have long had to deal with infestations of the native African armyworm, *Spodoptera exempta*, which tend to cause serious damage to crops during rainy seasons or after periods of prolonged drought.

Native to tropical and subtropical regions of the Americas, the fall armyworm was first found and identified on the African continent in Nigeria in January 2016. Since then, it has been marching east and south through Africa like, well, an army.

It's not clear how or when exactly this pest arrived in Africa. Some scientists think the caterpillar or its eggs may have reached the continent via imported produce. But it is also possible that it accidentally boarded a commercial flight. The insect reproduces quickly, with a lifecycle of 30 to 90 days, depending on the climate, and is a strong flyer, with adult moths covering up to 100 kilometers a night, even more if there is a strong wind. The longest recorded fall armyworm flight was 1,600 kilometers from Mississippi to southern Canada in 30 hours.

Either way, within a year the fall armyworm spread rapidly across the continent — as far east as Somalia and as far south as South Africa, and even to the island nations of Madagascar and Cape Verde. The United Nations' Food and Agriculture Organization (FAO) says that by February this year, only 10 out of 54 African states had not reported infestation and that the pest is on the brink of causing devastating food shortages, especially in southern African countries that are recovering from a severe drought and are already deeply food insecure.

The fall armyworm feeds on over 80 different plant species that include rice, sorghum, and millet, but it especially likes maize, a staple crop that is the main food source of more than 300 million Africans. Unlike other larval pests, the fall armyworm doesn't just eat the leaves or the fruit of a plant; it bores into the stalks as well, damaging the crops from both inside and out. There are other reasons — including the moth's strong flying powers, the highly fertile adult female moth's ability to lay more than 1,000 eggs in its 10-day life, and its tendency to develop pesticide resistance — that make it hard to keep this pest in check. Its inability to survive in cold temperatures is one of the key things that has helped keep the fall armyworm under control in most of the United States. In Brazil, however, where the warmer weather allows fall armyworms to breed all year round, it costs about \$600 million a year to control them. Africa's temperatures remain high all year long as well, and that has allowed the pest to proliferate faster than the continent's mostly subsistence farmers can handle.

While climate change is a common

culprit when it comes to agricultural problems, experts seem to agree that this is more of a globalization problem than a climate one. Africa's climates were already ideal for the fall armyworm. However, while climate change hasn't impacted the fall armyworm's spread, it may have an effect on its level of damage. "To me, the most important factor is the double whammy of the stressed plants due to erratic rains, which could be due to climate change, and the fall armyworm,



which can really reduce yields," says Allan Hruska, FAO's principal technical coordinator for fall armyworm.

The US Agency for International Development (USAID) reports that the pest may have cost up to \$13 billion in crop losses in Africa so far. But it is still not clear exactly how much damage the fall armyworm is causing. For instance, the nonprofit Centre for Agriculture and Bioscience International (CABI) did surveys in Ghana and Zambia and those farmers reported on average around a 45 percent crop loss. However, because this is a new pest, it is possible they were overestimating the damage at the time.

"If we were losing that amount continentally, we'd already be in famine

I think," says Roger Day, program executive for CABI's Action on Invasives program. "My estimate based on that logic is that the losses must be somewhat lower."

Hruska estimates the average loss to be closer to around 10 to 20 percent, but notes that individual farmers may see higher numbers, especially if their plants are already weakened to begin with. "We still don't know how much yield loss is caused by the fall armyworm. And it's not just yield loss but who is losing the yield. Even a 10 to 20 percent yield loss to smallholder farmers is a big deal because it's their food security, not cash sales. These are subsistence farmers, and the majority of the maize they grow is for personal consumption."

THE FALL ARMYWORM IS just one of the latest in a long line of agricultural pests invading new areas of the world. Thanks to increased travel and global trade, species are able to cross oceans at speeds and with frequency that would have been impossible only centuries ago. "Everything is moving around much more and that automatically increases the risk of pests being moved around," Day says.

In 2006, for example, another American pest made its way across the Atlantic, landing in Spain. *Tuta absoluta*, known as the South American tomato leafminer, then found its way to Africa. The insect is a voracious tomato pest — in 2016, the term "tomato Ebola" was coined due to its toll on Nigerian tomato crops. Already it is in continental Europe, most of Africa, the Middle East, and now Asia as well.

Another invasive agricultural pest getting a fair amount of media attention went from east to west. Coffee rust, *Hemileia vastatrix*, is a fungus native

to Ethiopia. In the late 1800s, it found its way to Ceylon, modern day Sri Lanka, and toppled the country's coffee growing market. Around 100 years later, it showed up in Brazil and within

controlled that it cannot cause an undue level of damage.

That is where we are with the fall armyworm, and the focus of governments, agricultural scientists, and aid

who can't afford a regular supply of pesticides, and government handouts last only so long. Then there's the issue of the pesticides themselves. The fall armyworm has already developed resistance to many pesticides in its native range. Besides, most locally available pesticides tend to be broad-spectrum ones that don't necessarily work on the fall armyworm. To compound the problem, even these are sometimes mislabeled, highly toxic chemicals that can prove hazardous not only to the environment but to the farmer and the farmer's family as well.

"In some cases you're getting really hazardous materials into the hands of farmers who have never really used these things before," says Hruska. "So the exposure can be quite high due to the lack of experience and lack of knowledge about these substances."

Unlike in the United States, where maize is planted in neat rows and giant spraying machines can cover fields in precise amounts of pesticide, maize in Africa is usually planted close together, more haphazardly. It grows up to about six feet tall. With just the backpack sprayers that most of these farmers use, caterpillars at the top of the plants are very difficult to reach.

Alongside the smattering of unverified pesticides, African farmers are also resorting to more traditional control methods such as handpicking the armyworms one by one and applying ash, sand, salt, or soil into the whorl of the maize plant to suffocate the caterpillar. Some farmers are spreading lard on young maize stalks to attract ants up the stems to eat the fall armyworm larvae. Others are using a mixture of sugar and fish soup to attract ants or applying crushed neem leaves, which contain the insect repelling chemical azadirachtin.

Hruska sees these indigenous



Since fall armyworms invaded his maize fields in central Ethiopia last year, Mohamud Abdu has had little success controlling them. He estimates that he lost 50 percent of his crop in 2017.

a decade had spread throughout South and Central America's coffee growing regions. It lay dormant for the next 30 years, but in 2012, it experienced resurgence and heavily disabled the Central American coffee growing industry.

"When you move a species to someplace new without its natural predators to keep it in check, it can become invasive," Day says. Species often co-evolve, meaning that in the Americas, the fall armyworm has had predators evolving alongside it over thousands of years. But when it made the journey to Africa, it went alone, leaving its natural enemies behind. And once an invasive species is established, eradication is often no longer an option; the only hope is to reach a point of managed stasis where the pest is well-enough

organizations has now turned towards management. First stop: chemical pesticides.

While a problem on the scale of the fall armyworm will likely take years to manage, farmers and governments looking for a quick, interim solution more often than not rely on chemicals. "The immediate reaction on the part of national governments is to go to pesticides," Hruska explains. "There's political pressure to do something immediately ... Donors give money to governments and they buy pesticides and either give them away [to farmers] or apply them [on the fields] themselves."

However, even as an interim measure, this is a flawed option. First, most African farmers are smallholders

practices as important tools in the fight against the pest. He says that the FAO is encouraging farmers to explore and study local practices, because some of them are effective, and some are “effective enough.”

“These practices might sound primitive, but they are locally available and almost free and, in some cases, they cause a high percentage of mortality among fall armyworm,” he says. “If there’s 10 to 20 percent yield loss from the fall armyworm, and if ash can halve that amount, that may be enough for [the farmers] to get by on.”

Some are not as convinced. BM Prasanna, director of the Global Maize program at the Mexico-based International Maize and Wheat Improvement Center, for instance,

Niger. The research center in Maradi, Niger’s third largest city, sits an hour’s drive from the country’s border with Nigeria. Inside the lab, air conditioners work valiantly against the heat and intermittent power failures. Amid glass cages and petri dishes, doctoral student Laouali Amadou works to figure out biological control solutions to the fall armyworm invasion.

Amadou had been working on biological control for two millet pests — the pearl millet headminer and stemborer — but with the recent arrival of the fall armyworm in Niger, a deeply food insecure country that was ranked 187 out of 188 countries on the UN’s 2015 Human Development Index, he expanded his research to biological control agents for the caterpillar.

include *Trichogramma*, a small wasp that feeds on insect eggs, which has native sub-species spread across the world. In Brazil, *Trichogramma* wasps are used as part of the country’s overall pest control strategy. However, the fall armyworm egg clusters, which look like a small, white droplet of spit, are protected by tiny scales, which *Trichogramma* can have difficulty penetrating.

“Parasitoids and their hosts co-evolve together,” says FAO’s Hruska. “Those niches haven’t yet been filled in Africa, so there’s less natural control of fall armyworm in Africa than in the Americas.” A popular strategy to combat this is to import the pest’s natural enemies. Researchers are, for instance, considering using *Telenomus remus*, another egg parasitoid native to Papua New Guinea that is currently being used to help control the fall armyworm in Florida. At least a dozen *Telenomus* species can presently be found across Africa, and Amadou has also found a species of *Telenomus* attacking fall armyworm eggs, but has not yet identified which one. Of course, bringing in these enemies could cause other problems. “There’s a touch of irony in that area,” CABI’s Day says, “because the problem is invasive species and the solution is to bring in another exotic.”

Crop scientists are also exploring a number of alternative control strategies, including building plant resistance through crossbreeding and using genetically modified corn.

Robert Beiriger, a senior biological scientist specializing in plant breeding at the Everglades Research and Education Center, has been working for the past decade on hardier plant hybrids that can survive armyworm attacks. He has been working on managing the fall armyworm in Florida for nearly 30 years and is also working with scientists on the pest in

Researchers have yet to find a single solution that’s effective against this pest.

is more skeptical. “We keep hearing about indigenous-based practices but we need to test this,” he says. “How effective is this practice? How affordable is this practice? How widely available is this practice? Can we scale up this practice across the country, across the continent?”

Either way, everyone agrees that there is an urgent need to work out fast and effective ways to stall the relentless march of the fall armyworm through Africa.

A FEW LOW BUILDINGS surrounded by test fields of millet and sorghum and insect traps that look like phone booths make up the National Institute for Agronomic Research of

Amadou has identified some locally available biological agents that show promise in controlling fall armyworm. One of these is *Habrobracon hebetor*, a tiny wasp that is a larval parasitoid, meaning it will predate on insects in the larval/caterpillar stage. This wasp is effective at killing young headminer larvae and has potential to do the same to fall armyworms. “We have seen that the *Habrobracon hebetor* can kill the [armyworm] larvae and it can lay eggs on the laboratory level,” Amadou says. The few field tests that Amadou and his team have run so far are showing some positive results too, but the rate at which the wasp kills the armyworm is lower than in the laboratory setting.

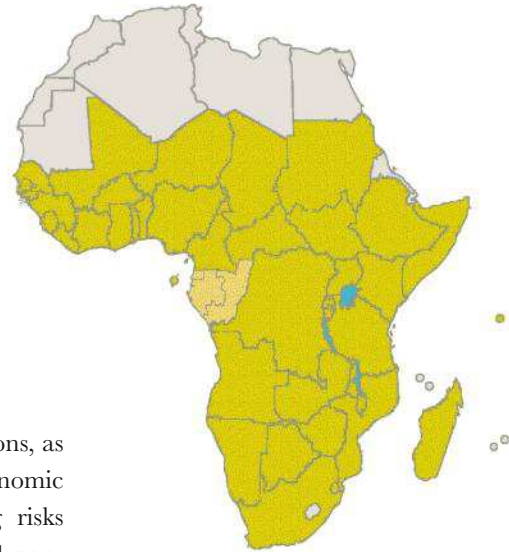
Other parasitoids with potential



AS OF FEBRUARY 2018 FALL ARMYWORM IN AFRICA

- DETECTED AND OFFICIALLY REPORTED
- DETECTED AWAITING OFFICIAL REPORTING
- NOT YET DETECTED

SOURCE: FAO



Africa. “We’ve got the corn out in the field growing now and I am hopeful we may have some test hybrids to send to Africa this fall,” Beiriger says.

Bt (*Bacillus thuringiensis*) transgenic corn is used heavily in Brazil and the United States, but the fall armyworm has also evolved resistance to some *Bt* toxins as well. Besides, on the African continent, South Africa is the only country that even permits GMO crops to be grown, making *Bt* maize untenable in most of the continent.

Beyond the regulations, it is hard to imagine how smallholder farmers who often cannot afford basic agricultural inputs would be able to afford modified seeds. “Even if it’s approved, not every farmer can afford it,” says Muni Muniappan, director of the USAID-funded Feed the Future Innovation Lab for Integrated Pest Management (and, full disclosure, my former boss). “And one variety might not be suitable all over the continent. The pest doesn’t just attack corn; it attacks others crops.”

Researchers are also exploring integrated pest management techniques, an economic and environmentally sensitive approach that relies on a combination of common-sense practices — such as using biopesticides made of plant extracts, insect pathogens like fungi, viruses, and bacteria, natural pest predators like wasps and ladybugs, and intercropping fields with plants that repel pests. These techniques do not necessarily totally eliminate pests,

but can help keep their populations, as the FAO puts it, “below the economic injury level,” while minimizing risks to human health, beneficial and non-target organisms, and the environment.

“Interestingly, some of the traditional cropping systems farmers use are already more resilient in that sense,” Day says, pointing to a push-pull intercropping system that’s used by some farmers in Africa. In this system, maize is planted alongside *Desmodium*, a legume that repels certain pests. The edge of the maize field is then lined with Napier grass, which attracts the pests away from the maize. Researchers have found that fall armyworm infestation is 80 percent lower in plots in where push-pull has been adopted.

“There is no single technology that is ideal against fall armyworm,” says CIMMYT’s Prasanna. “If you want to sustainably manage or control this pest you need to adopt a broad range of tools.”

WHILE THE SAHARA HAS thus far provided a barrier against the fall armyworm traveling north, it is only a matter of time until it turns up in Egypt and from there, it’s an easy flight to other parts of North Africa, the Middle East, and eventually, Europe and Asia. Already, the fall armyworm is in Sudan’s Nile valley.

“Bioclimatic models won’t show Egypt as a suitable place and in the desert, corn won’t grow,” Muniappan

says. “But it doesn’t take the Nile into account and on either side of the river, there is agriculture and there is corn growing there.”

The FAO is planning a workshop on fall armyworm in Egypt in next few months to train Egyptian officials, farmers, and plant doctors — local experts trained to help farmers — and USAID is offering prize money for digital tools that help farmers obtain information and make management decisions. And in a clear indication that countries outside of Africa recognize that this is a global problem, the European Food Safety Authority has produced an urgent pest categorization for the fall armyworm and is working on a full risk assessment for the continent that should be ready this summer.

Meanwhile, for the tens of thousands of small farmers like Abdu whose fields have already been invaded, there’s no quick solution at hand. It will take a host of strategies to control this pest, and Abdu and farmers like him, having no other option, will continue to plant maize and wait. ■

Stephanie Parker is a freelance environmental writer and photographer living in Switzerland.

It's Not the Trees That Need Saving

The Overstory

BY RICHARD POWERS

WW Norton & Company, 2018, 512 pages

Anyone who has read and loved *The Hidden Life of Trees*, Peter Wohlleben's surprising bestseller about what trees feel and how they communicate, will find much to love in Richard Powers' twelfth novel, *The Overstory*. This sprawling, multi-branched tale is part love letter to trees and part *cri de coeur* about the state of the world's forests. By turn poetic, bleakly factual, thrilling, heart-wrenching, and uplifting, the book tells the tale of a group of strangers, all drawn to trees by unexpected circumstances, who come together to try and save the last remaining acres of virgin forest in North America. A proven master storyteller, Powers has outdone himself with this epic saga about the interrelationship of humans and nature.

The core plot of *The Overstory* pivots on five characters for whom the moniker "tree hugger" would be an understatement. Their youthful endeavor to protect an old-growth forest from a clearcutting operation changes their lives irrevocably. But we also read about the quasi-spiritual journey of a reclusive coding genius, and the less-obviously relevant story of a married couple — workers in the legal profession by day, amateur actors by night — whose significance plays out (mostly symbolically) only at the end.

To some degree, the trajectories of these eight characters are touched by the life work of a ninth, a plant ecologist. Dr. Patricia Westerford closely resembles, and is probably based upon, the scientist who first researched the way trees communicate, Dr. Suzanne Simard of the University of British Columbia. Westerford's immersion in her work is almost literal: She sees herself as part of the forest ecosystem. Her life and work provide a context for the goings-on in the novel, a kind of symbolic framework for the interactions of characters, events, and even chance.

If there is any main character, it is Adam Appich, ironically

the least committed of the young protesters. Besides serving as an apparently more mainstream foil for his four fervent companions, his academic career of studying cognitive biases and "legacy traits" proves to be a crucial element of Powers' highly original insights about the anthropogenic ecological disaster we are heading towards.

For the purposes of the novel, the most significant of these traits is the bystander effect — the tendency of each member of a gathered group to rely on the others to handle an emergency witnessed by all. The larger the group, the more pronounced the effect. This can describe partying friends who stand and gawk, instead of calling 911, when one of them overdoses on alcohol. But Powers indicates that it can also apply to the way many of us "gawk" at unfolding natural disasters or social plagues without lifting a finger, expecting that *someone else* will fix the problem. Whether this is willful blindness, apathy, fear of standing out, or just evolution gone awry, a whole planet full of bystanders will doom millions of species, including ours. The process is well underway already, as Powers makes clear.

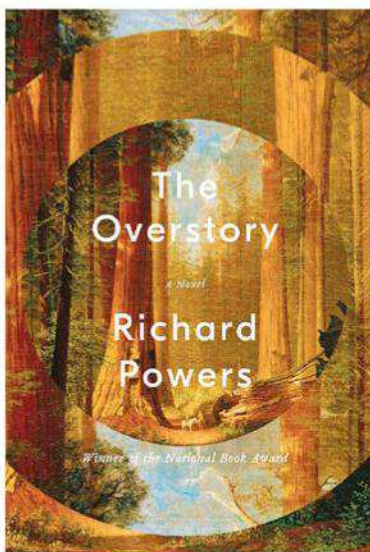
But Powers also knows we cannot save what we do not love, and his lush descriptions of such things as the mini-ecosystem of an ancient redwood — complete with flying squirrels and a huckleberry bush hundreds of yards above the old-growth understory — help evoke a sense of awe. If you ever doubted the exceptional ability of fiction to convey the urgency of an environmental issue,

this book should change your mind for good.

While the story is gripping, the writing vivid, and the takeaway undeniably important, *The Overstory* does have its flaws. The rhapsodic tone sometimes lapses into pop fiction tropes, and Powers has a curious distaste for mothers. (Fathers, in contrast, tend to fare well.) Some readers are likely to find the maximalist style of this 500-page novel a little *too* much. But these are minor quibbles about an ambitious undertaking.

Powers ends on a tentatively optimistic note without resorting to maudlin palliatives. "There are no individuals. There aren't even separate species." He zooms out to the vast timeline of a tree — sometimes stretching across millennia — leaving behind our own tight, human perspective. Within that context, we cannot despair for the biosphere. Darwin's "tangled bank" will outlast us all. ■

— LOUISE FABIANI



In Search of a World Done Differently

Lands of Lost Borders: A Journey on the Silk Road

BY KATE HARRIS

Dey Street Books, 2018, 299 pages

Like many a twenty-first century travelogue, *Lands of Lost Borders* is as much about the inner journey of the author as the outer, physical, map-plotted journey that she follows. However, there are no traces of pasta, yoga, or steamy Balinese love affairs here. Kate Harris and her travel companion, a childhood friend named Mel, push themselves far beyond the comfort zones of even the fairly intrepid traveler, including this reviewer, whose adventures bussing from Kathmandu, Nepal to Leh, India pale in comparison to Harris's experience cycling this same route.

Lands of Lost Borders: A Journey on the Silk Road recounts Harris and Mel's cycle adventure from Istanbul, Turkey to Ladakh, India, passing through Georgia, Azerbaijan, Kazakhstan, Uzbekistan, Tajikistan, China, Tibet, and Nepal on the way. But, as Harris sets out to demonstrate, the borders we are used to seeing on maps are artificial. Human-drawn borders disrupt but cannot entirely eliminate the natural flow of rivers, glaciers, forests, and even nomadic people, who continue to defy them. She writes:

"Unlike political frontiers, so crisp and martial — precisely here is Tajikistan, exactly there is Afghanistan — ecological borders are more often murky, a mosaic of give-and-take: the thinning of greenery above the treeline at Zorkul, say, or the interlude of dusk that drew marmots from their dens."

But, as Harris finds, however artificial the lines on a map may be, they do contain potent meaning and have tangible effects on peoples and ecosystems. On traveling to South Korea (a trip that pre-dated the cycling adventure of this book), she visited the demilitarized zone (DMZ) between the Koreas and was amazed to find that this 160-mile long, 2.5-mile wide strip of land without human touch has returned to wilderness. Animals and plants that can no longer be found

to the north or south, at least not to any large degree, thrive in the DMZ. It was this discovery that prompted her thinking about wilderness and nationalism, and how wilderness areas may serve to eliminate nationalism in the effort to conserve common resources.

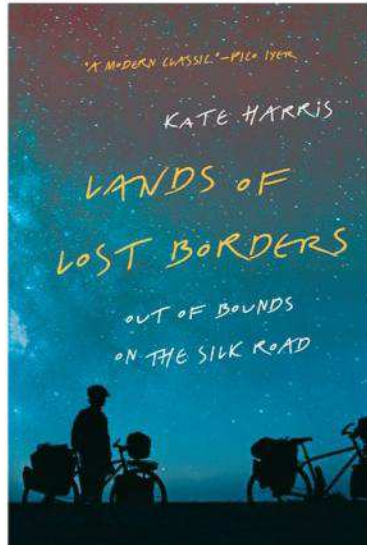
Harris was drawn to her biking expedition through her disappointment with institutionalized education, which led her to drop out of her PhD program at MIT. Obsessed with Mars exploration from a young age, she sees all that is noble in the act of travel, exploration, and documentation in the name of science. But over the course of her travels, her naiveté is replaced by the devastating realization that exploration, however good the intentions, is co-opted by nationalism and military control, and can lead to the destruction of that being explored. While astronauts famously pointed out that borders between countries cannot be seen from space, it was

loyalty to arbitrary lines that sparked the Cold War and launched humans to the moon in the first place. As Harris writes:

I lay in my sleeping bag, aching all over, and fervently hoped humans never made it to Mars. We didn't deserve a new world; we'd just wreck it all over again. As a kid I'd genuinely believed that the discovery of alien life, whether sentient being or microbes, would change lives, incite a revolution near-holy in its repercussions. At the very least people would be kinder to each other, knowing we're all of a kind, earthlings every one ... Now I wasn't convinced. Discovering extra-terrestrial life wouldn't change a thing, just as learning to fly didn't lift us higher as people.

Lands of Lost Borders concludes that it is the journey, rather than the destination, that counts. Harris does not — indeed, *cannot* — fully map the places she passes through, just as she does not find answers about how to turn the act of exploration into a noble rather than conquering cause. But her apparent drive to name and label gives way to a celebration of human connections with each other, and with the natural world. However much we may refuse to see our common humanity and continue to destroy the only place we can call home, our fates as humans on earth are inextricably tied. ■

— ELEN TURNER



Aligning My Life with Nature

by Stacy Martin

I started my career in agriculture back in early 2007, just before graduating from college, as an agronomist for one of the largest dairies in Wisconsin. This single dairy had more than 3,000 head of cattle and produced millions of gallons of manure every year. Because I didn't grow up on a farm, but had a lifelong desire to raise cattle of my own, I was intensely eager to get started. I longed to become deeply immersed in agriculture. I wanted to experience and learn from the best, and in my young, naive mind, I thought the best was the biggest.

As the years passed, I became increasingly uncomfortable in my job. I didn't believe that raising cattle on concrete inside a building was in the animals' best interest. I didn't believe that separating calves from their mothers shortly after birth was good for the calves. Harvesting animal feed from the fields, bringing it inside buildings for animals to consume, collecting the waste from the animals inside the buildings, and hauling the waste back to the fields didn't make any sense to me whatsoever. I left my position in 2013.

My next job put me on the other side of the table, as an environmental regulator for the Wisconsin Department of Natural Resources. In this position, I inspected and issued manure discharge permits to concentrated animal feeding operations (CAFOs) just like the one I had previously worked for. The goal was to keep Wisconsin surface waters and groundwater clean by minimizing the amount of manure pollutants that were discharged from the CAFOs. This

position placed me inside even more mega-farms. As a result, I was able to see firsthand even more negative consequences of large-scale agriculture, like manure spills and runoff that led to fish kills in surface waters and groundwater contamination of private wells. I witnessed the lack of true environmental protection and regulation of these operations, and I felt that by staying in my position, I was contributing to a very broken system.

Although I spent my days during this decade working in factory farms, I lived within a completely different world at home, where I had started a small ranch of my own on 40 acres in 2009. It was like a parallel universe, in which I was rotationally grazing a couple head of cattle on pasture, letting my chickens free-range amongst them, and producing grass-fed beef and pastured eggs for my family.

It took a long time for me to realize that what I was doing with my own animals at home was significant. Once I realized this, however, I knew exactly what I needed to do.

On Earth Day 2016, I quit my job with the state government to begin promoting the type of agricultural system I believe in: small-scale food production, where the animals are raised with love and in alignment with nature. I named my passion MooPoo Ranch, and I began putting all my energy into it. My evolved ranch now contains a small herd of less than ten head of purebred Belted Galloway beef cattle, a couple Tamworth pigs, just under one hundred heritage chickens, and around a dozen turkeys. All the four-legged creatures



rotationally graze, and the creatures on two legs free-range throughout the 40 acres.

Raising animals in alignment with nature means allowing them to live outside on healthy land, as they would if they were wild in nature. It means keeping the number of animals on the land at a healthy level so that they can be adequately fed from the earth, and the earth can adequately absorb the waste from the animals. Rotational grazing mimics nature's principal of movement to stimulate new growth and prevent the infestation of disease. It also means allowing that animal the ability to express its natural instincts: the rooting action of pigs, the scratching and pecking action of poultry, and the grazing action of cattle. Allowing animals the space to be themselves helps them naturally thrive. There's no need for additives, chemicals, or drugs. Humans, animals, and the entire ecosystem as a whole benefit.

MooPoo Ranch is my version of healthy food production. But it's even more than that. It is my example of the ongoing practice of aligning one's life with nature, and a vessel for spreading my love out into the world. ■

Stacy Martin is the creator of MooPoo Ranch in Junction City, Wisconsin — a happy place where animals are raised with love and according to nature's principles.

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