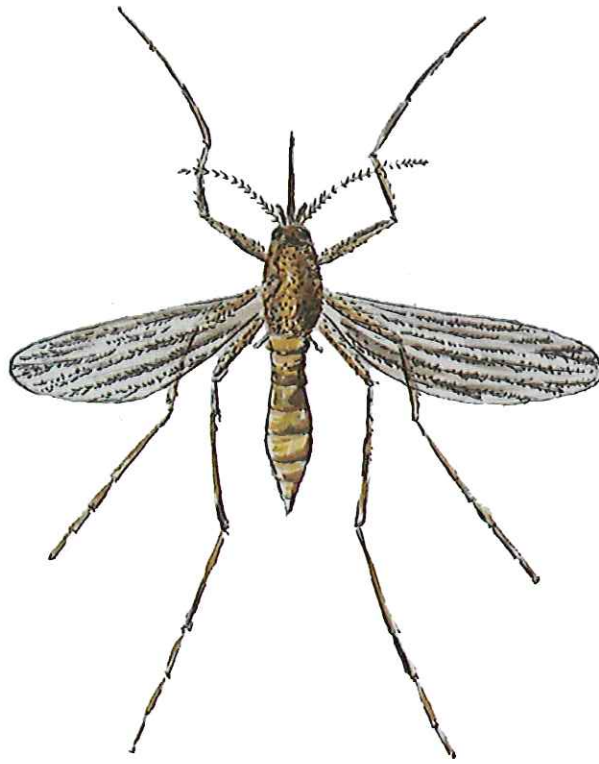


# Climate Change: Its Potential Effect on Mosquitoes and Disease in Michigan



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Mosquitoes have been present since dinosaurs roamed the Earth and we can only imagine that they were both a nuisance and a health threat even back then. Recently, in an article published in LiveScience, a blood- engorged mosquito fossil was found in a piece of shale rock in Montana. A researcher, Dale Greenwalt, with The National Museum of Natural History in Washington, D.C., analyzed the sample and found that the mosquito was feeding about 46 million years ago "suggesting they were around much earlier and could have fed on dinosaurs." (Main) Mosquitoes are still as much as of a menace today because they are bothering us at the ball field and they are spreading disease and causing public health challenges.

In Michigan people currently deal with several types of mosquito-carried diseases including West Nile Virus (WNV), Eastern Equine encephalitis (EEE), St. Louis encephalitis (SLE), and LaCrosse encephalitis (LAC). Over the last 10 years or so West Nile has been by far the most common disease carried out by mosquitoes reported in our state. According to the Michigan Emerging Diseases website there were a total of 33 human cases of WNV and 1 death for 2013. Besides WNV there were no other mosquito-carried diseases reported in the 2013 season. Looking back, 2002 was the year that saw widespread levels of WNV because there were a total of 644 human cases in Michigan with 51 deaths. (MI Emerging Diseases) Although the 2013 season had much lower numbers, WNV seems to be a disease that will always be around because there have been cases reported every year since it arrived.

We always hear that mosquitoes are a given when we get enough rain. This is true, especially when a sufficient amount of rain floods mosquito habitats like fields, ditches, and buckets and eventually causes mosquitoes to be produced. Temperature,

too, can affect mosquito populations by causing them to either thrive or to decline (such as with a hard frost). Impoinvil, and other scientists, conducted an experiment on how temperature affects egg hatching in *Anopheles* mosquitoes; they found that in temperatures between 71-80°F more eggs hatch than at more extreme temperatures of 54°F or 108°F. (Impoinvil) Weather also has an effect on the diseases the mosquitoes can carry. We tend to think that rainy seasons will lead to a lot of mosquitoes and therefore a lot of diseases, however, experts say that the opposite is true. It is hot, dry summers that we need to worry about disease carrying mosquitoes. According to the U.S. Centers for Disease Control and Prevention the hot dry summer of 2012 contributed to the worst West Nile season on record. (Hauser)

While current weather conditions help us see what mosquito populations will be at any given time, climate change gives an idea about how weather affects mosquitoes in the bigger picture. The Earth's climate is constantly changing and experts say that we are in a warming phase. "Temperature, rainfall, and humidity are especially important, but other factors such as wind and the duration of daylight, can also be significant." (Reiter) All these variables play a role in how successfully mosquitoes develop and how abundant they are, but also in how they survive.

In the case of WNV, the disease's main vector is *Culex pipiens* or the Northern House Mosquito and it likes to breed in polluted waters (Wayne J. Crans, Rutgers. The State University of New Jersey). Climate change might influence where these mosquitoes are found, how many are found, and how they transmit disease. Warmer temperatures could mean that *Culex* mosquitoes become active earlier in the year. They are a mosquito that spends the winter as an adult and an early spring would mean

they would be out and about earlier than normal. If it is warm spring, birds might be returning or migrating back to Michigan earlier as well so the whole disease cycle could start early.

Climate change in Michigan might also have an impact on the length of the season. Now, adult mosquitoes are found from May into October and those who control mosquitoes (pest control companies or county mosquito control agencies) may find that a warmer climate expands this time frame by a couple months. This will lead to having more expenses such as extra chemicals for control and added manpower and wages.

Warmer weather in our state may also lead to mosquito vectors that are found in other parts of the country to find their way here. Now, there are some mosquitoes like the Asian Tiger mosquito, *Aedes albopictus* that are not found in Michigan. It is thought that they cannot survive Michigan winters. If the temperatures rise, though, it is possible that this mosquito could very well be found here. Other mosquitoes like *Aedes aegypti*, who carry dengue fever and dengue hemorrhagic fever, are found in more tropical and subtropical areas (Estallo), but the thought is that these mosquitoes could show up in Michigan if climate change is true and temperatures rise. There are also viruses in other parts of the world that are not found in Michigan or even the United States now, but that could find their way here especially if warmer temperatures would allow them to survive. Rift Valley Fever (RVF) is generally found in regions of eastern and southern Africa where sheep and cattle are raised, but the virus also exists in most countries of sub-Saharan Africa and in Madagascar. (Centers for Disease Control and Prevention RVF Fact Sheet). Rift Valley fever (RVF) is an acute, fever-causing viral disease that affects domestic animals (such as cattle, buffalo, sheep, goats, and

camels) and humans. RVF is most commonly associated with mosquito-borne epidemics during years of unusually heavy rainfall. In the case of RVF, if climate change that causes warmer temperatures and stronger or more severe storms happens, this is a disease Michigan might see in the future.

Another thing to consider is that other animals besides mosquitoes play a part in how mosquito-carried diseases survive in the environment. In the case of WNV, birds like sparrows, blue jays, robins, and cardinals are the most likely to have the virus if they were infected by a mosquito. "Some infected birds can develop high levels of the virus in their bloodstream and mosquitoes can become infected by biting these infected birds." (Centers for Disease Control and Prevention) Therefore, climate change that could affect when bird migration occurs might mean that birds are around longer in the summer when warm climates prevail or not around as long if cooler climates happen.

Hypothetically, diseases that are found in certain latitudes may find their way north because of climate change. If climate change models are true, then eventually Michigan will be home to more mosquito-carried diseases. This will be a real challenge in the future for mosquito control employees and it is a scary thought that the people who live in Michigan will have to face more diseases than what they even know of now. If climate change happens and mosquito-carried diseases increase, then it will be important to educate people to let them know about the different diseases and the risks that are found with each one. The more people know, the better off they will be in protecting themselves from letting the disease take over. Hopefully, this will not be the case and we won't have to worry about mosquito-carried diseases getting worse, but if climate change does happen, then we have to be prepared.

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