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As Dwindling Monarch Butterflies Make Their Migration, Feds Try to Save Them

"Catastrophic drop" in pollinator's numbers this year means that species is "going to need all the help we can give it."

By **Eve Conant**, for National Geographic

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Hundreds of Mexico-bound monarch butterflies enjoy a morning respite from their long migration in Stone Harbor Point, New Jersey, in 2011.

PHOTOGRAPH BY DALE GERHARD, THE PRESS OF ATLANTIC CITY/AP

CAPE MAY POINT, New Jersey—Two years ago migrating monarch butterflies transformed the lush gardens of Cape May Point into a series of "giant orange snowglobes." That's how Mark Garland of the Monarch Monitoring Project describes the good monarch days, the kind of days when thousands fly overhead.

There's been no such spectacle yet this year, but Garland and members of the project's team, who take a census of the monarchs three times a day, are holding out hope. The popular orange-and-black insects will be drifting toward this peninsula for a few more weeks to fill up on nectar before riding the winds that will hoist them over the Delaware Bay and on toward Mexico.

Holding one gently in his fingers, Garland measures its wings and fat stores, among other details, before affixing it with a numbered sticker. "Right here," he demonstrates to some 80 gathered enthusiasts, pointing to an orange cell on its hind wing, limned with black veins, that he says is shaped "a bit like a mitten."

NG MAPS. SOURCE: JOURNEY NORTH.

Few animals inspire as much devotion and study as the monarch butterfly. Its multigenerational, 3,000-mile migration from Canada to Mexico

and back to the Gulf Coast states in the spring has long served as a symbol of the beauty and mystery of nature. After centuries of sightings, the discovery of their Mexican wintering sites was first reported in *National Geographic* in 1976. (Read "Found at Last: The Monarch's Winter Home.")

But the very migration that still puzzles researchers could soon become a thing of the past. Monarch populations are declining at an alarming rate, thanks to a deadly combination of factors that includes Illegal logging in Mexico, wildfires, droughts, and a drastic loss of their crucial milkweed habitat in the United States.

The outlook is so grim for monarchs that the U.S. government is getting involved in a major effort to save them. Last winter marked the lowest monarch count ever recorded at a time when other pollinators such as honeybees, native bees, birds, and bats—vital to U.S. agriculture and therefore the nation's economy—also are facing serious decline.

"This year we saw a catastrophic drop" in population, says Lincoln Brower, a biologist who teaches at Sweet Briar College in Virginia. Brower, who has studied monarchs for 60 years, says "we could lose the migration and overwintering phenomena, which are unique and spectacular behaviors."

Falling Numbers

The trend is not a good one. The North American monarch population has declined by 90 percent over the past two decades. At its high in the winter of 1996-1997, there were a billion monarchs. Today, there are only about 35 million, according to a petition filed in August by scientists from several environmental organizations asking the U.S. Fish and Wildlife Service to classify the monarch as "threatened" under the U.S. Endangered Species Act.

The classification provides various protections including the authority for the agency to purchase habitat, and prohibitions on killing or injuring an

animal or destroying its habitat without a permit, according to the Fish and Wildlife Service.

It's too hard to count millions of monarchs one by one, so scientists estimate the size of the population by measuring the acreage of monarch wintering habitat in central Mexico's Transverse Neovolcanic Range. In 1996, monarchs covered some 50 acres in the range's high-altitude oyamel fir forests. Compare that with this past winter, when the monarchs occupied a paltry 1.66 acres—the lowest recorded since annual surveys began 20 years ago.

Monarchs are finicky about the temperature and their exact habitat, it turns out, and these narrow requirements make them especially vulnerable to climate change, loss of habitat, and weather fluctuations, according to the recent petition.

A single winter storm in 2002, for example, killed up to 500 million monarchs in Mexico, 75 percent of their population that winter, says Brower. But back then, there were still enough survivors to reestablish a spring population, a feat that would be much more difficult today with their numbers below 35 million. Sarina Jepsen of the Xerces Society for Invertebrate Conservation says that "the current population is now extremely vulnerable to winter storms."

Pulling Together

But after two years of the lowest ever recorded monarch numbers, there is cautious optimism that 2014, the year that marks the hundredth anniversary of the extinction of the once-abundant passenger pigeon, could be a positive turning point.

The political will has been growing. In February, President Barack Obama and the leaders of Canada and Mexico pledged to create a three-

country task force to save the monarch. That effort dovetails with a new White House memorandum calling for a federal strategy to promote the health of honeybees and other pollinators, like the monarch.

"Pollinators contribute substantially to the economy of the United States and are vital to keeping fruits, nuts, and vegetables in our diets," the memorandum reads.

The memorandum also says that the federal government, at the urging of scientists, farmers, and educators, is creating a multiagency Pollinator Health Task Force.

"The butterfly is in trouble, and it's going to need all the help we can give it," says Dan Ashe, director of the Fish and Wildlife Service. As part of the federal pollinator effort, he is leading a task force that will be specifically focused on salvaging the monarch migration.

The Mexican government has brought illegal logging—a prime threat to the monarch's habitat in Mexico—"largely under control," says Ashe. The most pressing task for the U.S., he says, is to restore the monarch's milkweed and nectaring habitat, now that much of America's historic short- and long-grass prairie has been converted to farmland.

"Here is probably the most identifiable insect on the continent. Probably every child can identify a monarch butterfly," he says. One reason he's optimistic is that "the threat to the monarch butterfly is the loss of habitat. But we know how to make habitat, and this habitat is pretty easy to grow."

Ashe is calling on colleagues in high places. "When you bring in [U.S. Forest Service Chief] Tom Tidwell, you bring 200 million acres of national forest; when you bring in [National Park Service Director] Jon Jarvis, you get 83 million acres of the national park system."

His list goes on to include multiple agencies including the Department of Transportation (to build habitat along highways), the utility industry (to plant nectaring flowers along transmission corridors), the agricultural industry, state leaders, monarch conservation groups, and even kids. Says Ashe: "We are really looking at big pieces of the American landscape."

> A local guide in central Mexico is covered in monarch butterflies. Ecotourism supports communities near the monarch's overwintering sites and has helped prevent subsistence logging and other threats to the insect's winter habitat.
> PHOTOGRAPH BY BIANCA LAVIES, NATIONAL GEOGRAPHIC

Milkweed = Monarchs

If there is one key to saving the monarch, it's milkweed. The butterfly and the plant evolved together over the centuries.

"Milkweed is the only food plant that the monarch caterpillar can eat. This is true of many butterflies and moths—they are very specific in what their caterpillars can eat," says Sweet Briar College's Brower.

The chemicals in milkweed also protect the monarch. The chemicals the caterpillar ingests remain in its body even after metamorphosis, making the adult butterfly toxic and bitter-tasting to many predators, even though adults no longer feed on milkweed leaves but on the nectar of milkweed flowers and other nectar-producing plants.

But milkweed is in decline, a victim of the human battle against weeds. "Modern agriculture and chemicals, which have been very effective at weed control, have benefited American society and the world," says Ashe. "But the casualty of that is the loss of milkweed and of nectar-producing plants that are the foundation of the monarch migration. What we have to do is restore that."

The increased use of glyphosate-based herbicides used on genetically modified crops has been a leading cause of milkweed loss, according to the petition. One study points to a 58 percent decline in milkweed on the Midwest landscape and an 81 percent decline in monarchs in the Midwest from 1999 to 2010, "coincident" with increased use of these herbicides.

Migration Mysteries

Meanwhile, scientists are still trying to understand the monarch migration even as the butterfly's numbers dwindle. The entire migration requires about four generations, so the butterflies one might see this fall, flying to Mexico from southern Canada and the northern U.S., are several generations removed from those that left Mexico in the spring. So how does this last generation, with butterflies that never made this trek before, find their way for the first time to the 12 mountain ranges some 10,000 feet high

in central Mexico's Transverse Neovolcanic Range, where they will overwinter?

Each generation lives a very different life. A butterfly born in Minnesota in September, for example, will not mate until after its long winter rest, and can live for up to eight months. But monarchs that emerge in the spring and summer months reproduce within a few days and have shorter life spans, only two to six weeks. Their primary job is to reproduce enough for subsequent generations to survive the return to Mexico.

> Monarchs convene at a water hole along a small streambed in the Monarch Butterfly Biosphere Reserve in Michoacan, Mexico.
> PHOTOGRAPH BY MEDFORD TAYLOR, NATIONAL GEOGRAPHIC

In late August and early September, cool weather and deteriorating milkweed plants—along with what Brower describes as the "key cue" of shorter days—triggers monarchs to delay mating and focus their energy on migrating. They trek to the oyamel fir forests in Mexico, the only micro-climate in which they can survive until spring, when they'll fly north and finally lay eggs.

The timing couldn't be more specific. "They are leaving Mexico around the 21st of March and then they start heading back to Mexico around the 21st of September—and you know what those dates are," says Brower. "They are timed to the equinox. It's pretty neat."

Scientists are still figuring out how the butterflies do it. Recently, researchers sequenced the genomes of 90 monarchs, discovering a gene that determines which monarchs will be migratory, and showing that the butterflies have muscles specially tuned for flight efficiency. (See "Monarch Butterfly's Genes Reveal the Key to Its Long-Distance Migration.")

From Farms to Backyards

The fascination with monarchs, however, has not been enough to help the species. And thorny questions remain over the most effective ways to restore milkweed.

"There is so much good energy that has gone into protecting the monarch," says Bill Freese, a science policy analyst with the Center for Food Safety, one of four signatories to the petition to list monarchs as threatened. "But it's clear when you look at the numbers that what we've done up until now is not working."

One idea is to change how farmers use herbicides. Freese advocates for restrictions on spraying glyphosate late in the growing season, when milkweed is flowering and is more effectively killed by the herbicide. He also

supports measures to restore low levels of milkweed to farmland, noting that farmers and weed scientists have not found milkweed to be much of a problem.

Representatives of the Dow Chemical Company and Monsanto disagree. "To a farmer, milkweed is a weed that competes with crops in the field for water, soil, and nutrients," says Monsanto spokesperson Charla Lord. But she says the company is part of a new coalition to tackle the monarch problem, convened by the Keystone Center in Colorado.

"Our task here is to restore a million acres a year at a minimum," says Chip Taylor, founder and director of the conservation group Monarch Watch and a biologist at the University of Kansas, in Lawrence. "The goal is to get private landowners to devote some of their landscape to pollinators and monarch butterflies."

More milkweed seed is needed, too. "It's supply and demand. The demand for restoration seeds is growing, but restoration is still relatively small-scale," says Taylor. The effort also requires better seed mixes, says Fish and Wildlife's Ashe. "So we're hopeful that we'll see great seed producers like Monsanto and others coming to the table and agreeing to be partners."

Monarchs take to the skies at El Rosario Monarch Butterfly Sanctuary, part of the Monarch Butterfly Biosphere Reserve in Michoacan, Mexico. When enough butterflies take flight, they can entirely obscure parts of the forest in what look like orange clouds.

PHOTOGRAPH BY MEDFORD TAYLOR, NATIONAL GEOGRAPHIC

Regular citizens need to remain engaged in the effort as well. One major concern has been that a "threatened" listing could make the very animal that has brought so many people close to nature suddenly off-limits.

But Tierra Curry, a senior scientist with the Center for Biological Diversity, which joined in filing the petition, says they specifically requested that the monarch be listed as threatened because it's faster to get than endangered status. That classification also has more flexibility with exemptions, "so that kids can still bring caterpillars inside and watch them transform and so that citizens can still tag them and people can still handle them."

Next Stop, Mexico

There are signs that their numbers may go up this winter, says Brower. An unusual radar pattern over St. Louis, Missouri, in September generated a lot of excitement when meteorologists suggested it may have come from passing monarchs, though monarch experts now think that was unlikely.

"It's very interesting [that] everybody thinks monarchs go south to be warm during the winter," says Brower. "But they're going up into these high-

elevation forests to keep cold so that they can get through winter with their fat reserves." The butterflies need Mexico's forest canopy to protect them from rain and wind, and from freezing to death.

And while large-scale illegal logging has been curtailed in their wintering grounds, what locals call tala hormiga or "ant logging"—the removal of one or two trees at a time—continues near and inside the butterflies' habitat.

Monarch butterflies enjoy some nectar in Cape May, New Jersey. Staff and volunteers of the Monarch Monitoring Project, buoyed by devoted butterfly gardeners in this southernmost tip of the state, have helped maintain it as a popular layover point for the fall migration.

PHOTOGRAPH BY GEORGE GRALL, NATIONAL GEOGRAPHIC

"We hear some monarchs are crossing the border already," says Homero Aridjis, a poet and former diplomat who founded the Grupo de los Cien (Group of One Hundred), an association of prominent artists and intellectuals (including the late Gabriel García Márquez) that helped protect the monarchs' winter habitat in Mexico.

"We expect them to arrive around the Day of Dead," the Mexican holiday honoring friends and family who have died that takes place from October 31 through November 2, says Aridjis. When the monarchs return, there will be a big ceremony to welcome them.

"I was born in this area," Aridjis says. "When I was a child, people thought the monarchs were the souls of the dead, coming back to the world in the form of butterflies."

How You Can Help Monarchs

—Plant locally appropriate species of milkweed in your garden, on your farm, or wherever you manage habitat. Try the Milkweed Seed Finder to see if seeds are available in your area.

Monarch Watch provides small milkweed plants and resources to find the right species for your region. It also runs a program, funded by the National Resources Defense Council, to provide free plants to schools and NGOs.

Be judicious in your use of herbicides and pesticides, and try not to apply it on milkweed.

—Become a "citizen scientist." Researchers depend on individuals across the country to help tag monarchs and to report observations. "That type of bio-geographical information is really hard for a single researcher or even a group of researchers to obtain," says Sarina Jepson of the Xerces Society.

Journey North, founded by one of the first monarch citizen scientists, Elizabeth Howard, is one place to start. Or sign up with the Monarch Larva Monitoring Project and help track caterpillars and milkweed.

Explore more ways to get involved, donate, or get informed with the Monarch Joint Venture, a partnership of federal and state agencies, non-governmental agencies, and academic programs.

If you're in California, the Western Monarch Thanksgiving Count is seeking volunteers to monitor overwintering monarch populations west of the Rockies. And farther south, El Correo Real helps track the migration across northern Mexico with the help of schoolchildren and other volunteers.

Update: *An earlier version of this story mentioned that meteorologists suspected that a radar pattern over St. Louis may have been caused by monarch butterflies. Monarch experts doubt that the butterflies were in the area at that time. The story was updated October 13.*