

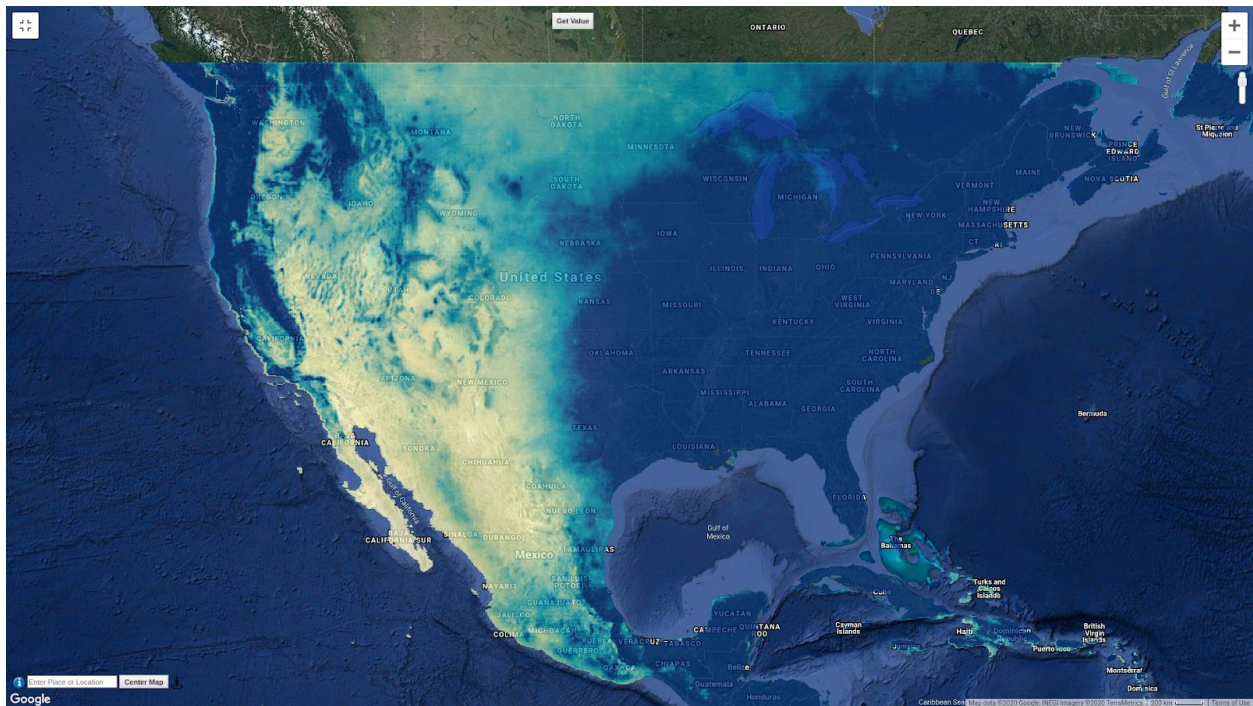
# The Effect COVID-19 has had on Mosquito Populations

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# Abstract

When I was wondering what to make my research project about I wanted to do something that had a direct effect on me, and since my project was about mosquitoes it led to me to one thing. Mosquito bites. I'm allergic to mosquito bites and to add insult to injury, mosquitoes love me. Since I was born mosquitoes flock to me during the summer, and I've gotten accustomed to them. However, this summer, there was something missing, the familiar but annoying, mosquitoes bites. There has been a distinct lack of mosquitoes this summer all across the United States. The only difference was this year there was COVID-19. I set out with this question; what effect has COVID-19 had on mosquitoes? I used NASA satellite data to see if temperature and precipitation have changed greatly from 2019 to 2020. I also used SEES mosquito habitat observation to back up my claim of lower mosquito counts. Additionally I explained how COVID-19 has possibly affected mosquito populations.



An example of GLOBE data I used in my project

## Research Question

**Research Question:** To what extent has COVID-19 had on mosquito populations this year?

This research question is critical to understanding future summers. What happens this year will have repercussions in later years and may have a permanent effect on mosquito populations. The climate conditions between this year and last are not major but the mosquito population is drastically lower, understanding why will help us find a cure to mosquito-transmitted diseases. By finding a way to lower the population of mosquitoes that

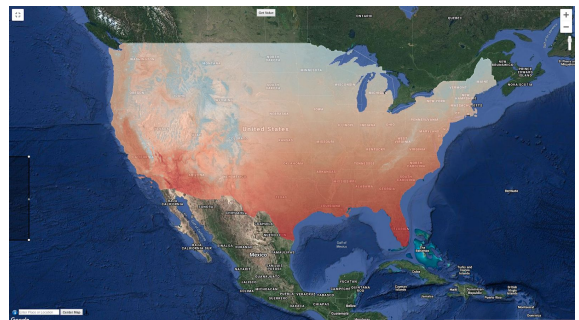
spread diseases could save millions of lives, according to the CDC “forty percent of the world’s population, about 3 billion people, live in areas with a risk of dengue”.

## Introduction and review of literature

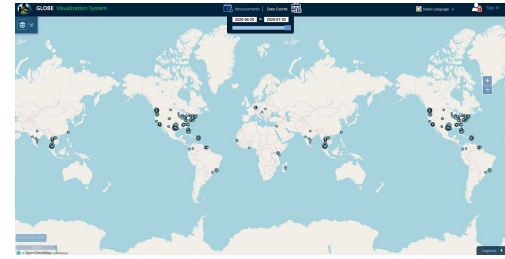
Many theories have been proposed to predict the number of mosquitoes this summer. The Associated Press writes, “this year, because of COVID-19, the mosquitoes will fly free”. They support this claim by giving examples of mosquito control staffers, instead of placing out traps and responding to claims of mosquitoes, they are instead running COVID-19 call centers, “stocking warehouses and preparing coronavirus testing materials”. COVID-19 is taking the attention away from mosquitoes which unleash a myriad of diseases onto the human population. However, despite this prediction of mosquitoes remaining unchecked this year, mosquitoes are notably less common this year. Why is that? Everyone thought that with resources diverted towards COVID-19, there would be more mosquitoes, but its the exact opposite. The state of the research on this topic is barebone, theories are everywhere with few real conclusions. This is due to the recency of this topic. COVID-19 only became serious in the United States in March, mosquito season also started in March and while we should be seeing the peak right now according to CDC, there seem to be none. Understanding the true effect COVID-19 has had on mosquito populations could help save millions of ecosystems. Norbert Becker, Dusan Petric, Marija Zgomba write in their book *Mosquitoes and Their Control*, “As a result, the regulatory power of the ecosystem is maintained by protecting the existing community of mosquito...”. Whether or not the lack of mosquitoes has anything to do with COVID-19 understanding why they’re missing will be key to not only saving mosquitoes but also saving lives. The World Health Organisation writes; “Of all disease-transmitting insects, the mosquito is the greatest menace, spreading malaria, dengue and yellow fever, which together are responsible for several million deaths and hundreds of millions of cases every year”. If we can safely replicate what happened this summer to the specific strains of mosquitoes which transmit diseases, we could wipe out diseases like dengue, West Nile fever, and malaria, saving millions of lives.

## Research Methods

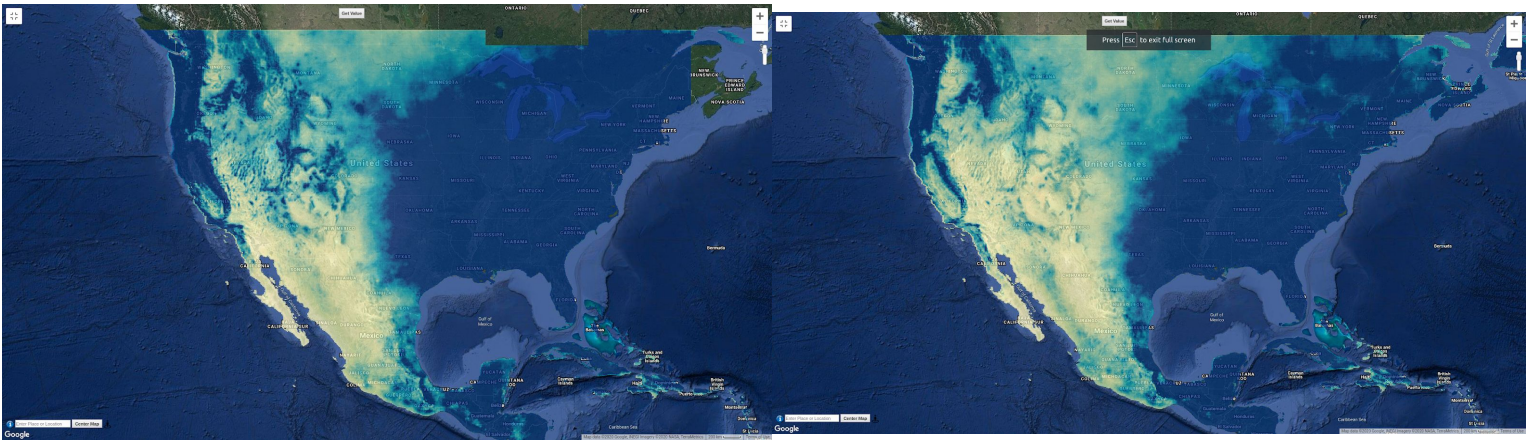
There were two variables I eliminated to make sure that whatever results I found would be as trustworthy as possible, temperature, and precipitation. I used the climate engine provided by [climateengine.org](http://climateengine.org) to look at the precipitation and humidity in 6/20/19 to 9/22/19 and then from 6/20/20 to 9/22/20, (The average temperature index in the United States in 2019 is shown in the image to the



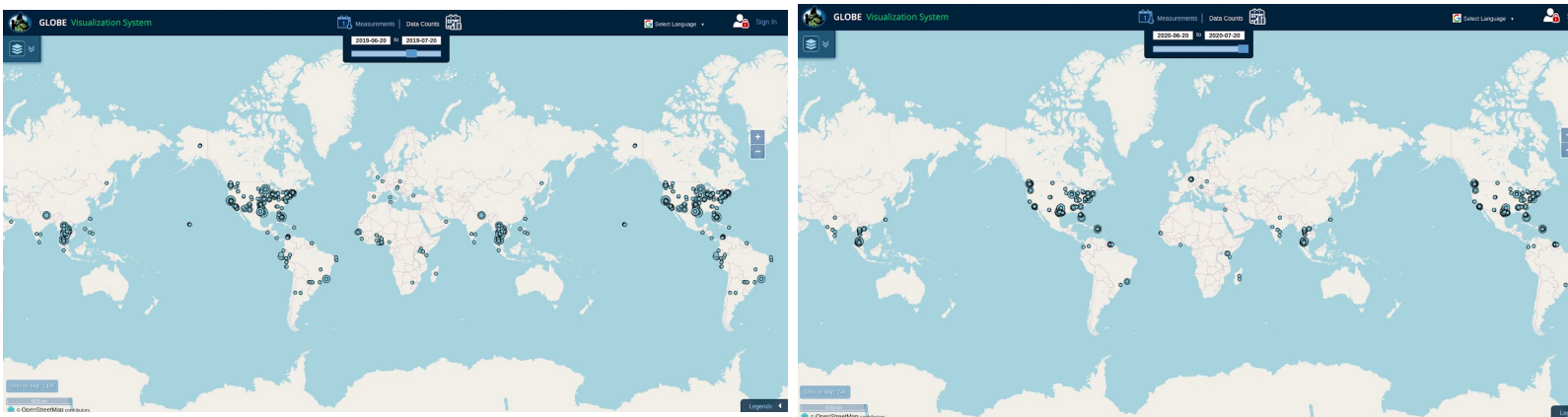
right). After finding that data I used the GLOBE Visualization System to find mosquito habitat observations within 6/20/19 to 7/20/19 and then again from 6/20/20 to 7/20/20. The GLOBE data was used to determine if there were fewer mosquitoes, (which would be found through the number of observations), this year compared to last. The image to the right shows mosquito observations in 2019 from June 20 to July 20. I compared this chart to another from 2020 to back up my claim that there were fewer mosquitoes this year. Having eliminated variables that would change the outcome and having proved there were fewer mosquitoes this year this let me draw conclusions.



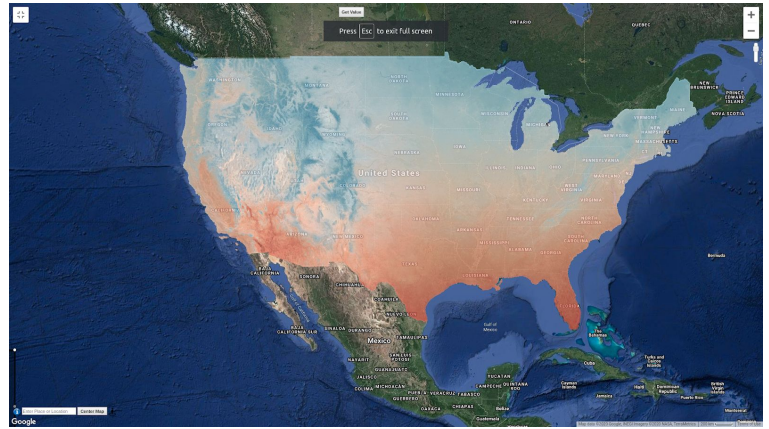
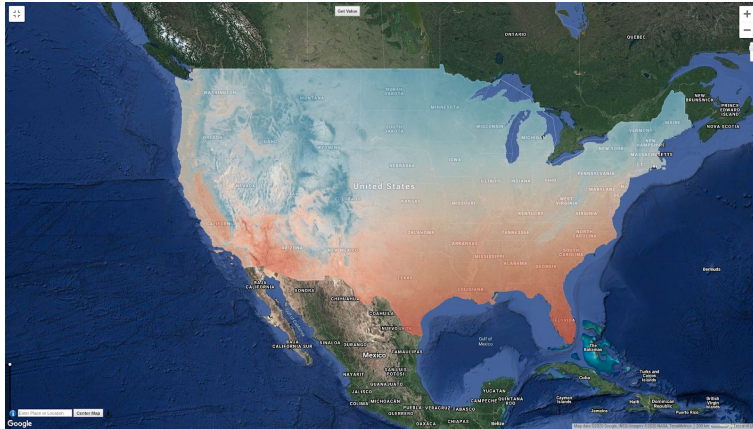
## Results



From left to right satellite data from 2019 and 2020 showing average precipitation in the United States



Mosquito Habitat observations from the GLOBE database the first is from June to July 2019 and the second is from June to July 2020



From left to right satellite data from 2019 and 2020 showing average temperature in the United States

## Discussion

The satellite data showing average precipitation showed that from 2019 to 2020 the levels of precipitation stayed around the same. In fact, 2020 was slightly wetter which should have yielded more mosquitoes, not less. The same goes for the satellite data showing average temperature in 2019 and 2020. 2020 was slightly hotter, instead of fewer mosquitoes this year all factors point to there being more. However, this is not the case as one can see in the GLOBE Mosquito Habitat Mapper observations in the same span of one month exactly one year apart, there are significantly fewer observations. This proves that this year, despite all the factors, reports, and theories saying otherwise, there were fewer mosquitoes. There's one variable that hasn't been ruled out, COVID-19.

When I started this research project, I agreed with all the articles and theories. Because of COVID-19, there would be more mosquitoes than ever. Mosquitoes love street trash, The Baltimore Sun reports; “The main reason poor neighborhoods have more of the buzzing, biting pests is because there are more ‘discarded container habitats’ — trash that pools water and harbors mosquito larvae’, said Shannon L. LaDeau, an associate scientist of disease ecology at the Cary Institute of Ecosystem Studies, an independent environmental research organization in New York”. Due to the increased amount of trash on the streets due to PPE, there would be an increased amount of mosquitoes. That in conjunction with the fact that mosquito control offices are understaffed due to manpower being diverted to COVID-19, everything pointed to a mosquito outbreak. But that wasn't the case. My research was wrong, I thought that the lack of mosquitoes was localized, but it wasn't, it was all over the United States, proven through GLOBE observations. Then I thought well, social distancing which was caused by COVID-19 could be the reason. With a smaller food source maybe mosquitoes were dying out. But humans aren't mosquitoes' main source of nutrients. Even if humans were the main source, social distancing isn't enough to eradicate mosquitoes because its that strict. People aren't holed up in

an airtight house. Mosquitoes would have little difficulty in finding their way into someone's home, and many people are spending more time outside now that they have more time on their hands. My research proved my hypothesis incorrect.

## Conclusion

Mosquito populations respond to lots of variables, but I proved that from last year to this year, there was no major difference, except, for COVID-19. To say COVID-19 is completely at fault for the lack of mosquitoes would be incorrect. There are factors I haven't considered. However, COVID-19 surely had some effect on mosquito populations. The extent of which is difficult to determine until mosquito season is over. If mosquitoes start to pick up then we know that COVID-19 had little effect on mosquitoes. If mosquitoes continue to stay low then its not a stretch to say COVID-19 definitely had an effect. We can assume that having ruled out the two other major variables, temperature, and precipitation. One major improvement that could have been made would be a graph that predicts the mosquito count month by month. If the prediction was available then a conclusion would be much easier to arrive at.

I want to thank Rusty Low and Cassie Soeffing. Ms. Low helped me brainstorm ideas for my project and guided me, her help was critical to the progress of my project. Ms. Soeffing helped me contact my local mosquito control center, without her help I couldn't have gotten access to the data I needed.

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