

Vector of the Month—Mosquitoes of Orange County

Orange County supports a unique assemblage of mosquitoes represented among common and rare species. Several are known for their involvement with the transmission of St. Louis encephalitis, malaria, and West Nile virus to humans. The following text presents a brief synopsis of the commonly occurring mosquito species currently known from the county.

***Aedes aegypti* & *Aedes albopictus*:**

These invasive mosquito species are primarily associated with urban areas and can be found breeding in natural and small artificial water sources, such as flowerpots. They are active during the day and readily take blood meals indoors and outdoors.

These species can transmit yellow fever, dengue, chikungunya, and Zika to people, and dog heartworm to dogs. *Aedes aegypti*, also known as the “ankle biter,” is now the species responsible for most of the District’s mosquito complaints.

***Culex quinquefasciatus*:** The southern house mosquito is the species formerly responsible for a majority of the District’s mosquito abatement services and related control activities. Females are active nearly year around in the more sheltered areas of the county and will frequently enter houses to seek blood. Larvae are commonly associated with all types of “urban waters” held in sources ranging from swimming pools to flower pots. This species serves as our primary vector of both West Nile (WNV) and St. Louis encephalitis (SLE) viruses.

***Culex tarsalis*:** The western encephalitis mosquito is considered by most mosquito biologists to be the principal encephalitis vector throughout much of its range in North America. It is our primary vector of western equine encephalitis (WEE) virus and primary/secondary vector of WNV and St. Louis encephalitis (SLE) virus. Adults are

active during the spring, summer, and fall. Though more common in less developed areas, breeding occurs throughout the county in association with most types of clean, standing water sources in channels and marshes.

***Culex erythrorhox*:** The tule mosquito is a distinctive reddish-colored species associated with coastal and inland permanent wetlands, particularly the San Joaquin Marsh. Although females do not disperse far from breeding sources to bite, their often painful bite is usually followed by a severe local reaction. The tule mosquito overwinters as mature larvae, unlike most *Culex* species that overwinter as adult females. Emergence occurs as early as late February with continuous breeding extending well into the fall during favorable years. This species has been found naturally infected with WNV, WEE, and SLE, but is considered a less competent vector of these mosquito-borne diseases.

***Culex stigmatosoma*:** This close relative of *Culex tarsalis* is sometimes referred to as the foul water mosquito as a consequence of its breeding habits in association with either stagnant or polluted waters. Females are on the wing throughout the county from spring to early fall, seldom bite humans, and only rarely enter homes. This species has been demonstrated to be an efficient vector of WNV and St. Louis encephalitis (SLE) virus, and thus, represents an important link in the maintenance of these viruses in birds.

***Aedes squamiger*:** The California salt marsh mosquito is a late winter and early spring species that breeds in coastal wetlands flooded by seasonal rainfall. Larvae usually occur in rainwater filled depressions in association with pickleweed and salt grass. It is an extremely aggressive day and dusk biter with the capacity to disperse long distances to obtain a blood meal. Bolsa Chica populations have been found naturally infected with a California group (CE) encephalitis (Morro Bay) virus. The potential impact of this virus on residents inhabiting coastal areas is unknown.

***Aedes taeniorhynchus*:** This summer species is sometimes called the dark salt marsh mosquito because of its highly contrasting black and white coloration. Larvae develop in upland pickleweed flats that are flooded by high tides. It is an aggressive biter during the day and at dusk and can be troublesome to coastal residents living near breeding sources.

***Culiseta incidens*:** The cool weather mosquito is most often encountered from February through June. It is found throughout the county in association with a variety of larval habits that include rainwater pools, artificial containers, and ornamental ponds. Although this mosquito is not considered a major pest, females will occasionally enter homes or bite residents outdoors near breeding sources.

***Anopheles hermsi*:** This spring, summer, and fall mosquito is found sporadically throughout the county in association with breeding sources containing floating mats of filamentous algae. As a competent vector of human malaria, this species has been involved with the autochthonous

(indigenous) transmission of this disease in San Diego County. Malaria transmission is possible in Orange County if residents are bitten by females that have been infected as a consequence of feeding on either a resident or transient experiencing a typical relapse.

***Culiseta inornata*:** The impressive large winter mosquito is encountered during the cooler months of the year. Larvae develop in all types of natural sources. Abundant larval populations occur in association with *Ae. squamiger* in salt marsh habitats. At times, this species can be locally troublesome to coastal residents. Elsewhere, this species has been involved with the transmission of a number of mosquito-borne encephalitides: WEE, SLE, and Jamestown Canyon viruses.

***Culiseta particeps*:** Similar to *Culiseta inornata*, this distinctive species with scale patches on the wings usually breeds during the cooler months of the year. Larvae occur in shaded alga-laden pools along foothill streams both inland and near the coast.

***Aedes washinoi*:** *Aedes washinoi* occurs along the coast and sporadically inland where it can be locally annoying to residents following wet winters. Larvae develop in fresh water located in the upland portions of salt marshes and in floodwater sections of coastal and inland streams.

***Anopheles franciscanus*:** On the wing during the spring, summer, and fall, this species is found at a limited number of sites within the county. It breeds in sources supporting abundant algal-growths and floating mats of vegetation. This species seldom bites humans and does not experimentally transmit human malaria in the laboratory.

West Nile virus: another alarming side effect of US drought



A small stream of stagnant water is all that's left of a former wetland near Tulelake, California. Photograph: Nathan Howard/AP

For five days in the late summer of 2018, doctors battled to bring down John Hayden's high fever.

Hayden's sudden onset of symptoms, including high fever, had everyone stumped, said his daughter Ann Hayden, and his body seemed to fail to respond to any treatment. He succumbed to the inexplicable illness just after Labor Day, his family at his side.

Two days later, the single infectious disease doctor in California's Yolo county, where Hayden lived, told his family that a spinal tap had shown Hayden had been infected with the West Nile virus, a rare virus spread by mosquitoes that can cause neurological disease and death. Symptoms often include fever, headache, nausea and vomiting, and severe cases can cause inflammation of the brain or its surrounding membranes. It is considered by public health officials to be the most serious vector-borne disease in the state of California.

"It was life changing for me," said Ann, a senior director for the advocacy organization the Environmental Defense Fund. It added even more weight and urgency to the work she does.

The West Nile virus was once associated with higher humidity and moisture, conditions that help mosquitoes thrive. But a growing body of research has found that drought conditions – such as those being felt across the American west – could amplify its effects. States are already on alert.

California reported its first death of the year in July. By the end of that month, the state's department of public health (CDPH) had documented the virus in 4 people, 94 dead birds, 563 mosquito samples, 10 chickens and 1 horse.

"West Nile virus activity in the state is increasing, so I urge Californians to take every possible precaution to protect against mosquito bites," said Dr Tomás J Aragón, CDPH's director, in a statement confirming the death of a man in San Luis Obispo county.

A spokesperson for CDPH told the Guardian that “hot temperatures contribute to increasing numbers of mosquitoes and the increased risk of virus transmission to humans”, but that activity remains within expected levels. People 50 years of age and older, or those with diabetes or hypertension, are most at risk.

West Nile virus is difficult to track, as most people don’t show signs of infection, and trends aren’t easy to spot year over year. But Cameron Webb, a medical entomologist and senior investigator with the Centre for Infectious Diseases and Microbiology – Public Health says research shows that drought hastens its spread.

“During drought, the water levels in pipes and pits and ponds drop, and the water is more likely to get stagnant,” he said. “Fish die along with other animals that live in these systems, and the mosquitoes have free rein.”

In storm water systems, regular rainfall flushes out young mosquitoes and puts a strain on their populations. “When it is dry it is actually better conditions in the man-made structures for these types of mosquitoes,” Webb added.

It doesn’t take much – mosquitoes are able to reproduce in mere milliliters of water, hatching hundreds of eggs that will be ready to bite people and animals in little more than a week.

Water scarcity also draws clusters of birds closer to human settlements, and they play a big role in transmitting the virus. “Because there’s limited water in the environment and everything is dry, the birds go looking for water and refuge, which tends to be around where people live,” Webb said. Birds that are typically dispersed through the environment become more concentrated in urban areas, amplifying infection rates.

“You bring together people, wildlife, and the mosquitoes, and that seems to be one of the key factors that might drive increasing risk of West Nile virus during drought years,” Webb added.

By mid-century, the increasing severity of drought could triple the number of West Nile cases in regions with low human immunity, according to a study published in 2017. Illustrating how the climate emergency can alter transmission dynamics, a team of scientists studied 15 years of data on human cases across the US and found that epidemics of the disease, which typically occur in summer and autumn, were larger during dry years.

“We thought epidemics would coincide with the most ideal temperatures for transmission,” Marm Kilpatrick, an associate professor of ecology and evolutionary biology at the University of California, Santa Cruz, said in a statement when the study was released. “Instead, we found that the severity of drought was far more important nationally, and drought appeared to be a key driver in the majority of individual states as well.”

But along with increased risks during dry times, the findings indicate there are also tools to combat the rise of transmissions – and they are the same strategies needed for conservation when water is scarce.

Water-use restrictions dramatically reduce the number of dangerous mosquitoes, according to a separate study released earlier this year. Scientists from the University of California, Los Angeles, and three other universities found that without the policies enacted to adapt to the last major drought, which lasted from 2012 to 2016,

mosquitoes in Los Angeles county, home to 13.3 million people, would have been 44% higher, and they would be 39% higher in Orange county.

"We are going to have a warmer climate, and the demand for water for outdoor irrigation in particular will go up," Dennis Lettenmaier, a UCLA professor of geography and the study's senior author, said in a statement.

"Efforts to reduce urban water use have a secondary benefit: they reduce the abundance of the mosquitoes that are responsible for West Nile virus."

That's why Hayden, of the Environmental Defense Fund, says she has hope.

"The connection between West Nile virus and the drought is yet another one of these unforeseen, really unfortunate impacts we are going to be seeing from climate change," she said, noting that the loss of her father underscored how devastating the effects on individuals, families, and communities can be. "But improvement can be made. We can create a positive impact if we can implement more resilient practices."

Retrieved from: <https://www.theguardian.com/us-news/2021/aug/06/drought-west-nile-virus-human-health>

BOARD MEETING HIGHLIGHTS

For the August 12, 2021 Meeting

F/ETCA BOARD OF DIRECTORS

Peggy Huang, **Chair**,
YORBA LINDA

Joseph Muller, **Vice Chair**,
DANA POINT

Trevor O'Neil,
ANAHEIM

Farrah Khan,
IRVINE

Scott Voigts,
LAKE FOREST

Patricia Kelley,
MISSION VIEJO

Mark A. Murphy,
ORANGE

Anthony Beall,
RANCHO SANTA MARGARITA

John Taylor,
SAN JUAN CAPISTRANO

David Penaloza,
SANTA ANA

Austin Lombard,
TUSTIN

Donald P. Wagner,
COUNTY OF ORANGE, 3RD DIST.

Doug Chaffee,
COUNTY OF ORANGE, 4TH DIST.

Lisa Bartlett,
COUNTY OF ORANGE, 5TH DIST.

Ryan Chamberlain, Ex-Officio
Member, CALTRANS DIST. 12

SJHTCA BOARD OF DIRECTORS

Patricia Kelley, **Chair**,
MISSION VIEJO

Will O'Neill, **Vice Chair**,
NEWPORT BEACH

Richard Hurt,
ALISO VIEJO

Arlis Reynolds,
COSTA MESA

Richard Viczorek,
DANA POINT

Farrah Khan,
IRVINE

Janine Heft,
LAGUNA HILLS

Fred Minagar,
LAGUNA NIGUEL

Cynthia Connors,
LAGUNA WOODS

John Taylor,
SAN JUAN CAPISTRANO

David Penaloza,
SANTA ANA

Donald P. Wagner,
COUNTY OF ORANGE, 3RD DIST.

Lisa Bartlett,
COUNTY OF ORANGE, 5TH DIST.

Ryan Chamberlain, Ex-Officio
Member, CALTRANS DIST. 12

F/ETCA BOARD APPROVES CONSTRUCTION CONTRACTS FOR NORTHBOUND STATE ROUTE 241 CHANNELIZERS PROJECT

The F/ETCA Board unanimously approved a contract with Peterson-Chase Engineering Services for northbound State Route (SR) 241 channelizers construction and inspection replacement services for \$1,043,392. The channelizers will be installed on an approximately one-mile segment on the existing northbound 241 Toll Road and is an interim condition that is anticipated to remain in place until the 241/91 Express Connector Project construction begins.

The channelizers will help improve traffic operations and enhance safety by preventing vehicles from trying to cut in front of the queue that forms in the evening peak hours on the two SR 241 lanes that merge onto the eastbound SR 91.

F/ETCA BOARD AUTHORIZES 241/91 EXPRESS CONNECTOR CONTRACT AMENDMENTS

The F/ETCA Board unanimously voted to authorize current contract amendments with WKE, LSA and Michael Baker to fund several beneficial design refinements that will enhance project performance and support avoidance of cost escalation. This work will aide in continuing to advance the project to construction with the goal of being open to traffic in late 2025.

The 241/91 Express Connector Project is a regionally significant median-to-median tolled facility that is included in the Agency's Capital Improvement Plan (CIP). The project can provide significant travel time savings for all users on SRs 241 and 91.

ANNUAL INVESTMENT PORTFOLIO REVIEW SHOWS INVESTMENT RETURNS EXCEEDED BENCHMARKS FOR FISCAL YEAR 2021

The annual investment review, conducted by the Agencies' investment advisor, Chandler Asset Management, detailed the Agencies' strong and robust investment portfolios for Fiscal Year 2021 (FY21). Highlights include:

- The Agencies' combined \$1.59 billion portfolio earned \$19 million in interest.
- Portfolio returns exceeded assigned benchmarks, despite the challenging economic and financial market environment.
- The stable value of the securities held in the Agencies' portfolios continues to adhere to the primary tenets of safety, liquidity and return.
- The total market value plus accrued interest of the Foothill/Eastern portfolio is \$771,628,976 and the total market value plus accrued interest of the San Joaquin Hills portfolio is \$817,789,470.



BOARDS ADOPT FY22 INTERNAL AUDIT PLAN

The Boards adopted the FY22 internal audit plan, which was developed based on input solicited from the Joint Finance and Investment and Joint Toll Operations Committees.

Some of the activities in the FY22 audit plan include:

- Support external financial statement audit (in progress)
- Independent review of budget allocation percentages
- Member agency development impact fee audits
- Review of Toll Operations contract for road maintenance and customer service
- Audit of selected PCI (payment card industry) controls and support annual PCI assessment
- Customer service system access and security assessment
- Time and materials contracts invoice review

F/ETCA BOARD VOTES TO AMEND OSO BRIDGE PROJECT COOPERATIVE AGREEMENT TO FINALIZE PROJECT CLOSE-OUT

The F/ETCA Board unanimously voted to amend the Oso Bridge Project Cooperative Agreement to provide \$189,000 in additional funding necessary to facilitate project close-out activities pursuant to construction administration service supplied by the County of Orange.

The Oso Bridge Project opened to traffic on January 13, 2021. During the last eight months, project close-out activities have been advanced, including procurement and installation of additional guard railing, ramp lighting and a crash cushion. Due to the pandemic, the construction contractor encountered delays procuring punch-list related construction materials and completion of the punch-list took longer than anticipated. It is anticipated that all remaining items will be completed during August 2021. After all items are complete, the Caltrans encroachment permit will be finalized and closed.



BOARDS AUTHORIZE CEO TO SUBMIT FORMAL RESPONSES TO JUNE GRAND JURY REPORT

Both Boards authorized the CEO to submit formal responses to the Orange County Grand Jury's June 21, 2021, report findings and recommendations.

The Grand Jury's report contains six findings and three recommendations. Highlights of the report acknowledge:

- The Toll Roads are a regional success and provide an essential service
- TCA delivered and operates excellent roads
- Recognized TCA's toll collection system and process management
- TCA is financially stable and took actions to reduce future interest payments by taking advantage of low interest rates
- TCA used innovative financing to build The Toll Roads
- Development Impact Fees (DIFs) assist with defraying construction costs and are not taxes
- To some extent, South County owes its success to The Toll Roads that were built in the absence of government funding

The Grand Jury's findings and recommendations are centered around TCA's CIP, debt management, revenue and cash management, and structure.

TCA's responses to the Grand Jury's findings and recommendations include:

- The Grand Jury's report did not account for the Agencies' FY22 CIP which identifies timing and funding for TCA's projects, including the 241/91 Express Connector, SR 73 Catalina View Widening, SR 241 Loma Segment Widening and post-2035 conceptual projects.
- The TCA's are already actively taking steps to decrease debt.
 - F/ETCA has saved more than \$600 million in recent bond refundings without extending repayment dates.
 - SJHTCA and F/ETCA are reviewing near term opportunities for paying down callable bonds.
- Merging the SJHTCA and F/ETCA would be extremely expensive and would likely extend current bond maturity dates.
- Both Agencies are already in the process of developing plans for their respective financial futures, which focus on debt management and funding the Agencies' CIP without adding burden to limited state and Measure M resources.

The responses will be finalized and submitted by September 20, 2021, as set forth by the Grand Jury.

MONTHLY REPORT: Yorba Linda

August



	Monthly	Year to Date (YTD)	County Monthly	County YTD
OPERATIONS				
Service Requests Completed:	29	93	1033	2,864
Mosquitoes:	21	66	863	2,060
Rats:	6	21	75	438
Rifa:	2	6	86	338
Number of Swimming Pools Treated/Inspected:	25	299	729	6,842
Hours Spent Treating/Inspecting Gutters	13	94	957	4,887.1
Undergrounds Treated:	0	100	3,630	17,382
Acres of Flood Channels Treated:	2.19	8.813	178.43	640.5151
Acres of RIFA Treated/Inspected:	152	1,784	7,185	46,424
Number of Inspection Treatments:	26	315	1,704	12,300

LABORATORY				
Adult Mosquitoes Collected:	440	1628	30,888	134,430
Collected From Trustee Home:	0	0	0	0
Invasive Aedes	17	33	1,641	2,442
Mosquito Pools (Samples) Tested:	21	58	1,171	3,897
WNV Positive Samples:	0	0	15	15
WNV Positive Birds:	0	0	0	0
Number of Human Infections/Deaths:	0	0	0	0
Fleas, Ticks, and Others Tested:	-	-	0	2,173

COMMUNICATIONS				
Outreach Events Attended:	0	0	3	8
General Presentations:	0	2	3	33
Educational Program Presentations:	0	0	2	81
Calls Received	-	-	369	2,087

PROJECTS IN COLLABORATION WITH OCMVCD				
None at this time				

<

BOARD MEETING HIGHLIGHTS

For the September 09, 2021, Meeting

F/ETCA BOARD OF DIRECTORS

Peggy Huang, **Chair**,
YORBA LINDA

Joseph Muller, **Vice Chair**,
DANA POINT

Trevor O'Neil,
ANAHEIM

Farrah Khan,
IRVINE

Scott Voigts,
LAKE FOREST

Patricia Kelley,
MISSION VIEJO

Mark A. Murphy,
ORANGE

Anthony Beall,
RANCHO SANTA MARGARITA

John Taylor,
SAN JUAN CAPISTRANO

David Penaloza,
SANTA ANA

Austin Lumbard,
TUSTIN

Donald P. Wagner,
COUNTY OF ORANGE, 3RD DIST.

Doug Chaffee,
COUNTY OF ORANGE, 4TH DIST.

Lisa Bartlett,
COUNTY OF ORANGE, 5TH DIST.

Ryan Chamberlain, Ex-Officio
Member, CALTRANS DIST. 12

SJHTCA BOARD OF DIRECTORS

Patricia Kelley, **Chair**,
MISSION VIEJO

Will O'Neill, **Vice Chair**,
NEWPORT BEACH

Richard Hurt,
ALISO VIEJO

Arlis Reynolds,
COSTA MESA

Richard Viczorek,
DANA POINT

Farrah Khan,
IRVINE

Janine Heft,
LAGUNA HILLS

Fred Minagar,
LAGUNA NIGUEL

Cynthia Conners,
LAGUNA WOODS

John Taylor,
SAN JUAN CAPISTRANO

David Penaloza,
SANTA ANA

Donald P. Wagner,
COUNTY OF ORANGE, 3RD DIST.

Lisa Bartlett,
COUNTY OF ORANGE, 5TH DIST.

Ryan Chamberlain, Ex-Officio
Member, CALTRANS DIST. 12

SAN JOAQUIN HILLS TRANSPORTATION CORRIDOR AGENCY BOARD UNANIMOUSLY APPROVES SERVICES NEEDED FOR POSSIBLE BOND REFUNDING

The San Joaquin Hills Transportation Corridor Agency (SJHTCA) Board of Directors unanimously approved a contract for services needed to proceed with a strategy to take advantage of current opportunities and favorable interest rates in the bond market to refund some of the Agency's bonds. The refunding would generate significant savings in future interest payments without extending any of the bond maturity dates. The strategy also creates an opportunity to pay off debt earlier than projected while giving future Boards greater financial flexibility. The contract was approved with Stantec Consulting Services Inc. for \$32,500 to complete necessary work related to the Agency's existing investment-grade traffic and revenue (T&R) forecast and bond and disclosure counsel services.

The refunding opportunity could save the SJHTCA over \$100 million net of costs and adds to the Foothill/Eastern Transportation Corridor Agency's (F/ETCA) successful bond refundings in recent years that have reduced payments by more than \$600 million without extending any bond maturity dates. Both Agencies are considering early pay down of bonds over the next five years, which could save an additional \$400 million in interest resulting in nearly \$1 billion in savings in recent years. Including a 10-year call provision on the refunding bonds – as in recent F/ETCA bond transactions – will afford future SJHTCA Boards maximum flexibility to pay down the bonds earlier.

ANNUAL CUSTOMER SERVICE REPORT SHOWS HIGH LEVEL OF CUSTOMER SATISFACTION

Staff presented the Boards with the results from the Agencies' Annual Customer Service Report, which shows an overall customer satisfaction rate of 4.5 out of 5, reflecting customers' positive experience and achieving the Boards' goal of attaining a 4.5 out of 5 rating.

The customer satisfaction rate held steady from FY20 through FY21, the survey response rate increased by seven percent, the average wait time was just three minutes and 14 seconds and new accounts increased by 10%; proving that even during a global pandemic and resulting challenges experienced by nearly every industry, TCA is committed to customer service and the customer experience.

PayNearMe, a cash payment network that customers can use to pay a toll, violation or replenish their account at stores like 7-Eleven, CVS and, now, Walmart and Family Dollar, continues to be a popular option with customers. PayNearMe transactions increased by 47% over the previous year, while PayNearMe amounts collected increased by 75% compared to last year. Currently PayNearMe transactions have increased by 500% since the implementation of QR (Quick Response) codes, which provide even more customer convenience, resulting in an estimated savings of \$10,000 per month in credit card fees.

Staff produces the Annual Customer Service Report to share key performance indicators related to customer service feedback and contractor performance.

