



2020 Annual Report



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2020 AT A GLANCE

Mosquito Abundance

Total Abundance: 129,737 mosquitoes collected

15 total species caught, top 3 were:

- 76.7% *Culex quinquefasciatus*
- 13.4% *Aedes aegypti*
- 5.2% *Culex tarsalis*

Mosquito Samples Tested for Mosquito-borne Diseases

Total Samples Tested: 2,785

139 samples tested positive for West Nile virus.

37 samples tested positive for St. Louis encephalitis virus.

Mosquito samples may contain up to 50 mosquitoes.

Dead Birds

Total Tested: 10

Of the 10 bird carcasses tested, 4 tested positive for West Nile virus.

Human Cases

Cases Reported: 1

The single human West Nile virus infection within the District boundaries was symptomatic with the individual surviving the infection.

Control

Total Inspections: 45,699

3,214 Mosquitofish used to treat 184 sources.

554 Sources controlled with physical methods.

16,818 Chemical treatments were made.

Community Education & Outreach

Total Outreach Events: 4

Participants: 196

Radio Spots: 408

Newspaper Ads: 4

Vehicle PSA Magnets: 24

Service Requests

Total Service Requests: 1,671

684 Mosquito issues reported

530 Inspections requests

319 Potential mosquito-breeding sources reported

92 Mosquitofish requests

ABOUT THE DISTRICT

The Delta Vector Control District was established in 1922 to protect residents from malaria, a mosquito-borne disease that was common to the central valley then. The Visalia Women's Club played a key role in the formation of the District. Today, the District is responsible for control of mosquito vectors of West Nile virus, St. Louis encephalitis, Western equine encephalitis, Chikungunya, and Zika viruses. The District covers 712 square miles including the cities of Dinuba, Exeter, Farmersville, Visalia, and Woodlake and the communities of Cutler, Orsi, Goshen, Traver, and Ivanhoe, all within Tulare County.

Our Vision

The Delta Vector Control District is the authority for vector control and vector-borne disease prevention in northern Tulare County.

Our Mission

The Delta Vector Control District is committed to protecting the public's health from vector-borne diseases and discomfort by delivering exceptional services which preserve and enhance the quality of life and desirability of the area to make northern Tulare County a safe place to live, work, and raise a family.

Our Goals

1. Provide continual surveillance of mosquitoes to determine the threat of mosquito-borne disease transmission and annoyance levels.
2. Use safe, integrated vector management (IVM) methods to keep mosquito populations suppressed.
3. Promote cooperation and communication with property owners, residents, social and political groups, and governmental agencies.

The Board of Trustees

As an independent special district, Delta Vector Control District serves its residents under the guidance of the Board of Trustees. The seven-member Board of Trustees consists of one resident from each of the incorporated cities in northern Tulare County and two representatives for the county-at-large.

Trustees are appointed by their respective City Council or the County Board of Supervisors to govern the District knowledgeably and effectively. Board members serve two or four-year terms according to the rules of their appointing body.

The regular Board meetings are held on the second Wednesday of each month at 1737 W. Houston Avenue in Visalia at 4:30 PM. The meetings are open to the public.

Board Member	Position	Representing
Greg Gomez	President	Farmersville
Belen Gomez	Secretary	Woodlake
Kevin Caskey	Trustee	County-at-large
Linda Guttierrez	Trustee	County-at-large
Larry Roberts	Trustee	Dinuba
Rosemary Hellwig	Trustee	Exeter
Michael Cavanagh	Trustee	Visalia

District Personnel

Administration

Dr. Mustapha Debboun, *General Manager*
Mir Bear-Johnson, *Assistant Manager*
Sheri Davis, *Administrative Assistant*
Mark Dynge, *System Administrator*
Mary Ellen Gomez, *Administrative Analyst I*

Laboratory

Crystal Grippin, *Scientific Program Manager*
Javier Valdivias, *Biologist*
Jesse Erandio, *Biologist*
Mark Nakata, *Biologist*

Operations

Paul Harlien, *Foreman*
Rick Alvarez, *Supervisor of House Mosquito Program*
Bryan Ruiz, *Vector Control Technician III*
Bryan Ferguson, *Vector Control Technician III-Mechanic*

2020 Retirements

The District acknowledges the following individuals for their dedication to serving District residents and wish them the best during their retirement.

Employee	Position	Years of Service
Michael Alburn	General Manager	33
Paul Jobe	Superintendent	29
Darin Dula	Foreman	28
Tim Christian	Vector Control Technician III-Mechanic	24

Professional Associations

Delta Vector Control District participates in various professional organizations that promote best practices in vector and vector-borne disease control, research, and management of special districts. The District is a member of Mosquito and Vector Control Association of California (MVCAC), American Mosquito Control Association (AMCA), Society for Vector Ecology (SOVE), Entomological Society of America (ESA), National Association of County and City Health Officials (NACCHO), California Special District Association (CSDA), and the Tulare County Health Emergency Coalition (TCHEC).

Publications, Presentations, and Posters

Characterization of actions of p-menthane -3-8-diol repellent formulations against *Aedes aegypti* mosquitoes. *Trans Royal Society of Tropical Medicine and Hygiene*.

L. Goodyere, M. Grootveld, K. Deohankar, **M. Debboun**, M. Philip

Effects of storage temperature and freeze-thaw cycles on the stability of West Nile virus positive mosquito homogenate in the Ambion® MagMAX™ lysis/binding solution. *AMCA and MVCAC*.

Jesse Erandio, Crystal Grippin, Mark Nakata, Mir Bear-Johnson

Yeast fermentation as a cost affordable CO₂ source for BG-Sentinel traps. *AMCA and MVCAC*.

Mark Nakata, Crystal Grippin, Jesse Erandio, Mir Bear-Johnson

Prioritizing door-to-door yard inspections based on prior breeding status to control *Aedes aegypti*. *AMCA and MVCAC*.

Crystal Grippin, Mark Nakata, Jesse Erandio, Mir Bear-Johnson

Facility Upgrades

Construction started on the Alburn Fish Hatchery (AFH) with two additional offices in mid-2020. The indoor mosquitofish hatchery facility contains four 3,000-liter tanks that will be used to rear mosquitofish. The outdoor mosquitofish holding facility was also updated with three 3,000-liter tanks to hold mosquitofish that are ready for distribution to residents throughout the District. This construction project will raise mosquitofish in an advanced closed Elite Filtration and Tank System to keep water clean and mosquitofish healthy and allow the District to keep up with the demand for mosquitofish during the summer months and provide needed space for staff.

SERVICE REQUESTS

The District provides services directly to residents in addition to routine surveillance and control efforts. Services include inspecting properties for mosquito-breeding sources, mosquitofish for backyard water features, and investigating reports of increased mosquito activity or standing water.

There were 1,671 service requests in 2020 (Figure 1). This was a 182% increase over the previous five-year average but only a 9% increase from 2019. Part of this increase was due to an increase in inspection requests and reports of mosquito presence, likely from the invasive *Aedes aegypti* mosquito. *Aedes aegypti* are aggressive, day-biting mosquitoes that prefer to lay their eggs in small, man-made containers, allowing them to thrive in common backyard environments. The number of mosquitofish requests nearly tripled from the five-year average, indicating an increase in the awareness of their use as an important control method for backyard water features.

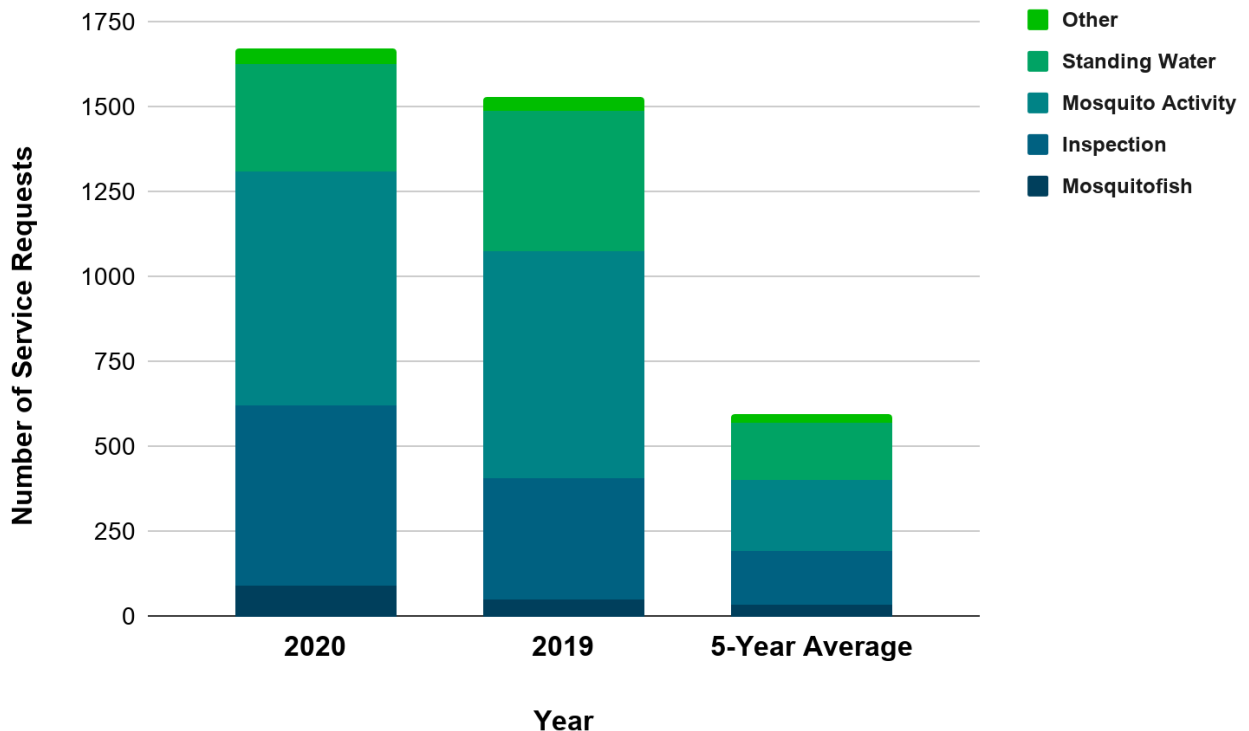


Figure 1. Service requests by category, i.e. 2020, 2019, and 5-year average.

Although service requests were received every month, the majority were between June and September (Figure 2). This corresponds to the warmest summer temperatures of the year in the District. Warm weather increases mosquito abundance, leading to an increase in service requests during the hot summer months. The majority of households who requested services learned about the District from a friend or family member. This was closely followed by households who had requested District services in the past (Figure 3).

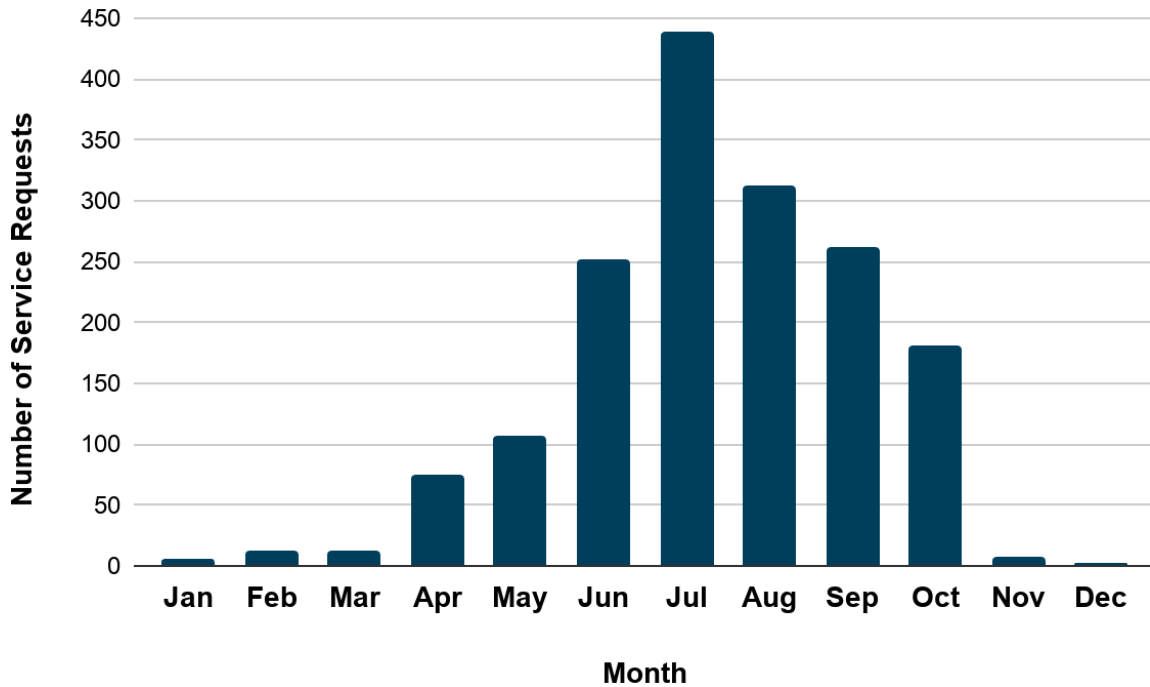


Figure 2. Monthly service requests in 2020.

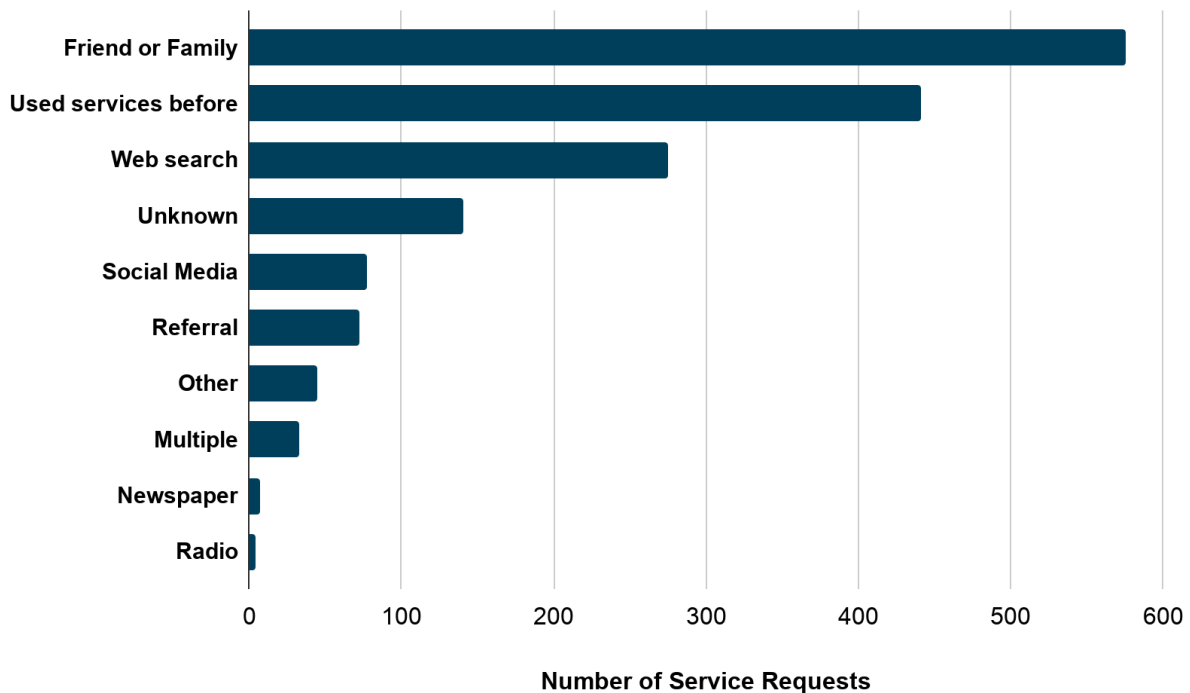


Figure 3. Individuals who requested services learned about DVCD through a variety of ways.

INTEGRATED VECTOR MANAGEMENT

The District uses evidence-based IVM principles to protect residents from vectors and vector-borne diseases. The IVM combines surveillance, control, and community outreach techniques to improve the effectiveness, ecological soundness, and sustainability of vector control programs.

Surveillance

The District monitors vector abundance and arbovirus activity through a variety of adult mosquito traps and by testing mosquitoes and dead birds for West Nile virus (WNV), St. Louis Encephalitis Virus (SLEV), and Western Equine Encephalitis Virus (WEEV). Human cases are also reported and investigated alongside the Tulare County Public Health Department.

Districtwide, the average number of female mosquitoes per trap night was 17.9 for the 2020 mosquito season. Female mosquitoes can transmit diseases of public health concern because they require a blood meal to lay eggs. During 6,697 collections, the District caught a total of 129,737 mosquitoes, of which 92.3% were female (Table 1). Of the 15 mosquito species represented, *Culex quinquefasciatus* contributed the most to total mosquito abundance at 76.7% followed by *Aedes aegypti* at 13.4% and *Cx. tarsalis* at 5.2%.

Table 1. Mosquito abundance species and sex in 2020.

SPECIES	FEMALES	MALES	TOTAL
<i>Culex quinquefasciatus</i>	96,049	3,425	99,474
<i>Aedes aegypti</i>	11,192	6,138	17,330
<i>Culex tarsalis</i>	6,439	323	6,762
<i>Culex stigmatosoma</i>	3,298	104	3,402
<i>Culex erythrothorax</i>	1,549	8	1,557
<i>Anopheles freeborni</i>	829	4	833
<i>Aedes nigromaculis</i>	103	0	103
<i>Anopheles franciscanus</i>	84	0	84
<i>Culiseta particeps</i>	64	1	65
<i>Aedes vexans</i>	39	0	39
<i>Anopheles punctipennis</i>	37	2	39
<i>Culiseta incidens</i>	14	1	15
<i>Culiseta inornata</i>	15	0	15
<i>Aedes sierrensis</i>	11	2	13
<i>Aedes melanimon</i>	6	0	6

Every mosquito sample contains 10 to 50 female mosquitoes of a single species that were caught in the same trap. The four *Culex* species tested are *Cx. quinquefasciatus*, *Cx. tarsalis*, *Cx. stigmatosoma*, and *Cx. erythrothorax*. A total of 2,785 mosquito samples composed of 87,520 individual mosquitoes were tested in 2020. While no samples were positive for WEEV, 139 tested positive for WNV and 37 for SLEV (Figure 4).

In 2020, 47 dead birds were reported to the District. Of those, 10 were viable for disease testing. Dead bird carcasses are considered testable only if they have died within the past 48 hours, have no obvious physical trauma that led to death, and are of an accepted species for testing. Of the 10 tested birds, 4 tested positive for WNV (Figure 5).

The Tulare County Public Health Department reports human arbovirus infections to the District. In 2020, the single human WNV infection within the District boundaries was symptomatic with the person surviving the infection. There were no asymptomatic cases reported.

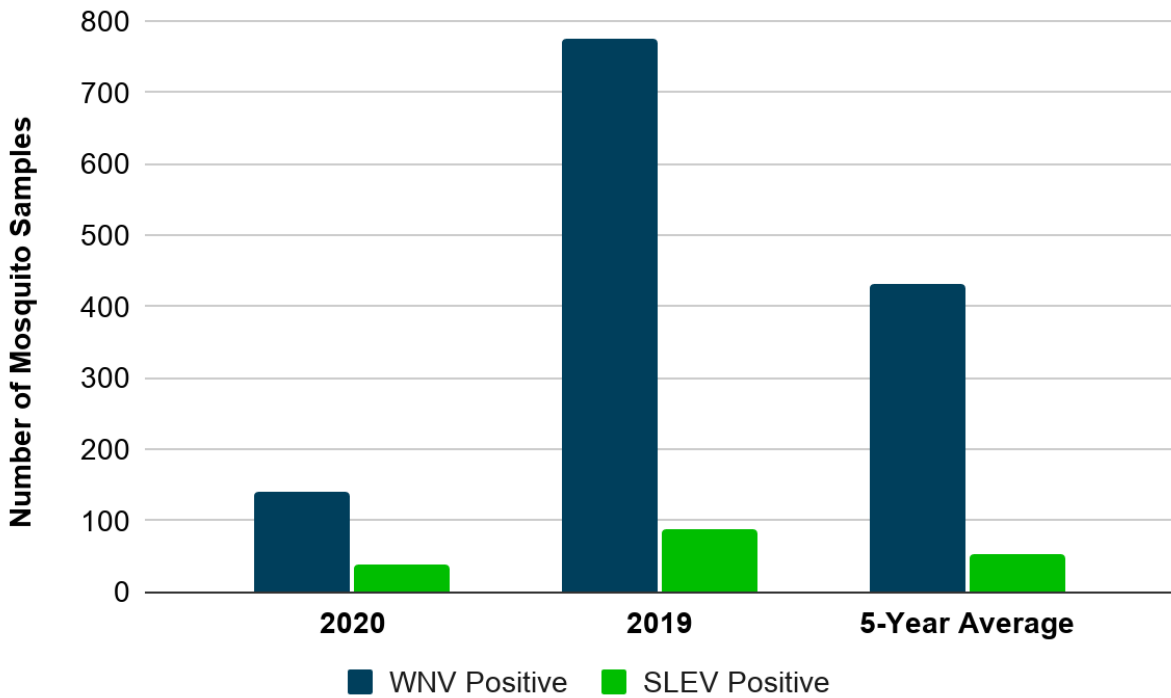


Figure 4. Mosquito samples positive for WNV and SLEV, i.e. 2020, 2019, and 5-year average.

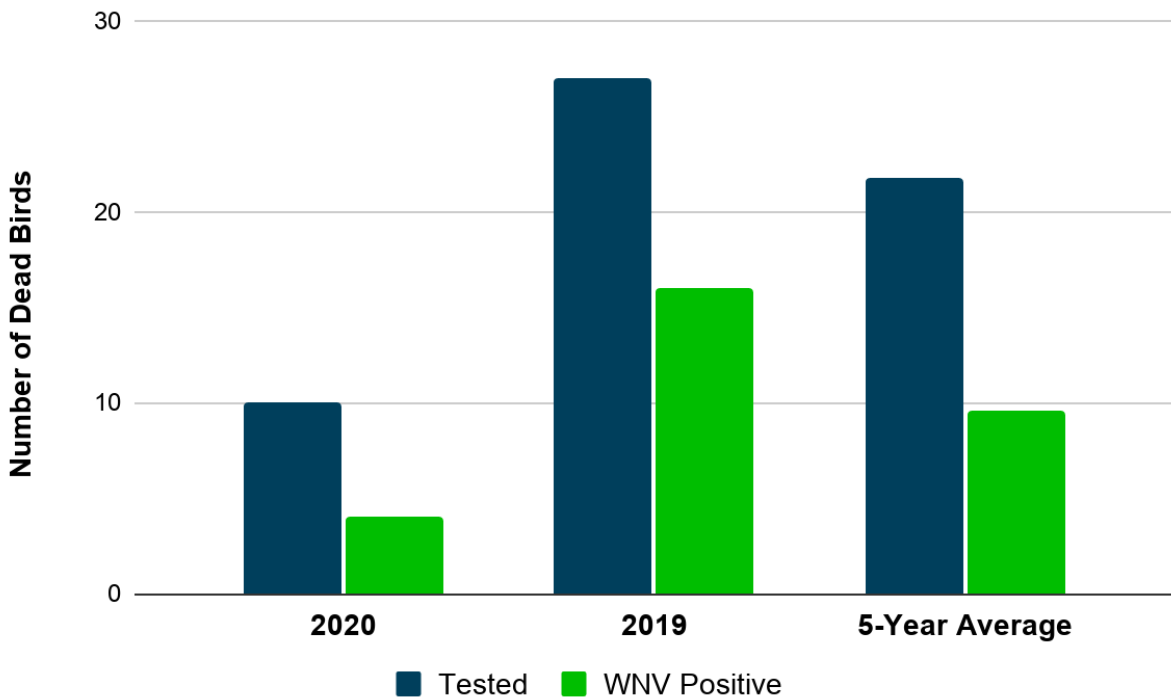


Figure 5. Number of dead birds tested and positive for WNV, i.e. 2020, 2019, and 5-year average.

Control

Delta VCD's mosquito control program is prevention focused, relying on the early identification and control of larval mosquito sources to reduce the biting adult mosquito population. Physical, biological, and chemical control methods are used to control larval sources, allowing for mosquito-specific control. Larval-based control also slows the recovery of adult mosquitoes when adulticide treatments are necessary to be used to reduce arbovirus disease risk to the public.

In 2020, technicians controlled 16,818 (36.8%) mosquito-breeding sources out of 45,699 potential mosquito sources inspected (Table 2). In accordance with IVM principles, a variety of control methods were used to control these sources and prevent insecticide resistance in mosquitoes (Table 3).

Mosquitofish, *Gambusia affinis*, are a large component of maintaining permanent water sources such as ponds and troughs. More than 3,214 mosquitofish were used to treat mosquito-breeding sources in 2020 (Table 3). Free mosquitofish are provided to residents by request. Five adulticide treatments took place in 2020 to reduce the threat of mosquito-borne diseases in areas at elevated risk.

Table 2. Inspections and treatments of source types in the District in 2020.

SOURCE TYPE	INSPECTED	TREATED
Catch Basins	12,200	12,200
Historical Sources	28,383	2,402
Property Inspections	3,253	353
Wastewater Sites	1,358	1,358
Other	505	505

Table 3. Operational data for control efforts in 2020.

PHYSICAL CONTROL OPERATIONS	AMOUNT
Number of sources	554
MOSQUITOFISH OPERATIONS	
Number of sites stocked	184
Number of fish planted	3,214
ADULTICIDE OPERATIONS	
Number of operations	5
Pyronyl 525 (oz)	2,961.1
SURFACE AGENTS	
Agnique Liquid (oz)	666.5
BVA2 larvicide (gallons)	4,492.8
BIORATIONAL LARVICIDES	
<i>Bacillus thuringiensis israelensis (B.t.i.)</i>	
VectoBac 12AS (oz)	140,974
VectoBac G (lb)	41
VectoBac GR (lb)	40
VectoBac WDG (lb)	88
<i>Bacillus sphaericus (B.s.)</i>	
VectoLex Granules (lb)	45
VectoLex WSP (each)	1,512
<i>B.t.i. and B.s.</i>	
FourStar 180 (each)	7
Spinosad	
Natular 2EC (oz)	853
Natular DT (each)	237
Natular G30 (lb)	31.9
Insect growth regulator (Methoprene)	
Altosid Briquets (each)	164
Altosid Liquid (oz)	1,148
Altosid Pellets WSP (each)	69,572
Altosid Sand Mix (lb)	695.5
Altosid XRG (lb)	482

Community Education and Outreach

The goal of community education and outreach is to increase resident participation in preventing nuisance biting and vector-borne diseases by teaching residents to reduce mosquito-breeding sources and use the appropriate personal protection measures to reduce bites.

In early 2020, District staff participated in the Linwood Elementary STEAM Family Night and provided presentations to Sequoia Garden Club, Visalia Host Lions Club, and Visalia Breakfast Lions Club. In total, 196 adults and children were reached. All other scheduled events were cancelled when the stay-at-home mandate was issued on March 15, 2020 due to the COVID-19 pandemic. Although the COVID-19 pandemic limited participation in events and in-person activities, education and outreach efforts continued through other means such as radio and newspaper.

The District website, www.deltavcd.com, was updated and relaunched in early 2020. The new website increased information for residents on vector control, prevention, and the understanding of what the District does. Along with Frequently Asked Questions and downloaded brochures in both English and Spanish, residents are able to find reliable and relevant information.

Radio advertising began earlier in the season in May and ended in August. Similar to previous years, messaging focused on reducing mosquito breeding sources and bite prevention. In total, 408 thirty-second radio spots in both English and Spanish were aired on 4 local radio stations. Also, 4 print advertisements were placed in *The Good Life*, a local newspaper whose senior audience is at high risk of neuroinvasive WNV infections. In addition, 24 large vehicle magnets and decals with the District website were placed on the work trucks (Figure 6). Through routine staff activities, these items increase access to key prevention messages across the District including rural areas where traditional media may not reach them.

PREVENT THE BITE DAY & NIGHT!



TIP

standing water weekly



TOSS

unused containers



REPEL

with EPA-registered insect repellents

Figure 6. Rural areas across the District received key prevention messages with banner style truck magnets placed on work vehicles.

Delta Vector Control District collaborated with Tulare Mosquito Abatement District and Kern Mosquito and Vector Control District for the creation of a newspaper insert leaflet by N&R Publications (Figure 7). The leaflet teaches residents about basic mosquito biology, mosquito-bite prevention, and recognizing common backyard mosquito-breeding sources. These insert leaflets will be distributed through community centers, libraries, senior centers, and local newspapers.

Take Action!

LEARN HOW YOU CAN STOP MOSQUITOES FROM BREEDING AT YOUR HOUSE

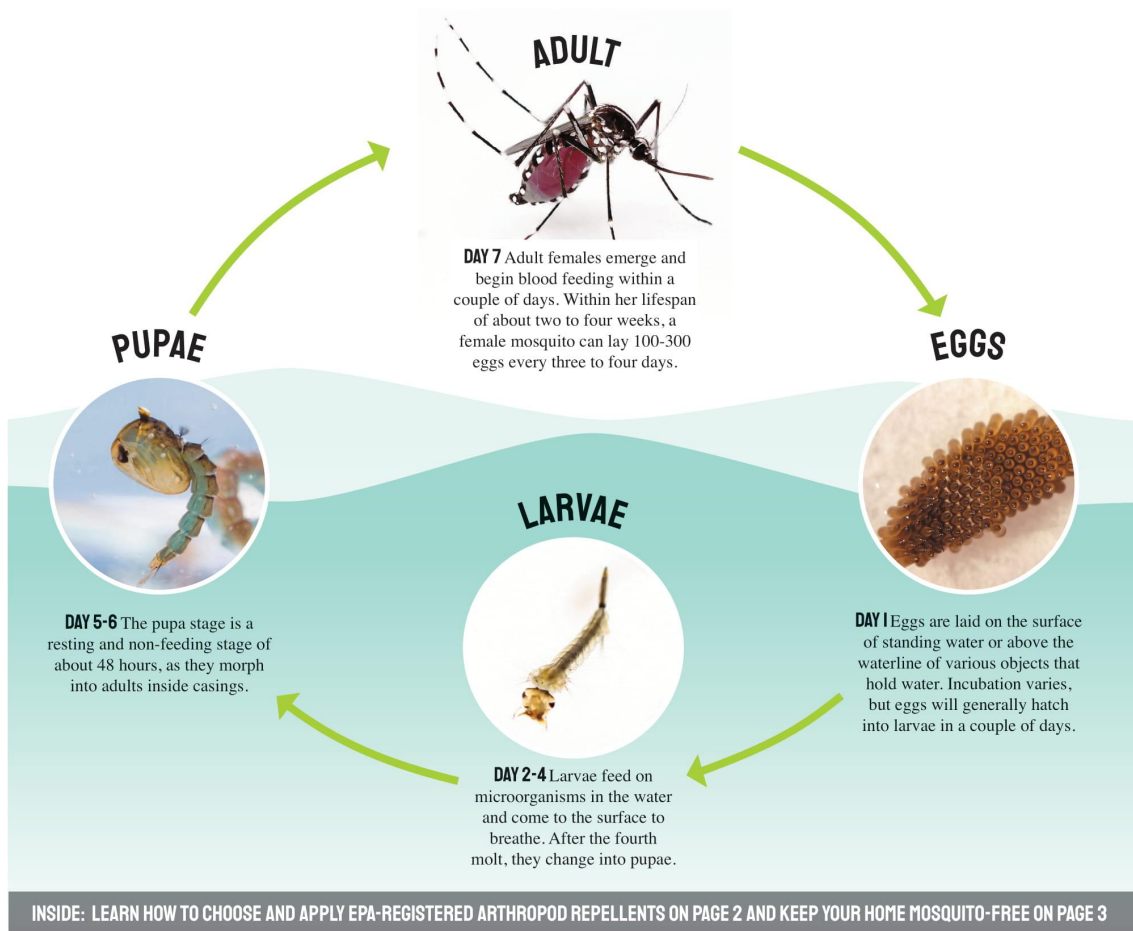


Figure 7. The newspaper insert leaflet will be distributed at community centers, libraries, senior centers, and local newspapers.

Financial Reports

Budgetary Comparison Schedule General Fund

Fiscal Year ended June 30th, 2020

	Budgeted Amounts		Actual	Variance with Final Budget
	Original	Final		
REVENUES				
Property Taxes:				
Current secured	\$ 2,309,889	\$ 2,309,889	\$ 2,302,506	\$ (7,383)
Current unsecured	130,918	130,918	136,630	5,712
Prior secured	46,828	46,828	49,884	3,056
Prior unsecured	2,098	2,098	2,283	185
State homeowner's property tax relief	19,407	19,407	18,786	(621)
Pass through income	305,019	305,019	376,813	71,794
Interest income	62,376	62,376	96,477	34,101
Charges for current services	5,081	5,081	7,064	1,983
Other governmental income	-	-	1,068	1,068
Assessments	921,969	921,969	907,095	(14,874)
Other income	-	-	119,295	119,295
Total Revenues	<u>3,803,585</u>	<u>3,803,585</u>	<u>4,017,901</u>	<u>214,316</u>
EXPENDITURES				
Current:				
Salaries and employee benefits	2,415,351	2,415,351	2,445,120	(29,769)
Services and supplies	670,230	670,230	724,421	(54,191)
Capital outlay	968,045	968,045	691,166	276,879
Total expenditures	<u>4,053,626</u>	<u>4,053,626</u>	<u>3,860,707</u>	<u>192,919</u>
Excess (deficiency) of revenues over (under) expenditures	(250,041)	(250,041)	157,194	407,235
OTHER FINANCING SOURCES (USES)				
Lease proceeds	-	-	1,000,000	1,000,000
Total other financing sources (uses)	<u>-</u>	<u>-</u>	<u>1,000,000</u>	<u>1,000,000</u>
Net change in fund balance	<u>\$ (250,041)</u>	<u>\$ (250,041)</u>	<u>1,157,194</u>	<u>\$ 1,407,235</u>
Fund balance, July 1, 2019			<u>3,747,740</u>	
Fund balance, June 30, 2020			<u>\$ 4,904,934</u>	

Governmental Fund Balance Sheet

	General Fund	Adjustments	Statement of Net Position
ASSETS			
Cash and cash equivalents	\$ 4,526,935	-	\$ 4,526,935
Accounts receivable	1,223	-	1,223
Capital assets, net of accumulated depreciation	-	3,396,001	3,396,001
Other post employment benefits asset	-	31,645	31,645
Restricted Cash:			
Fish Hatchery	444,014	-	444,014
Total Assets	<u>4,972,172</u>	<u>3,427,646</u>	<u>8,399,818</u>
DEFERRED OUTFLOWS OF RESOURCES			
Pension deferrals	-	598,561	598,561
Other post employment benefits deferrals	-	52,180	52,180
Total deferred outflows of resources	<u>-</u>	<u>650,741</u>	<u>650,741</u>
LIABILITIES			
Accounts payable	43,666	-	43,666
Accrued expenses	9,112	-	9,112
Payroll liabilities	14,460	-	14,460
Accrued interest	-	30,810	30,810
Due in one year:	-		
Compensated absences	-	72,763	72,763
Lease payable	-	89,591	89,591
Due in more than one year:	-		
Compensated absences	-	48,510	48,510
Lease payable	-	930,409	930,409
Net pension liability	-	1,954,422	1,954,422
Total Liabilities	<u>67,238</u>	<u>3,126,505</u>	<u>3,193,743</u>
DEFERRED INFLOWS OF RESOURCES			
Pension deferrals	-	177,341	177,341
Other post employment benefits deferrals	-	195,696	195,696
Total deferred inflows of resources	<u>-</u>	<u>373,037</u>	<u>373,037</u>
FUND BALANCE/NET POSITION			
Fund balance:			
Unassigned	4,907,934	(4,904,934)	-
Total fund balance	<u>4,904,934</u>	<u>(4,904,934)</u>	<u>-</u>
Net position:			
Net investment in capital assets	-	2,820,015	2,820,015
Unrestricted	-	2,663,764	2,663,764
Total fund balance/net position	<u>4,904,934</u>	<u>5,483,779</u>	<u>5,483,779</u>