

FISCAL YEAR 2021-22

# ANNUAL REPORT





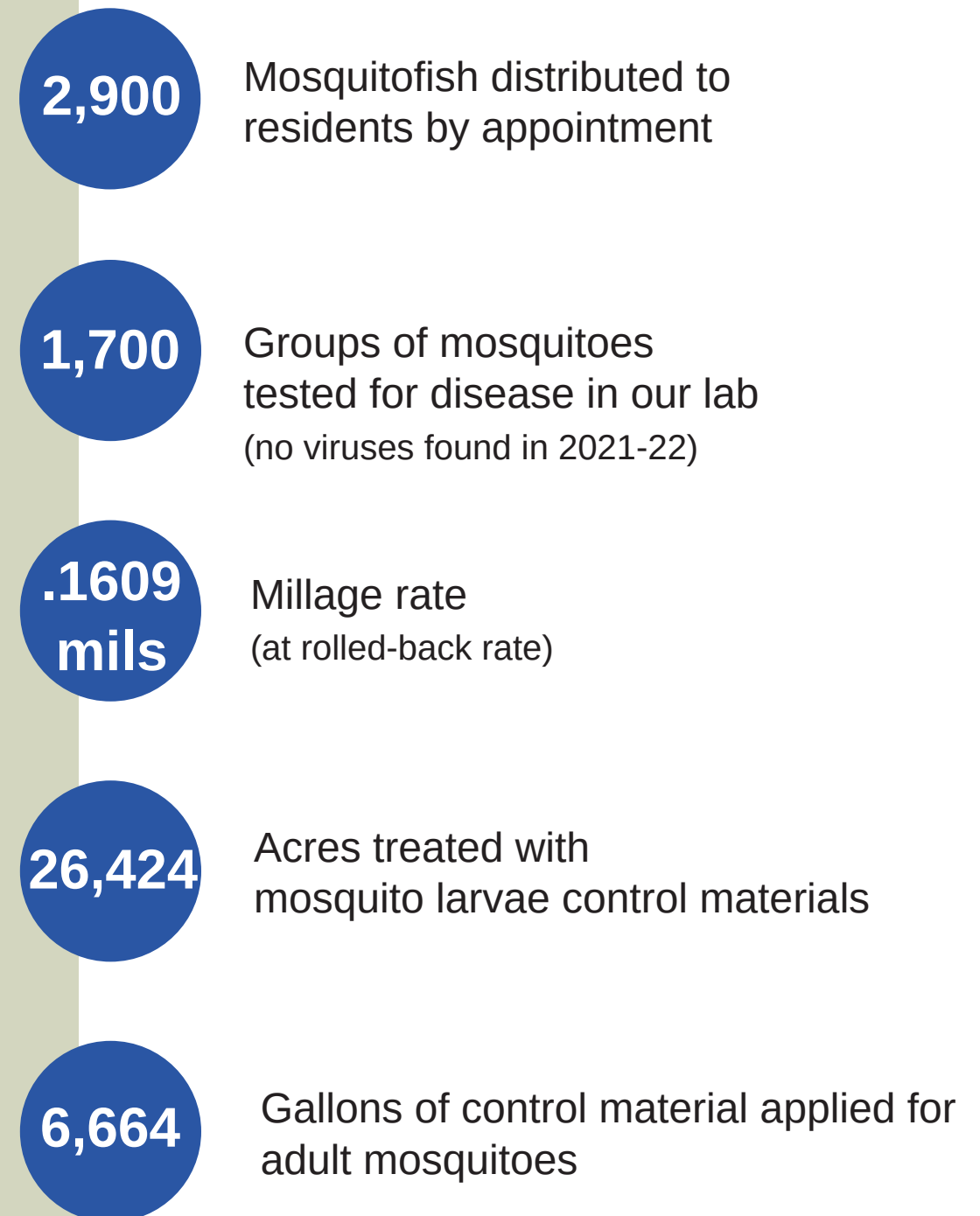
# Annual Report

## 2021/2022

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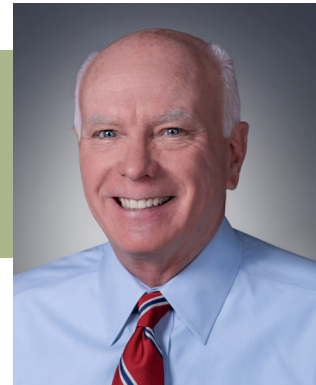
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## 2021/2022 At A Glance



## Russell Burland

SEAT 5  
Terms of office: 2021-2025



## Chair's Message

This was an exciting year to serve on the Collier Mosquito Control District's (District) Board of Commissioners as we took action to ensure the District will continue to meet its mission to protect public health for a rapidly growing community.

Upon Board guidance through unanimous approval, District staff worked towards a land lease approval at the Immokalee Airport for a new facility. Subsequently, this Board of Commissioners made an important decision by selecting an architectural firm for the project. Thanks to many years of careful budgeting and skillful planning, the vision of an inland location for the District is on its way to becoming a reality.

The new location ensures the aerial fleet's safety and mission response time, particularly after Hurricane Ian flooded the current campus this year. Despite the facility's damage, operations were restored within days after the storm to protect District residents from mosquito threats.

The Board supports the District's all-important boundary expansion initiative. Residents moving to newly developed areas in the eastern reaches of the county will be receiving the same services enjoyed by those residing within

the current 401-square-mile boundaries.

Lastly, I would like the public to be assured that as elected officials on this vital Board, we accept full responsibility to serve as prudent stewards of their tax dollars. This, coupled with the staff's thoughtful financial planning, has placed the District in an excellent position for meeting the demands of population growth. This Board approved the year's budget and a rolled-back rate of .1609 mils, which translates to a lower ad valorem tax line item for District residents.

As a Commissioner, I have witnessed first-hand that the District's success requires cutting-edge scientific knowledge from many fields, including biology, entomology, and geology. Talented pilots execute aerial treatments, and our public receives valuable information in real time through targeted outreach and education efforts. The Executive Director and his staff are dedicated professionals, meeting the mission of protecting public health and controlling nuisance mosquitoes.

On behalf of the Board of Commissioners – and on behalf of our citizenry – we are grateful and offer our continued support. It has been a privilege to serve as the Board of Commissioners' Chair.

## Board of Commissioners

The Collier Mosquito Control District operates under Chapter 388, Florida Statutes, governed by a five-member board of commissioners. Each member of the Board is elected at-large for a four-year term. As elected officials, the Commissioners provide a direct link between government and the District's residents. These individuals are charged with setting the ad valorem millage rate, approving the annual budget, overseeing the expenditure of taxpayers' dollars, and ensuring the Executive Director and staff are fulfilling the District's mission.



### John Johnson

SEAT 1  
Terms of office: 2019-2023



### Sandra Lee Buxton

SEAT 2  
Terms of office: 2019-2023



### Jacquelyn Thompson-Fresenius

SEAT 3  
Terms of office: 2019-2023



### Bruce Buchanan

SEAT 4  
Terms of office: 2021-2025

### William Owens

LEGAL COUNSEL TO THE DISTRICT



Patrick Linn, MS, MSHAPI

## Director’s Message

The 2021-2022 fiscal year was momentous, for several reasons. Many of the events that shaped the previous year (2021) evolved in meaningful ways – in a sense – composing the impactful story of 2022.

### District expansion

Through persistence in the process and the assistance of the Collier Supervisor of Elections, the issue of expanding the District’s boundaries was placed on the August 2022 primary ballot. Voters opted in favor of expanding the boundaries by more than 70 percent.

Expansion of the District’s boundaries to include areas undergoing rapid development is now a local bill to be voted upon during the 2023 legislative session.

### Fleet rejuvenation

In May 2022, the District took delivery of its second Bell 407 helicopter in Piney Flats, Tenn. – a purchase that completes a substantial portion of a multi-year plan to augment our aerial capabilities. The new helicopter will be used extensively in treatment with new, organic control materials for adult mosquitoes. The ship’s tail number pays homage to a long-time District pilot (Chris Laidlaw-Bell) lost to cancer in 2021.

With two new Bell 407’s and two fully refurbished MD 500’s, the helicopter side of the District’s aerial fleet is now set

for at least the decade to come.

### Naples headquarters

The District’s headquarters, located on a remote patch of land at the Naples Airport, has endured years of hardship. Hurricanes, humidity, relentless heat and age have all tried to topple the humble steel buildings, still standing after 30+ years.

The year 2022 brought an insult to the facility heretofore left out of the list of punishments: flood, courtesy of Hurricane Ian storm surge. Made worse by the fact that the buildings were at the end of a lengthy remodel project – we had just moved back in – the ultimate insurance claim was for replacement of brand new materials.

### Plans for a facility at the Immokalee Airport

The District issued a Request for Qualifications (RFQ) this year for the necessary services to begin construction on a facility located at the Immokalee Airport. The District’s Board ultimately settled on the architectural services of MLM Martin from Orlando, Fla.

Given that there will no doubt be more storms affecting our area in the future, a stalwart facility further inland will allow the District to continue to meet its mission of valuable service to the community.



## Dedication Professionalism Responsibility

The Collier Mosquito Control District is an independent special taxing district in the state of Florida. Its employees are tasked with the mission of protecting public health and comfort by and through the control of disease-carrying and nuisance mosquitoes.

Our professionals are dedicated to meeting the District’s core mission of protecting public health and reducing nuisance mosquitoes while adhering to the highest level of safety and ensuring minimal impact to Southwest Florida’s ecology.

Contributing to a healthy, high quality of life in southwest Florida and beyond by upholding public trust, applying sound science, using best practices in mosquito control, economic responsibility, and an enduring search for solutions.



Jesvia Alvarado Daniel Anez Rachel Bales Nacho Barranco Mike Berkitsch Ken Bouck  
Peter Brake Jacob Chappa Jonathan Cleaves Jim Delie Kevin Dunleavy  
Joe Lee Galegos Sara Grant Mark Grazewski Rebecca Heinig Scott Hendricks  
Jose Hidalgo Leith House Bob House Robin King Derrick Klein Partrick Linn  
Brett Lowe Keira Lucas Wayne Luettich Butch May Mickey McDonald Andrea McKinney  
Jon Morris Zachary Nickell Colton Nielsen Patrick Perri Nate Phillips Noe Pineda  
Mark Prince Jorge Puente Atom Rosales Dave Ruffell Richie Ryan Greg Schiegner  
Jennifer Stein Robert Straser Mark Trombley Jack Voth McCoy Ward Andrew Weiss  
Haley Welch Stacy Welch



Mission

The mission of the Collier Mosquito Control District (the District) is to provide valuable service to the community through suppression of both disease carrying and pestiferous mosquito populations by and through the safest and most economical means available. The District uses a variety of methods (Integrated Mosquito Management) in a manner consistent with the highest level of safety and minimal adverse impact on humans, wildlife, the environment, and non-target organisms.

Vision

Contributing to a healthy, high quality of life in southwest Florida and beyond by upholding public trust, applying sound science, utilizing best practices in mosquito control, economic responsibility, and an enduring search for solutions.

2021/2022  
STAFF TRAININGS

OCTOBER

Naples Chamber of Commerce: Wake Up Naples

DECEMBER

2021 Florida Mosquito Control Association Fly-In

JANUARY

2022 Dodd Short Courses  
Chemical Spill Training  
Government Finance Officers Association Governmental GAAP Update

FEBRUARY

Fly Safety International Training  
  
American Mosquito Control Association 88th Annual Meeting

MARCH

2022 Lee County Mosquito Control District Fly-In

APRIL

2022 Florida Local Gov't. Inf. Systems Assn. Conference

MAY

2022 Florida Association of Special Districts Annual Conference  
  
Public Relations Society of America: Managing Your Online Reputation

JUNE

Transition Training 500 Series  
Bell 407 Training

JULY

Twin Otter Training

AUGUST

Flight Instructor Training  
Society for Vector Ecology Conference  
Florida HR Conference



Hurricane Ian: Sept. 28, 2022

By the time District staff moved back into a freshly renovated building, hurricane season was well underway. On Sept. 28, Hurricane Ian made landfall in Southwest Florida causing catastrophic flooding which unfortunately surged through our newly renovated buildings. A coordinated effort between our Director of Facility Maintenance, Administration, staff and Hurricane Response Team members resulted in swift action within 24 hours after the storm passed to remove soggy carpeting, four feet of water-soaked drywall and insulation, and water-damaged furnishings. The cleanup and restoration will continue into FY2022-2023.







Hot-Loading the helicopters

This year, the District began using a modified EZ Trial Inc., seed tender to load the helicopter Isolair hoppers with granular larvicide. At its full operational capacity, it provided a new, improved mechanism to hot reload in a safer, streamlined process. The system eased the physical workload on chemical loaders, avoided hazards, and increased safety during the hot reloading process.

The equipment was built in-house and mounted to a flatbed trailer, which allowed easy transportation to and from the landing zone (LZ). It is currently equipped with a EZ Trail Inc., seed tender, a 2,000-pound heavy weight scale, and a Seed Vac with an extended delivery hose.

The loading process begins with a chemical loader using heavyweight equipment to lift a 1,000-1,200 pound supersack over the seed tender and releasing the supersack’s funnel. To load the modified Isolair spray system of the helicopter, the Seed Vac’s motor and seed tender’s auger are activated, and the seed tender gate is manually opened to achieve the desired flow rate of the Seed Vac. The chemical loader holds the Seed Vac spout to the

PROS		CONS	
HOT RELOAD WITH 35-40 LB BAGS			
Enhanced inventory tracking during loading		Need a larger crew (4-6) under main rotor	
More reliable as it is solely manpower		More physically demanding	
Suitable for any size mission		Increased risk of debris (bags) entering main rotor or tail rotor	
Minimal disruption from dust from granular products			
Compatible with all granular products			
Less time spent under main rotor			
HOT REALOAD WITH GRANULAR RELOADER			
Smaller crew (2) under main rotor		Challenging for accurate inventory tracking	
Less physically demanding		Possibility of mechanical failure	
Reduced risk of debris (supersacks) entering main rotor or tail rotor		Not well suited for small missions <1000 lbs	
Allows streamlined use of supersacks		Increased dust from granular products	
		Not compatible will all granular products	
		More time spent under the main rotor	

opening on the modified Isolair hopper, while another loader stabilizes the delivery hose.

New hires

During FY2021-2022, the Operations department welcomed two new field technicians: Brett Lowe and Jacob Chappa. Further, it was the first year that the District hired an on-call driver, Hayden Williams, to assist with the District’s truck-mounted Buffalo Turbine sprayers.

Training and conferences

The District’s newly hired field technicians attended the Florida Mosquito Control Association (FMCA) Dodd Short Courses Introduction to Mosquito Control course. As well, Field Technician Supervisor Richard Ryan and Field Technician McCoy Ward attended the Advanced Mosquito Control class during the FMCA Dodd Short Courses. Both employees passed the Advanced Mosquito Control Certification examination.

Several Operations staff attended the American Mosquito Control Association (AMCA) annual meeting in Jacksonville, Fla. Operations Director Nate Phillips, Ryan and Logistics Coordinator Sara Grant participated in the AMCA Annual Meeting field day, showcasing the District’s Vortex, the granular loader, and the AI Super Duty Mister. Grant also presented a poster during the AMCA annual meeting which illustrated the efficiencies of the District’s new granular loader.

All Operations staff attended biweekly department meetings, and throughout the year attended chemical spill training, aircraft safety training, and larvicide loading training. The staff also

began annual rotations to new areas of the District which increases their experience and knowledge of varying mosquito environments and habitats.

New landing rate counts protocol

Until the end of August 2022, field technicians followed a long-standing landing rate protocol to track mosquito populations. The practice called for them to record the number of mosquitoes landing on them within a set time interval, which was two minutes during the daytime or five minutes in the evening hours. However, it was difficult for them to accurately track mosquito counts once they exceeded a count of 25, typically when populations became excessive.

At that point, they would estimate counts of 25+, 50+ or 100+ mosquitoes per time interval. Because a record of 25+ represented 25–49 mosquitoes, calculated averages based on these estimates underestimated the true biting pressure. For this reason, the protocol was adjusted so that technicians would count mosquitoes until they reached 25 and record the time interval or, if the total was less than 25, count mosquitoes for the standard time interval of two or five minutes. The impact of this change will be closely assessed during the 2023 field season, but it’s expected to result in more accurate estimates of true biting pressure and treatment mission efficacy.

Optimizing FieldSeeker layers

In Winter 2022, the Operations staff collaborated with Research staff in beta-testing the use of larval hotspots in the site visit layer of FieldSeeker. All Operations staff were trained in FieldSeeker’s site visit layer – where

they could record inspections and larval abundance – and the layer became fully operational.

Logistics Coordinator Grant began using FieldSeeker’s polygon layer and treatment records layer for easier data entry. Further, the chemical inventory layer was fully beta-tested, then made operational after the field staff was trained in its use.

**Integrated Mosquito Management**

During FY2021-2022, trends in adulticide and larvicide usage remained similar to previous years. The District performed over 400 treatment missions with 69 adulticide missions (16.75%) and 343 larvicide missions (83.25 percent). Given the current level of adult mosquito populations, and larvicide efforts and other control initiatives, the District’s adulticide applications remains low.

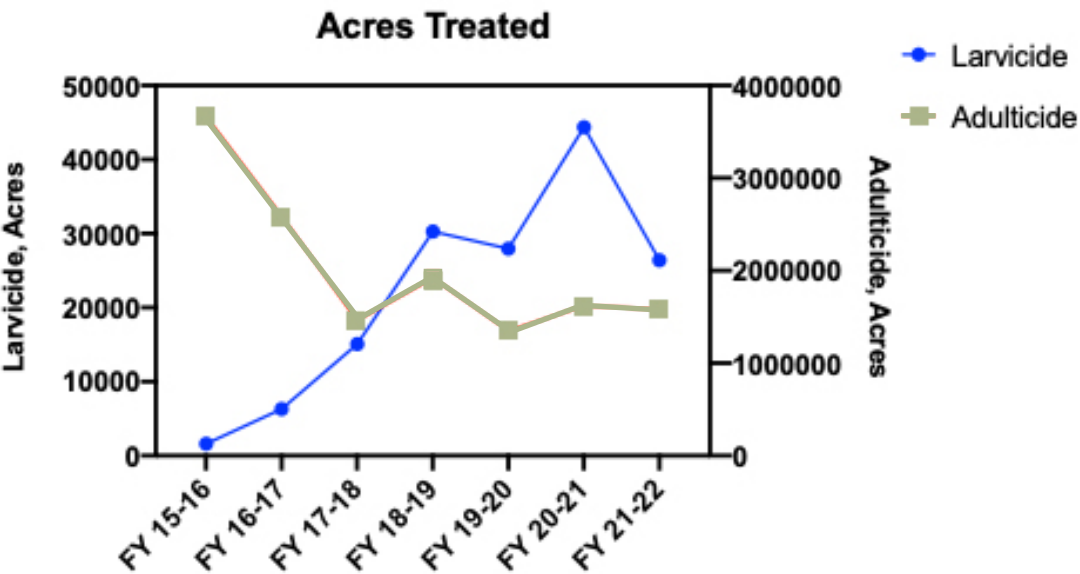
**Larval control materials**

Materials used to control mosquito larvae (larvicides) were reduced in FY2021-22 compared to the previous year. Granular applications using the District’s Bell 407 and MD 500 helicopters, and Vortex TR Granular

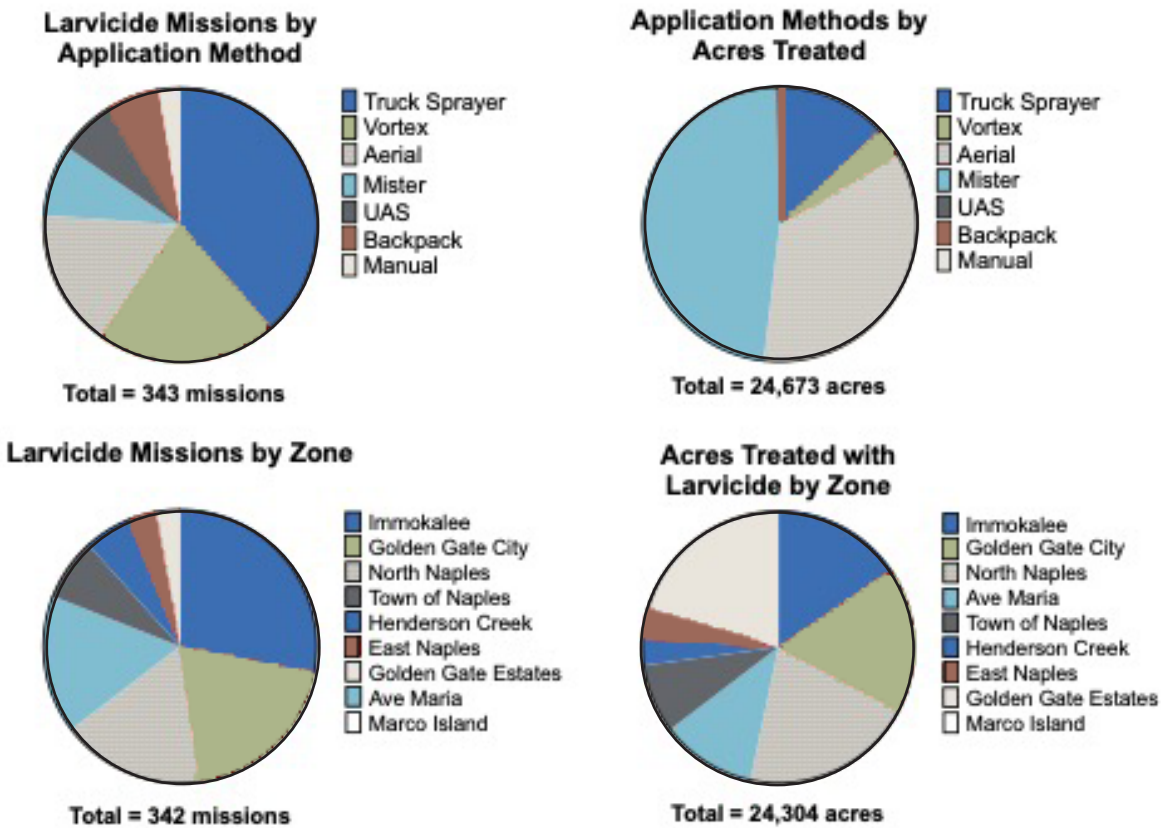
Spreader, applied less than 80,000 pounds of granular materials due to a reduced application rate and lower *Aedes taeniorhynchus* populations in the District’s salt marsh areas.

The District re-evaluated the effective application rate used for granular larvicide applications, and found that lowering the rate did not impact effectiveness. Application rates for Vectoprime FG, Vectomax FG and Natular G30 were reduced from 8 lbs/acre to 7 lbs/acre. The change also reduced the overall cost per acre for granular larvicide from \$31.60 to \$27.79 for Vectoprime FG, \$62.40 to \$54.74 for Vectomax FG and \$135.92 to \$126.07 for Natular G30. The District is experiencing an increased trend for larvicide applications and the application rate change reduces straining the chemical budget.

Pretreatment of the District’s salt marsh areas decreased nearly 75 percent to 1,304 acres treated with just over 10,000 pounds of Fourstar BTI CRG. The decrease primarily is due to lower mosquito population numbers in FY2021-22. The District continued using



**Larvicide Applications FY2021-2022**



organic extended-release materials (ie., Vectomax FG and Natular G30), for targeting freshwater mosquito species in the inland areas of the District, treating over 6,000 acres treated with over 18,000 pounds of Natular G30 and 28,000 pounds of Vectomax FG. Further, 588 acres were targeted for single brood applications using over 4,500 pounds of Vectoprime FG.

The District also investigated the use of Bti-based treatments using Fourstar BTI CRG in freshwater areas, applying over 15,000 pounds to nearly 2,000 acres. Fewer applications in freshwater areas were due to the reduced risk of West Nile virus and changes in effective application rates.

Ground-based applications of

liquid larvicide also continued in FY2021-22 and accounted for the majority of the District’s larvicide missions. With local transmission of Dengue virus, applications targeting mosquito species that inhabit water-filled containers using the District’s Buffalo Turbine sprayer applied 2,700 pounds of Vectobac WDG and 124 gallons of Natular SC to nearly 13,000 acres of residential and industrial locations.

**Improvements to ground larvicide applications**

In FY2021-2022, the District purchased a second Vortex TR Granular Spreader. The Vortex is mounted to the back of an off-road vehicle and used to apply larvicide in smaller, hard-to-reach areas by ground. This year, the District completed 73 granular larvicide missions



using the Vortex, treating over 860 acres. Areas commonly treated with the Vortex include aquatic weeds harboring *Mansonia* mosquitoes, freshwater areas too small for helicopter applications, roadside and agricultural ditches, and small retention ponds.

The Vortex enhances efficiency and effectiveness of ground larvicide applications. It can treat large areas because of its capacity to carry additional bags of material for refills. Only one field technician is required to operate the equipment and is mostly free from

the strenuous labor associated with a backpack blower. With the appropriate flow rate calibrated and a speed of 8.5 mph, applications are significantly more efficient than a backpack blower. Overall, the Vortex provides an efficient means of application via more acres covered, less strenuous activity, and reduced labor hours.

The Vortex's effectiveness was nearly a 100 percent reduction in larval mosquitos for all products using standard larval dips as the measurement tool. Overall, the Vortex provided effective

FY 2021-22

Material	Acres Treated	Amount of Material	Number of Applications
Larvicide Materials			
BVA Oil	1	1 gal	1
Fourstar Bti CRG	3,050	26,685 lbs	37
Natular G30*	2,625	18,400 lbs	32
Natular SC*	7,552	124 gal	16
Natular XRT*	19	727.49 lbs	N/A
Vectobac 12AS	3,280	102 gal	131
Vectobac WDG*	5,100	2,550 lbs	14
Vectomax FG*	4,109	28,981 lbs	95
Vectoprime FG	588	4,664 lbs	16
Adulticide Materials			
Dibrom Concentrate	1,252,060	4496 gal	46
Duet HD	344,240	2151.5 gal	23
Merus 3.0*	2.621.69	17 gal	1

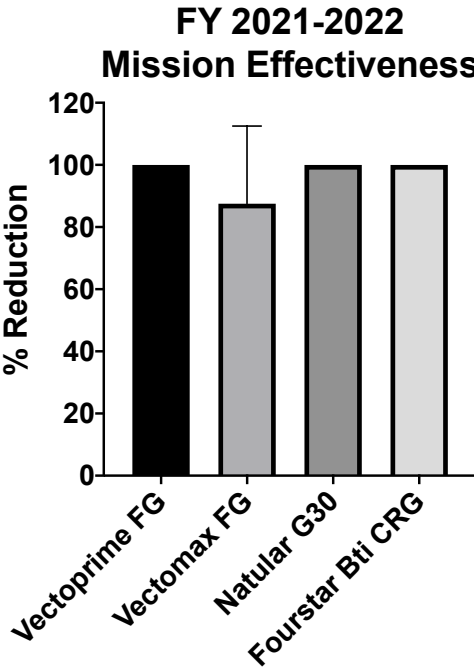
\* Organic Materials Review Institute (OMRI) Listed® Product

control in all habitat locations across an array of mosquito species.

Adult mosquito control materials

Materials used to control adult mosquitoes (adulticides) remained about the same in FY2021-22 as in the previous year. Overall, the District performed 69 adulticide missions using Dibrom (45), Duet HD (23) and Merus 3.0 (1). Spring populations of *Aedes taeniorhynchus* were low, so the number of aerial treatments was reduced.

Most of the District's adulticide materials were used for freshwater mosquito species, mainly *Culex nigripalpus* and *Mansonia*, and concentrated on the inland areas of the District. Immokalee received most of the treatments (29), followed by Ave Maria (22), and Eastern Golden Gate Estates (10). The Henderson Creek area experienced an abundance of freshwater mosquito species, resulting in 12 treatments.





RESEARCH

Mosquito trapping and arbovirus surveillance

After two years of heightened West Nile virus activity in Collier County, this year was a welcome respite with only one reported equine West Nile virus case and no reported human cases. However, Collier County was put under a Mosquito-Borne Illness Advisory in August due to a locally acquired dengue case in one of our residents.

In September, the laboratory incurred significant damage from Hurricane Ian's floodwaters, leaving it unusable. However, just one week after the storm, traps were again placed in the field and mosquito pool testing shifted to RAMP.

Insecticide resistance monitoring

The Department staff also continued to perform CDC bottle bioassays to evaluate local mosquito populations for signs of insecticide resistance. Pyrethroid resistance had already been detected in several local *Aedes aegypti* populations, and last year, Dr. Eva Buckner found signs of Naled resistance at one location. This year, Laboratory Technician Zachary Nickell confirmed Dr. Buckner's results and detected signs of developing Naled resistance in *Aedes aegypti* from

a second location. The Operations Department adjusted its treatment approaches accordingly, and the Research Department continued to test additional local *Aedes aegypti* populations.

Wide area larvicide applications

The Research and Operations departments characterized Natular SC in one of the District's Buffalo Turbine Sprayers for use targeting *Aedes aegypti*, *Aedes albopictus* and *Culex quinquefasciatus* mosquito species. A semi-field evaluation of two different larvicides (Natular SC and VectoBac WDG) showed that VectoBac WDG worked well against local *Aedes aegypti* and *Culex quinquefasciatus* strains. Field trial results were inconclusive, so this experiment will be repeated during the 2023 field season. With the addition of two new Buffalo Turbine Sprayers, the District will continue to evaluate the effectiveness and utility of Natular SC.

BG-Counter trap evaluations

Building on work begun last year by Dr. Rebecca Heinig, Biologist Atom Rosales worked on a project designed to evaluate BG-Counter accuracy at various sites within the District and to determine which species were being captured by the existing counter configuration.

~ 2,000 trap collections

1,700 mosquito pools tested  
(a 22 percent increase over last year)

0 viruses detected

Mosquitoes collected 1-2 times/week from

- 34 CDC light trap locations
- 16 BG Sentinel trap locations
- 8 gravid trap locations

While the majority of the mosquitoes captured were *Culex nigripalpus*, 25 different species were collected from the traps, suggesting that they are sampling a broad range of the District's known mosquito species. Rosales continues to analyze data from the project and plans to publish the results in 2023.

Mansonia and aquatic weeds

Biologist Rachel Bales worked on an operational pilot program designed to monitor and control *Mansonia* mosquito populations. *Mansonia* larvae are unusual because instead of swimming freely in the water like other mosquito species, they attach themselves to the roots of

floating aquatic weeds, primarily water lettuce and water hyacinth. This makes it difficult to quantify larval densities and assess larvicidal treatment efficacy.

Bales' work in 2021 suggested that the solution might be emergence traps, which are placed directly on top of aquatic weeds and capture adult *Mansonia* mosquitoes as they emerge from the water. A pilot study was conducted to determine whether the traps would be a good addition to the District's operational surveillance program.

The Research Department selected a 6,000-acre focus area

Mosquito fish program

The District's mosquitofish distribution program began later than normal this year due to campus renovations, but the Department still managed to complete 77 appointments and distribute approximately 2,900 fish. The fish scheduling, tank maintenance, and data tracking workflows were improved to meet the demand.

Using Calendly – an online platform that residents used to select dates and times for fish pick up – streamlined the process. It virtually eliminated the back-and-forth discussions that previously were required to schedule pick-ups. It also ensured that appointments were optimally spaced so that each resident had sufficient opportunity to have their questions answered.

Early in the season; Dr. Heinig, Rosales and Bales created an online form that records information about where and how mosquitofish were being used and a dashboard that allowed the staff to evaluate long-term data trends. These tools indicated that the mosquitofish were being used broadly throughout the District and residents were using them most frequently to treat ditches/swales, ornamental ponds, or flooded yards. It also revealed that requests for appointments were much higher immediately following arbovirus-related news stories in the local media.

This information and additional insights gained from the dashboard have helped the Research Department allocate staff hours and fish stock more efficiently based on anticipated demand from residents.

in Ave Maria that had a high number of aquatic weed-filled irrigation ditches. Bales worked with the Operations and Technical Development Departments to establish relationships with local land managers and farms to gain access to the irrigation ditches for the *Mansonia* data collection.

The Research and Technical Development Departments developed two emergence trap designs: one that could be deployed by hand, and one that could be placed using a drone in areas not accessible by foot. The traps were set once per week for three days, and Bales counted the number of *Mansonia* mosquitoes that emerged during each trapping period. Canals with above-baseline numbers of *Mansonia* were treated with larvicide, and efficacy was evaluated by comparing pre- and post-treatment emergence trap counts.

While the traps indicated that the larvicidal treatments frequently reduced the number of emerging *Mansonia*, the data were less consistent than expected, suggesting that environmental factors might have significant impacts on larvicide efficacy in this system.

There were also complications with trap placement, battery life and drone usage, as many locations had obstacles that made it difficult to fly the drones at the optimal altitude for trap deployment and treatment. Trap placement was also incredibly time-intensive due to issues with site access caused by rough terrain and flooding.

Based on these results, the District is currently re-evaluating the program and plans to use the emergence traps as a binary indicator of *Mansonia* presence/

absence rather than as a quantitative tool in the coming field season.

#### **ArcGIS and FieldSeeker developments**

Prior to this year, Dr. Heinig was the only employee with experience managing the District's FieldSeeker database and ArcGIS analytical interfaces. This lack of redundancy posed serious risks to operational continuity, so she began training Rosales on how to navigate the system. He now serves as employees' primary contact for basic FieldSeeker troubleshooting, has created several ArcGIS dashboards and has taught himself the Python coding language, which has allowed him to create custom scripts for data analysis within ArcGIS.

The Research staff continued to develop and refine its suite of ArcGIS tools, which are used by multiple departments to track surveillance data in real time, assess treatment efficacy, and identify long-term trends. The most exciting development this year was the Treatment Efficacy Dashboard, which was developed by Dr. Heinig and Rosales to generate post-treatment efficacy summaries that satisfy Florida Department of Agriculture and Consumer Services (FDACS) mission recordkeeping requirements.

Previously, the Operations Department had to compile data manually from several different sources to generate these summaries. Now, with a few mouse clicks, they can bring up the flight details and efficacy information for each treatment mission, print the results and file them for recordkeeping compliance.

The Department staff also worked to make drone imagery data obtained by the Technical Development Department

more accessible. Because Collier County population is growing rapidly – and development is racing to meet the demand for housing – imagery from sources like Google Maps is frequently out of date, which complicates trap placement and navigation. To solve this problem, Dr. Heinig worked with Technical Development Specialist Andrew Weiss to create a composite ArcGIS map that incorporated the District's most up-to-date aerial drone photography. This map can now be viewed on all of the District's dashboards, allowing users to view current information on property development and aquatic weed coverage.

#### **Promotions and new hires**

Several promotions and new hires occurred in the department this year. Director of Research Dr. Keira Lucas was promoted to Deputy Executive Director, and Research Entomologist Dr. Rebecca Heinig was named Director of Research. In addition, the Department hired three employees: Dr. Robert Straser, Research Entomologist; Zachary Nickell, Laboratory Technician I; and Atom Rosales, Laboratory Technician II, and was later promoted to Biologist I.

#### **Mosquito species new to the area**

This year, Rosales found two new species not detected previously in Collier County: *Culex lactator* and *Aedes hendersoni*. *Culex lactator* is a poorly studied species that was first detected in the U.S. in 2018 and has now been detected in three south Florida counties. *Aedes hendersoni* is a floodwater species that has been detected across the United States and southern Canada from Washington to northern Florida, where records exist for Alachua, Duval, Jackson,

Leon and Volusia counties. Neither is currently considered a significant vector of disease.

## **RESEARCH COLLABORATIONS**

The Research Department had a number of collaborations with university researchers this year, many of which are ongoing.

**Dr. Estelle Martin**, University of Florida  
Examining arbovirus co-infection in *Culex* mosquitoes.

**Dr. Lawrence Reeves**, UF IFAS Florida  
Medical Entomology Laboratory  
Provided local specimens as part of a survey of local mosquito bloodmeals designed to evaluate various species' feeding preferences and their impact on vector-borne disease transmission.

**Dr. Eva Buckner**, UF IFAS Florida  
Medical Entomology Laboratory  
Provided local specimens for her project examining the prevalence and impact of novel *Aedes aegypti* insecticide resistance (kdr) mutations.

**Dr. Christina Anaya**, Florida Gulf Coast Univ.  
Assessing macroparasite incidence and diversity in local mosquitoes.





#### **New Bell 407 added to fleet**

The District's newest Bell 407 (N579LB) arrived in May and was named to include initials of Chief Pilot Chris Laidlaw Bell, who was lost to cancer in 2021. The Maintenance staff made quick work of preparing the aircraft for treatment missions.

The staff completed the following installations:

- AgNav application guidance system
- underbelly product tank mounting frame
- product pump and associated plumbing in forward portion of underbelly product tank housing
- left and right atomizer booms onto product tank assembly

They also performed leak checks and a functional check of the application system. The aircraft's system was then calibrated for treatments using Merus 3.0 adult mosquito control material.

In April, the District's Board of Commissioners approved the disposition of one Skyvan fixed-wing airplane. In July, we said farewell to one to the aircraft when an out-of-state agency purchased it for use by skydiving enthusiasts.

#### **Twin Otter fixed wing**

The District's new Twin Otter (N647MC) was put into service for its first mission in May. To get the aircraft "mission-ready," Maintenance staff completed the following installations:



- AgNav application guidance system
- 200-gallon product tank in cabin
- product pump and all associated plumbing required to move product from tank to boom
- mounted atomizer booms on back of aircraft left and right side

Staff also performed leak checks and a functional check of application system. The Twin Otter went through its final calibrations in April and performed treatments throughout the summer.

The District's fleet in FY 2021-22 also included two MD 500 helicopters, one Bell 407, and two Skyvans.

### **Aircraft Maintenance Staff Training**

#### **August**

Wayne Luettich: Twin Otter Initial Maintenance training with Flight Safety International.  
Mike McDonald: Bell 407 Field Maintenance Training at the Bell Training Academy in Hurst, Texas.

#### **September**

Leith House: Pratt & Whitney Canada PT6A Line and Base Maintenance Course (Twin Otter engines) at Flight Safety in Wichita, Kan.

#### **February**

Mark Trombley: 407GX Avionics and Electrical Systems training at the Bell Training Academy in Hurst, Texas.



# FLIGHT DEPARTMENT

In 2022, the Twin Otter came online and was fully operational for spray missions, and the Flight Department readily took the controls of this new aircraft. It exceeded expectations with enhanced safety features in the Agnav spray system, Garmin 950 avionics, and air conditioning to reduce pilot fatigue.

Pilot Scott Hendricks joined the department, an ATP rated fixed-wing pilot. He quickly learned the Skyvan and became an integral part of the Flight Department. He also passed his public health and aerial applicator exams.

Helicopter pilot Derrick Klein began his fixed-wing training and obtained his private pilot airplane certificate. He will complete his instrument rating in 2023.

Chief Pilot Kevin Dunleavy attended Flight Safety's Twin Otter course in Ontario, Canada. He enhanced his knowledge about the Twin Otter systems and procedures which he shared with his fellow pilots upon returning to the District. Dunleavy and Pilot Mike Berkitsch attended MD helicopter recurrent training in Mesa, Ariz.

In September 2022, pilots relocated two of the District's airplanes to the Miami Homestead Airport in advance of the Hurricane Ian's landfall in southwest Florida. Moving aircraft to locations where they can safely weather tropical storms is a standard practice per the District's hurricane policy. Naples Aviation assisted in housing the District's remaining aircraft in secure hangars around the airport. Our pilots returned all aircraft to the District's hangar within days after the storm passed, and the fleet was fully prepared for treatments following the storm's heavy rain.



# TECHNICAL DEVELOPMENT

During the past few years, Florida's mosquito control industry has increasingly found that using drones in operations – from mapping hard-to access geography to applying materials – has streamlined functions and created efficiencies. The District is no exception, and in fact, is perceived as an early adopter of the technology.

## Drones used for mapping and data collection

The Technical Development Department continued using drones in FY2021-22 to map mosquito breeding grounds and to conduct aerial inspections of mosquito breeding sites that were difficult to reach on foot. A total of more than 100 flights were completed using the District's DJI Mavic Pro Platinum. Most of the mapping and imagery performed concentrated on *Mansonia* breeding areas and aquatic weeds, capturing images of the geography for pre- and post-hurricane preparation, and inspecting areas for the presence of mosquito larvae prior to material applications.

The department also completed a second round of LiDAR data collection. Collection of LiDAR-point cloud data provides a 3D model of the Earth's surface from the air, even when heavy tree cover obstructs the site. Regardless of the foliage, the LiDAR model clearly maps the geography below the foliage. These LiDAR operations assist in detecting sites where mosquitoes are growing beneath dense vegetation, collect data



regarding the geography, and create geographic information system (GIS) files. The GIS maps are necessary to accurately apply control materials where larval mosquitoes are present. The department is continuing to analyze the past two years of data to develop more ways that fully employ LiDAR in the District's operations.

## Placing traps in challenging environments

Mosquito traps are standard tools in this line of work: some capture adult mosquitoes, and others collect mosquito eggs. Both field technicians and biologists use these valuable tools to gather information about mosquito





The summer edition of Wingbeats, an FMCA trade journal, featured a story about the District's use of drones to place traps in areas difficult to reach on foot.

populations, but safely placing traps where mosquitoes are breeding can be challenging thanks to wildlife and swampy geography.

To overcome these challenges, the Technical Development department staff adapted the design of one type of trap so that a drone can place it in areas inaccessible on foot. An "emergence trap" captures adult mosquitoes as they alight from the waters they've grown in.

The original trap design was too heavy and bulky for the drones to carry, so major modifications were needed including adding a lightweight 6V battery system that

would keep the trap running for four days after placement, devising a lift mechanism that attached to the drone, and designing an emergency release system.

Once the trap design was perfected, the department used drones to routinely set traps at six locations, which resulted in 42 successful collections of adult mosquitoes. The drone-deployable emergence trap has greatly enhanced the District's large-scale *Mansonia* monitoring program, by increasing our ability to more accurately survey for *Mansonia* at their source.

Physical and environmental barriers no longer prevent field technicians and biologists from placing traps in hard-to-reach locations. Further, drone deployment of emergence traps allows for increased precision and placement of the traps in central locations of the wetlands as opposed to the outer perimeter of aquatic plant growth. And perhaps most importantly, drone deployment promotes employee safety by eliminating the need for District staff to wade into freshwater habitat where alligators are plentiful.

#### Services to the mosquito control industry

The Technical Development staff attended and presented at several industry conferences throughout the year, including the Florida Mosquito Control Association (FMCA) annual meeting, the American Mosquito Control Association (AMCA) annual meeting, and the FMCA Dodd

Short Courses. In addition, the Technical Development Department partnered with Lee County Mosquito Control District and the Florida Department of Agriculture and Consumer Services to host a Drone Workshop for state employees to explain drone usage in Florida's mosquito control industry.

#### Employees

In 2021, the District bid farewell to the Director of Technical Development Peter Brake. Technical Development Specialist Andrew Weiss assumed the department's responsibilities as the District awaited the regulatory ruling that would determine the fate of drone use by government entities in Florida.

## 2021-22 DRONE APPLICATIONS

#### Larval control materials

- AG-110
- Fourstar BTI CRG
- VectoMax FG
- VectobacFG
- Natular G30

#### Inland areas

21 treatments targeting mosquitoes capable of spreading West Nile virus and *Mansonia* mosquitoes

#### Totals

523 lbs of granular larval control materials were applied to 75 acres in one year

#### New drone regulations created

In 2021, Florida created legislation to protect the confidentiality, integrity, and availability of data collected, transmitted, or stored by a drone from foreign adversaries.

934.50 Florida Statute was amended via Senate Bill 44 and included the addition of Section 7 – Security Standards for Governmental Agency Drone Use. It specifically targeted Shenzhen DJI Sciences and Technologies Ltd., which was identified as a Chinese military company operating in the United States by the United States Department of Defense.

The legislation enacted the following

1. By Jan. 1, 2022, the Department of Management Services (DMS) was to publish on their website a list of approved manufacturers whose drones may be purchased or acquired and used by a governmental agency.
2. By July 1, 2022, a governmental agency that uses any drone not produced by an approved manufacturer shall submit to the department a comprehensive plan for discontinuing its use.
3. By Jan. 1, 2023, all governmental agencies must discontinue the use of drones not produced by an approved manufacturer.
4. The DMS shall establish by rule defining minimum security requirements for governmental agency drone use.

The District developed comprehensive plans for discontinuing our use of several drones, including all DJI, Quantum Systems, and Hyllo drones. Further, our Technical Development Department and other District leadership worked closely with FMCA membership, technical experts, and industry partners to devise a position statement on 934.50 FS and educate DMS on the use of drones in the state's mosquito control efforts.

The overall goal is to assist DMS with the creation of the 60GG-2.0075 rule, which will set security standards for drone use by government agencies, particularly for the continued use of drones for mosquito control material applications.



Community engagement is a continual, ever-changing process where a mosquito control program routinely interacts with the public to create trust, increase knowledge, build relationships, and understand citizen perceptions and behaviors. The Public Relations/Education Department continues to increase the District's reach to its community as part of this agency's integrated mosquito management program, from classroom curricula to tours of the District's campus.

The limitations posed by COVID-19 restrictions began to ease, and Public Outreach Specialist Andrea McKinney was again allowed into local classrooms. With a program designed around insect life-cycle curriculum, she was able to reach 1,638 second-grade students. Another 497 children learned how to "Fight the Bite" during summer camp presentations conducted by McKinney.

The staff received an invitation from the Coordinator of Secondary Sciences & Environmental Studies at Collier County Public Schools (CCPS) to create a video using a "real world" example of the scientific method in the District's laboratory.

The film demonstrated the purpose and method of performing bottle bioassays to test local mosquitoes for pesticide resistance while using the Orlando 1952 strain of *Aedes aegypti* mosquitoes as a control. The film also included information about biological mosquito controls, how mosquitoes are blood-fed in the lab, the process of pre- and post-treatment counts, and various application methods. The finished film was made available to CCPS science teachers to use throughout the school year.

Public events and gatherings slowly began to reoccur and groups



2021-22 PR/Education At A Glance

- 58 Outreach events
- 51 Media stories
- 16 Campus tours
- 13 Community presentations
- 1,638 Students reached in classrooms



The District's aerial fleet received international recognition this year when two separate magazines included the aircraft in stories about helicopters' use in controlling mosquitoes. On two occasions, photographers spent time with the District's pilots in flight to capture the fleet in use.

started visiting the District campus for tours. Staff welcomed 16 groups to learn first-hand how treatment missions are determined, an overview of activities in the laboratory, drone demonstrations, gain knowledge of application systems and materials, and see the aerial fleet.

Civic groups and organizations also began to conduct in-person meetings again, and District staff addressed audiences at 13 events. In addition to civic clubs, Homeowner Associations, and political groups, this year the Big Cypress National Preserve requested that a District representative speak with their seasonal commercial operators. It was well received and now the District staff is part of all subsequent operators' trainings.

The community was ready for the return of parades to mark holidays, and the PR/ Education staff created themed floats for each event. The staff was joined by members of the District's Board of Commissioners and District employees during the activities.

Relationships with local print and broadcast media resulted more than 50 stories about Collier Mosquito Control District. The topics receiving the most coverage included news of West Nile virus transmission, and one incidence of a local Dengue fever transmission.



The Administration Department strives to support the District's employees and residents. As the science and technology of mosquito control continues to evolve within the District, so too does the role of its Administrative team.

Along with the rest of the District, the Department experienced significant challenges this year. However, through prudent planning and forward thinking, the Administration team has helped to position the District for a new project: construction of headquarters at the Immokalee Regional Airport.

The District's Board of Commissioners selected an architect/engineer team this year to develop plans and begin construction. The Administration staff's financial expertise has contributed to orchestrating the financial oversight of a project that will shape the future of this District.

Working side by side with the Director of Facility Maintenance Butch May, Administration staff helped oversee and coordinate the completion of District headquarters renovations this year. A facelift to the current facility was many years in the making and finally came to fruition in April 2022. Amidst the renovations and displacement of staff, our IT department ensured employees remained connected and online. The renovations provided the District's growing staff with very necessary space until a larger facility in Immokalee is available.

Thanks to astute planning by the District's IT Department, the installation of a new phone system earlier in the year allowed communication among staff and the District's public throughout the time employees were displaced.

The 2021-22 budget was adopted by the Board of Commissioners in September 2021 using a millage rate of 0.1609 mills – the rolled-back rate. This rate generated the prior year's tax revenue, less certain exceptions. The millage rate produces \$16.09 per \$100,000 of taxable property value for those within District boundaries. All statutory requirements were met as defined by the Florida Department of Revenue, Property Tax Oversight Department, utilizing the Truth in Millage process (TRIM).

An employee benefit – originally established to fund retirees' health insurance premiums for a set number of years – was "sunsetted" in 2016. To honor the promise made to those retirees (and to contain the future financial liability to the District), a Trust was established. This Retiree Benefit Trust is managed by the Administration department. During the fiscal year the trust fund reached a fully-funded level for the first time since inception.

The District continues its membership in a self-funded consortium which consists of Florida public entities, providing cost advantages via volume pricing and reduced administrative costs. United Health Care remains the preferred provider organization (PPO).

For the seventh consecutive year, employees and their dependents over the age of 18 were encouraged to participate in a healthy living (wellness) program. This was the fourth year we used Go365, a wellness program managed through Humana Healthcare. Go365 incorporates a biometric screening, health assessment, and an interactive wellness website/smart phone application. Those who participate earn health insurance premium discounts as well as other rewards.

During FY2021-22, the District was financially audited by Grau & Associates for the third year as part of a five-year contract with a clause for yearly renewal thereafter.

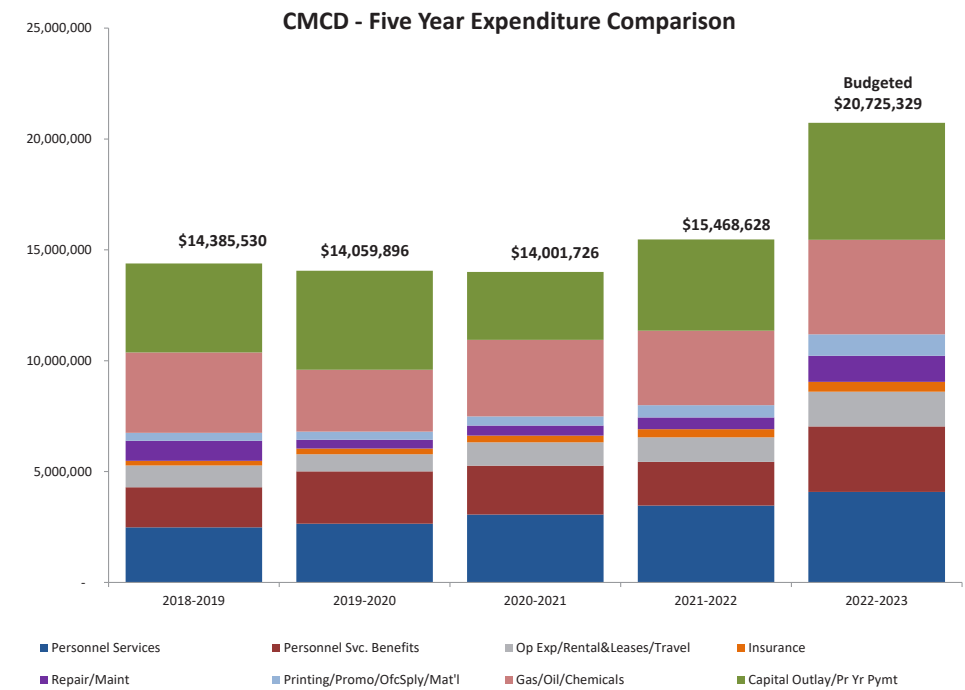
The District continues to employ the services of Bond, Schoeneck, and King, with Bill Owens serving as District Counsel.

The District budgets for and purchases control materials based on average usage over time. Carryover of adult and larval control materials for use during the 2023 season is valued at \$2,922,557, representing a dollar increase in chemical of \$452,702, or 18 percent. Mosquito control product inventory consists of four different adulticides and 10 types of larvicides. Larvicide usage has increased substantially over the recent years and is currently used in a variety of habitats and circumstances.

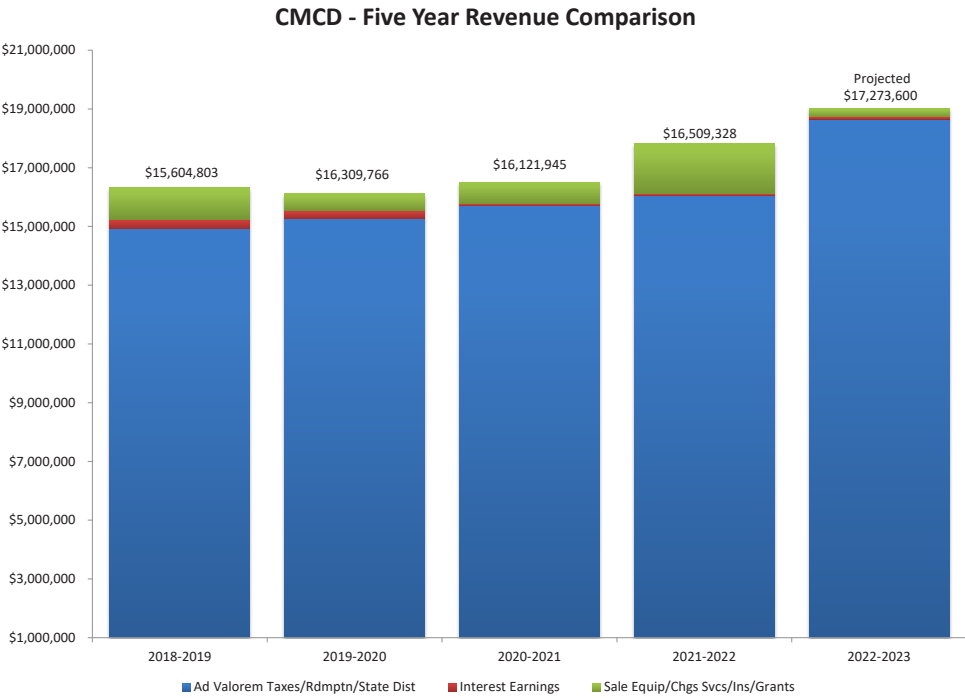
Projected expenses and plans for FY2022-23
Begin design and build phase for new District structures at the Immokalee Airport based on our future expansion needs
Conclude cleanup and restoration of current District headquarters from Hurricane Ian
Continue ongoing efforts to protect the District against future natural disasters
Continue training staff in new technologies to enhance the capabilities of the District
Continue evaluation of alternative control materials

TOTAL REVENUE  
\$17,822,811

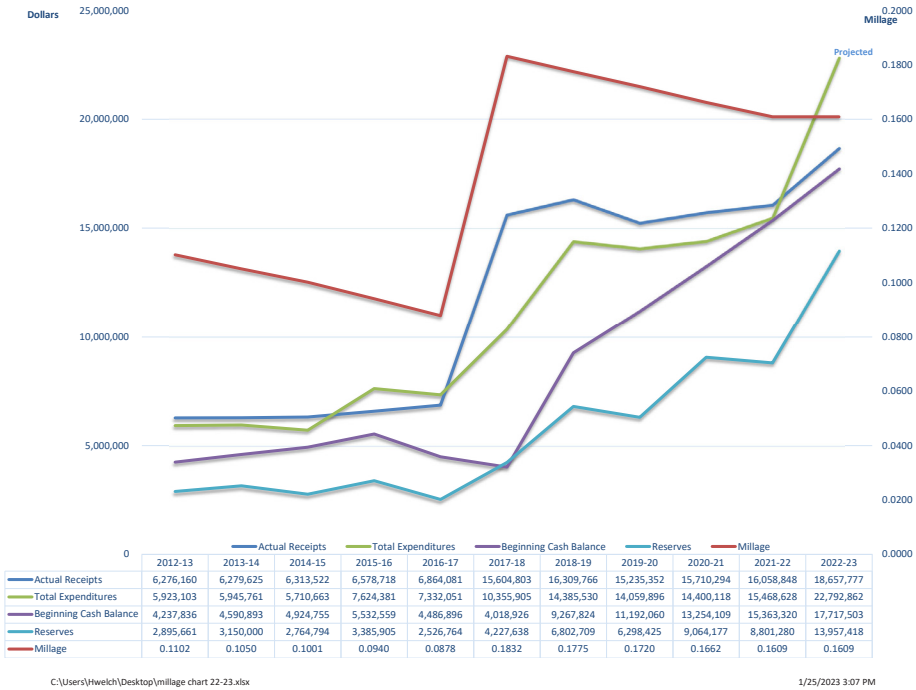
Total revenue for FY2021-22 was \$17,822,811 which included \$455,715 from the Ave Maria Stewardship Community District for contractual mosquito control activities. Fiscal year expenditures were \$15,468,628; a 10 percent increase from the prior fiscal year.



The exact amount of expenditures, revenues, and fund balance will be verified by the auditors and released in early 2023 as part of the annual audit, and subsequent Financial Statements, which will be available on the District's website (cmcd.org).



Collier Mosquito Control District  
Ad Valorem Receipts/Millage Rates



ENDING CASH BALANCE  
\$17,717,503

The District concluded FY2021-22 with an ending cash balance of \$17,717,503. The budget was balanced, and the District maintained satisfactory reserves, as well as readily accessible funds for FY2022-23

Five-Year Comparison of Reserves





# Annual Report 2021-22

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