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A NEW AND
AGGRESSIVE
MOSQUITO

TAKE BACK FRESNO COUNTY



RESIDENTS CAN TAKE SIMPLE ACTIONS THAT WILL HELP THE
COUNTY'S MOSQUITO AND VECTOR CONTROL DISTRICTS MANAGE
ANNOYING MOSQUITOES AND THE DISEASES THEY SPREAD



MOSQUITOES:

The public must work together with mosquito and vector control districts to keep mosquito populations at bay in Fresno County

Most people are hard-pressed to find anything good about mosquitoes. At best, they're an itchy annoyance. At worst, they bring illness or death to millions of people around the world by spreading diseases like malaria, as well as St. Louis encephalitis and West Nile virus — both of which can be regularly found in Fresno County.

"It is important that we work together to control mosquitoes and reduce the risk of mosquito-borne diseases," said Steve Mulligan, District Manager of Consolidated Mosquito Abatement District. "Mosquitoes are vectors of serious human diseases and their biting nuisance impacts people's lives."

In 1915, California passed the Mosquito Abatement Act, allowing for the creation of mosquito and vector control districts throughout the state to better control mosquito populations and mosquito-borne diseases. But it wasn't until after World War II that many areas developed their own agencies, including Fresno County. Today, four independent special districts serve the county and its surrounding areas: Consolidated Mosquito Abatement District, Coalinga-Huron Mosquito Abatement District, Fresno Mosquito and Vector Control District, and Fresno Westside Mosquito Abatement District. The districts conduct programs to control mosquito populations and keep residents healthy (and hopefully a little less itchy) through:

"IT IS IMPORTANT THAT WE WORK TOGETHER TO CONTROL MOSQUITOES AND REDUCE THE RISK OF MOSQUITO-BORNE DISEASES."

STEVE MULLIGAN
District Manager, Consolidated Mosquito Abatement District

SURVEILLANCE

- Determining mosquito populations,
- Identifying specific species demographics,
- Identifying the presence of mosquito-borne diseases,

INTEGRATED PEST MANAGEMENT PROGRAM

- Using biological control methods, including mosquitofish (*Gambusia affinis*),
- Implementing physical modifications and removal of standing water mosquito sources,
- Using chemical and biological larvicides to target immature mosquitoes,
- Reducing disease transmission through limited use of products targeting adult mosquitoes,

PUBLIC OUTREACH AND EDUCATION

- Identifying and eliminating mosquito breeding sites,
- Encouraging the use of effective repellent products.

In 2013, a new species of mosquito invaded the state. *Aedes aegypti*, more commonly known as the yellow fever mosquito, has inundated residential areas such as the cities of Clovis and Fresno. Typically found in tropical and subtropical areas, this mosquito is a known vector for several serious mosquito-borne diseases. This mosquito can hatch and develop in a small amount of water and breeds throughout the year, depositing its eggs inside any container that can hold water. This opportunistic mosquito will readily enter homes to exploit even the most unlikely of water sources, and has even been found breeding in the reservoir of a coffee maker.

When it comes to mosquito management, the best offense is a good defense. Eliminating potential breeding sites can help keep populations of *Aedes aegypti*, as well as other mosquito species, in check. Residents and mosquito and vector control district staff *must* work together to identify and take care of problem areas and protect the community.

MORE THAN JUST A PEST

BY
ANNE
STOKES

KNOW YOUR MOSQUITOES

Out of the 29 types of mosquitoes found in the Fresno County area, there are a few key species of concern:

YELLOW FEVER MOSQUITO (*Aedes Aegypti*)

Known to transmit: Yellow fever, dengue, chikungunya, Zika
Eggs: Eggs laid on the insides of potential water-holding containers can resist drying and hatch months later when covered in water
Larvae: Develop in standing water for six days; pupal stage lasts one day
Adults: Females bite throughout the day; feeds aggressively and prefers to bite humans on the lower legs



SOUTHERN HOUSE MOSQUITO (*Culex quinquefasciatus*)

Known to transmit: West Nile virus, St. Louis and western equine encephalitis
Eggs: Eggs laid on water surface hatch after 24 to 48 hours
Larvae: Develop for four to six days; pupal stage lasts one to two days
Adults: Females bite during dusk, dawn and at night; prefer birds but will readily attack humans



WESTERN ENCEPHALITIS MOSQUITO (*Culex tarsalis*)

Known to transmit: West Nile virus, St. Louis and western equine encephalitis
Eggs: Eggs laid on water surface hatch after 36 to 48 hours
Larvae: Develop for five to eight days; pupal stage lasts two to three days
Adults: Females bite at night; prefer birds but will also bite humans



For more information on how to help control mosquito populations in your area, visit www.fresnocountymosquito.com.

“IT ONLY TAKES ONE PERSON
IN THE NEIGHBORHOOD TO
PRODUCE ENOUGH MOSQUITOES
TO CAUSE A PROBLEM.”

CONLIN REIS

District Manager, Fresno Westside Mosquito Abatement District

REDUCING MOSQUITO POPULATIONS

In 2016, Consolidated Mosquito Abatement District conducted a study to see what methods were most effective in reducing mosquito populations. Its efforts included public education and the elimination of breeding sites at 122 Clovis homes. The results were huge.

“Yard to yard inspection and sanitation is a great method to reduce the mosquito population,” said Katherine Ramirez, Science Education Coordinator for Consolidated Mosquito Abatement District and Training Coordinator for the South San Joaquin Valley Region of the Mosquito and Vector Control Association. “It takes a lot of work from mosquito control professionals and residents to make it sustainable.”

IMPACT:

80%



homeowner
compliance

LED TO

87%

decrease of
biting female
Aedes aegypti
during peak
season



‘PREVENTION STOPS IS WHAT THE PROBLEM’

BY
ANNE
STOKES

Neighbors need to take a stand together to reduce mosquito populations

Niki Pool and her Clovis neighbors knew they had a problem — a mosquito problem.

“I couldn’t open my front door without these little black mosquitoes — and they’re really ferocious biters — entering,” she said. “I’d go out and talk with neighbors and they’d all have the same concerns.”

It turned out that Pool’s neighborhood was not far from where Consolidated Mosquito Abatement District first identified *Aedes aegypti* mosquitoes, a new and aggressive breed of mosquitoes in Fresno County. Because this mosquito can live inside or outside homes it had quickly taken over Pool’s neighborhood, plaguing its residents.

This invasive species, also known as the yellow fever mosquito, first started gaining a foothold in Fresno County in 2013. *Aedes aegypti* is capable of spreading Dengue fever, yellow fever and Zika virus, and is more adept than native species at breeding in small water sources — like dishes under flower pots, pet water bowls and even out-of-sight sources such as underground yard drains. *Aedes aegypti* can also breed throughout the winter months inside homes.

“This mosquito species has changed things to the point that our standard operations are not going to be able to control it,” said Conlin Reis, District Manager of the Fresno Westside Mosquito Abatement District. “Where reduction or elimination of the species has happened in the past, there has been a full community effort with people engaged and actively thinking about eliminating the sources.”

The districts continue to investigate new approaches to stopping the spread of this resilient mosquito, including focused response teams and innovative control strategies. While these efforts are showing promise, the districts and Pool both emphasize it’s critical that residents do their part to eliminate potential mosquito breeding sites.

“Prevention is what stops the problem in the end, it’s what helps to reduce the potential annoyance and concerns for your safety, your children’s safety or anybody else who lives in those areas,” she said. “These just happen to be vectors for some really ugly diseases and it just takes one situation for that to become a problem here.”

Reis agreed, noting that it’s important for residents to combine their efforts to combat mosquitoes in their community.



Niki Pool makes sure to empty standing water around her house so she can help protect her neighborhood from mosquitoes.

PHOTO BY CLAIRE
TAKAHASHI

“It’s essential that you not only look for and eliminate everything in your backyard, but you let your neighbors know and encourage the neighborhood to actively participate in eliminating these sources,” Reis said. “It only takes one person in the neighborhood to produce enough mosquitoes to cause a problem.”

NOT AT MY HOUSE

Mosquito-proof the inside and outside of your home to reduce coming across this pest

INSIDE



SCREENS

Fix any holes to keep mosquitoes outside.



HOUSEPLANTS

Do not overwater plants and keep any plant saucers free from standing water.



PET WATER DISHES

Dump inside dishes and replace water twice a week.



WATER-HOLDING HOUSEHOLD APPLIANCES

Keep free of water when not in regular use, and empty and clean water storage tanks once a week. Includes coffee makers, humidifiers and dental appliance reservoirs.



TOILETS

An unused toilet, like one in a house whose residents are on vacation, is a great place for mosquitoes to lay eggs.



WINDOWS

Before opening windows, ensure screens are repaired and that there are no gaps.



FISH PONDS

Stock with mosquitofish, clear excess vegetation.



SPAS AND HOT TUBS

Keep clean and filtered. If not in use, keep empty and covered.



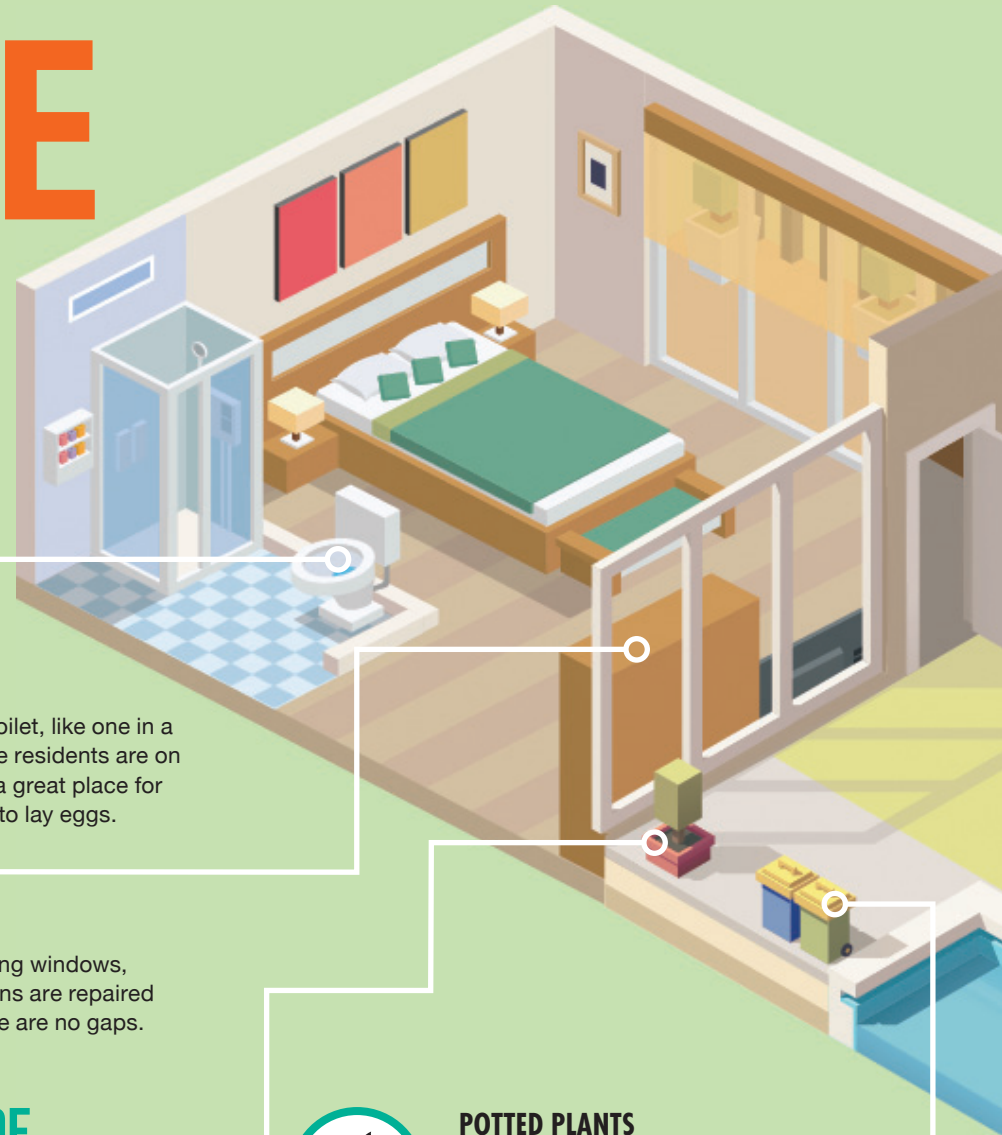
POTTED PLANTS

Residents are strongly encouraged to discard saucers and other water reservoirs, or fill with sand. For pots, dump excess water and clean every week.



TRASH BINS

Dump any standing water, keep lids tight.





BIRD BATHS OR FOUNTAINS

Flush out completely once a week, scrub clean and refill.



RAIN GUTTERS

Remove leaves, dirt and debris. Keep clean to maximize water flow and prevent standing water.



SPRINKLERS

Don't over-irrigate landscaping — excess water can provide breeding habitats.



PET WATER DISHES

Dump outside dishes and replace water twice a week.



WATER TROUGHS

Stock with mosquitofish or change the water weekly.



TIRES

Dispose of properly or cover, so water does not collect inside. Drill drainage holes in tire swings.



WHEELBARROWS

Dump standing water, store upside down.



UNCOVERED BOATS

Clear out standing water. Cover with a tarp.



BARBECUES

Keep covered so water does not collect inside of them.



BUCKETS/CONTAINERS

Keep water-free and store upside down.



TARPS

Dry off any water that collects after rain.



TREEHOLES

Inspect for water during the rainy season. If water is present, consult an arborist to determine the best method of eliminating water. You can also contact your mosquito control district for help.



YARD DRAINS

Put screens on all yard drains to prevent mosquitoes from laying eggs inside of them. Here's how:

- 1 Obtain supplies. You will need standard window screen material, and zip ties or adhesive (i.e. hot glue gun).
- 2 Cut two pieces of screen in the shape of a circle, larger than the drain screen.
- 3 Place the two pieces on top of each other. Rotate the top piece so the screen mesh of the two pieces are not in line and the openings between the mesh become smaller.
- 4 Place the screen pieces over the top of the drain or inside the drain cover against the existing grate. Glue or zip tie screens in place.
- 5 Once the screens are secured, cut away any extra materials from the drain top or cover.
- 6 Repeat for all yard drains.

Tip: You may need to clean the screens periodically to prevent clogging. Consider placing small landscaping stones or gravel over the drain to prevent accumulation of debris.



POOLS

Keep clean and filtered. If not maintained, completely drained or stock with mosquitofish.

1. LITTLE NINJA

Female *Aedes aegypti* will follow their target around and then bite them, but not in just one place. They will bite, suck, then quickly move to a new spot on the same person — which lessens the chance of the mosquito being squashed. For humans, this means multiple welts and places to scratch.

2. ADAPTABLE

The larva is able to survive and grow in just a capful of water, both inside and outside the house. This determined pest has been known to lay eggs in coffee machines, humidifiers and toilets. The mosquito also stays inside and active during the winter, enjoying the warm weather and free food offered inside a house. Its eggs can survive up to one year on a dry surface.

3. KEEPING EGGS IN MORE THAN ONE BASKET

The *Aedes aegypti* is a sly egg layer. While many mosquitoes lay raft-like collections of eggs on the surface of a single water source, *Aedes aegypti* lay eggs singularly and just above the water line in multiple containers. With females laying up to 1,000 eggs in their two-week life span, there will be plenty of survivors.

4. DANGEROUS VESSEL

The *Aedes aegypti* can be a carrier of the yellow fever, Zika and dengue viruses. Since the mosquito's preferred meal is humans, it is also an efficient vector for these viruses. For instance, if a mosquito feeds on a human traveler with an active infection of any of these viruses, the mosquito can then transmit those same diseases to residents in the local area.

6 SURPRISING FACTS ABOUT THIS DETERMINED HUNTER

BY RODNEY OROSCO

The Aedes aegypti mosquito



LIFE CYCLE OF THE AEADES AEGYPTI

EGG

After a blood meal, the female *Aedes aegypti* lays its eggs on the inner walls of a small water-holding artificial or natural container. Larvae hatch when water covers the eggs as a result of rain or human activity.

LARVA

The larva goes through four growth stages, that last about four days, before it transforms into a pupa. Males develop faster than females. Larvae feed on microorganisms and other organic material while in the water.

PUPA

While in the water, the pupae are mobile but do not feed during this time. They take about two days to develop into an adult mosquito.

ADULT

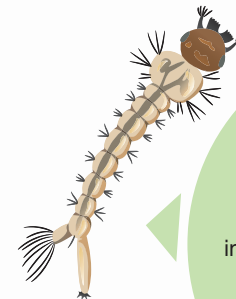
The life span of an adult is about two weeks. This mosquito is well-suited to life inside and has a preference for feeding on humans.

5. ALL DAY BUFFET

Aedes aegypti females feed during the day, all day, inside or outside. A female *Aedes aegypti* will often take multiple blood meals to help produce her eggs.

6. BULLY IN THE WATER

The larva of the *Aedes aegypti* will often out-feed other species of mosquito larva that were hatched into the same body of water, consuming more of the available micro-organisms. The result: the baddest bad gal lives.



SAFETY COMES FIRST

Fresno County mosquito and vector control districts' top concern is protecting residents

BY RODNEY OROSCO

A fascination with insects led Consolidated Mosquito Abatement District (CMAD) Scientific Services Director Jodi Holeman into the world of mosquitoes — that and her desire to protect her community.

An undergraduate introductory entomology class at CSU Fresno turned into a summer job at the District, serving as the start of a meaningful relationship.

“I fell in love with the work,” she said. “My job is one of protecting public health and it’s one that I take to heart.”

Her work at CMAD keeps some very bad viruses from hurting people near and dear to her and ensures everyone can enjoy Fresno County safely.

Holeman knows the best way to combat mosquitoes starts with understanding them. In this Q&A, she shares key things to know about mosquitoes and protecting yourself in Fresno County.

WHEN DO MOSQUITOES MOST OFTEN BITE?

The biting behavior of mosquitoes varies by species. *Culex* mosquitoes, our native variety, prefer to bite at dawn and dusk, while *Aedes aegypti*, the yellow fever mosquito, will bite at all hours of the day and even at night. If you’re outside, you should always protect yourself from mosquito bites by putting on insect repellent — regardless of what time of day it is.

WHY ARE MOSQUITOES SUCH GOOD CARRIERS OF DISEASES?

The biology, behavior and ecology of mosquitoes make them ideal vectors for disease. Female mosquitoes take blood meals so their eggs can mature prior to laying. However, this behavior sometimes results in the female picking up a pathogen or disease that she can then transmit in a subsequent blood meal. Also, some species of mosquitoes live in close proximity to people, increasing the likelihood of disease transmission.

HOW LONG DO MOSQUITOES LIVE?

Life span varies depending on the species, but most mosquitoes live two to three weeks.

HOW DOES ONE AVOID MOSQUITO BITES?

The use of mosquito repellent in accordance with the repellent label is the best way to prevent mosquito bites. There are multiple options for mosquito repellent. The Center for Disease Control and Prevention recommends repellents with any of the following active

ingredients to prevent mosquito bites: DEET, picaridin, lemon eucalyptus oil and IR3535. Loose-fitting pants and long sleeve shirts can provide additional protection against mosquito bites by keeping them away from your skin.

WHY CAN'T MOSQUITOES JUST BE SPRAYED WITH INSECTICIDE?

Well, we do spray for mosquitoes, but only if it’s sustainable and effective. There are also a lot of variables. If we are unable to identify the source of the mosquitoes we would have to spray for adults on a regular basis to sustain the effect. In some cases, this isn’t even that effective because of high levels of insecticide resistance we have in some mosquitoes in the valley. We will spray for adult mosquitoes when there is any indication of disease. While the reduction in the mosquito population is short lived, a few repeated and targeted applications can interrupt transmission cycles and decrease the number of disease-carrying mosquitoes in an area, thereby reducing the risk to people.

WHERE IS AEADES AEGYPTI?

Red indicates areas of Fresno County where the *Aedes aegypti* has been found since 2015.

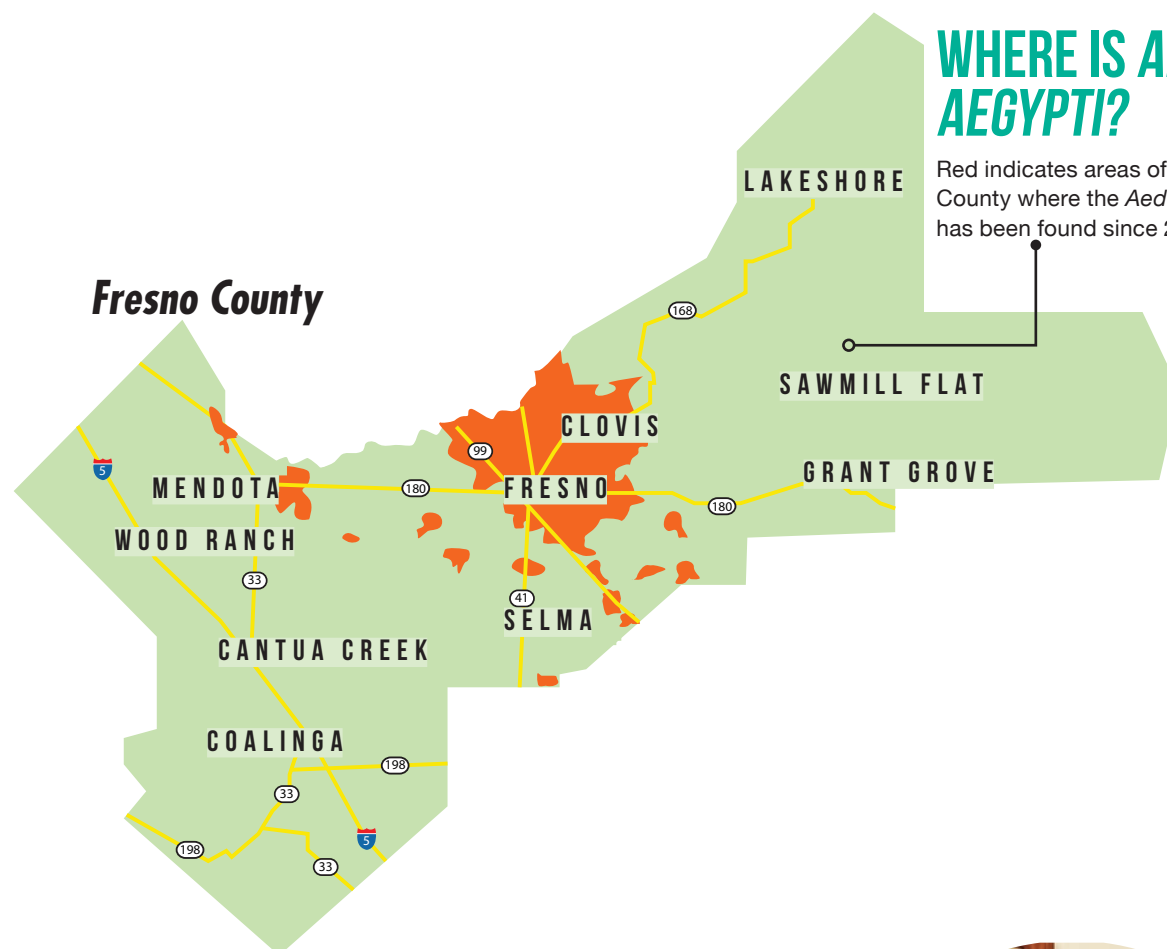


PHOTO COURTESY JODI HOLEMAN

**“IF YOU’RE OUTSIDE
YOU SHOULD ALWAYS
PROTECT YOURSELF.”**

JODI HOLEMAN
Scientific Services Director,
Consolidated Mosquito
Abatement District

NUISANCE-FREE

FRESNO COUNTY!

Preventing mosquitoes and the diseases they can carry is simple: Follow the water. And when you find the water, dump it — no matter if it is inside or outside the home. Also make sure to use insect repellent to prevent bites, and have your neighbors take these same actions.

Mosquito and vector control districts provide area-wide mosquito control services, including: source treatments, mosquito trapping, disease surveillance, outreach and education, as well as responding to requests for service from the public. Contact your district for more information.

CONSOLIDATED MOSQUITO ABATEMENT DISTRICT

Covers approximately 1,100 square miles in central and eastern Fresno County, including:

Clovis	Kingsburg	Reedley
Caruthers	Laton	Riverdale
Del Rey	Orange Cove	Sanger
Fresno	Parlier	Selma
Fowler	Raisin City	

559-896-1085
mosquitobuzz.net



FRESNO MOSQUITO AND VECTOR CONTROL DISTRICT

Covers central and western Fresno and central Fresno County, including:

Kerman
Biola
Calwa
Malaga
Easton

559-268-6565
fresnomosquito.org



FRESNO WESTSIDE MOSQUITO ABATEMENT DISTRICT

Covers nearly 1,300 square miles of western Fresno County, including:

Firebaugh
Mendota
Tranquillity
Five Points
Three Rocks
Oro Loma

559-659-2437
fresnowestmosquito.com



PROTECT YOUR...

FAMILY

- ☐ Wear long-sleeve clothing when mosquitoes are active (often at dusk and dawn)
- ☐ Use an EPA-approved mosquito repellent and always follow label instructions
- ☐ Be aware of and proactive about standing water

HOME

- ☐ Fix ripped screens
- ☐ Fix leaky faucets
- ☐ Keep fresh water in pet bowls
- ☐ Discard saucers beneath potted plants and any other unnecessary water-holding containers

PROPERTY

- ☐ Completely drain unused spas/pools
- ☐ Store buckets and containers upside down
- ☐ Put mosquitofish in livestock water troughs
- ☐ Avoid excess irrigation to prevent runoff and accumulation of water
- ☐ Screen or cap all yard drains

