



Coachella Valley Mosquito & Vector Control District



**Employee of the
Year 2016**

Gonzalo Valadez,
Vector
Control
Technician II



2016 Annual Report



Protect Coachella Valley. Fight the Bite. Together.



Coachella Valley Mosquito and Vector Control District Board of Trustees 2016

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Coachella Valley Mosquito and Vector Control District Staff Teambuilding 2016

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Letter from the General Manager

Dear Stakeholders, Trustees, and Staff,

From the discovery of an invasive mosquito species capable of transmitting deadly disease to the resurgence of Saint Louis encephalitis virus (SLE) in the eastern Valley, 2016 was an extraordinary year for mosquito and vector control in the Coachella Valley. Fortunately for our Valley residents and visitors, the District's Integrated Vector Management program was primed to meet the new and old threats to public health from mosquitoes and the pathogens they transmit.

On May 9, 2016, the District confirmed the first detection of the invasive *Aedes aegypti* mosquito in the City of Coachella. This discovery triggered the rapid implementation of the District's Invasive *Aedes* Response plan by District staff. The plan was executed throughout 2016 in battling this new public health threat. By the end of the year, *Ae. aegypti* had been discovered in four Coachella Valley cities. The response included targeted public outreach and education to residents and stakeholders, door-to-door inspections, enhanced surveillance and control measures, and responding to imported human cases of arboviruses transmitted by *the invasive Aedes mosquito*. The plan was developed in collaboration with District staff, other California vector control professionals, and the California Department of Public Health, ensuring that staff were prepared to protect public health from this new invasive vector. While staff continue to work diligently to eliminate the invasive mosquito from backyards in infested communities, the District is relying on residents of affected communities to do their part in eliminating backyard mosquito sources.

The Board of Trustees and staff continued their commitment to transparency and financial stability in 2016. This was evident in the adoption of a balanced budget, receiving for the eighth consecutive year the Certificate for Achievement in Excellence in Financial Reporting, and being awarded an outstanding audit for the FY 2015-16 finances. The District also maintained its District Transparency Certificate of Excellence.

It is with great pride and pleasure that I present to you this 2016 annual report highlighting the outstanding contributions and accomplishments the District's dedicated staff achieved while fulfilling the District's mission to provide effective and environmentally sound vector control and prevention programs throughout the Coachella Valley.

The Board of Trustees and staff will continue to plan for the future, improve on our programs, and be prepared for the next "imported" disease or vector that could threaten the health and welfare of the residents of the Coachella Valley.

Respectfully,

Jeremy Wittie, MS
General Manager

Battling the Invasive Aedes Mosquito in 2016

May 9: Invasive mosquito species *Aedes aegypti* detected in the City of Coachella.

9,070 door hangers, postcards, and fact sheets delivered directly to residents in detection zones across the Valley educating them on how to get rid of the invasive *Aedes* mosquito species.



September 12: *Aedes aegypti* detected in Cathedral City.

5,801 door-to-door inspections at properties in invasive *Aedes* detection zones across the Valley.

October 12: *Aedes aegypti* turns up in Indio.

5,408 barrier and handheld fogging applications on properties where invasive *Aedes* mosquitoes were found.



November 16: Palm Springs becomes the 4th city in the Coachella Valley with *Aedes aegypti*.

55 truck-mounted ultra low volume (ULV) applications and **15** aerial larval control operations in *Aedes* detection zones.

Integrated Vector Management

No sooner had District staff completed an “Invasive Mosquito Species Response Plan” for 2016 than the first *Aedes aegypti* was detected in the Coachella Valley. Within a couple of days, District staff were assigned to *Aedes* Response Teams and descended on the neighborhood where the invasive mosquitoes were found, carrying out door-to-door inspections, educational outreach, and control applications where necessary. In the days that followed, traps specifically designed for the invasive *Aedes* were purchased and deployed, city officials were contacted and briefed on the detection and future steps, and educational materials were developed and distributed to residents Valley wide.

Following the Integrated Vector Management program (IVM), District staff were able to effectively address the public health threat from the invasive mosquito species, which are capable of spreading serious viruses not yet locally transmitted in California, and the Valley’s local mosquitoes, which annually transmit viruses, such as West Nile virus (WNV) and Saint Louis encephalitis virus (SLE). While there were no human cases reported of either WNV or SLE in the Coachella Valley in 2016, a record number of SLE-positive mosquitoes and typical detections of WNV-positive mosquitoes provided District staff with one of their busiest seasons to date.

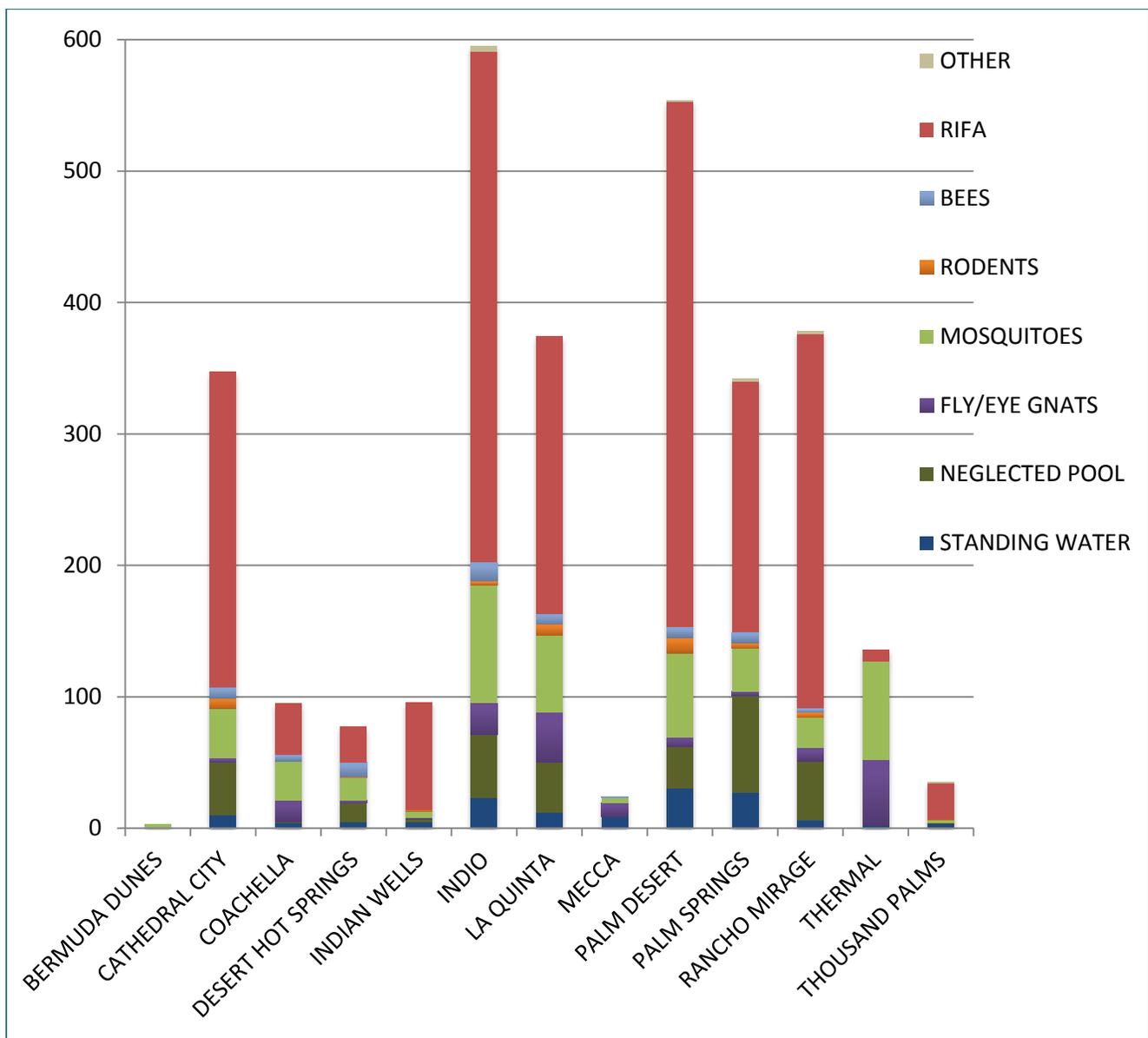


Service Requests

The District received more than 6,500 phone calls and emails in 2016 from Coachella Valley residents requesting service or information for red imported fire ants (RIFA), mosquitoes, and other nuisance species problems. More than 3,000 of those requests resulted in inspections by the District’s state-certified vector control technicians, about the same number as the prior year. Indio and Palm Desert were the cities with the most requests for service, together making up almost 40% of all service requests to the District.

Twenty four technicians are assigned across the Valley to provide District services to Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage, and unincorporated areas of Riverside County, including residential areas of Bermuda Dunes, Mecca, Thermal, and Thousand Palms. **Figure 1** represents where and which types of service requests were received in 2016.

Figure 1. Total Number of Service Requests by City or Area and by Type in 2016



Mosquitoes

There are 13 mosquito species detected in the Coachella Valley; two of these, *Culex tarsalis* (the western encephalitis mosquito) and *Culex quinquefasciatus* (the southern house mosquito), are considered important vectors of arboviruses (viruses transmitted by mosquitoes and other insects). In 2016, the District detected fewer positive virus samples than in 2015, but more positive samples than in an average year (**Table 1**). The District also trapped more adult mosquitoes for both species, compared to the 5-year average (**Figures 2 and 3**).

In 2016, the District faced two main challenges. First, was the sustained presence of Saint Louis encephalitis virus (SLE) in the eastern Valley. While no human cases were detected in the Coachella Valley, increased activity was detected across the state. The District also detected the invasive mosquito, *Aedes aegypti*, for the first time. District efforts suppressing this mosquito also helped to reduce *Culex* mosquitoes in the Valley’s urban areas.

Mosquito Surveillance

The District uses three different types of traps to capture adult mosquitoes – carbon dioxide (CO₂), gravid (attracting egg-bearing mosquitoes), and BG (used to target invasive *Aedes* mosquitoes). Trapped mosquito counts are used to provide mosquito abundance data, arbovirus surveillance, and when compared to previous years, help determine the risk levels of arbovirus transmission.

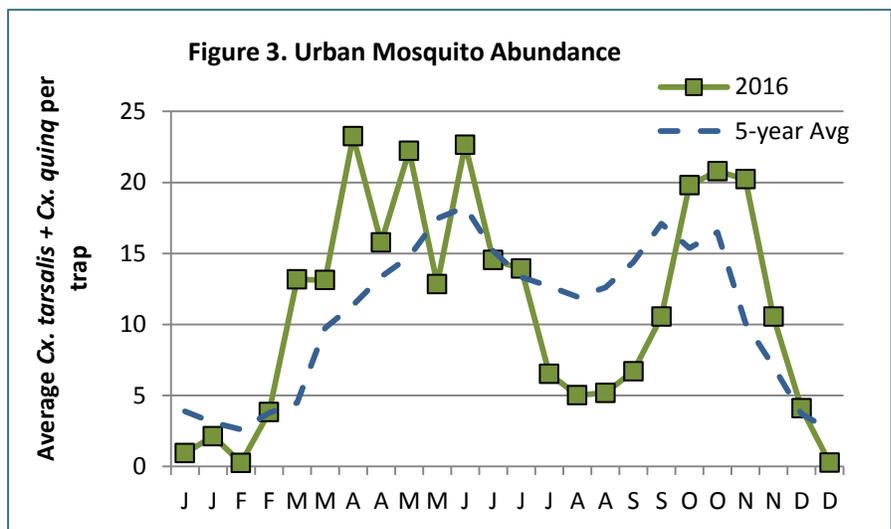
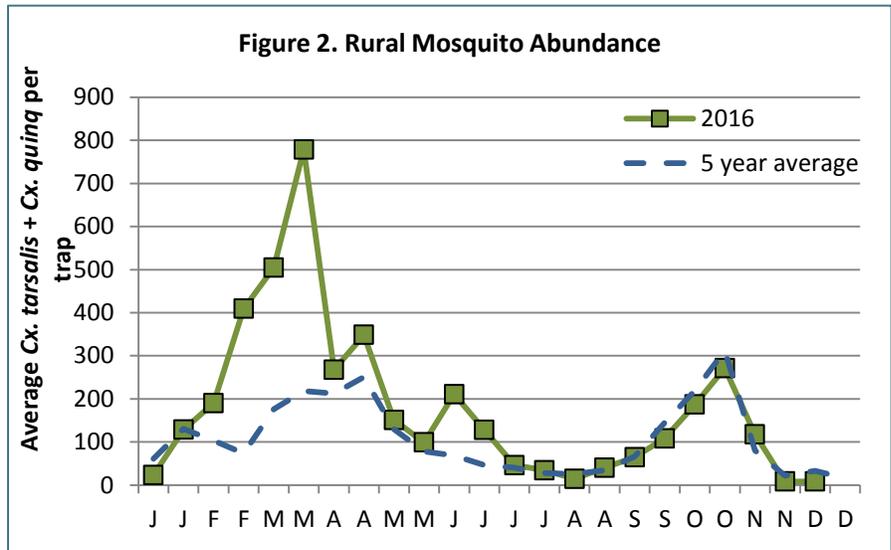


Table 1. Summary of Arbovirus Surveillance in the Coachella Valley 2011-2016

		2011	2012	2013	2014	2015	2016
Mosquito samples	Samples tested	2,996	3,399	2,014	2,130	3,903	4,630
	Number of mosquitoes	106,522	127,699	69,407	70,884	112,248	148,447
	WNV positive	43	118	43	67	99	19
	SLE positive	0	0	0	0	37	92

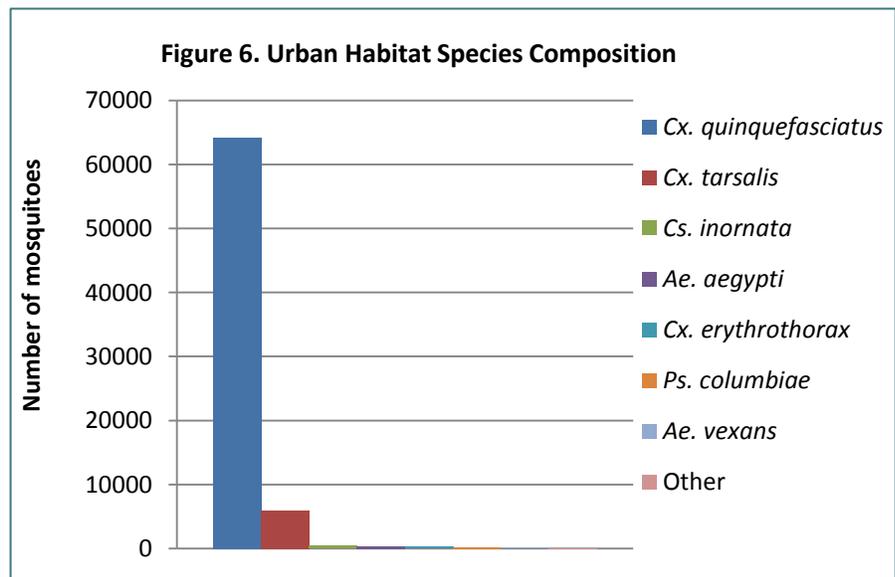
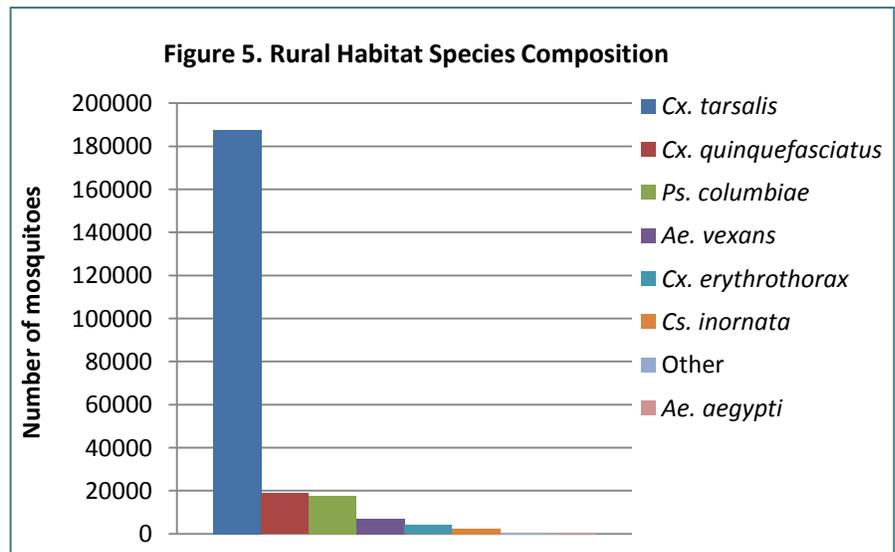
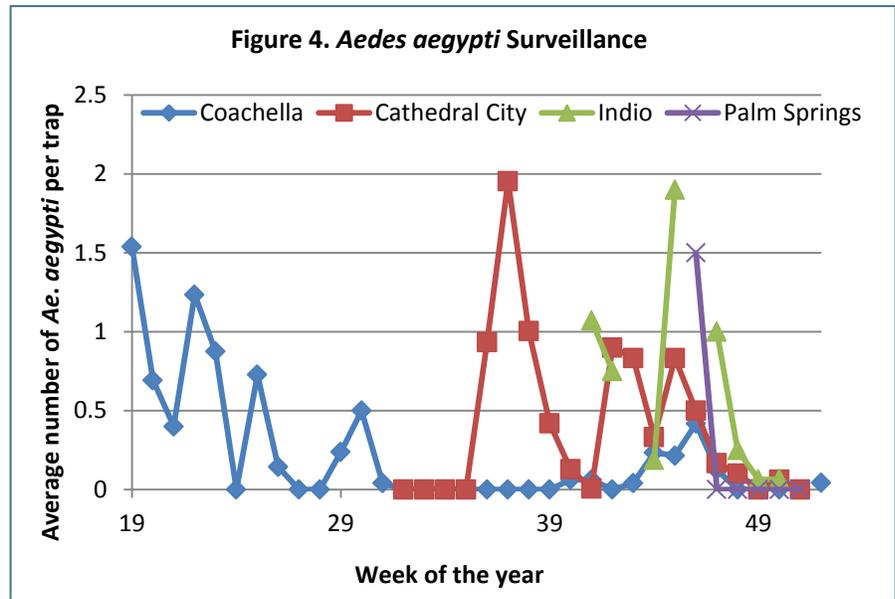
The District’s operational effort to control mosquitoes is in large part directed by the distribution of the mosquito population as determined by the District’s surveillance program. In 2016, the District collected more than 310,000 adult mosquitoes as part of surveillance efforts.

Aedes aegypti

In May, the District detected *Ae. aegypti* in the City of Coachella. This dictated the use of CO₂ and BG traps to collect adult mosquitoes at residences. Throughout the season, traps were placed at residences to guide control efforts. *Ae. aegypti* typically fly less than 450 feet, so finding adults at a residence indicated that a source of mosquitoes was near. Adult *Ae. aegypti* were detected in Cathedral City (September), Indio (October), and Palm Springs (November). **Figure 4** shows the average number of adult *Ae. aegypti* collected each week in each city. Breaks in the lines reflect weeks when traps were not set. In Palm Springs, adult mosquitoes were only collected during week 46 (November 13 – 19), but larval mosquitoes were collected since then.

Rural Zones

The rural habitat of the Coachella Valley includes areas south and east of the incorporated cities including desert, small residential areas, farmlands, wetlands, and the Salton Sea shoreline. In 2016, the District set CO₂ traps at 59 locations and gravid traps at three rural locations.



These traps collected a total of 228,772 mosquitoes including more than a half dozen species (**Figure 5**). CO₂ traps are effective at capturing most of the mosquitoes in the Coachella Valley including *Cx. tarsalis*, the most abundant and important vector of WNV and SLE in the rural areas.

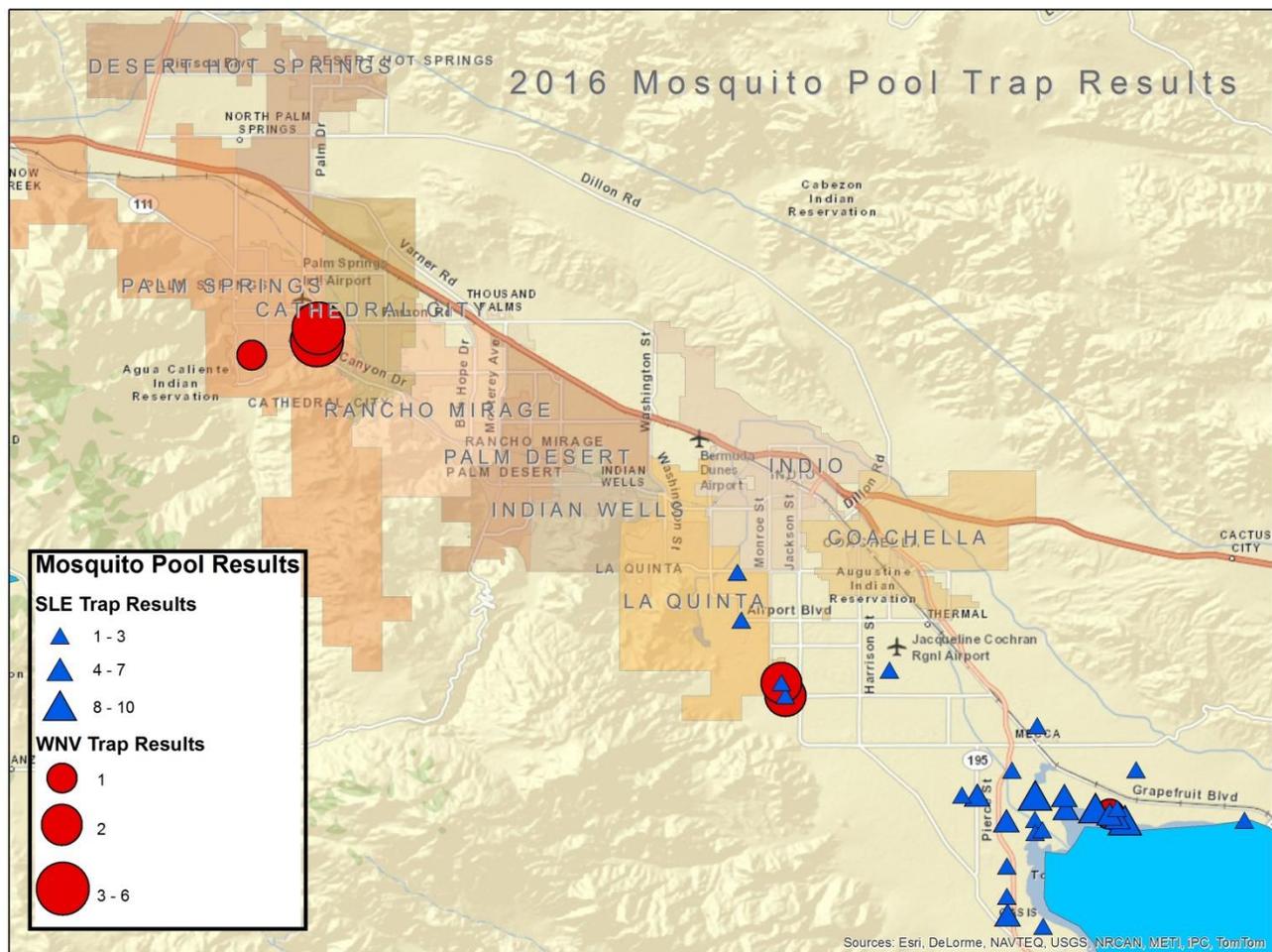
Urban Zones

The urban zones of the Coachella Valley include the cities from Palm Springs and Desert Hot Springs in the north and west to La Quinta, Indio, and Coachella in the south and east. In 2016, the District continued to use an increased number of traps and trap sites in the urban areas as established in 2015 – 100 traps at 48 locations – collecting more than a half dozen species and 62,883 mosquitoes (**Figure 6**). Gravid traps are used more heavily in the urban areas than rural areas, as they are effective and specific to collecting *Cx. quinquefasciatus* mosquitoes, the most abundant vector of WNV in urban areas of the District.

Arbovirus Distribution

In 2016, WNV was detected on either side of the Valley starting in Palm Springs in May, Thermal in July, and Mecca in August. SLE was detected earlier in 2016 than the previous year. The first positive samples were detected in Mecca in June, nearly a month earlier than in 2015, in Thermal in July, in Oasis in August, and then in the North Shore and La Quinta in October, which was the first record of SLE detection in La Quinta.

Arbovirus Surveillance in the Coachella Valley 2016



The District discontinued the use of sentinel chickens as an arbovirus surveillance tool in 2016. By testing mosquitoes for virus using real-time Polymerase chain reaction (PCR) at the District, results from mosquito samples are available in 24 hours, allowing for a quick control response. Information from the chicken samples, while useful, was always two weeks behind.

While Riverside County reported zero human cases of WNV or SLE in the Coachella Valley, the District responded to five suspected or confirmed human cases of arboviruses where the resident acquired the illness during travel. In these cases, the diseases were caused by pathogens that *Ae. aegypti* mosquitoes can transmit. District staff conducted inspections in areas near where the patient resided, making treatments for mosquitoes as they were detected. Adult mosquitoes collected were tested for chikungunya, dengue, and Zika viruses. No positive samples were detected.

Mosquito Control

Invasive Aedes Response

In 2016, the District devoted a good portion of staff time and resources battling the invasive *Aedes* mosquito in an effort to rid the Valley of the species before it became established here. In response to the initial detection of *Ae. aegypti* in May, educational materials were developed within 48 hours and then distributed door-to-door by certified Vector Control Technicians to homes within 450 feet of the initial detection home. The *Aedes* Response Teams that went door-to-door provided information on eliminating water sources, how to recognize the mosquito, and how to avoid bites. The teams applied barrier and fog treatments intended to reduce the adult mosquito populations. Truck-mounted ultra-low volume (ULV) applications were performed in the neighborhoods weekly. By early June, the detection zone had expanded to more than 1,000 homes making it difficult to keep up with timely door-to-door inspections.

To more effectively target the expanding zone, the District decided to carry out aerial larval treatments by helicopter, a strategy that had been successful in Florida and the Caribbean to curb larvae development, and in turn, adult populations. The District worked with local city officials, notified affected residents, and secured a Congested Flight Operation Plan approval from the Federal Aviation Administration before starting weekly helicopter applications at the end of June. The aerial applications were performed weekly for the first four weeks and then done on a bi-weekly basis.

Within three weeks of the initiation of the aerial operation, adult trapping in the entire area of infestation had dropped significantly, and during the three months following the applications no larvae or pupae were found by any ground teams inspecting the area.

From September to November, District staff responded to three more cities following the detection of *Ae. aegypti* in several neighborhoods: Cathedral City in September, Indio in October, and Palm Springs in November. Door-to-door teams were again assigned to the areas within 450 feet of the detection site. Truck-mounted ULV was carried out in Cathedral City (21 applications) and Indio (12 applications) but not in Palm Springs given the time of year and low numbers of mosquitoes detected.

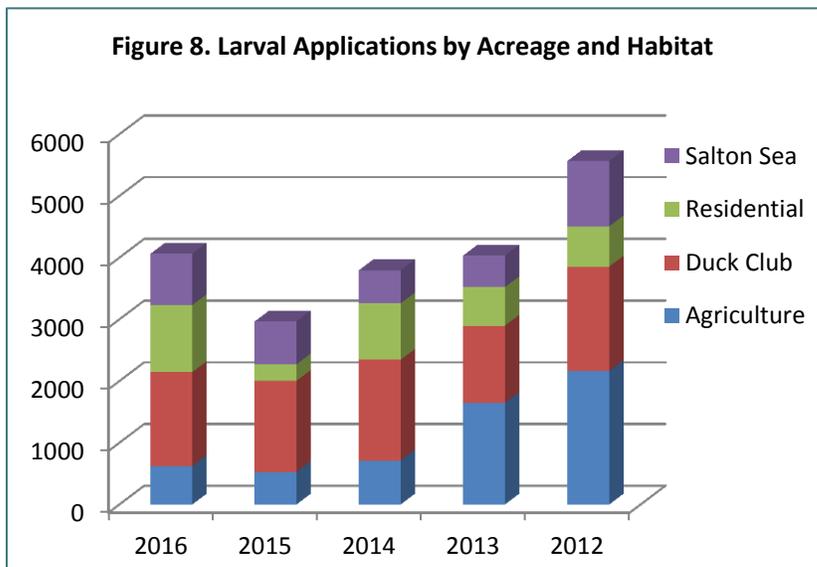
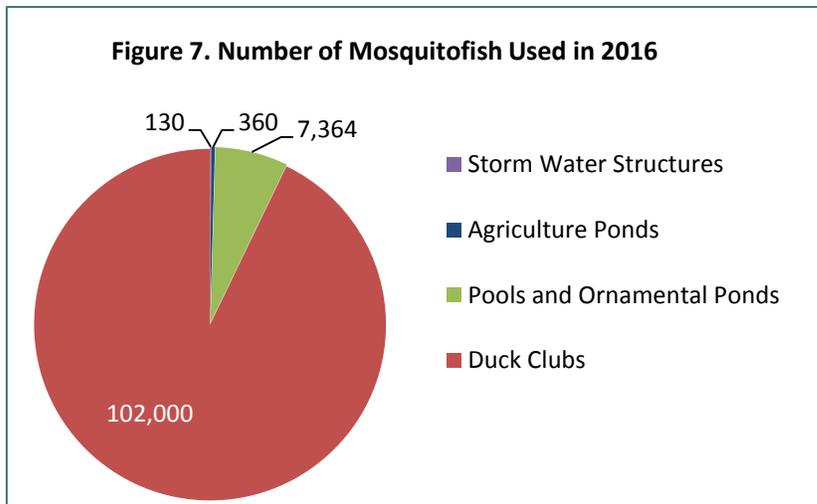
Aerial larvicide applications have proven to be an effective tool in the control of the invasive *Aedes* mosquito. It provides a rapid response, covers a large area, and delivers a uniform application of product that other control methods cannot accomplish. The District will evaluate future aerial larval applications as a continued component to the invasive *Aedes* control program in the Coachella Valley.

Biological Control

The District uses mosquitofish (*Gambusia affinis*) in permanent bodies of water to control mosquitoes. In 2016, the District produced 123,627 mosquitofish. More than 107,000 fish were stocked in 190 unique sites, including neglected swimming pools, duck clubs, storm water structures, and private ponds (Figure 7).

Microbial and Chemical Control

Larval Mosquito Control – Microbial and chemical control are used to reduce or maintain mosquito populations at acceptable levels in coordination with physical and biological control strategies. Larval control is an effective way to target control and significantly reduce local mosquito populations. The total number of larval treatments increased in 2016 compared to 2015, primarily due to the large increase in residential treatments associated with the invasive *Aedes* response operations. Agriculture treatments decreased in numbers of treatments and total acreage since 2014. One of the factors in the decrease is the trend by farm operations to convert to drip irrigation systems (Figure 8).



Adult Mosquito Control – The District carries out chemical control targeted at adult mosquitoes typically when the District’s mosquito Risk Assessment Plan indicates a significant health threat from arboviruses. Adult control is currently performed either through ULV or barrier applications utilizing public health adulticides registered with the U.S. Environmental Protection Agency (EPA). ULV applications involve delivering a fine mist at specific times of the day to target flying adult mosquitoes using special equipment attached to a truck or helicopter. Barrier applications involve the misting of standing, tall vegetation in areas with elevated mosquito or virus activity to control mosquitoes as they rest in those protected areas. In 2016, adulticide applications were made in both urban and rural areas in response to both WNV- and SLE-positive mosquitoes collected in traps in the Coachella Valley. Three nights of truck-mounted ULV were carried out in Palm Springs in July, following WNV virus activity found there. No positive mosquito samples were detected in the Palm Springs area after the District’s enhanced larval and adult mosquito control campaign.

SLE detections increased in 2016 after disappearing for nearly a decade and returning to the Valley last year. In 2015, 37 mosquito samples tested positive for SLE. This year 92 SLE-positive mosquito samples were reported.

The response to the SLE-positive detections is essentially the same as it is for WNV-positive detections. SLE-positive mosquitoes trapped in Mecca led to a three-day truck-mounted ULV response in late July. The District responded with 11 aerial adult mosquito control applications over the North Shore after more than a dozen mosquito samples collected there tested positive for SLE. The flights covered nearly 27,000 acres.

Product Quality Control and Efficacy

Aerial larvicide. Aerial applications of VectoBac WDG, with the active ingredient *Bacillus thuringiensis israelensis* (Bti) for the control of *Ae. aegypti* mosquitoes, were evaluated from June through November. In June and early July, aerial sprays were done at a residential block covering approximately 100 acres. To confirm that the product would deposit in residents’ yards, cups were placed at 20 houses within the spray area. At each house, four cups were set under various states of cover: 0% cover, 25% cover, 50% cover, and 100% cover. The cups were returned to the laboratory and bioassays were performed to test for efficacy. The area of aerial application was then extended in July to cover approximately 800 acres and cups were placed at 30 houses within the spray area as described above. From June through November, evaluations showed that the product deposited in the cups and that larval mortality between 78% and 95% was seen in the four different cups (**Table 2**).



Cups were placed before and collected after the application.

Backpack applications. Different products can be used for barrier applications when making applications for controlling *Aedes*. Applications consist of a mixture of an adulticide to kill adult mosquitoes and a larvicide to control the immature stages of the mosquito. The products are applied to ornamental plants in the yards of residents’ homes and not to vegetation that is grown for food. Lab staff examined some of the products in applications made to landscaping at the District. In the application, Onslaught mixed with NyGuard and Demand CS with VectoBac WDG was compared. Onslaught (active ingredient: esfenvalerate) and Demand CS (active ingredient: lambda-cyhalothrin) control adult mosquitoes. Plant clippings were used in bioassays to compare efficacy of mixtures. Analysis of bioassay results showed that Demand worked much better than Onslaught against adult mosquitoes. Regardless of plant type, Demand lasted longer than Onslaught, killing about 50% of the mosquitoes 21 days after the application. Demand was used to control adult mosquitoes in residents’ yards.

NyGuard (active ingredient: pyriproxifen) and VectoBac WDG (active ingredient: Bti) were also compared for their efficacy against larval mosquitoes. Plastic cups were placed out in the open and in vegetation to collect the product. A portion of those cups were collected weekly for three weeks and returned to the laboratory to perform bioassays. Both products showed excellent larval control 21 days after the treatment (**Figure 9**).

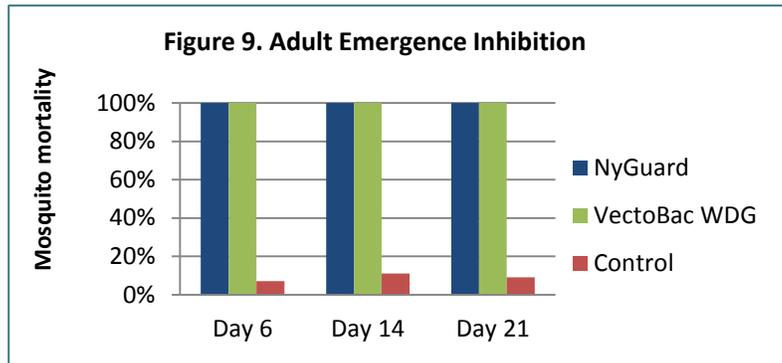
Table 2. Aerial Larvicide Evaluation	
Type of Coverage	Percent Larval Mortality at 48 Hours
Aerial Application of 100 Acres from June and July	
0%	92%
25%	90%
50%	93%
100%	80%
Aerial Application of 800 Acres from July through November	
0%	95%
25%	90%
100%	86%
100%	78%

Resistance assays. A common problem in mosquito control is mosquitoes becoming resistant to products used to control them. This is especially prevalent in adult mosquito control products. This year, the District tested for resistance to four different adulticide products in three different populations of *Cx. quinquefasciatus* mosquitoes using the bottle bioassay developed by the Center for Disease Control (CDC). The results showed that there were levels of resistance in three of the four products tested. The three products with resistance are all pyrethroids. The product that did not show resistance had the active ingredient of malathion, an organophosphate. Currently, malathion is not a chemical in the District’s product rotation.



Leaf clippings. Adult mosquitoes were added to see if the product controlled them.

To ensure that the pyrethroid products used by the District are still effective under field conditions, the lab also tested the products applied at a regular label rate using a small spray trial. The results of these trials showed that the products are indeed effective and achieve the expected level of control that is needed for operational control of local mosquitoes.



Aerial adulticide applications. The District conducted aerial adulticide applications using ULV application methods in response to arbovirus activity in the eastern Valley. We examined the efficacy of the applications using spinners, which collect the droplets and let us see that product is reaching areas where mosquitoes are active, using caged lab-reared mosquitoes. Cages were placed in open areas with no vegetation as well as areas with some or lots of vegetation. Scourge 18 + 54 (active ingredient: resmethrin and PBO) controlled the caged mosquitoes in all three habitats, but the results varied between cage sites. Anvil 10 + 10 (active ingredient: sumithrin and PBO) and Duet (active ingredients: prallethrin, sumithrin, and PBO) worked well in the cages in the open area, indicating that both would work well against flying mosquitoes.



Bottles for a resistance assay for adult control products.

Aerial larvicide in duck clubs. The Salton Sea marsh is extensive and can be laborious for District technicians to treat. Aerial spraying is conducted to treat the areas that ground-based spraying cannot reach. Three formulations with the same active ingredient were tested: Altosid XR-G, Altosid Pellets, and MetaLarv S-PT. The products prevent immature mosquitoes from developing into adults. Aerial applications made to sites along the Salton Sea shoreline and at duck club ponds were examined. Staff collected water samples from the field weekly and they were examined for adult emergence. Modified Bioquip breeders were also used in the field to examine

if lab-reared *Cx. tarsalis* larvae would survive to adulthood. MetaLarv S-PT provided the best control at the mid rate (8 lbs. per acre) and up to the expected residual activity listed on the chemical label compared to Altosid Pellets (10 lbs. per acre) and Altosid XR-G (20 lbs. per acre) at the high rate.

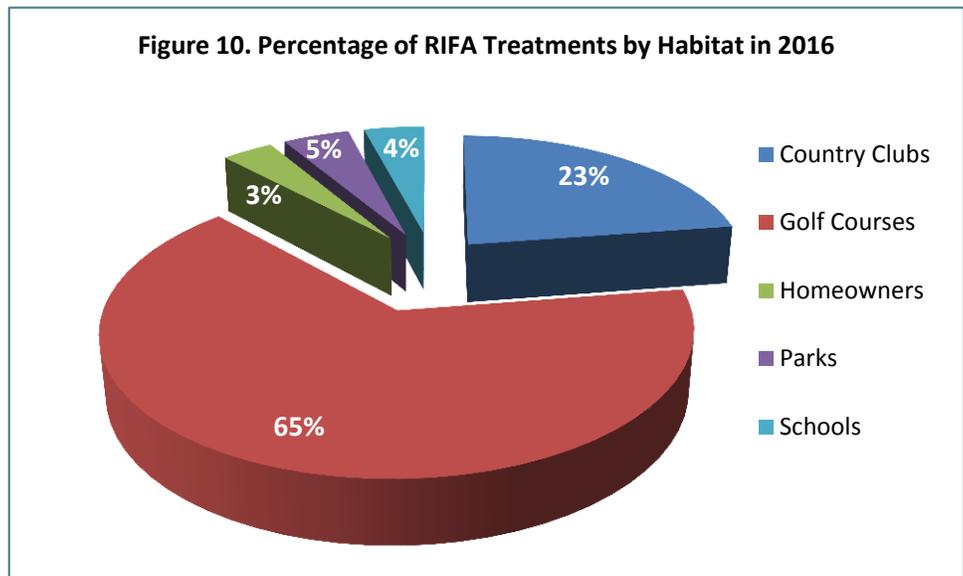


Typical rural mosquito breeding source.

Red Imported Fire Ants (RIFA)

Surveillance and Control

Vector control technicians confirm the presence of RIFA on a property and determine the level of the infestation. Positive findings initiate treatment using bait granules, which contain a toxin, insect growth regulator (IGR), or a combination of both. These granules are taken back to the colony by foraging ants and fed to larval and adult ants, ultimately killing the colony. District technicians carried out more than 2,500 RIFA treatments at private homes, schools, parks, golf courses, and country clubs (Figure 10), covering nearly 19,000 acres in 2016. While golf courses make up the most acreage treated, homeowners represent the most treatments.



Foraging Activity. Knowing when RIFA are active allows District staff to optimize inspections and treatments. The District completed a project started in 2015 where 32 mounds were examined every two weeks to see what time of day the ants were most active. Hot dog slices were placed three feet away from the mounds and replaced every hour. Ant activity appeared to be correlated with temperature; the highest number of ants were seen when the air temperature was between 60°F and 95°F. This means that in the summer, treatments should be made early in the day, or the water should be left off for longer to ensure that the ants come out of their mounds to pick up the bait.

Fire Ant Grid Spot Evaluation. We looked to see if a bait station could provide similar results as our current broadcast treatments. By using bait stations, we could make use of the normal foraging activity of ants. We could also reduce the impact of irrigation on treatments. The study was completed in nine catch basins. Regular broadcast treatments were made in three of the basins; bait stations were placed in three basins; and broadcast treatments were made initially in the last three basins, followed by the placement of bait stations. The greatest reduction in RIFA occurred in the last scenario where basins were treated with both broadcast and bait stations. Ants were reduced 97% one week after treatment. The broadcast-only treated basins had a 70% reduction and

those treated with bait stations only had a 44% reduction. At 16 weeks, the number of ants foraging on hot dog slices remained low at the sites treated using broadcast and broadcast with bait station methods. The number of ants increased at the sites treated with the bait stations alone. Ant activity never returned to pre-treatment levels at any of the sites.

Nuisance Species

The District runs a limited program for the surveillance and suppression of nuisance species that have the potential to transmit disease or produce human discomfort or injury to the public. The primary focus of these programs includes surveillance, physical control, and public education. Many problems associated with a nuisance species can be minimized, or even eradicated, through proper sanitation and maintenance.



RIFA mound.

Flies and Eye Gnats

Filth fly surveillance is performed based on requests from the public and in chronic problem areas. Upon request, the District provides residents with bottle traps, food lure concentrate, and instructions on how to maintain the trap. In 2016, the District received an increase in complaints about flies in La Quinta. District staff carried out inspections, set traps, and held an informational meeting with concerned residents about what the District does to help reduce fly populations and what residents can do. The District will pilot workshops with farmers in the coming year to go over best practices in farming to reduce fly habitats and breeding.



RIFA bait station.

The District's eye gnat program consists of responding to service requests, limited golf course control, and rural area control. An egg bait solution is placed in plastic bottles as part of a "trap out" strategy to control eye gnats in problem areas.

In 2016, the District received 164 service requests from Valley residents for filth flies and eye gnats.

Rodents

Upon request by residents or business owners, District staff conduct rodent inspections of building exteriors and surrounding grounds to determine the level of rodent activity, access points for rodents to enter the building, food and harborage areas for rodents, and landscape management strategies to limit rodent activity. In 2016, certified Vector Control Technicians responded to 42 rodent inspection requests.

Research

The District has a strong commitment to ensure that its Integrated Vector Management (IVM) program is effective, efficient, and environmentally sound. This is achieved through applied research projects focused on various aspects of the District's IVM program. Projects are typically conducted through collaborative research projects by District staff, university and government scientists, and private organizations.

Mosquito Surveillance and Control Applied Research

USDA Center for Medical, Agricultural and Veterinary Entomology (CMAVE) – The District worked in collaboration with the USDA-CMAVE during two weeks in the summer of 2016 to evaluate techniques and products for performing mosquito and filth fly control in a desert habitat. Information from these projects helps determine the best strategies to control vectors for the military to protect the troops as well as learning how to better perform and improve vector control in our desert environment.

University of California, Davis – Previous research developed a simple sugar feeding bait station to detect WNV from virus transferred by infected mosquitoes during sugar feeding. Sugar bait stations are simple to deploy in the field, offering both greater flexibility in placement and reduced maintenance cost over sentinel chicken flocks. In 2016, researchers found that detection of WNV and SLE were possible using the bait stations. In some instances, the bait station samples had virus that had not been detected by the District's tests of the mosquitoes in the same area. This could be because the bait stations are sampling mosquitoes which are in the sugar feeding stage, while the District's current methods test mosquitoes which are seeking blood meal hosts or seeking places to lay eggs (after they have taken a blood meal).



Sugar bait station used in UC Davis research.

University of California, Riverside – Researchers are examining the use of biopesticides with fungi as the active ingredients to control adult mosquitoes in underground storm water systems, such as catch basins. This research used commercially available products already approved to control insects in agriculture settings. The researchers have developed a device that allows for mosquitoes to encounter control products in different ways as they feed on an attractive sugar bait. They have found that whether the mosquitoes are seeking a blood meal or a place to lay eggs matters in the efficacy of the control products. The researchers are examining some modifications to the station to see if they can improve the control of the mosquitoes.

University of Miami – The goal of this research is to evaluate the use of the attractive toxic sugar bait (ATSB) method for adult mosquito control. ATSB lures mosquitoes to a scented sugary substance that has been mixed with a toxicant. The toxic material is ingested by the mosquitoes, causing them to die. This method has recently been shown to work in many habitats including locations with similar climates, such as Israel.

The District uses just one class of insecticides to kill adult mosquitoes (pyrethrum and pyrethroids). Because the route of exposure is ingestion rather than contact, other classes of insecticides may be used in ATSB solutions.

RIFA Surveillance and Control Applied Research

USDA-CMAVE – Two biocontrol agents 1) the fire ant decapitating phorid fly *Pseudacteon* species and 2) the fire ant virus SINV-3 were released in 2014 in the Valley to help control RIFA. These agents should be self-sustaining once established sufficiently, and spread through the area. In 2016, researchers monitored and evaluated the establishment and spread of the two biocontrol agents at the release sites. The SINV-3 virus appears to be spreading from its release site. The flies have been collected at one of two release sites. The biological control agents should increase the sensitivity of fire ants to our chemical control methods. The researchers have also been examining the ability of water-resistant fire ant bait to control fire ants. The product currently used by the District is on corn grit. When water comes in contact with the product, the corn becomes mushy and is not attractive to the fire ants. Since the fire ants live in grass, keeping water from contacting the product can be time consuming. The researchers have found several potential options of water-resistant bait, which they will test further in 2017.



Bait station and mosquito cages used in the UC Riverside research.

Environmental Compliance

Federal and State National Pollutant Discharge Elimination System (NPDES)

The District complies with the Clean Water Act by ensuring that applications of control products made to or near waters of the U.S. sites are made under a National Pollutant Discharge Elimination System (NPDES) Permit. On February 29, 2016, the District filed its 2015 annual report for the California NPDES permit. Technicians made 1,104 larvicide treatments to waters of the U.S. and seven applications of adulticides near waters of the U.S. No adverse conditions due to applications of vector control products were seen or reported. Following the State Water Control Board's renewal of the Vector Control NPDES Permit, the District revised its Pesticide Application Plan and renewed its permit.

Mosquito habitats on lands owned by Native American tribes are not subject to California state law. In 2015, the District obtained a federal NPDES permit to make applications at these sites and to comply with the federal regulation. In 2016, the District provided the Agua Caliente Band of Cahuilla Indians, the Cabazon Band of Mission Indians, and the Torres Martinez Desert Cahuilla Indians reports of treatments made in 2015 to sites that could be considered waters of the U.S. The Environmental Protection Agency renewed the NPDES permit in October 2016, and the District has applied for a renewed permit.

California Environmental Quality Act (CEQA)

The California Environmental Quality Act (CEQA) requires public agencies to conduct an environmental review to determine the cumulative impact of their activities on the environment. In 2011, the District concluded that its IVM Program could have negative impacts on the environment if its activities were not mitigated, and therefore adopted a Mitigated Negative Declaration. The District filed its Annual Compliance Report regarding the monitoring performed on February 1, 2016. The District complied with the 18 mitigation measures and concluded that the operation of its IVM Program did not have a significant impact on the environment.

Pesticide Environmental Stewardship Program (PESP)

The District is a Bronze-level member of the Environmental Protection Agency’s Pesticide Environmental Stewardship Program (PESP). The program encourages members to reduce the risk of pesticide use by educating their staff and public about proper use of pesticides and by examining alternative methods of controlling pests. The District submitted its five-year monitoring strategy in 2013 and filed its third annual report on January 28, 2016. For the strategy plan, staff track source reduction, visits where no pesticide is used, visits where reduced-risk pesticides were used, surveillance activities performed, trainings held for staff, and outreach activities conducted on the topic of integrated vector management.



Desert flooding site.

Public Outreach

The Public Outreach Department focused most of its efforts in 2016 on raising awareness about the invasive *Aedes* mosquito – working with cities, community partners, and schools in affected areas, hosting awareness events, and developing educational materials and media campaigns that inspire changes to behavior to reduce mosquito friendly habitats.

Community Events and Talks

The District took part in more than 60 outreach events in 2016, directly reaching about 8,000 people. This included events such as the Riverside County Date Festival, the Mecca Resource Fair, and the CSUSB Sustainability and Environmental Expo, where we hosted a booth with an invasive *Aedes* display and sculpture, live mosquito life cycle demonstration, a photo booth, coloring station, and lots of information on how to reduce mosquito breeding and mosquito bites. We hosted the District's first ever "Fight the Bite 5K" and Community Resource Fair in La Quinta where we recruited local runners and outdoor enthusiasts to be on the lookout for invasive *Aedes*. We engaged hundreds of the Valley's youngest residents, from the Mecca Migrant Head Start program to the Desert Recreation District camps to a dozen students in job shadow programs, showing them how the District uses science to protect the people in the Valley from mosquito-borne disease. The Public Outreach Department launched the "Vector Inspector Program" in four Coachella schools in the neighborhoods where *Aedes aegypti* were detected. The program involves students searching for mosquito larvae in their yards and submitting standing water samples to the District through their schools.

Partnering with State, City, and Community Stakeholders

The General Manager visited eight City, County, and Community Councils over the year, briefing officials on the threat to Valley residents from mosquito-borne diseases currently transmitting or with the potential to transmit in the near future. The District joined forces with Congressman Dr. Raul Ruiz and Riverside County Department of Public Health to raise awareness about emerging and existing mosquito-borne disease threats in the Coachella Valley with a news conference and District tour in March, which included congressional and public health staff as well as five media outlets. We gave trainings on invasive *Aedes* to the Coachella Valley Emergency Communications Committee, school district custodians, and water district staff. We gave District tours to students, Eisenhower Medical Center medical residents, and the Riverside County Grand Jury.

Publications and Electronic Outreach

With the new mosquito in town, we developed and produced a new slate of awareness materials to inform people about the mosquito menace. We created 10 targeted flyers and information sheets, and updated the District website to include information on invasive *Aedes* mosquitoes, the Zika virus, and links to the state and national health agencies. District staff were trained how to speak with the public about the detection of invasive *Aedes*. Close to 10,000 people received a door hanger or postcard informing them of how to get rid of standing water and what to expect next in the District's control efforts.

Media and Advertising

We launched an advertising campaign to raise awareness about invasive *Aedes*, running more than 500 TV, radio, and newspaper spots with a total reach of nearly 400,000 during one campaign. We chose not to run a second advertising campaign given the extensive and targeted door-to-door campaign. The District published 20 news releases in 2016, resulting in 50 TV, radio, newspaper, and electronic news stories and 127,576 visits to the District website.

“Fighting the Bite” around the Valley



Legislative Relations

It is important to maintain relationships with State and Federal Legislators to educate and ensure they understand the critical role Integrated Vector Management Programs serve in protecting public health. Federal and State laws and regulations can impact the District's ability to effectively and efficiently protect the public from vectors and the pathogens they can transmit in the Coachella Valley.

District Tours

One way the District fosters relationships and educates elected officials is by hosting tours with them at the District facility. This allows them to see firsthand the programs, methods, and tools District staff use to protect public health. In 2016, District staff had the pleasure to meet with Congressman Dr. Raul Ruiz, Senator Jeff Stone, and Riverside County Supervisor John Benoit and their staff to tour the District, discuss District programs, successes, and future challenges.



District Tour with State Senator Jeff Stone.

2016 Mosquito and Vector Control Association of California (MVCAC) Legislative Day

The Mosquito and Vector Control Association of California (MVCAC) held its annual legislative day in Sacramento on April 6, 2016. Board Trustee Adam Sanchez and the District's General Manager Jeremy Wittie met with Assemblyman Eduardo Garcia, Assemblyman Chad Mayes' staff, and Senator Jeff Stone. During these meetings, legislators were updated on District activities, the impact of Invasive *Aedes* on public health in California, the need for statewide funding of mosquito control research, and the MVCAC's opposition to proposed bills that would hinder the District's ability to provide a quick and effective response to mosquito- or vector-borne threats.



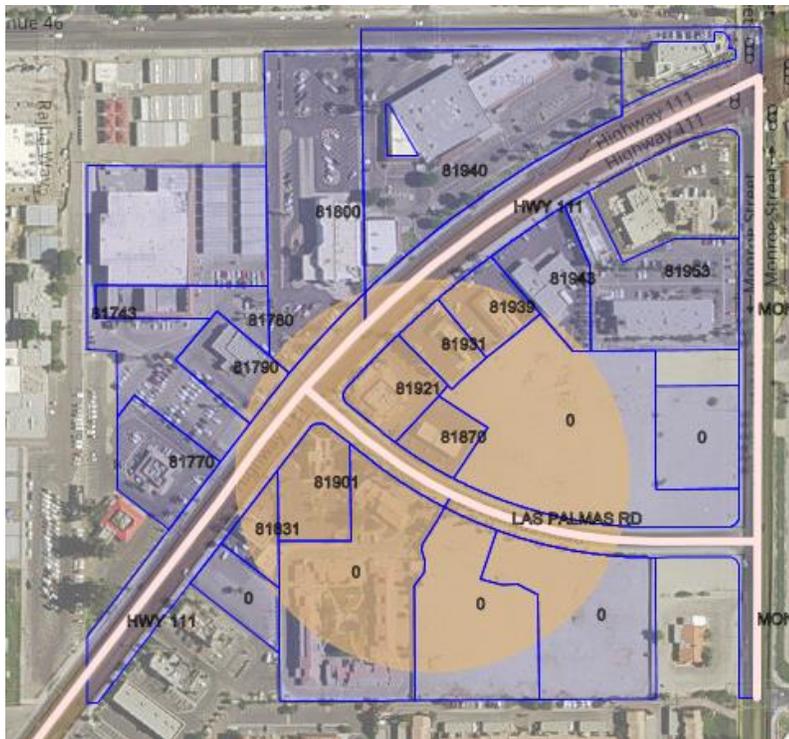
MVCAC Legislative Day with (left to right) Assemblyman Chad Mayes Legislative staff member, Joshua White; District Board Trustee Adam Sanchez, and District General Manager Jeremy Wittie.

Information Technology

In 2016-2017, the District's Information Technology and Geographical Information Systems Department (IT/GIS) continued customization of the Mobile Inspection Application to improve the Operations Department's ability to document, track, and report on invasive *Aedes* mosquito locations and activities. New dropdown menus and checkboxes were added to the mosquito inspection form in the District's Mobile Inspection Application to respond to the detection of the new invasive mosquito in the Valley. For example, "Adults Collected," "Potential Breeding," "Adulticide Applications" and an "Aedes Property Check List" were included. These new features are used by Vector Control Technicians to identify breeding locations within a property. The information collected is then used to assist Vector Control Technicians in their follow-up mosquito inspections to determine if source elimination has been achieved or requires additional intervention.

The District Laboratory also benefited from IT/GIS's Mobile customization by expanding the collection field of the Lab Sample form. The sampling activity in the Mobile Inspection Application now includes the ability to capture adult mosquito counts.

Mosquito Inspection Form	Lab Sample Form



Using the data collected in the Mobile Inspection Application, a module was created in the Operations Application to automate the process of creating a 450 ft. buffer around a positive invasive *Aedes* location for the Operations Department. The module identifies the number of properties intersecting the 450 ft. buffer to be inspected by a Vector Control Technician.

Through the Mobile Inspection Application and OPS Application, the Operations Department now has enhanced capabilities for identifying and focusing on properties in the short flight range of the *Ae. aegypti* mosquito.

*Automatically generated map of 450 ft. buffer around an *Ae. aegypti* detection site, providing District Operations with the inspection zone.*

Human Resources

The Human Resources department provides services and support to the staff in ways that embrace the District’s core values by ensuring professional delivery of services, maintaining high ethical standards and open communications, and maintaining a professional, technical, and skilled staff. A major focus in 2016 was on revising the District’s Personnel Policies, Procedures and Regulations Manual, which was finalized and approved by the Board of Trustees in November 2016.

Recruitment

In 2016, Human Resources received and processed 64 applications and filled five regular positions and 10 seasonal positions.

Years of Service

The District’s 57 regular full-time employees represent:

- An average age of 43 with an average of 9.75 years of service
- 558 total years of service
- 20 employees with 10 or more years of service
- 7 employees with 20 or more years of service

Training

Human Resources identified and provided training (in-house, online and external) aimed at satisfying state mandated requirements and building employee knowledge and skill. Training is provided to increase the capacity of District employees to deliver services, meet strategic needs and align with the District’s overall Mission. Training included:

- Sexual Harassment
- Workplace Violence Prevention
- Active Shooter
- Supervisors Quarterly Training
- Ethics in Public Service - AB 1234

In addition, individual employees attended or participated online in various other training such as Cal/OSHA Compliance, Project Management, Electrical Troubleshooting and Preventative Maintenance, Financial Reporting, Governmental Accounting, Productivity, and Leadership.

Figure 11. Employee Distribution by Department in 2016

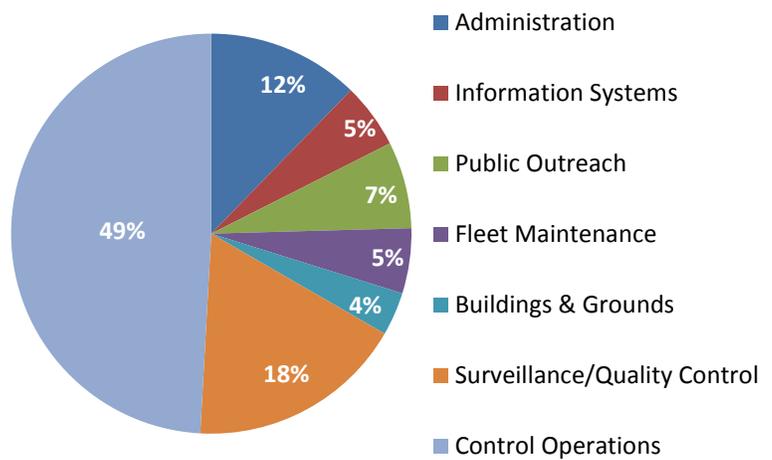


Table 3. Personnel Actions

	Regular	Seasonal
New Hires	4	10
Promotions	3	0
Retirements	1	0
Resignations	2	10

Fleet and Facilities

The District's Fleet Service's main focus is on the maintenance and repair of the District's large trucks, light duty trucks, and specialized equipment and extends its knowledge to support the control efforts of the District.

Fleet

In 2016, the District's Board of Trustees approved the purchase of six vehicles with a total acquisition cost of \$160,871.

The new all aluminum body Ford F-150 4x4 standard trucks came equipped with Tonneau Covers and Gorilla Slides, a new configuration for the District, which provides a protective and secure cover for the mosquito and RIFA application equipment. It also provides an easy to access roll-out cargo tray to reach the application equipment stored in the truck bed.

The six new vehicles were branded with the District's "Fight the Bite! Together." slogan along the rear of the vehicle.

Fleet Services supported the Invasive *Aedes* effort by fabricating four aspirators for the Operations Department by modifying electric leaf blowers. The leaf blower motors were reversed to draw in air through a screened cup to capture adult mosquitoes. These aspirators are used by Vector Control Technicians to capture resting adult mosquitos, while performing residential mosquito inspections. Collecting resting mosquitoes provides important surveillance data of the vector population in an area.

Building and Grounds

The District's Buildings and Grounds Maintenance Department is charged with the maintaining, repairing, and upgrading of the District's facilities, property, and special equipment.



New District vehicles.

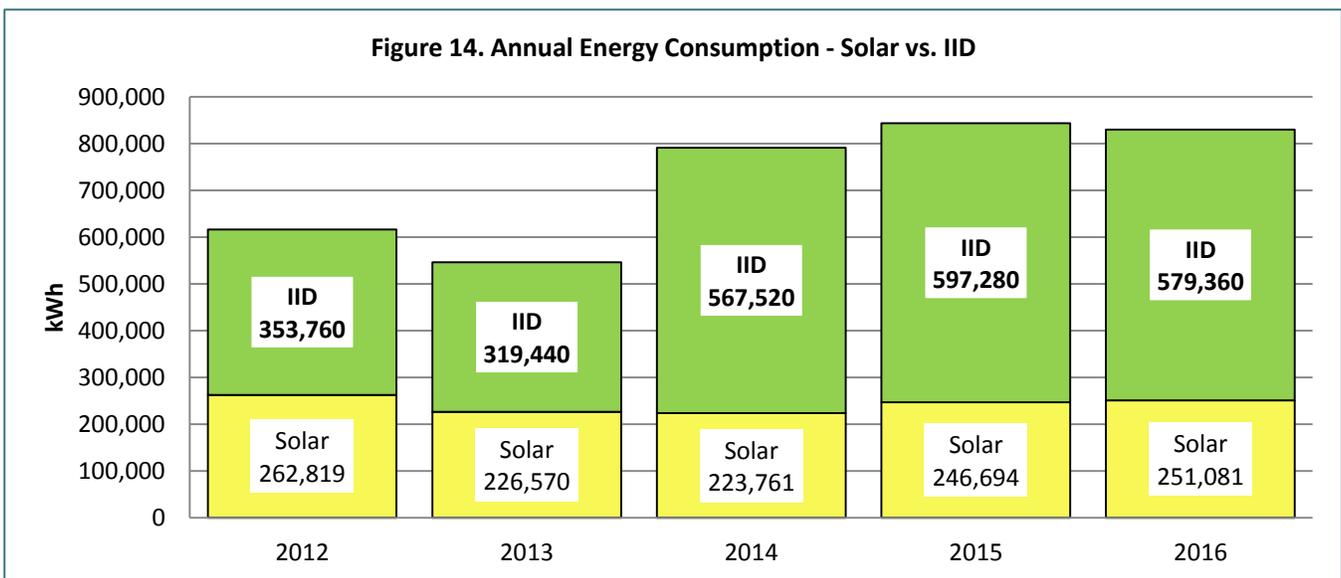
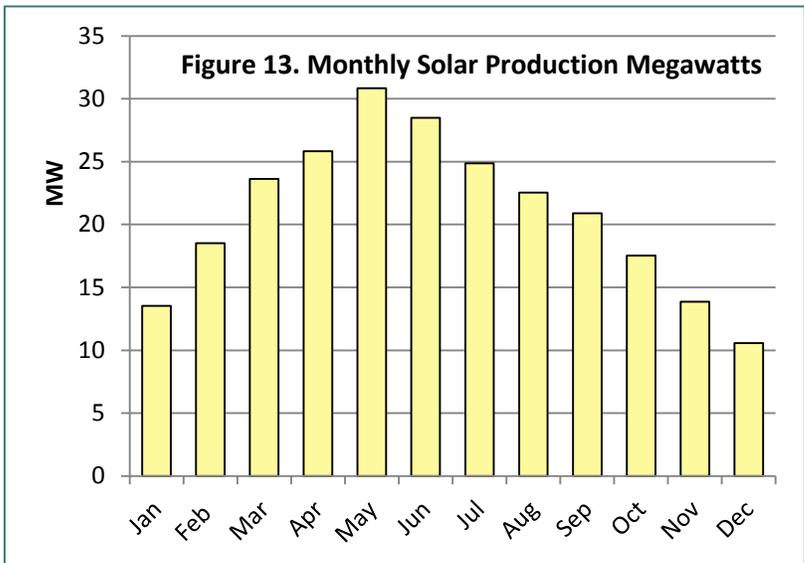
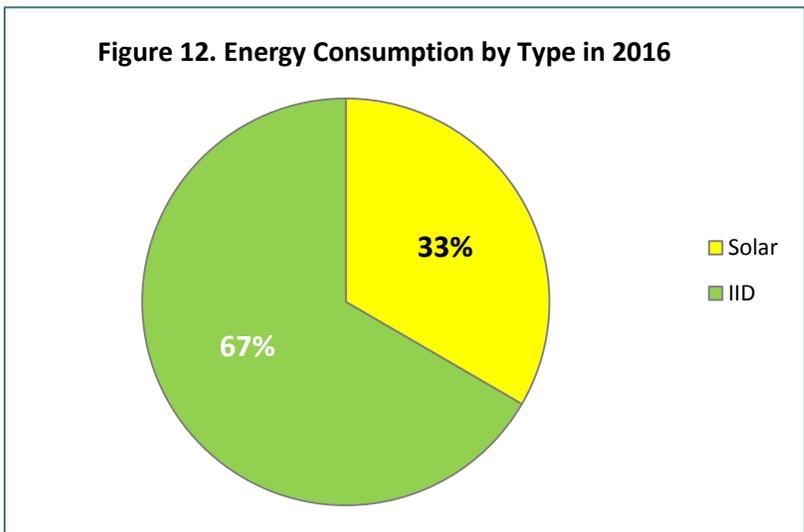


Leaf blowers modified to aspirate mosquitoes.

Solar Panels – The District has two arrays of solar panels. Solar energy produced from the District’s solar panels provides approximately 33% of the District’s energy needs (**Figure 12**). In 2016, the District consumed over 830 MWh of electricity. The District’s solar energy production in 2016 was 251 MWh providing an energy cost saving of over \$23,350.

Production in May is the highest (**Figure 13**) because of the longer days and the optimum temperature for solar output. Annual maintenance costs for cleaning the panels total \$2,496.

The District’s total energy consumption rose in 2014 (**Figure 14**) to 800 MWh because of the completion of the upgraded Laboratory. In 2013 and 2014, the 35 kW solar array located on the Laboratory parking structure was offline during construction accounting for the lower solar production of 227 MWh (226,570 kWh) and 224 MWh. The five year average annual solar production is 242 MWh.



Finance

The Finance function of the District involves budgeting, accounting, record keeping, and the control of fixed assets and investments. The objective of the District’s financial management is to be ethical, fiscally responsible, and law abiding in the stewardship of public funds to achieve the District’s mission. The primary goal of the Finance function is to provide financial administrative support to the District’s Board of Trustees, operations, scientific, and facility staff in their efforts to reduce the risk of disease transmission by mosquitoes and other vectors for residents and visitors of the Coachella Valley.

Statement of Financial Position: FY 2015-16 (June 30, 2016)

Assets

Cash & investments	\$	12,978,829
Current Assets	\$	1,763,204
Net fixed assets	\$	11,188,461
Total Assets	\$	25,930,494

Liabilities and Equity

Total Liabilities	\$	4,862,560
Equity	\$	21,067,934
Total liabilities and equity	\$	25,930,494

Statement of Activities

The Statement of Activities is a summary of FY 2015/16 (June 30, 2016), showing revenue and expenditure/expenses.

Revenue FY 2015-16

Charges for Services - Benefit Assessments	\$	955,039
Property Taxes	\$	3,550,298
RDA Property Tax Increment	\$	3,859,864
Interest & Miscellaneous	\$	119,887
Total Revenue	\$	8,485,088

Expenditures/Expenses FY 2015-16

Salaries & Wages	\$	4,286,732
Employee Benefits	\$	1,722,667
Field Operations	\$	1,060,140
Materials, Services & Supplies	\$	696,150
Insurance	\$	186,663
Contract Agreements	\$	134,189
Depreciation	\$	628,027
Total Expenditures/Expenses	\$	8,714,568

Figure 15. Revenue FY 2015-16

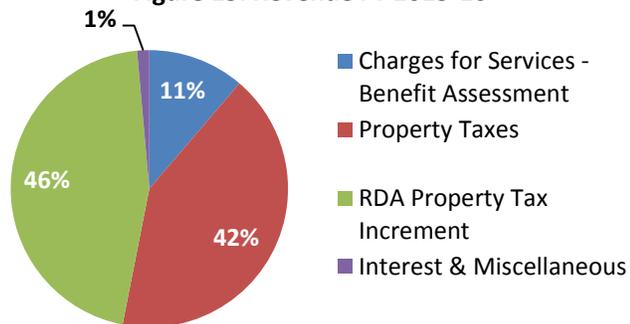
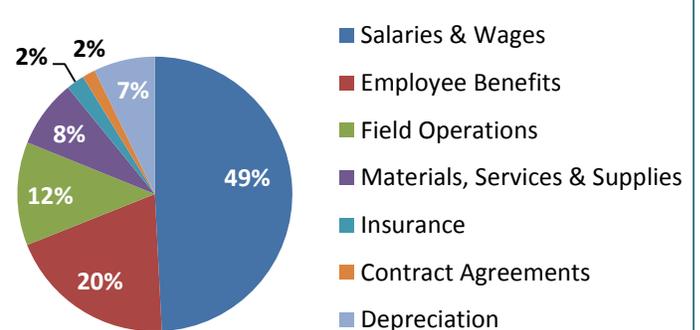


Figure 16. Expenditures/Expenses FY 2015-16



For more information on the District’s financial position, please see the Comprehensive Annual Financial Report FY 2015/2016, online at www.cvmvcd.org/press/documents/ComAnnualFinancialRpt/2016cvmvcdCAFR.pdf.

Awards and Committees

Employee of the Year

Congratulations to the 2016 **Employee of the Year**, Gonzalo Valadez, Vector Control Technician II. Gonzalo is known by his fellow employees as an ultimate team member. He is a consistent high performer, eagerly works with everyone, is willing to help in any area or department he is needed, and uses his artistic ability to help design various graphics for the District, such as on the District’s educational coloring books and video games and awareness raising T-shirts. Gonzalo has been an employee of the District for 11 years and is an asset to his department and to the entire District.

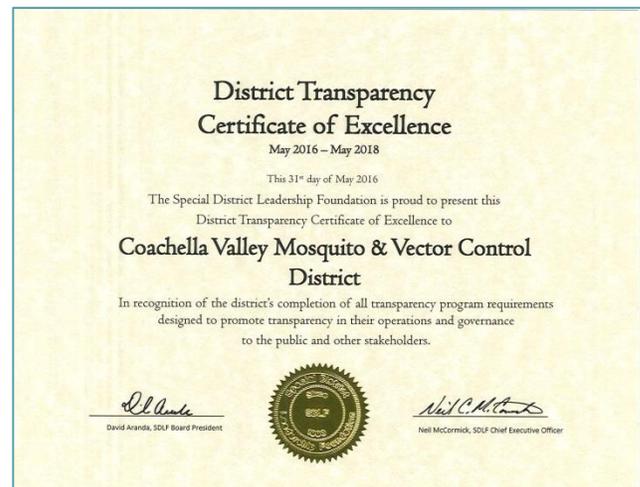


Employee of the Year 2016 (left) Vector Control Technician II, Gonzalo Valadez with General Manager Jeremy Wittie (right).

District Transparency Certificate of Excellence

For the second time, the District received the District **Transparency Certificate of Excellence for 2016–2018**. The program was created by the Special District Leadership Foundation (SDLF) in an effort to promote transparency in the operations and governance of special districts to the public and to provide special districts with an opportunity to showcase their efforts in transparency. The three main subject areas include:

- Basic Transparency Requirements
- Website Requirements
- Outreach Requirements



Certificate of Achievement for Excellence in Financial Reporting

For the eighth year in a row, for the fiscal year that ended June 30, 2015, the District received the **Certificate of Achievement for Excellence in Financial Reporting** presented by the Government Finance Officers Association of the United States and Canada (GFOA) for its Comprehensive Annual Financial Report (CAFR). This award is the highest form of recognition in the area of governmental accounting and financial reporting and its attainment represents a significant accomplishment by a government agency and its management. Administrative Finance Manager, David I’Anson, received the Award of Financial Reporting Achievement (AFRA) again this year. The AFRA is presented by GFOA to the individual(s) designated as instrumental in their government unit achieving a Certificate of Achievement for Excellence in Financial Reporting. David was responsible for the District receiving its first CAFR in 2009 and each year since.

Committees

Board of Trustees

The following Trustees assumed additional responsibility as members of the Board and as part of their volunteer time with the District in 2016.

Executive Committee

Doug Walker – President
Sam Torres – Vice President
Bito Larson – Secretary
Shelley Kaplan – Treasurer

Finance Committee

Shelley Kaplan – Treasurer
Bito Larson – Committee Member
Betty Sanchez – Committee Member
Adam Sanchez – Committee Member

Research Committee

Bito Larson
Michael Monroe
Doug Walker

Mosquito and Vector Control Association of California – (MVCAC)

Doug Walker – Southern Regional Trustee Representative

District Staff

Throughout 2016, District employees worked on local, state, and national committees and councils to raise awareness about vectors and vector-borne disease, build partnerships that contribute to protecting the public from vectors, and exchange knowledge with industry leaders to improve overall practices.

Roberta Dieckmann

- National eXtension Fire Ants Community of Practice – State Leader and Expert Panelist

Jennifer Henke

- MVCAC NPDES Committee – Member
- MVCAC Regulatory Affairs Committee – Member
- MVCAC Southern Region IVM Group – Coordinator
- Coachella Valley Environmental Justice Task Force – Representative for the CVMVCD
- NPDES Desert Task Force Advisory Committee – Representative for the CVMVCD
- Integrated Regional Water Management Group Planning – Representative for the CVMVCD

David I’Anson

- MVCAC Executive Committee – Treasurer
- MVCAC Finance Committee – Member

Anita Jones

- CSDA Human Resources & Personnel Expert Feedback Team – Member
- College of the Desert HR Advisory Roundtable

Jill Oviatt

- MVCAC Training and Certification Committee – Chair
- MVCAC Southern California Region - Regional Training Coordinator

- MVCAC Public Relations Committee – Member
- AMCA Public Relations Committee – Member
- Coachella Valley Economic Partnership (CVEP) Healthcare Council – Member

Edward Prendez

- MVCAC Information Technology Committee – Chair
- Municipal Information Systems Association of California – Member
- International Urban and Regional Information Systems Association (Southern California Chapter) – Member

Gregory White

- MVCAC Vector and Vectorborne Disease Committee – Member
- MVCAC Vector Control Research Committee – Member
- MVCAC Laboratory Technologies Committee – Member

Jeremy Wittie

- MVCAC Legislative Committee – Chair
- MVCAC Southern Region – Member

Looking Forward

Looking Forward

Thank you for taking the time to review this annual report that highlights just a fraction of the many accomplishments that the District's staff achieved in 2016 to better protect residents and visitors from mosquito and vector borne diseases in the Coachella Valley.

District staff are already busy preparing and planning for the 2017 season by building on the knowledge that was gained in 2016. Some major projects that staff will be focused on and prepared for in 2017:

- Continued focus on control and prevention of transmission of West Nile virus and Saint Louis encephalitis virus to Valley residents and visitors.
- Revise and implement the District's 2017 Invasive *Aedes* Response plan with an emphasis on new strategies aimed at limiting the expansion of invasive *Aedes*.
- Delineate areas infested by invasive *Aedes* and eliminate them from backyard sources through novel and proven surveillance and control measures.
- Build relationships, educate, and collaborate with Valley residents, organizations, and agencies to increase their ability to reduce vector production on their properties.
- Successfully collaborate with the District's two employee unions to draft and adopt a new memorandum of understanding to ensure a seamless transition in the coming fiscal year.
- Finalize projects from the District's 2015 Strategic plan and develop and implement a 2017 Strategic plan that will provide a road map for Trustees and staff for the next 3 years.

District Staff and the Board of Trustees are looking forward to the opportunities and challenges that 2017 season will bring.

For information about the Coachella Valley Mosquito and Vector Control District, please contact us at

43420 Trader Place | Indio, CA 92201 | (760) 342 8287

cvmosquito@cvmvcd.org.

Visit us at our website at www.cvmvcd.org.