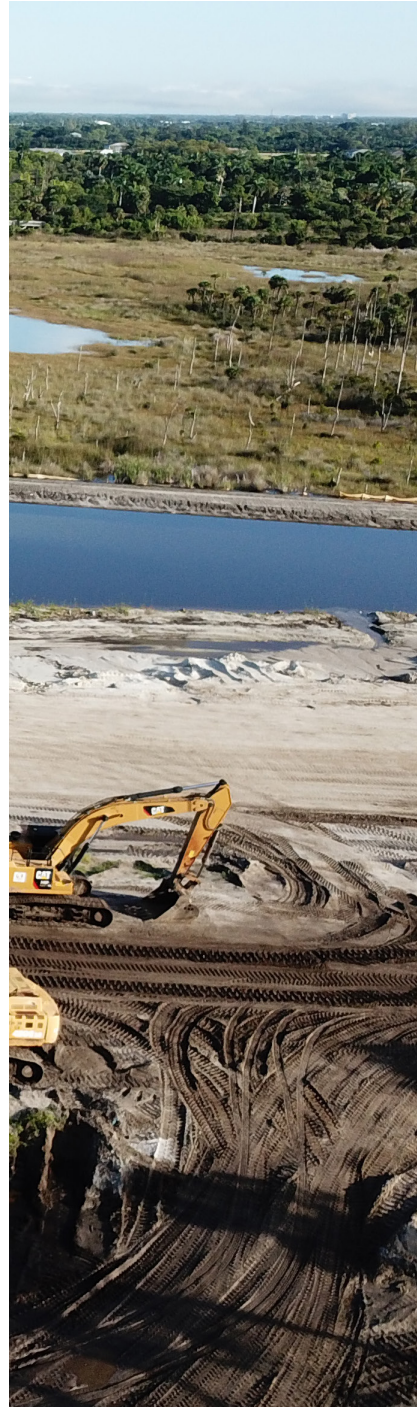


Collier Mosquito Control District

ANNUAL REPORT

Annual Report for the year
ended Sept. 31, 2021



CONTROLLING NUISANCE AND
DISEASE-BEARING MOSQUITOES SINCE 1950

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2021 AT A GLANCE

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.

58%
INCREASE

LARVICIDE APPLIED: GRANULAR (20K ACRES) AND LIQUID (25K ACRES)

2,400
ACRES

AREAS MAPPED BY DRONES USING LIDAR TECHNOLOGY

9K
FISH

MOSQUITOFISH DISTRIBUTED TO RESIDENTS

1,400
POOLS TESTED

MOSQUITO POOLS TESTED FOR WEST NILE VIRUS

>45
MEETINGS

LEADERSHIP DISCUSSED EXPANSION WITH COMMUNITY PARTNERS & POLICY MAKERS

4
SPECIES

RESEARCH DETECTED VECTOR SPECIES NEW TO COLLIER COUNTY

CHAIR'S MESSAGE



Sandra Lee Buxton
Board Chair

This year has been a busy one for not only District employees, but its Board as well. It has been gratifying to serve as both a participant and a witness to the achievements made possible by several years of strategic planning, prudent financial decisions, and mindful policy guidance. I am happy to report that the District is successfully poised for much-needed growth in its resources, facilities, and even its boundaries to keep pace with a booming population in Collier County.

A fine example of the District keeping pace with growth in the community was this Board's unanimous support for Resolution #10-2020-2021 in July. The Resolution approved expansion of the District's boundaries to better protect the health and comfort of Collier's rapidly growing population. The Collier Mosquito Control District Board supports expansion of the existing boundaries to include an additional 393 square miles, most of which lie in eastern portions of the county where new villages have been approved for development. We anticipate the District's local bill addressing the expanded boundaries will soon receive sponsorship from a member of the Collier Legislative Delegation, then proceed to the 2022 Legislative session in Tallahassee.

The growth of communities in eastern

Collier County will be well served by establishing a second location for mosquito control operations in Immokalee. Negotiations began this year to secure space for a new facility to be constructed at the airport. Again, years of planning and careful budgeting will make it possible for staff and aerial assets to be based there. The Immokalee site will also serve as an alternative hub for operations in the event a tropical storm damages the campus located at Naples Airport.

As the Board's Chair, I am proud to say that our entire, growing community is well represented by the District's Commissioners and staff. The Board serves our taxpayers as the fiscal guardians of their ad valorem funding for mosquito control services, while maintaining a keen focus on meeting the mission of protecting public health and controlling nuisance mosquitoes. Our meetings are open to the public, and we encourage participation from those whom we represent. I anticipate that the next year will be equally fast-paced and chock-full of initiatives related to this District's strategically planned growth.

I wish to thank the dedicated staff at the District for their unwavering commitment to a mission that contributes to an enviable quality of life here in Southwest Florida for residents and visitors alike.

During the past several years, those involved with the work of the Collier Mosquito Control District have moved toward a culture of action. The year 2021 exemplified this notion as many aspects of the District's Strategic Plan have advanced from idea to implementation. These efforts – aimed at achieving the overarching goal of meeting a growing community's public health needs for decades to come – require tenacity and patience.

District expansion

The continued influx of those who want to call Collier County home make District expansion periodically necessary. The combined efforts of the District's Board, Counsel and staff proved formidable in this overdue event, but saw limited success in 2021. The District's policy guiding an expansion process requires Collier's Board of County Commissioners (BCC) approve proposed new boundaries prior to any Charter revision in Tallahassee. Ultimately, the BCC resolved to approve the District's request, less and except public lands.

Fleet rejuvenation

In June of 2021, the District took delivery

of its first Ikhana Twin Otter X-2 aircraft. Built to "better-than-new" standards, once on-site in Naples, work began to install and test the spray system.

Naples headquarters remodeling

Facilities designed and built 30 years ago have provided more than their value to the District and its residents. Times change though, and a clever re-imagining of the available space became necessary. A significant remodel project began this year, which should provide functional space for an increasing number of productive and creative staff.

Immokalee Airport lease negotiations

A growing community and need for mosquito control services to the east of our current District boundaries have signaled that the time is right to pursue a land lease at the Immokalee Airport. This lease, under negotiation for the whole of 2021, will provide flexible space and operational options for a growing District; not to mention sound protection from rising floodwaters during future storm events.

DIRECTOR'S MESSAGE



Patrick Linn, MS, MSHAPI
Executive Director

YEAR IN REVIEW

GROWTH WAS THE THEME FOR MANY ASPECTS OF THE DISTRICT IN 2020-21 AS COLLIER COUNTY EXPERIENCED A RAPID INCREASE IN POPULATION

Explosive growth and new villages approved for development beyond the District's current 401-square-mile borders prompted leadership to embark on the process of expanding its boundaries-- its 10th expansion since it was founded in 1950. This expansion represents the continued commitment to Collier County residents to provide services for the control of disease-bearing and nuisance mosquitoes.

The District's leadership launched a feasibility study and proactively arranged meetings with community leaders, elected officials, and property owners/managers to discuss a proposed boundary expansion, which will double the size to just more than 800 square miles.

THE DISTRICT'S BOARD APPROVED A RESOLUTION IN JULY, CITING FIVE INDICATORS WARRANTING THE EXPANSION



1

RAPIDLY INCREASING PERMANENT POPULATION

2

INCREASING THREAT OF MOSQUITO-BORNE DISEASE

3

CONTINUOUS ADVANCES IN THE DISTRICT'S INTEGRATED MOSQUITO MANAGEMENT PROGRAM

4

ECOLOGICAL CONSIDERATIONS AS THE RESULT OF A CHANGING GEOGRAPHY

5

ACCESS TO IMPROVING TECHNOLOGIES



OPERATIONS DEPARTMENT

APPLICATIONS OF BOTH GRANULAR AND LIQUID LARVICIDES WERE INCREASED TO COMBAT WEST NILE VIRUS

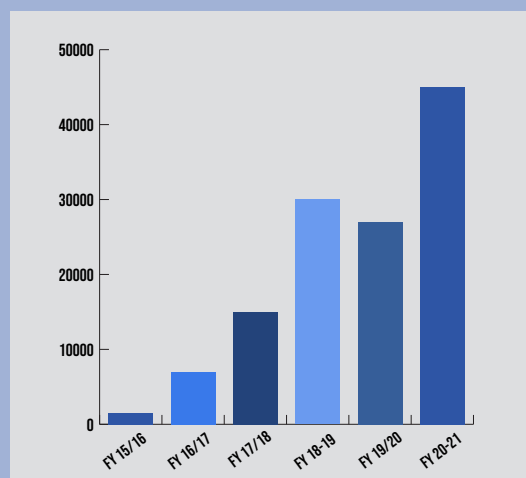
Larvicide usage increased by 58 percent in 2020-2021 compared to 2019-2020, in part due to the District's aggressive larvicide approach to combating West Nile virus (WNV) during the year. More than 160,000 lbs. of granular larvicide were applied this year. Granular applications using the District's Bell 407 and MD 500 helicopters, and Vortex TR Granular Spreader increased by 71 percent during the year.

Pretreatment of the District's salt marsh habitat areas increased by 22 percent with more than 5,000 acres treated with nearly 41,000 lbs. of Fourstar BTI CRG. The District also continued the use of the organic extended-release materials – VectoMax FG and Natular G30 – for targeting freshwater mosquito species in the inland areas of the District. The Operations department increased applications targeting freshwater mosquito

species by 88 percent with more than 14,000 acres treated with over 60,000 lbs of Natular G30 and 53,000 lbs. of VectoMax FG. Further, 750 acres were targeted for single brood applications using 6,000 lbs. of VectoPrime FG.

Ground-based applications of liquid larvicide also increased by 50 percent in 2020-2021. In response to WNV concerns, field technicians increased applications of VectoBac 12AS targeting ditches and swales by 65 percent with 5,680 acres treated with 178 gallons of material. Applications targeting container-inhabiting mosquito species using the District's A1 Super Duty and Buffalo Turbine mist sprayers also increased by 48 percent. The District applied 5,850 lbs. of VectoBac WDG and 106 gallons of Natular SC to more than 12,500 acres of residential and industrial locations.

TOTALS OF LARVICIDES USED



NEW LARVICIDE INCREASED EFFICIENCY

Operations started using a new wide-area larvicide, Natular SC, to target container-inhabiting species in residential neighborhoods.

Logistics Coordinator Sara Grant, performed an efficiency study on the product and determined that Natular SC had some benefit over VectoBac WDG. These benefits include a reduction in work hours needed during the mix process, in which 0.25 work-hours are needed for Natular SC and three work-hours are needed for VectoBac WDG.

Further, the risk of inhalation of the product is reduced as Natular SC is a suspension concentrate

versus a water dispersible granule which creates dust during the mix process.

Lastly, the product can target a wider range of species than VectoBac WDG. While the product has potential toxicity to pollinators, usage in the late evening hours mitigated those risks. However, mosquitoes developing resistance to the product's active ingredient is a concern; therefore, Natular SC serves as a great rotational product with VectoBac WDG to enhance efficiency of District's mist sprayers.

With the District's growing



A FULL TANK OF NATULAR SC COVERS NEARLY 400 ACRES, TWICE AS MUCH AS A FULL TANK OF VECTOBAC WDG

larvicide program, the Operations department looked for innovative techniques to manage the increased capacity of larvicide missions, enhance safety, and streamline the granular loading process for aerial applications.



INNOVATIVE EQUIPMENT CREATED TO EASE LARVICIDING APPLICATIONS

The Operations, Technical Development and Facilities Maintenance departments worked together to build in-house an automated granular loader. Modified from an agricultural seeder, the granular loader allows for more granular larvicide to be loaded in a matter of minutes from large 1000 lb. totes compared to the smaller 35-40 lb. bags which had to be loaded by hand. As the majority of our granular loading occurs "hot" (while the helicopter is still running), the new granular loader addresses several safety concerns and reduces the number of staff

needed during the "hot loading zone."

Previously, seven trained staff members were required for the loading process; the automated granular loader reduces the number of staff needed to 3-4, thus reducing work-hours needed during the loading process.

Using larger 1,000 lb. totes also reduces trash at the loading site – always a concern due to bags getting trapped in the helicopter's main rotor system or cause a staff member to misstep in the hot loading zone. The Operations department plans to have the new

automated granular loader in full operation in 2022.

This year, the Operations department also added a new A1 Super Duty larvicide sprayer to its fleet of ground-based larvicide vehicles. The addition of the new A1 Super Duty allows Operations to cover more acreage when targeting container-inhabiting mosquito species, such as *Aedes aegypti* and *Culex quinquefasciatus*.

The Department also welcomed Field Technician Jacob Chappa to its staff.



STAFF ACCOMPLISHMENTS

Travel restrictions implemented by the COVID-19 pandemic limited staff's ability to attend many in-person trainings, but thankfully virtual class options were offered. A complete list of successful completions follows:

- Jim Delie completed the Twin Otter maintenance training with Flight Safety International through a virtual class program.
- Mike McDonald completed MD500 maintenance training at MD Helicopters in Mesa, Ariz.
- Wayne Luettich completed the Honeywell TPE331 line maintenance class at Flight Safety International in Wichita, Kan.
- Jim Delie completed the Pratt and Whitney PT6 field maintenance training (for the Twin Otter) with Flight Safety International in Wichita., Kan.
- Mark Trombley and Jim Delie earned their Public Health Licenses.

NEW ADDITIONS

- A new Pro Blend pesticide mixing device from Micro Matic was purchased. This mixes control materials in their storage drums prior to loading into the aircraft.
- Our team welcomed Aircraft Maintenance Leith House and Mark Trombley.

LOOKING AHEAD

- The District's new Twin Otter arrived from Ikhana late in the year, and much preparation was required before the ship could be considered for treatment applications. The work included installing a spray system and the AgNav guidance system. These projects were steadily moving forward, and it's expected that the Twin Otter will be ready for its first mission in early spring 2022.
- As well, the arrival of a new Bell 407 is expected to arrive in the spring.

**HIGHLY TRAINED AND ENGAGED PERSONNEL
CONTINUED TO MEET THE CHALLENGE
OF A GROWING FLEET**



The District lost its well-seasoned and fine colleague – Chris Laidlaw-Bell – this year. Chris' several decades' service to the District left not only a hole in our collective hearts, but also in leadership of our Flight department.

Although a difficult transition to make, Pilot Kevin Dunleavy rose with grace to the task of taking over Chief Pilot duties and responsibilities this year. Our pilot staff remains closely

knit and has remained supportive of Dunleavy's position change.

With new aircraft arriving and older aircraft still in use, the Flight department faced both training and logistical challenges in 2021.

Transition from older to new technologies on the flight deck and in our product-delivery systems have served only to increase the resolve of this department's personnel.

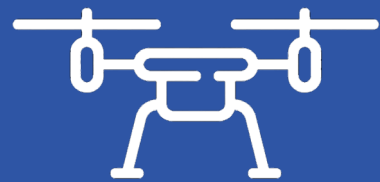
CHRIS LAIDLAW BELL

1957-2021

For more than two decades, Chris enthusiastically dedicated himself to the District's mission, all the while irreverent and full of sass, even as his health waned. His words remained to the end, "hyper-alloy combat chassis, mate," referring to his enduring spirit.

A remarkable soul, Chris was committed to his friends, animals, family, and the mission. We miss him greatly and remain inspired by his spirit, humor, and grit.





TECHNICAL DEVELOPMENT

THE TECHNICAL DEVELOPMENT DEPARTMENT WAS HEAVILY INVOLVED IN THE DISTRICT'S GIS AND FLIGHT NAVIGATION NEEDS AS THEY PLANNED TREATMENT MISSIONS

The Department assisted with the planning and execution of 65 aerial larvicide missions (154,253 lbs.). With the increase in our larvicide efforts, this Department's ability to create new treatment blocks on an as-needed basis has been essential to Operations' rapid action for the application of larvicide where it was most needed.

With the integration of new adulticide materials—such as Duet HD—the Department also created new treatment blocks for aerial adulticiding. The differing characteristics between our three adulticides resulted in the need for different treatment blocks for each material. Altogether, 30 different treatment blocks were created, uploaded into Fieldseeker and used for both fixed and rotary wing aircraft.

The Department also plays a significant role in the GIS tracking of the current District boundaries,

restricted areas, and public lands. The staff manages a repository of GIS files for these locations, using them for treatment missions, research/surveillance projects, and determining the necessity of District expansion. They assisted with creating maps for the proposed expanded boundaries, and developed GIS maps that were amended numerous times during the District's feasibility study.

DRONE LARVICIDE APPLICATIONS

In 2021, the Department received the Hylio AG-110 UAS platform for mosquito control applications. The AG-110 was calibrated for Fourstar BTI CRG, VectoMax FG, and Natular G30. In collaboration with the Research department, extensive calibration and characterization was performed on the spray system and established an effective swath of 20-25 ft.

The AG-110 then completed 24 treatment missions primarily

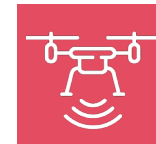
targeting West Nile vector mosquitoes in the county's inland areas. The use of the AG-110 greatly complemented the District's larvicide program by targeting areas too small for helicopter applications but too large for the Vortex TR Granular Spreader. In total, 1,042 lbs. were applied to 120 acres using the device. Three treatment missions occurred in Ave Maria applying VectoMax FG, 20 treatment missions occurred in Immokalee applying VectoMax FG, and one pre-treatment mission occurred in Naples applying Fourstar BTI CRG. Drone larvicide treatments resulted in an average of 95 percent reduction in larval production in key habitat areas.

They also worked on a proof-of-concept project for larvicide tablet applications. Using the DJI Mavic Pro Platinum, 20 tablets were applied to small hard-to-reach areas not suited for wheeled vehicles using a custom-made payload release mechanism.



TEROS PROJECT

In 2020-2021, the Department began investigating the feasibility of using the Navmar Applied Sciences Corporation (NASC) Teros™ unmanned system for mosquito control. Department personnel visited NASC in 2021 and began producing a Concept of Operations (CONOPS) manual for the use of the Teros for mosquito control. This required weekly consulting services with NASC and meetings with FAA representatives. The CONOPS was delivered to the FAA for their review.



UAS HABITAT MAPPING

UAS technology allows for a higher degree of precision when performing inspections of potential mosquito habitat. This year, the District's drones performed 35 mapping flights to assist several research projects, including mapping for the identification of *Mansonia* habitat to help understand the need and feasibility of an aquatic weed program. Mapping was also used to pinpoint eggshell sampling locations in hard-to-reach coastal mangrove areas for the identification of salt marsh mosquito habitat.

Most of the Department's mapping flights focused on operational needs. Many were used as initial inspections and reconnaissance for larvicide applications. Others were used to modify or create new larvicide treatment blocks.

The Department contracted with Frontier Precision for Light Detection and Ranging (LiDAR) work to gain in-depth information on the topography of current larvicide application sites. Using a Matrice 600 Pro with the YellowScan Surveyor Ultra LiDAR unit, they conducted aerial surveys of 16 locations throughout the District covering 2,400 acres. Overall, 1.25 TB of data was used to identify the terrain elevations to reduce the amount of control material being washed away with the tidal flow.

Using the District's drones, the staff also assisted with several projects and presentations, including:

- District Expansion – Imagery captured the growth and development occurring near the boundary of Rookery Bay NERR and the current District boundaries.

- Mapping progress of the ramp remediation and the demolition of vehicle maintenance building provided real-time imagery for planning and tracking the changes occurring at District Headquarters.
- Imagery for the Collier County Community Redevelopment Agency's annual report on improvements to the Bayshore/Gateway Triangle redevelopment areas assisted Collier County with future planning and community outreach efforts to improve the neighborhood. The images also showed potential mosquito habitat which will aid in future treatments.
- Inspection flights of the Naples Airport Authority's surrounding area helped mitigate nesting of returning eagles near runways to prevent potential bird strikes.



3-D PRINTER

The Department's personnel have been operating the District's Ultimaker 2+ 3D printer. This printer saves time and costs required to order parts and allows them to custom build equipment rather than employ a vendor's services. During the year, the 3-D printer was used for printing granular spreader components for the AG-110. It was also used to design:

- Vehicle floor covers for the department's van.
- An air conditioning vent to cool UAS batteries while charging in the van.
- CDC-light trap lid covers for UAS placement with the emergence traps.
- UAS battery retainer for adulticiding kit.



WIND INFORMATION

Wind towers located at two static locations within the district - Immokalee (300 ft) and County Barn (260 ft) – are used for aerial adulticide applications to determine offset during flight. In 2021, the Department began evaluating the use of the District's DJI Mavic Pro Platinum UAS to determine wind speed and direction for use in calculating offset needed during aerial adulticide applications. Here's how it works:

- The drone pilot collects wind data in the treatment area at various altitudes through the entirety of the wind column to get the average wind velocity up to and including 300 ft. (application height via airplane).
- Real-time wind information is relayed to the plane's pilot at various time points throughout the treatment mission so that offset adjustments can be made accordingly.
- This allows for greater precision in determining the proper offset for aerial adulticiding missions, providing real-time and location-specific wind information of the entire air column.

Using this method of determining windspeed, the District made 58 aerial adulticide missions:

- 28 missions (56 percent) have only used UAS wind information
- 18 missions (20 percent) have used both wind tower and UAS wind information
- 12 missions (24 percent) have only used wind tower information.



RESEARCH DEPARTMENT

27

West Nile virus
mosquito pools
identified

9K +

Mosquito fish
distributed to
residents

4

Species of mosquitos
new to Collier County
identified

1

New mode of
action control
material tested

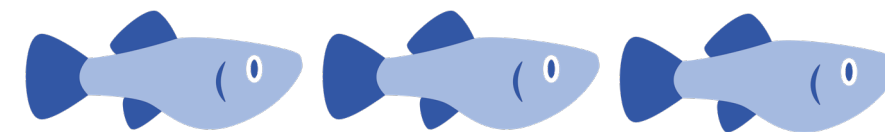
IT WAS A BUSY YEAR FOR DISEASE VECTOR AND ARBOVIRUS SURVEILLANCE, WITH THE RESEARCH DEPARTMENT TRAPPING AND TESTING MORE MOSQUITO POOLS THAN EVER BEFORE

Collier County saw another year of heightened West Nile virus (WNV) activity, keeping our research and operations teams hard at work tracking *Culex* mosquito populations and performing treatment missions. Travel-associated mosquito-borne disease was nearly stagnant in Collier County, with only one imported human case of malaria.

The District continued surveillance for endemic arboviruses, including WNV, Saint Louis Encephalitis virus, and Eastern Equine Encephalitis virus. Research and Operations staff collected CDC light traps from 36 locations (858 collections) and Gravid traps from eight locations (216 collections). Research staff tested more than 1,400 mosquito pools containing *Culex* mosquitoes for WNV using real-time PCR. In July 2021, the Research team began detecting WNV in *Culex* mosquito pools tested in-house. This led to the Florida Department of Health's decision to issue a Mosquito Borne Illness Advisory for Collier County. In August, human cases began to

emerge, resulting in the state's declaration of a Mosquito Borne Illness Alert in the county. Altogether, four WNV human cases were reported and 27 WNV positive mosquito pools were identified. With virus actively circulating in Collier's mosquitoes for a second year, the District intensified larval mosquito control applications. Further, to protect the health of our field staff, the District temporarily suspended human landing rate counts. Trap counts and WNV-positive mosquito pools became the primary drivers of the District's aerial adulticide applications.

The Research department also continued surveillance for *Aedes* mosquitoes using BG-Sentinel traps from 14 locations (212 collections). Due to the reduced threat of *Aedes* transmitted arboviruses, no *Aedes* mosquito pools were tested; however, data was used to guide Buffalo Turbine and A1 Mister treatments. No local transmission of any *Aedes* transmitted arbovirus was reported in the state in 2021.



MOSQUITO FISH PROGRAM

In 2021, our mosquito fish program was in high demand. District Biologist Rachel Bales coordinated appointments for District residents to obtain *Gambusia holbrooki* (also known as mosquito fish) as calls and emails poured in.

The Communications department assisted the Research department with creating online forms on the District's new website to streamline the appointment process, allowing Bales to better plan and prepare distribution events.

The District allocated mosquito fish to 93 households, several of which were repeat "customers" from previous years. The Research department estimated to have issued just over 9,000 mosquito fish this year. This surpassed our "curbside pickup" totals from last year of 4,000 fish to 64 households. Residents report they commonly place mosquito fish in small ponds and ditches.

It is safe to say that the mosquito fish program is officially a well-known and utilized tool by District residents.

Further, FGCU 360 Magazine featured Bales and her role as a biologist in the mosquito fish program, recognizing her as a Florida Gulf Coast University graduate in a STEM career.

EARLY STAGES OF AN AQUATICS PROGRAM

The District continued to battle high numbers of *Mansonia* mosquitoes in Collier's inland areas. *Mansonia* mosquito larvae attach to the roots of floating aquatic weeds, primarily water lettuce and water hyacinth. Until recently, the District did not have an aquatic plant or *Mansonia* production site monitoring program. Throughout the year, Biologist Rachel Bales used CDC-light and emergence trap data of the *Mansonia*, which helped to define the scope and need for an aquatic weed control program in Collier County.

As the District began to develop an operational approach to aquatics, Bales performed evaluations on various emergence trap designs to maximize capture efficiency.

The Research department compared the use of standard passive emergence traps to a modified emergence trap design. In addition, Bales devised floating battery platforms to reduce damage caused to batteries by rapidly rising water.

The resulting modified emergence trap design in combination with floating battery platforms has enhanced our efficiency in collecting mosquito species associated with aquatic plants. Through this trapping method, the District has been able to map and define mosquito species derived from aquatic weed habitat. Using this novel trap design, we can more efficiently identify mosquito production sites and estimate *Mansonia* production per acre of water lettuce.

With this information, we can target these areas for larvicide application of immature stages of *Mansonia* species and in the future designate mechanical removal or herbicide application of aquatic weeds. This work was published in the Journal of the Florida Mosquito Control Association.



COLLABORATIVE RESEARCH PROJECTS

With COVID-19 still in full swing, collaborative research projects were difficult to foster; however, the Research department was willing to take part wherever we could. Research Entomologist Dr. Rebecca Heinig continued her collaboration with Estelle Martin, Assistant Professor at University of Florida, on a project looking at arbovirus diversity in *Culex* mosquitoes. She also started working with Dr. Martin and Dr. Lawrence Reeves, Research Assistant Scientist at the University of Florida, on a project that will utilize bloodmeal analyses to refine vector borne disease risk analysis and prediction models. The District also hosted Kristin Sloyer, a Ph.D. candidate at the University of Florida, several times to identify *Culex cedecei* in District traps. The research provided mosquitoes to Madeline Grucci, a student at Berry College, for her undergraduate research project evaluating dog heartworm parasite incidence in various vector species.

The District also supplied

Aedes aegypti and *Culex quinquefasciatus* mosquitoes to Dr. Eva Buckner, an Assistant Professor at the University of Florida, for studies associated with pyrethroid resistance attributed to metabolic resistance.



INSECTICIDE RESISTANCE MONITORING PROGRAM

The Department staff continued to engage in our insecticide resistance monitoring program. Although limited due to staffing shortages, several populations of *Culex nigripalpus* and *Aedes taeniorhynchus* were monitored for resistance to products used by the District. No significant resistance was identified in either mosquito species.

A research project at the Naples Botanical Garden that involved surveying for bromeliad inhabiting mosquito species and testing them for insecticide resistance was published in the Journal of the Florida Mosquito Control Association. The study identified that

Culex quinquefasciatus, *Culex nigripalpus* and *Aedes albopictus* were the most common species inhabiting the Naples Botanical Gardens bromeliads, with *Culex quinquefasciatus* accounting for nearly 75 percent of all specimens collected. These mosquitoes were highly resistant to pyrethroid-based control materials used by the District.

The Florida Department of Health allocated grant funding to Dr. Eva Buckner at University of Florida, Florida Medical Entomology Laboratory to perform statewide insecticide resistance testing on container inhabiting mosquito species. The research department provided mosquito eggs and potential trap sites to her laboratory. As expected, the majority of the *Aedes aegypti* and *Culex quinquefasciatus* populations were highly resistant to all pyrethroid-based control materials. Unexpectedly, naled resistance was identified in *Aedes aegypti* collected from Golden Gate City. The District plans to continue to monitor of naled resistance and develop an approach for targeting dual-action resistance in Collier's mosquito species.



FIELDSEEKER AND ARC GIS DASHBOARDS

The Operations and Research departments continued to use FieldSeeker to track and record the vast majority of their surveillance and treatment planning. They fully beta-tested and purchased an online webform for submitting service requests and using FieldSeeker/ArcGIS Dashboards to visualize service requests.

Dr. Heinig created several new ArcGIS dashboards to streamline our operational data analyses and help disseminate information across our different departments. These dashboards provide daily visualization of mosquito population densities across the district. For example, one new dashboard allows the Operations Department to compare maps of landing rate counts and trapping data before and after treatment, making it much easier to interpret and assess treatment impact. This dashboard has also facilitated communication between the operations and our flight departments. Unlike our field technicians, our



RESEARCH WELCOMED THE OPPORTUNITY TO TEST A NEW ACTIVE INGREDIENT IN CONTROL MATERIALS FOR ADULT MOSQUITOES

For the past 50 years, mosquito control agencies have only had two modes of action available for the control of adult mosquitoes – organophosphates and pyrethroids. In 2018, the District dramatically increased its usage of pyrethroid-based adulticides and, at the same time, identified pyrethroid resistance in two disease vector species.

In 2021, resistance and developing resistance to the organophosphate, naled, was identified in Collier's *Aedes aegypti*. District personnel teamed up with Valent Biosciences to test a novel mode of action that can effectively target mosquitoes resistant to available adulticides. The product, currently known as VBC-60748, uses the active ingredient abemectin, which is similar to ivermectin and represents the first macrocyclic lactone-based adulticide used as a space spray.

Under an Experimental Use Permit issued by the EPA, ground-based field cage trials were performed against Colliers' pyrethroid-resistant *Culex quinquefasciatus* mosquitoes.

Application of VBC-60748 resulted in nearly 100 percent mortality across the spray path. Conversely, application of the pyrethroid-based adulticide, Merus 3.0, resulted in only 2.6 - 47.8 percent mortality across the spray path. These results will assist with guiding the manufacturer and the EPA on determining the effectiveness of VBC-60748 as a mosquito space spray. If the new adulticide is brought to market, the product will revolutionize our ability to effectively target mosquitoes resistant to currently available adulticides. The research department is anticipating conducting aerial trials in the near future.

pilots don't have a mental inventory of the >100 landing count sites and >60 trap locations that is regularly monitor. The map-based dashboard translates these data into an aerial perspective, which has served as a springboard for interdepartmental discussions for treatment strategies.



NEW SPECIES RECORDS

In 2021, Dr. Heinig identified four new mosquito species that had never been recorded

in Collier County: *Aedes tortilis*, *Culex declarator*, *Culex tarsalis* and *Aedes scapularis*. *Aedes scapularis* is particularly noteworthy. Although this species was initially spotted in the Keys in the 1940s, it was recently rediscovered in Broward and Miami-Dade Counties. Since it is a known vector of multiple arboviruses including yellow fever virus,

Research staff has been paying very close attention to this species' ecology and distribution within the District.

Understanding the dynamics of disease vector populations will assist the District with operational decision making in event of a disease outbreak.



PUBLIC RELATIONS AND OUTREACH

COVID-19 RESTRICTIONS CANCELLED MANY IN-PERSON EVENTS AND CLASSROOM PRESENTATIONS, SO PIVOTING TO VIRTUAL AND VIDEO METHODS -- PLUS A MUSEUM EXHIBIT -- ENSURED THE FLOW OF COMMUNICATION

70
MEDIA EXPOSURES



NEW WEBSITE
LAUNCHED IN APRIL



PRODUCED EDUCATIONAL VIDEO
LESSONS FOR CLASSROOMS

Media stories, virtual presentations, video collaborations, and a summer-long museum exhibit were a few of the methods the Public Relations and Outreach Department staff used to continue community engagement keep the District's messaging in front of our citizens even though in-person events were restricted due to the pandemic.



MEDIA COVERAGE

Hungry for news other than COVID-19, media partners were eager to produce stories with the District to keep our public informed of topics such as the status of West Nile virus, mosquito populations, the spring onslaught of *Aedes taeniorhynchus*, and the

identification of mosquito species new to Collier County.

One such story featured a photo of more than 25,000 mosquitoes caught in a trap over a two-night period. It proved was extremely popular, or "viral," and was featured on news broadcasts from as far away as Missouri, Georgia, and Kansas.

An even larger audience learned about the District's helicopter fleet from its featured story in "Rotor" magazine, which has a global reach. The publication's reporting staff spent a couple of days with our pilots shooting photos of the fleet at work and spoke with staff about the District's mission. The resulting story accurately portrayed our mosquito control operations and the vital role helicopters fill in the District's mission. The piece was titled Man vs. Mosquito: Another case of helicopters

saving lives (in this case human, canine, and equine).

Sharing all these stories in the District's social media created the opportunity for further engagement, as well as posting them in the new blog that is part of the redesigned cmcd.org website. Staff worked with RGB Systems to produce a fresh, mobile-device-friendly, site that incorporated all the features previously found in the District's app. Once the site launched in April, app support was discontinued. Collaboration with the Operations and Research departments ensured that service requests and reports of mosquitoes are easy to access and use for residents on the site, and the data is seamlessly delivered.



VIDEO PRODUCTION

Another new feature on the site is an active link to the District's informative videos on its YouTube channel. Again, with in-person events cancelled, videos provided a quick and entertaining method of sharing information with our public.

Public Outreach Specialist Andrea McKinney worked with Research and Operations staff and a professional videographer to produce an educational video for school classrooms. She also collaborated with a Collier County Public School videographer to produce a

second video for classroom purposes.

The American Mosquito Control Association also used videos to engage with our nation's public, and the District's staff enjoyed participating in them. One video encouraged dumping and draining water, presented in languages from around the globe. The District participated with five distinct languages in the production. Another video demonstrated people applying of repellents throughout the nation. Biologist Rachel Bales was featured in the video applying repellent while in a waist-deep swamp wearing waders.



MUSEUM EXHIBIT

McKinney collaborated with the staff at Collier Museum for an exhibit about the history of mosquito control in the county. Historical news clippings, anecdotal quotes from early settlers, District equipment that was more than 30 years old, and a wide selection of District photos collected throughout the years created an entertaining and informative display that ran from June through the end of August. Director of Facilities Maintenance Butch May helped to locate old District equipment and safely provided its transport for the display.

Of special note, McKinney spent weeks sorting through dozens

and dozens of the District's slide carousels to find photos for the exhibit. As she did so, she digitized the slides into images that are now kept in a repository on the District's computer network.

She also worked to achieve certification as a National Geographic Educator to complement her expertise.



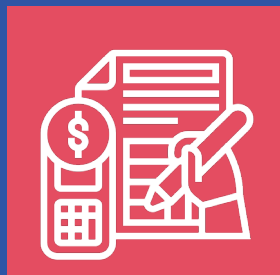
DISTRICT EXPANSION

For the majority of the year, Director of Communication Robin King took the lead on scheduling outreach presentations and meetings with community partners, land owners, and policy makers so that District leadership could discuss expansion.

Virtual options made it possible to meet with dozens of partners at once for engaging discussions. Policy makers such as Collier County Commissioners and State and U.S. legislators visited the our campus for tours and to learn more about the expansion.

A townhall meeting in Ave Maria was expected to draw a large crowd, but with in-person restrictions, only three citizens attended. However, dozens participated online.

In all, more than 40 meetings have been held, with many more anticipated before the local bill is passed in Tallahassee.



ADMINISTRATION

THE TASKS OF THE ADMINISTRATION DEPARTMENT INVOLVE SERVING BOTH THE EMPLOYEES AND RESIDENTS OF THE DISTRICT

Some of the many duties performed by this Department's staff include financial accounting, coordinating the annual audit, accounts payable/receivable, administering personnel training programs, maintaining public records, responding to telephone inquiries, human resources, and reporting to the Board of Commissioners.

They strive to provide quality professional service to the District's public and the employees, and even established their own motto: Provide professional effective assistance in an ethical manner, with integrity, to support the overall goals of the District.



Budget approved, millage set

The 2020-2021 budget was adopted in September of 2020 using a millage rate of 0.1662

mills, which was at the rolled-back rate. This rate generates the prior year's tax revenue, less certain exceptions, which produces \$16.62 per \$100,000 of taxable property per year.

The District's Board of Commissioners sets the millage rate annually. The proper planning and outlook allowed the District to remain at the rolled-back rate while accumulating sufficient reserves for future projects and needs.

The District adheres to the regulatory and statutory requirements set forth by the Florida Department of Revenue, Property Tax Oversight Department, utilizing the Truth in Millage process.



Retirement fund contributions

In accordance with Florida

Statutes, the District also contributes a monthly percentage, based on employee gross wages to the Florida Retirement System (FRS). This percentage is established by the Florida Legislature yearly. Funding the District's retirees' future health benefits is important, thus the Board of Commissioners made discretionary payments totaling \$336,148 to the District's Internal Revenue Code Section 115 Retiree Benefit Trust during the fiscal year as well as a \$200,000 contribution to fund the future liability.



Consortium provides savings

The District continues to use a self-funded program through the Florida Group Health Insurance Consortium (FGHIC), which consists of

Florida public entities. Chief Financial Officer Stacy Welch sits on the Consortium's board and was elected to serve as the Consortium Treasurer. Participation in this program provides the District with cost advantages via volume pricing, thus reducing administration costs. United Health Care remains the preferred provider organization (PPO).

For the sixth consecutive year, employees and their dependents over the age of 18 were encouraged to participate in a healthy-living program. This is the third year using Go365, a wellness program through Humana Healthcare. This program incorporates an annual biometric screening, health assessment, and an interactive wellness website/smart phone application. Those who participate can earn health insurance premium discounts as well as



JORGE SANTIAGO RETIREMENT

The District wished Aircraft Mechanic Jorge Santiago a hearty congratulations on his retirement in April. Santiago served the District nearly 8 years in his position.

Pictured with Jorge (center) are Executive Director Patrick Linn (left) and Director of Aircraft Maintenance Mark Prince (right).

other rewards.

During FY 2020-2021, 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 services of Bond, Schoeneck, and King, continue with Bill Owens serving as District Counsel.



Personnel

The District welcomed five new employees, which equated to a 15 percent increase in personnel expenses.

We congratulated Aircraft Mechanic Jorge Santiago on his retirement (*see above*).

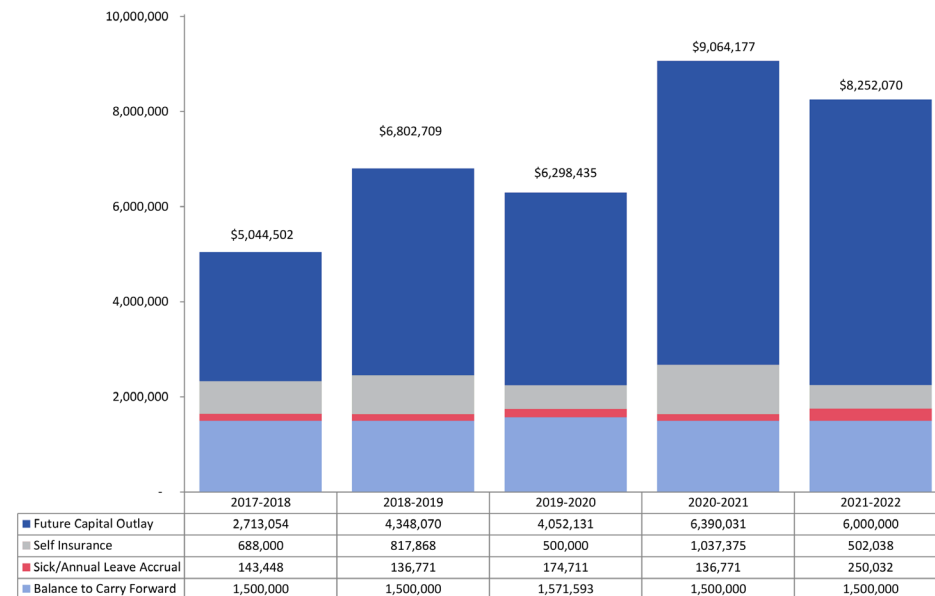
As part of this Department's succession plan, Accounting

Specialist Mark Grazewski earned his master's degree in accounting during the year.

The Administration and Information Technology (IT) departments worked hand-in-hand to coordinate logistics related to the pandemic by facilitating virtual video conferencing/meetings, electronic signatures/filing, and other ancillary activities. IT accomplished the set-up of a Quality Network Appliance Provider (QNAP) as a backup solution, replaced all the network switches, and an additional backup system for disaster recovery was put in service.

IT welcomed IT Support Specialist Patrick Perri to the Department.

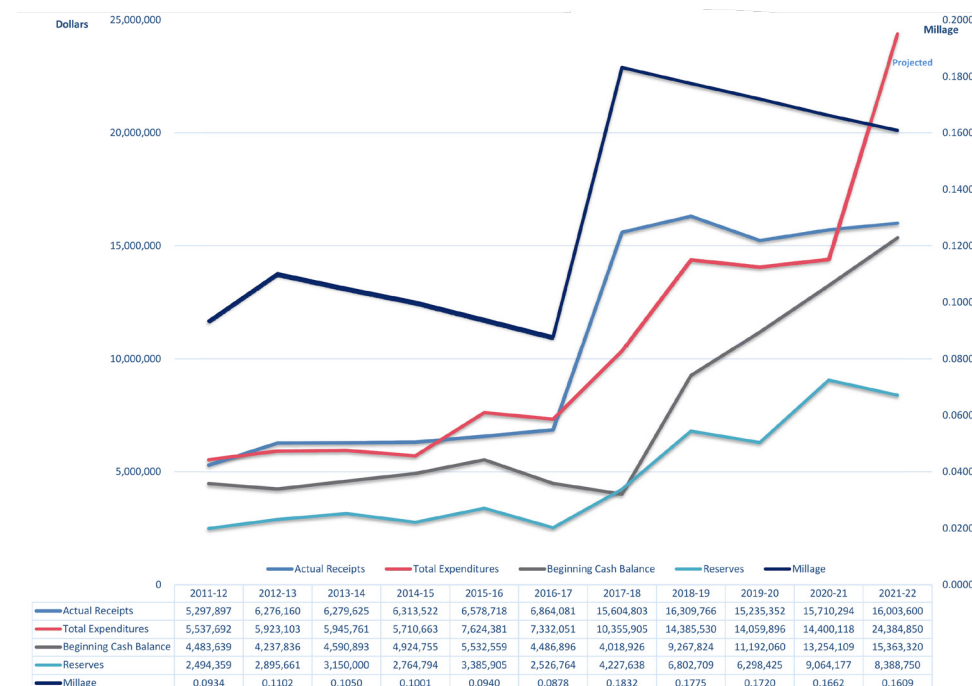
FIVE-YEAR COMPARISON OF RESERVES



The five-year Comparison of Reserves Chart shows the prior four years of reserves and projected reserves for FY 2021-2022.

The reserves indicate that the district is properly conserving funds for the capital improvement project in Immokalee.

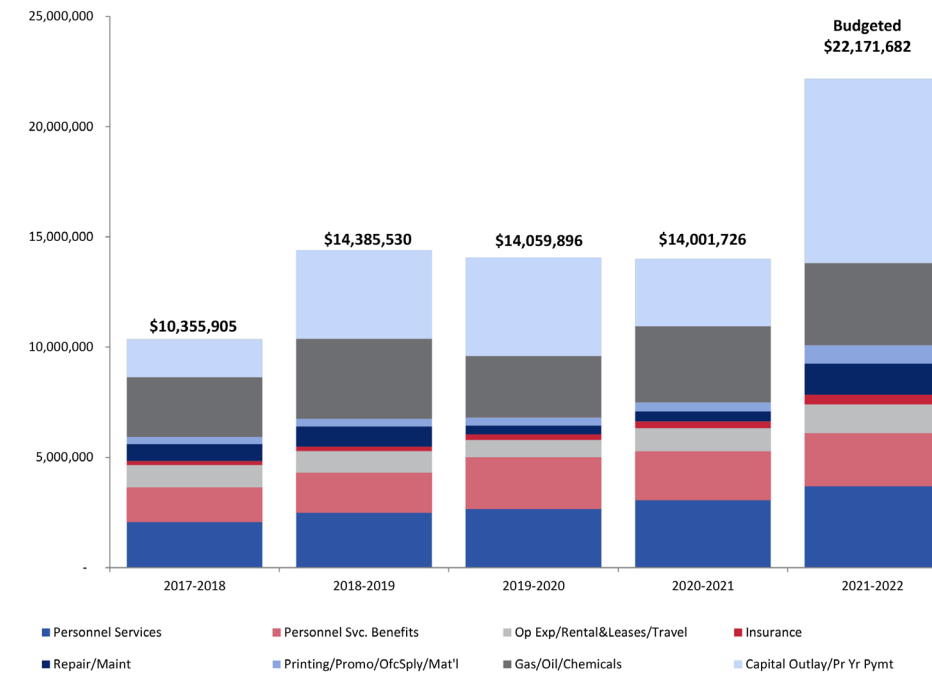
AD VALOREM RECEIPTS/MILLAGE RATES



Total revenue for the Fiscal Year (FY) 2020-21 was \$16,509,328 which is an increase of roughly \$387,000 or 2.5 percent from the previous year. As indicated in the chart above, the District is heavily reliant upon ad valorem

revenue. In addition to property taxes, the District receives revenue from an interlocal agreement with the Ave Maria Stewardship District which accounted for \$524,507 during FY 2020-2021.

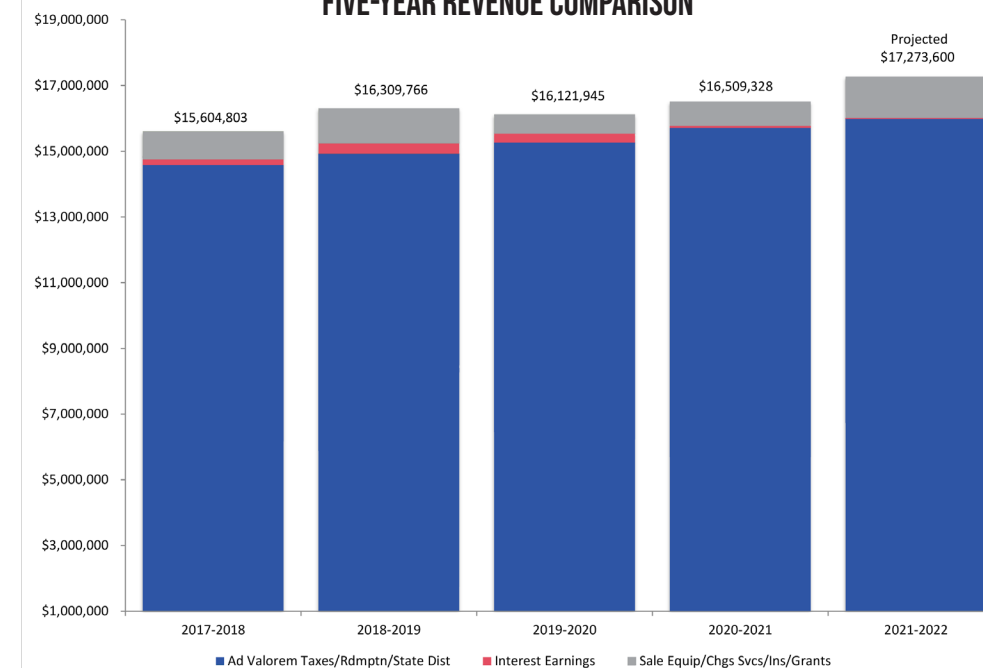
FIVE-YEAR EXPENDITURE COMPARISON



FY 2020-21 expenditures were \$14,001,726. Most of the funds expended in the capital outlay account were attributed to the final payment and delivery of a Twin Otter X2 aircraft. There was an increase in the

chemical account due to a shift in treatment methodology. Currently, mosquito control product inventory consists of four different adulticides and 10 types of larvicides.

FIVE-YEAR REVENUE COMPARISON



The District is amid substantial capital improvement projects in both infrastructure as well as aircraft, earmarking reserves for this reason. Therefore, we are carrying a

larger ending cash balance as these projects ensue. The District concluded fiscal year FY 2020-2021 with an ending cash balance of \$15,363,320.

INDUSTRY CONTRIBUTIONS



TECHNICAL DEVELOPMENT DEPARTMENT

Technical Development Manager Peter Brake

- Member of the American Mosquito Control Association's (AMCA) Legislative and Regulatory UAS subcommittee and the Science and Technology UAS subcommittee
- Vice President for the local chapter of the Experimental Aircraft Association
- Co-founded the Collier County Drone Committee which is composed of representatives from government organizations using various UAS platforms
- Served on Food and Agriculture Organization/World Health Organization working group for the revision of the Aerial Application Guidelines of Pesticides



RESEARCH DEPARTMENT

Director of Research Keira Lucas, Ph.D.

- Chair, AMCA Science and Technology Committee's Sterile Insect Technique Subcommittee
- Assistant Editor, Journal of the Florida Mosquito Control Association
- Subject Editor for Pesticide Efficacy/Evaluation, Journal of the AMCA

Research Entomologist, Rebecca Heinig, Ph.D.

- Chair, Florida Mosquito Control Association (FMCA) Dodd Committee
- Advisor, Biodiversity Enhancement and Control of Non-Native Species (BEACONS)
- Member, AMCA Science and Technology Committee



PUBLIC RELATIONS/EDUCATION DEPARTMENT

Director of Communication Robin King

- South Atlantic Region Representative of the American Mosquito Control Association's Public Relations Committee
- Board member of the local chapter of the Public Relations Society of America



ADMINISTRATION DEPARTMENT

Chief Financial Officer Stacy Welch

- Treasurer, Florida Group Health Insurance Consortium (FGHIC)



2020-21 STAFF TRAININGS

OCTOBER

Aquatic Weed Control Short Course

NOVEMBER

Aviation Training

JANUARY

Chemical Spill Training
GFOA Governmental GAAP Update

FEBRUARY

2021 Dodd Short Courses
Fly Safety International Maintenance Training

MARCH

AMCA Annual Virtual Meeting

APRIL

Twin Otter Training
FMCA Fly-In

JUNE

Black Hat USA 2021
Transition Training 500 Series
Bell 407 Refresher

AUGUST

Society for Vector Ecology
Florida HR - Virtual Conference
Flight Instructor Certification

2020-21 BOARD OF COMMISSIONERS

THE DISTRICT IS AN INDEPENDENT SPECIAL TAXING DISTRICT OPERATING 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



SEAT 1

John Johnson
Terms of office: 2019-2023



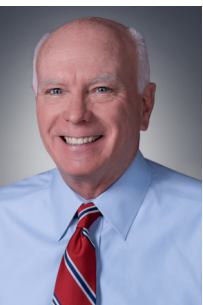
SEAT 4

Bruce Buchanan
Terms of office: 2021-2025



SEAT 2

Sandra Lee Buxton
Terms of office: 2019-2023



SEAT 5

Russell Burland
Terms of office: 2021-2025

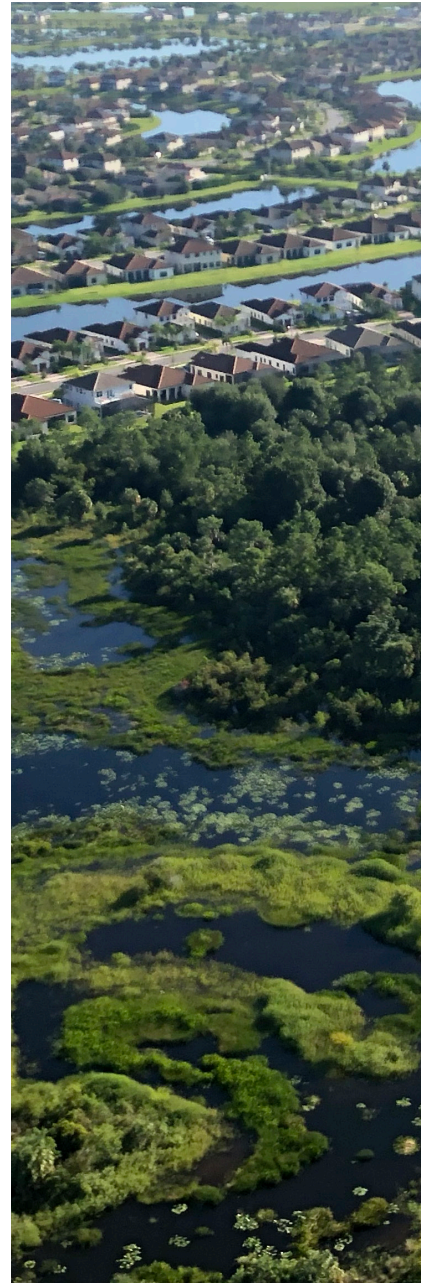
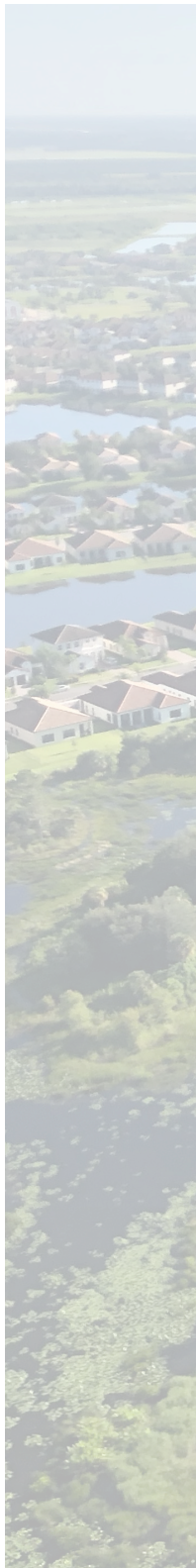


SEAT 3

Jacquelyn Thompson-Fresenius
Terms of office: 2019-2023



LEGAL COUNSEL
William Owens



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