

THE MOSQUITO AND YOU: WHAT YOU NEED TO KNOW

Fight the Bite

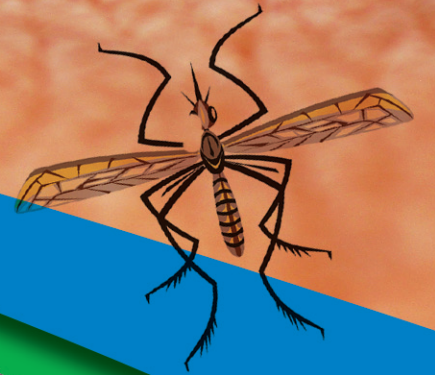


SACRAMENTO-YOLO
MOSQUITO
& VECTOR
CONTROL
DISTRICT

1.800.429.1022
FIGHTtheBITE.net

INSIDE:

- Mosquito Factoids
- Preventative Measures
- Talk From Experts
- Harrowing Tales



MOSQUITO 101

CHECK OUT THESE INTERESTING SCIENTIFIC FACTS

- There are 3,500 species of mosquitoes on earth; 170 in North America.
- 53 different mosquito species occur in California; 24 mosquito species live in Sacramento and Yolo counties.
- Only female mosquitoes bite; they need blood protein to make eggs.
- Mosquitoes use exhaled carbon dioxide, body odor, temperature and movement to target humans, other mammals and birds.
- Female mosquitoes live from three to 100 days, males from 10 to 20 days.
- The female of most species can lay 100 to 300 eggs at a time, and 1,000 to 3,000 eggs in her lifetime.
- Mosquitoes need water to complete the first three stages of life — egg, larva, pupa — that precede adulthood. Remember: No stagnant water, no mosquitoes!
- Mosquitoes can breed in old tires, street basins (storm drains), buckets, neglected pools, flowerpot bottom dishes, birdbaths, pet dishes, kiddie pools and toys, ponds — wherever there is standing water.
- Most adult mosquitoes remain within one mile of where they were hatched. A few species range 20 miles or more.
- Mosquitoes have been around since dinosaurs walked the earth. They're not going away.
- Mosquito populations can be kept from exploding before they become airborne threats to public health! District efforts target them at the larval and pupal stages.
- Mosquito bites kill more people on earth than any other single disease factor.
- In the U.S., mosquitoes are a vector* who spread West Nile virus, encephalitis, dog heartworm, malaria and dengue fever.

* **Vector:** any animal that can transmit a disease to another animal or human.
A mosquito is an example of a vector.

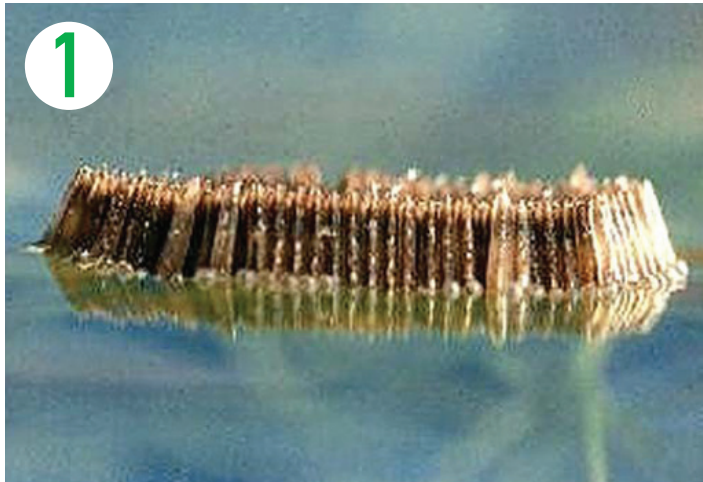
MOSQUITOES OF PUBLIC HEALTH SIGNIFICANCE

Encephalitis Mosquito (*Culex tarsalis*)

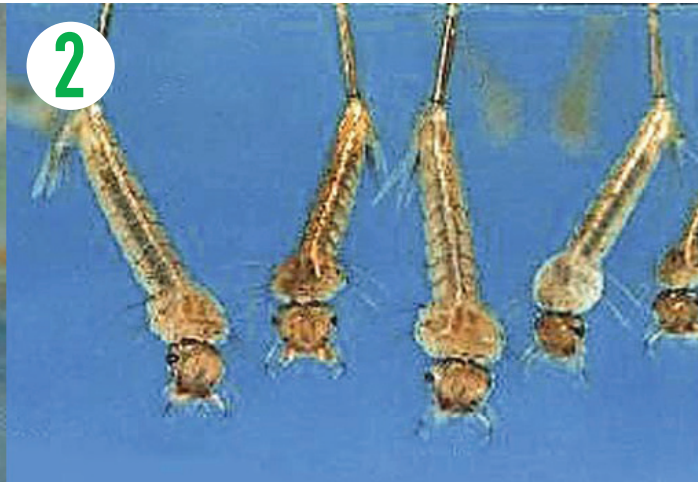
This mosquito can transmit West Nile virus, Western Equine Encephalomyelitis virus and St. Louis Encephalitis virus. Immature mosquitoes develop in wetlands, duck clubs, rice fields and irrigated crops. The adult mosquito prefers to feed on birds and mammals. It is most active during summer and fall months.



LIFE CYCLE OF THE MOSQUITO



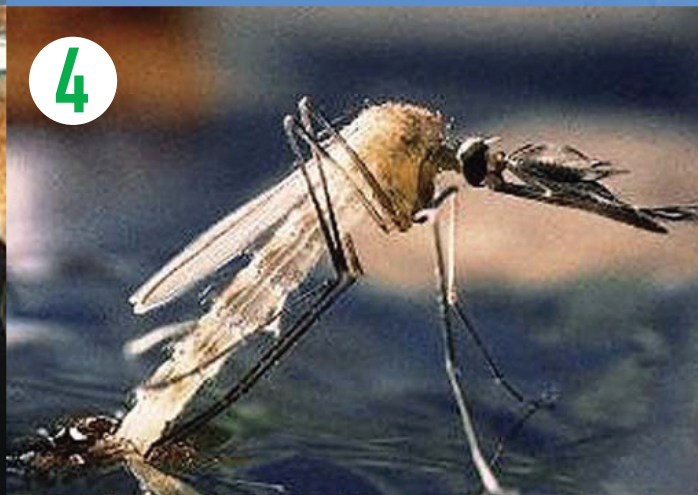
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1 Mosquitoes lay eggs in or near water, or on flood-prone soil. Mosquito eggs need water. Water activates the hatching process — the warmer the water and air, the quicker the egg becomes an adult. Some species, such as *Culex pipiens*, lay eggs by the hundreds, bundled in rafts; others lay individual eggs. The incubation period of *C. pipiens* can take two days from a laid egg to hatch into a larva.

2 Each larva, or “wiggler,” breathes through a tube in its tail, which breaks the water surface. The larva feeds on decaying plant matter and other organic material in the water.

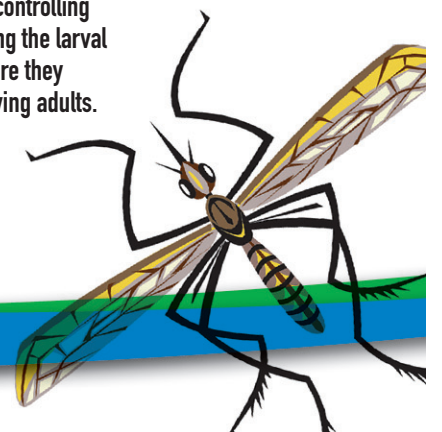
3 After seven to 14 days, the larva transforms into a pupa, or “tumbler.” The hardened, comma-shaped pupa breathes through a pair of trumpet-like appendages on its thorax. The pupa doesn’t feed; it’s busy transforming into an adult, which takes around two days. The pupa remains aware of its surroundings, reflexively flipping away from threats.

4 The adult emerges after the submerged pupal shell fills with air until it bursts. It rests on the water surface until its wings dry and stiffen, then flies away. Most adult mosquitoes feed on nectar from plants, flowers or rotting fruit. But females of most species need animal blood for protein to make eggs.

Since some adult female mosquitoes bite humans, other mammals and birds, they are called vectors, or transmitters of disease between animals and humans (other arthropod vectors include ticks, mites and fleas). Vector control, for mosquitoes, includes controlling populations by attacking the larval and pupal stages, before they become disease-carrying adults.

Northern House Mosquito (*Culex pipiens*)

The Northern House Mosquito has been known to transmit West Nile virus and St. Louis Encephalitis virus. It is common through Sacramento and Yolo counties. Immature mosquitoes develop in foul water sources such as dairy drains, catch basins and artificial containers. It prefers to feed on birds but will readily feed on humans. This mosquito is most active during the summer and fall months.



KEIRA DOMER: GRATEFUL TO BE ALIVE

by Anna Barela

Keira Domer's life changed the day she contracted West Nile neuroinvasive disease – the worst known form of West Nile virus – presumably from a mosquito along Putah Creek in Davis. As her symptoms proliferated, Domer sought medical treatment and diagnosis. But it would be a long wait before Domer knew the cause of her symptoms, and even longer for her to fully recover.

Domer – named Simmons at the time – frequently hiked with her fiancé, Paul, along Putah Creek after work during the spring of 2005. Domer worked in research at the UC Davis School of Medicine. She and Paul had been dating for about six months, and she was planning to attend medical school to continue her work with infectious disease research. She never considered the possibility of West Nile virus interrupting her life.

It all started when Domer woke up one June morning in 2005 with a splotchy red rash all over her body. Within days she developed an overwhelming headache, a fever of 106 degrees, vomiting, muscle pain and dizziness. She began to lose weight rapidly. On one occasion, her fiancé reported she passed out. In the course of a week, he rushed her to the emergency room four times.

Domer recalls one doctor mentioning the need to test for West Nile virus. Apparently the test was never performed. This oversight, combined with – Domer supposed – medical staff assumptions that West Nile virus only affects the elderly to this extent, left Domer undiagnosed and untreated.

"No one ever mentioned West Nile again," said Domer. "I had no idea what was going on. I was generally healthy, young, and really had no conditions that should have predisposed me to this kind of infection."

After her fourth ER discharge, Domer visited her family physician. This doctor finally acknowledged the severity of her symptoms and had her admitted to the hospital. She received IV fluids to combat her severe dehydration and steroids to help her headache. She finally began to recover and was able to go home.

But continued recovery was slow. For two months her symptoms kept her trapped in her home, unable to work, drive or even perform simple tasks like taking a shower. Her fiancé Paul stayed by her side, assisting her with everything.

"I had never been so sick," she recalled. "Even after I started getting well, I was so dizzy I couldn't walk without holding on to the walls. I couldn't drive for quite a while, which for someone as independent as I am, that was a real tough pill to swallow."

When she felt well enough to return to work, she was still plagued with bouts of dizziness and headaches as well as weakness in her hands, making her work in the lab difficult. She felt unsupported by her supervisors and coworkers, which she blames on the fact that her illness was not labeled.

She said, "I'd gone from being very active in my research and very good at what I did to being completely incapable of doing it anymore."

Domer left her job of five years that fall and accepted a position with the UC Davis Center for Vectorborne

Diseases (CVEC). Ironically, her new job involved surveillance of West Nile virus. Employees of CVEC received routine blood tests to track their exposure to viruses; Domer's results showed massive antibodies to West Nile virus, indicating massive infection by the virus. She felt vindicated, then angry.

"I felt a sense of relief. Even though there was no doubt I was horribly sick, it's strange psychologically what putting a name to it can do. Then I think anger took over. I presented with absolutely classic symptoms of West Nile from beginning to end. No one thought about it, and the normal channels of testing weren't followed."

It was a full two years before all of Domer's symptoms subsided. Today, she is symptom-free and healthy. She and Paul are married, and she is studying at the University of Pacific to become a pharmacist – a career path change she chose because of her experience being sick.

Domer views pharmacists as the most accessible health

professionals and wants to educate others. She hopes people will protect themselves with long sleeves and bug repellent. She supports aerial spraying for mosquitoes, comparing it to the risk of a vaccine outweighed by the risk of debilitating diseases they prevent.

She also urges people to be their own advocate in the medical field. She wonders if her symptoms would have subsided sooner or been milder if she had received treatment right away. She wonders if her career would have changed so dramatically if she'd had a diagnosis.

Despite these questions, Domer is grateful for her fiancé caring for her every step of the way. She is grateful she shows no signs of permanent brain damage, a common effect of the brain swelling caused by West Nile virus. Above all, she is grateful to be alive.



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THE COUNTY AND CONTROL

DR. GLENNAH TROCHET AND HER RELATIONSHIP
WITH MOSQUITO VECTOR CONTROL by Jeff Chinn

Mosquito season in Sacramento can leave masses of people littered with itchy bumps. But when it comes to mosquitoes, the bigger threat lurking is West Nile virus.

West Nile virus (WNV) is labeled by the Center for Disease Control as "a potentially serious illness." While many infected can suffer no disease, Sacramento County Public Health Officer Dr. Glennah Trochet said it could also lead to death or other tragic ends.

"People in their 50s and older have a very high risk of developing a paralytic disease, or a neuroinvasive disease where they have swelling of the brain or even go into a coma."

When a doctor believes they discovered a case of West Nile fever or West Nile neuroinvasive disease, they are obligated by law to report it to the county. If the county confirms the virus is West Nile, then Trochet calls the Mosquito Vector Control.

"We give Mosquito Vector Control the location so that they can go trap mosquitoes and determine whether that area has a lot of infected mosquitoes," Trochet said. "And then they do whatever they need to do to control those mosquitoes."

In 2005, what Mosquito Vector Control needed to do included aerial spraying. That year saw a high of 177 cases of WNV reported, and Mosquito Vector Control decided spraying was the best way to combat the virus. Despite public controversy over the decision, Trochet happily supported them.

Still, the aggressive treatment left some members of the public anxious. To make sure there were minimal side effects of the aerial spraying, Trochet had a researcher visit every single emergency room in the county to see if there were increased visits for respiratory problems.

After nearly two years of research, no such cases were found.

The more usual operations of the Mosquito Vector Control, however, include tasks such as watching bird populations. After mosquitoes bite birds, birds become a reservoir where the virus can multiply. Then when mosquitoes bite the birds again, they are capable of infecting humans.

There are several species of birds that are especially susceptible to the virus, and when large amounts of them die in an area, it can be an indicator of where WNV is moving.

"As it moved across the country it was usually preceded by the deaths of cormorants: crows, jays and unfortunately in the Sacramento Valley, the Central Valley magpies."

Trochet also mentioned Mosquito Vector Control also works to control the spreading of viruses other than WNV. In the 1980s there were a couple of cases malaria in the Delta region, and Mosquito Vector Control handled them efficiently.

"Mosquito Vector Control went out and sprayed around the home of the person who had malaria and the family who also got the malaria," Trochet said. "And it never spread again."

Really, the control of WNV and other mosquito-spread illnesses is the control of the mosquitoes. And with an organization like Mosquito Vector Control, Trochet is happy to lend her support.



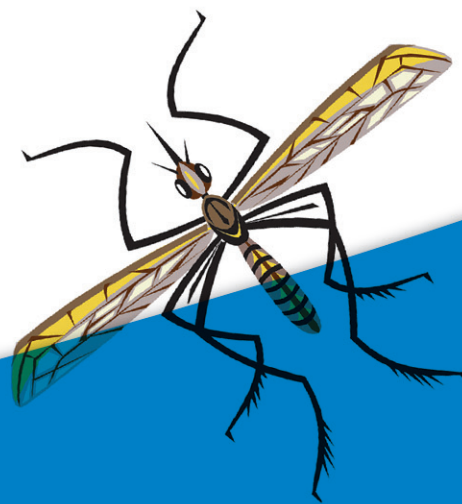
WHAT YOU CAN DO: DRAIN IT!

WATCH OUT FOR THESE COMMON BACKYARD MOSQUITO BREEDING SOURCES



- NEGLECTED POOLS
- PONDS
- FOUNTAINS AND BIRD BATHS
- PLANT SAUCERS
- WATER BOWLS FOR PETS
- WAGONS AND OTHER TOYS
- LEAKY HOSES
- LOW AREAS OF YOUR LANDSCAPE
- ROT HOLES IN TREES
- CLOGGED RAIN GUTTERS
- UNCOVERED BOATS
- OPEN TRASH BINS

*** Be sure to inspect your yard once a week, and drain any standing water!**



PROTECT YOURSELF: LEARN THE 7 Ds

DRAIN any standing water that may produce mosquitoes. Today's puddle is tomorrow's mosquito nursery.

DAWN and **DUSK** are times to avoid being outside. This is when mosquitoes are most active. Remember: When the sun goes up or it's going down, that's when mosquitoes are flying around.

DRESS appropriately by wearing long sleeves and pants when outdoors. Yes, on some hot days, it's hard to think about wearing additional clothing – but those extra clothes may protect you from mosquito bites.

DEFEND yourself against mosquitoes by using an effective insect repellent, such as DEET (N,N-Diethyl-m-toluamide), Picaridin or oil of lemon eucalyptus. Make sure you follow label directions! Repellents keep mosquitoes away, so they won't bite you.

DOOR and window screens should be in good working condition. Keep doors closed and make sure your screens are free of holes. This will prevent mosquitoes from entering your home and biting you when you are asleep.

DISTRICT personnel are available to address any mosquito problem you may be experiencing. Call the District at **1-800-429-1022** or visit **FIGHTtheBITE.net**.

WHAT YOU CAN DO: USE REPELLENTS



REPELLENT SAFETY

- ☐ Always follow label instructions when using repellents.
- ☐ Apply repellents only to exposed skin and/or clothing.
- ☐ Do not apply repellents over cuts, wounds or irritated skin.
- ☐ Do not spray repellent directly on your face—spray on your hands and then apply to face. Use repellent spray sparingly around eyes, mouth and ears.
- ☐ Children should not handle repellents. Apply repellent to your own hands first and then put it on the child. You may not want to apply to children's hands.
- ☐ Use separate repellent and sunscreen products, because they need to be reapplied at different times.
- ☐ Do not spray aerosol or pump products in enclosed areas.
- ☐ After using repellents, wash treated clothing before wearing again.
- ☐ If you or your child suffers an adverse reaction following repellent use, discontinue use, wash affected areas and contact your physician or a local poison control center.

“Find a product that you like and use it.”

There are lotions, sprays and towelettes.

The most important thing to look for is the percentage of the active ingredient. Examples of active ingredients include DEET, Picaridin, IR3535 and oil of lemon eucalyptus. The higher the percentage, the longer it protects. It's also important to consider the activity.

A simple walk to the park or walking your dog in the evening would require a lighter repellent, whereas, if you're going camping (where there will be other biting insects and ticks), [it] would require something stronger.

— Luz María Rodríguez,
Public Information Officer,
Sacramento-Yolo Mosquito & Vector
Control District.

**FREE
REPELLENT**
Protecting yourself against mosquito bites includes using an effective insect repellent. The District provides **FREE MOSQUITO REPELLENT WIPES** to the public and to any group that is organizing an evening outdoor event. Call the District to get additional details.

PESTICIDES ARE JUST ONE COMPONENT OF AN INTEGRATED PEST MANAGEMENT PLAN

Q&A WITH DAVID BROWN, MANAGER OF THE SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT

BY JEFF VON KAENEL

How critical are pesticides to controlling mosquitoes?

The public health pesticides that we use are a component of our integrated pest management plan. We do what we can to detect where the mosquitoes are, and then take corrective measures. Corrective measures include managing the water, draining the water, and using biological controls such as mosquito fish that may be able to feed on the mosquitoes. In the event we can't do that, then really the only other way of controlling mosquitoes is using targeted pesticide applications. So they are a critical component of an integrated mosquito management plan.

How do the pesticides that you use differ from those people use at home?

I'll answer that in two different ways. One, the pesticides we use, many of them have been formulated to target mosquitoes or insects the size of mosquitoes. We use such low dosage rates; they really only go after just the mosquitoes, as opposed to other products used at home that have a much broader spectrum of impact on a variety of insects. So that's the main difference.

The second component of this is that at home, you're using them as an individual who's not necessarily trained in how to either mix or apply the pesticides. All of our technicians are certified through the California Department of Public Health to not only understand the impact of the pesticides they use, but then to apply those pesticides in ways that minimize any impact that may occur.

We have to be regulated, we have to be trained, and we use the products according to the label directions. As an example, the average homeowner doesn't do that. My dad may go to [a nursery] because he has ants on his roses, and he wants to get rid of the ants. If a little of the pesticide is good, then a lot is probably better. So he empties the bottle without reading the label. He knows it will kill them because it says so.

We in mosquito control are being trained and regulated, but the average homeowner is not necessarily trained in the appropriate use of pesticides ... so putting more regulation on us as a public health agency will not necessarily address the issue of pesticides in our environment.

So how does your agency ensure the safety of the pesticides?

We try to avoid or to minimize the use of pesticides in the first place. If we can drain that bucket of water, then we'll drain it rather than applying a pesticide. We extensively train our technicians to go through those steps first before we make those pesticide applications.

We also train our technicians in how to apply the pesticides, how to mix and formulate the pesticides so that we use them as efficiently and as economically as we can. And of course, the label's the law: They're all trained to make sure they follow the label directions in any application they make.

There's been proposed legislation and judicial rulings that would impact the use of pesticides. How could those rulings and decisions impact your agency?

Back in the '70s, both the Clean Water Act and the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) were significantly amended. At that time

pesticides, when applied according to their label directions, were never identified as "pollutants" and regulated under the Clean Water Act. Because of litigation, properly applied pesticides have now been identified as pollutants. This is a concern because it allows citizens to identify parts of the Clean Water Act that they deem us to be noncompliant with that results in litigation ... and in some cases this litigation is simply because some citizens don't want any spraying of pesticide, no matter what they are being used for.

An awful lot of natural waterways produce mosquitoes. We have to treat those waterways. If we have to take a water sample prior and we have to take a water sample after, in each one of those areas where we may have to treat for mosquitoes, it can get prohibitively expensive for us to be able to continue to do our job to reduce the overall mosquito problem.

We will be diverting resources to try to address these regulations that will not provide any environmental benefit. The current regulations will not only impact our ability to control mosquitoes, but the public's ability to avoid being bitten by mosquitoes infected with mosquito-borne diseases.

Then, Dave, how should we balance the public need for controlling mosquitoes while minimizing the danger of pesticides? What do you recommend there?

I think there should be recognition of risks vs. benefits. It's clear, at least for public health pesticides, that we do this based on surveillance, based on a demonstrated need that if these mosquitoes aren't reduced, the quality of life and risk of disease transmission can occur to our general population.

So, in terms of the amount of pesticides that are put into our water systems, what percentage comes from agencies like yours?

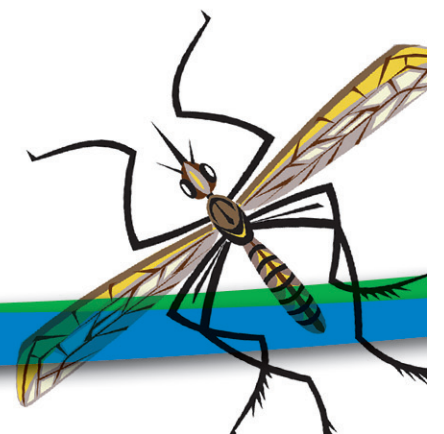
We know from a study done by the California Department of Public Health that mosquito control public health pesticides are less than one-third of one percent of all reported pesticide use. So we're a very small component of any pesticides found throughout California.

In summary, the pesticides used by the Mosquito & Vector Control District represent a very small component of the total pesticides used, and they tend to be less damaging because they are so geared towards mosquitoes. And you have additional training in the proper use of pesticides, which most homeowners would not have.

That's correct. That's what I wish I had said.

Finally, as opposed to other uses, which may help increase the value of a certain crop slightly, or make a park more beautiful, you're using pesticides to prevent a major public health problem.

That's correct. You know, if it's a crop, then that's a little different, because you're trying to feed the world. But I have a problem with spraying pesticides in areas just to keep the roses redder or the grasses greener. Boy, I think there's a huge distinction there.



ABOUT THE SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT

Established in 1946, the Sacramento-Yolo Mosquito & Vector Control District is a forward-thinking agency that employs **Integrated Pest Management (IPM)**, a comprehensive scientific approach to implement vector control strategies and management tactics that has earned the District several honors.

IPM INCORPORATES FIVE COMPONENTS:

Public Information and Education:

The District's outreach program educates and informs the public about mosquito and West Nile virus prevention. District messages are disseminated via extensive media and advertising campaigns, governmental affairs, community events, school and community presentations and partnerships with local groups. Every year the District hosts the FIGHT the BITE Design a Calendar Page Contest for K-12 students.



Laboratory & Surveillance:

The District monitors mosquito activity, mosquito populations, climate change and virus activity by testing mosquitoes, sentinel chickens and wild birds for the presence of a virus or parasites; this information helps guide all control efforts.

The laboratory also provides tick and Lyme disease surveillance, identification of arthropods significant to public health, and participates in research and special projects.

Biological Control:

The use of living organisms to control a particular pest. For example, the mosquitofish (*Gambusia affinis*), when placed in neglected swimming pools, eats mosquito larvae before they turn into biting adults. Mosquitofish quickly adapt, multiply and are capable of sustaining an effective control level.



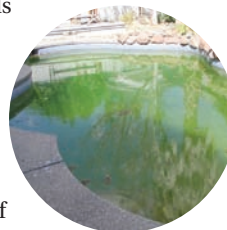
Physical Control:

This is achieved by manipulating the environment to reduce mosquito breeding sites. Physical control can include promoting effective water drainage, controlling vegetation, appropriate timing of irrigation and encouraging mosquito reduction best management practices in urban, agricultural and conservation areas.



Microbial & Chemical Control:

The prudent use of chemical compounds (insecticides) to reduce mosquito populations. These materials are applied when other methods are unable to maintain mosquito numbers below a tolerable level, or when emergency control measures are needed to rapidly disrupt or terminate the transmission of disease to humans and animals. All products and application methods are approved for public health and are designed to minimize non-target effects. Larvicides target larvae and pupae; adulticides are chemicals that reduce adult mosquito populations.



SOME OTHER SERVICES THE DISTRICT PROVIDES:

To keep neglected or unmaintained **swimming pools** from turning into breeding grounds for mosquitoes, the District will deliver mosquitofish to pools so the fish can eat mosquito larvae, before they turn into blood-sucking adults. Mosquitofish are offered free of charge for placement in pools, ponds, animal troughs or wherever else they may be needed.

Street basins, or storm drains, are also major mosquito breeding spots, and yard waste placed at curbside can clog the basins. The District actively encourages people to place yard and garden clippings in **green waste containers** instead of loose on the street.

Another breeding spot is in **cemeteries**, where flower vases can allow water to stagnate. The District works with cemeteries to add water crystals to the vases that turn water into a gel that keeps flowers fresh and keeps them from turning into mosquito nurseries. The District encourages cemetery visitors to keep the water crystals in the vases.

Another service includes working and dealing with yellow jackets if they present a public health threat.



OTHER SERVICES INCLUDE:

- FREE presentations for your classroom or community organization
- FREE home inspections if you are being bothered by mosquitoes
- FREE email notifications by ZIP code. Sign up to receive email notifications of any adult mosquito control activities in your area.

To request any of these FREE services, visit FIGHTtheBITE.net

REPORT A DEAD BIRD

Help us protect you and your community by reporting dead birds and squirrels. The District and the California Department of Public Health use dead bird reports to help identify increased West Nile virus activity in an area. Crows and magpies are particularly susceptible to the disease, so they make excellent early warning sentinels for virus activity. If you see a bird that may be dead for less than 24 hours, please call 1-877-WNV-BIRD (1-877-968-2473).



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