



Mosquito & Vector Prevention & Control

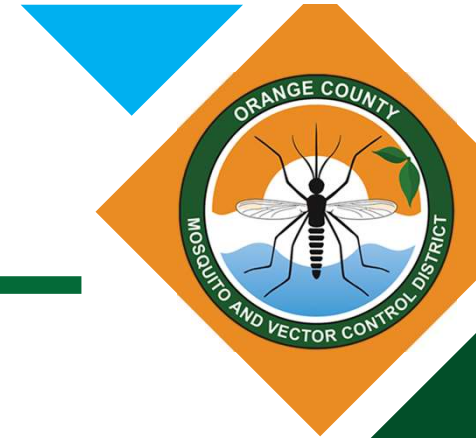
Laura Krueger
Vector Ecologist

Mayra Heredia
Inspector

Orange County Mosquito and Vector Control

Our Mission

Educate and protect the people of Orange County from vectors and prevent vector-borne diseases in an environmentally responsible manner.



Arthropods of significant public health importance:

- Ticks, chiggers and other biting mites, scabies mites, dust mites, widow spiders, recluse spiders, scorpions, centipedes, cockroaches, lice, bed bugs, kissing bugs, biting flies, house flies, filth flies, mosquitoes, fleas, wasps and bees, fire ants, harvester ants

February 23, 2023

Pesticide Registration Notice (PR Notice) 2023-01

NOTICE TO MANUFACTURERS, FORMULATORS, PRODUCERS, REGISTRANTS AND APPLICATORS OF PESTICIDE PRODUCTS

ATTENTION: Persons Responsible for Public Health Programs and Those Responsible for Registration of Pesticide Products

SUBJECT: Lists of Pests of Significant Public Health Importance – Revised 2023

This notice updates and replaces PR Notice 2002-1, which identifies pests of significant public health importance. Section 28(d) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the United States Environmental Protection Agency (EPA), in coordination with the United States Department of Health and Human Services (HHS) and United States Department of Agriculture (USDA), to identify pests of significant public health importance and to develop and implement programs to improve and facilitate the safe and necessary use of chemical, biological and other methods to combat and control such pests of public health importance.

...arthropods of significant public health importance:

“cause asthma or trigger allergies, contaminate food, irritate skin, cause direct injury, or carry agents causing diseases”



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German cockroach

- The most common indoor insect pest of public health significance
- Found in residential settings, restaurants, food service, break rooms, public indoor spaces, etc.
- Breathing in cockroach feces and shed skins causes and exacerbates asthma and allergies

German cockroach (*Blattella germanica*).
Photo credit: Luis Agurto, Jr. of Pestec, used with permission



Integrated Vector Management

- **Education:** outreach, presentations, literature, web info, social media
- **Surveillance:** testing pathogens in mosquitoes, ticks, fleas, rodents, birds, and opossums
- **Control** of mosquitoes, RIFA, rats, filth flies
 - Source reduction – eliminate breeding
 - Biological control – mosquito fish
 - Chemical control – larvicide, adulticide





MOSQUITOES

The most dangerous animals in...the WORLD

...California

...in Orange County

- Female mosquitoes kill **> 700,000 people annually**
- Vector human pathogens during blood-feeding:
 - Protozoa (malaria)
 - Viruses (west Nile, encephalitis, dengue, yellow fever, zika, chikungunya)
 - Nematodes (dog heartworm)

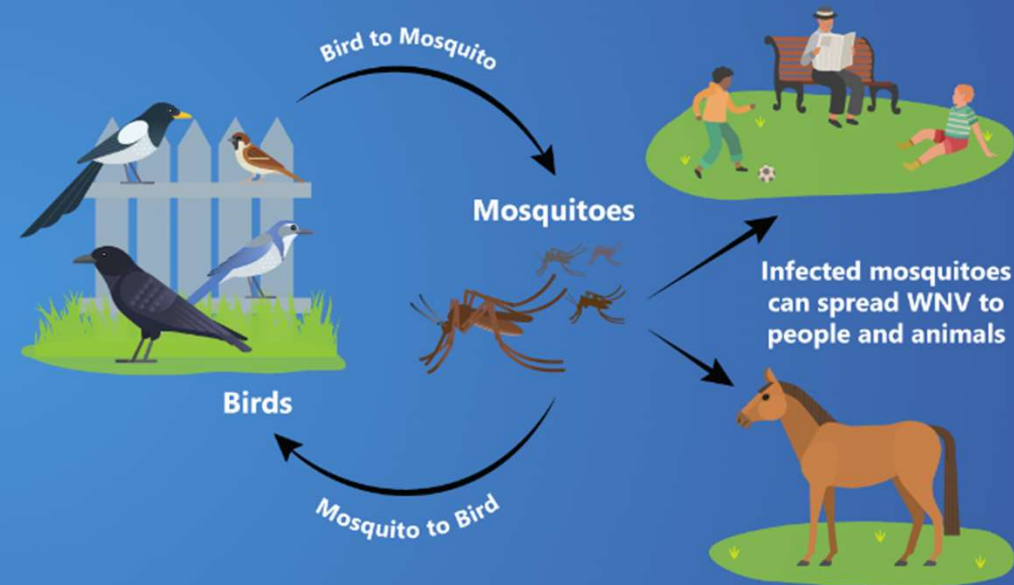
West Nile Virus Transmission

WEST NILE VIRUS (WNV) is a mosquito-borne virus that causes disease in humans, horses, and birds. WNV spreads to people through the bite of an infected mosquito, and it can make people sick and even cause death. WNV is common in the United States, especially in California, and is a problem that is here to stay. The best way to prevent WNV is to protect yourself from mosquito bites.

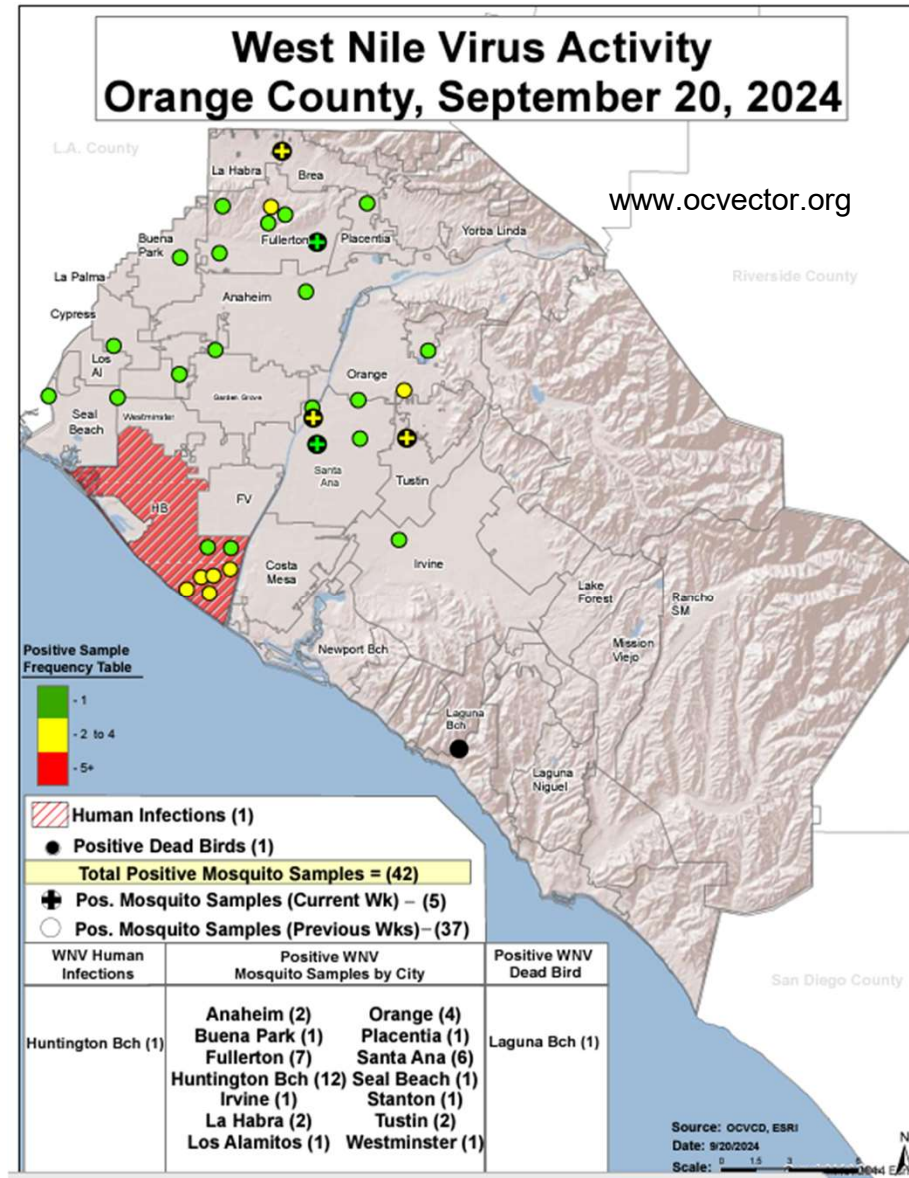
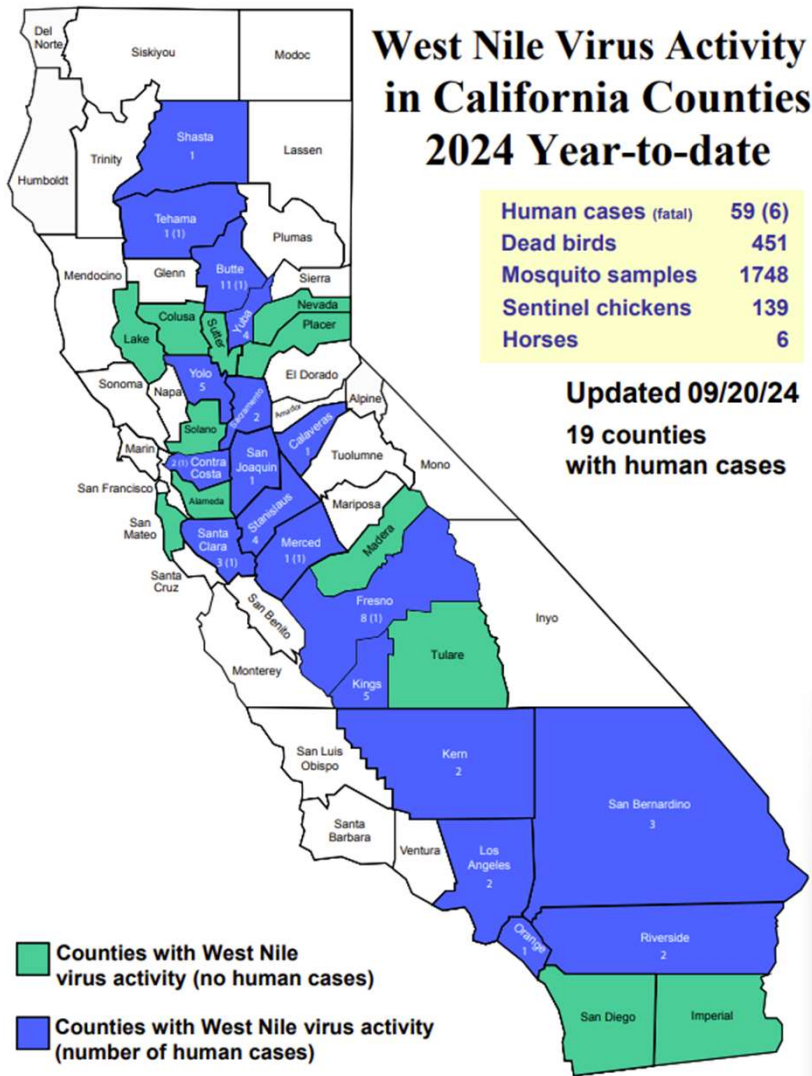
Mosquitoes often get WNV from birds. Dead bird reports are one way of tracking where WNV could be spreading. You can help the California Department of Public Health (CDPH) track WNV in California by reporting dead birds.

 [Report a Dead Bird](#)

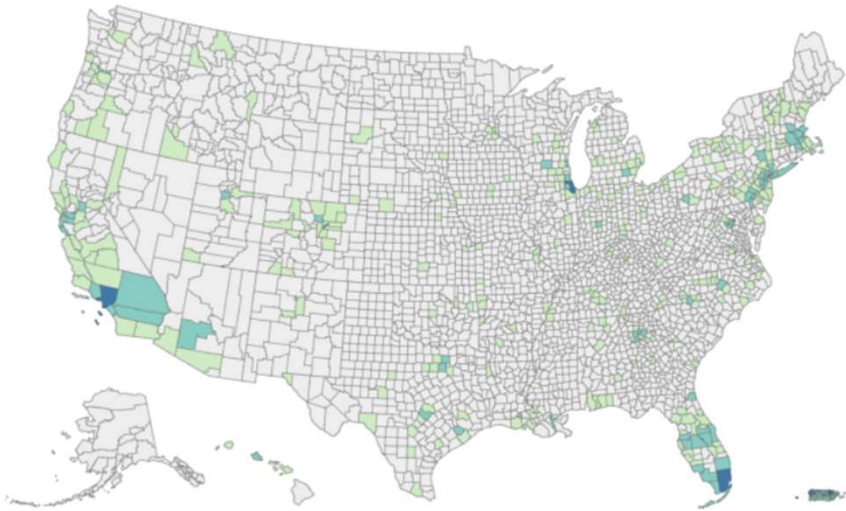
 [Look Up Local Vector Control Agency](#)



Westnile.ca.gov



Dengue Fever Transmission



Legend

- No reported cases
- 1 to 4
- 5 to 49
- 50 to 249
- 250+

CDC: September 11, 2024

Dengue Virus

cdc.gov/dengue

Cause	Spread
<p>Dengue is a viral disease caused by any of the four related viruses: dengue virus 1, 2, 3, and 4.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Dengue 1</p> </div> <div style="text-align: center;"> <p>Dengue 2</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;"> <p>Dengue 3</p> </div> <div style="text-align: center;"> <p>Dengue 4</p> </div> </div>	<p>Dengue viruses are mainly spread to people by the bite of an infected <i>Aedes</i> mosquito.</p>
Symptoms	Warning Signs
<p>The most common dengue symptom is fever with...</p> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: left;"> <p>Pain Behind Eyes</p> <p>Rash</p> <p>Aches & Pains</p> </div> <div style="text-align: center;"> </div> <div style="text-align: right;"> <p>Headache</p> <p>Nausea & Vomiting</p> </div> </div> <p style="font-weight: bold; margin-top: 10px;">Symptoms typically last 2–7 days.</p>	<p>Dengue can become severe within a few hours. Watch for warning signs 1–2 days after fever has gone away.</p> <ul style="list-style-type: none"> 🩸 Blood in nose, gums, stool or vomit 🤢 Belly pain, tenderness 📵 Feeling tired, restless, or irritable

‘No turning back’: Unprecedented dengue outbreak in Los Angeles signals infection tipping point

Cluster of cases in the city with no ties to international travel indicates a migration of the mosquito that carries the parasite

The Telegraph, 9/24/24

CALIFORNIA

‘Unprecedented’ cluster of mosquito-borne dengue virus cases confirmed in Baldwin Park

Los Angeles Times, 9/20/24



Subscribers are Reading >

CLIMATE & ENVIRONMENT

Governor signs California plastic bag bill into law

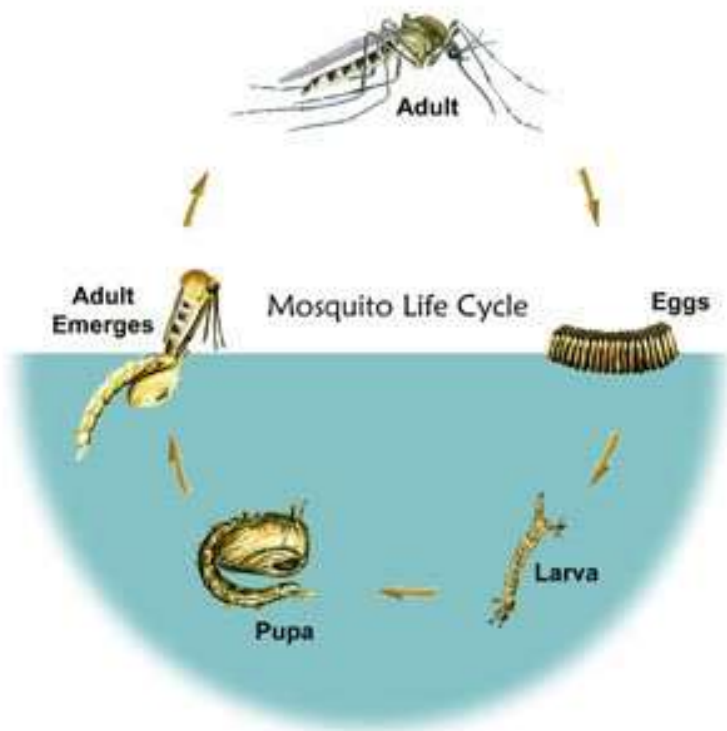
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FOR SUBSCRIBERS

OCMVCD Aedes Transmitted Disease Response 9/20/24

- OCMVCD responds to disease cases in travelers returning home from visiting other countries
- YTD: OCMVCD responded to 31 ATD cases
 - 27 dengue, 1 Chikungunya, 2 Zika
- Current Trapping Efforts- Week 38 Dengue Response in Newport Beach (2), Santa Ana (3), Garden Grove (2), Orange, Mission Viejo

Mosquito Classification and Life Cycle



Life cycle completed in 1 to 4 weeks.

Photo credit: [EPA](#)

- **Diptera: Culicidae**

- ~ 50 species in California

- **Life cycle**

- **Egg:** laid on or above water)
- **Larva:** four instars, omnivorous detritivores, wriggle to surface to breathe
- **Pupa:** nonfeeding, also must surface to breathe
- **Adult:** females: blood-feeding, males: nectar-feeding, may overwinter



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Mosquito Control Is Complicated

Marshes and



Underground



Curbs and



**Pools, Ponds and
Spas**



**Drains/City
Infrastructure**



**Backyards and Small
Sources**



Inspection and Control

MVCDs maintain databases of known breeding sources:

- Abandoned and unmaintained swimming pools
- Gutters
- Manholes and storm drains
- Flood channels



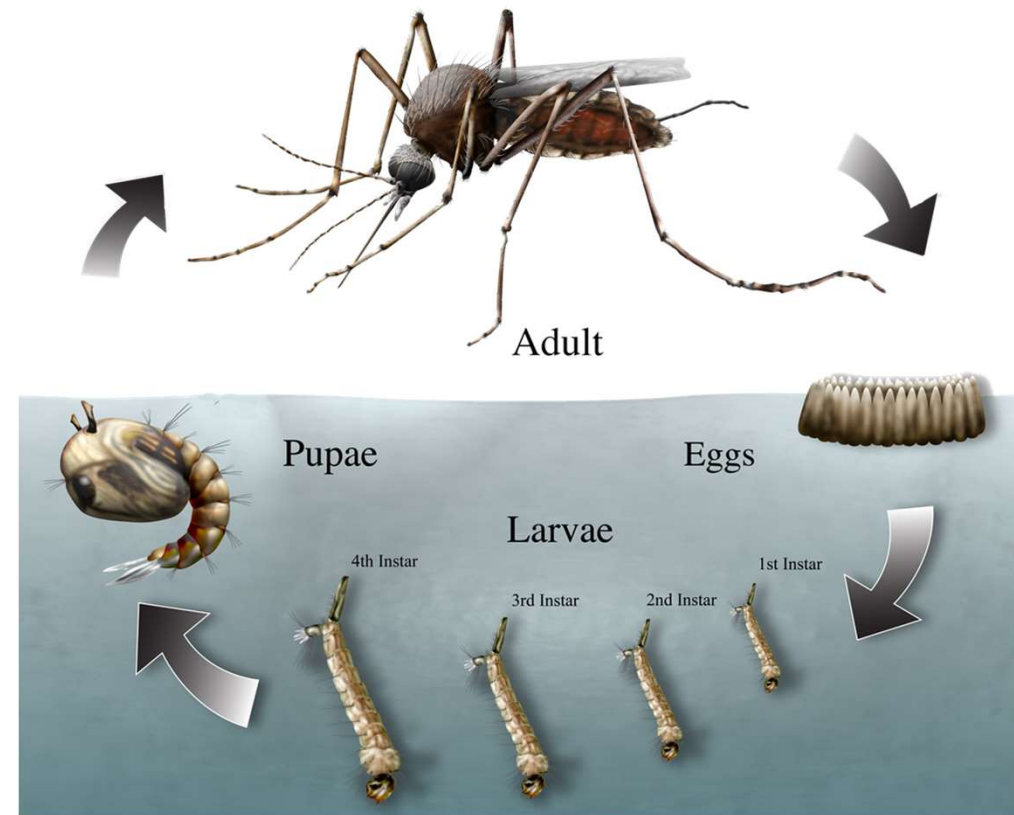
Culex vs Aedes Mosquitoes



	Culex	Aedes
Breeding habits	Larger Sources	Backyard Sources
Biting habits	Bite at dusk and dawn, prefer birds	Bite during day, prefer mammals
Eggs	Eggs laid in rafts, require water	Individual eggs, viable for years in dry conditions
Breeding time	In as little as one week	In as little as one week
Where do they live	Outdoors	Indoor and Outdoors

The “house mosquito” or “encephalitis mosquito”

- Genus: *Culex*
- Common species: *Cx. pipiens*, *Cx. tarsalis*, *Cx. quinquefasciatus*
- Vectors of West Nile fever, St Louis encephalitis, equine encephalitis
- Breed in marshes, wetlands, stream edges & pools, rice fields, septic tanks, abandoned swimming pools



The “yellow fever mosquito” or “tiger mosquito”

- Genus: *Aedes*
- Common species: *A. aegypti*, *A. albopictus*, *A. dorsalis*, *A. sierrensis*
- Vectors of yellow fever, dengue, zika, chikungunya, California encephalitis
- Breed in plastic containers, saucers, bird baths, tree holes, clogged gutters, snow pools

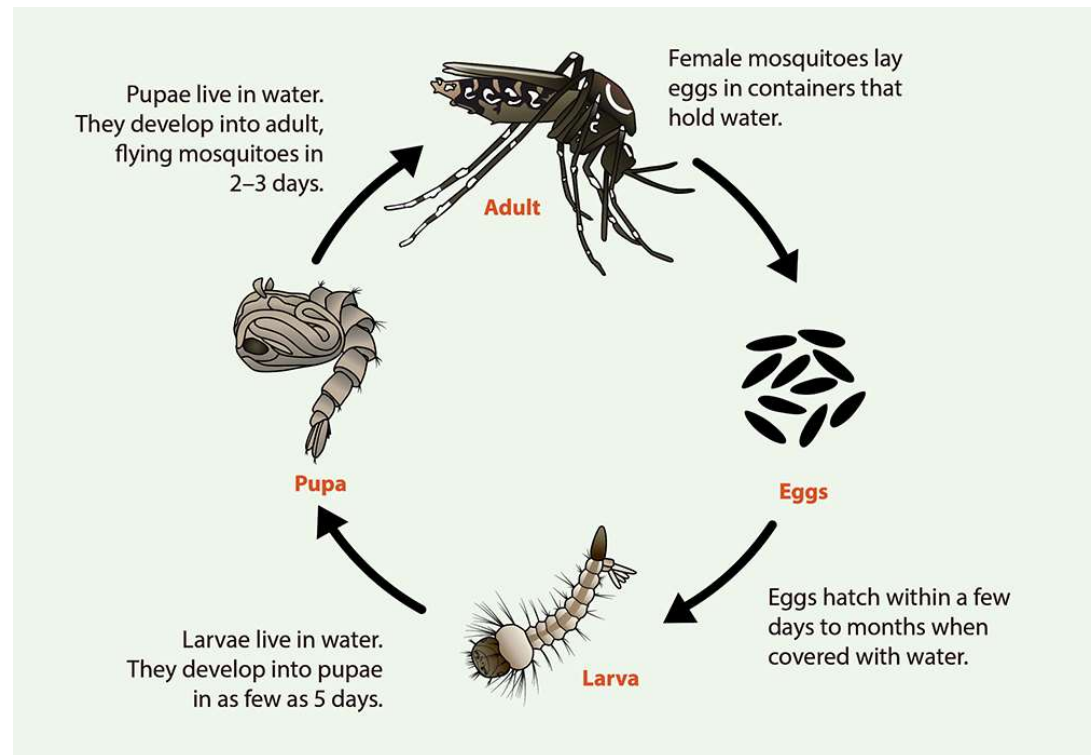


Photo credit: CDC

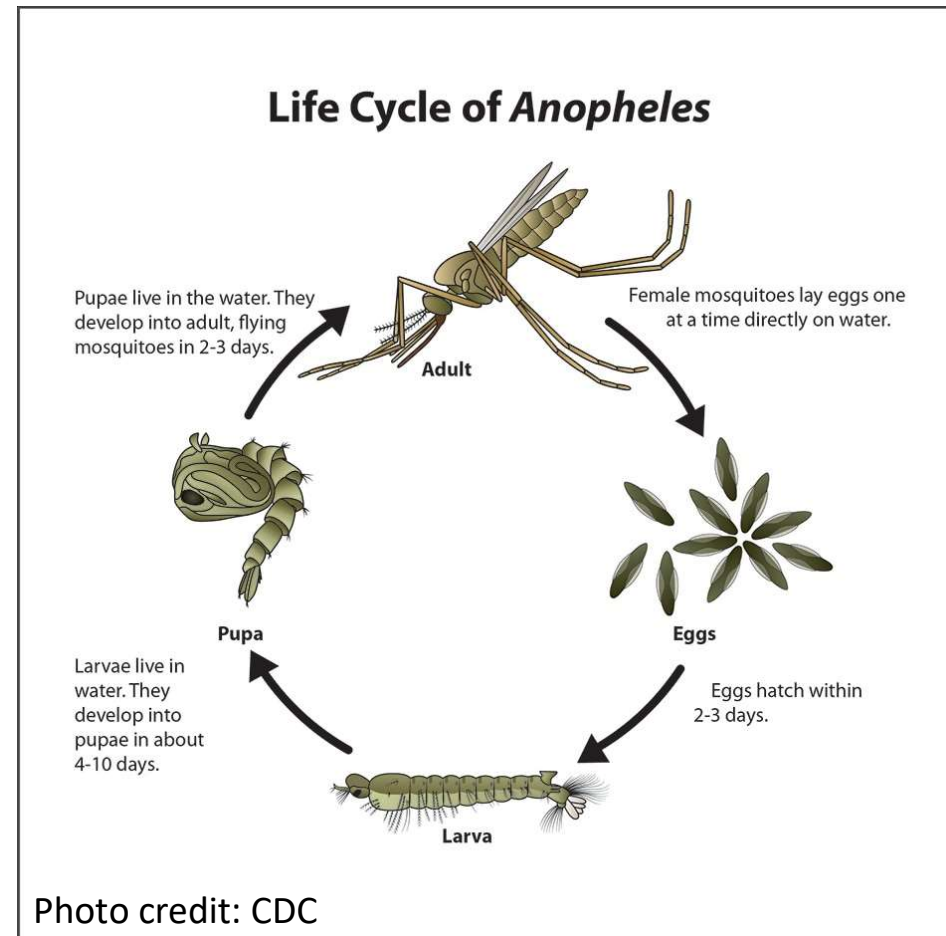


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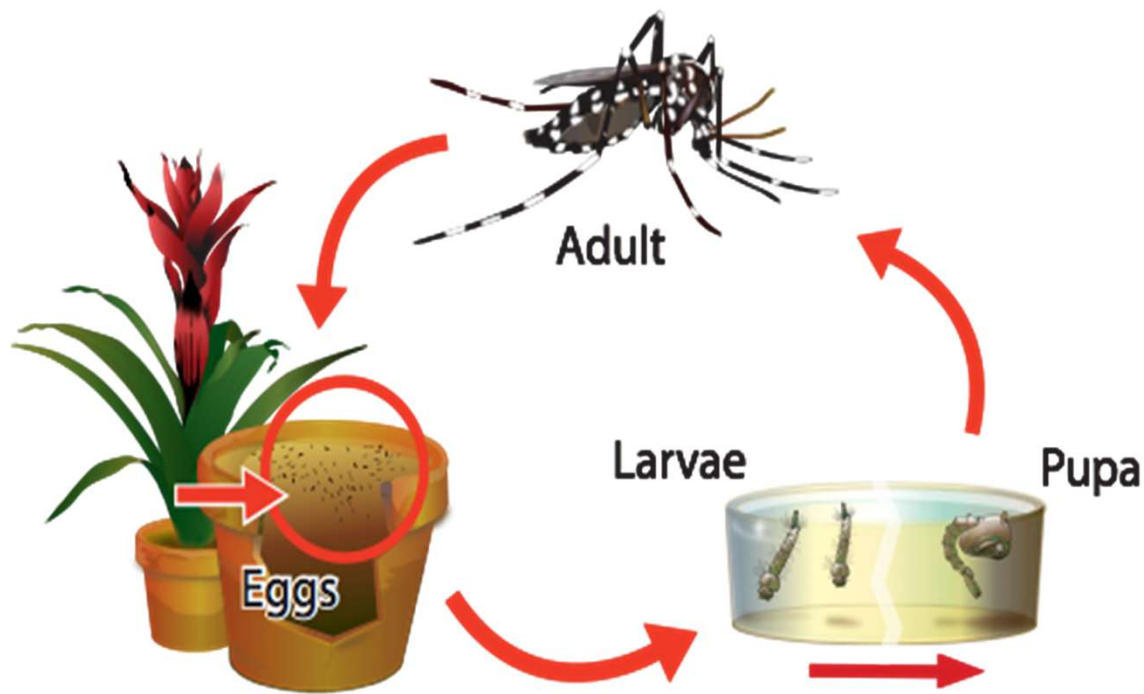
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The “malaria mosquito”

- Genus: *Anopheles*
- Common species: *A. freeborni*, *A. punctipennis*, *A. franciscanus*
- Vectors of malaria
- Breed in wetlands, rice fields, ponds, lakes (prefer clean, sunlit water)
- Larvae do not have a siphon



Aedes aegypti Life Cycle



- *Aedes aegypti* can complete their life cycle (from egg to adult) in about 5 to 7 days.
- Eggs can survive without water for years and hatch when water is present, and conditions are right.
- Can transmit dengue, yellow fever virus, chikungunya, and Zika.



Aedes aegypti Breeding Sources



What We Do: Sterile Insect Technique

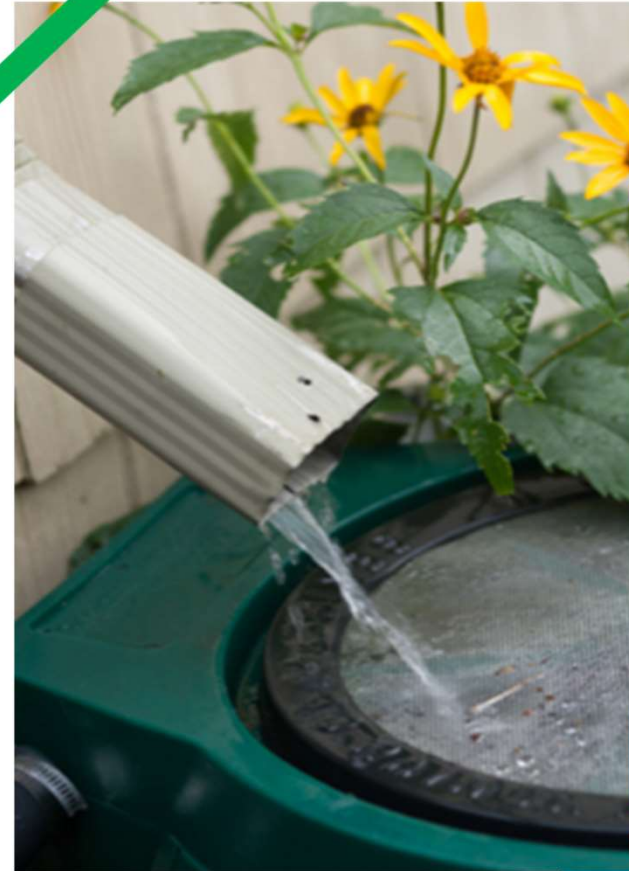


What You Can Do: Take Charge

- Clean up clutter in your yard.
- Don't grow plants in water-filled buckets or vases — even indoors.
- Remove saucers from under potted plants.
- Remove bromeliads and other plants that naturally hold water.
- Scrub outdoor containers that have held water with hot, soapy water to kill mosquito eggs. Store in a dry place.



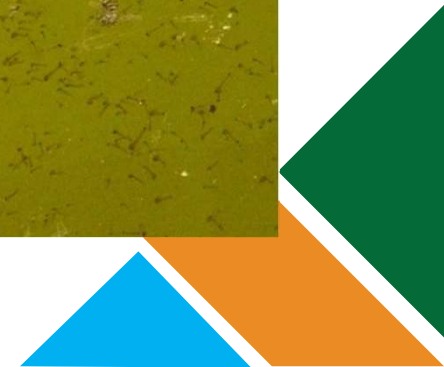
What You Can Do: Cover Rain Barrels



What You Can Do: Mosquito Fish

Suitable for some ponds, unmaintained swimming pools, and large water features.

Contact the District for an inspection to see if mosquito fish will work for you.



Mosquito control (for larvae)

- *Bacillus thuringiensis israelensis* (Bti): “dunks”, “bits”
 - Must be consumed
 - Replace every 30 days
- Methoprene (IGR): Altosid, “mosquito torpedo”
- Spinosad: Natular DT
 - May also affect pupae
- Oil films (vector agencies only)



What You Can Do: Don't Let Them In



- Use screens on windows and doors
- Keep doors and screens closed
- Repair holes in screens



What You Can Do: Protect Yourself



Use EPA-approved repellent and look for the following active ingredients:

- DEET (30% or higher)
- Picaridin
- IR3535
- Oil of Lemon Eucalyptus



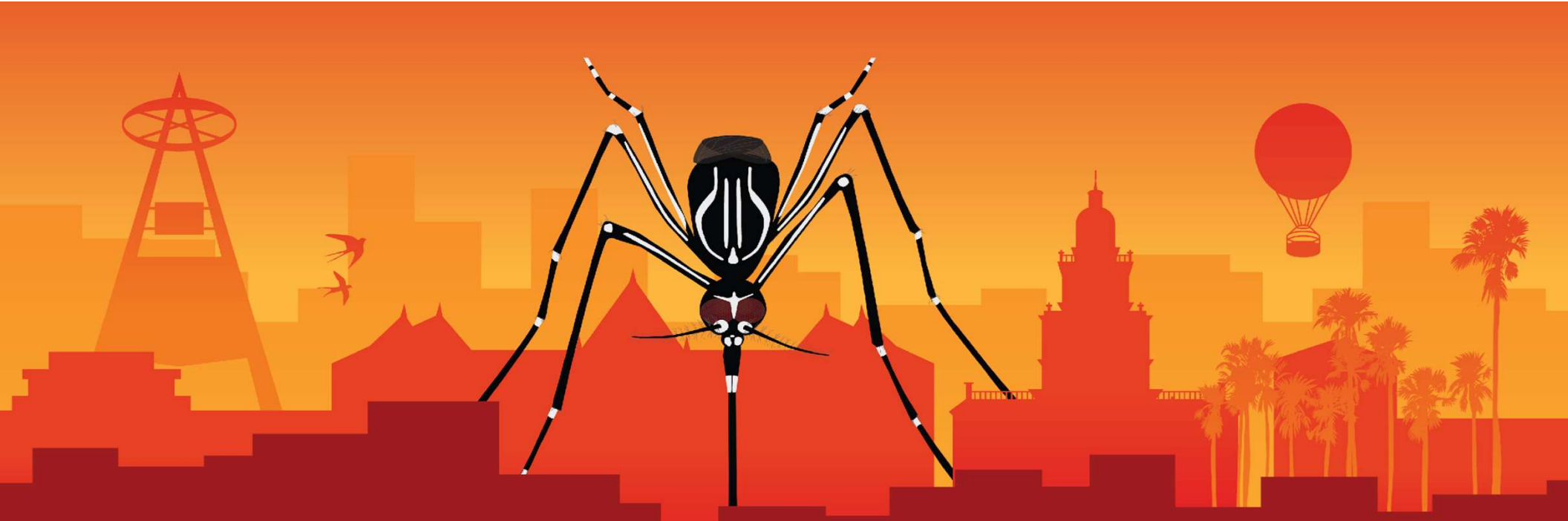
What You Can Do: Up

Wear clothing that is:

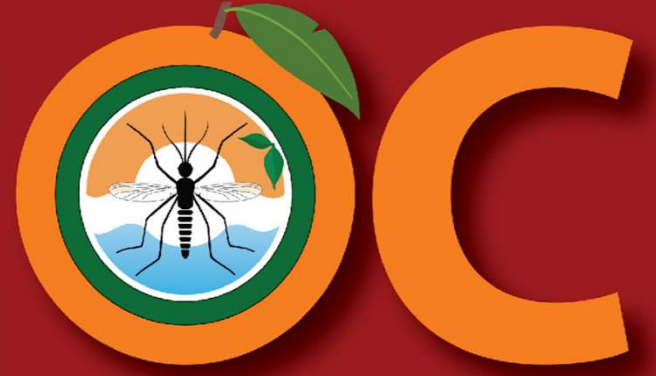
- Light-colored
- Long
- Loose

Example: Long-sleeved shirts and pants.





FIGHT BACK



Contact Us

- lkrueger@ocvector.org
- www.ocvector.org
- Social media @ocvector
- Customer service line:
(714) 971-2421



Mosquito Resources

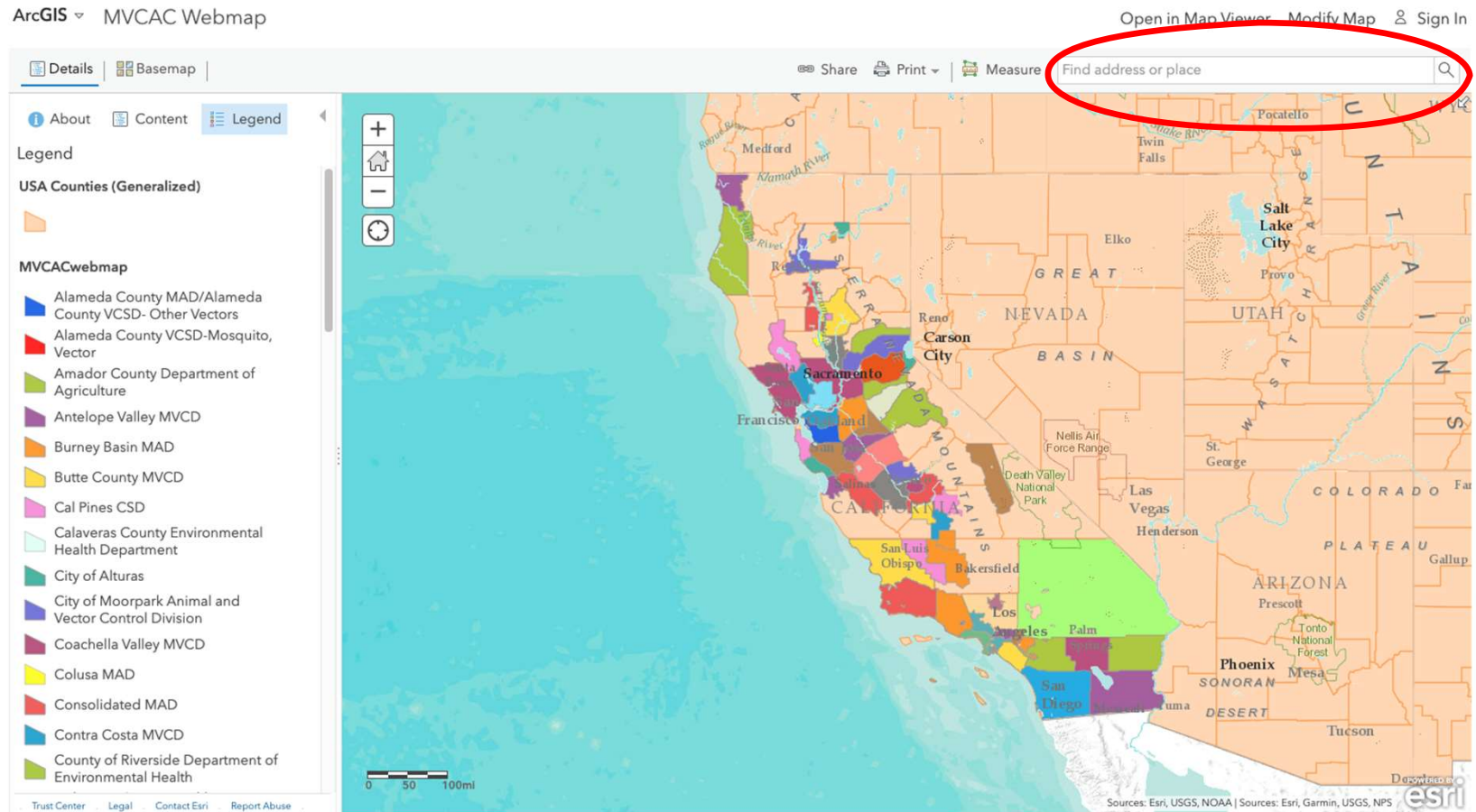


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Find your local Mosquito & Vector Control District

- Map of MVCAC by county
- Search by your address



UC IPM mosquito resources

Homes, Gardens, Landscapes, and Turf > Invertebrate pests > Files

PRINT

Mosquitoes

More than 50 species of mosquitoes are found in California. Their habitats range from deserts at or below sea level, to mountain meadows at elevations of 10,000 feet or more.

Many species of California mosquitoes are relatively uncommon and seldom pose a threat to the health or well-being of California residents. However, several species readily attack people, and some species can transmit microbial organisms that cause human diseases such as West Nile Virus, malaria, and encephalitis. The mosquitoes of major concern in California belong to the genera *Culex*, *Aedes*, and *Anopheles*. Other mosquitoes may transmit diseases to livestock or pets.

Mosquitoes are best managed on an areawide basis by public agencies organized specifically for mosquito control. In California, more than 50 mosquito and vector control districts provide this service. For assistance, look under the county government section of your telephone directory for mosquito abatement or vector control.

For the general public

- Quick Tips: [Mosquitoes](#)
- Pest Note: [Mosquitoes](#)

On farms

- [Managing Mosquitoes on the Farm](#) (PDF)

In wetlands and stormwater systems

- [Managing Mosquitoes in Surface-Flow Constructed Treatment Wetlands](#)
- [Managing Mosquitoes in Stormwater Treatment Devices](#)

En español

- Nota Breve: [Mosquitos](#)

MORE INFORMATION

[Zika Virus](#) (PDF) information from the Regional IPM Centers

[West Nile Virus and related mosquito information and links](#) from California Surveillance Information Center, CA Department of Health Services



Adult western malaria mosquito.



Don't let mosquitoes breed in your yard! (2:03)



Protect yourself from mosquito bites (1:38)

UC IPM Pest Notes, Publication 7451
Revised April 2020

UC IPM

UC RESEARCH REVIEWED

Mosquitoes

Integrated Pest Management for Home Gardeners and Landscape Professionals

More than 50 species of mosquitoes occur in California, with habitats ranging from deserts at or below sea level to mountain meadows with elevations of 10,000 feet or higher. Many of these species are relatively uncommon and seldom pose a severe nuisance or threat to human health.

However, several species readily feed on people and can transmit microbial organisms that cause human diseases such as encephalitis and malaria. The mosquitoes of major concern in California belong to the genera *Culex* (Figure 1), *Aedes*, and *Anopheles*.



Figure 1. Adult *Culex tarsalis* mosquito.

IDENTIFICATION AND LIFE CYCLE

Mosquito adults are small, delicate, two-winged flies. Non-biting midges and the comparatively large crane flies, sometimes called mosquito hawks, are often mistaken for mosquitoes (although they don't actually eat mosquitoes). However, female mosquitoes differ from similar insects because of their long, slender proboscis, a tubular set of mouthparts adapted for piercing skin and sucking blood. Only female mosquitoes feed on animal blood; males do not. Male mosquitoes use their proboscis only for sucking plant juices and other sources of sugar rather than blood.

If you were to view a mosquito with a magnifying glass or microscope, you would see another characteristic that distinguishes mosquitoes from closely related flies—small scales cover their long, slender wings.

The life cycle of mosquitoes (and many other insects) involves an egg, larval, pupal, and adult stage. The life cycle

of mosquitoes varies widely among species. Some female mosquitoes lay single eggs on water surfaces, while others lay batches of 100 or more eggs, called rafts (Figure 2). Other species lay single eggs just above the water line in moist tree holes, or containers where later flooding is likely. Egg deposited on water surfaces usually hatch within a couple of days, but eggs laid on the sides of saucers under plant jars, cans, or soil surfaces won't hatch until flooding occurs which can be months or even years later.

Larvae grow through stages called instars. First instar larvae which are nearly invisible to the naked eye, hatch from eggs. Larvae molt three more times, growing larger after each molt. Mosquito larvae, or wigglers, (Figure 3) are usually black or brown and occur in stagnant or near water in surface pools, tree holes, or man-made containers.

Authors:

William E. Walton, Entomology and Pacific Southwest Center of Excellence in Vector-borne Diseases, UC Riverside.

Bruce F. Eldridge, Entomology, UC Davis.



Figure 2. Egg rafts of *Culex tarsalis*.

Quick Tips

UC IPM

Mosquitoes

Mosquitoes are small flying insects that bite people and animals and can spread diseases such as West Nile virus.

Female mosquitoes require blood from humans or other animals to develop eggs.

Mosquito larvae live in aquatic habitats and can grow in ponds, bird baths, and any other objects containing standing (non-moving) water. Decrease your chances of getting mosquito bites by reducing standing water around your home, using repellents, and wearing protective clothing when outdoors.



Adult western malaria mosquito, *Anopheles freeborni*.

Minimize mosquito breeding habitats.

- Empty water from unused garden pots and other objects. Store containers upside down, cover, or dispose of them so mosquitoes can't lay eggs.
- Change water in pet dishes, watering troughs, and bird baths every week.
- Avoid overwatering outdoor landscapes, which can lead to standing water.
- Keep litter and garden debris out of street gutters. Remove debris from rain gutters and downspouts annually.
- Seal rain barrels and keep all filters and prefilters clean and free of moisture-retaining debris. Inspect water reservoirs regularly for leaks.
- Remove excess vegetation, stock with mosquito-eating fish, or use *Bacillus thuringiensis* (Bt) products in ponds. Bt is a bacterium that kills mosquito larvae but doesn't affect people, other animals, or plants.
- Maintain water quality in swimming pools with chemical treatments. Keep water off swimming pool covers. Cover or drain water from plastic pools when not in use so mosquitoes can't lay eggs.
- Fill open tree holes with sand or mortar.



Egg raft of encephalitis mosquito, *Culex tarsalis*.

For more information about managing pests, visit ipm.ucanr.edu or your local University of California Cooperative Extension office.



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UC IPM mosquito videos



Don't let mosquitoes breed in your yard!



UCIPM
5.29K subscribers

Analytics

Edit video

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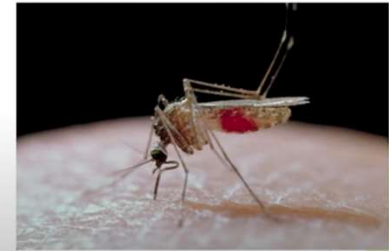


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UC IPM Urban & Community Webinar Series

Mosquitoes and Ticks of Public Health Concern

Presented by: Mary Sorensen,
Placer Mosquito & Vector
Control District
April 18, 2024



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Thank you

Laura Krueger

Vector Ecologist

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Station 1: Culex and Aedes Mosquitoes

- Observe Culex and Aedes mosquitoes
 - Egg
 - Larvae
 - Pupae
 - Adult



Station 2: *Gambusia affinis*

- Feed mosquito larvae to the mosquito fish and observe their behavior
- Review the mosquito fish placement guidelines



Station 3: Mosquito Repellants

- The higher the concentration of active ingredients, the longer they provide protection.
- Studies show the DEET > Picaridin > IR3535 > Oil of lemon eucalyptus
- Repellant concentrations >30% are for <8 hours protection
- Repellant concentrations <20% are for <4 hours protection



Station 4: What Works and What Doesn't

- Review the commonly available mosquito control sprays and devices.
- Do these devices/sprays work? What are the limitations of each option?
 - Bug Lights
 - Ultrasound repellent
 - Sprays
 - Essential oil sprays
 - Thermacell
 - Candles
 - Coils



Station 5: Common Sources of Standing Water Around Homes

Learn how to prevent mosquitoes in common sources around homes

- Drains: how to screen a drain and effective options for screening; window screen fabric or metal, 90% landscape fabric
- Plants: aqua beads for plant cuttings,
- Bird baths/fountains: use mosquito bits or dunks; dump and drain every 96 hours, scrub to remove mosquito eggs
- Pet supplies: scrub pet bowls to remove mosquito eggs; dump and drain every 96 hours



Station 6: Mosquitoes and Disease

- Discover your local MVCD
- Review WNV activity in your community
- Review invasive *Aedes* mosquitoes present in your community

