Migrating Monarchs

By Karen Oberhauser

Which monarch generation migrates to Mexico? Is it the third generation of the year (the great-grandchildren of the previous year’s migrants) or the fourth generation (the great-great-grandchildren)? The answer is... both! Because monarchs live a relatively long time as adults (about 3-5 weeks on average), by the end of the summer there is overlap between generations. If a female lives a long life, by the time she lays her last eggs, her first daughters may be laying eggs themselves. Some migrants are the first offspring of the first offspring of last year’s overwintering generation (the third generation), but others, with older mothers or grandmothers, will be the fourth generation. It is most accurate to say that monarchs that emerge as adults after the middle of August will migrate. There are still a few monarchs emerging in their northern breeding range now, in the middle of September, and they’ll join their older brothers and sisters (and probably some aunts and uncles) on the migratory journey.

You cannot tell the difference between the migratory and non-migratory monarchs by looking at them, unless you see obvious behavioral cues. If they’re flying south, they’re probably heading to Mexico. If they’re laying eggs, mating, or chasing females, they’re not. If they’re old and beat up, they’re probably not part of the migrating generation. Researchers at the University of Georgia have shown that, on average, migratory monarchs are redder, but you can’t detect this difference by looking at only one or a few butterflies.

There is a bit of nuance to all of this, because some reproductive monarchs do start flying south in what we call the pre-migration migration. These butterflies are laying eggs as they go, probably giving their offspring a better chance of making it to adulthood. Eggs laid late in the summer in the north could develop very slowly if it is cool in late August/early September.

One final point, I am not a fan of the term Methuselah generation as a descriptor for the generation that migrates. If you know the biblical story of Methuselah, you know that he was an unusual individual. This isn’t true for migratory monarchs; any monarch that emerges in the late summer is part of the wintering generation. In fact, every single monarch carries the genes that would make it migrate, given the right environmental cues.

An Amazing Year for the Eastern Migratory Monarch Population

We hardly need data to tell us that the Eastern North American monarch population did well in summer 2019. We received reports of high numbers of eggs and larvae throughout the spring and summer, and, more recently, monarchs streaming south and congregating in dense roosting sites. These reports are coming from all over the northeastern quarter of the US and southern Canada. Participants in a UW-Madison Arboretum night hike following September’s full moon (Sept 14), were treated to nighttime views of multiple roosting monarchs. Photo courtesy of Journey North
clusters, and Journey North observers are reporting roosts containing hundreds and even thousands of monarchs.

**Why are monarch numbers high this year?**

First, last year was a good year for monarchs. Monarch numbers at the Mexico wintering sites were higher than they had been for over a decade, so more monarchs started the journey north this year than in previous years. Second, as monarchs started breeding in the southern US, they found better conditions; the drought had broken, and spring temperatures were conducive to quick development. Conditions were also good in the northern breeding grounds. It was wet, but not too wet, so milkweed and nectar plants were in good condition, and there weren’t many rainy days that prevented monarchs from flying. It was warm, but not too warm. Extremely hot conditions slow monarch development and can lead to higher mortality, and cool conditions also slow development. Fast development minimizes the time that monarchs spend in their vulnerable egg and larva stages, and allow faster generation time. With more generations, monarch numbers can increase more during the summer.

**What do MLMP data tell us about numbers this year?**

While we don’t have all of the data yet, graphs from four Midwestern states in 2019 tell a promising story. In Minnesota, Wisconsin and Michigan, peak July or August densities of eggs and larvae reached over 0.4; on average, 4 out of 10 plants checked by observers had a monarch on them. The peak in Ohio almost reached this value. Values were similarly high in 2018, but before that, none of these states had seen values this high since 2008, the last year that monarchs occupied over five hectares in Mexico. While the numbers from Mexico document what’s happening to the population as a whole, MLMP data show us that 2019 was good for monarchs throughout their breeding range.

We definitely have cause to celebrate. Given excellent weather conditions, monarchs have the potential to achieve numbers that are considered sustainable. A population that occupies 6 hectares in the Mexico wintering sites has a low risk of extinction in the next 20 years*, and monarchs occupied just over 6 hectares in the winter of 2018-2019. However, the average population from 2009-2018 has occupied just 2.7 hectares, a size with a higher risk of extinction. In contrast, the population from 1999-2008 occupied an average of 6.4 hectares. Thus, while numbers for the past two years seem very high, numbers in the winter of 2018-2019 only reached our previous average. We’re hoping for even more this winter!


![Figure: Summer 2019 monarch egg and larva densities for Minnesota, Wisconsin, Michigan, and Ohio.](image-url)
Volunteer Spotlight: Denny Brooks

Note from Karen Oberhauser: I first met Denny at a workshop in Kalamazoo Michigan in 2004 and remember that meeting as reiterating my sense that I’d be meeting a lot of life-long friends through the MLMP. While we haven’t crossed paths many times in person, we’ve stayed in touch, and I’ve followed his work through the frequent Monarch Updates that Michigan volunteers receive from Denny. He does frequent trainings for local volunteers, and, as you’ll read, is now engaging a new generation of monarch monitors. Denny has the most important qualities of a scientist; he’s incredibly observant and very curious. It’s been a pleasure to receive his questions about his site, monarchs, and data patterns, and his suggestions about making the MLMP better! And Denny’s monarch citizen science observations aren’t limited to the MLMP; he also contributes data to Project Monarch Health, and tags monarchs for Monarch Watch.

How long have you been volunteering with the MLMP?

I have been a volunteer since 2004, after attending a training section at the Kalamazoo Nature Center in Michigan. I do both the formal survey and the anecdotal surveys every year.

New Monarch Research

Summer 2019 was a busy time for new monarch butterfly research! We’ve summarized a few interesting new articles.

- Researchers at the Field Museum in Chicago have highlighted the importance of cities for monarch conservation. They suggest that metropolitan areas have a high potential for providing usable habitat and connecting migration pathways. Cities also provide a lot of opportunity to engage millions of people in conservations efforts.

- A recent paper by Ayse Tenger-Trolander, Wei Lu, Michelle Noyes, and Marcus R. Kronforst at the University of Chicago showed that commercially-bred monarchs can be highly different genetically from individuals from wild populations. The paper also explores the effects of captive rearing of monarch larvae on migratory ability. We believe that rearing individual monarchs in small numbers under proper conditions can have incredible educational, inspirational, and scientific importance. You can read more about our reaction to this paper here.

- Western monarch populations have experienced large population declines (>99% since the 1980’s). A new paper lays out critical priorities needed to save the western population: protecting, maintaining, and restoring overwintering, breeding, and migratory habitat and protecting monarchs from pesticides.

- Researchers are closer to understanding how the protozoan parasite, Ophryocystis elektroscirrha (OE) infects monarchs. The combination of transmission from adult females to eggs, from adult to adult, and from the environment can reduce monarch abundance in affected populations by up to 50% and could contribute to declines in monarch numbers. Because tropical milkweed in the South can contribute to transmission, we recommend replacing it with native milkweed species or cutting it back from October through February.

- A recent study has shown that strategic mowing of common milkweed along roadsides can maximize monarch reproduction. Mowing once before peak egg-laying season, which differs by region, produces young milkweed plants at the right time to benefit monarchs, as seen by higher egg densities following this treatment.

Denny Brooks participating in monarch monitoring.
How did you get started with the MLMP?
I started working with butterflies in the early 1980’s. I had been doing fundamental monarch research and tagging since 2000. I registered for the MLMP program that was offered at the Kalamazoo Nature Center lead by Dr. Oberhauser. I pledged to do a one-year trial that’s going in to the 16th year.

Which activities do you do and which is your favorite?
The caterpillar surveys, they are so fun to work with. I plan on going back to doing weights & measurements this next season. My research team (my two granddaughters, ages 5 & 7, and I) did two seasons of caterpillar research doing daily weights, measurements and development times on reared caterpillars.

What has motivated you to stay involved?
Simplicity! I have done many survey projects (butterflies, birds, bird banding, elk, amphibians and etc.) through the years. With many of these programs, there was a complicated protocol, time frames, and restrictions that made doing the project difficult. The MLMP is the best; it covers the complete summer monarch phenology with simple methods. Kudos to Dr. Oberhauser.

What has been your favorite part about being involved?
There are many great parts about being involved: getting to be outside all summer with a purpose, seeing and documenting the perpetual change of a specific area, all of the little milkweed critters that keep you on your toes (my favorite is when I find hiding tree frogs), and, unlike most programs, with the MLMP you can see the results of your work.

Do you have a story that you would like to share?
In 2013 with a loss of habitat and low monarch population my site crashed, I had NO monarch activity. I moved my site to my yard. I had one pollinator bed, one milkweed bed and one mixed bed. We surveyed that for 2 years. In the meantime, the nature center, where my site is, decided to rehab my site into a pollinator area. When I returned the site, we had 3.5 acres with a milkweed density 5+ plants per square meter, a fantastic recovery.

What do you like to do when you aren’t volunteering with the MLMP?
I’m an outdoor educator at local state park. I do nature photography and work with a bird bander. I volunteer at the local nature centers and the local nature conservancies doing butterfly, wildflower, and macro surveys. I also assist a local remediation agency with their surveys.

Is there anything else you would like us to know?
I generally do 2-6 outreach programs each year; depending on how things come together. One program is an inner-city program. In a two year span I gave out 50 + bags of milkweed seeds.

It’s a joy to work with the really good people of MLMP.