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A Prince among Monarchs

An interview with David Wolfe

By Miriam Horn

By adding diversity — a few wetlands and patches of prairie, native wildflowers and milkweed — this Missouri farm can now grow not only abundant food but also biomass for alternative energy and a place for monarch butterflies to eat and rest.

For a creature that weighs half a gram – that's 1/56th of an ounce – the monarch butterfly has proven a mighty unifier. As the only species to require four generations to complete a single migration cycle, the delicate orange and black beauty is a perfect icon of multigenerational thinking and the power of shared effort. The monarch has mobilized citizens. It has brought together farmers and seed chemical and food companies with environmentalists and alternative energy producers. Within EDF, it has inspired us to more fully integrate our work on wildlife habitat in Texas and California with our collaborative efforts with heartland farmers to protect water quality, soil health and climate.

Like all insects, the monarch is in severe decline, with alarming implications for food production and ecosystems. So we sat down with David Wolfe, EDF's director of conservation strategy, to learn more about this fragile messenger.

A monarch may fly 3,000 miles to reach the high-altitude oyamel fir forests in central Mexico where it overwinters with friends.

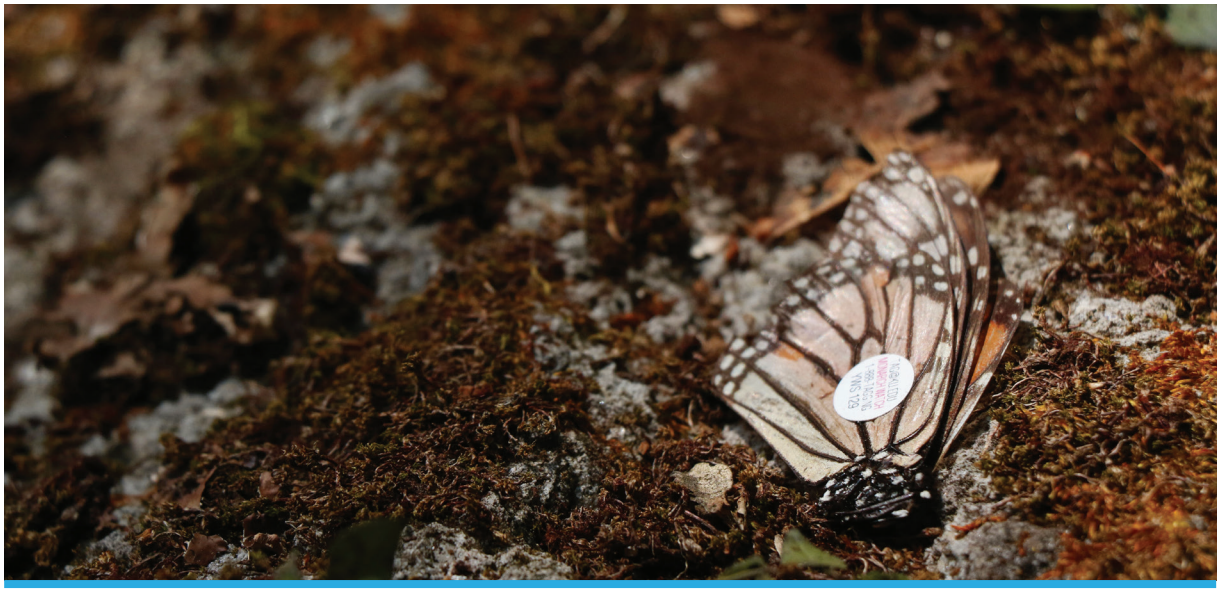
David, let's begin with the headlines. When you started at EDF 20 years ago, West Coast monarchs numbered in the millions. The latest count found just 28,429. That's 0.5 percent of their historical average and below the number scientists believe needed to keep the population going. What's causing the crash?

The U.S. actually has two populations of monarchs, divided by the Rocky Mountains, each of which face somewhat different challenges. The Eastern population, which migrates between Mexico and the Great Plains, had in fact a pretty good year, though that's in the context of decades of severe decline.

The problem for both populations is that monarchs need three crucial things that are getting harder to find: milkweed to lay their eggs on, wildflowers for nectar and forests to shelter in for the winter.

Eastern monarchs used to have 200 million acres of prairie to call home; what we now call the Corn Belt was their most important breeding ground. Now most of that land is in monocultures of corn and soy. And even the edges and ditches are swept clean – with mowing or herbicides – of the milkweed and wildflowers the butterflies need. The forests in Mexico where they spend the winter have also been damaged by illegal logging, though the government is now stepping up enforcement and helping local communities find alternative ways to make a living without cutting down those critical trees.

The Western population is less well understood. We do know they've lost more than 50 coastal wintering grounds, a dozen of those just since 2017, to development and to the widespread removal of non-native eucalyptus to regenerate native Monterey pine, which is great in the long-term but causes near-term dislocations. But we don't know nearly as much about their migration, which makes it harder to know what's limiting their population. We know they move through the Central Valley, Sierra foothills and into Oregon and Nevada, but we haven't yet located their prime breeding and feeding grounds. Do they need more milkweed, which is the only thing the caterpillars can eat? More nectar plants along their migratory pathway? Did the California fires do them terrible harm?



Monarch Watch, based at the University of Kansas, uses tags to collect vital data on the butterflies' migratory paths.

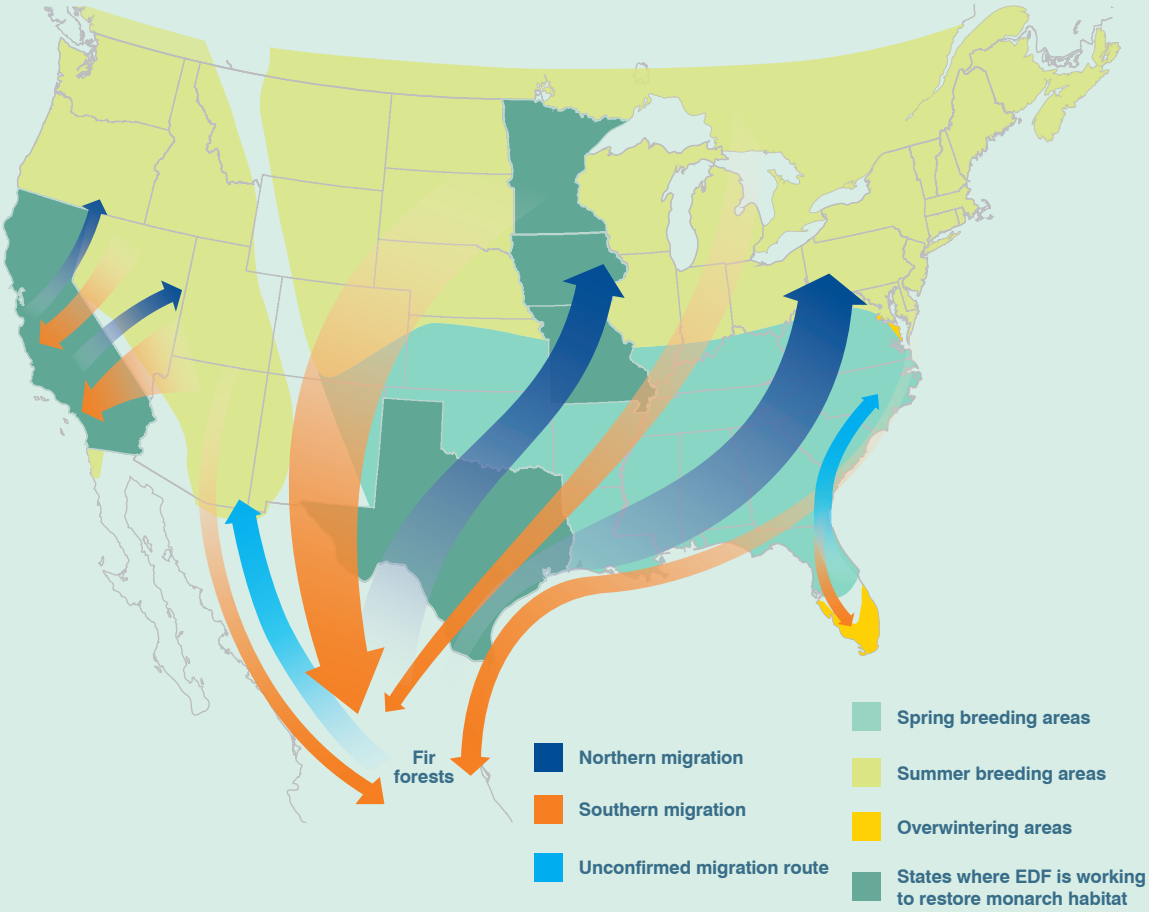
Wow, I didn't realize we know so little. I guess you can't radio collar and track them.

No. You can put tiny little tags on their wing so that when someone finds it, they can know where it came from. But not a transmitter.

Now climate change is making their lives harder still. We're starting to see mismatches in timing: The monarchs start moving before the milkweed has sprouted or grown up enough for them to lay their eggs on it. And while butterflies have always been vulnerable to extreme weather – they can get torn apart by wind or freeze in severe cold – as storms get more intense and temperatures fluctuate more widely, they may face mass die-offs.

The humble plant that powers an epic migration

The monarch is the only butterfly that performs a two-way migration. Dependent on milkweed, they fly to Mexico and back, a trek that takes four generations to complete. EDF is targeting key states along the main monarch flyways to restore vanishing habitat so that future generations of Americans can marvel at this miraculous species.



David, when did you get interested in the monarch?

Well, I only realized it was in trouble in 2014, when several groups petitioned for it to be listed under the Endangered Species Act. But I quickly saw why this butterfly stirs so much fascination and concern. I've never had quite the same feeling for another species. This tiny, delicate creature migrates as far as 3,000 miles, surviving all the threats to its existence in our not-so-delicate world. The northern migration takes three generations to complete, then the fourth generation finds its way all the way back to its wintering grounds: That's unique in the world.

How do they navigate and survive over so many miles?

Scientists think they use the sun to navigate, and possibly the Earth's magnetic fields, though how they pass that knowledge along the migration relay is unknown. As for surviving, if it's not flyable weather, because of a blizzard or high winds, they'll hunker down. In their wintering grounds, tens of thousands will cluster in a single tree to create their own little microclimate; with all that biomass, they generate some warmth and humidity. They don't feed, but live on the nectar they collected during the warm season.

You mean they hibernate like bears, living on accumulated stores in those tiny little bodies? Do they gain weight for that?

Yes, but it'd be in micrograms.

So what is EDF doing to help the monarch survive?

We've set a goal of getting back to 225 million butterflies on the American landscape by 2028, which means we'll need to restore a million and a half acres of habitat east of the Rockies and another 30,000 acres in the west. In both landscapes, we're focused on ranches and farms, which we know can serve many functions: protecting water, animals and climate, while growing food in ways that actually enhance resilience and long-term productivity.

In the West, where we have this emergency situation, we've mobilized to fill the gaps in science. In February, we convened a workshop at the University of California, Davis, so that scientists, restoration practitioners, agricultural producers and public agencies could share knowledge and identify key opportunities. One attendee, River Partners, shared a really inspiring story about a high school that grew 10,000 milkweed seedlings to give away free to farmers; all River Partners provided was trays, seed and a few hundred dollars. We'd love to see that expanded to 100,000 seedlings. We also discussed the big opportunities in projects that are already underway. The state, for instance, could add milkweed and nectar plants into the ongoing floodplain restoration along the San Joaquin and Sacramento rivers. Farmers could grow habitat in young pecan orchards during the five years before they start to produce. That would also build the pollinator populations those nut trees and other high-value crops need, an example of how these efforts can serve both wildlife and agriculture. As we're developing more definitive science, we'll work to expand these kinds of "no-regrets" solutions. My colleague Dan Kaiser, for instance, is talking to vineyards in Napa Valley about planting habitat. He also launched a project called "Monarchs in the Rough" which now has almost 500 golf courses planting monarch habitat. EDF is also working with UC Davis to analyze how social networks could better advance monarch conservation.

Farmer Kristin Duncanson produces corn, soy and pork in Mapleton, Minnesota. Until she met David two years ago, she and her husband Pat did all they could to get rid of milkweed. Now she raises it.

And for the Eastern population?

There, we're building on partnerships with ranchers and farmers that EDF has been developing for 20 years.

In Texas, where we know the monarchs breed, it's a matter of enhancing existing grasslands. Historically, those rangelands would have burned every few years, knocking back the grasses so that native wildflowers had a chance to sprout up and compete. Without that disturbance, the grasses crowd everything else out. So we work with ranchers to put fire back on the land, or to mimic it with mowing. We also plant milkweed seedlings where it's been eradicated.

In the Midwest, where the monarchs nectar and lay their eggs, we're starting more from scratch, working to turn marginal land or even a yard around a farmhouse or hog building into habitat. We do have a big head start, because a lot of what our sustainable ag team has been doing with farmers to improve water quality – like planting buffers along creeks or the edges of fields to prevent runoff of soil and nutrients – can serve as habitat too if you grow the right things. The long-term relationships they've built with groups like National Corn Growers Association and Iowa Soybean Association have opened doors to that conversation.

The idea is to move to what we're calling "multifunctional agriculture," which produces many goods at once: our food, of course, but also clean water and wildlife habitat and an improved capacity to sequester carbon and soak up water, so these hard rains don't produce such destructive floods. At the center of this vision is

diversity. We need more diverse crops and also cover crops, which are plants farmers grow during fall and winter to shelter the soil and bank nutrients. We also need diverse features on the land, including wetlands and patches of restored prairie filled with many kinds of native grasses, wildflowers and milkweed.

Milkweed is the only food a monarch caterpillar can eat. It stores the plant's toxic steroids in its body, using them for the rest of its life to defend against predators. The adult's beauty works like a skull and crossbones, advertising that it's poison.

Haven't conservation programs always focused on creating habitat?

Historically, no, they haven't prioritized that kind of diversity. Both public and private programs have focused on the cheapest, easiest ways to get anything growing to stabilize creek banks and ditches. That has typically meant rolling out giant bags of seed of a single non-native grass species like fescue or brome, which establish quickly. There's a reason for that. Native, diverse seed is more expensive. People have to collect it from remnant prairie patches, or find the few seed companies that are growing the wildflowers monarchs love best, like asters, goldenrod and blazing star. Those native grasses and wildflowers also take more time to grow.

But once they are established, you have a far more resilient landscape that does many different things. Diverse wildflowers generate diverse and abundant insects, including bees and other pollinators and beneficial predators that eat pests. Abundant insects in turn support grassland birds, which are among the fastest-declining species in the U.S. If your patches of habitat are more than a few acres in size, you may even see those birds nesting. And these native plants sequester far more carbon, putting down deep roots that suck it out of the atmosphere and store it in the soil.

How do farmers feel about all this?

A lot of farmers are stepping up to learn more about monarch biology and habitat needs, because they want to play a part in its recovery. Our holistic approach to the landscape also works better for them: they don't have time for eight different people to each show up with their pet issue. And they're increasingly focused on building both soil health, to keep their land productive for the long term, and resilience to drought, extreme temperatures and flood.

In the Corn Belt, where diversity is really lacking, we're probably looking at stepwise transitions. We're already seeing Iowa farmers adopt cover crops, some of which may have at least temporary benefits for monarchs and pollinators. Iowa State has also found that planting strips of prairie within crops can vastly improve soil health.

What's the biggest challenge for farmers and ranchers who want to help the monarch?

The biggest hurdle is expertise, knowing how to restore a diverse habitat. That's why we have our biologists out there helping. We also recently launched a Field Guide to Creating Monarch Habitat in California, drawing on lessons learned from partners like Davis Ranches, which produce rice and walnuts alongside a 70,000-acre wetland refuge and have a long history of conservation.

> "Our goal is to get back to 225 million butterflies on the American landscape, which means we'll need to restore a million and a half acres of habitat."

The second big hurdle is the cost of locally adapted seed, which can run several hundred dollars an acre. We think we can bring that price down if we can show significant demand across the agricultural community and provide ways to ameliorate the risk for seed companies to grow more varieties. I've been out talking to companies like Applewood Seed to understand the scale they'd need. We're also exploring a collaboration with the Bee and Butterfly Habitat Fund, which buys seed in bulk and then provides it free to farmers who are willing to do all the site preparation.

We just don't think it's fair to have this all come down on farmers' shoulders. They operate within a larger system: of commodity markets, chemical and seed companies, federal policy. We want to change that system to empower them to be more effective stewards of the land.

Beyond lowering the price of seed, what other kind of system changes do you have in mind?

Well, we're starting to rethink how to structure incentives. For years, we've focused on directly rewarding landowners for achieving environmental goals. But behavioral scientists are finding that direct payments may reduce a person's internal motivation for stewardship. We've seen that with Farm Bill conservation payments: a landowner will put in habitat until the cost-share ends, then plow it up for corn. We're after more sustainable outcomes, so we are evaluating alternatives like grants to a group of farmers working collaboratively to put in habitat.

We're also working on policy. The California legislature just passed an EDF-sponsored bill providing $3 million for monarch and pollinator recovery. And we're hoping that U.S. Fish and Wildlife, which will decide this month whether to list the monarch as endangered, might arrive at a decision that maintains momentum for monarch conservation without placing an undue regulatory burden on farmers and ranchers.

From a small diversity plot on Amy Greer's central Texas ranch, native wildflower and milkweed seed will be spread by the wind to surrounding rangelands. A rancher is a servant and a steward of the land, the Greers believe.

Can you tell us a bit about the projects we already have underway?

One of my favorites is our partnership with Smithfield Foods, Roeslein Alternative Energy, Iowa State University and the Missouri Prairie Foundation. Smithfield provided $300,000 to restore prairie on 1,000 acres of its hog farms in Missouri. Roeslein came in because they're already producing biogas from hog waste and want

to use those prairie grasses as a backup feedstock. Every couple of years, they'll come in and mow – when there aren't baby birds in ground nests, of course, or breeding monarchs – and turn those grasses into biogas. What's great is that a disturbance like mowing is just what this restored prairie needs to spur abundant growth of wildflowers and milkweed. And Iowa State will measure and track the multiple benefits.

Another project that excites me is here in Texas with Amy Greer, a sixth-generation rancher who's one of our key monarch ambassadors. Amy can remember a time when monarchs would just blanket their trees. But she's seen fewer and fewer come through every year, so she was moved to do something. Because she has a big place – 6,000 acres – we settled on planting what we call a "diversity plot." EDF members provided the funding. Last fall, on about a fifth of an acre, we put in a highly diverse mix of plants which we've been intensively managing: fencing out cows and deer, watering as needed. The idea is that as the milkweed and flowers come up, the wind will disperse their seeds over the broader landscape. So we're planning management on the surrounding lands too: removing mesquite and maybe putting fire on it to help those plants spread faster. We'd like to get to 1,000 acres of prairie, but to plant that could cost $500,000 or more. We don't have that money. Amy doesn't have that money. So our plan is to add a few of these plots across the ranch over time and let nature scale it.

David, how did you wind up working on wildlife in Texas?

Well, I kind of came the long way around. I've loved the outdoors since I was a kid on Florida's Gulf Coast, riding bikes to the beach or running around in orange groves. I went to University of Florida for a master's in agricultural engineering because I thought it would keep me outside. I did get a good job, working on wastewater

David and wife Beth on the Rosedale Ride, raising funds for disabled kids.

> "Agriculture can be 'multifunctional,' producing food but also clean water, wildlife habitat and an improved capacity to store carbon."

treatment for the state of Florida. But I spent my days at a computer and hated every minute of it. So I quit and for a while worked with a friend managing a bicycle shop. That's where I met my wife Beth, when I sold her a bicycle. She was a member of every environmental group – Audubon, Greenpeace, Sierra Club, EDF – and got all their publications. I started reading about their work conserving wildlife and habitat, and thought, "This is what I'd like to do." So I can thank my wife for helping me figure that out.

I went back to school for a second master's in plant ecology at the University of Georgia. My research was on long-leaf pine habitat, which is extremely diverse, hundreds of different species, so I got lots of practice identifying plants. But I also learned how wildlife like the endangered red-cockaded woodpecker relies on that habitat. I got a field job with The Nature Conservancy in Tennessee, developing plans for military bases to protect habitat to protect threatened species – work I continued when we moved to Texas in 1992. When our team found the first black-capped vireo ever spotted at a National Guard training site in Texas, that set me thinking about all the birds America has already lost – the Carolina parakeet, the passenger pigeon. So I started working to protect vireos and golden-cheeked warblers, which were also on the brink.

Those birds led me to switch my focus to private lands, where most of these creatures live. I started helping landowners enhance habitat: the ranchers wanted more bobwhite quail and white-tailed deer – many earn income by leasing their land to hunters – but that worked fine for our birds too. The vireo likes to hide and nest in dense deciduous shrubs mixed with grassy swales, which also provide great cover and food for quail and deer. The warblers need the mature oak-juniper forest that grows in our canyons and hillsides, which is again great cover for game and also slows erosion.

In 2000, I heard about the innovative incentives and tools EDF was designing to encourage private landowners to recover habitat, so I came to work on vireos and warblers with Michael Bean and Robert Bonnie. [Both were later appointed by President Obama to top wildlife jobs in the Interior Department.]

How do you spend your days?

I spend about half my time on ranches and farms. I was in Iowa and Minnesota for most of April, visiting farms with various colleagues: an engineering consultant who's working for the state on water quality issues, young staff from our San Francisco office, to give them exposure beyond California, and field staff from Pheasants Forever, who have local expertise in restoring the prairie habitat that both pheasants and monarchs need.

I also make regular visits to agriculture schools like Texas A&M and Iowa State to talk about the role of farmers in monarch conservation. The University of Texas

Law School has also had me in to speak. Because the monarch is heading toward a possible Endangered or Threatened listing, their students want to understand the context beyond the law and policy: the butterfly's biology, the actual threats on the ground, how conservation work is implemented.

A monarch butterfly takes a well-deserved break on the shores of Lake Superior in Minnesota on its northward return to Canada from Mexico — a four-generation migration that is unique in the world.

What can the rest of us do?

For starters, people can help us fill the gaps in knowledge. The Monarch Joint Venture has a big citizen science effort focused on counting butterflies, eggs on milkweed and nectar plants. EDF members can also Adopt a Monarch Acre of habitat, each one of which will create 70 new monarchs.

You can also plant habitat in your own yard, though it's important to plant milkweeds and nectar plants appropriate for your area. If you just go to a big box store and buy what's called tropical milkweed, which is popular because it's colorful and tough, it will grow year-round in warm climates and monarchs will use it. But because it doesn't die back in the winter the way natives do, parasites like tachinid flies and the protozoa called OE can build up over time and make the monarchs sick and weak. If you cut the tropical milkweed back around Thanksgiving, mimicking the die-back, that will reduce the problem. But our suggestion would be to plant local native milkweeds if you can. Xerces and Monarch Joint Venture both offer good guides.

If we work together, we can all share that uplifting, energizing, almost spiritual feeling of seeing the monarchs return each spring: reassurance that life has continued and regenerated for another year.

For more information, please contact EDF Member Services at 800-684-3322 or email members@edf.org.

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