Agenda Item 6.A.

GENERAL MANAGER REPORT

BACKGROUND AND STATUS:

Monthly report summarizing status updates for District activities and services. Also, GM will be providing a demo of MapVision/Power BI used for tracking properties and when meeting with employees.

RECOMMENDATION:

None

REFERENCE MATERIALS ATTACHED:

A. 2022 Annual Report

TURLOCK MOSQUITO ABATEMENT DISTRICT

2022 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 2022 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 2022 observing a reduction in WNV positive mosquitoes and humans.

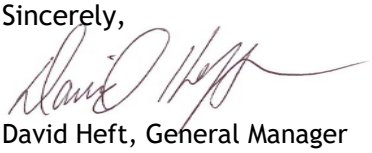
The invasive mosquito *Aedes aegypti* can now be found throughout the District and continues to become more and more of a challenge to control. This mosquito lives very closely with humans, it can even live entirely indoors. While this mosquito hasn't transmitted any disease in California, a local case 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.

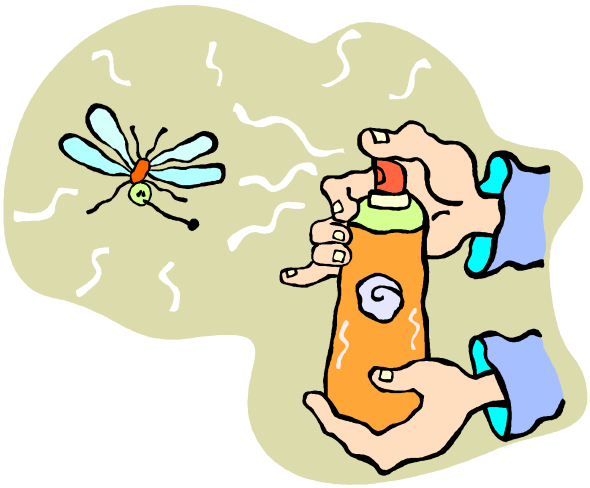
Sincerely,



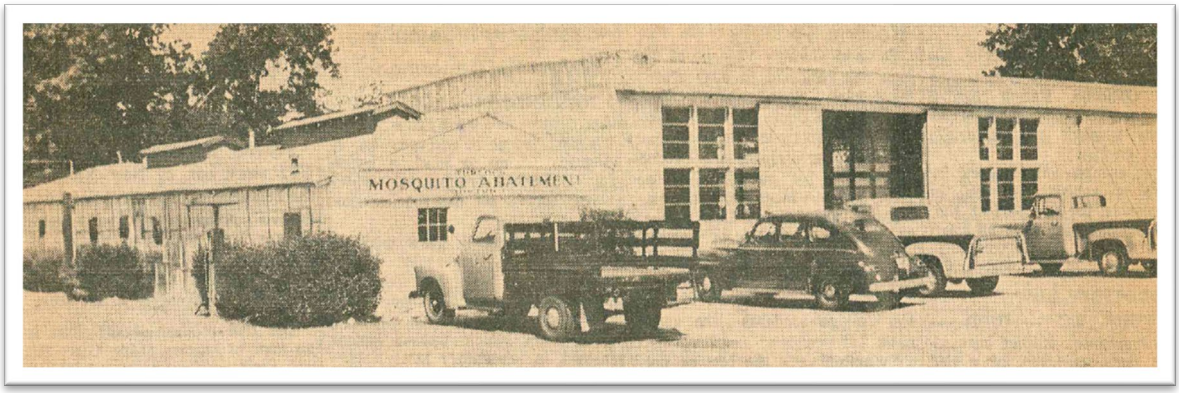
David Heft, General Manager

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
L. Kevin Showen
Ceres

Vice President
Michael Mitchell
Hughson

Secretary
Lynn Apland
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Aaron Hackler
Turlock

Rodman Hooker
County-at-Large

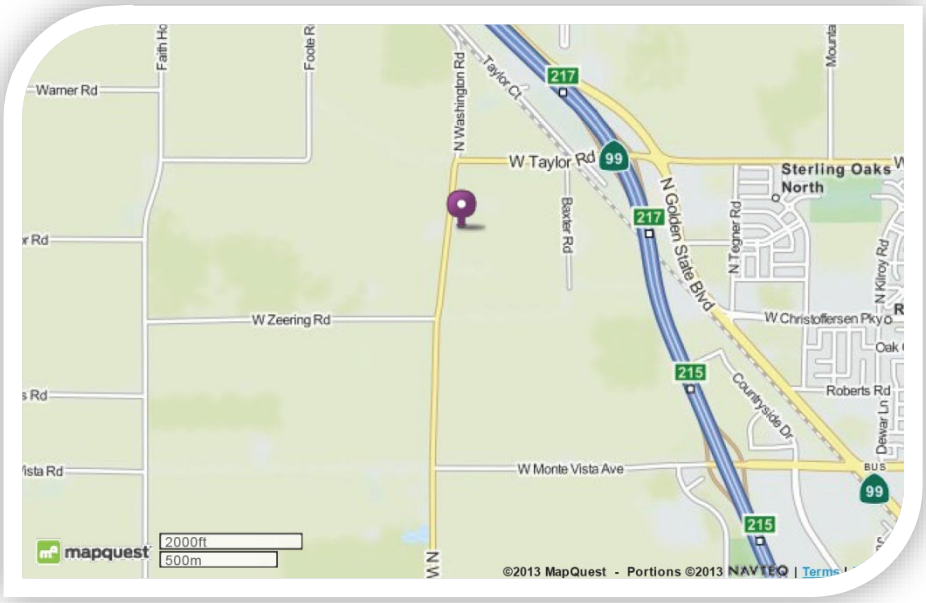
Kern Hunewill
Newman

Dan Peterson
County-at-Large

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: Alex Avila

Mosquito Control Operators:

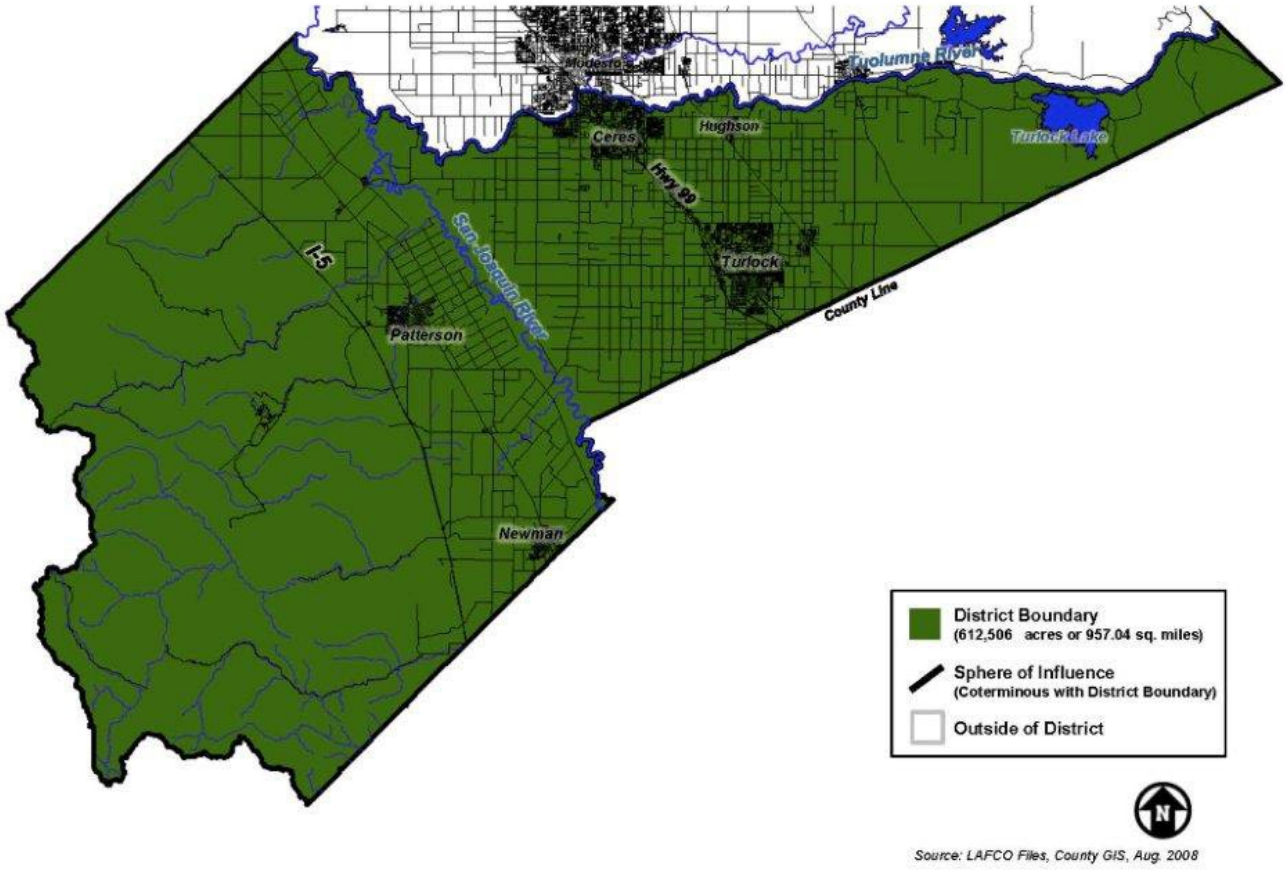
- Brandon Barker
- Tim Cardiff
- Francisco Lemus
- Ivan Maya
- Jim Oliveira
- Mel Pinney
- Ron Reforma

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:

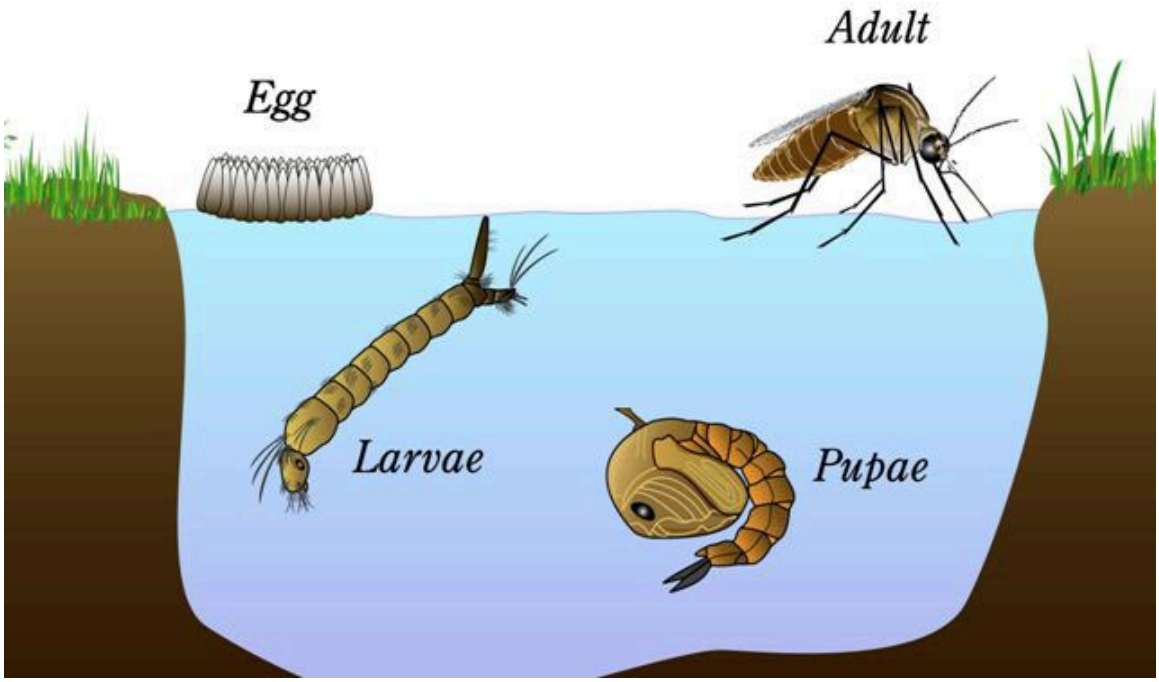
- Formed by local residents to provide local services
- Sanctioned by the State of California Government Code
- Often the most economical means of providing public service
- Independent, self-governed agencies governed by a board of trustees
- Operated as non-profit organizations
- Responsible directly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

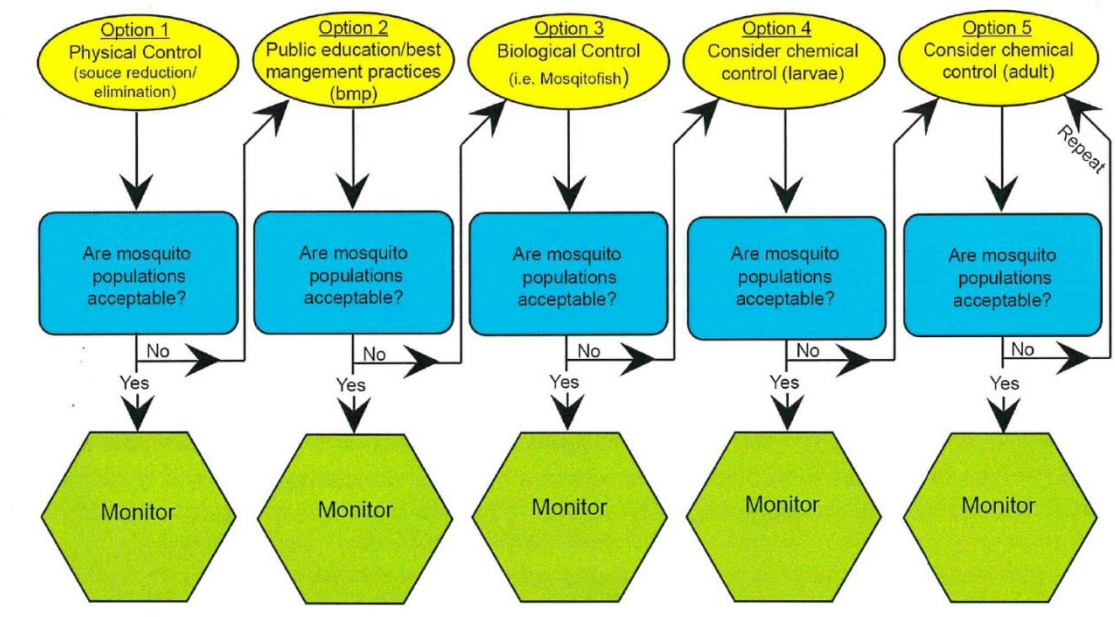
Mosquito pupae are also entirely aquatic and are commonly referred to as "tumblers" due to their bulky appearance and tumbling swimming motion. Pupae, like larvae, must also breathe air and do so through two snorkel-like devices called trumpets. The pupae have no mouthparts and do not eat; however, big 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

The Turlock Mosquito Abatement District continues to make a concerted effort to broaden the impact of the public education portion of its 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 huge potential audience. In addition, the District partnered with the East Side Mosquito Abatement District and the San Joaquin Mosquito & Vector Control District to run ads on popular local radio stations to remind the public regarding 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.

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) and larvicidal oils. Methoprene (Altosid) is a synthetic insect hormone 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 up to 3-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 larvicides and methoprene (insect growth regulator) 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 an insect growth regulator like methoprene 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.

2022 Larvicide Use

Altosid Briquettes	5,429	ea
Altosid Liquid Larvicide	19.2	oz
Altosid XRG	305	lb
CocoBear Larvicide Oil	1,826	gal
MetaLarv XRP	284	ea
Natular 2EC	8.9	gal
Natular G30	68	lb
Natular XRT	356	ea
VectoBac 12AS	23.3	gal
VectoBac G	200	lb
VectoLex WDG	87.4	lb
VectoLex WSP	5,835	ea

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.

2022 Adulticide Use

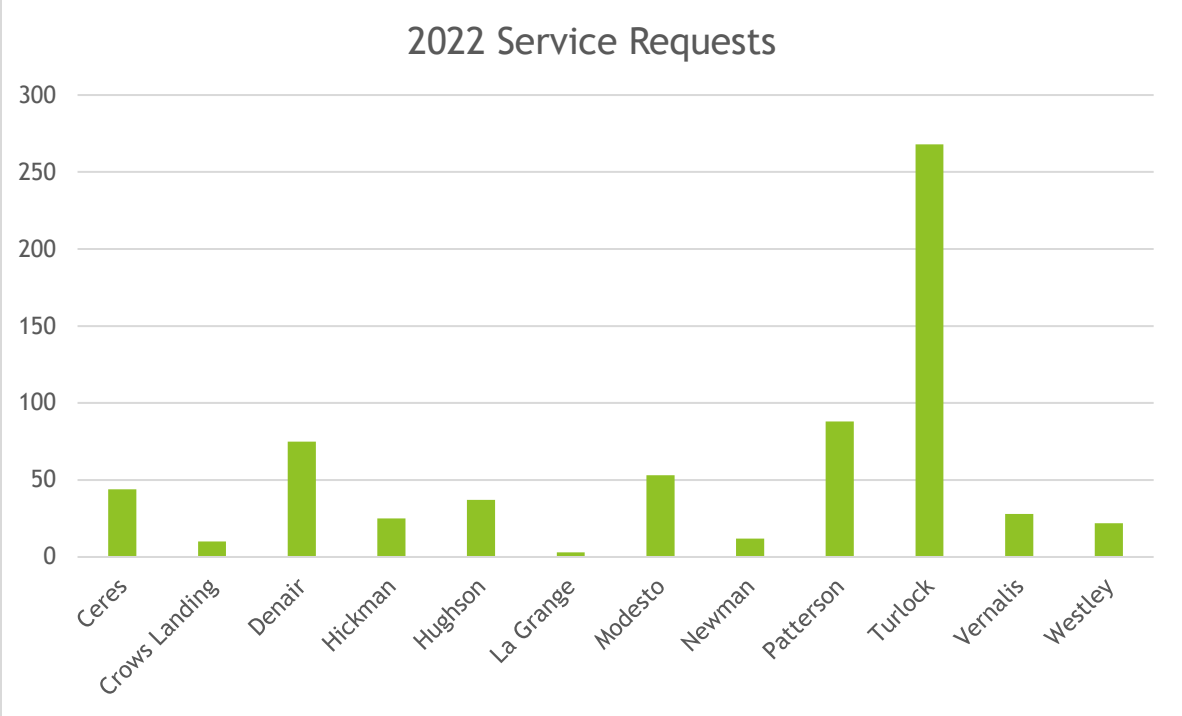
DeltaGuard	12.5	gal
Dibrom	221.6	gal
Pyronyl Crop Spray	400	gal

2022 Herbicide Use

Glyphosate	296	gal
Oxyflourfen	32.4	gal
Glufosinate-ammonium	103.5	gal

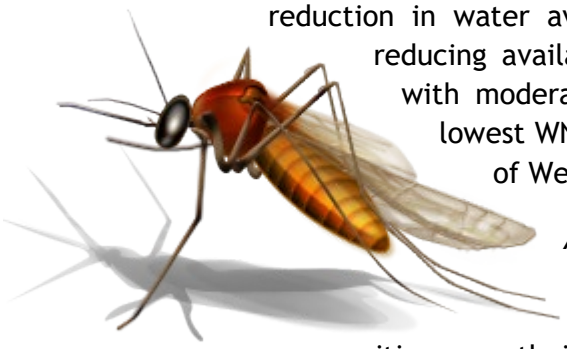
Residential Services

The District received (679) requests for services in 2022. 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.

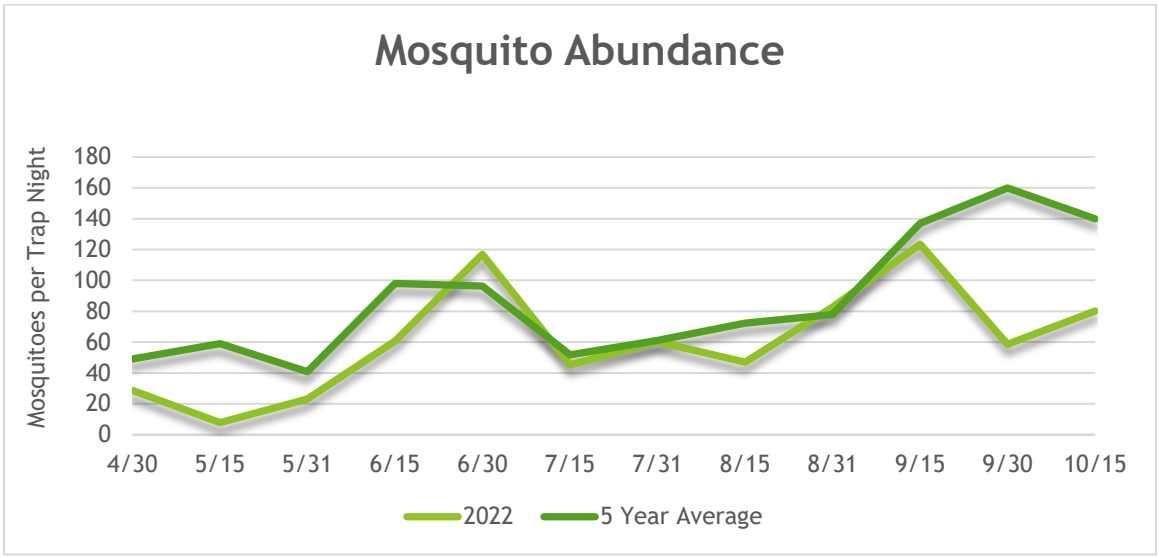


2022 Mosquito Surveillance

The 2022 mosquito season experienced low overall mosquito and virus activity due to continued drought conditions in California. The lack of rainwater and subsequent reduction in water available for irrigating had significant impacts on reducing available habitat for mosquito breeding. This coupled with moderate summer temperatures resulted in the second lowest WNV transmission rate in the District since the arrival of West Nile Virus.



Aedes aegypti, on the other hand, continued to spread throughout the District. New discoveries were made in the city of Hughson while other cities saw their *Ae. aegypti* populations expand. A significant increase in service requests was noted towards the end of the 2022 season due in most part to the increased *Ae. aegypti* populations and interactions with people.

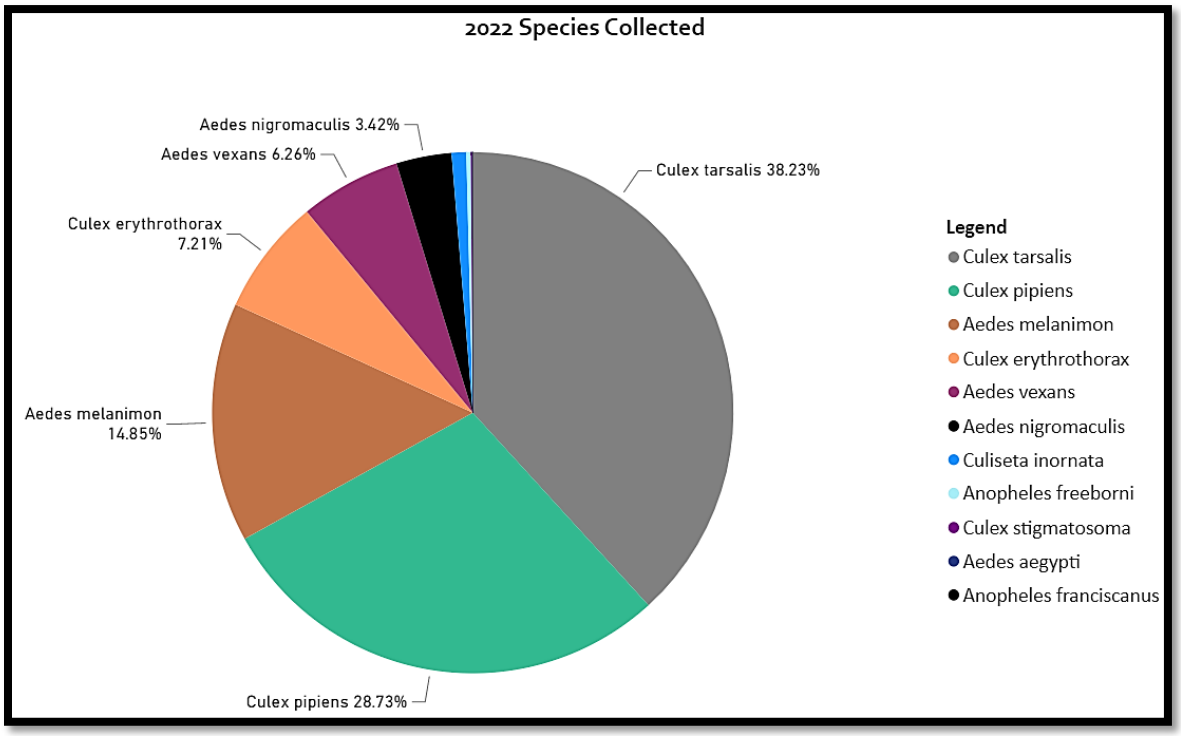


EVS Trap

AGO Trap

OVI Trap

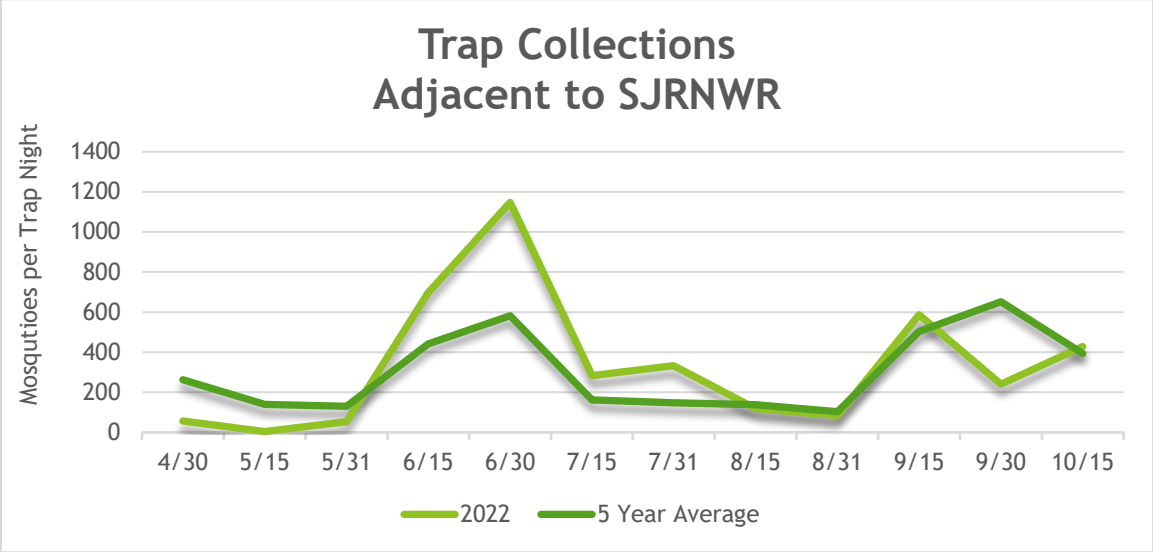
Currently, there are (25) different species of mosquitoes that occur in Stanislaus County. Each species differs in its habitat preferences, biting patterns, preferred host, and ability to transmit disease. It is important to understand the characteristics of each mosquito species in order to determine 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 within the District; but 2022 wasn't without it's challenges. Of particular note were the large numbers of *Aedes melanimon* being collected in and around the San Joaquin River National Wildlife Refuge (SJRNWR). Over the past 2-3 years, *Ae. melanimon* has become the dominant species being collected in this area and has become a significant problem for West Side residents. *Ae. melanimon* is an important vector of Western Equine Encephalomyelitis (WEE) virus and the gradual increase of it's numbers over the past few years is most likely due to land-use changes, planting and irrigation practices within the SJRNWR and neighboring properties. As lands

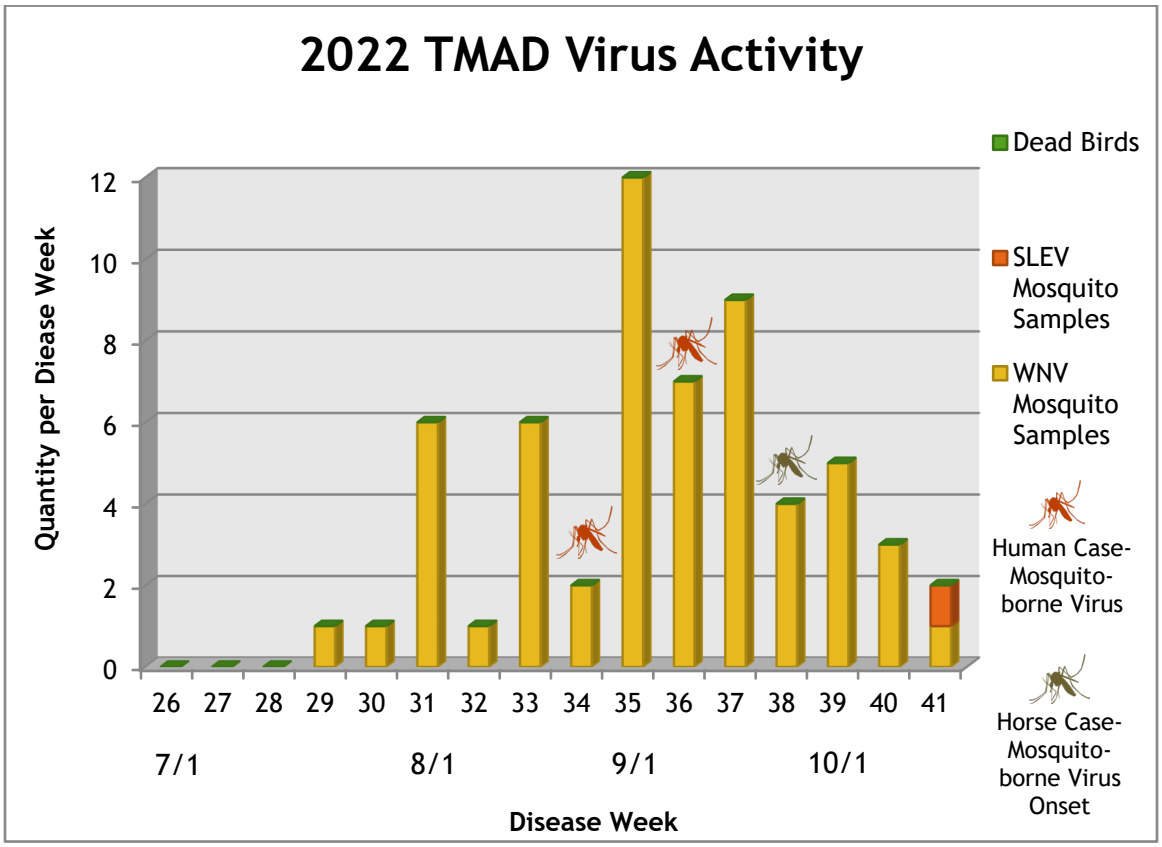
are acquired for habitat restoration, native plants are planted and if irrigation of these plants isn't conducted properly large populations of *Aedes* mosquitoes will occur. District staff have since met with SJRNWR and River Partners staff and will aggressively pursue getting these mosquitoes under control in 2023.



2022 West Nile Virus Activity

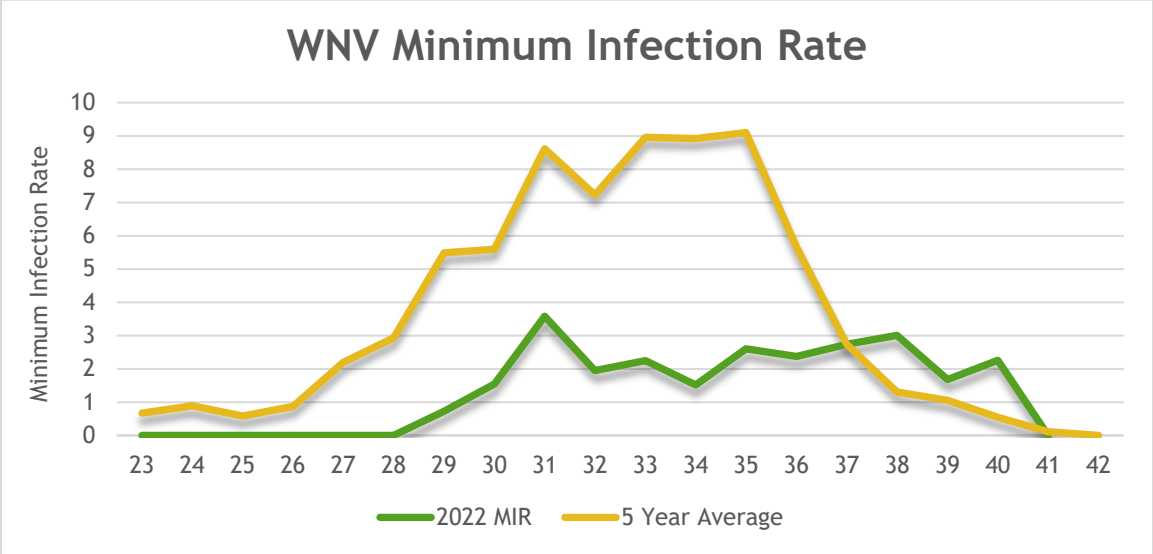
Virus activity is monitored through the testing of mosquitoes, dead birds and humans. Mosquitoes which are collected from a variety of areas in the District are brought to the lab for species identification and virus testing. Birds that are collected from the field are also identified by species and 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 "2022 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) were markedly reduced during the 2022 year (Items 6,8). This reduction was due to many factors. First the populations of Culex pipiens and Culex tarsalis, (Items 4,5) in the

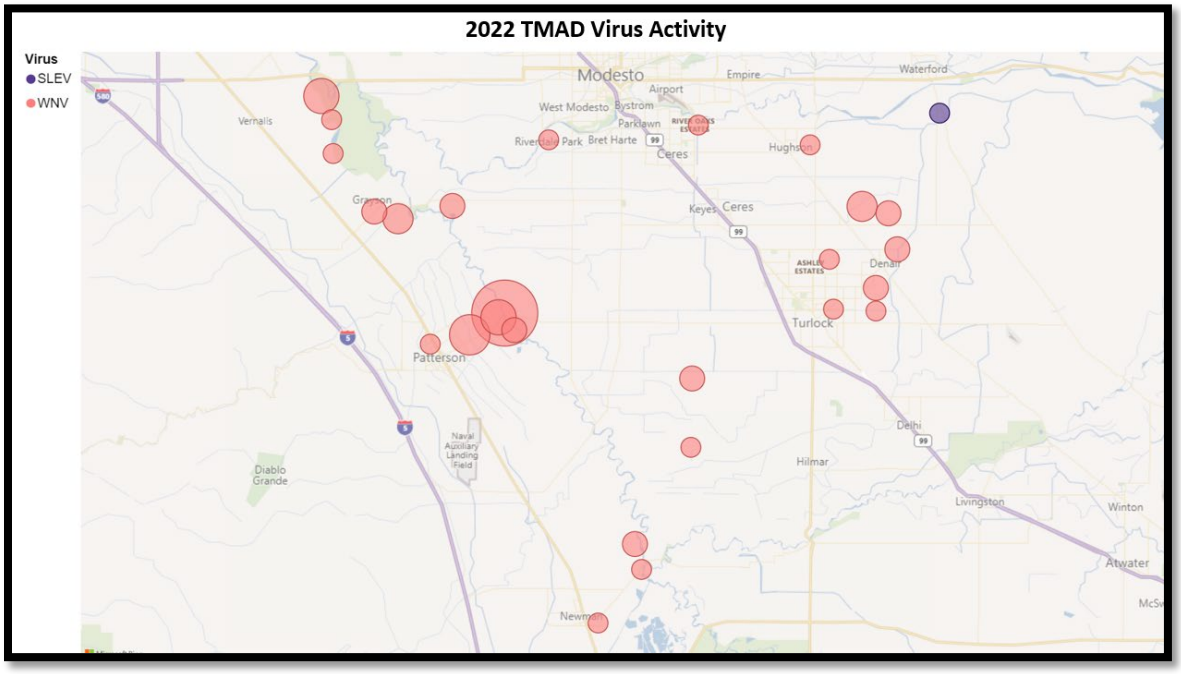
District were well below average. Note these are the 2 species in the District that transmit viruses. Next, the temperatures were below average through the spring and summer. Lower temperatures reduce the opportunity for mosquito breeding and virus development. Finally, the virus had a late arrival in the District on July 19th (Items 6,7) which reduced the overall virus season in the District. This was reflected in the late occurrence of the first WNV human case, which did not occur until August 21st.



Year	WNV + Mosquito Samples	Total No. Mosquito Samples Tested	WNV + Dead Birds	WNV + Human Cases	SLE + Mosquito Samples	SLE + Human Cases
2022	57	1,043	0	2	1	0
2021	91	1,220	2	3	2	1
2020	243	1,615	4	15	2	0
2019	183	1,422	1	11	11	1
2018	111	1,900	0	3	0	0
2017	196	1,401	6	8	27	1
2016	258	1,400	14	8	0	0
2015	76	1,990	5	4	0	0
2014	151	1,435	32	10	0	0
2013	142	1,207	6	4	0	0
2012	185	1,771	26	7	0	0
2011	88	1,133	22	4	0	0
2010	81	1,303	25	3	0	0
2009	89	1,590	13	6	0	0
2008	61	1,994	23	2	0	0
2007	75	2,209	46	5	0	0
2006	47	1,824	42	2	0	0
2005	111	1,349	150	16	0	0
2004	3	624	30	0	0	0
2003	0	0	0	0	0	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 2022, only (1) mosquito sample tested positive for SLEV which shows that even during a down year, it is still active.



Invasive Species Monitoring

Aedes aegypti

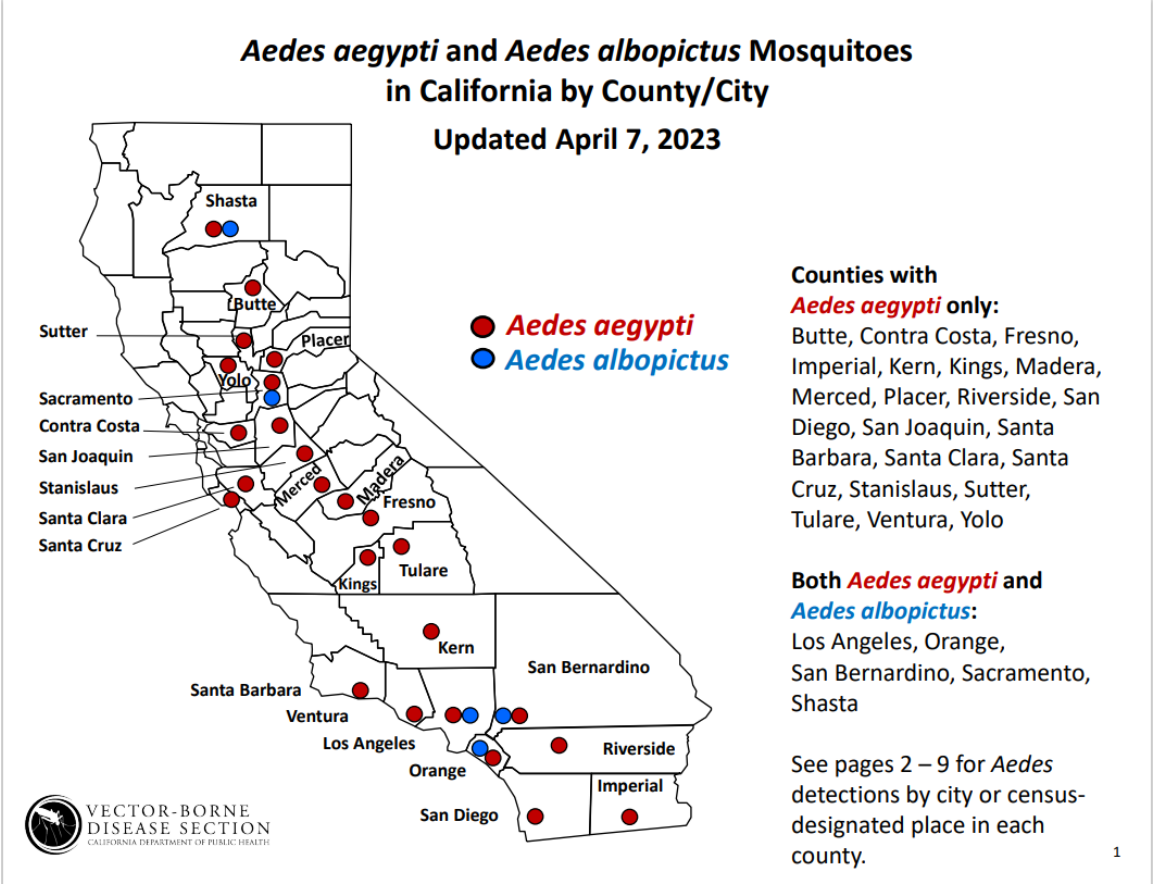
California has been dealing with a couple of invasive mosquitoes, *Aedes albopictus* (Asian Tiger Mosquito) and *Aedes aegypti* (Yellow Fever Mosquito). *Ae. Albopictus* arrived in 2011 and *Ae. Aegypti* arrived in 2014. Although both of these species have been spreading, *Ae. aegypti* has spread much further and faster in California. These species are a concern because they live in urban 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



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 urban 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.

Looking at the percentage of mosquito species collected in 2022 shown in an earlier chart, it appears Ae. aegypti were collected in very small numbers compared to Culex tarsalis and Culex quinquefasciatus. Keep in mind, that different traps and methodologies are used to collect Ae. aegypti and they are collected in much smaller numbers than other mosquitoes. Collecting just a few Ae. aegypti 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.

Public Outreach

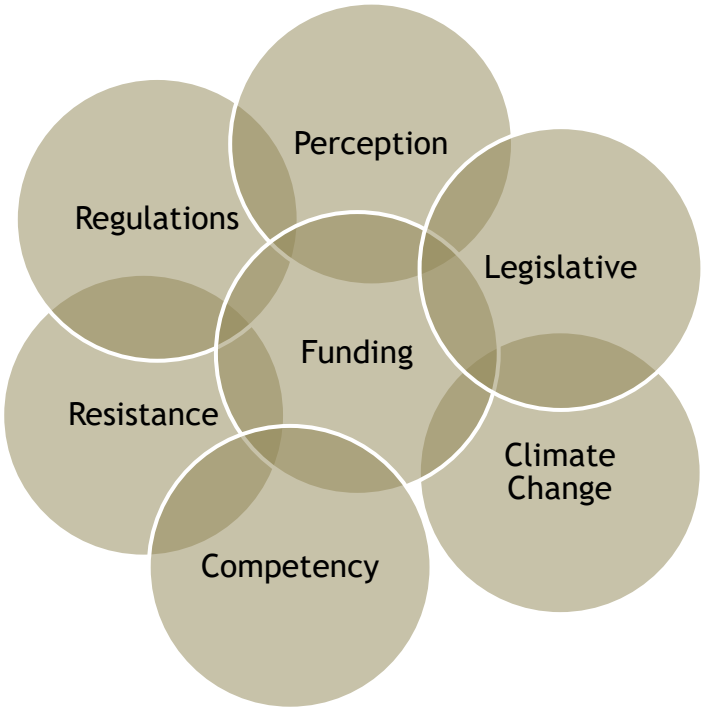
Public outreach remains a critical part of our mosquito control program. Through outreach we can remind residents how they can prevent breeding on their properties and report mosquito issues in their community. We speak to various organizations and schools, in our District, along with having an outreach booth at community street fairs and the Stanislaus County Fair. Through our interactions with students and residents we are able to educate them about the threats of mosquito borne viruses, how to protect themselves, and how to prevent mosquito breeding at home.

Reminding residents to report daytime biting mosquitoes especially in town has become one of our key messages. *Ae. aegypti* are known for being an aggressive daytime biter, and has often been discovered in other cities through reports from residents. This was not the case this year in Newman, but could likely occur in our other cities. We have developed informative print materials along with an invasive mosquito brochure to provide to residents. Advertising on buses, on the radio and in movie theatres also aid us in getting messages out to citizens to prevent WNV by avoiding mosquito bites and to report any daytime biting mosquitoes.

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.

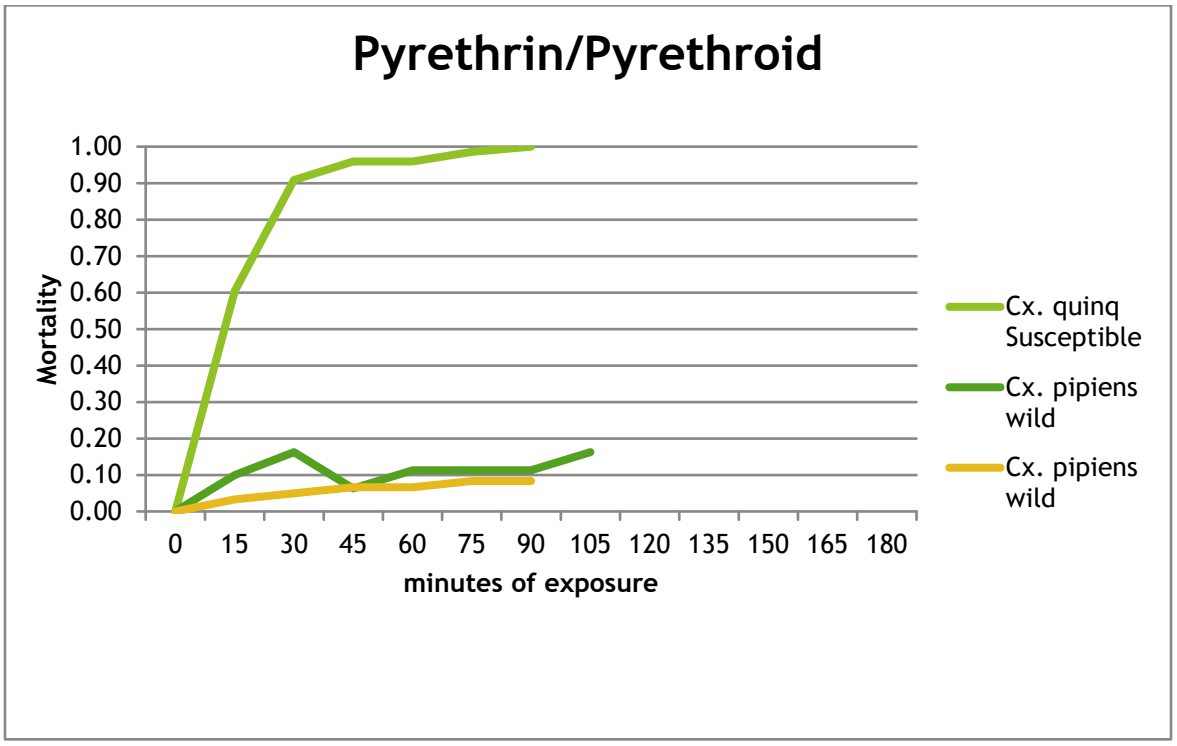
Finally, the levels of resistance to pyrethrin/pyrethroid based pesticides have reached critical levels in local mosquitoes. Unfortunately, the cost of registering chemicals and associated regulatory burdens have severely limited the options for adult mosquito control. Currently, there is only one other 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 2022, the District collected $20,965.50 in control costs and collected $5,927.53 in abatement charges.

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.

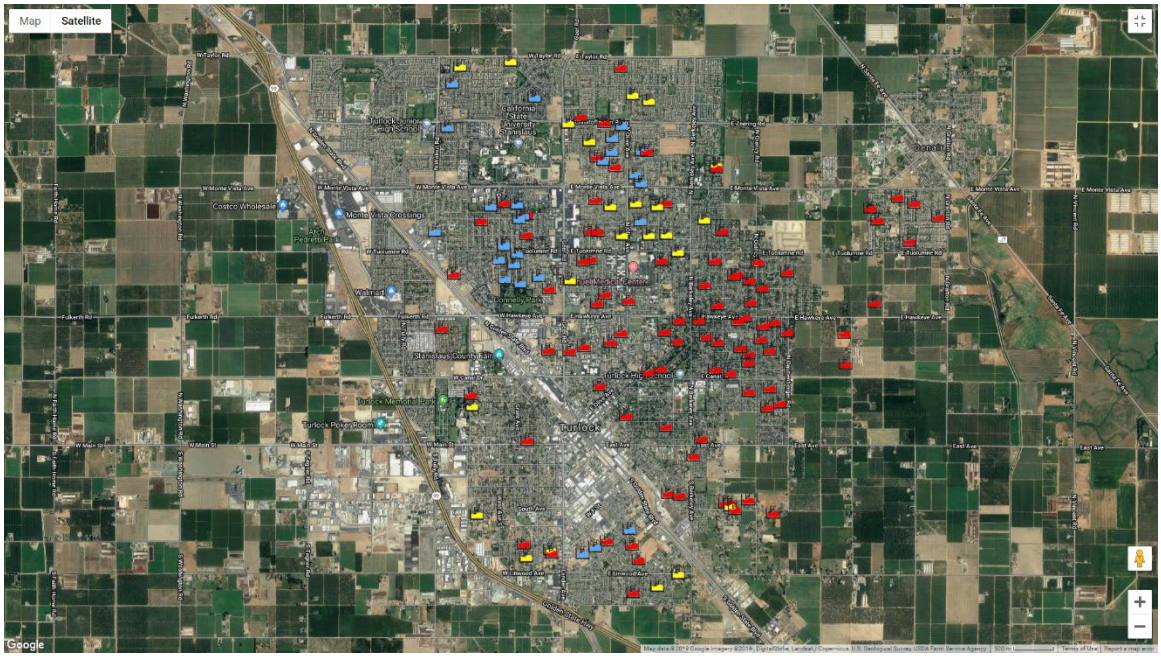
In 2015, the District made several changes to its mosquito control guidelines in response to pyrethrin resistance. These policy decisions must balance judicious use of pyrethrins

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.

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 2022, District staff inspected (312) 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.

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 2022, District personnel made (27) applications to waters of the U.S.

Financial Statement

The District depends on property tax revenue in Stanislaus County to fund its operations. Property tax revenue is only now starting to approximate levels seen before the housing crisis. Additionally, local property tax revenue earmarked for the District is annually diverted to the State of California's Educational Revenue Augmentation Fund (ERAF). As such, for the past several years, District expenditures have outpaced property tax revenue decreasing the District's fund balance reserves. In 2012, confident that the District reserve accounts should not be depleted any further, the Board of Trustees decided to implement the District's Special Tax to generate much needed additional revenue.

In 1981, residents within the District passed Measure "C", District Resolution 5-81, giving the District the authority to collect a "Special Tax" to augment District funds. Subsequent to Proposition 13, the District was not collecting adequate funds solely from property taxes to provide the level of mosquito control and service that the public wanted; so, Measure C was placed on the ballot to provide the District additional revenue needed for a more robust mosquito control program. The decision to re-implement the Special Tax is made on a year-to-year basis and only as needed.

Statement of Finances: FY 2021-22 (June 30, 2022)

ASSETS	
Cash & Investments	$3,703,114
Accts. Rec. & Inventory	$526,535
Deposits, non-current	$30,007
TOTAL ASSETS	$4,259,656
LIABILITIES & FUND BALANCES	
Total Liabilities	$126,399
Total Fund Balance	$4,133,257
TOTAL LIABILITIES & FUND BALANCE	$4,259,656
REVENUES	
Property Taxes	$2,810,022
Other Governmental Revenue	$167,660
Interest & Miscellaneous	$121,280
TOTAL REVENUES	$3,098,962
EXPENDITURES	
Salaries & Benefits	$1,452,438
Services & Supplies	$720,035
Capital Outlay	$131,521
TOTAL EXPENDITURES	$2,303,994