



Annual Report 2020



Solano County Mosquito Abatement District

Letter from the District Manager

On behalf of the Board of Trustees and the Staff of the Solano County Mosquito Abatement District it is my pleasure to present to you the 2020 annual report.

2020 proved to be a challenging year due to the Covid 19 virus spreading throughout the entire globe. Mosquito and Vector Control Districts were deemed “essential services”. The SCMAD navigated through the Covid 19 laws and regulations, adjusting work spaces and work hours to keep staff safe. District staff was able to fulfill the district’s mission “to control all mosquitoes that may bring disease or harassment to humans and domestic animals”. With safety protocols in place, we were able to respond to requests for service from the public without interruption, as well as check and treat known mosquito breeding sources at routine intervals.

The SCMAD Board of Trustees and staff are committed to suppressing both disease carrying and nuisance mosquitoes with the most ecological and cost-effective methods available. I want to thank the SCMAD Trustees and staff for their continued dedication to mosquito control, making Solano County a healthier place where its citizens and visitors can live, work and visit.

We look forward to providing our services to you and if you have any questions or need more information, please contact me.

Respectfully,



Richard Snyder
District Manager
Solano County Mosquito Abatement District
707-437-1116



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Independent Special District

The Solano County Mosquito Abatement District (SCMAD) is an independent special district and is not a part of the Solano County governmental system. Rather, each city within the district's jurisdiction appoints a trustee to represent their community on the SCMAD's Board of Trustees; in addition to the trustees that represent the municipalities, the county at large is also given a representative trustee position called the Trustee-at-Large.

Independent special districts are formed by residents and sanctioned by the State of California Government Code to provide local services.

2020 Board of Trustees

President: Charles Tonnesen (Fairfield)
Vice President: Mike White (Benicia)
Secretary: Ronald Schock (*Trustee-at-Large*)
Trustee: Joe Anderson (*Dixon*)
Trustee: Ron Stevenson (*Rio Vista*)
Trustee: Marlon Osum (*Suisun*)
Trustee: Robert C. Meador (*Vacaville*)
Trustee: Daniel Glaze (*Vallejo*)

SOLANO COUNTY Mosquito Abatement District



Solano County Mosquito Abatement District Staff

Administration

Manager: Richard Snyder
Administrative Assistant: Tami Wright

Laboratory

Biologist: Bret Barner

Operations

Mosquito Control Technicians:

Tommy Bosson
Ian Caldwell
Ryan Dawson
Gary Dula
Damon Gray
Mark McCauley
Brian Slover



Mission Statement

The SCMAD is a special district responsible for mosquito abatement throughout the incorporated and unincorporated areas of Solano County, which covers 909 square miles. Within this area, SCMAD contends with an extremely diverse range of aquatic habitats and temperature regimes. There are 23 species of mosquitoes known to be found within the SCMAD boundaries, 12 of which are important either as disease vectors (i.e., capable of transmitting disease) or pests.



The function of the SCMAD is to control all mosquitoes that may bring disease or harassment to humans and domestic animals. At the SCMAD, we fulfill this function by evaluating and selecting the most effective and economical management techniques that result in the least possible damage to non-target organisms and to the environment. SCMAD deploys a variety of preventive management techniques to control mosquitoes including natural, physical, and chemical control measures. We also emphasize preventive measures, principally natural and physical control methods; however, chemical control is also integrated with other measures when necessary.

History of the SCMAD

The SCMAD was founded in 1930 in order to control the *Aedes* mosquitoes that were being produced in the 184 square mile Suisun Marsh. It was formed according to guidelines set forth by the Mosquito Abatement Act of 1915 and the California Health and Safety Code.



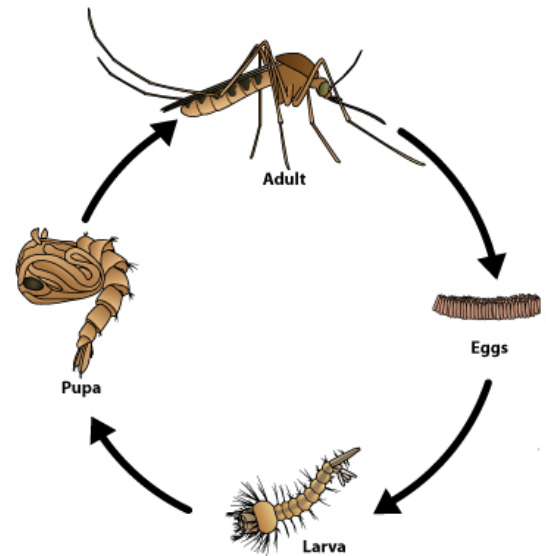
Working with the Public

SCMAD technicians work diligently to monitor and suppress mosquito populations within Solano County's 909 mi² boundaries. However, it is nearly impossible to predict the mosquito population trends with any degree of certainty; the SCMAD relies on information and service requests from the public. Information from the public allows the SCMAD to pinpoint mosquito breeding areas and assists us in allocating our resources to respond effectively and efficiently. In 2020, SCMAD's mosquito control technicians responded to approximately 1,118 service requests. During service requests, SCMAD technicians conduct habitat evaluation and make treatment applications if necessary. If you would like to make a service request you can do so by calling the SCMAD at (707) 437-1116 or by placing an online service request at <https://www.solanomosquito.com/contact-us>.

Mosquito Biology & Development

Of the 23 mosquito species that are known to occur in Solano County, each has a specialized set of environmental preferences. While all of the mosquitoes in Solano County share the same basic requirement for standing water to complete their life cycle, some species within the county can complete their lifecycle very quickly with only a small amount of water. Only a bottle cap full of water present for a period of 5 days is all that is required to produce the next generation of mosquitoes. This makes identifying and abating the breeding sources of these mosquitoes very challenging.

All mosquito species have a four-stage lifecycle: eggs, larvae, pupae, and adult. For mosquitoes, this is a process referred to as complete metamorphosis. Adult male and female mosquitoes feed primarily on sucrose from plants; the female mosquito requires blood meals in order to produce viable eggs. It is during this blood feeding period that both humans and domestic animals in Solano County are bitten, causing not only a nuisance but also a means of disease transmission.



Mosquito Abatement Methods



It is the goal of the SCMAD to cause a significant interruption in the mosquito lifecycle whenever possible in order to reduce the overall mosquito population in Solano County. Keeping the mosquito population at low levels not only reduces the nuisance to our community but also reduces the likelihood of arbovirus transmission, such as West Nile virus, from spreading to members of the public.

To achieve this goal the SCMAD utilizes an Integrated Vector Management (IVM) program. IVM is a rational decision-making process to optimize the use of resources for vector control. The purpose of IVM is to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. Additionally, when compared to traditional pest control methods, IVM is a more environmentally conscious method of mosquito control. The SCMAD's IVM program integrates biological and disease surveillance information into selecting the appropriate abatement method. The vector control methods of IVM can be broken into 3 main method types: physical control, biological control, and chemical control.

Physical Control

The most effective method of controlling mosquitoes is to drain or eliminate standing water where mosquitoes may breed; this method of physically manipulating mosquito breeding habitat is referred to as physical control. Physical controls can be broken into two different types: source elimination/reduction and source maintenance.

Source Elimination/Reduction

This type of physical control eliminates a larval habitat by modifying the landscape to allow for better drainage or by eliminating a source entirely. Habitat modification or elimination can be as complex as adding drainage canals to a marsh or as simple as cleaning gutters, flushing dog water bowls frequently, or even covering a pool/spa that is unmaintained. While the SCMAD does not conduct these more complex types of habitat modification or land management strategies that eliminate habitats conducive to mosquito breeding (such as ditching and vegetation management), we do work closely with landowners to promote this method of mosquito control on their own properties.



Source Management

When a source of mosquitoes cannot be eliminated completely, source management is a practice that can reduce the population of mosquitoes. Source management often includes water management, vegetation management, as well as infrastructure maintenance, like flood gate maintenance. This method of habitat modification is often employed at duck clubs when lowlands are flooded to create a desirable duck habitat prior to duck hunting season. Source management requires more labor hours to monitor for mosquito larvae and often results in applying a chemical treatment only when necessary.

Physical control may not always be a practical method of mosquito abatement due to the practical limitations of source size, logistical hurdles, or cost. For this reason, the SCMAD utilizes biological and chemical control methods to prevent mosquitoes from completing their lifecycle.

Biological Control Methods

When a water body does not drain regularly or is permanent but not suitable for physical control -such as source elimination, reduction, or maintenance- it may be selected as a candidate for biological control. Biological control is when control of the mosquito population is accomplished by introducing/increasing the predator population in the mosquitoes' ecosystem.



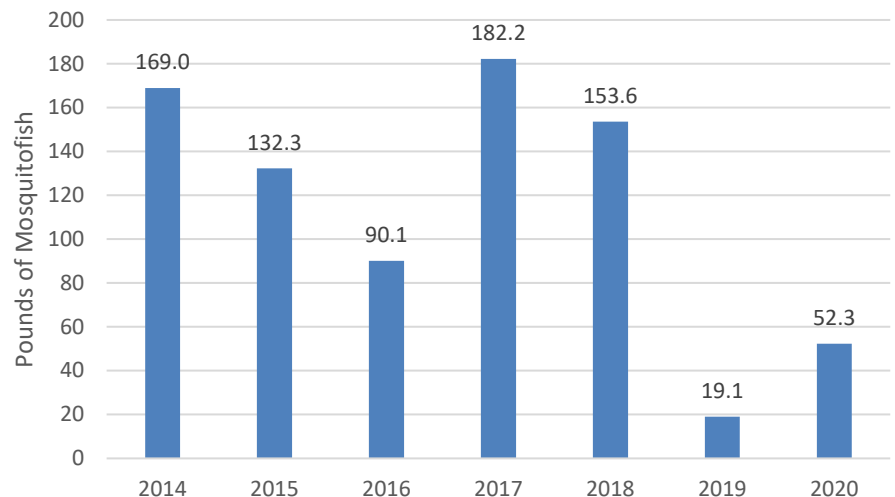
SCMAD breeds -and may also purchase- live mosquitofish that are then distributed to the public free of charge for use on private properties in Solano County.

Mosquitofish are commonly stocked in places like ornamental ponds, cattle troughs, stagnant swimming pools, and large fountains. The SCMAD staff will also stock the mosquitofish in other environments, including golf courses, country club ponds, water treatment facilities, and stock ponds that do not have a population of predatory fish. In 2020 mosquitofish pick-up times were scheduled over the phone and fish were set outside the district office due to contactless COVID-19 precautions.

Mosquitofish are ideally suited for biological control because they are small (under 2.5 in length) and able to reproduce quickly. These fish have also been observed eating up to two times their body mass in mosquito larvae per day. Mosquitofish are also extremely resilient to harsh environmental conditions and can be successfully stocked where other aquatic predators might not survive. Stocking mosquitofish in a permanent water feature can result in months, or even years, of effective mosquito control.

The SCMAD Mosquitofish program has become very popular with the public. Before the 2020 pandemic, the SCMAD staff went to special events across the county to educate the public about mosquito control programs in Solano County. The SCMAD took this opportunity to distribute mosquitofish to the public while they were at the events. In 2020 the SCMAD distributed an estimated 52 lbs. of mosquitofish throughout Solano County providing long lasting, pesticide free mosquito abatement to an estimated 209 acres.

Pounds of Mosquitofish Distributed by Technicians 2014-2020



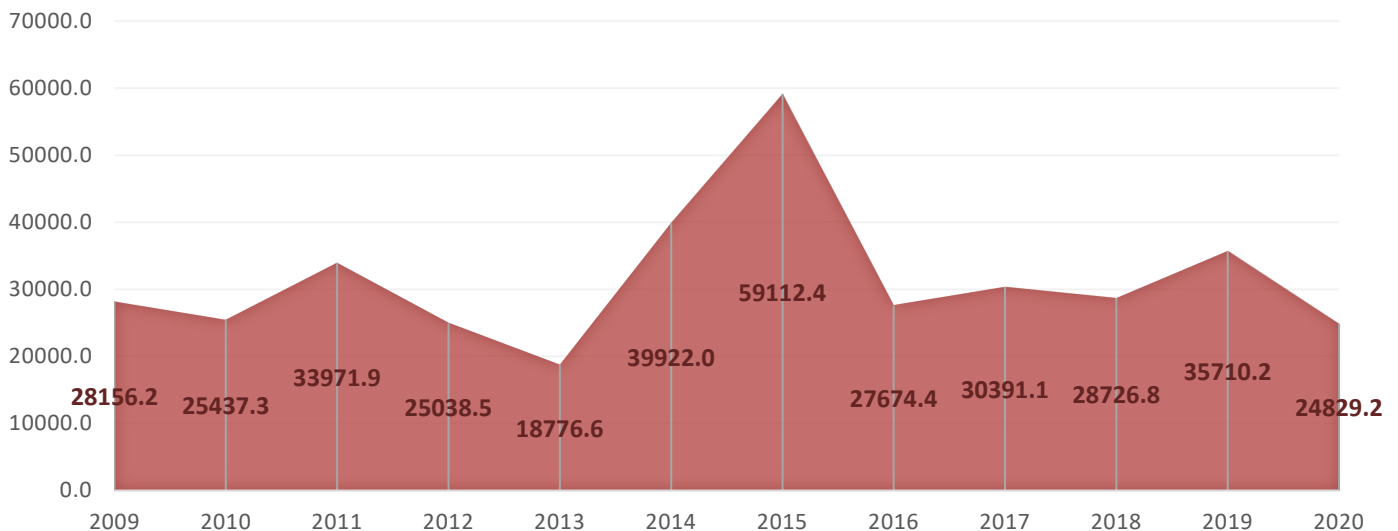
Chemical Control Methods

When physical and biological control methods are not viable options to reduce the mosquito population, the SCMAD can select a chemical control method to reduce the number of mosquitoes to acceptable levels. The SCMAD works diligently to select and use all of our chemical pesticides in a manner that poses the lowest possible risk to both the public and the environment.

The chemical pesticides used by SCMAD can be classified into two different categories: larvicides and adulticides.



TOTAL ACRES TREATED WITH PESTICIDE 2009-2020

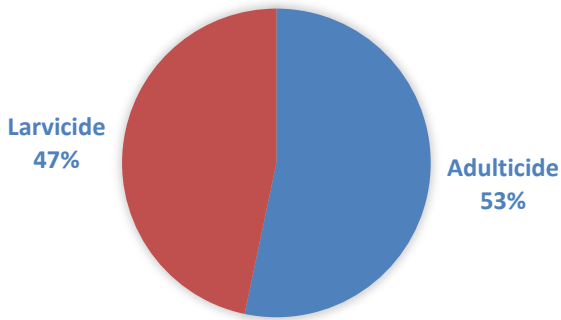


Larvicides

Larvicides are insecticides that target mosquitoes in the larval stage of their lifecycle. Larvicides are by far the most heavily used form of insecticide used by the SCMAD, although adulticide applications treated a greater area per application. Most larvicides used by the SCMAD contain the active ingredient methoprene. Methoprene is frequently used as a public health pesticide because it poses a very low risk to residents and their animals, while at the same time reducing the amount of biting adult mosquitoes that emerge from an aquatic environment.

In 2020 the SCMAD deployed larvicides by ATV, hand, and even aircraft. Larvicides are important in controlling the mosquito populations that develop in the tidal marshes in late winter, spring and summer. The SCMAD also uses larvicides to control mosquito populations that develop in the fall when duck clubs are flooding prior to duck hunting season.

2020 PROPORTION OF TOTAL ACRES TREATED LARVICIDE VS. ADULTICIDE

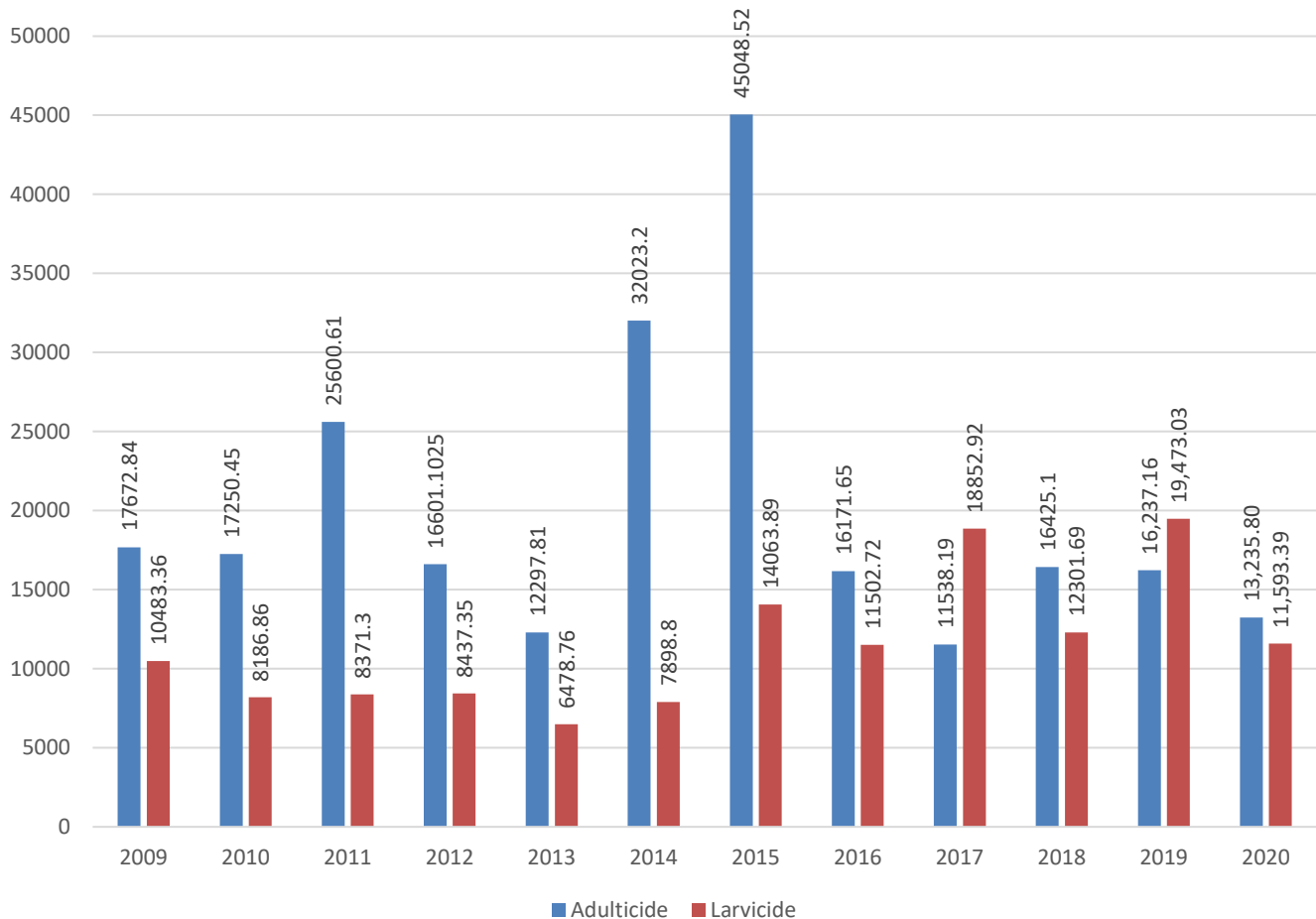


Adulticides

Adulticides are chemical pesticides that target mosquitoes in their adult life stage. Adulticides utilized by the SCMAD are effective in rapidly reducing the adult mosquito population in a specific area for a short period of time; however, if the mosquito habitat is not abated adulticide treatments will not provide long lasting results.

Adulticides used by the SCMAD are not target-specific and could affect the beneficial insect population. For this reason, the SCMAD generally only applies adulticides in/around areas that have known arbovirus activity to reduce the risk of arbovirus transmission. To date in Solano County adulticides are ONLY deployed by ground vehicles or using a hand applicator. The SCMAD has never applied adulticides using aircraft.

Total Acres Treated 2009-2020
Larvicide vs. Adulticide

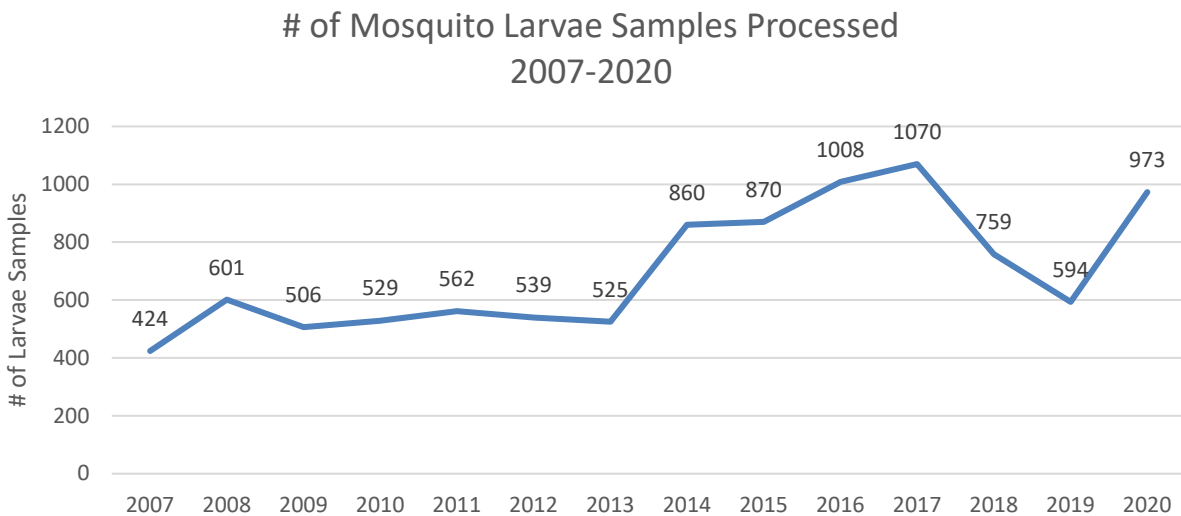


2020 Mosquito Surveillance

In 2020 the SCMAD used a variety of surveillance techniques to monitor and lower the mosquito population for both public nuisance and public health reasons. Mosquito surveillance yields a cornucopia of data that is useful for district staff. For example, the species and abundance of adult mosquitoes trapped in a specific time period could yield valuable information about where the mosquitoes are breeding, what flight range the mosquitoes have, and whether the public is at risk of disease transmission; larvae mosquito samples give us information about when the next generation of mosquitoes might emerge, their potential population size if unabated, how far they could travel, whether the species is a known vector of disease, and if pesticides applied are effective.

Larval Surveillance

In an effort to identify mosquito breeding sources and plan abatement efforts, the SCMAD technicians collect larval samples from aquatic habitats as a response to service requests or from known breeding sources. These samples are brought back to the SCMAD laboratory where the specimens are inspected and all mosquito larvae are identified to species. This population data allows the SCMAD to assess the upcoming risk to the public and the future adult mosquito population if unabated. Larval surveillance is crucial to not only achieving mosquito control before the mosquito population emerges as biting adults, but it also allows us to monitor our pesticides' effectiveness. In 2020, the SCMAD laboratory processed 973 mosquito larvae samples.

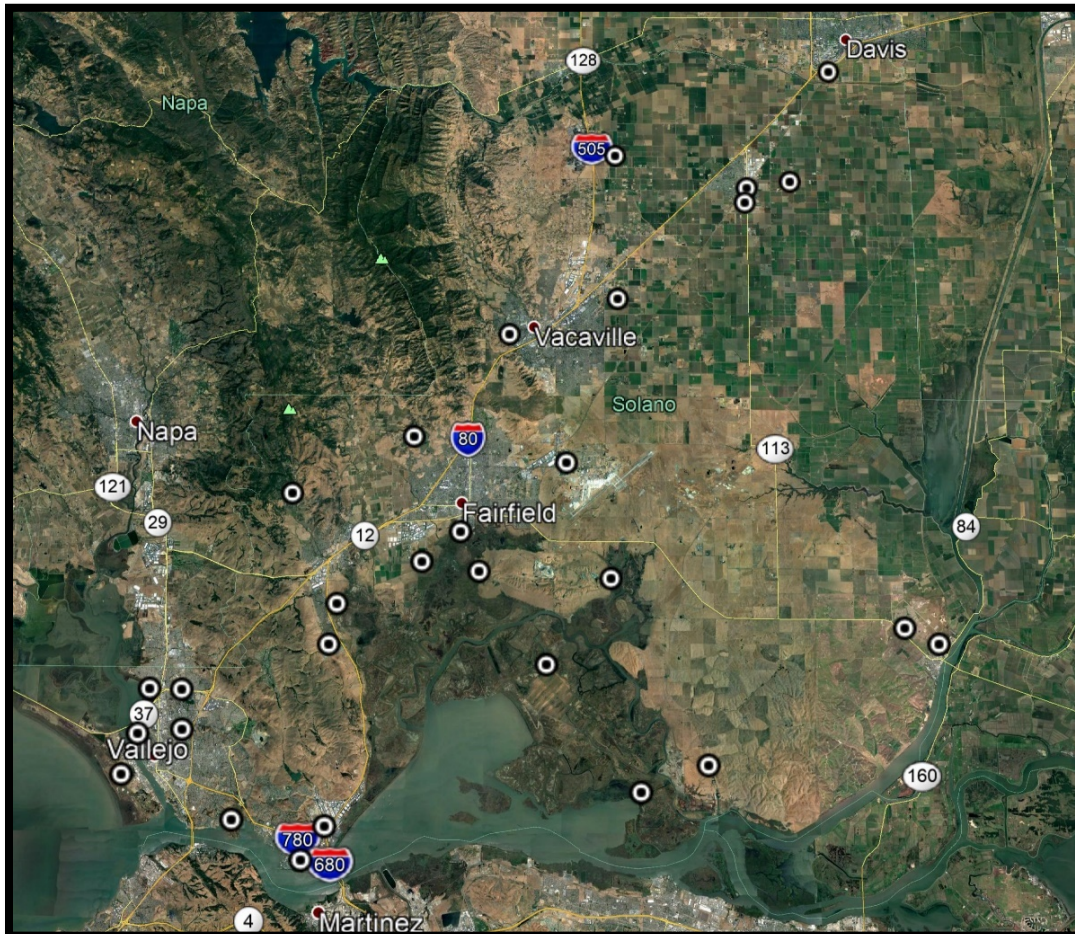


New Jersey Light Traps

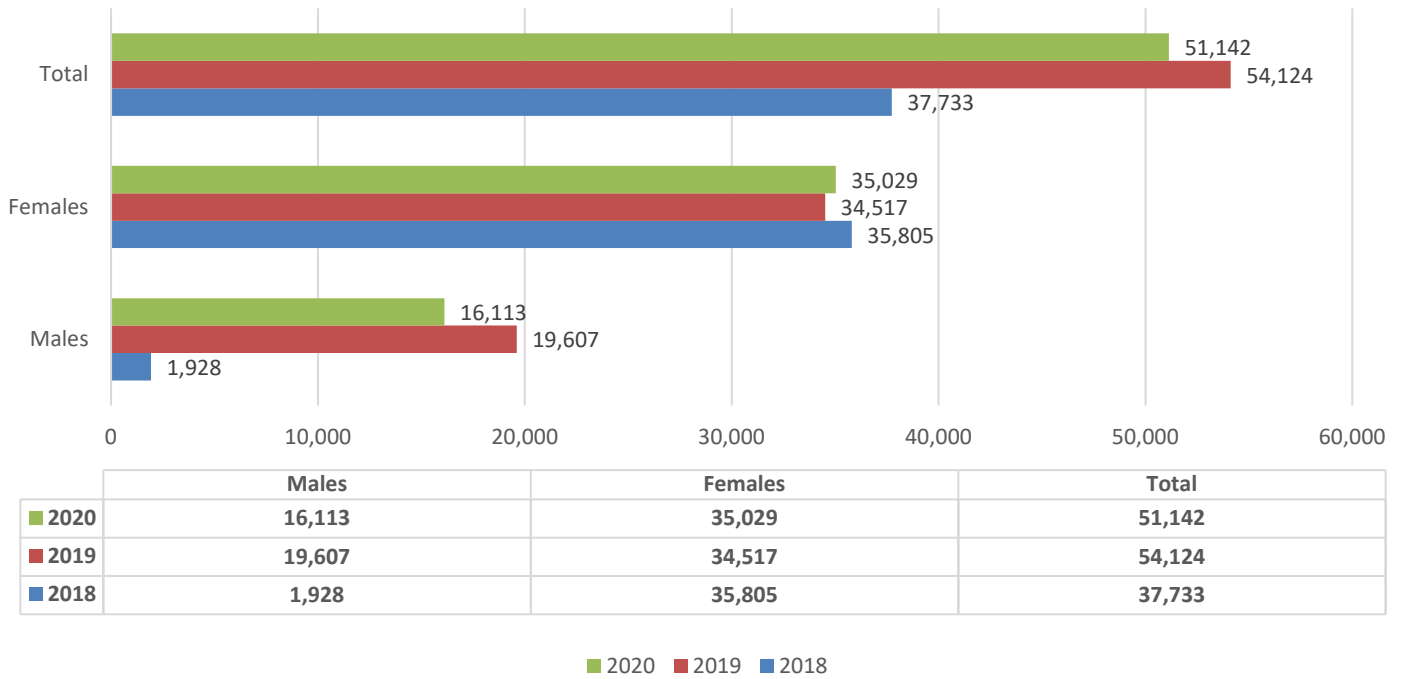
The SCMAD uses New Jersey Light Traps as semi-permanent monitoring stations for mosquito surveillance. The SCMAD deploys these traps for roughly 9 months a year throughout the county by partnering with local land owners. New Jersey Light Traps use light to attract mosquitoes at night, then traps and kills them. These traps are very effective in providing the SCMAD staff with mosquito diversity and long-term comparable population data used for resource allocation

decisions. The trap numbers and locations are roughly the same year to year, which allows the SCMAD to use the data from previous years to compare and identify trends and patterns in the adult mosquito population.

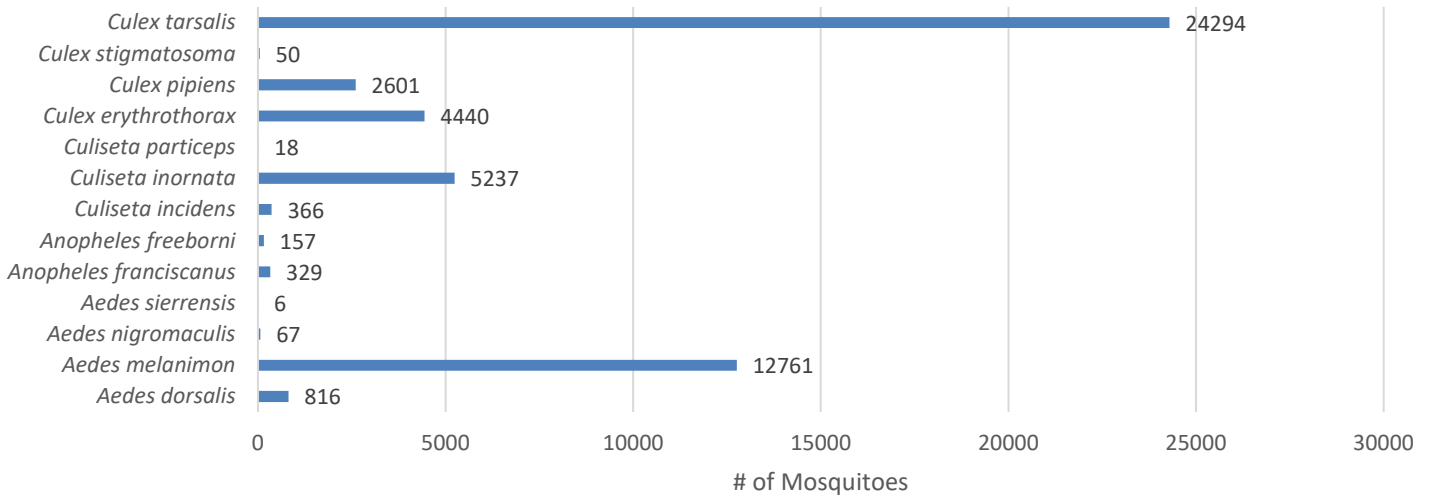
Light traps are a very effective method in measuring the mosquito population overall because they attract a wide range of mosquito species. These traps are also useful in measuring the male adult mosquito population, too. The number of male mosquitoes captured in a NJLT provides useful information in terms of source proximity to the trap site. Male mosquitoes in general do not fly far from their source of origin. Male mosquitoes are, in general, not strong fliers nor do they possess the need to fly great distances in the way female mosquitoes may to attain a blood meal. Interpreting both the species and sex ratio of the trapped mosquitoes will aid technicians in determining where a particular type of source may be located. In 2020, 29 light traps were collected and reset on a weekly basis from March through November. The map below plots the location for each of the NJLTs deployed in 2020.



2020 NJLT Adult Totals 2018-2020



NJLT Adult Mosquito Species Diversity 2020



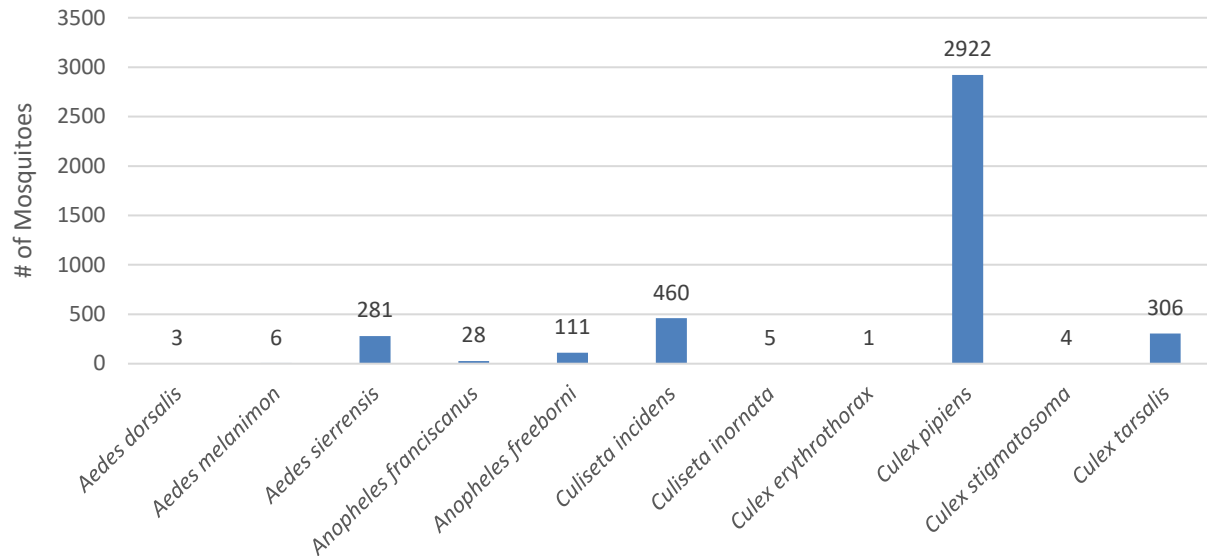
BG Sentinel Trap

BG Sentinel traps contain a battery-powered motor that pulls in mosquitoes flying near the top of the trap. These traps can also be retrofitted to receive power from an electrical outlet. Mosquitoes are attracted to the octenol, carbon dioxide and BG-Lure with which this trap is baited. The overall black and white design of the BG Sentinel trap is attractive to *Aedes* mosquitoes.

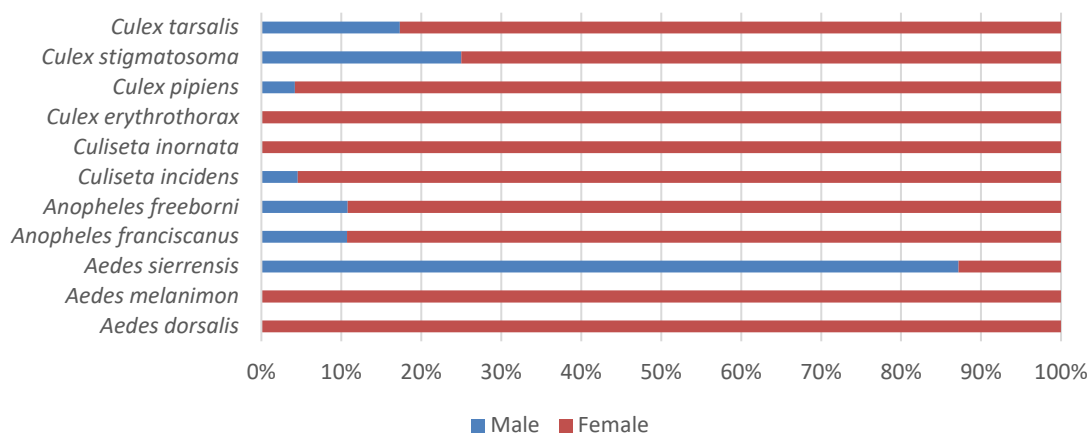
BG Sentinel traps attract female mosquitoes in search of a host and are used mainly to monitor for invasive *Aedes aegypti* and *Aedes albopictus*. In 2020, the most abundant species this trap collected was *Culex pipiens*. *Culex* mosquitoes captured in BG Sentinels were pooled and tested for arbovirus, making this trap useful for the SCMAD arbovirus surveillance program.



BG Sentinel Adult Mosquito Species Diversity 2020



BG Sentinel Adult Male to Female Ratio 2020





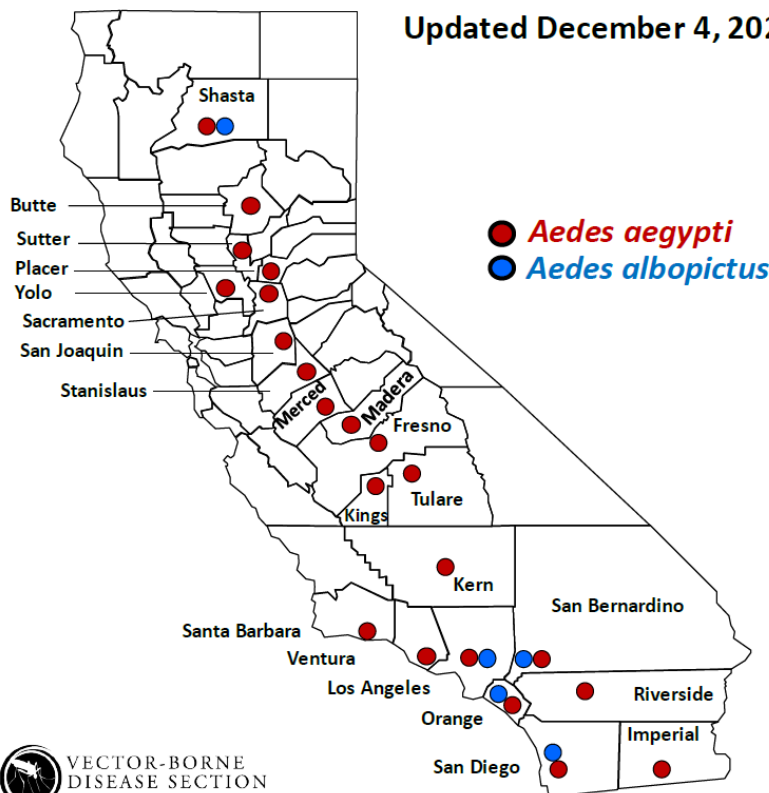
Invasive *Aedes* Mosquitoes

SCMAD incorporates two trap types into the invasive mosquito surveillance program. These traps are specifically designed to attract and capture the invasive *Aedes aegypti* (Yellow Fever mosquito) and *Aedes albopictus* (Asian Tiger mosquito). These two mosquito species were introduced to North America and act as highly competent vectors of diseases not transmitted by any of our current 23 mosquito species; these diseases include yellow fever, dengue, chikungunya virus and Zika virus (associated with microcephaly). *Aedes aegypti* and *Aedes albopictus* were not detected in any larvae samples or surveillance traps deployed in 2020, nor have they been detected in Solano County any year prior. Neighboring counties of Solano including

Stanislaus, San Joaquin, Placer and Sacramento counties all made their first detection of *Aedes aegypti* in 2019. Yolo county had their first detection of *Aedes aegypti* in Winters, CA in 2020. The Yolo detection site is located less than 100 yards from the Solano County northern border. SCMAD conducted a long-term surveillance effort to monitor for *aegypti* in Winters. Fortunately there were no detections of the invasive species on the Solano County side of the two counties' border. Below is an updated distribution map of all counties in California that have one or both of these invasive mosquito species.

Aedes aegypti and *Aedes albopictus* Mosquitoes in California Detection Sites by County/City

Updated December 4, 2020



See pages 2 – 8 for *Aedes* detections by city or census-designated place in each county.

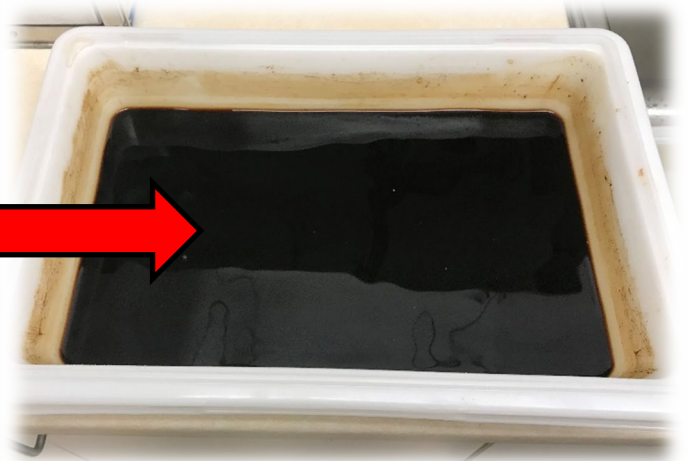
Rediscovered Species

The White-lined mosquito, *Orthopodomyia signifera*, is a mosquito species that has not been detected in Solano County in over 40 years. This species was detected in a larvae sample from rural Vacaville in January 2020. There is not much known about *signifera*, other than it is a species that prefers to feed almost exclusively on birds. These mosquitoes are a tree hole species that require standing water year-round. Reports claim that their eggs are laid individually along the inner walls of tree holes, slightly above the surface of the standing water that occurs in the tree hole throughout the year. Larvae hatch within several days and work their way down into the water where they remain in the larval stage until the following summer.

This species is rare in Solano County due to the lack of natural environments that are suitable for *signifera* to complete their lifecycle; the long, hot, dry summers evaporate nearly all sources of tree hole water within Solano County. Adult *Orthopodomyia signifera* are reluctant to enter traps deployed by SCMAD. Future work to monitor for the species is being considered. Because this is a species that prefers to feed on birds, they have enormous potential to become a vector of arboviruses like West Nile virus- possibly circulating the virus within the local bird population.



Left: Blue oak (*Quercus douglasii*) tree hole source where *O. signifera* were found. **Below:** water extracted from tree hole containing *O. signifera* larvae (n=300).



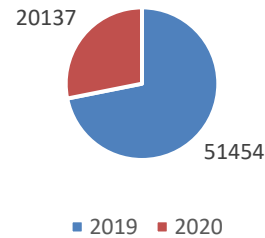
Arbovirus Surveillance

Mosquito Population Testing

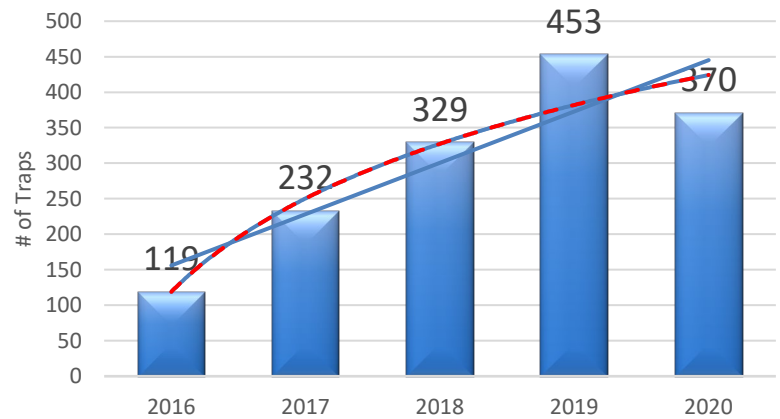
A robust mosquito sampling program is very important in order to identify areas where arboviruses are active in order to prevent human transmission from occurring. In 2020, there were 370 CO₂ traps deployed from which 20,137 mosquitoes were captured and then identified in the SCMAD laboratory. From this total there were 16,029 mosquitoes pooled and tested for arbovirus.

The purpose of this testing is to identify areas within Solano County where the human population was at risk of contracting mosquito-borne disease, such as West Nile virus. Of the mosquitoes tested this year, 7 out of 131 individual sites were found where the mosquito population was confirmed to host West Nile virus. These sites were identified between the months of August and September when WNV is most active in Solano County. When these areas were identified, mosquito control technicians responded by conducting a habitat assessment and developing and implementing an effective abatement strategy to quickly lower the mosquito population in these areas. Solano County Public Health and the Municipalities City Managers were also notified of the positive results.

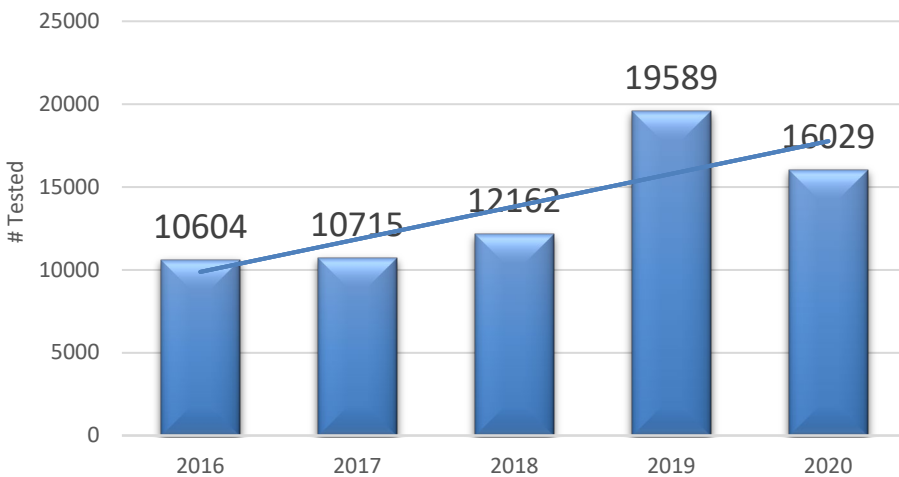
CO₂ Trap Totals 2019 vs. 2020



Number of CO₂ Traps Deployed 2016-2020



Number of Female Mosquitoes Tested 2016-2020



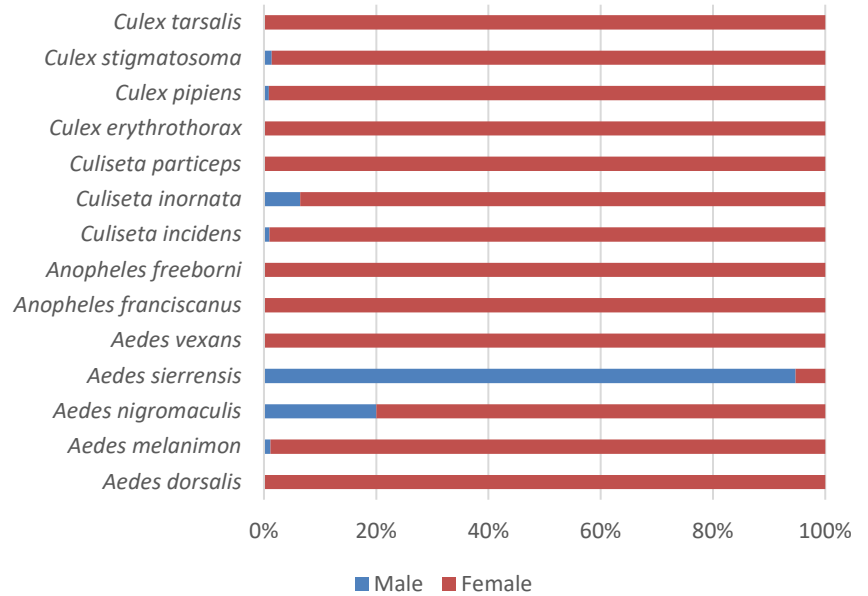
CO₂ Mosquito Trapping

CO₂ mosquito traps emit carbon dioxide to attract adult mosquitoes, and these traps yield a very high catch rate. However, due to battery and bait limitations, they can only be deployed for less than 24 hours; adult mosquitoes are still alive and viable for arbovirus testing when these traps are collected the next day; mosquitoes must be fresh in order to test for the viral RNA that is present in an arbovirus-infected mosquito. The mosquitoes that are trapped in CO₂ traps do not yield the same population information as New



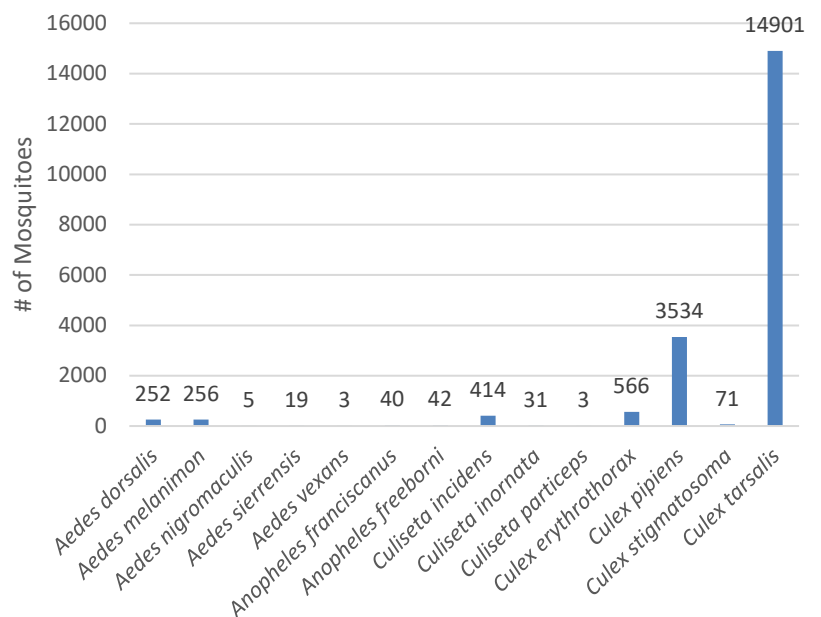
Jersey Light Traps. Instead, CO₂ traps attract host seeking female mosquitoes. Male mosquitoes are certainly captured by these traps as well, but it is thought that they are attracted to the female mosquitoes that have already been trapped. Another theory is that males will swarm around a host animal (or in this case a CO₂ baited trap) in order to mate with the females that will be attracted to said host.

CO₂ Trap Adult Male to Female Ratio 2020

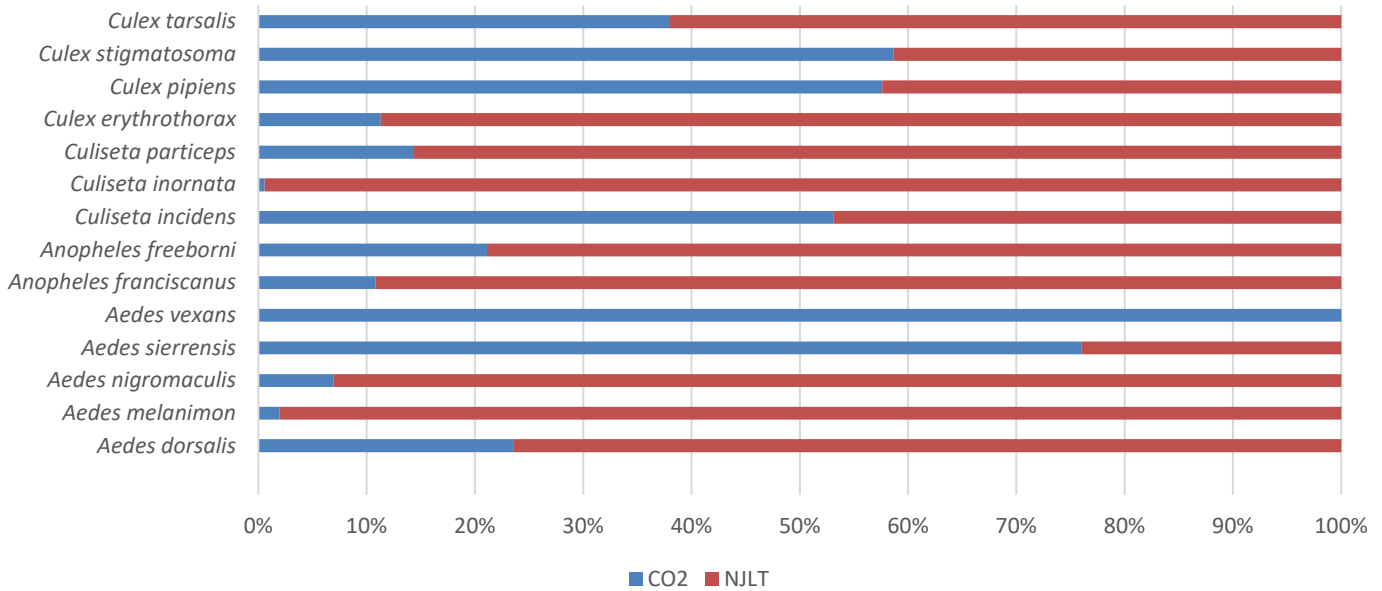


CO ₂ Trap Species Diversity 2019 vs. 2020		
Mosquito Species	2019 Total	2020 Total
<i>Aedes dorsalis</i>	48	252
<i>Aedes melanimon</i>	8042	256
<i>Aedes nigromaculis</i>	144	5
<i>Aedes sierrensis</i>	44	19
<i>Aedes squamiger</i>	7	0
<i>Aedes vexans</i>	11	3
<i>Aedes washinoi</i>	6	0
<i>Anopheles franciscanus</i>	15	40
<i>Anopheles freeborni</i>	58	42
<i>Anopheles punctipennis</i>	1	0
<i>Culiseta incidens</i>	1257	414
<i>Culiseta inornata</i>	752	31
<i>Culiseta particeps</i>	22	3
<i>Culex erythrothorax</i>	1806	566
<i>Culex pipiens</i>	3212	3534
<i>Culex stigmatosoma</i>	119	71
<i>Culex tarsalis</i>	35910	14901
TOTAL	51454	20137

CO₂ Trap Adult Mosquito Species Diversity 2020



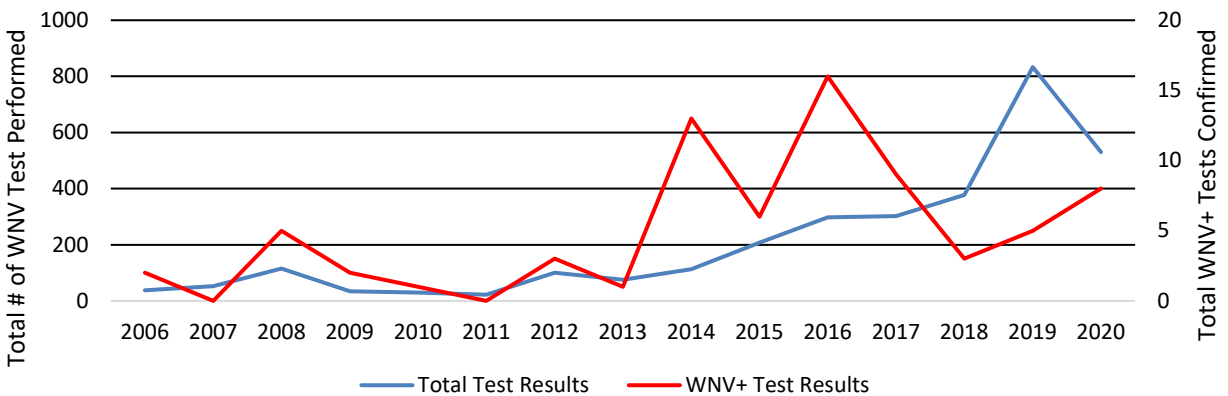
2020 Adult Mosquito Species Proportion Trapped by CO2 Trap vs. NJLT (Male and Female)



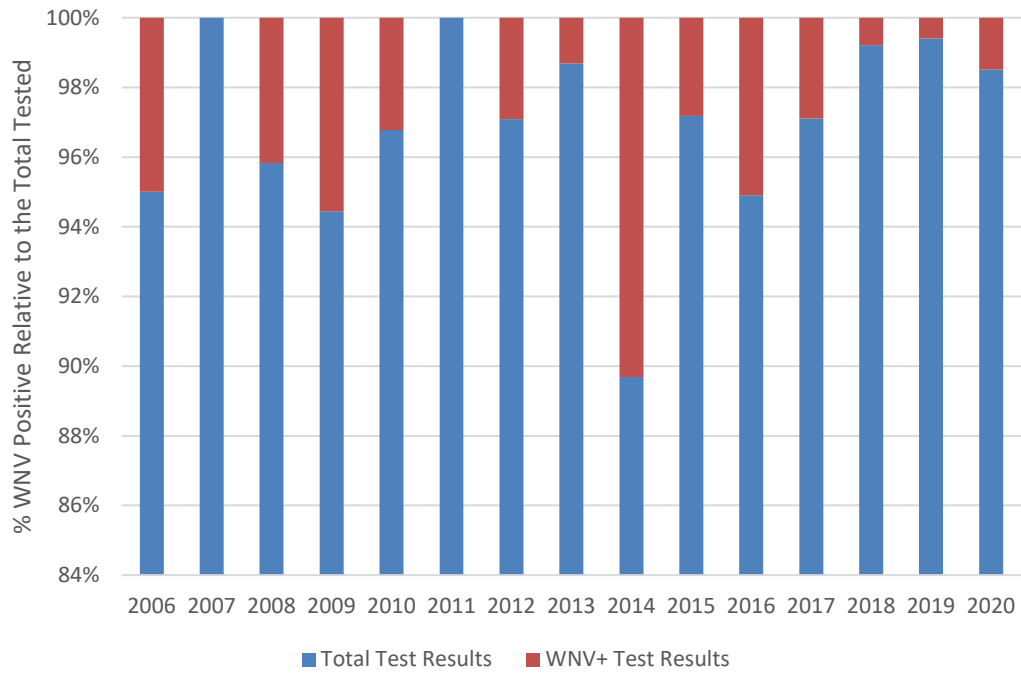
Species	2020			2019		
	# Pooled	Total Pools (# pools +)	Average # per Pool	# Pooled	Total Pools (# pools +)	Average # per Pool
<i>Culex erythrothorax</i>	300	7 (0)	42.86	N/A	N/A	N/A
<i>Culex pipiens</i>	3,577	164 (0)	21.81	3,194	275 (1)	11.61
<i>Culex tarsalis</i>	12,152	359 (8)	33.85	16,490	558 (4)	29.55
TOTAL	16,029	530 (8)	30.24*	19,684	833 (5)	23.63*

* Average of the Total Pools

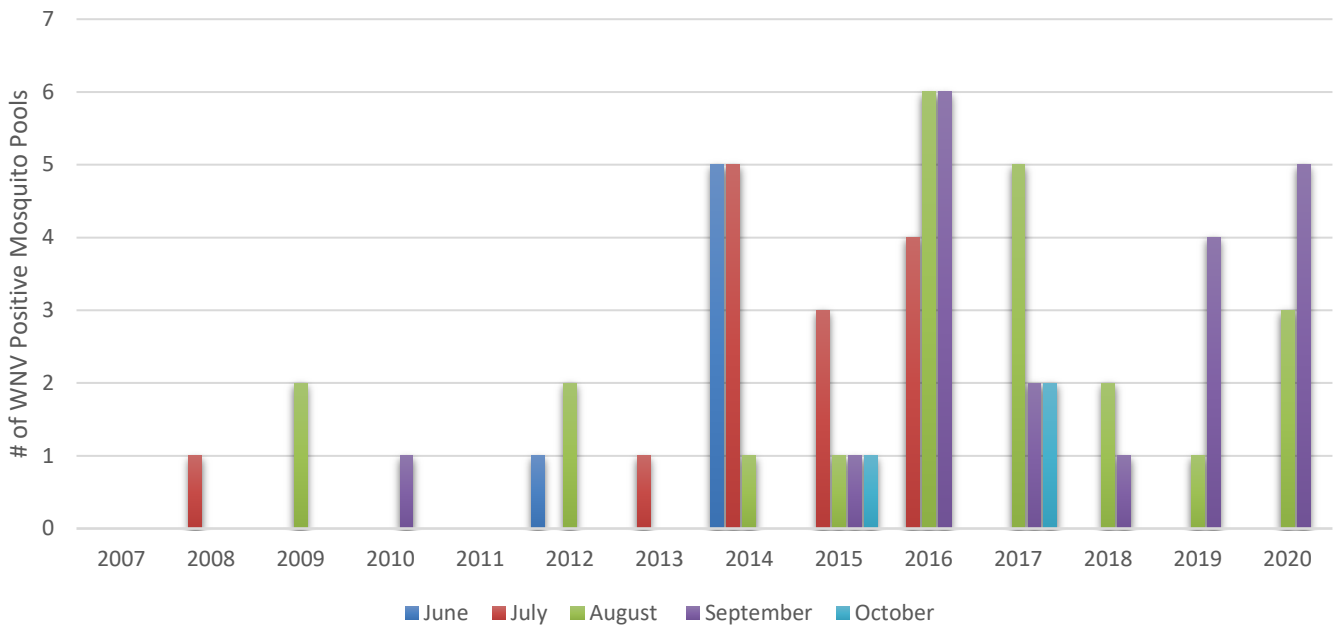
Total WNV Tests VS WNV+ Test Results 2006-2020



Proportion of WNV + Test Results / Total # of Tests



Seasonality of WNV Positive Mosquito Pools 2007-2020

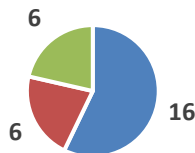


Dead Bird Testing

The SCMAD works with the California Department of Public Health (CDPH) and the University of California Davis to collect and test dead birds within Solano County for arboviruses. Dead birds are reported by calling **1 (877) 968-2473** or by reporting them online at <http://westnile.ca.gov> to the CDPH West Nile Virus and Dead Bird Call Center. This year there were 17 bird species collected. In 2020, a total of 78 dead birds were reported, 28 dead birds were collected and tested, and 3 birds tested positive for WNV. This year we expanded the range of our acceptable condition from dead less than 24 hours to dead less than 48 hours, which increased the number of birds tested in 2020 by 100% from the number tested in 2019.

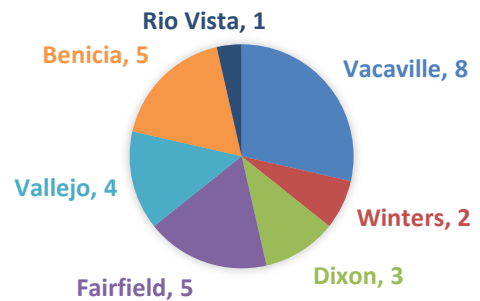


2020 # OF DEAD BIRDS PER CONDITION STATUS

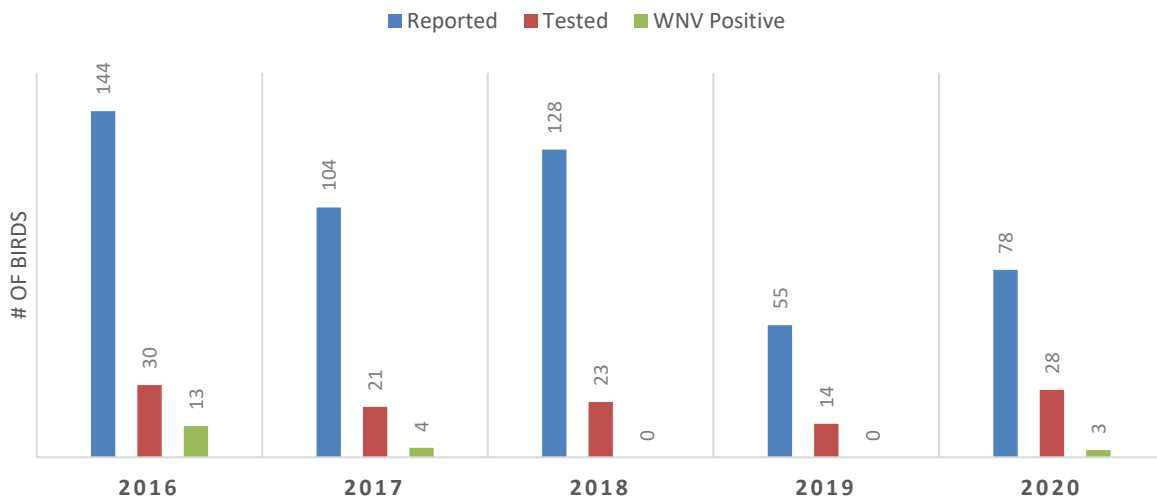


- Dead less than 24 hours
- Dead greater than 24 hours
- Dead less than 48 hours

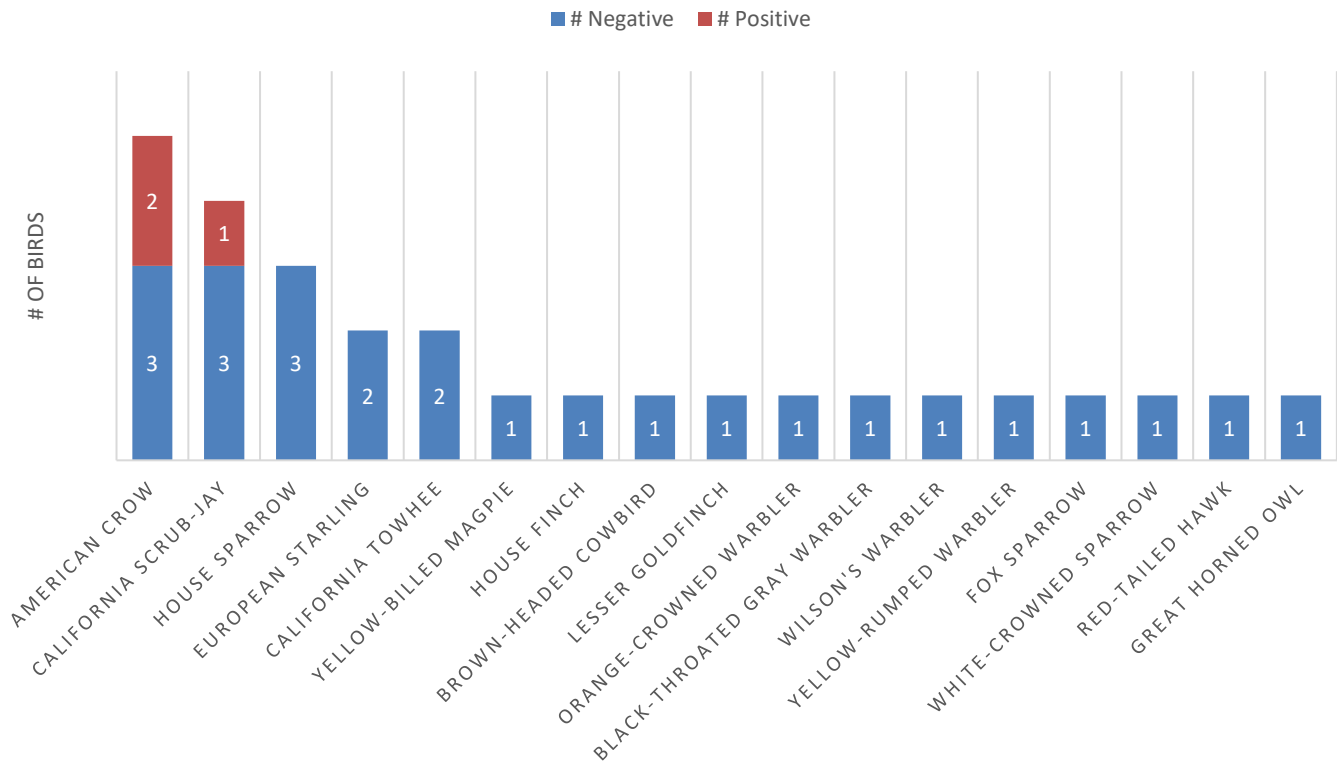
2020 DEAD BIRD SUBMISSIONS BY SOLANO COUNTY CITY



DEAD BIRD ACTIVITY 2016-2020



2020 TOTAL BIRD SPECIES TESTED W/ TEST RESULTS

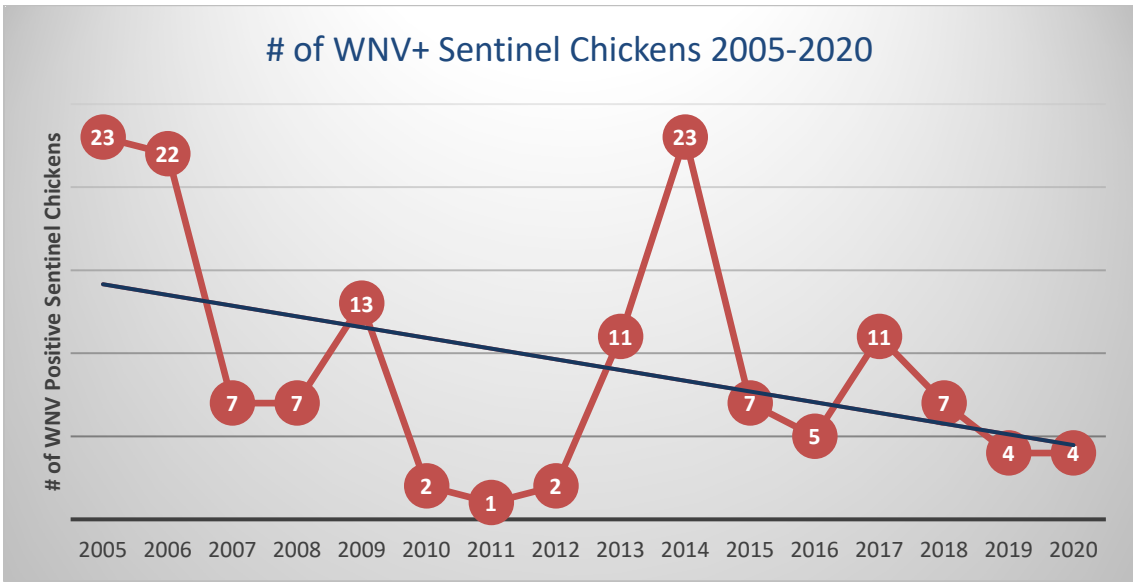


Sentinel Chickens

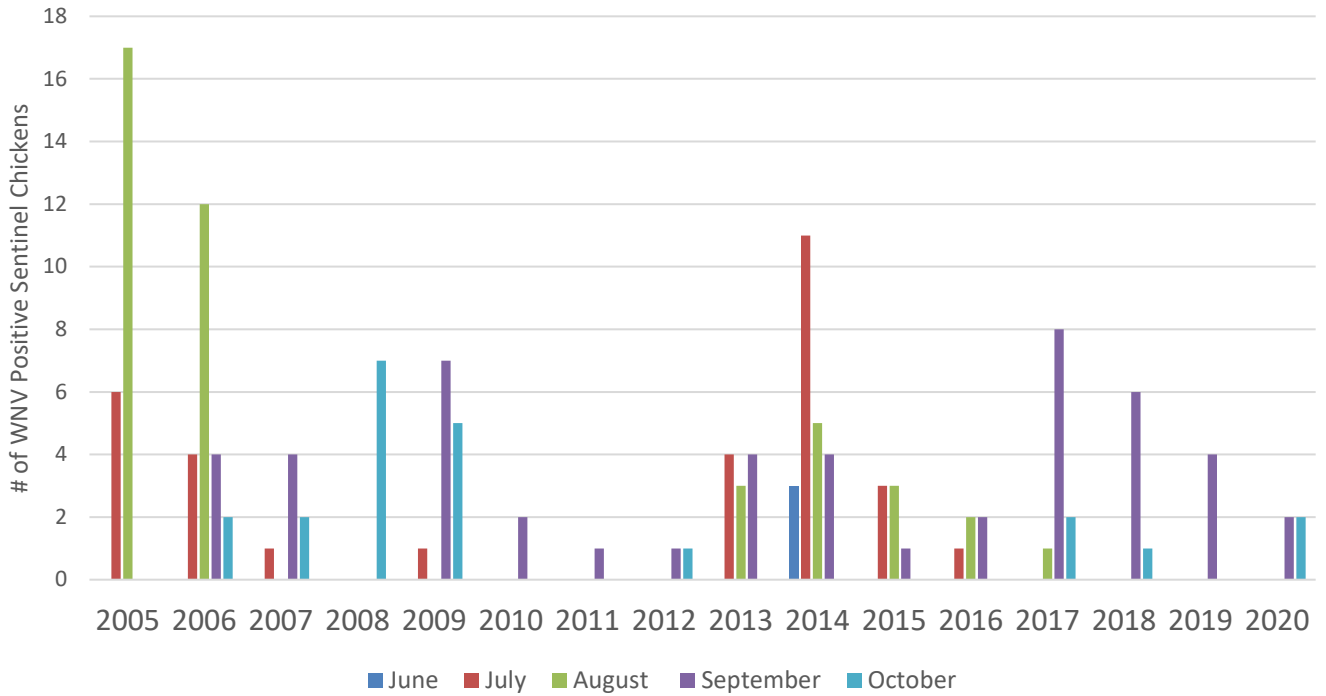
Sentinel chickens provide the SCMAD with crucial information about arbovirus activity within Solano County. Three sentinel chicken flocks are located throughout Solano County. Chickens develop antibodies in response to arbovirus exposure. Chickens cannot transmit West Nile virus back to mosquitoes; they do not serve as a reservoir for the virus. Every two weeks a blood sample is taken from each chicken in our program. Flocks were downsized this season to allow for faster sample collecting, increased space per chicken and cost-savings to the district; historically there have been 12 birds per flock but in 2020 we used 7 birds per flock.

Four chickens from one coop in Cordelia tested positive for West Nile virus antibodies in 2020. Two chickens tested positive in September and two tested positive in October; each of the four sentinel chickens tested positive from separate sample collections. Solano County Public Health was notified each time positive test results were confirmed.





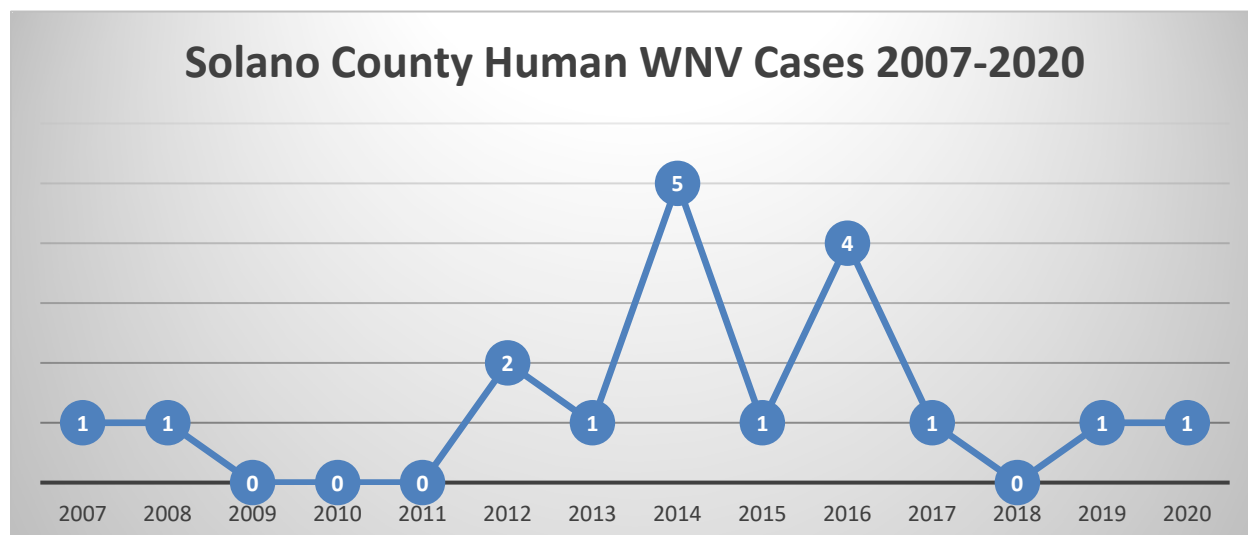
Monthly Seroconversions in SCMAD Sentinel Chickens 2005-2020



Human Arbovirus Case Response

It is our goal at the SCMAD to identify areas where arbovirus transmission is present and reduce the risk of disease to the residents of Solano County. In the event of a human infection, the occurrence is reported to the Solano County Mosquito Abatement District by the Solano County Public Health Department (SCPHD). All information that is supplied the SCMAD is provided in a manner that is compliant with all HIPAA regulations and guidelines. When possible the SCMAD will collaborate with the SCPHD to determine the likelihood of the disease transmission occurring in Solano County by conducting trapping and habitat surveys. For human case responses traps are deployed, sampled, and tested for arboviruses. *Culex* spp. are the target vector for West Nile virus cases. Malaria response trapping focuses on *Anopheles* spp. and dengue and/or Zika virus response trapping focuses on invasive *Aedes* spp.

Mosquito abatement is conducted in areas where arbovirus activity is confirmed in order to rapidly reduce the risk of disease transmission to the public. Any areas where arbovirus activity occurs is then monitored for 14 to 21 days to ensure a low risk to the public. In 2019 there were 5 confirmed human cases of arbovirus infections (one WNV) within Solano County, all of which are presumed to be travel-related cases. By comparison, there was one confirmed human case of WNV in 2020.



2020 Larvicide Resistance Monitoring

Larvicides are an important component of the SCMAD's abatement strategy in Solano County's managed wetlands and marshes. The SCMAD biologist conducts larvicide resistance studies on habitats that have been recently treated. These studies are conducted by post treatment sampling of field collected larvae. Resistance monitoring is also conducted in the laboratory via biological assessments (bioassays) in which a genetic population of mosquitoes is strategically exposed to various known concentrations of an active ingredients. Through the careful monitoring of the mosquito population's response to the corresponding dosage rates, results can be interpreted and then applied to the field. Data from these experiments are an important component in decisions made by the SCMAD staff when deciding types of insecticides to use or purchase, as well as what dose will be used in particular areas of the county.

Two field trials were conducted on the Mare Island tidal marsh utilizing larvicide products that were new to the SCMAD arsenal of pesticides. Natular G30 is a granular larvicide that provides 30 days of control in larval mosquito habitats. This product uses the active ingredient spinosad which is biologically derived from the fermentation of a soil organism known as *Saccharopolyspora spinosa*. The trial was remarkably successful in controlling the mosquito population. Results were monitored through pre- and post-treatment sampling in the marsh, utilizing sentinel larvae cages in treatment and control areas, comparing adult surveillance abundance to previous years' data, and anecdotal evidence of receiving no service requests from Mare Island residents during the course of the entire adult mosquito season post treatment- a worthy metric to consider in this part of the county!



The second field trial was conducted in mid-summer using VectoBac GR, which utilizes the active ingredient *Bacillus thuringiensis* var. *israelensis* (*Bti*), a bacteria microbe that targets the gastrointestinal tract of the mosquito larvae. Great success was achieved in controlling the mosquito population in the tidal marsh when used at the 20 lb. per acre rate. Lab results also indicated that this product is highly effective at higher dosage rates in the tidal marsh environment. Application rates and swath width were monitored using granule capturers deployed in both transects and groupings throughout the treatment area. Results were observed through examination of pre- and post-treatment samples.



Public Outreach

Public Events

In 2020, the Solano County Mosquito Abatement District conducted presentations and attended several public events to meet and interact with members of the public despite the COVID-19 pandemic. We estimate that we engaged directly with an estimated 95 people.

Below is a list of events and presentations that were conducted by SCMAD staff. Presentations are conducted free of charge to the public upon request. To schedule an appointment, please call the Solano County Mosquito Abatement District.

1. **Solano County Public Health (January 14):** 15 people
2. **Mare Island Nimitz Group/ Touro University Staff (February 13):** 10 people
3. **Vallejo Rotary Club (February 13):** 20 people
4. **Soundings Magazine (July 16)**
5. **Solano County GSD Tree and Landscape IPM Seminar (September 17):** 50 people



Advertising

In 2020, the Solano County Mosquito Abatement District continued to develop our official website and several advertising campaigns. In order to educate and conduct outreach to the public bus ads were created and ran on busses in Fairfield, Suisun, and Vacaville. In addition to bus ads, newspaper ads were printed in the Vallejo Times Herald, Daily Republic, and Vacaville Reporter.

The District also aired radio advertisements and radio commercials on KUIC's local radio station and website. It is our hope that 2020's advertising campaign will yield positive long-term results, and allow us to interact with more residents of Solano County.

FINANCE

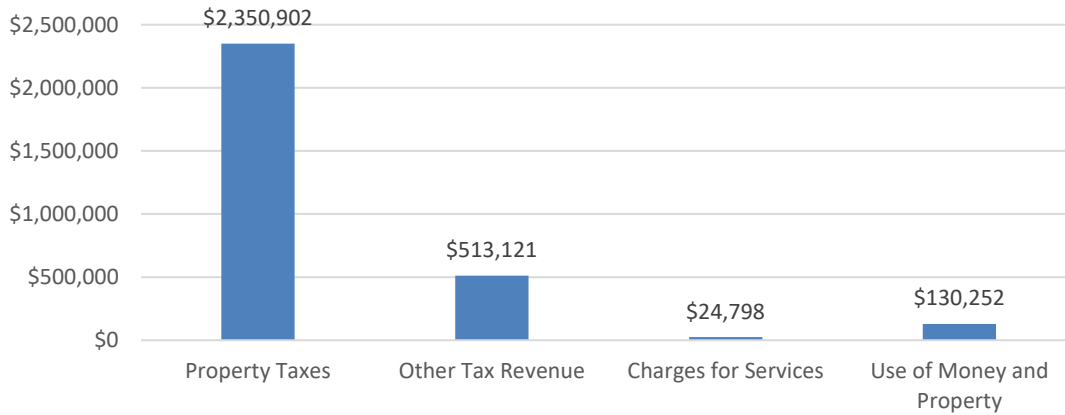
The District Manager, the Board of Trustees and the District's Administrative Assistant manage the budgeting, accounting, and record keeping. The finances are also audited annually by a certified third-party public accountant (Fechter & Company). The SCMAD is committed to the ethical and fiscally responsible management of public funds in the efforts to reduce the risk of disease transmission and nuisance to members of the public in Solano County.

<u>Revenue</u>	<u>2019-2020</u>
Property Taxes	\$2,350,902
Other Tax Revenue	\$513,121
Charges for Services	\$24,798
Use of Money and Property	\$130,252
Miscellaneous	-\$1,193
TOTAL REVENUES	\$3,017,880

<u>Expenditures/Expenses</u>	<u>2019-2020</u>
Salaries and Wages	\$929,570
Employee Benefits*	\$703,804
Pesticides	\$343,946
Aircraft Services	\$114,380
Insurance	\$59,140
Utilities	\$35,571
Property Tax Administration	\$31,103
Professional Services	\$50,302
Property Maintenance & Supplies	\$75,989
Advertising & Communications	\$48,675
Motor Vehicles	\$38,381
Staff Development	\$24,333
Capital Outlay	\$86,038
TOTAL EXPENDITURES	\$2,541,232

* includes \$400,000 towards unfunded pension liability

2019-2020 Fiscal Year SCMAD Revenue



2019-2020 Fiscal Year SCMAD Expenditures

