



**KNOW**

**THE**

**RISKS**

**Join the fight against the bite!**

Fun mosquito facts  
'I survived'

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Pesticides – how safe are they?

## Mosquito 101

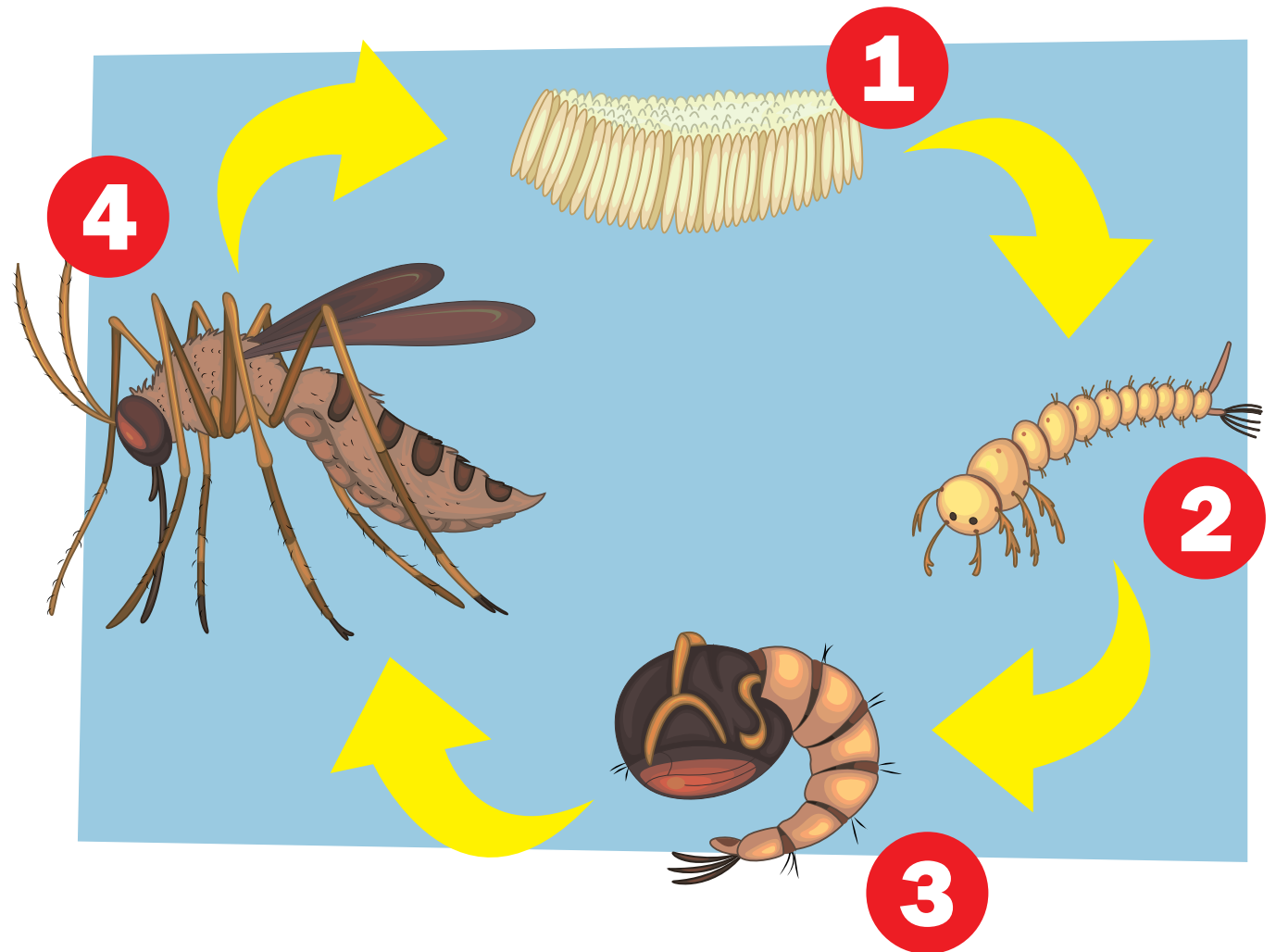
Most people might just view mosquitoes as pests, but they are actually quite complex little bloodsuckers. Here are a few fun facts about these pesky insects:

- There are more than **3,000 species** of mosquitoes worldwide, 176 live in the United States, and 51 different species live in the state of Utah.
- The average mosquito weighs about **2.5 milligrams** and ingests about 5 microliters (5 millionths of a liter) of blood every time it bites.
- Mosquitoes are **attracted to people** by the CO<sub>2</sub> we exhale, sight, and heat.
- All mosquitoes drink nectar and fruit juices for energy, but only the **female mosquito** requires a blood meal before laying her eggs.
- Mosquitoes have two strategies for **laying eggs**. Some mosquitoes lay their eggs in soil. The eggs only hatch when exposed to temporary water, such as rain, irrigation or snow melt. Other mosquitoes lay their eggs on top of permanent/semipermanent bodies of water, such as stagnant water or other water sources around the home.
- Not all mosquitoes transmit **West Nile virus**. The mosquitoes that do transmit WNV only bite from dusk until dawn. This is the time to wear mosquito repellent if you are outside.

# LIFE CYCLE

BY MEREDITH J. GRAHAM

## OF A MOSQUITO

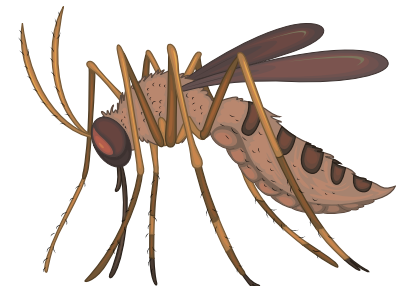
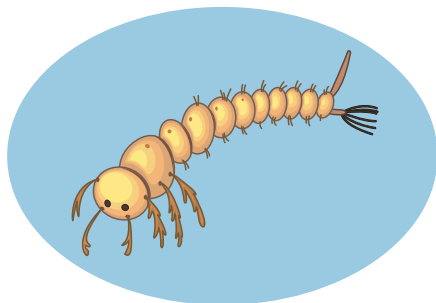
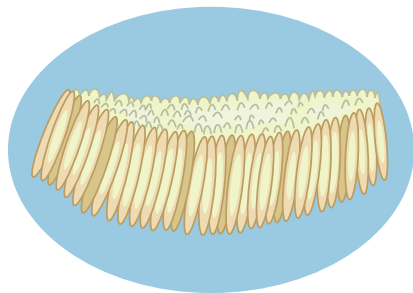


**1. EGG:** Female mosquitoes can lay up to 200 eggs after each blood meal. Eggs laid on the surface of stagnant water hatch almost immediately, while those laid in the moist soil around temporary bodies of water will remain dormant until reflooded.

**2. LARVA:** Larvae breathe air from the surface of the water and feed on bacteria, algae and decaying plant material from the bottom of a water source. When moving between the surface and bottom, they make a wiggling motion, which is why they are sometimes referred to as “wigglers.”

**3. PUPA:** After a few days, the larva sheds its skin and transforms into a “C”-shaped stage known as a pupa. It breathes from the surface through two trumpet-shaped appendages. When the water is disturbed or a shadow is cast over the water, the pupa quickly moves to the bottom of the water in a tumbling-like action to avoid predation.

**4. ADULT:** After about two days the pupa starts a transformation into an adult mosquito. The adult mosquitoes rest on the surface of the water until their wings unfold and they can fly. Male mosquitoes form large swarms in the evening where female mosquitoes join to mate. The cycle is then complete.



JUST

ONE

BITE

BY MEREDITH J. GRAHAM

## That's all it took to turn one woman's life upside down

**W**hen Melissa Dimond stepped outside her new home in Bountiful to chat with a neighbor one evening, she thought to herself, "I should go back in and get some bug spray." But she didn't. And she was bitten by a mosquito on her left ankle.

About 10 days later, Dimond started feeling strange. She had a rash and a headache, as well as a small wedge of blindness in her left eye. She went to a few doctors, explaining she thought she might have West Nile virus. They dismissed her. It wasn't until she went to the emergency room and got tested that she found out she was right.

Dimond actually works for the Utah Department of Health, overseeing the West Nile virus program. So it was painfully ironic when she came down with the virus herself. To make matters worse, her symptoms were among the most severe. Many victims — up to 80 percent — don't have any symptoms at all.

"With my particular case, I became disoriented," Dimond says. "Things stopped making sense. For instance, I went to wash my hands and I couldn't remember how to do it."

Dimond came down with meningitis and encephalitis. She also suffered from gastroparesis, which affected her stomach's ability to digest food, and a loss of the sensation

of swallowing, making it impossible to eat. These complications sent her to the neurocritical care unit. Altogether she spent a month in the hospital and was out of work for three months.

"It took such a long time to recover," she says, recalling all of the relearning she had to do — how to walk, how to type — because she'd simply forgotten how to do those things. "It took about six weeks from the time I became sick to where I was actually able to start eating again."

But West Nile virus wasn't finished with Dimond yet. Six months after her initial recovery, other symptoms appeared and it was suddenly extremely painful to walk or move. She now wears a WalkAide device on her left leg to correct foot drop caused by West Nile.

"Luckily this is not a typical story. I share it because it's really important to understand that while it's rare, it does happen," Dimond says. "Prevention is so simple. I hope people will keep in mind that it can be pretty bad if you're the unlucky person who gets it."

For Dimond, her experience with West Nile virus was a reminder to appreciate the small things.

"I was 31 years old, really active, a cyclist, I did yoga two to three times a week — to have all that taken away was frustrating and awful," she says.



**"Things stopped making sense. For instance, I went to wash my hands and I couldn't remember how to do it."**

MELISSA DIMOND  
WEST NILE VIRUS SURVIVOR

Melissa Dimond contracted West Nile virus in 2006. She's still suffering the effects and now needs a WalkAide to correct her gait. PHOTO BY CHAD ZAVALA

## The Effects of West Nile

West Nile virus is carried by certain species of mosquitoes and can be transmitted to people by the bite of a mosquito. There is no vaccine for West Nile virus, so preventing bites is the best way to avoid infection. Here are some key facts to know about the virus, according to the Centers for Disease Control and Prevention:

- It is estimated that **80 percent** of people infected show mild, flu-like symptoms or no symptoms at all.
- About **20 percent** of people infected will have symptoms that include a fever, headache, body aches, joint pains, vomiting, diarrhea or rash. Fatigue and weakness can last for weeks or months.
- **Fewer than 1 percent** of people infected will develop a neurologic illness such as encephalitis or meningitis (inflammation of the brain and surrounding tissues).
- **Symptoms** associated with neurologic illnesses include headache, fever, neck stiffness, disorientation, coma, tremors, seizures and paralysis.
- About **10 percent** of people who develop the neurological form of West Nile virus will die.



# THE BUZZ ON

# PESTICIDES

BY MICHELLE CARL

## Scientist looks at the risks and benefits of controlling mosquito populations

**D**r. Robert K. D. Peterson does highly technical studies on the effects of pesticides on the environment.

“The papers will be guaranteed to put you to sleep at night,” he jokes.

But that research has given public health professionals — including mosquito abatement districts — information on what science says about the risks and benefits of controlling mosquito populations.

Peterson is a professor of entomology at Montana State University. He studies comparative biological risk assessment — the potential harm different things can have on humans, animals and the environment.

“With the mosquito work we do, we look at what’s the risk from the diseases that these mosquitoes can transmit, and then compare that to the risks from the things we do to manage those mosquitoes,” he says.

Since 2002, he has been conducting lab and field research to assess the effects of introducing mosquito control products into the environment.

The risk those pesticides have to people and wildlife is then compared to the risk for contracting West Nile

virus. Although he points out that West Nile is primarily a disease of birds, when it is contracted by humans, it can be quite severe. It’s estimated that 20 percent of humans infected with West Nile develop severe symptoms.

Science has shown that the benefits of controlling mosquitoes and reducing the spread of West Nile virus far outweigh the potential harm from using pesticides. Peterson says there are plenty of scientific data to back this up.

Mosquito abatement districts serve the public interest by keeping West Nile from spreading through the judicious use of several mosquito management tools. Many of those tools, such as water source reduction and mosquitofish, don’t involve aerosol pesticides. But spraying pesticides is one of the only ways to eliminate adult mosquitoes, which carry the West Nile virus. Peterson says the ultra-low volume application method many districts use is designed to release tiny droplets of pesticide into the air, which then land on flying mosquitoes.

“When it comes to risk to people, the amount of those pesticides used in the environment to knock down

Dr. Robert K. D. Peterson studies the risks mosquitoes and pesticides pose to humans and the environment.  
PHOTO COURTESY OF ROBERT K. D. PETERSON



“The amount of those pesticides used in the environment ... are not anywhere near the amount needed to cause any kind of illness in people.”

DR. ROBERT K. D. PETERSON  
PROFESSOR OF ENTOMOLOGY, MONTANA STATE UNIVERSITY

mosquitoes are not anywhere near the amount needed to cause any kind of illness in people,” Peterson says.

He adds that the ultra-low volume technique deposits less pesticide into the environment than pesticides used to treat agricultural crops.

“When you’re dealing with that low of a concentration you’re putting in the environment, people’s exposure ... is very, very low, and because risk is a function of exposure, the risk is very low,” Peterson says. “These are not particularly toxic materials — they’re toxic to insects, but not particularly toxic to things with backbones.”

Although Peterson looks at the science, he can certainly understand the public’s concerns around spraying pesticides. That’s why he shares his research so that public health professionals can pass good information along to residents.

“It’s a totally normal human reaction to be concerned about [spraying pesticides],” he says. “Where I come in is using the best science we have to be able to predict the risks, and be able to say, ‘Is the cure worse than the disease?’”

## How to Kill a Mosquito



Mosquito abatement districts (MADs) use a combination of techniques known as integrated mosquito management (IMM) to keep mosquito annoyance level and potential for disease transmission at a minimum. IMM includes public education, surveillance, water management, biological control and chemical control.

Mosquito abatement districts perform surveillance to determine mosquito larvae and adult populations. The principles of IMM are then used to determine the best control measure — water management, biological control, or as a last resort, chemical control. If chemical control is the only available option, the life stage of the mosquito is determined and an insecticide is chosen for larvae (larvicide) or for adults (adulticide). Larvicides are applied

to the water where the larvae live. Because adult mosquitoes fly, airborne sprays are required to knock down the adult mosquito.

Both the Environmental Protection Agency and the Centers for Disease Control and Prevention agree that insecticides are necessary to control mosquitoes and protect against the spread of disease. All insecticides used by mosquito abatement districts are approved and registered with the EPA, which has reviewed scientific studies on their use.

“The EPA has assessed these chemicals and found that, when used according to label directions, they do not pose unreasonable risk to public health and the environment,” according to a joint statement released by the EPA and the CDC in 2012.





# FIGHT THE BITE

## Around your home

The mosquito species that carries and transmits West Nile virus could be growing in your own yard. Mosquitoes need water to breed and can lay eggs in even small amounts of standing water, such as plant saucers and pet dishes. To do your part and keep family, neighbors and yourself safe, inspect your yard often and change or drain any sources of water. Mosquitoes can grow from egg to adult in just a few days, so check at least weekly.

## Other Tips:

- Make sure doors and windows of your home are fitted with screens to keep the biting pests at bay.
- Stock your ornamental pond with mosquitofish, which feed on mosquito larvae. Contact your local mosquito abatement district for information on getting mosquitofish for free.
- Anonymously report sources of standing water in your neighborhood, such as neglected swimming pools, ditches or storm drains, by calling the local mosquito abatement district.
- When experiencing mosquito problems around your home call your mosquito abatement district for help — that's their job.

## Watch out for these trouble spots where water can collect:



- Birdbaths and fountains
- Rain gutters and downspouts
- Plant saucers
- Tree holes and stumps
- Over-watered lawns and gardens
- Open trash or recycling bins
- Ponds or low-lying areas that may fill with water
- Kiddie pools



- Pet dishes
- Tarps over woodpiles, boats or vehicles
- Rain gutters and downspouts
- Old tires, buckets, bottles or cans
- Wheelbarrows and wagons
- Leaky hoses and puddles
- Sand pails and other toys
- Neglected or untreated swimming pools, above-ground pools and spas

## Going Out? Stay safe from a mosquito's bite

Mosquito repellents are an important way to protect yourself and your family when you head outside. Here's what you need to know:

- Choose a repellent that has been reviewed and approved by the Environmental Protection Agency. Repellents containing the active ingredients DEET, Picardin or oil of lemon eucalyptus have been approved.
- Follow label directions carefully.
- Use repellent sparingly and reapply as necessary, as directed by package instructions. Spraying repellent on heavily **does not increase its effectiveness.**
- Apply only on exposed areas of skin, **not over clothing.**
- **Cover all exposed skin** with repellent — a mosquito can find

a patch of untreated skin the size of a dime.

- Avoid applying near the eyes, nose and lips. Avoid inhaling or ingesting repellent.
- The American Academy of Pediatrics suggests that DEET-based repellents at concentrations of **10 percent or less** can be used on children as young as 2 months. Concentrations of up to 30 percent can be used if disease risk is high.
- Avoid applying repellent to areas of children's hands that are likely to come in contact with the eyes or mouth.
- **Pregnant and nursing women** should minimize repellent use.
- Do not apply repellent to broken or irritated skin.

In addition to repellent, keep in mind these other tips when heading outdoors:

- If possible, avoid outdoor activity from dusk until dawn, the **peak mosquito biting time.**
- Wear loose-fitting, light-colored clothing. Studies show mosquitoes are **more attracted to dark colors**, and can even bite through tight clothing.
- Wear long-sleeved shirts and long pants, especially from dusk until dawn.
- Candles, torches and coils containing oil of citronella can offer some protection, but are useful **outside only when there is no wind** and are generally not as effective as repellent.

# FINDING

# THE RIGHT MIX

BY MIKE BLOUNT

## Integrated mosquito management controls population



Mosquito traps help mosquito abatement districts conduct surveillance, which is one of the principles of integrated mosquito management. PHOTO COURTESY OF WEBER MOSQUITO ABATEMENT DISTRICT

“Much of it goes back to two things: public education and surveillance.”

RYAN ARKODAS

DIRECTOR OF WEBER MOSQUITO ABATEMENT DISTRICT

When it comes to controlling the mosquito population in Utah, mosquito abatement districts use an approach known as integrated mosquito management (IMM). Ryan Arkoudas, director of Weber Mosquito Abatement District, says that integrated mosquito management is like a tool box districts can use to be more effective. The tools of IMM are public education, water management, surveillance, biological control and chemical control. But in order to find the right tools to use, they first have to know what they’re dealing with.

“Surveillance is the key component,” Arkoudas says. “We go into the field to inspect and survey areas taking larval

samples or through adult trap collections. We need to know which species of mosquitoes we’re dealing with. That helps us determine which tools to use.”

Arkoudas adds that surveillance also entails following up on their methods after they’ve been implemented to see how effective they are. If they don’t have an impact, they can switch their focus to a different tool.

“One of the methods that everyone can help with in controlling mosquitoes is water management. This is simply done by removing any standing water around your house or on your property” Arkoudas says. “On a large scale, like in a marsh or wetland, this isn’t possible. However, water management, by draining or eliminating standing water around one’s home, can really help.”

Because mosquitoes lay their eggs on standing water, residents can break the mosquito life cycle by eliminating potential breeding grounds around the home.

Some examples would be changing out birdbath water, water troughs, and pet dishes once every week, being sure to not over-water their lawn and looking for anything that collects water. Educating the public on how they can help is a large part of integrated mosquito management, according to Arkoudas.

Many mosquito abatement districts will provide help in controlling mosquitoes in ornamental ponds by introducing mosquito-eating fish, a form of biological control, or by adding a slow-release growth inhibitor to stop mosquitoes from developing.

Most mosquito abatement districts spend the majority of their time inspecting a wide variety of mosquito habitats looking for mosquito larvae. These habitats range from small storm drains and gutters to irrigated fields and pastures to marshes and wetlands covering hundreds of acres. When mosquito larvae are found and meet certain control requirements, larvicides are used and can be very effective.

Adult mosquitoes also have to be treated with chemicals known as

adulticides. Since adult mosquitoes can fly and move several miles, these can be more difficult to control. Adulticides are used to control adult mosquito populations because they can cover a larger area and can be more effective.

Mosquito abatement districts primarily use a process of spraying known as “ultra-low volume,” in which pesticides are sprayed from above, creating a cloud that relies on wind to carry it over an area. Arkoudas says the pesticides are safe and are used at concentrations well below those that have been determined safe by the Environmental Protection Agency.

“There are a number of different ways we control mosquitoes, each originating in the principles of integrated mosquito management. But I believe that much of it goes back to two things: public education and surveillance,” Arkoudas says. “It is important to know the mosquito species before the appropriate control tool is used and equally important to know if that control method is effective. And educating the public on what they can do helps us that much more.”

### Integrated mosquito management tools

- Public education
- Surveillance
- Water management
- Biological control
- Chemical control



### Mosquitofish

*Gambusia affinis*, or mosquitofish as they are more commonly known, are a species of freshwater fish that feeds on mosquito larvae. Mosquitofish are used by mosquito abatement districts as part of integrated mosquito management.

Generally, mosquitofish can be provided by the mosquito abatement district for no additional charge if the property meets specific criteria, such as having ponds above the 100-year flood line that are not connected to a natural waterway. Because mosquitofish are extremely voracious predators, they must be introduced into closed systems, such as an ornamental pond, to prevent them from out-competing other species of fish. Mosquito abatement districts in Utah work with the Utah Division of Wildlife Resources to ensure a safe introduction.

For more information, contact your local mosquito abatement district.





# MEET

# THE DISTRICTS



BY SCOTT CATRON (OWN WORK) VIA WIKICOMMONS

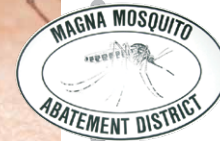
## Mosquito Abatement District - Davis

The Mosquito Abatement District - Davis (MAD-D) started its mosquito control program in 1951 under the direction of the health department. The Special or Local District was formed in 1954. Two employees were hired to conduct the spray program. The district equipment consisted of two backpack sprayers and transportation was one horse and a motorcycle. Today, the district is meeting increasing demand for mosquito control in Davis County in a safe and ecologically sound manner. The district not only controls the mosquito population for public health and comfort, but also serves as a resource on mosquito biology, control and prevention.



## Magna Mosquito Abatement District

Since 1946, the Magna Mosquito Abatement District (MMAD) has been protecting the public from mosquitoes and mosquito-borne diseases. The district covers 100 square miles, which includes more than 20,000 mosquito breeding sites. Staff members monitor these sites to find, identify and control the mosquito population. Staff also visit schools to discuss mosquitoes and how to stay safe.



## South Salt Lake Valley MAD

Since 1953, South Salt Lake Valley Mosquito Abatement District's mission has been to safeguard the health, welfare and comfort of the public by controlling mosquitoes and black flies over a mostly urban space that covers 561 square miles. The district does this with an emphasis on safety, high standards, environmental awareness, cost efficiency, responsibility and leadership. It remains committed to educating the public on how to protect against mosquitoes by reducing breeding sources, such as horse troughs and tree holes.



## Weber Mosquito Abatement District

The Weber Mosquito Abatement District (MAD) has been serving the residents of Weber County since 1947. The district's mission is to enhance public health and quality of life through the suppression of mosquito transmitted diseases and to reduce the levels of nuisance causing mosquitoes. The Weber MAD employs qualified, professional staff that monitor adult mosquito populations, conduct larval surveillance and inspections, using the safest, most advanced and approved pesticides available today when needed. The Weber MAD operates several trucks, ATVs, and an airplane in its efforts to achieve this mission.

## Salt Lake City Mosquito Abatement District

The Salt Lake City Mosquito Abatement District was organized in 1924 under the state law passed by the Utah State Legislature in 1923. District employees are constantly inspecting, treating and draining nuisance areas in the 111 square miles that comprise Salt Lake City. Most mosquitoes are produced in the wetlands northwest of the SLC International Airport. However, there are many areas around homes and in the city that can breed mosquitoes. The district also monitors adult mosquito populations throughout the city using a variety of trapping devices. The district tests captured mosquitoes for a number of diseases including West Nile virus, western equine encephalitis and St. Louis encephalitis.





# JOIN THE FIGHT

# AGAINST THE BITE

Your mosquito abatement district is here to protect you against mosquitoes and the harmful diseases they spread.



### WHAT YOU CAN DO:

- REDUCE SOURCES**  
Eliminate standing water sources around your home, such as birdbaths, tires and over-watered lawns.
- USE REPELLENTS**  
A DEET-based repellent will keep mosquitoes away.
- REPORT ABANDONED POOLS**  
If there is a neglected swimming pool in your neighborhood, report it to your local district.

### WHAT YOUR MOSQUITO ABATEMENT DISTRICT CAN DO FOR YOU:

- SERVICE CALL**  
If you have more than the usual amount of mosquito activity on your property, contact your district to schedule a service call.
- MOSQUITOFISH**  
Many districts will provide mosquitofish for free to residents with an ornamental pond on their property. *(Unavailable in Magna)*
- CONTROL**  
Districts will determine the best way to curb mosquitoes on your property, whether from a biological control method (mosquitofish) or insecticides.

### Weber Mosquito Abatement District

505 West 12th St.  
Ogden, UT 84401

🕒 Monday – Friday, 7 a.m.-4:30 p.m.

☎ 801-392-1630

🌐 [www.webermosquito.com](http://www.webermosquito.com)

👍 Like us on Facebook

### Mosquito Abatement District - Davis

85 North 600 West  
Kaysville, UT 84037

☎ 801-544-373

✉ [davismosquito@gmail.com](mailto:davismosquito@gmail.com)

🌐 [www.davismosquito.org](http://www.davismosquito.org)

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### Magna Mosquito Abatement District

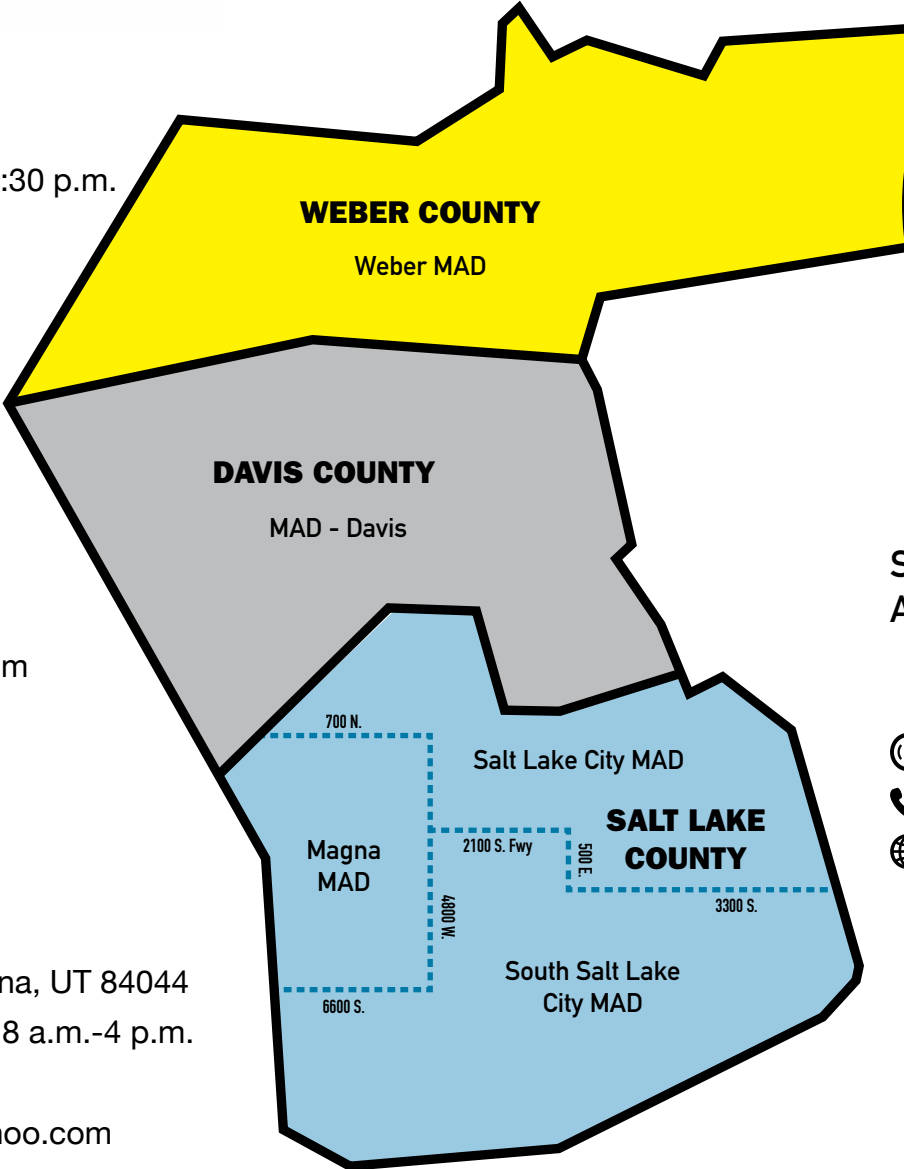
P.O. Box 40, Magna, UT 84044

🕒 Monday – Friday, 8 a.m.-4 p.m.

☎ 801-250-7765

✉ [magnamosq@yahoo.com](mailto:magnamosq@yahoo.com)

🌐 [www.magnamosquito.com](http://www.magnamosquito.com)



**Visit the website of your mosquito abatement district to share your thoughts on this educational supplement.**

### Salt Lake City Mosquito Abatement District

2020 N. Redwood Road  
Salt Lake City, UT 84116

🕒 Monday – Friday, 7 a.m.-3:30 p.m.

☎ 801-355-9221

🌐 [www.slcmad.org](http://www.slcmad.org)

### South Salt Lake Valley MAD

7308 Airport Road  
West Jordan, UT 84084

🕒 Monday – Friday, 7 a.m.-3:30 p.m.

☎ 801-255-4651

🌐 [www.sslvmad.org](http://www.sslvmad.org)