

“Integrated Mosquito Management and Its Role in Pollinator Protection”

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Due to recent events, most people are familiar with the dreaded Zika virus. Even if they do not know exactly what it is, they have at least heard it mentioned in the news. The panic that spread through the United States over this virus may seem a little extreme, considering that there have only been 4,091 reported cases in this country since January of 2015. (1) However, this does not belittle the horrendous effects this virus may cause to the fetus carried by an infected mother. Conditions such as microcephaly, hearing loss, eye defects, and impaired growth may result. (2) Microcephaly is a condition in which an infant's skull, and as a result, brain is smaller than normal. This often causes developmental issues in the child.

What has caused all this commotion? A simple and insignificant mosquito. When an infected *Aedes* species mosquito bites a human, they transmit the virus. (3) It is that simple and can happen to anyone. Although Zika has been in the news recently, it is certainly not the only harmful disease spread by these tiny insects. Illnesses such as Malaria, Yellow Fever, West Nile Virus, and even Dog Heartworm are all spread by mosquitoes. (4) In 2012 alone, over 627,000 deaths were caused by malaria, according to the Centers for Disease Control and Prevention.

Because of the many harmful diseases spread by these insects, mosquito management has become an important focus in recent years. According to the Michigan Mosquito Manual, this management includes, "a number of methods designed to mitigate, prevent, reduce, exclude, or control the numbers of biting mosquitoes to such an extent that they no longer adversely affect the health or quality of life of persons or populations of people." (5) The manual goes on to list

several methods of mosquito management including impounding water and ditching, draining swampy mosquito breeding areas, treating breeding areas to kill larvae, and aerosol spraying by ground or aerial equipment to eliminate adult mosquitoes.

Some of these methods may have unintended consequences, however. Pesticides, particularly insecticides, that are used on mosquitoes can be very dangerous for honey bees and other pollinators. (6) While mosquito management targeting larvae is rarely harmful to bees, that which seeks to eliminate the adult mosquitoes presents a problem. (7) When thinking about the health of pollinators, it is better to hold off on the pesticides. Before applying insecticides to an area, a person should assess whether a pesticide is truly necessary. If they can find other methods for controlling the mosquitoes, then they should apply those first. If nothing else works, pesticide should be used sparingly and with care.

Speaking about all this pollinator protection may raise the questions, “Why are pollinators so important? Aren’t they just another insect?” To understand the importance and caring for honey bees, it is first essential to appreciate the role they play in everyday life, the environment, and the economy. Pollinators are responsible for the production of more than 85 crops, the value of which is estimated to be over \$15 billion dollars a year. Much of the food that humans enjoy every day is made possible by the work of pollinators such as honey bees. (8) They also provide us with the products of honey and beeswax.

The good news in all this is that, through the use of carefully Integrated Mosquito Management (IMM), we can keep pests under control without harming these important pollinators. According to the Michigan Mosquito Control Association, IMM, “Involves careful consideration of mosquito biology and the environment, as well as, based on scientific surveillance.” (9) The same website states that prevention is the key to dealing with these pests.

Elimination of mosquito breeding grounds stops the larvae from ever reaching adulthood, thus removing the need for insecticides and other pest control methods that present a threat to pollinators.

When using integrated management, one of the first steps is identifying which pests are present in an area. (10) If a person randomly “blanket” sprays an area with pesticides before checking to see what pests live there, he may not even kill the most harmful species and instead damage pollinators. Identifying the pests living in an area also allows a person to decide whether the pest can be tolerated, or if management action is required.

Another asset to integrated management is biological control. This method simply uses natural predators, parasites, pathogens, or competitors to eliminate the mosquitoes. Creatures such as bats, mosquitofish, dragonflies, and toads all enjoy snacking on mosquitoes on a regular basis. (11) Because of this, humans can use these organisms to their advantage in mosquito management by introducing the species to their land.

Environmental sanitation, such as water and waste management, and civil engineering help to cleanse the larval habitats that appear in seasonal floodwaters. If that level of prevention is not possible, the next step is to target the mosquito larvae before they develop into adults. Several larvicide substances have positive results in eliminating larvae and cause little to no damage on the environment. These include bacterial formulations *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*, as well as methoprene, a growth regulator, and temephos, in addition to many others.

When insecticides must be used, natural insecticides such as pyrethrin should be used. These present fewer threats to other organisms than some other insecticides. Before using any insecticides, however, a person must be sure to read the application directions carefully.

To be honest, before I started researching for this essay, I did not even know what Integrated Mosquito Management was. I assumed that all methods of controlling mosquitoes would be harmful to pollinators. Because this is clearly not the case and there are many safe, environmentally-friendly ways to eliminate these pests, we must try our hardest to educate others on the importance of a safe approach to mosquito management. I am sure that many other people know little to nothing about pest control. Through the research I conducted to write this essay, my eyes have been opened to how much Integrated Mosquito Management plays a role in everyday life. We must continue to spread the word about the correct methods of management.

The battle between mosquito management and pollinator protection has been an issue for years, but perhaps now this struggle will no longer trouble people. While misuse of insecticides and unchecked pest control can cause serious damage to the pollinators, the use of Integrated Mosquito Management techniques allows everyone to remain happy, healthy, and pest-free.

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