TURLOCK MOSQUITO ABATEMENT DISTRICT

2024 Annual Report

Contents

Letter from the General Manager

On behalf of the Board of Trustees and the staff of the Turlock Mosquito Abatement District, it is my honor to present the Turlock Mosquito Abatement District's 2024 Annual Report.

The District had a successful year serving the residents of the District by utilizing integrated vector management (IVM) which includes public education and outreach, vector surveillance, reduction or elimination of breeding sources, and sound use of biological and chemical control methods. This report outlines the work conducted by District staff and outlines the results with the primary goal of protecting public health.

The prevention of vector-borne disease outbreaks remains the District's primary goal and its most important responsibility to the public. West Nile virus (WNV) remains the District's largest public health concern and controlling mosquitoes who transmit this disease remains the District's number one focus. The District was successful in 2024 observing a reduction in WNV positive mosquitoes and humans.

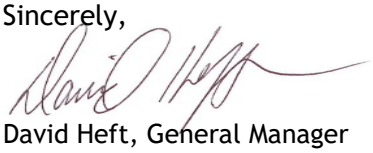
The invasive mosquito *Aedes aegypti* can now be found throughout the District and continues to become more and more of a challenge to control. This mosquito lives very closely with humans, it can even live entirely indoors. While this mosquito hasn't transmitted any disease in California, a local case of Dengue fever was recently transmitted by *Ae. aegypti* mosquitoes in neighboring Arizona. So, this mosquito is important from a public health standpoint in addition to its pestiferous nature. The interaction between this mosquito and humans is much more common, and its bite is very painful, leading to more requests for service. Balancing the fiscal requirements of controlling this invasive mosquito while meeting our primary objective of reducing the transmission of WNV continues to be a challenge.

The good news is the District has been preparing for the arrival of this species for several years. Our Aggressive Source Reduction program has been in effect for several years, identifying the most egregious sources breeding mosquitoes and working with property owners to eliminate or reduce the amount of water and breeding habitat. By partnering with owners and having them assume responsibility of the costs involved in controlling mosquitoes on their property, we have seen a significant reduction in District time and materials spent battling these problem properties. This savings now allows us to confront the ever increasing challenge of controlling *Aedes aegypti* with little to no impact on our WNV program.

As typical, the District continues to aggressively control unmaintained/abandoned swimming pools, catch basins, storm drains, retention ponds and works in partnership with other federal, state, local agencies and governments.

The following Annual Report is testament to the long hours and hard work accomplished by staff that focused not only on controlling mosquitoes but providing the best service to you and your families.

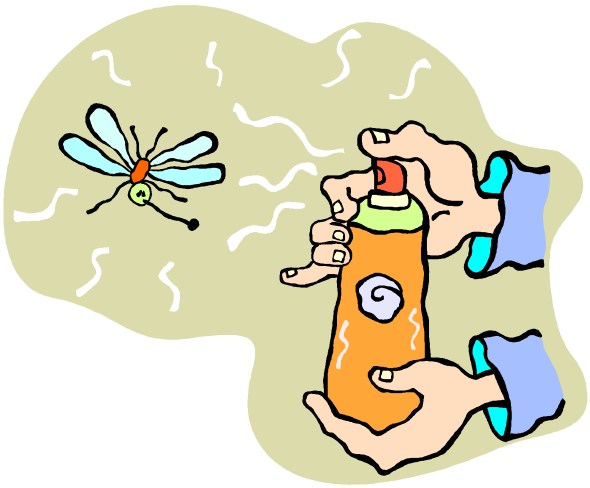
Sincerely,



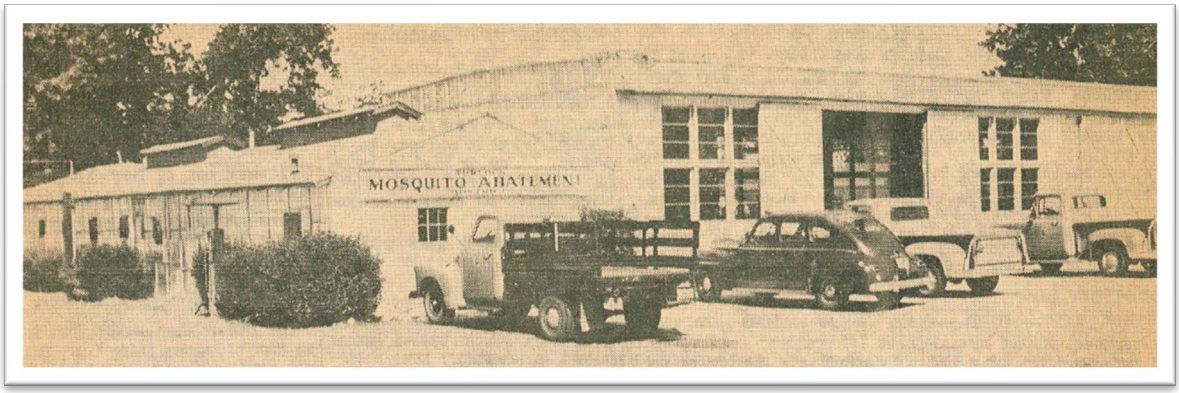
David Heft, General Manager

Mission Statement

The Turlock Mosquito Abatement District is dedicated to enhancing the quality of life for our community by providing effective and environmentally sound mosquito control and disease prevention through timely and efficient surveillance, control and public awareness.



History



The Turlock Mosquito Abatement District was formed in January 1946, at the behest of the Turlock Rotary Club, to protect the public from mosquitoes and the diseases they can transmit. Mosquitoes were not a new problem to California, first mention of them having been made in 1772 by Spanish missionaries. As early as 1903 abatement work was discussed to fight malaria in Marin County, and in 1910 abatement work was actually undertaken in Placer County. The California legislature provided for the formation of abatement Districts by laws it passed in 1915. Originally serving the Turlock, Denair and Ceres communities, cities such as Hughson, Newman, Patterson, and the community of Crows Landing quickly petitioned the Board of Trustees for annexation into the District.

Board of Trustees

President
Aaron Hackler
Turlock

Vice President
Ryan Taylor
County-at-Large

Secretary
Kern Hunewill
Newman

Lynn Apland
Patterson

Rodman Hooker
County-at-Large

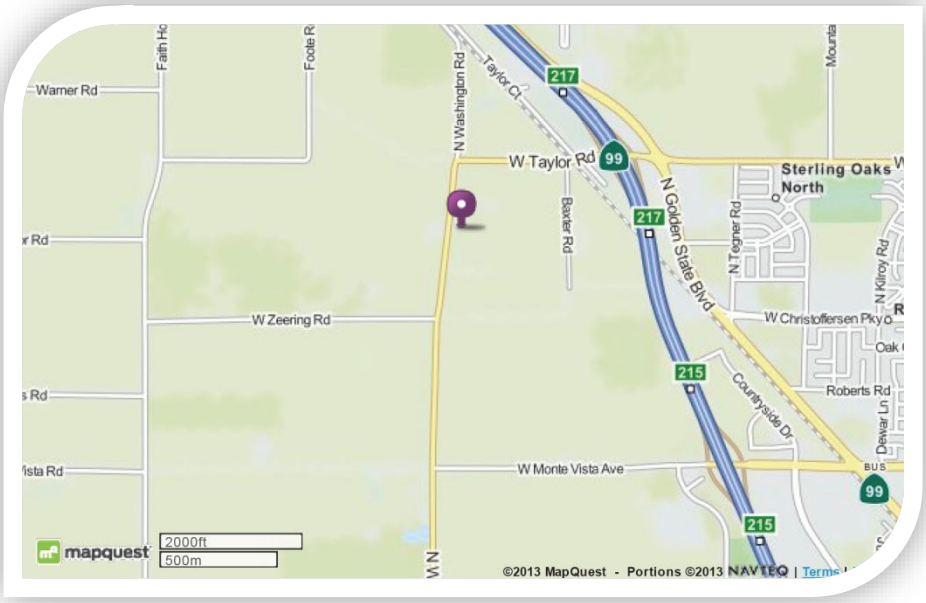
Michael Mitchell
Hughson

L. Kevin Showen
Ceres

Vacant
County-at-Large

Turlock Mosquito Abatement District

4412 N. Washington Rd.
Turlock, CA 95380
209-634-1234



www.turlockmosquito.org

Personnel

Administration

General Manager: David Heft

Administrative Assistant/Clerk of the Board: Ana Rodriguez

Vector Biology/Laboratory

Vector Biologist: Monica Patterson

Operations

Mosquito Control Supervisor: Richard Oberholtzer

Mosquito Control Lead: Brandon Barker

Mosquito Control Operators:

Tim Cardiff

Francisco Lemus

Jesus Lemus

Ivan Maya

Jim Oliveira

Mel Pinney

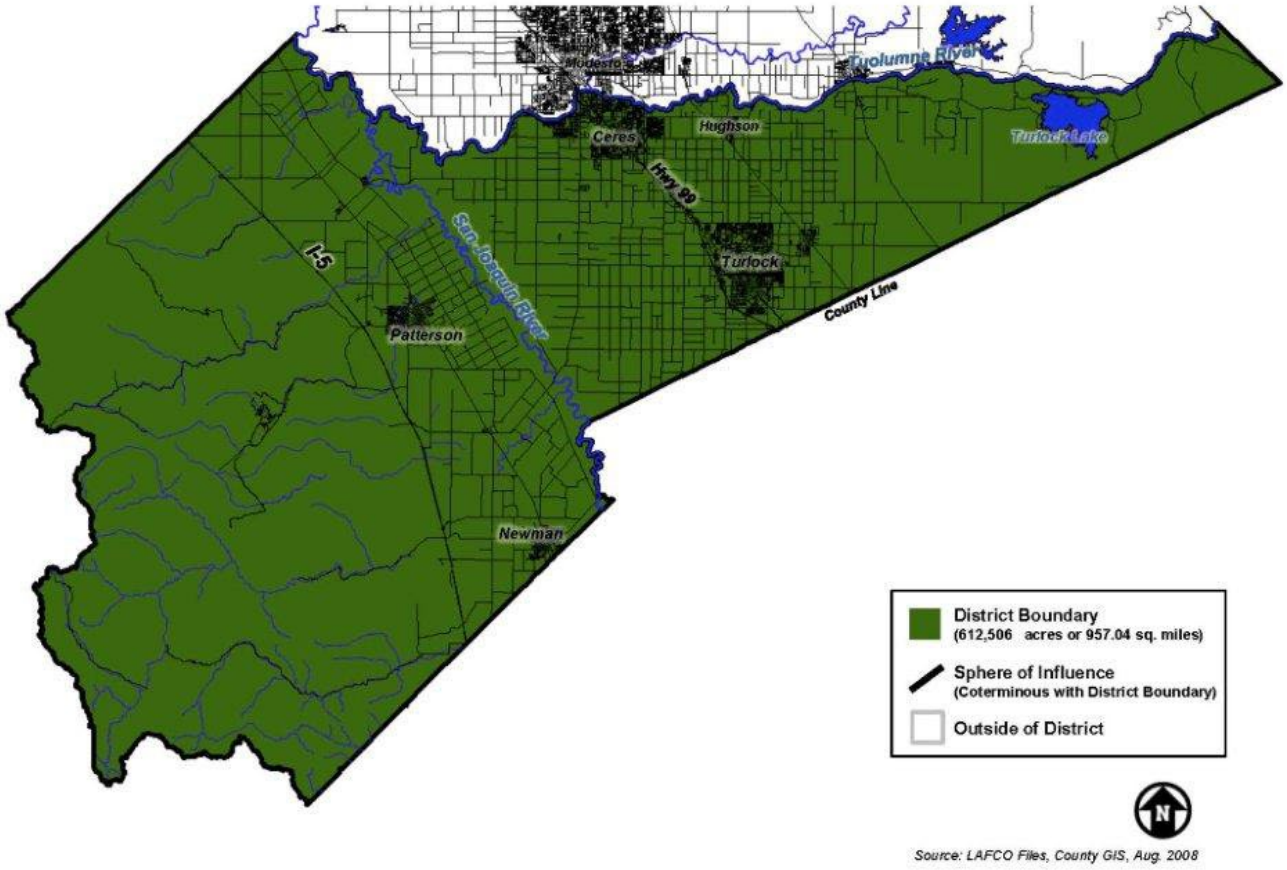
Ron Reforma

Independent Special Districts

The Turlock Mosquito Abatement District is classified as an independent special District and is not part of Stanislaus County's governmental system. Each city within the District's jurisdiction may appoint one board of trustee member to represent their community; the county-at-large is given three board of trustee member appointments to represent citizens in the unincorporated areas of the District's jurisdiction. Special Districts are:

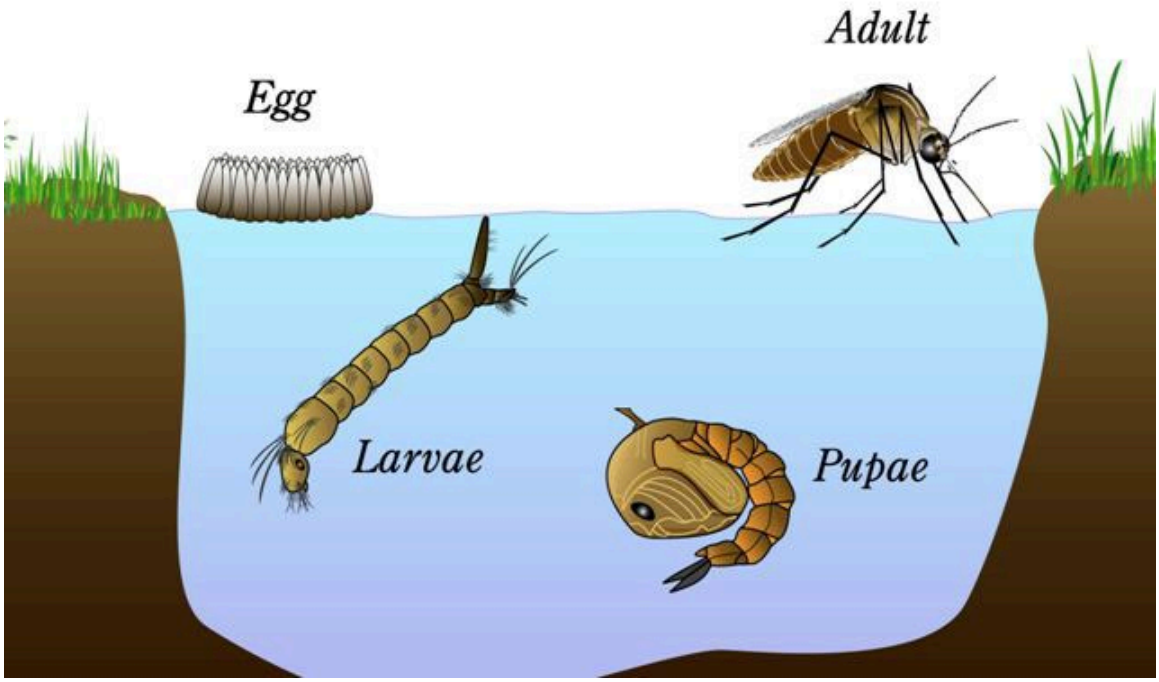
- Formed by local residents to provide local services
- Sanctioned by the State of California Government Code
- Often the most economical means of providing public service
- Independent, self-governed agencies governed by a board of trustees
- Operated as non-profit organizations
- Responsible directly to the people
- Accountable – Accessible - Efficient

Turlock Mosquito Abatement District
Sphere of Influence



Mosquito Biology & Development

There are approximately 3,500 species of mosquitoes distributed worldwide. In California, there are 53 species of mosquitoes and 24 of these are commonly found within the District. Like other insects, mosquitoes have four stages in their life cycle: egg, larvae, pupa, and adult.



Mosquito eggs are laid on the surface of water or moist soil. Some mosquitoes lay their eggs in clusters called “egg rafts” while others lay their eggs singularly.

Larvae hatch from mosquito eggs. They are also sometimes referred to as “wigglers” since they are worm-like in appearance and their swimming behavior gives them a “wiggling” appearance. Mosquito larvae are aquatic and require water to live throughout the larval stage. Mosquito larvae feed on algae, bacteria and organic debris in the water. Although entirely aquatic, mosquito larvae must breathe air using their siphon which acts as a “snorkel device”. Larvae go through four instars or molts each time getting successively larger. After the 4th instar, the larvae enter the pupal stage.

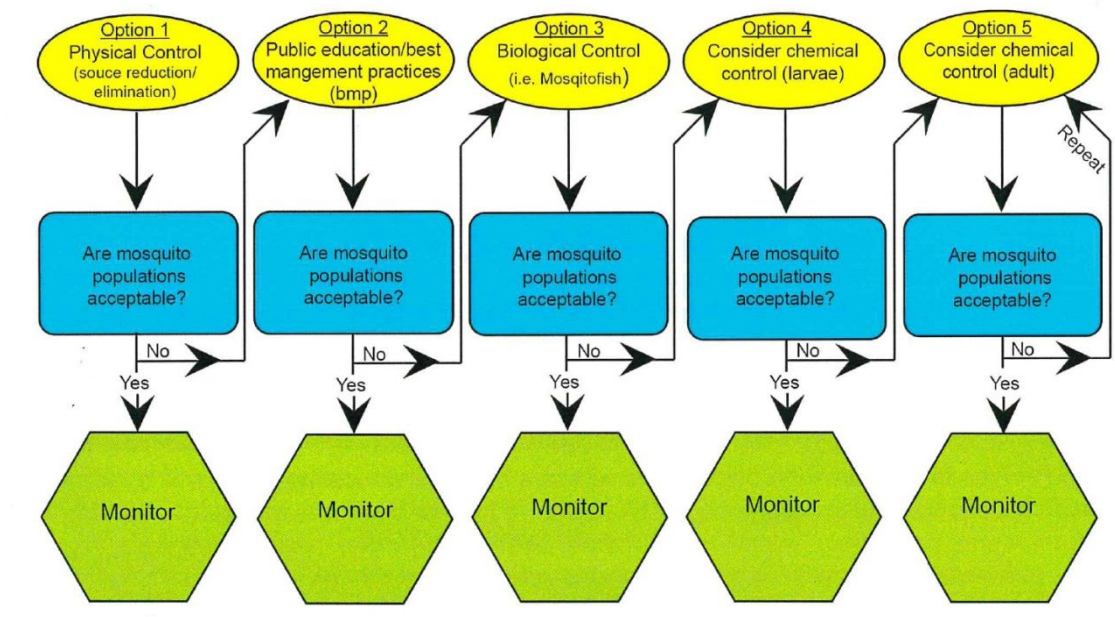
Mosquito pupae are also entirely aquatic and are commonly referred to as “tumblers” due to their bulky appearance and tumbling swimming motion. Pupae, like larvae, must also breathe air and do so through two snorkel-like devices called trumpets. The pupae have no mouthparts and do not eat; however, big changes are taking place within the main pupal chamber as the adult mosquito develops.

The adult mosquito needs flat water and calm air as it cautiously emerges from the pupal casing to dry its wings on the surface of the water. An adult mosquito's body is divided into three distinct areas: head, thorax and abdomen. The head contains the eyes, antennae, and proboscis. The antennae allow the mosquito to hear and smell while the proboscis is a long "straw-like" device used to pierce the skin of host animals and to draw blood. It's important to note that only female mosquitoes ingest blood and this blood isn't used as "food" but rather the female mosquito needs the proteins found in blood to make her eggs. All mosquitoes drink nectar from flowers as food/energy source. Attached to the thorax are two wings and six legs while most of the mosquito's vital organs are contained in the abdomen.

Adult female mosquitoes find a blood source by initially tracking the carbon dioxide (CO_2) exhaled by animals and then using heat and body odors once within the general vicinity of the host.

Integrated Vector Management (IVM) Program

Integrated Vector Management (IVM) is an effective and environmentally sensitive approach to vector management based on scientifically established procedures. Effective IVM begins with an assessment of the mosquito population and the various factors influencing their development. The best strategies for control are then implemented to minimize the mosquito's threat in the most economical and environmentally sensitive way possible. The District's IVM program includes public education, surveillance, source reduction, biological control and chemical control.



Each time a breeding source is located and inspected the District's control operators assess the site and determine the appropriate course of action, much like the flow chart above illustrates.

Source Reduction

The most effective method of mosquito control is source elimination or the removal of mosquito breeding sites. This strategy removes the need for other methods of control and often provides a long-term solution. There are three levels of physical control:

- **Source Elimination:** This approach completely eliminates potential habitats for mosquitoes to develop in. Source elimination can be as simple as repairing leaky faucets, cleaning out gutters, maintaining swimming pools, and filling in areas that pond or puddle.

- **Source Reduction:** This strategy involves altering habitats available for mosquito development. Water may not be totally eliminated but it is greatly reduced in space and/or time. By reducing the larval habitat, the opportunities for adult mosquitoes to develop and spread disease are decreased. Examples of source reduction include: eliminating vegetation along ditches, construction of water holding ponds using steep sides to prevent vegetation growth, the use of drip system irrigation reducing the amount of standing water, proper irrigation methods and not over-irrigating.

- **Source Maintenance:** Maintaining a source may be necessary when it cannot be eliminated or altered to reduce mosquito breeding. Source maintenance can include water management, vegetation management, wetland infrastructure maintenance, and wetland restoration. Source maintenance requires frequent monitoring for mosquito breeding along with plans for managing mosquitoes at each maintained site.

Public Education

Educating the public regarding the importance of mosquito control and how they can protect themselves and their family from mosquitoes and mosquito-borne disease is an important part of the District's IVM program. The District invested in a mobile display that can be used at local events such as fairs, harvest festivals, schools, etc. summarizing the District's programs and educating the public concerning the importance of mosquito control and the dangers regarding West Nile virus. In addition, the District produced a short video that was played before every movie at the theater in Turlock advising the public about District services and the importance of notifying us if they are being affected by mosquitoes or find dead birds. This movie theater serves as the only theater for the entire District allowing us to reach a large potential audience. The District continues to partner with the East Side Mosquito Abatement District and the San Joaquin Mosquito & Vector Control District in a radio campaign each year on popular local radio stations to remind the public how to prevent the transmission of West Nile virus through the use of repellants. Finally, the District redesigned its web site making it much easier for the public to submit requests for service and to find more information quickly regarding local mosquito control activities.

As a special activity in 2024, the District hosted an open house event inviting residents to tour the District office, meet employees, and learn about the District's control program and activities. This event was organized completely by the dedicated employes of the District and was very successful!

Biological Control

Biological control is a method of controlling pests (mosquitoes) using other organisms. The District uses the mosquitofish, *Gambusia affinis*, to provide biological control of mosquitoes through direct predation of larvae. Control operators collect fish from several natural sources throughout the summer season and return the fish to the District pond at our headquarters. From there, these fish are either planted directly in irrigation ditches, ornamental and artificial ponds, unmaintained swimming pools, etc. or are handed out freely to the public for use. Stocking by District personnel complies with strict guidelines designed to ensure that no significant impacts can occur to native species.

Mosquitofish are omnivorous, extremely tolerant to most conditions, and have a voracious appetite for mosquito larvae. The mosquitofish's mouth is adapted for feeding on the surface of the water where mosquito larvae must go to breathe. A fully grown female mosquitofish can consume up to 500 mosquito larvae per day!

Chemical Control

When physical and biological control methods are not viable, the District must employ the use of chemical control measures to reduce or maintain mosquito populations at tolerable levels and to protect public health. The ultimate goal is to control mosquitoes in their larval, aquatic stage when they are confined to a known and defined location. There are two categories of chemicals used by the District, larvicides and adulticides.

Mosquito Larvicides

Mosquito larvicides are primarily divided into two categories, biorational and chemical larvicides.

Biorational Larvicides

Biorational pesticides refer to pesticides of a natural origin, developed from bacteria for instance, that have limited or no adverse effects on the environment or beneficial organisms. In terms of mosquito control, the biorational used most often is called Bti (*Bacillus thuringiensus* var. *israelensis*) which is a bacterium that is ingested by larval mosquitoes and disrupts their gut lining, leading to death before pupation. Bti is applied by the District as a liquid or bonded in solid formulations such as granules, pellets or briquettes. Persistence is low in the environment and efficacy depends on careful timing of application relative to the larval growth stage. Therefore, use of Bti requires frequent inspections of larval sources during periods of larval production, and may require frequent applications. Applications can be made by hand, ATV, or aircraft. *Baccilus*

sphaericus (Bs) is similar to Bti but has a longer persistence allowing for longer duration of control. Spinosad ("Natular") is a bacterial fermentation product which acts on the nervous system of mosquito larvae and is also available in several liquid and solid formulations. All three materials have very low toxicity to non-target organisms.

Chemical Larvicides

Chemical larvicides used routinely by the District include methoprene (Altosid/MetaLarv), pyriproxyfen (SumiLarv) and larvicidal oils. Methoprene and pyriproxyfen are synthetic insect hormones designed to disrupt the transformation of a larval mosquito into an adult. It is applied either in response to observed high populations of mosquito larvae at a site, or as a sustained-release product that can persist for several months. Applications can be made by hand, ATV, or aircraft. While highly effective against mosquitoes, it has very low toxicity to non-target organisms. However, both biorational and chemical larvicides are ineffective against pupae. Pupae do not eat so they do not ingest the biorational larvicides and the pupal stage is generally too late in development for insect growth regulators to be effective. In instances where a control operator finds a breeding site with an abundance of late-stage mosquito larvae and pupae the only effective method of control is larvicidal oil.

Larvicidal oils are petroleum distillates (mineral oil) with low toxicity to plants and designed for fast environmental breakdown by sunlight. The oil forms a thin film on the water and kills the larvae through suffocation and/or direct toxicity. It is typically applied by hand, ATV, or truck. Unlike other larvicides, this material is also effective against mosquito pupae.

2024 Larvicide Use

Altosid Briquettes	232	ea
Altosid Liquid Larvicide	1.7	gal
Altosid Duplex-G	859.25	lb
Altosid P35	165	lb
Altosid XRG Ultra	420	lb
CocoBear Larvicide Oil	1,798	gal
MetaLarv XRP	1,649	ea
Natular 2EC	6.9	gal
Natular DT	496	Ea
Natular G30	84.6	lb
SumiLarv WSP	6,046	ea
VectoBac 12AS	24.6	gal
VectoBac G	50	lb
VectoBac WDG	389	Lb
VectoLex WDG	48.9	lb
VectoLex WSP	3,856	ea
VectoMax FG	460	lb

Mosquito Adulticides

In addition to chemical control of mosquito larvae, the District also makes aerosol applications of pesticides for the control of adult mosquitoes; however, spraying for adult mosquitoes is only conducted when specific criteria are met, including: population density, species composition, and disease risk. As with larvicides, adulticides are applied in strict accordance with the pesticide's label requirements. Commonly used adulticide products include natural pyrethrins (derived from the chrysanthemum plant) and synthetic pyrethoids (molecules similar to natural pyrethrins except manufactured in the lab). Both of these products may contain the synergist PBO (piperonyl butoxide) which improves their effectiveness against adult mosquitoes while reducing the amount of active ingredient needed. In addition, the District also utilizes the active ingredient naled which is an organophosphate as a rotational product to help combat the development of chemical resistance in mosquitoes.

Both materials are applied as ultra-low-volume (ULV) fogs by truck or potentially by aircraft. In addition to having low toxicity to humans and other animals, these materials are applied in very small amounts (approximately 1-2 oz. of active ingredient per acre) and break down rapidly in sunlight. Applications are conducted at night, either dawn or dusk, when the target mosquitoes are active, but bees and other non-target organisms would not be exposed.

2024 Adulticide Use

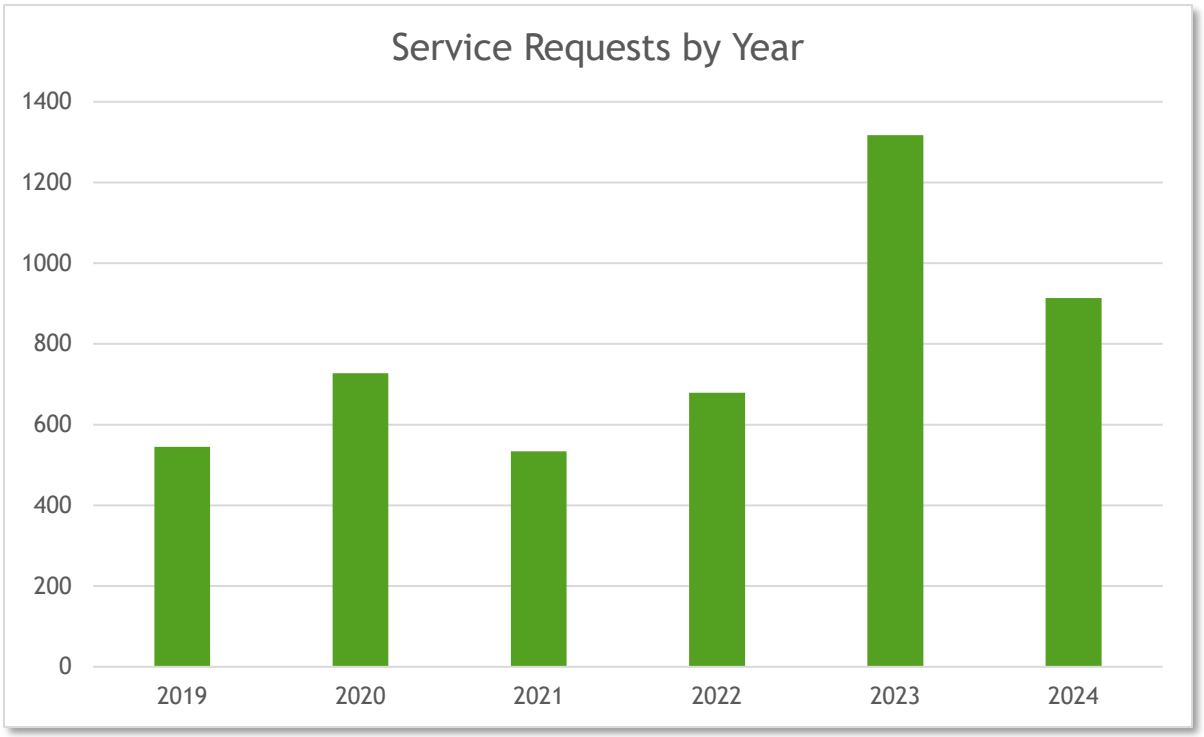
DeltaGard	28.2	gal
Dibrom	838	gal
Pyronyl 525	232.4	Gal
Pyronyl Crop Spray	59.8	gal

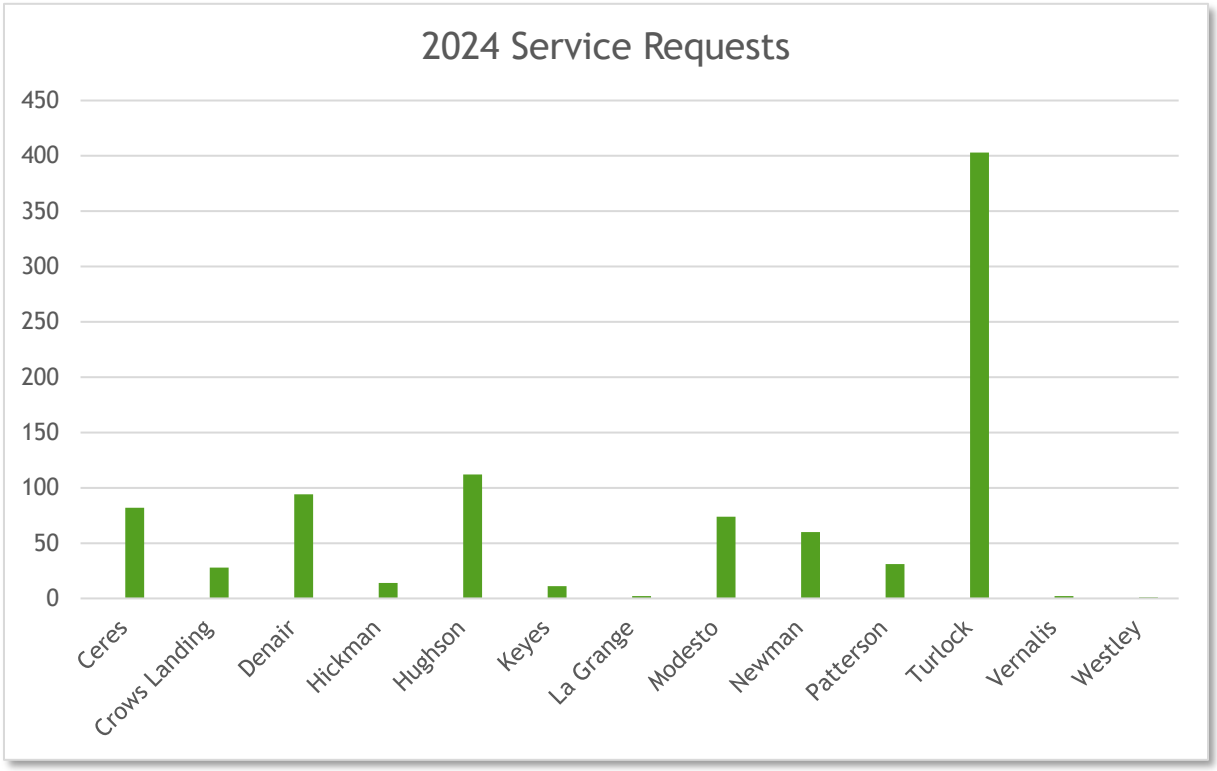
2024 Herbicide Use

Glyphosate	499.7	gal
Oxyflourfen	18.3	gal
Glufosinate-ammonium	184.8	gal

Residential Services

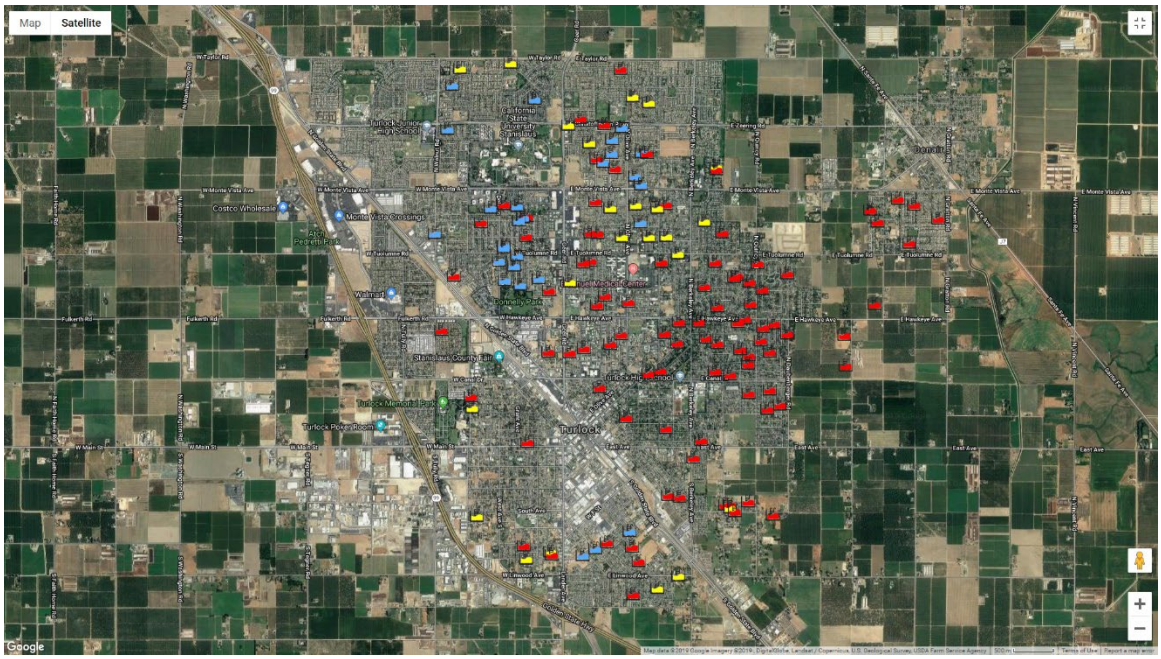
The District received (914) requests for services in 2024. The services required on most residential properties consist of identification of a mosquito sample provided by resident, an inspection of the property or surrounding community for potential mosquito sources, and recommendations on how to alleviate a current mosquito problem and prevent future mosquito problems from occurring. Typically, a trap will be placed to ascertain the level of mosquito abundance and to help determine what species of mosquito is causing the problem. Depending on the trap and inspection results, follow-up larvicide and/or adulticide applications may be warranted.


Service Requests by Year
1400
1200
1000
800
600
400
200
0
2019
2020
2021
2022
2023
2024


2024 Service Requests
450
400
350
300
250
200
150
100
50
0
Ceres
Crows Landing
Denair
Hickman
Hughson
Keyes
La Grange
Modesto
Newman
Patterson
Turlock
Vernalis
Westley

Neglected Swimming Pools

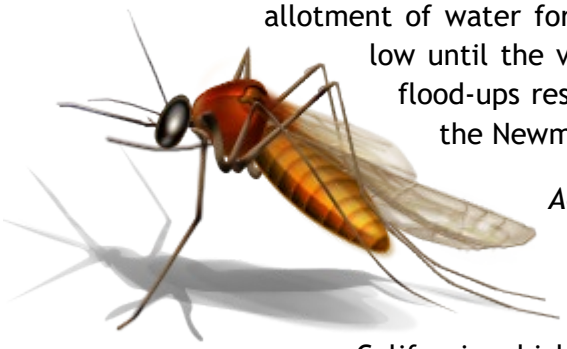
Typically, during the months of April and July, the District conducts a flyover of urban/suburban neighborhoods to identify neglected or unmaintained swimming pools. Since its inception, the District's aerial photographs have identified thousands of unmaintained swimming pools. Just one swimming pool can produce more than 1 million mosquitoes capable of transmitting WNV and affecting people up to five miles away.



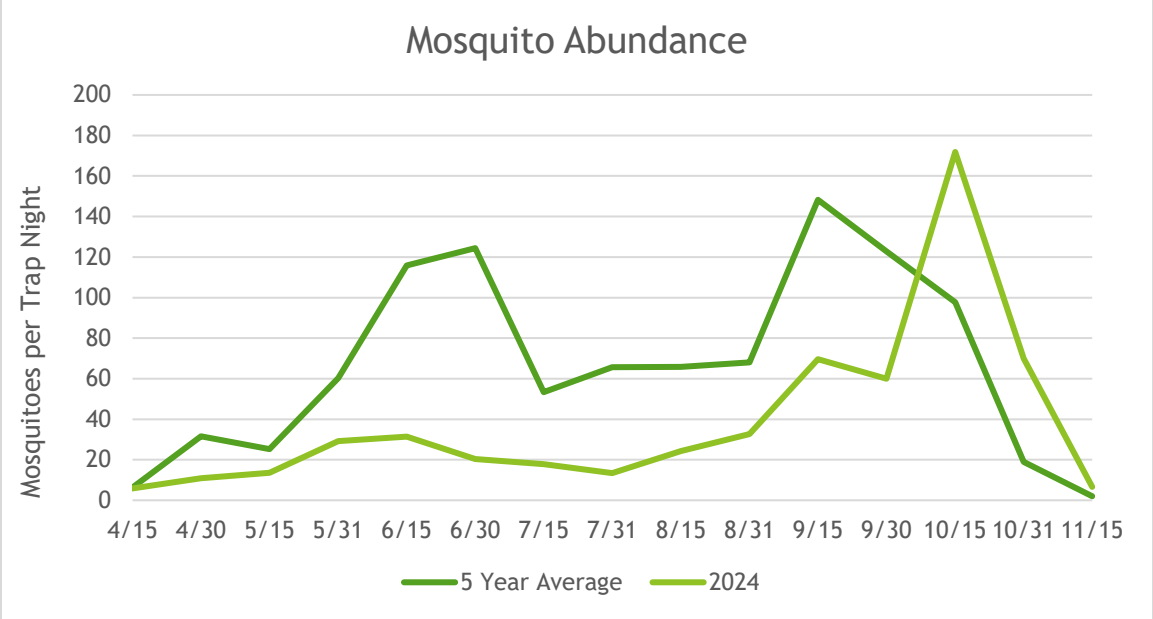
In 2024, District staff inspected (305) pools as green and potentially breeding mosquitoes. District control staff inspected each one of these pools and treated those that were found to be breeding mosquitoes. Although these pools were successfully treated, in all instances, the owners of the pools are notified that District control measures are just a temporary solution and that the pools will need to be maintained on a permanent basis. Owners with repeat violations will be abated subjecting them to reimbursing the District's control costs and up to $1000 per day in civil penalties.

2024 Mosquito Surveillance

The 2024 mosquito season experienced low overall mosquito and virus activity following a very busy 2023. Although customers of the Turlock Irrigation District got a full allotment of water for irrigation, native mosquito populations remained low until the very end of the season when refuge and duck club flood-ups resulted in a large peak of late season mosquitoes in the Newman area.



Aedes aegypti, on the other hand, continued to spread throughout the District and drive late season service requests. In 2024, (18) locally transmitted cases of Dengue Fever were reported in Southern California which significantly changes the control strategy for this invasive mosquito. Until 2023, *Ae. aegypti* was not involved in disease transmission in California and was just considered a pest. *Ae. aeypti* transmitting diseases such as Dengue, chikungunya, or Zika virus ramps locally up the importance of controlling this mosquito. Until recently, these disease had been detected in California but they were associated with recent travel by an individual to regions/countries where these diseases are endemic.

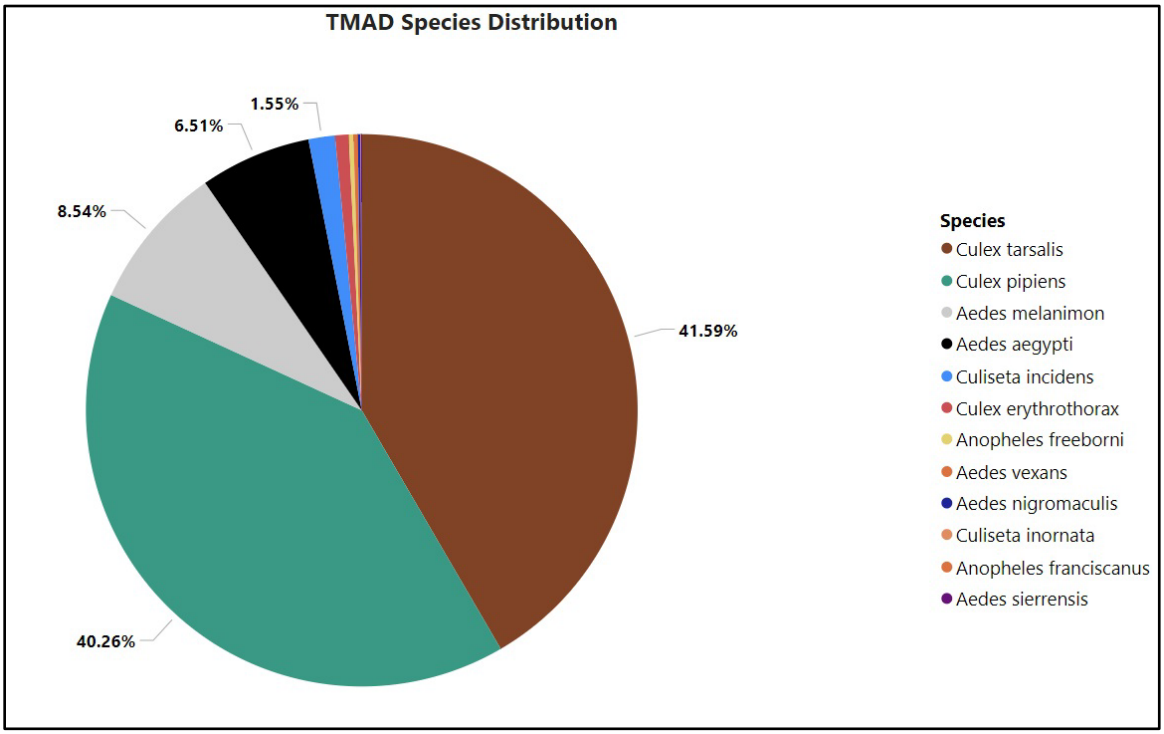


EVS Trap

BG Sentinel Trap

OVI Trap

Currently, there are a dozen different species of mosquitoes that commonly occur in Stanislaus County. Each species differs in its habitat preferences, biting patterns, preferred host, and ability to transmit disease. It is important to understand the characteristics of each mosquito species in order to determine the most effective trap type to use and strategies for control. Within an IVM program, the surveillance component is essential to understanding the changes in distribution of the various mosquito species and the diseases they carry. This surveillance data is reviewed and the information provided is used to coordinate control measures to effectively protect the public from biting mosquitoes and disease transmission.



The two species which occur most frequently are *Culex pipiens* and *Culex tarsalis*. These two species are of greater concern not only because of their high abundance but also because of their ability to transmit diseases such as West Nile Virus and Saint Louis Encephalitis Virus.

Overall, mosquito abundance was down and below the 5-year average for much of 2024 within the District. As mentioned, there was a significant increase of mosquitoes late in the season as a result of refuge and duck club flood-up in Merced County. This led to a migration of *Ae. melanimon* and *Cx. tarsalis* from Merced County into Newman and the surrounding area. *Ae. aegypti* was responsible for the bulk of service requests in suburban areas such as Turlock and Ceres. Their numbers begin slowly starting in April but steadily increase into October and November.

Invasive Species Monitoring

Aedes aegypti

California has been dealing with a couple of invasive mosquitoes, *Aedes albopictus* (Asian Tiger Mosquito) and *Aedes aegypti* (Yellow Fever Mosquito). *Ae. albopictus* arrived in 2011 and *Ae. aegypti* arrived in 2014. Although both of these species have been spreading, *Ae. aegypti* has spread much further and faster in California. These species are a concern because they live in urban/suburban habitats, like to feed on people and are capable of spreading diseases such as Dengue, Chikungunya and Zika Viruses.

Starting in 2014, the District began utilizing new traps designed to be more attractive to the invasive species that are being found in other areas of California. These traps are designed to attract ovipositing (egg-laying) females which differ from the CO_2-baited traps the District uses for native species. In 2019, *Aedes aegypti* expanded its range in California being detected in Stanislaus, San Joaquin, Sacramento and Placer counties. The District was successful in finding a small but widespread population of *Aedes aegypti* in the east side of Newman, CA.

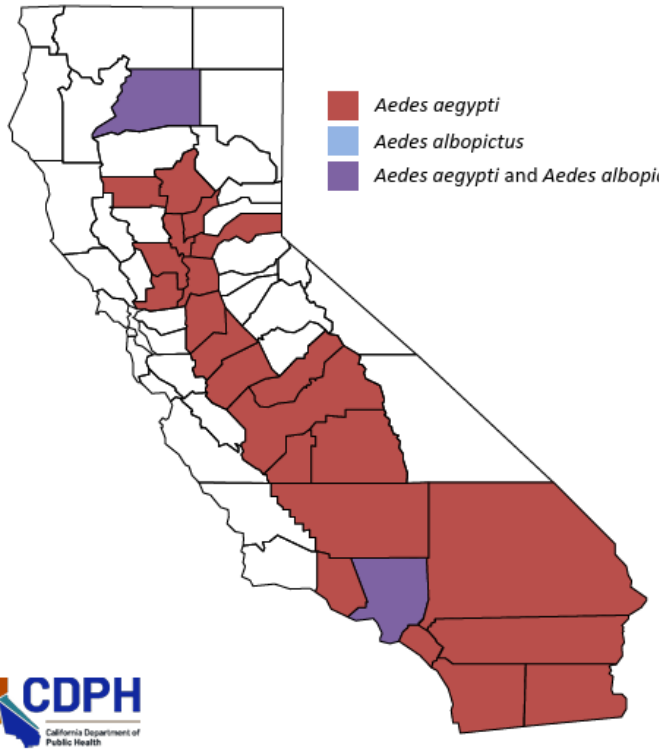
Aedes albopictus

BG Sentinel Trap

Oviposition

Aedes aegypti and *Aedes albopictus* Mosquitoes in California by County

Updated April 4, 2025



Counties with *Aedes aegypti* only (22):
Butte, Fresno, Glenn, Imperial, Kern, Kings, Madera, Merced, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Joaquin, Solano, Stanislaus, Sutter, Tulare, Ventura, Yolo, Yuba

Counties with *Aedes albopictus* only (0):
None

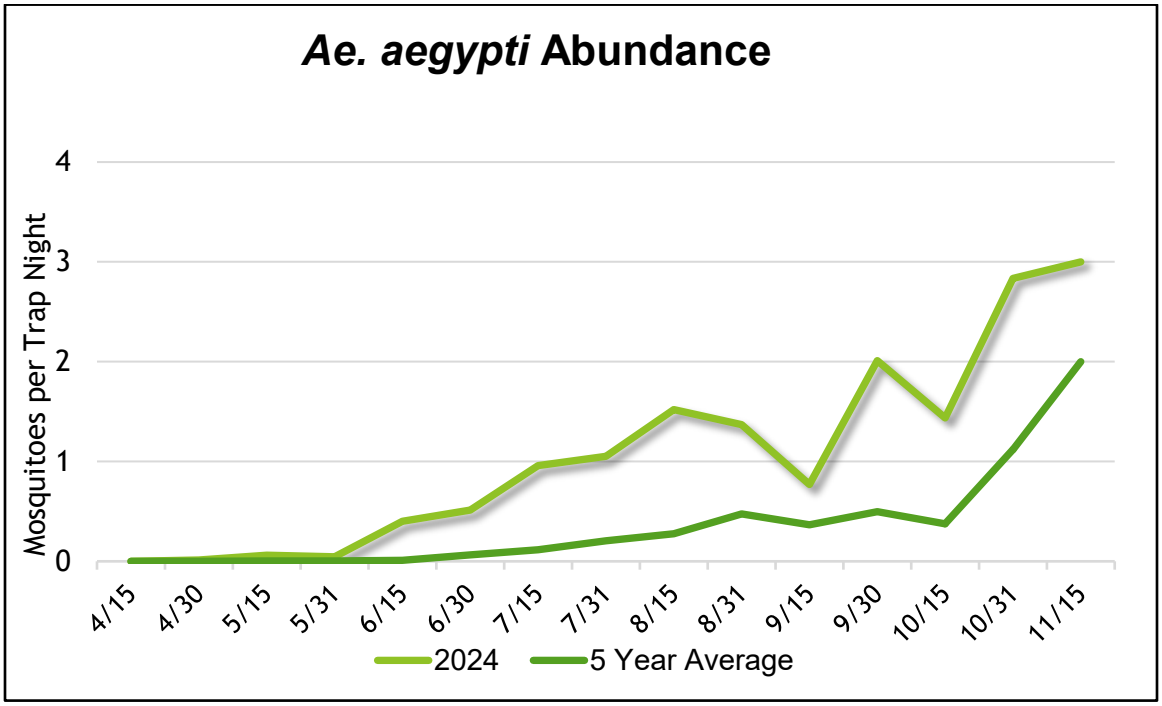
Counties with both *Aedes aegypti* and *Aedes albopictus* (2):
Los Angeles, Shasta

For a list of cities, including historical detections, see *Aedes aegypti* and *Aedes albopictus* Mosquitoes in California by City or Census-Designated Place

For a detailed map, see CDPH Interactive Map of Invasive *Aedes* Mosquitoes in California

CDPH
California Department of Public Health

As anticipated, the *Aedes aegypti* population has continued to spread throughout the District and increase in size. During 2022, they were found in the city of Hughson for the first time, which completes their discovery in all suburban areas in the District. Similar to past years, the *Ae. aegypti* abundance gradually increased in July, but during August, September and October the numbers multiplied quickly. This increase resulted in numerous service requests late in the mosquito season.

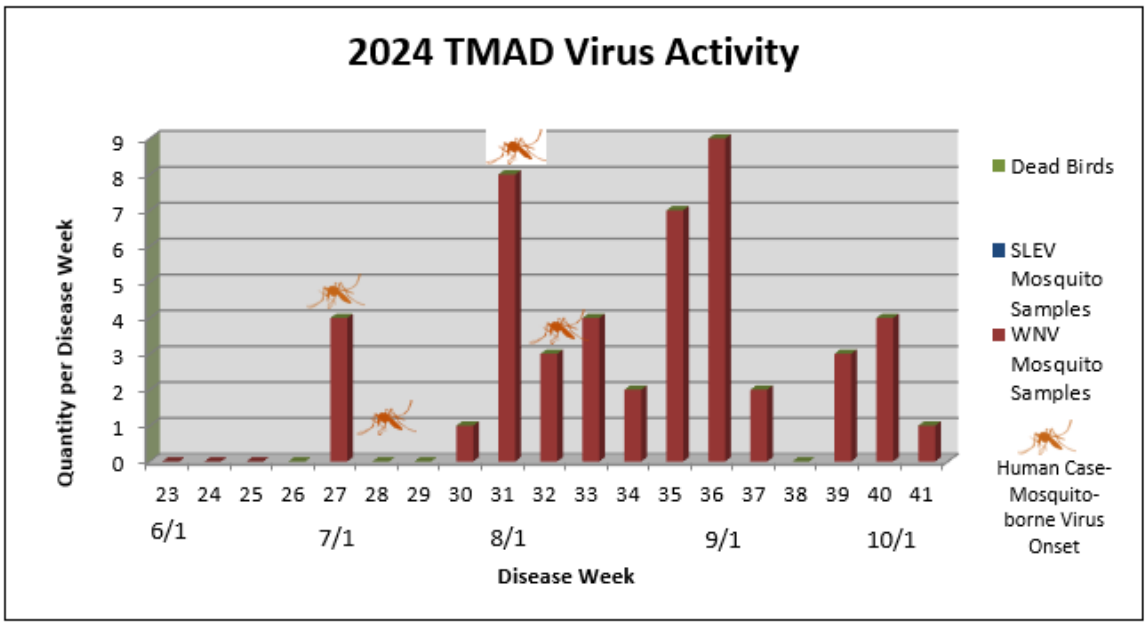


Typically *Ae. aegypti* are collected in much smaller numbers than other mosquitoes, so even collecting just a few in a trap may represent a significant problem in a neighborhood. In addition, these mosquitoes prefer people for their blood meal, live directly in and around residences and their bites are more painful. This naturally leads to an increase in requests for service.

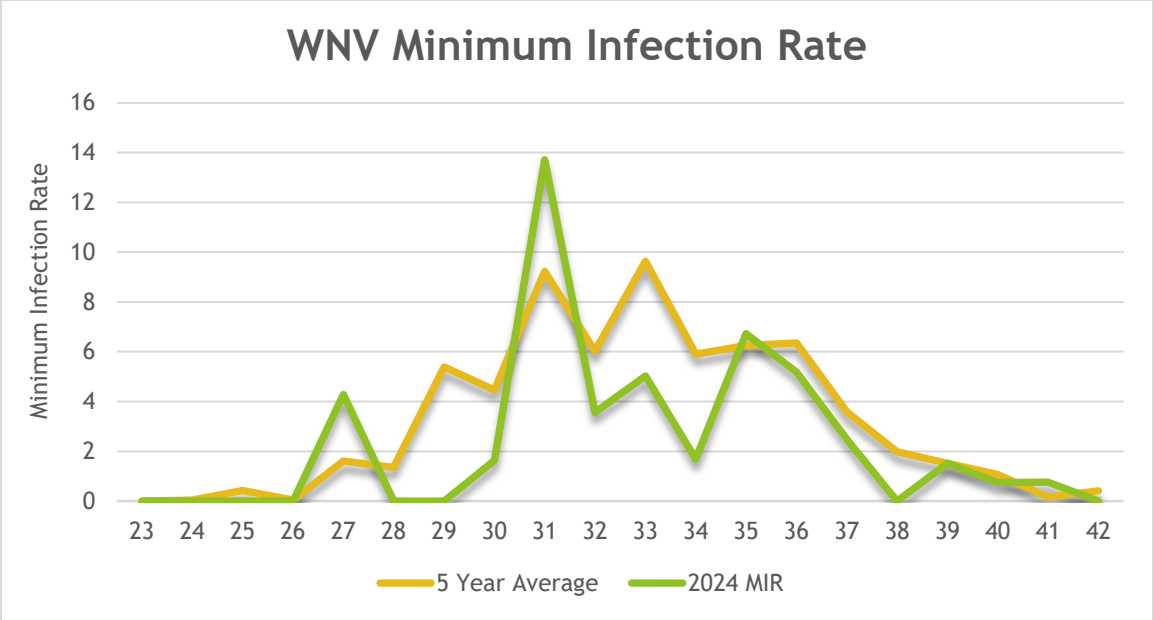
2024 Arbovirus Activity

Virus activity is monitored through the testing of mosquitoes, dead birds and humans. Mosquitoes which are collected from a variety of areas in the District are brought to the lab for species identification and virus testing. Birds that are collected from the field are also identified by species and tested for WNV. The mosquitoes, dead bird and human results can be a reflection of the level of virus activity in the District and can indicate new areas of virus emergence.

The "2024 Virus Activity" table below displays the timing of WNV activity in mosquitoes, dead birds, and humans. The Minimum Infection Rate (MIR) is a tool used to measure the amount of WNV in collected mosquitoes each year. Basically, it is the frequency of WNV positive mosquitoes out of 1,000 collected mosquitoes.



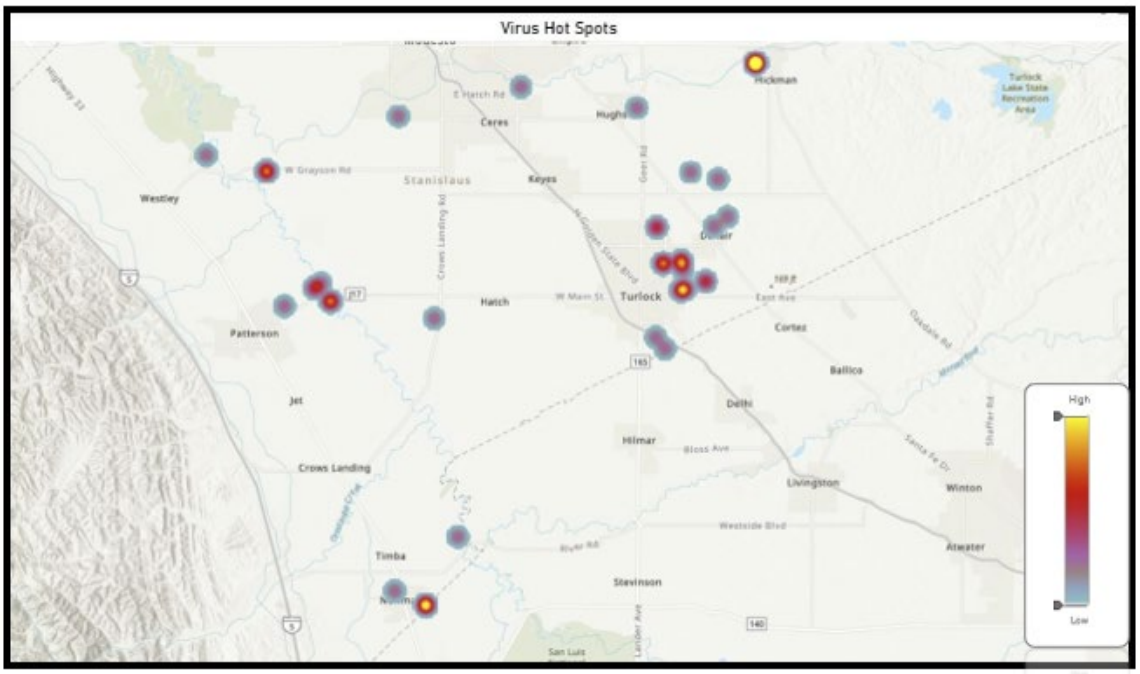
Virus activity for both West Nile Virus and Saint Louis Encephalitis Virus (SLEV) was markedly reduced during the 2024 year. This is directly related to the lower-than-average populations of *Cx. tarsalis* and *Cx. pipiens* observed during 2024.



Year	WNV + Mosquito Samples	Total No. Mosquito Samples Tested	WNV Dead Birds	WNV Equines	WNV Human Cases	SLEV Mosquito Samples	SLEV Human Cases
2024	48	896	0	0	4	0	0
2023	253	1,969	3	0	16	23	1
2022	57	1,043	0	1	2	1	0
2021	91	1,220	2	0	3	2	1
2020	243	1615	4	1	15	2	0
2019	183	1,422	1	0	11	11	1
2018	111	1,900	0	0	3	0	0
2017	196	1,401	6	0	8	27	1
2016	258	1,400	14	0	8		
2015	76	1,990	5	0	4		
2014	151	1,435	32	0	10		
2013	142	1,207	6	0	4		
2012	185	1,771	26	1	7		
2011	88	1,133	22	0	4		
2010	81	1,303	25	1	3		
2009	89	1,590	13	2	6		
2008	61	1,994	23	2	2		
2007	75	2,209	46	0	5		
2006	47	1,824	42	4	2		
2005	111	1,349	150	18	16		
2004	3	624	30	1	0		

Saint Louis Encephalitis

Saint Louis Encephalitis Virus (SLEV) returned to TMAD in 2017, after years of inactivity. The prevalence of SLEV is significantly less than WNV; however, it is still contributing to encephalitis human cases. During 2024, no mosquito samples tested positive for SLEV.



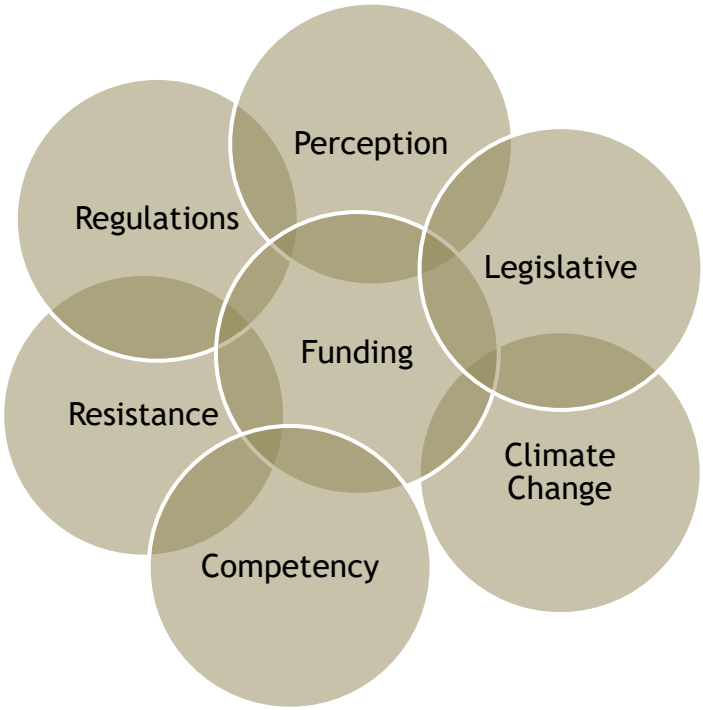
Dengue

No locally transmitted cases of Dengue were reported in Stanislaus County in 2024; however, 6 travel cases were reported. This means that individuals travelled to a region/country where Dengue is actively being transmitted and brought it home with them. The concern with travel cases is that they can lead to local transmission of new diseases such as Dengue, Chikungunya, and Zika now that *Ae. aegypti* are established in the area. This scenario is what health officials are finding in Southern California where 18 locally transmitted cases were reported in 2024. The Stanislaus County Health Services Agency keeps the District informed of all mosquito-borne virus human cases so that the District can follow up with surveillance and control efforts in the area.

Policy Issues

Aggressive Source Reduction Program

The Board of Trustees and District management continue to review policy issues at the federal, state and local levels and how these issues will impact the future of mosquito control. For the most part, all policy issues tend to make the job of mosquito control more difficult and costlier.



Primarily, the District has focused in on (3) policy issues that we believe will have the biggest impact on future mosquito control activities:

- Regulations
- Climate Change
- Resistance

The layering and overlapping of state and federal regulations continue to have a great impact on effectiveness and costs of mosquito control. For instance, all pesticides are controlled by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). This law establishes the system to protect applicators, consumers and the environment in regards to pesticides and their application. In 2011, the District was made to register and comply with a National Pollution Discharge Elimination System (NPDES) permit for any pesticide applications that may leave a residue in water – specifically aimed at Waters of the US. The safety, application rates, and procedures have already been tested and approved by FIFRA – requiring Districts to track, test, monitor applications that are already regulated and approved by FIFRA is a costly and overlapping regulatory burden that is unnecessary.

Whatever the cause of "climate change", whether it represents natural cycles or is caused by the effects of manmade pollution, it is universally accepted that temperatures have increased dramatically over the past decade or two. In response, there has been more change within the mosquito control industry over the past decade than what was observed over the previous century. We have seen diseases such as West Nile virus become established in California as well as invasive species such as *Aedes aegypti* and *Aedes albopictus* which can transmit diseases such as: Zika, Dengue and Chikungunya virus. With the arrival of each new public health threat, a local district may see a small, temporary grant to deal with this new issue; but eventually the local district is expected to control this new threat with no new funding source. In 2019, a small but widespread population of *Aedes aegypti* were found in Newman, CA.

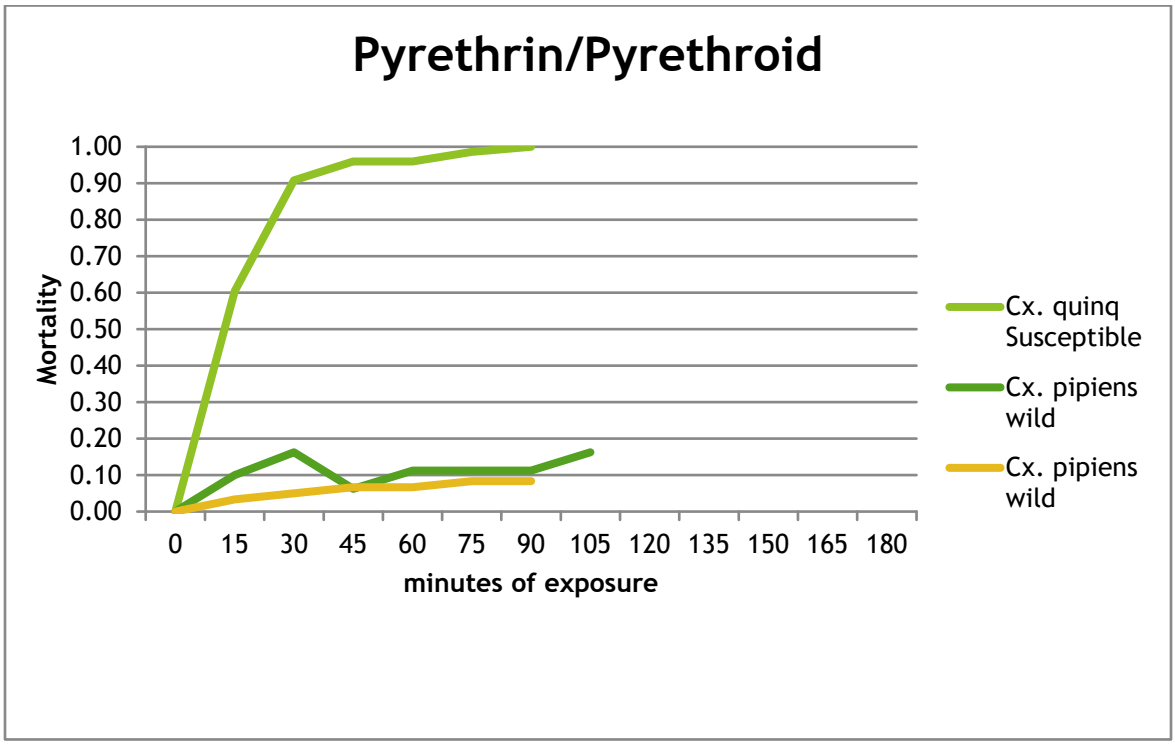
Finally, the levels of resistance to pyrethrin/pyrethroid based pesticides have reached critical levels in local mosquitoes. Unfortunately, the cost of registering chemicals and associated regulatory burdens have severely limited the options for adult mosquito control. Currently, there is only one other class of chemical available for adult mosquito control in California beside pyrtherin-based pesticides, and those are organophosphates. The District has begun utilizing Dibrom (naled – organophosphate) to reduce the applications of pyrethrin-based pesticides, but Dibrom must be applied only via aircraft which is very effective, but also costly.

In reviewing these and other policy issues, it became clear that the District needed to evolve and modify its control policies and program. The District invested in the MapVision© program, a geospatial database designed exclusively for mosquito control activities. District staff could now track exactly where and when applications were being made in real time as well as print and file reports to meet the growing regulatory burdens in an efficient manner. In addition, we could now more easily track costs and where the District was spending its money and more clearly make distinctions about the "outcomes" of that money. In response, the District designed and implemented the Aggressive Source Reduction Program to identify properties where the District was spending an excessive amount of time and money when compared to comparable properties. Owners of these properties were then contacted and were given (2) options:

- Reimburse the District for labor and materials in controlling the public nuisance on their property, or
- Permanently fix the conditions causing the public nuisance or a public abatement would be filed.

In 2024, the District billed $27,442.92 in control costs as part of its Aggressive Source Reduction Program. Abated properties were billed $7,856.25 and assessed $43,800.00 in civil penalties.

Insecticide Resistance



Perhaps the biggest policy issue affecting mosquito control in California concerns pyrethrin/pyrethroid resistance in adult mosquitoes. In 2014, the District sent in approximately (1000) mosquitoes to the California Department of Public Health to be tested using PCR techniques for the presence of the *kdr* mutation in a mosquito's DNA that would confer pyrethrin resistance in adult mosquitoes. The name of the mutation is *kdr* which stands for "knock down resistance" since mosquitoes with this gene are initially "knocked down" by the pyrethrin/pyrethroid insecticide, but not killed.

Over 90% of the *Cx. pipiens* mosquitoes submitted for testing were homozygous for *kdr* resistance. This result tells us that the vast majority of the wild population of mosquitoes are resistant and very few susceptible individuals remain in the population – which is certainly not promising results! As such, this issue will have a large impact on the District's future control program:

- Experts recommend that the District use an alternative adulticide with a completely different mode of action than pyrethrin/pyrethroids;
- Use of pyrethrin/pyrethroids will need to be much more controlled and on a much smaller scale;
- Increased emphasis on larviciding activities (i.e. killing the mosquitoes before they become adults);
- Increased emphasis on source reduction and elimination – which may include an increased use of the District's abatement powers.

In 2015, the District made several changes to its mosquito control guidelines in response to pyrethrin resistance. These policy decisions must balance judicious use of pyrethrins to ensure the pesticide remains effective for as long as possible; but, also the importance of protecting public health. For the first time in 2015, the District began aerially applying naled which is an alternative class of chemical called organophosphates and has a completely different mode of action than pyrethrin. By utilizing an alternative pesticide, the intent is to reduce the genetic selection pressure against pyrethrins while also killing any adult mosquitoes which may be surviving our pyrethrin applications.

Pyrethrin applications were much more limited and occurred on smaller scales – when possible we tried to rely on our aerial applications of naled to provide control of adult mosquitoes. In addition, mosquito control operators continue to place much more emphasis on larviciding and source elimination realizing that adulticiding activities are truly a last resort.

Regulatory Compliance

National Pollution Discharge Elimination System (NPDES)

In recent years, there have been a few lawsuits involved with the release of pesticides or their residues (termed “pollutants”) into waters of the United States. On November 27, 2006 EPA issued a final rule clarifying two specific circumstances in which a Clean Water Act (CWA) permit is not required to apply pesticides to or around water. They are: 1) the application of pesticides directly to water to control pests; and 2) the application of pesticides to control pests that are present over or near water, where a portion of the pesticides will unavoidably be deposited to the water to target the pests. The action put into effect a rule that confirms EPA's past operating approach that pesticides legally registered under FIFRA for application to or near aquatic environments, and legally applied to control pests at those sites, are not subject to NPDES permit requirements.

In 2008, this rule was challenged by several environmental groups and the U.S. Sixth Circuit Court of Appeals held that this rule was not a proper interpretation of the Clean Water Act. The Sixth Circuit ruled that a CWA permit would be required for all biological and chemical pesticide applications that leave a residue in water. After a couple lengthy stays granted by the court, this mandate went into effect October 31, 2011. No further legal appeals are expected, so any further help regarding this matter would be legislative in nature.

To comply with permit requirements established by the California State Water Resources Control Board, the District was required to record all applications made to or near waters of the United States. In 2024, District personnel made (21) applications to waters of the U.S.

Financial Statement

The District depends on property tax revenue in Stanislaus County to fund its operations. Subsequent to Proposition 13, revenue from property tax alone was not sufficient to provide the level of mosquito control and service that the public demanded. So,in 1981, District residents passed Measure "C", District Resolution 5-81, allowing the District to collect a "Special Tax" to augment District funds to provide the District additional revenue needed for a more robust mosquito control program. A public hearing is held each year where the Board of Trustees considers the implementation of the Special Tax for that fiscal year.

Statement of Finances: FY 2023-24 (June 30, 2024)

ASSETS	
Cash & Investments	$4,483,483
Accts. Rec. & Inventory	$891,294
Deposits, non-current	$22,074
TOTAL ASSETS	$5,738,279
LIABILITIES & FUND BALANCES	
Total Liabilities	$30,173
Total Fund Balance	$5,409,767
TOTAL LIABILITIES & FUND BALANCE	$5,439,940
REVENUES	
Property Taxes	$3,196,223
Other Governmental Revenue	$216,357
Interest & Miscellaneous	$192,559
TOTAL REVENUES	$3,605,139
EXPENDITURES	
Salaries & Benefits	$1,440,719
Services & Supplies	$740,149
Capital Outlay	$99,777
TOTAL EXPENDITURES	$2,510,210