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# LEE COUNTY MOSQUITO CONTROL DISTRICT REVIEW FINAL REPORT

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**September 2023**

**Prepared for**

**The Florida Legislature**

**Prepared by**

**The Balmoral Group**

**165 Lincoln Avenue**

**Winter Park, FL 32789**

# Executive Summary

Lee County Mosquito Control District (Lee County MCD) serves the entirety of Lee County, Florida except for the Fort Myers Beach area. Lee County MCD totals 1,187 square miles making it the largest MCD in the state from a landmass perspective. The population serviced by Lee County MCD was 754,351 in 2020. The county has 50 miles of beaches and several barrier islands, including Sanibel and Captiva, which support a high seasonal population of tourists and snowbirds. Hurricane Ian devastated the barrier islands and caused extensive damage well inland in September 2022.

Eastern Lee County is largely rural, but development is encroaching rapidly on previously undeveloped areas. The eastern half also abuts several federally and state-owned protection areas that both spawn mosquitoes prolifically and have associated restrictions on Lee County MCD operations. About 550,000 households pay ad valorem taxes to support Lee County MCD operations. While the most recent budget year included about \$112 billion in taxable value, Hurricane Ian delayed tax collection and destroyed more than 6,000 homes.

As of this report, collections have recovered to about 90% of the amounts that were due for Fiscal Year 2021-22, but Lee County MCD has adjusted reserves to prepare for potential shortfalls. Operationally and to their credit, Lee County MCD had disaster recovery plans in place that allowed rapid resumption of effective operations despite heavy losses to equipment and facilities.

Lee County MCD was established in 1958, and over subsequent years, several other smaller MCDs within Lee County gradually ceased operations and were folded into Lee County MCD. As a result, Lee County MCD is tied with Florida Keys MCD for having the largest governing boards in the state with seven commissioners each. The board is actively engaged in the review of operational success, financial stewardship, and public information activities. Due to geographic scale, complexities of coordination with protected areas, and tourist-heavy islands, Lee County MCD has transitioned to Integrated Pest Management, focused on the prevention of mosquito infestation via surveillance, education, monitoring, larviciding, and targeted adulticiding. Lee County MCD also routinely works with industry, state and federal government, and international non-governmental organizations for research and product development and is an industry leader in applied research.

The Balmoral Group worked in consultation with a mosquito control expert in the course of this review and found that Lee County MCD effectively and efficiently delivers services that are within the scope of its charter and purposes outlined in applicable laws and regulations but some efficiency improvements are possible; similar services are provided by Fort Myers Beach MCD. The district is managing its resources in an efficient and effective manner to achieve its goals and objectives. The district recently established numerous goals and objectives that are clearly defined and measurable and that adequately address its statutory purpose; and it has largely upheld

## SCOPE

Section 189.0695, *Florida Statutes*, requires the conduct of performance reviews of Independent Mosquito Control Districts. The Balmoral Group was selected by the Office of Program Policy Analysis and Government Accountability to perform the review, which evaluates the district's programs, activities, and functions, including

- evaluating the district board's primary function and governance;
- assessing service delivery and comparing similar services provided by municipal or county governments located within the district's boundaries;
- describing district purpose, goals, objectives, performance measures, and performance standards and evaluating the extent to which they are achieved;
- analyzing resources, revenues, and costs of programs and activities; and
- providing recommendations for statutory or budgetary changes to improve the special district's program operations, reduce costs, or reduce duplication.



performance standards for other measures that have been tracked for several years. Overall, Lee County MCD is considered a leader in mosquito control in Florida and beyond.

Based on its review, The Balmoral Group presents the following recommendations for the improvement of mosquito control services in the Lee County MCD and neighboring Fort Myers Beach MCD:

- The district boundary maps presented by Lee County MCD and Fort Myers Beach MCD conflict. The district could work with Fort Myers Beach MCD and a professional licensed surveyor or take other action as appropriate to determine the correct property boundaries of each district.
- The Fort Myers Beach MCD currently provides similar mosquito control services for its service area within Lee County, but the district’s facility and all equipment were destroyed by Hurricane Ian. Representatives of the Fort Myers Beach MCD anticipate that the cost to rebuild and re-equip will be at least \$2 million. Lee County MCD has the current capacity to assume the operations of the Fort Myers MCD at a nominal cost. The Legislature could consider merging the Lee County MCD and the Fort Myers Beach MCD by special act, or the Lee County MCD and Fort Myers Beach MCD could jointly consider merging into a single independent special district.
- The Legislature could consider amending section 403.709(1), *Florida Statutes*, to require a portion of the funds currently administered by DEP for solid waste activities to be allocated to waste tire abatement activities by MCDs.
- The district has recently established nine goals and 112 objectives through its strategic planning process. It could formalize streamlined performance measures and standards that would allow the district to monitor and track progress toward all its goals and objectives through a handful of indicator metrics. Such performance information would facilitate the district in consistently monitoring its progress.
- The Florida Coordinating Council on Mosquito Control was established by the Legislature to foster maximum efficient use of existing resources and to assist entities involved in mosquito control with best management practices. The Legislature could consider amending s. 388.46, *Florida Statutes*, to direct the Florida Coordinating Council on Mosquito Control to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model goals, objectives, and performance measures and standards to assist MCDs with performance monitoring.



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# 1. Background

## District Description

### *District Purpose*

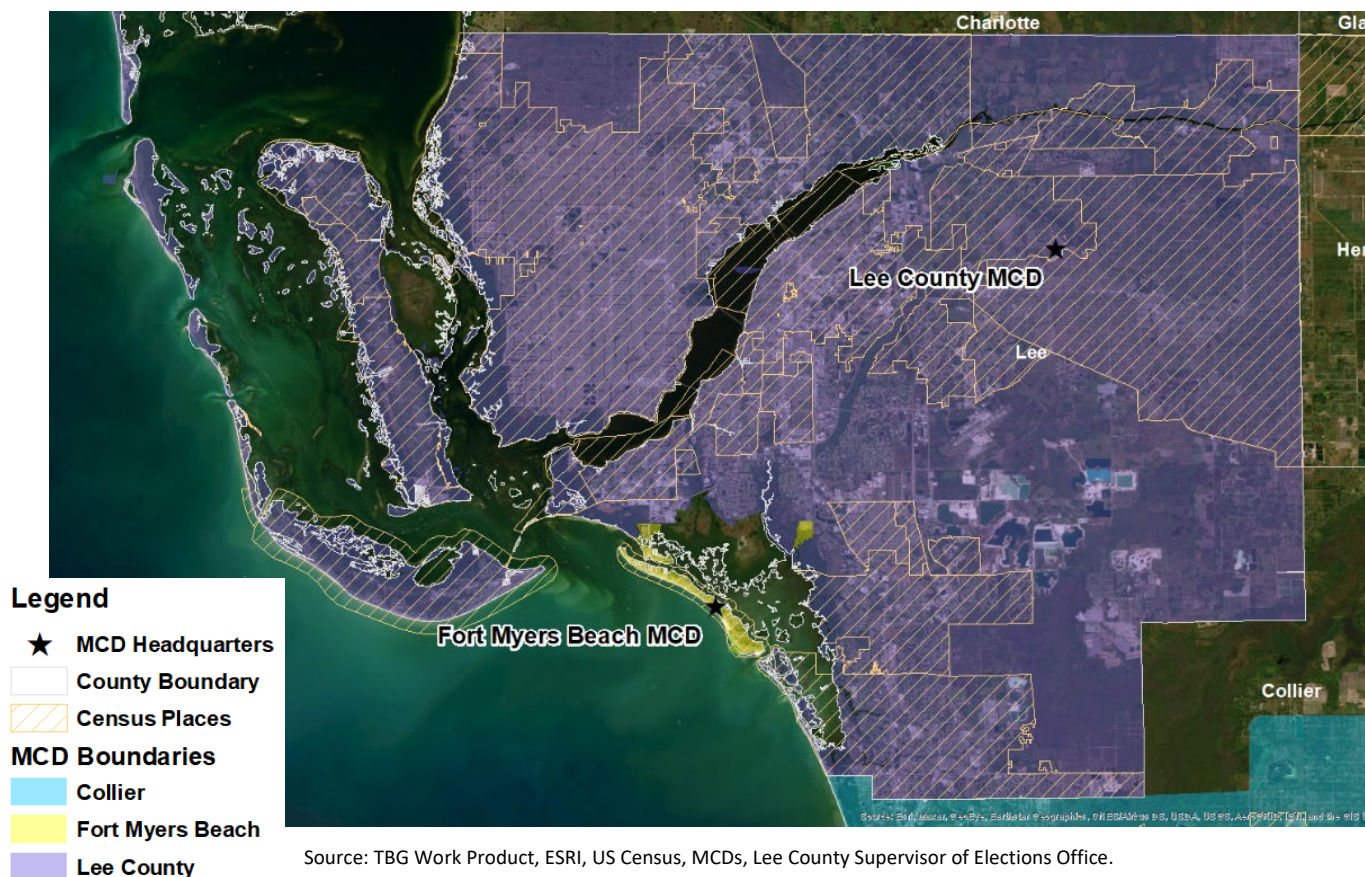
The purpose of the Lee County Mosquito Control District (MCD), as provided in Chapter 98-461, s. 19, *Laws of Florida*, is for the “abatement and control of mosquitoes within Lee County [as] is advisable and necessary for the maintenance and improvement of the health, comfort, welfare, and prosperity of the people thereof ....” Lee County MCD’s stated mission is “to provide rapid and effective control of disease-carrying and pestiferous mosquito populations to promote the general well-being and to protect the health of the citizens of Lee County.” Its adopted vision is “to be the premier mosquito control organization that protects the health of Lee County citizens and serves as a knowledge resource to the world.”

According to district representatives, Lee County has been committed since its inception to providing uninterrupted mosquito control services to the citizens of Lee County; developing control technologies that are effective and sensitive to Florida’s unique natural habitats and wildlife; improving the quality of life; facilitating outdoor activities; and protecting the public health in the district’s community by implementing environmentally sound practices that control mosquitoes throughout Lee County.

### *Service Area*

Lee County MCD’s service area totals 1,187 square miles, serving the entirety of Lee County, Florida except for the Fort Myers Beach area. The Fort Myers Beach MCD exists as a separate entity from the Lee County MCD. Lee County MCD’s headquarters is located at 15191 Homestead Road, Lehigh Acres, Florida 33971. The map shown in **Figure 1** represents what the district reported to TBG as its current boundaries and is based on a map from the Lee County Supervisor of Elections Office. It should be noted that the boundaries of this map conflict with the boundaries shown in the report for Fort Myers MCD under concurrent review by TBG. Further investigation to clarify the correct district boundaries by each district is warranted.

Figure 1. Lee County MCD Map



## Population

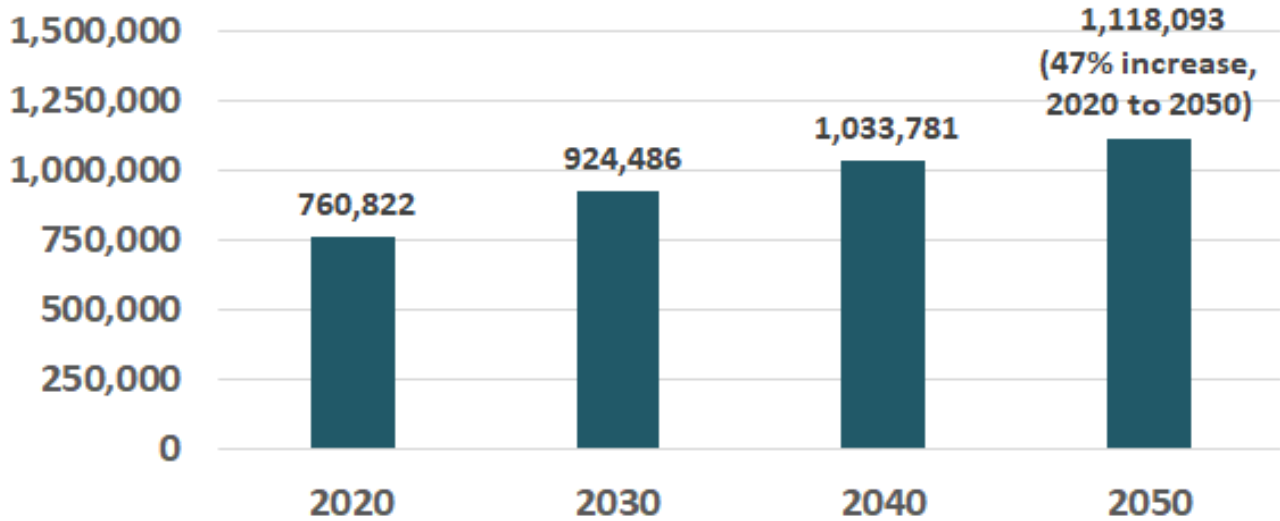
Lee County’s MCD’s population was estimated at 754,351 persons in 2020 according to the latest available block-level United States (U.S.) Census data.<sup>1</sup> The total population of Lee County was 822,453 in 2022 according to the U.S. Census.<sup>2</sup> The Florida Legislature’s Office of Economic and Demographic Research (EDR) projects Lee County’s population to increase by another 39% through 2050 to 1,118,093 residents compared to the 2020 baseline (760,822).<sup>3</sup> **Figure 2** shows Lee County’s projected population estimates calculated by EDR.

<sup>1</sup> Block-level data compiled from [Decennial Census P.L. 94-171 Redistricting Data Summary Files](#) and matched to the MCD boundary in GIS.

<sup>2</sup> Population Estimates, July 1, 2022, retrieved from [U.S. Census Bureau QuickFacts: United States](#).

<sup>3</sup> Based on 2021 Estimates, Population: 1970-2050, County projections retrieved from [Population and Demographic Data - Florida Products \(state.fl.us\)](#).

Figure 2. Lee County Population Projection



Source: TBG Work Product, EDR.

### *District Characteristics*

Lee County is on the southwest coast of Florida, with over 50 miles of beaches along the Gulf of Mexico. Adjacent counties include Charlotte to the north, Hendry to the east, and Collier to the south. The average annual temperature is 77.6 degrees Fahrenheit and rainfall is about 70 inches in total through the year. The county has 50 miles of beaches and several barrier islands, like Sanibel and Captiva, which support a high seasonal population of tourists and snowbirds. Densely populated areas include the barrier islands that are rimmed with mangrove areas and natural preserves that house larval habitats, with 56,000 acres of protected salt marsh and 785 square miles of flat, wet, subtropical terrain. Controlling mosquito populations in these areas is critical to quality of life in both the coastal and inland portions of the county.

Eastern Lee County is largely rural, but development is encroaching rapidly on previously undeveloped areas. Lee County has ranked among the fastest growing counties in Florida over the last four decades; population has risen from about 50,000 in 1960 to approximately 800,000 in 2022, a 16-fold increase. The eastern half also abuts the Everglades, as well as several federally and state-owned protection areas, which all spawn mosquitoes prolifically and have associated restrictions. Preserve areas require careful coordination with state and federal regulators, as treatment is greatly restricted.

Hurricane Ian, a Category 4 storm and the third most costly in U.S. history, devastated the barrier islands and caused extensive damage well inland in September 2022. Along the coastal areas in particular, the storm has left entire neighborhoods in ruins, with redevelopment likely to take years if not decades. Lee County MCD was affected by the storm, physically and financially, but has largely addressed the impacts sufficiently to resume operations. Interim preparations for the 2023 summer season, which is both hurricane season and mosquito season, were underway at the time of this review to ensure the continuity of operations. The growing population of the district and its meteorological history and geographic characteristics, as described above, create conditions conducive to extensive mosquito breeding habitats that require constant mosquito control. The services needed to control mosquitoes include routine surveillance of mosquito-producing habitats, source reduction through

aerial and/or ground treatments using pesticides to treat areas with large breeding mosquito populations, regular testing for disease transmission in animals, and other services described in greater detail later in the report.

## Real Property Data

Lee County MCD collects ad valorem taxes to fund district operations. The total taxable value of properties within Lee County MCD was over \$117 billion in the most recent fiscal year under a millage rate of 0.2300 (Table 1). Real property parcels subject to district millage have exceeded 540,000 parcels over the last four years (Table 2). The taxable value of real property parcels increased 34% in FY 2022-23 compared to FY 2019-20, following changes in property values.

**Table 1. Millage Rates and Total Taxable Value of Properties Subject to Lee County MCD Millage**

Lee County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
<b>Millage Rate</b>	0.2539	0.2439	0.2439	0.2300
<b>Taxable Value of Parcels (\$Bil.)</b>	\$83.9	\$89.0	\$95.9	\$112.0
<b>Taxable Value of Accounts (\$Bil.)</b>	\$4.1	\$4.9	\$4.9	\$5.2
<b>Taxable Value of Centrally Assessed Property (\$Mil.)<sup>1</sup></b>	\$6	\$5	\$5	\$5
<b>Total Taxable Value (\$Mil.)</b>	<b>\$88,034</b>	<b>\$93,966</b>	<b>\$100,923</b>	<b>\$117,321</b>

Source: Florida Department of Revenue (FDOR).

<sup>1</sup> Centrally assessed property includes railroad and private carline company assessments as defined in Rule 12D-2.011, F.A.C.

**Table 2. Real Property Parcels Subject to Lee County MCD Millage**

Lee County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
<b>Just Value of Parcels (\$Bil.)</b>	\$106.1	\$111.3	\$122.0	\$167.5
<b>Real Property Parcels Subject to District Millage</b>	540,758	542,159	545,235	546,682
<b>Taxable Value of Parcels (\$Mil.)</b>	\$83.9	\$89.0	\$95.9	\$112.0

Source: FDOR.

## Tangible Property Data

In addition to real property, tangible personal property accounts subject to district millage totaled 84,252 accounts in FY 2022-23, down 3% since FY 2019-20 (Table 3). However, the taxable value of tangible personal property accounts also increased in FY 2022-23 by 28% compared to FY 2019-20 due to higher property values.

**Table 3. Tangible Personal Property Accounts Subject to Lee County MCD Millage**

Lee County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
<b>Just Value of Accounts (\$Mil.)</b>	\$4,931	\$5,764	\$5,793	\$6,157
<b>Tangible Personal Property Accounts Subject to District Millage</b>	86,930	87,283	85,040	84,252
<b>Taxable Value of Accounts (\$Mil.)</b>	\$4.1	\$4.9	\$4.9	\$5.24

Source: FDOR.





## History and Composition

In 1957, the Florida Legislature enacted Chapter 57-2059, *Laws of Florida*, to authorize local voters in a January 1958, election to consider whether to establish Lee County MCD. The legislation, among other things, dissolved the Boca Grande, Sanibel-Captiva, and Fort Myers MCDs in existence at the time, transferring their assets and liabilities to Lee County MCD; provided that Lee County MCD's territory was Lee County except for the land area described in section two; and established a six-member governing board of commissioners. The voters subsequently approved this legislation.

Changes to Lee County MCD since its establishment have included the Legislature's enactment of Chapter 61-2404, *Laws of Florida*, to establish the Lee County Hyacinth Control District, and require the board for Lee County MCD to govern this district in controlling and eradicating hyacinths in all of Lee County; and Chapter Law 83-442, *Laws of Florida*, to expand the number of commissioners to seven. In 1983, the Legislature enacted Chapter 83-422, *Laws of Florida*, which proposed the dissolution and merger of the Fort Myers Beach MCD with Lee County MCD. Discussion with current management of both districts, and retired commissioners who served previously, indicates that no current institutional knowledge of the 1983 act exists. Anecdotally the expectation was that "local politics" and the fact that Fort Myers Beach MCD existed prior to the Lee County MCD likely prevented any merger.

At this time, Lee County MCD operates pursuant to Chapter 98-461, *Laws of Florida*, the most recent legislative enactment addressing the district. This law fixes the district's boundaries to include all of Lee County except for Fort Myers Beach, continues the seven-member board of commissioners, and addresses the board's powers and duties and other matters. Lee County MCD is also subject to Chapter 189, *Florida Statutes*, given its status as an independent special district; Chapter 388, *Florida Statutes*, setting forth the requirements for creating and operating MCDs in this state; and Chapter 5E-13, *Florida Administrative Code*, setting forth rules adopted by the Department of Agriculture and Consumer Services (DACS) for mosquito control program administration.

The district's board leadership positions include a chairperson, vice chair, and secretary/treasurer. Board members are elected to serve four-year terms, with the current board sitting at full capacity. Each board member is required to be a qualified elector residing within the area from which elected. One member must be elected from each of the seven residential areas that make up the total span of Lee County MCD boundaries. Each member must be elected at large by a plurality vote of the qualified electors of Lee County MCD voting in a nonpartisan election to be held on the date of the general election. Candidates for the office of commissioner shall qualify in accordance with general law.

Pursuant to Chapter 98-461, s. 5, *Laws of Florida*, the powers and duties of the board of commissioners include:

- Doing any and all things necessary for the control and elimination of mosquitoes and other arthropods in the district or in territory within five miles of the district's boundaries, which is situated such that mosquitoes or arthropods from the territory may disperse into the district.
- Using any and all mechanical, physical, chemical, or biological control measures necessary to accomplish the purposes of the district's chapter law.

- Authorizing land owners, upon request, to conduct mosquito or other arthropod control for their properties at their own expense, instead of the district implementing control measures; if the land owners’ efforts are ineffective, the board may obtain an order from the Lee County Health Department authorizing the board to take such action as the board deems necessary.
- Having the powers of a body corporate including the power to contract; to purchase and convey real estate and personal property; to secure patents on work products; to operate airports and air navigation facilities; to contract and cooperate with county, state, and other governmental agencies in regard to mosquito control or suppression; and to borrow money and issue negotiable promissory notes and bonds.

As required by s. 388.151, *Florida Statutes*, the board of commissioners has met at least monthly during the current fiscal year and past three fiscal years, with the number of meetings and special meetings (public hearings) shown in **Table 4**.

**Table 4. Lee County MCD Commissioner Meeting Counts**

<b>Commissioner Meetings</b>	<b>FY 2019-20</b>	<b>FY 2020-21</b>	<b>FY 2021-22</b>	<b>FY 2022-23<sup>1</sup></b>
<b>Monthly Meetings</b>	12	12	12	7
<b>Special Meetings</b>	3	3	3	0

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> 2023 YTD through April.

The board’s meetings are open to the public and noticed and conducted in accordance with s. 189.015, *Florida Statutes*. Board meeting agendas and recorded minutes are posted publicly online alongside a schedule of board meetings.

## Intergovernmental Interactions

Lee County MCD collaborates with national and state peers for research and training on a regular basis. Lee County MCD assists research efforts with the Centers for Disease Control and Prevention (CDC); National Center for Emerging and Zoonotic Infectious Diseases in Fort Collins, Colorado; U.S. Department of Agriculture’s Center for Medical, Agricultural and Veterinary Entomology in Gainesville, Florida and University of Florida’s Florida Medical Entomology Laboratory in Vero Beach.

Lee County MCD also collaborates with the International Atomic Energy Agency’s Insect Pest Control Subprogram located in Austria; the U.S. Environmental Protection Agency; and the Navy Entomology Centers of Excellence located at the Naval Air Station in Jacksonville, Florida. Lee County MCD Aerial Workshop training is offered annually to all MCDs in Florida and additional agencies nationally and internationally.

Lee County MCD also works closely with several local, county, and state entities in several ways:

1. Assisting state and local emergency operation centers during emergencies. For example, after Hurricane Irma in 2017 and Hurricane Ian in 2022, Lee County MCD’s south runway was a staging ground for essential equipment and supplies to include food, water, shelter, generators, heavy equipment, cell company equipment, electric company vehicles and equipment, etcetera. Lee County MCD also worked with the county to provide space to store debris from the hurricane clean up for a period of time sufficient to process the debris appropriately. In addition, Lee County MCD provides



pilots and helicopters so that essential federal, state, and county personnel can be in the air within 24 hours of a catastrophic event to address needs of the community.

2. Lee County MCD works closely with the Lee County Department of Health and the Florida Department of Health (DOH) for arbovirus disease response in Lee County providing vector surveillance and control.
3. Lee County MCD works with several local fire districts to provide space to train firemen. For example, Pine Island Fire District has access to the district's heliport on Pine Island for training.
4. Lee County MCD works with county emergency medical services (EMS) to help them with patient transport and evacuations from the surrounding islands by providing space at Lee County MCD's seven heliports for EMS to safely land their aircraft. Lee County MCD also provides EMS with a duplex located on the MCD's property where EMS may work and be ready to respond as needed.
5. Lee County MCD provides opportunities for several law enforcement agencies to train on the south runway to perform pit maneuvers, driving skills tests, and other training. Agencies include but are not limited to, Lee County Sheriff's Office, City of Cape Coral Police Department, Fort Myers Police Department, and the police academy.
6. Lee County MCD works with the Lee County Sheriff's Office on many levels and has an agreement that allows the office to operate the office's gun range and aviation unit on the district's property.
7. Lee County MCD works with Lee County 20/20, the Florida Department of Environmental Protection (DEP), the Florida Fish and Wildlife Conservation Commission, and the National Wildlife Refuge to assist with vector management on protected lands with specialized treatments to protect public health and maintain the pristine environment of the protected lands.
8. Lee County MCD manages the Lee County Hyacinth Control District to help maintain county waterways to ensure the waterways remain navigable and to assist with the control of invasive plants that harbor mosquitoes. The Lee County Hyacinth Control District assesses its own costs and coordinates with Lee County MCD, but each district bears its own costs.
9. Lee County MCD works with the Lehigh Acres Municipal Services Improvement District to help with the management of mosquitoes for Lehigh Acres waterways. Lee County MCD also provides assistance when Lehigh Acres needs to survey areas of responsibility by air on an as needed, compensated basis.
10. Lee County MCD provides contracted aerial spray services to the Fort Myers Beach MCD on an as needed basis for up to \$60,000 a year.

Lee County MCD also provides training to the University of Florida's Entomology and Nematology Department, Florida Gulf Coast University (in the form of internships), and the Florida counties of Hendry County, Collier County, Charlotte County, and Broward County. Lee County MCD assists in mosquito control research efforts with Illinois State University, University of Kentucky Department of Entomology, and Harvard University.



## Resources for Fiscal Year 2021-22

The published FY 2021-22 millage rate established by Lee County MCD was 0.2439. The district received \$25.7 million in revenues and spent \$26.1 million in FY 2021-22, covering the overage with funds in its reserves. Lee County MCD had 127 paid staff and owned numerous vehicles and equipment and 39 buildings in FY 2021-22 (Table 5).

Table 5. Lee County MCD Resources for FY 2021-22

Resource Item	FY 2021-22 Amount
Millage Rate	0.2439
FY 2021-22 Revenues	\$24.75 million
FY 2021-22 Expenditures	\$26.12 million <sup>1</sup>
Number of Paid Staff	101
Vehicles	5 airplane, 6 helicopters, 3 boats, 117 trucks, and 2 ATVs
Equipment	Field equipment: 424 Lab equipment: 68 Office equipment: 203 Surveillance equipment: 17 coops and 290 chickens
Facilities	1 headquarters site, 39 buildings

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> The district covered the overage with funds from its reserves.

## 2. Findings

### Service Delivery

**Lee County MCD effectively and efficiently delivers services that are within the scope of its charter and purposes outlined in applicable laws and regulations but some efficiency improvements are possible; similar services are provided by Fort Myers Beach MCD.**

To assess the delivery of services in the district, TBG requested and reviewed information on the geographic characteristics of the district; other local governments to which the district provides services or with which it coordinates efforts; the services provided by the district; similar services provided by other entities; district studies or evaluations of alternative service delivery methods including consolidation of services with other government entities; unique contributions from the district relative to the county or municipalities; local stakeholder perceptions of the relative value of the district's services. In addition, TBG requested information from representatives of the Board of County Commissioners, local health department, and local parks and recreation department on their perceptions of the district's service delivery and efficiency.

## Overview of Services

**Most mosquito control programs use an Integrated Pest Management (IPM) approach to control mosquito populations, which targets the different stages of a mosquito's life cycle with various prevention and control measures.** IPM addresses eight areas. Surveillance of mosquito populations is an essential component of all IPM programs with chemical treatments based on the surveillance findings. IPM can also include source reduction (e.g., container disposal and water/impoundment management), larviciding and adulticiding (using ground and/or aerial treatments), biological and alternative control, and disease surveillance. Research and education are also important components of IPM programs. See attachment titled, "Integrated Pest Management" for more information. Lee County MCD conducts activities in each of the eight areas of IPM.

Lee County MCD's mosquito surveillance activities include ground and aerial surveillance to pinpoint areas of concern on a daily basis, year-round. Aerial inspectors travel to remote areas of the county via helicopter to check salt marsh habitats for mosquito breeding. Ground inspectors look for breeding habitats throughout the county, visit sentinel chicken flocks throughout the county, and respond to service requests from citizens. In addition, trap trucks go out each evening during peak mosquito season, surveying the entire county for adult mosquito activity and measuring rainfall levels. The results of these surveys are used to determine when and where to concentrate control activities. Lee County MCD has divided the county into six regions. Each region has one mosquito biologist and four field inspectors that routinely survey their region looking for larvae. If larvae are found exceeding the threshold and the size of the treatment area is less than five acres, the field inspectors use tools and insecticides on the inspector's truck to immediately treat the larvae. If the treatment area is five to 50 acres, the mosquito biologist will consult with the district's drone and aerial units to have areas treated by drone or helicopter depending on the situation. If the treatment area is more than 50 acres, the mosquito biologist will work with the aerial unit to treat by helicopter.

Lee County MCD's source reduction activities include routine waste tire collection and disposal at local landfills, as well as distribution of mosquitofish (i.e., a freshwater fish native to Florida that eats mosquito larvae). Tires create problematic mosquito-producing habitats that are difficult to manage through routine chemical applications but can be managed through proper disposal. District staff routinely collect waste tires abandoned around the county and bring them to the local public landfill where the district is charged tire disposal fees. District staff reported that the district collected approximately 1,200 tires during FY 2022-23 and spent approximately \$8,500 on tire disposal fees. Additional sources of funding for waste tire disposal could help improve efficiencies for the district in managing mosquito populations from this ubiquitous source of mosquito breeding habitat.

Lee County MCD's larviciding activities include using the Airbus H125 helicopter platform to reach mangrove marshes and barrier islands to apply larvicide. An overview of area treatments is provided in **Table 6**.

**Table 6. Service Delivery Metrics – Acres Treated for Lee County MCD**

	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>1</sup>
<b>Ground Larvicide</b>	2,817	3,762	3,253	31
<b>Aerial Larvicide</b>	69,318	74,536	82,348	793
<b>Ground adulticide</b>	929,022	909,785	1,073,807	5,863
<b>Aerial adulticide</b>	1,415,290	1,099,359	1,276,918	0

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> YTD as of January 2023.

The district monitors mosquito trap counts and provides adulticide treatments when internal adult mosquito trap thresholds are met. Lee County MCD has a trap surveillance program that monitors for adult mosquitoes daily during mosquito season (May through November). Once mosquito counts surpass thresholds, adulticide missions by truck and/or by air are assigned to reduce populations to acceptable levels. Lee County MCD’s adulticiding activities include application of granular and liquid material targeting mosquito larvae using the Airbus H125 helicopter platform. Lee County MCD also conducts nighttime aerial adulticiding using the Beechcraft King Air, Douglas DC-3, and Airbus H125 platforms to deliver ultra-low volume (ULV) sprays between sunset and 2:00 a.m., when adult mosquitoes are most active. Lee County MCD uses highly sophisticated technology including satellite navigation and global positioning for precision application targeting, minimizing the quantity of chemicals used. Lee County MCD’s biological and alternative control activities include the deployment of male insects sterilized via X-rays, which results in the female insects’ eggs not hatching after mating (referred to as the “Sterile Insect Technique”). Lee County MCD’s mosquito research activities include developing new methods and technologies to improve the efficiency of treatments, including the use of Light Detection and Ranging (LiDAR) to identify mosquito pooling areas and reduce the use of products; and the implementation of a drone replacement program, which is necessitated by a change in law that prohibits the use of drones from unapproved manufacturers, so that the district may again deploy drones to gain access to remote areas typically accessible by foot only. Over the past two years of using drones, Lee County MCD has discovered that drone mapping and spraying of breeding habitats has substantially reduced costs compared to helicopters treatments, saved time, and made hard-to-reach areas readily accessible while increasing worker safety (through the avoidance of heat stress, alligators, snakes, etcetera). Recent changes to drone legislation, however, have required the district to cease use of existing drones and replace any drones with those of approved manufacturers. The estimated purchase price of replacement drones from approved manufacturers, based on quotes received by the district, is in some cases a ten-fold to twenty-fold increase. Lee County MCD will sell its retired drones to offset some of the cost.<sup>4</sup>

Lee County MCD’s outreach and education activities include educating and informing the public through school-based education programs to teach Lee County students about mosquitoes and mosquito control, public communication through presentations to local civic groups, tours of district headquarters, direct district contact lines of phone and email, and public open houses to allow residents to visit district facilities.

A summary of the eight areas of IPM in which the district conducts activities is set forth in **Table 7**.

<sup>4</sup> The Florida Legislature amended s. 934.50, F.S., in 2022, to require all government agencies to purchase drones from approved drone manufacturers and to discontinue use of drones not produced by an approved manufacturer by January 1, 2023. District staff reported that drones produced by approved manufacturers will be more costly than drones the district previously owned.

Table 7. Lee County MCD Services Overview

Integrated Pest Management Service	Lee County MCD Services Provided
Mosquito Surveillance	Ground and aerial surveillance using trap collection, sentinel chickens, mapping tools, and rainfall data
Source Reduction	Routine waste tire collection and disposal at local landfills, use of mosquitofish
Larviciding	Application of larvicides in coastal marsh and inland areas from the ground and using helicopters
Adulticiding	Delivery of nighttime aerial ULV adulticiding using trucks, helicopters, and fixed wing aircraft
Biological and Alternative Control	Use of the Sterile Insect Technique
Disease Surveillance	Regular blood sample collection from sentinel chickens and submittal of samples to the state laboratory in Tampa
Mosquito Control Research	Ongoing research efforts to identify new methods and technologies to improve treatment efficiency
Outreach and Education	Numerous education programs and outreach efforts coordinated with the county; ongoing employee training

Source: TBG Work Product, Lee County MCD.

### *Analysis of Delivery of Services*

Lee County MCD delivers a number of services across all eight categories of IPM that are within the scope of its charter and purposes outlined in applicable laws and regulations. All district services are directed toward the abatement and control of mosquitoes. No services were noted that fall outside the district’s charter or applicable laws and regulations. The district is implementing a broad array of mosquito control services across all areas of IPM and is continually seeking alternative methods to improve efficiencies. For example, the district sought out and implemented several technological approaches that reduce costs and improve operational efficiency, such as the use of LiDAR and drones. Recent changes to drone legislation have cost implications for the district and will change the efficiency improvements that the use of drones had created previously. Because the district is now required to purchase drones from approved manufacturers that may sell equipment at a higher cost than previously purchased drones, the district reports that it is in the process of determining how it will need to adapt its drone usage.

The mosquito control expert retained by TBG for this review did not identify any alternative methods for providing the district’s services that would reduce the district’s costs or improve the district’s performance. In addition, TBG requested information from the Board of County Commissioners, local health department, and local parks and recreation department on their perceptions of the quality and efficiency of services delivered by the district and whether the district is the most appropriate entity to efficiently deliver mosquito control services in the area. Lee County DOH provided a positive response reflecting its perception that the district provides efficient and effective service delivery, while Lee County Parks and Recreation reported that “LCMCD has proved themselves to be efficient and effective.” The Board of County Commissioners did not respond.

## *Comparison to Other Services*

**Mosquito control services similar to those provided by the Lee County MCD are also provided by Fort Myers Beach MCD, which is a municipality located in Lee County.** TBG interviewed staff, other county departments, and reviewed documents available online to establish if services similar to those provided by the Lee County MCD are also provided by county or municipal governments within the MCD's boundaries. A review of the Fort Myers Beach MCD was conducted concurrently with TBG's review of the Lee County MCD. TBG interviewed staff and visited facilities of both Fort Myers Beach MCD and Lee County MCD. Fort Myers Beach MCD was catastrophically impacted by Hurricane Ian, causing the loss of all of its facilities, records, and systems. No apparent disaster recovery plan was in effect. The Fort Myers Beach MCD is currently rebuilding its operations, but the uncertainty of its financial position will increase the difficulty of rebuilding the operations of the district.

## *Considerations for Consolidation*

**Lee County MCD may be an appropriate vehicle in which to consolidate Fort Myers Beach MCD.** As described above, the municipality of Fort Myers Beach is located in Lee County and the Fort Myers Beach MCD currently provides mosquito control services for the city. It currently operates with two full-time staff who are manually inspecting properties on foot for abandoned pools and larval habitats. Lee County MCD has capacity to absorb the operations of the two Fort Myers Beach MCD operations staff if the staff are retained to immediately implement effective monitoring and treatment processes for Fort Myers Beach MCD. In addition, Lee County MCD has the administrative capacity to absorb the statutory reporting requirements, compliance requirements such as chemical inventories and training, and administrative processes that Fort Myers Beach MCD will need to rebuild from scratch.<sup>5</sup> If merged with the Lee County MCD, Fort Myers Beach MCD would have access to additional resources, equipment, funding, and the well-established operations of the Lee County MCD, which could help improve service delivery within the Fort Myers Beach area.

As TBG found in the review of Fort Myers MCD, the expense to rebuild operations for Fort Myers Beach MCD is anticipated to cost at least \$2 million, whereas consolidation into Lee County MCD is expected to add nominal cost to Lee County MCD's operations. The additional cost to Lee County MCD would require absorbing the cost of two staff plus additional dedicated equipment for their current responsibilities. There are economies of scale that could be achieved with such a merger. For example, existing resources, equipment, treatment processes established by Lee County MCD would provide immediate benefits to mosquito control activities in Fort Myers Beach at nominal additional costs to Lee County MCD. The resources and operational capacity of Lee County MCD could provide the benefit of improved and more efficient mosquito surveillance and control through the regular nightly practice of monitoring truck traps, for example, as opposed to having individuals constantly monitoring on foot.

Given the economies of scale that could be achieved with the Lee County MCD, it is likely a better use of taxpayer funds to consolidate Fort Myers Beach MCD operations into Lee County MCD and coordinate treatment processes

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<sup>5</sup> Section 189.073, *F.S.* establishes that the Legislature, by special act, may merge independent special districts created and operating pursuant to special act. In addition, s. 189.074, *F.S.*, establishes the processes by which two or more contiguous independent special district created by a special act which have similar functions and elected governing bodies may elect to merge into a single independent district.



and procedures with existing Lee County MCD protocols. The consolidation of these two districts could provide more resources and operational capacity to the residents of Fort Myers Beach.

## Resource Management

**Lee County MCD is managing its resources in an efficient and effective manner to achieve its goals and objectives.**

To assess the district's resource management, TBG analyzed information on revenue sources, revenue and expenditure trends and their possible causes; analyzed staffing trends and their possible causes; requested data on services delivered by district staff versus third-party contractors for the last three fiscal years; analyzed equipment inventory and capital investment trends; reviewed the activities the district conducts to manage costs and plan personnel; requested information on resident feedback survey data related to finances and spending by the district; reviewed performance reviews and audits; and interviewed district staff and board members.

### *Current and Historic Revenues and Expenditures*

To review current and historic revenues and expenditures of the district, TBG requested and received information from the district for FY 2019-20 through FY 2022-23. In addition, TBG interviewed the MCD staff and reviewed documentation both online and as provided from Lee County MCD's accounting and operation systems. Revenues fluctuated during the review period, increasing from \$23.3 million in FY 2019-20 to \$24.7 million in FY 2021-22 after having decreased in FY 2020-21 to \$22.3 million (**Table 8**). FY 2022-23 is still in progress and revenues were \$21.7 million as of January 2023. The district projects total revenues for FY 2022-23 will be approximately \$28.7 million. Expenditures also fluctuated during the review period, decreasing from \$23.9 million in FY 2019-20 to \$21.6 million in FY 2020-21 and then increasing to \$26 million in FY 2021-22. Expenditures were almost \$9 million as of January 2023. Expenditures exceeded revenues in FY 2019-20 by \$0.59 million and in FY 2021-22 by \$1.3 million. The district funds the difference between revenues and expenditures by using funds from its reserves.

In the four years reviewed, revenue sources included ad valorem taxes, COVID refunds, federal and state grants, Sterile Insect Technique grants, service charges for mosquito control operations, interest collections, disposition of capital assets, sale of surplus materials and scrap, refunds, insurance recoveries and incentives, training class registration fees, and other taxes and miscellaneous revenue sources. Lee County MCD received grant funding from the CDC for \$621,033 in FY 2019-20 and \$175,800 in FY 2020-21

The total expenses for Lee County MCD in FY 2021-22 were \$26 million. Most of the expenses for the district came from direct program activities, totaling \$18 million, with an additional \$2.4 million expended for administrative and support costs, and \$5.4 million expended for other costs (e.g., debt repayment). For its staff, Lee County MCD makes substantial annual contributions to the Florida Retirement System and Retiree Health Insurance Trust fund, which varied from \$600,000 to \$1 million per year over the review period.

Table 8. Revenue and Expenditures

Revenues and Expenditures (in \$Mil.)	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>1</sup>
<b>Revenues</b>	<b>\$23.285</b>	<b>\$22.322</b>	<b>\$24.746</b>	<b>\$21.670</b>
Ad Valorem	\$21.265	\$21.773	\$23.802	\$20.531
Other Sources	\$2.020	\$0.549	\$0.944	\$1.139
<b>Expenditures</b>	<b>\$23.874</b>	<b>\$21.601</b>	<b>\$26.036</b>	<b>\$8.950</b>
Administrative Costs	\$2.493	\$2.317	\$2.392	\$0.992
Direct Program and Activity Costs	\$14.849	\$15.748	\$18.273	\$7.959
Other Expenditures	\$6.531	\$3.535	\$5.371	\$-

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> FY 2022-23 reflects YTD as of January 2023.

Lee County MCD has undertaken an upgrade of its aerial fleet during the review period, resulting in some years with higher expenses and some years with revenues supplemented by the sale of surplus aircraft and other equipment (e.g., \$1 million in FY 2019-2020). In FY 2019-20, Lee County MCD paid off remaining lease obligations on two of the district’s six helicopters at a cost of \$4.5 million, and in FY 2020-21, paid off \$2.1 million on another lease. The prepayments saved over \$600,000 in interest costs and, going forward, will reduce annualized operating costs for the aircraft.

Regarding reserves, Lee County MCD’s board made the strategic decision to begin to lower reserves once the aircraft upgrade was complete. Reserves were increased to accommodate the aircraft purchases as well as upgrades across several other mission-related equipment and facilities (e.g., upgrading an unused building at the Pine Island Heliport for use as a refueling facility to improve service delivery to other areas of the county, enhancing LiDAR capabilities to allow more precise and therefore less larvicide use, and upgrading older spray vehicles). The district’s FY 2022-23 budgeted expenditures of \$36.9 million reflect several of the upgrades to the aerial fleet, and the intended drawdown of reserves. It is notable that despite the devastation of Hurricane Ian, revenues have been surprisingly stable. In part, the revenue and expenditure trends reflect the rise in development, both through the gain of millage revenue, and the rise in expenses associated with expansion of services for new developments in areas where there were previously no homes. Targeted larvicide and extremely efficient aircraft operations become even more important in this environment, to avoid a linear increase in expenses with the increased population. Despite the losses incurred as a result of Hurricane Ian, revenue trends for the county appear to be stable for the coming years, due to the continued population growth in the county and the ability of the district to use reserve funds to pay off debt and lease costs, saving money on future interest payments.

### **Administrative Costs**

**Expenditures for administrative costs were relatively constant during the review period; a small decline in some costs such as personal services and personal service benefits occurred between FY 2019-20 and FY 2021-22.** As requested by TBG, Lee County MCD provided a breakdown of total expenditures by administrative costs for FY 2019-20 through May FY 2022-23. Costs fell into several categories, with the highest amounts of administrative costs during the review period including the indirect Personal Services and Personal Service Benefits, Operating Expenses, and debt payments categories. Administrative costs in these years have been stable fluctuating between \$2.3 and \$2.5 million, with personal services (employee salaries) being the largest contributor (**Table 9**).



Table 9. Administrative Cost Data

Expenditure Category <sup>1</sup>	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>2</sup>
Personal Services	\$938,146	\$733,592	\$741,766	\$316,738
Personal Service Benefits	\$748,980	\$601,358	\$718,993	\$304,985
Operating Expenses	\$221,988	\$348,532	\$263,957	\$106,100
Travel, Utilities, Repair, & Maintenance	\$152,596	\$246,741	\$252,344	\$158,310
Supplies and Materials	\$135,392	\$255,261	\$217,697	\$65,921
Land and Buildings	\$295,697	\$131,942	\$197,513	\$39,550
<b>Total</b>	<b>\$2,492,798</b>	<b>\$2,317,426</b>	<b>\$2,392,270</b>	<b>\$991,604</b>

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> Categorization of administrative and other costs was completed by Lee County MCD based on an outline provided by TBG to ensure consistency across reports.

<sup>2</sup> YTD as of January 2023.

### Direct Program Costs

Expenditures for direct program costs have increased steadily since FY 2019-20; on average, direct program costs accounted for about 68% of total expenditures during the last three complete fiscal years. As requested by TBG, Lee County MCD provided a breakdown of total expenditures by direct program costs for FY 2019-20 through January 2023. Direct program costs of Lee County MCD during FY 2019-22 fell into several categories, and most direct costs were related to mosquito control programs, aviation maintenance, and Geographic Information System (GIS)/mosquito larviciding.

Direct program costs increased 23% between FY 2019-20 and FY 2021-22. Operating expenses more than doubled during this timeframe and travel, utilities, repair, and maintenance increased by 49%. These are the two categories in which costs increased the most. Salaries and supplies and materials have also increased, but at a lower rate, 23% and 19%, respectively (Table 10). One primary concern for the district is the continuing rise of the cost of chemicals used to treat mosquitoes. Continued investment in the Sterile Insect Program and targeted larvicide programs are increasing in importance. Other program efforts to manage this trend are discussed elsewhere.<sup>6</sup>

<sup>6</sup> See paragraph regarding upgrades in “Current and Historic Revenues and Expenditures,” and also in “Evaluation of Cost, Timing and Quality.”

Table 10. Direct Program Cost Data

Expenditure Category <sup>1</sup>	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>2</sup>
Personal Services	\$5,182,893	\$5,735,051	\$6,363,296	\$2,167,648
Personal Service Benefits	\$2,863,814	\$3,089,052	\$2,923,049	\$1,675,632
Operating Expenses	\$410,489	\$360,052	\$981,911	\$695,366
Travel, Utilities, Repair, & Maintenance	\$1,665,521	\$2,087,032	\$2,488,220	\$1,383,237
Supplies and Materials	\$3,288,492	\$3,335,852	\$3,902,467	\$1,387,507
Capital Outlay	\$1,438,191	\$1,141,402	\$1,613,698	\$649,494
<b>Total</b>	<b>\$14,849,400</b>	<b>\$15,748,441</b>	<b>\$18,272,641</b>	<b>\$7,958,884</b>

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> Categorization of direct program costs was completed by Lee County MCD based on an outline provided by TBG to ensure consistency across reports.

<sup>2</sup> YTD as of January 2023.

## Contracts for Services

Lee County MCD contracts for several of its operations including maintenance, security, cleaning, and others.

TBG reviewed documentation provided by Lee County MCD for FY 2022-23 and the three previous fiscal years to determine the services Lee County MCD contracted, rather than conducted in-house, as well as the costs for each.

Lee County MCD contracts out several administrative services, including legal services and annual program audits.

**Table 11** summarizes the costs for contracted services that the MCD incurred in the current and past three fiscal years. In FY 2021-22, costs increased by 27% from FY 2019-20 mostly due to higher other contractual services costs. Services contracted by Lee County MCD include:

- Maintenance – Lee County MCD contracted Precision Aircraft Services in FY 2019-20 to perform maintenance, modification, and upkeep services for one of their Airbus H125 helicopters. The total cost was about \$36,000.
- Security – Lee County MCD negotiates a contract for 24-hour/365-day security services for the main complex at Buckingham with Weiser Security Services. For FY 2022-23, the cost is projected to be about \$154,000.
- Facility Cleaning Services – Lee County MCD negotiates a contract with Goodwill Industries of Southwest Florida for a custodian to clean the facilities during the workweek. For FY 2022-23, the cost is projected to be about \$51,000.
- Insurance Advisory Services – Lee County MCD negotiates a contract with Ben Few and Company for risk management advisory services; the company assists with insurance claims, negotiations with major insurance companies for aviation, worker’s compensation, and general liability insurances, and general risk questions. For FY 2022-23, the cost is \$48,000.
- School Teacher Contracts – To further the education and community outreach program, Lee County MCD negotiates with the Lee County School District to hire teachers for student education on mosquito control. The teachers are hired by the school district and Lee County MCD pays a contract amount to the school district to cover their payroll costs plus supplies for the program. For FY 2022-23, the cost is projected to be about \$192,468.

- Chiller/HVAC maintenance – Lee County MCD negotiated a contract with Page Mechanical Group to provide regular maintenance services for Lee County MCD’s HVAC and AC equipment. For FY 2022-23, the cost is projected to be about \$7,600.

**Table 11. Summary of Contracted Services**

<b>Expenditure Category<sup>1</sup></b>	<b>FY 2019-20</b>	<b>FY 2020-21</b>	<b>FY 2021-22</b>	<b>FY 2022-23<sup>2</sup></b>
<b>Professional Services</b>	\$7,500	\$3,000	\$9,996	\$5,561
<b>Legal &amp; Engineering Services</b>	\$95,076	\$54,415	\$58,355	\$11,407
<b>Accounting &amp; Auditing</b>	\$33,865	\$27,500	\$27,500	\$4,000
<b>Other Contractual Services</b>	\$359,665	\$491,568	\$535,291	\$201,996
<b>Total</b>	<b>\$496,106</b>	<b>\$576,483</b>	<b>\$631,142</b>	<b>\$222,964</b>

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> Categorization of contracted services costs was completed by Lee County MCD based on an outline provided by TBG to ensure consistency across reports.

<sup>2</sup> YTD through January.

## **Staff**

**Lee County MCD employed 101 paid staff in FY 2021-22.** Lee County staff positions fall into a variety of management, technical, and scientific positions (**Table 12**).

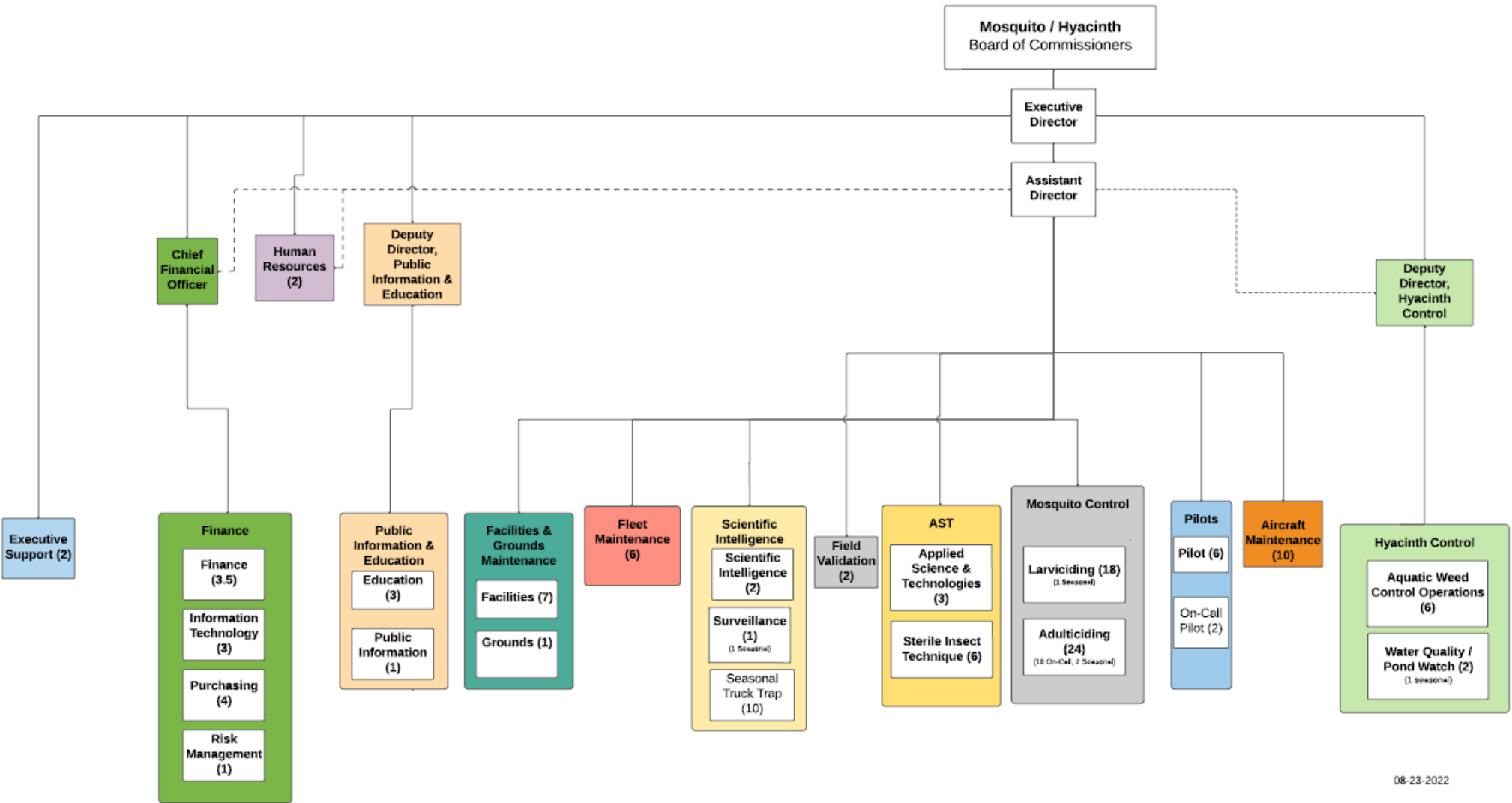
**Table 12. Lee County MCD Staff Positions**

<ul style="list-style-type: none"> <li>• Commissioner</li> <li>• Executive Director</li> <li>• Assistant Director</li> <li>• Receptionist/Administrative Assistant</li> <li>• Executive Administrative Assistant</li> <li>• Deputy Director, Public Information &amp; Edu.</li> <li>• Community Engagement Coordinator</li> <li>• School Board of Lee County</li> <li>• Director, Human Resources</li> <li>• IT Director</li> <li>• Senior Program Analyst</li> <li>• Network Support Technician</li> <li>• Accounting Specialist</li> <li>• Senior Accountant</li> <li>• Payroll Specialist</li> <li>• Chief Financial Officer</li> <li>• Inventory Services Assistant</li> <li>• Buyer</li> <li>• Purchasing Manager</li> <li>• Risk Manager</li> <li>• Facilities Maintenance Technician</li> </ul>	<ul style="list-style-type: none"> <li>• Manager, Facilities Maintenance</li> <li>• Groundskeeper</li> <li>• Manager, Aircraft Maintenance</li> <li>• Aircraft Radio Technician</li> <li>• Aircraft Mechanic III, Lead Mechanic</li> <li>• Aircraft Mechanic II</li> <li>• Aircraft Mechanic I</li> <li>• Chief Pilot</li> <li>• Pilot</li> <li>• Manager, Fleet Maintenance</li> <li>• Machinist-Fabricator</li> <li>• Lead Fleet Mechanic</li> <li>• Fleet Mechanic</li> <li>• Welder</li> <li>• Manager, Scientific Intelligence</li> <li>• Field Validation Biologist III</li> <li>• Field Validation Biologist II</li> <li>• Mosquito Surveillance Investigator</li> <li>• Applied Science and Technologies Manager</li> <li>• Applied Science and Technologies Assistant</li> </ul>	<ul style="list-style-type: none"> <li>• Applied Science and Technologies Technician</li> <li>• AST Supervisor</li> <li>• AST Quality Control Specialist</li> <li>• Field Validation Biologist II</li> <li>• GIS Coordinator</li> <li>• GIS Technician/UAS Pilot</li> <li>• Field Inspector</li> <li>• Mosquito Control Biologist I</li> <li>• Mosquito Control Biologist II</li> <li>• Mosquito Control Biologist III - Larvicide</li> <li>• Mosquito Control Biologist III - Adulticide</li> <li>• Supervisor, Ground Adulticiding</li> <li>• Lead UAS Pilot</li> <li>• Service Request Inspector</li> <li>• Marina Inspector</li> <li>• Seasonal Truck Trap Operator</li> <li>• On Call Pilot</li> <li>• Seasonal Service Request Inspector</li> <li>• On Call ULV Truck Operator</li> <li>• ULV Night Foreman</li> </ul>
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Source: TBG Work Product, Lee County MCD.

An organizational chart in **Figure 3**.

Figure 3. Lee County MCD Organizational Chart



08-23-2022

Source: Lee County MCD.

## Analysis of Program Staffing Levels

Lee County MCD staffing levels have fluctuated slightly over the current and past three fiscal years, and the district has adjusted staffing numbers over time to improve efficiencies; staffing levels meet current district needs. To assess program staffing levels, TBG reviewed documentation provided by Lee County MCD, interviewed Lee County MCD staff, and visited their facility. Lee County MCD staffing levels fluctuated slightly during the current and past three fiscal years, ranging from 86 to 91 full-time employees (Table 13).

The district has, over this time period, reconfigured its staffing to improve efficiencies and eliminated eight positions over the past four years by consolidating roles. At the same time, due to increasing development in the eastern half of the county, Lee County MCD added a team of four operators dedicated to eastern Lee County about three years ago. Of the team, two positions were filled by existing staff, and two were filled with new hires. Management has also looked to consolidate seasonal roles where possible to allow full-time staff opportunity for more hours, in an attempt to address rapidly rising housing costs in the area. Management believes this effort has helped with attrition, based on discussion with department heads.

Lee County MCD is the largest district in the state in size and scope and in staffing levels, which appear appropriate given the wide variety of complex issues the district must manage. The district provides a broad array of mosquito control services and continually researches and pursues technological innovations to address the complex challenges created by the combination of rapid development and growing population, meteorological conditions, and environmentally sensitive areas in the district. Given these challenges, it is appropriate that the district has a larger staff than other MCDs and the number of positions is commensurate with the variety and complexity of activities undertaken by the district in its mosquito control efforts.

Lee County MCD has been successful in recruiting qualified staff and achieving high levels of retention for most positions. With the increase in local housing costs recently, staff noted in interviews that recruitment and retention of field inspector staff has become more difficult. These mostly entry-level positions require hours in the hot sun, and while career advancement opportunities are available, the positions are comparable in pay to other jobs that offer air-conditioned, less rigorous work. Lee County MCD has been creative in finding ways to compensate staff through reimbursement of commercial driver license fees and other avenues that benefit both Lee County MCD and the employee. With their location minutes away from the Fort Myers Airport, pilots have other employment options that are competitive. As the aviation industry recovers from COVID, Lee County MCD is in an increasingly competitive environment for these highly specialized pilots and is continuously reviewing methods to improve retention.

Table 13. Lee County MCD Staff Counts

Employee Counts	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>1</sup>
Commissioners	7	7	7	7
Full Time	86	87	89	91
Part Time	0	0	1	1
Contracted	4	4	4	3
Volunteers	0	0	0	0
Vacancies	12%	11%	8%	14%
<b>Total</b>	<b>97</b>	<b>98</b>	<b>101</b>	<b>102</b>
Turnover Rate	13%	10.2%	14.9%	12.1%

Source: TBG Work Product, Lee County MCD.

<sup>1</sup>YTD through April.



## Equipment and Facilities

Equipment and facilities of Lee County MCD are currently sufficient for operations, with maintenance carried out regularly to maintain and maximize efficiency in operational capabilities. To review the equipment and facility trends of Lee County MCD, TBG analyzed documentation provided by Lee County MCD, interviewed district staff, and visited the facility housing equipment. Lee County MCD owns all of its equipment and facilities, and does not rent or lease any of its equipment or facilities. In FY 2022-23, Lee County MCD owns five airplanes, six helicopters, three boats, 117 trucks, and two ATVs (Table 14). Lee County MCD currently owns 11 aircraft, recently having downsized from 22 aircraft due to the versatility and adaptability that helicopters provide over other forms of aircraft. In addition, Lee County MCD owns substantial amounts of field, lab, and office equipment.

Lee County MCD has a service and replacement schedule in place for all vehicles to ensure operations are able to be conducted smoothly. Road-going vehicles are serviced based on odometer mileage, and equipment without odometers are serviced based on an hour meter. The current plan has listings for all vehicles that are to be sold, replaced, and purchased from 2023 to 2026.

Lee County MCD operates primarily out of its home location at the old Buckingham Army Airfield, but also utilizes seven other heliports throughout Lee County. Lee County MCD owned 39 buildings in FY 2022-23, including administration buildings and office spaces and several hangars, sheds, garages, and storage spaces. The majority of “buildings” are actually small storage facilities. Several buildings were damaged by Hurricane Ian, but are still in serviceable condition.

Similar to the discussion above regarding staffing level sufficiency, given the district’s size and complexity of operations and issues that it must manage, the equipment and facilities of the district are meeting the district’s needs.

**Table 14. District Vehicles, Equipment, and Facilities**

Category	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>1</sup>
<b>Vehicles</b>	<b>116</b>	<b>132</b>	<b>133</b>	<b>133</b>
Airplanes	6	6	5	5
Helicopters	6	6	6	6
Boats	3	3	3	3
Trucks and Vans	99	115	117	117
ATVs and Utility Vehicles	2	2	2	2
<b>Equipment</b>	<b>746</b>	<b>761</b>	<b>695</b>	<b>706</b>
Field Equipment	480	483	424	437
Lab Equipment	49	61	68	68
Office Equipment	217	217	203	201
<b>Facilities</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
Buildings	40	39	39	35

Source: TBG Work Product, MCD.

<sup>1</sup> YTD through April.

Lee County MCD also has several different types of surveillance equipment, including mosquito traps, sentinel chicken coops, and chickens. Lee County MCD has 17 sentinel chicken stations placed strategically throughout the county (Table 15).

Table 15. Surveillance Equipment

Category	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>1</sup>
<b>Mosquito Traps</b>	<b>148</b>	<b>148</b>	<b>148</b>	<b>148</b>
<b>CDC Light Traps</b>	25	25	25	25
<b>Biogents Traps</b>	123	123	123	123
<b>Sentinel Chicken Coops</b>	17	17	17	17
<b>Sentinel Chickens</b>	600	600	460	290

Source: TBG Work Product, Lee County MCD.

<sup>1</sup> YTD through April.

### ***Strategic or Other Formal Plans for the District’s Future***

Lee County MCD has created a strategic plan outlining its goals for the five-year span of 2023-2027, with measures to account for the expansion of district operations and services to accommodate newly developed areas in fast-growing portions of the county. To assess the formal plans for Lee County MCD’s future, TBG reviewed documentation provided by Lee County MCD to determine the full scope of Lee County MCD’s strategic plan. Lee County MCD published a 2023-2027 strategic plan outlining its completed goals and goals to achieve in the span of the next five years. This plan details the mission, vision, background, and goals of Lee County MCD in the context of being one of the fastest growing counties not just in Florida but in the country. Its plan states that the growing population requires sufficient planning, growth, and investment to continue to provide reliable and effective mosquito control services and will accomplish this through goals set for each of the district’s nine departments with two sections each. The nine departments are Executive, Human Resources, Information Technology, Finance, Aircraft/Vehicle Fleet/UAS, Public Information & Education, Operations, Facilities, and Research. For each department, the plan describes the goals the MCD aims to achieve over the next five years, as well as 112 specific objectives across the nine departments.

### ***Previous Performance Reviews, Financial Audits, and Resident Feedback Surveys***

Lee County MCD had no identified issues with performance reviews, financial audits, or resident feedback; audits report no material findings nor weakness in internal controls. Analysis of Lee County MCD’s financial audits was conducted with provided financial audits from Lee County MCD. The audits of Lee County MCD’s financial statements from FY 2019-20 to FY 2020-21 had no findings of material weakness and found that the statements fairly represented Lee County MCD’s financial position with assets exceeding liabilities at the close of the past three fiscal years. The FY 2021-22 audit was not completed at the time of this review.

Lee County MCD recently hosted a public open house (March 2023) and more than 1,300 residents attended, with positive feedback. The district has not conducted customer surveys but reports that positive feedback is often received in emails. Management feels that service requests might serve as a proxy for public perception, and fewer summertime requests have been received in the past three fiscal years than expected, indicating that treatments are effective.

### ***Analysis of Management Reports/Data and Performance Information***

Lee County MCD routinely monitors performance of its operations and administration against goals and has reporting mechanisms in place to measure results on a regular basis. To assess management reporting and



performance information, TBG reviewed documentation provided by Lee County MCD, board packets that include operational results, such as updates on projects and improvements to district operations, and onsite management documents and information systems that show real-time and daily, weekly, or monthly tracking of various operational measures. Extensive information was provided by Lee County MCD, and board and workshop packets also included detailed information. The review found regular monitoring of performance, identification of issues as they arise, and discussion of opportunities to improve efficiency and effectiveness. For example, meetings included updates from the Lee County Health Department on disease monitoring efforts, financial and budget considerations related to chemical purchases, updates on the status of facilities improvement projects, and discussions of strategies for aquatic weed and mosquito control in neighboring counties.

Lee County MCD regularly monitors the effectiveness and efficiency of its programs. The monitoring in place is germane to program outcomes, and considers the resources available to respond to issues as they arise and to improve performance. Systems in place are appropriate, sufficient, and effective to ensure successful performance of the mission.

### ***Evaluation of Cost, Timing, and Quality of Current Program Efforts***

**Within the last three years, Lee County MCD has conducted several activities to manage program cost, timing, and quality.** To assess cost, timing, and quality of program efforts, TBG reviewed documentation provided by Lee County MCD and publicly available data and reports, interviewed Lee County MCD staff, visited their facilities and shadowed personnel carrying out normal operational tasks. District staff reported that they have undertaken several activities within the last three years to reduce program costs.

As discussed in the “Analysis of Staffing Trends” section earlier in this report, the district has restructured some positions and not filled positions that have been vacated through attrition. Historically, the district has treated larval areas under five acres by using ditch trucks that required one person to drive and one person to be on the bed of the truck to apply treatment. Recently, the district fabricated a spray system that allows these treatments to be completed by the driver only with the utilization of mechanical switches and a spray wand that extends from the front of the truck. This has saved on labor and time allowing for more efficient operations. In addition, the district has increased its use of LiDAR to target precise areas for larvicide treatment, thereby reducing areas of treatment and costs of larvicide, fuel, and pilot time.

The district previously had 8 different types of planes and helicopters, which required a significant amount of training on aircraft maintenance and storage of a large number of different aircraft parts to keep the aircraft in working order. Over the last five years, the district has reduced the types of airframes (i.e., the framework of an aircraft excluding its engine) from 8 to 4, which has resulted in significant savings in aircraft technician trainings for multiple airframes and reduced the need to obtain differing parts for aircraft maintenance.

Lee County MCD’s Board voted to approve a purchasing policy within the last three years that ensures all purchases for district business are secured at the best possible price through multiple quotes and public bids when needed.

While the district submits weekly blood samples from sentinel chickens to the DOH lab in Tampa in order to meet the DOH testing requirement, it also has developed its own in-house lab testing to facilitate quicker disease surveillance response times. Current program efforts include in-house lab testing, which can reduce the time for

results indicating disease-bearing mosquitoes from one to one-and-a-half weeks down to overnight. As a result, missions to address mosquito populations can be carried out within 48 hours (weather permitting) of detecting disease-carrying mosquitoes. With mosquitoes able to multiply rapidly, and in a highly populated and tourism-dependent area, the ability to rapidly react is very valuable and effective.

## Goals, Objectives, Performance Measures, and Standards

**Lee County MCD has many newly established goals and objectives that are clearly defined and measurable, and that adequately address its statutory purpose; the district has largely upheld performance standards for other measures that have been tracked for several years.<sup>7</sup>**

To assess the district’s goals, objectives, performance measures and standards, TBG requested and reviewed the district’s charter; requested and reviewed the district’s strategic plan and the last three years of annual reports; requested information on performance measures and standards and records of current and previous three fiscal years’ measures, standards, and records of success or failure to meet the standards and evaluated the district’s actual performance in meeting its goals and objectives. TBG assessed whether performance measures and standards are relevant, useful, and sufficient to evaluate the performance and costs of the programs and activities, whether they are being met, and whether they need to be revised. TBG requested and reviewed previous performance reviews and audits; requested district assessments of why (if applicable) the district failed to meet performance measures and standards and/or goals and objectives; and requested information from the district on actions taken to address and prevent such failures in the future. In addition, TBG interviewed district staff and relevant local government entities about district performance and requested any available results of district-generated resident feedback surveys conducted during the current and previous three fiscal years.

### Goals and Objectives

**Lee County MCD has recently established clearly stated goals with 111 total objectives across its nine departments.** The enabling legislation that provided for the continuation of Lee County MCD, Chapter 98-461, *Laws of Florida*, states that the district’s purpose of abatement and control of mosquitoes within Lee County is advisable and necessary for the maintenance and improvement of the health, comfort, welfare, and prosperity of the people thereof and is found and declared to be for public health and other public purposes, but does not specify additional goals of the district.

The district’s departmental goals address the overarching problem of mosquito control as well as staffing challenges and keeping up with current technologies that are the most effective and efficient methods of mosquito control. In addition, the district’s goals address the challenge of continually keeping the public informed and educated about mosquito control and staying abreast of the most current research available for development of new processes and products for mosquito control. The expected benefits of these overarching goals include efficiency improvements to operations, maximization of workforce retention, streamlining of operations to reduce costs, maximization of financial efficiencies, improved use of state-of-the-art technology and research, and

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<sup>7</sup> While the Lee County MCD has established goals for each of its departments, information on the district’s objectives, problems or needs addressed, expected benefits, and performance measures and standards is available at the district level only.

improved quality of life and public health in the community. The goals are adequately defined, clearly stated, and appropriate for Lee County MCD’s purpose (Table 16).

**Table 16. Lee County MCD Goals and Objectives**

Department	Goal	Objectives
<b>Executive</b>	Continuously improve operational efficiency while right-sizing the workforce to maximize effectiveness of mosquito control for outdoor comfort and disease prevention for the citizens of Lee County	<ol style="list-style-type: none"> <li>1. Completion of 34-acre Woodstock heliport facility (currently minimally operational) and sale of Pine Island Center heliport</li> <li>2. Work with local government to find a heliport site in Cape Coral area to better serve north central Lee County</li> <li>3. Restore to full operational capacity three severely damaged heliports (Hurricane Ian)</li> <li>4. Work with local, state, and federal land managers to refine and increase treatment abilities on managed lands in Lee County (always ongoing)</li> <li>5. Continue to improve production techniques and numbers of sterile male <i>Aedes aegypti</i> to increase releases from 400,000/week to 1,000,000/week</li> <li>6. Locate, survey, and inform the public of the district’s new release site in Ft. Myers, shifted from Captiva Island after Hurricane Ian destroyed Captiva’s infrastructure</li> <li>7. Renovate the old administrative (Miller) building to accommodate training needs of the Lee County MCD and outside agencies involved in mosquito control</li> <li>8. Remodel the old mix/load building into an Unmanned Aerial System drone office and storage facility</li> <li>9. Repair the district’s 80-year-old runway where needed</li> <li>10. Improve West Nile Virus (WNV) response plans and treatments by developing a mathematical model based on weather activity with Florida Gulf Coast University</li> </ol>
<b>Human Resources</b>	Hire the best qualified candidates for the specialized jobs required by the district and provide excellent service to MCD employees to maximize retention, ensure salary competitiveness, and advancement opportunity.	<ol style="list-style-type: none"> <li>1. Transition the district’s performance review process to an online platform</li> <li>2. Update the district’s performance reviews to be specific to jobs and management levels (supervisor or non-supervisor)</li> <li>3. Transition to a digital benefits selection process</li> <li>4. Implement pre-employment assessments to help with selection process</li> <li>5. Digitize all human resources records</li> <li>6. Develop a record management policy that complies with state standards regarding personnel records</li> <li>7. Comply with the new records management policy and destroy records that are outside the established retention periods</li> </ol>

Department	Goal	Objectives
<b>Information Technology</b>	Research and implement new technologies to streamline operations and reduce costs, while identifying and securing the district's technology from exploitable vulnerabilities.	<ol style="list-style-type: none"> <li>8. Write a new department procedures manual that reflects transition to digital platforms</li> <li>9. Develop and implement a supervisor training program</li> <li>1. Develop an "active threat plan" to alert employees of an on-site emergency and proper response</li> <li>2. Upgrade network backbone speed to 40 gigabytes/sec from current 10 gigabytes/sec including replacement of fiber cables to all buildings from multimode to single mode</li> <li>3. Implement managed services for network switches so updates and fixes are performed automatically</li> <li>4. Upgrade <i>Fuel Master</i> fueling system to cloud-based service</li> <li>5. Implement second microservice architecture appliance into a second building with replication improving high availability and fault tolerance</li> <li>6. Develop a new program for tracking aircraft maintenance in-house</li> <li>7. Upgrade all VMware host servers for faster speeds and greater reliability with managed services so updates and fixes are automatic</li> <li>8. Install improved Wi-Fi system at headquarters</li> </ol>
<b>Finance</b>	Maximize efficiency by moving to a paperless system for all financial documents, develop or purchase systems to eliminate check writing, maximize vendor payment with Automated Clearing, and further improve payroll and inventory	<ol style="list-style-type: none"> <li>1. Move to a paperless system for all financial documents</li> <li>2. Update the vendor payment process to move as many vendors to the Automated Clearing House system as possible and reduce the need for paper checks and check printing</li> <li>3. Expand on the ways to use <i>Tyler Incode's</i> existing features to streamline the district's operations, similar to what was done with the Work Request feature</li> </ol>
<b>Aircraft/Vehicle Fleet/UAS</b>	Fleets will continue to upgrade operations with installation of state-of-the-art technology such as improved spray systems, spray	<p><b>Manager, Aircraft Maintenance</b></p> <ol style="list-style-type: none"> <li>1. Implement in-house maintenance tracking software (currently under development by IT)</li> <li>2. Continuously improve avionics capabilities due to equipment advancement</li> <li>3. Complete new instrument panel and <i>Garmin</i> package in N146RD to match panel installed in N198RD</li> </ol>

Department	Goal	Objectives
	<p>drones, and LiDAR to better find and apply mosquito control materials to both known and cryptic breeding sites of Lee County in a timely and effective manner.</p>	<ol style="list-style-type: none"> <li>4. Install polycarbonate impact-resistant windshields on the ultralow volume-equipped H125 helicopter (bird strike protection)</li> <li>5. Complete belly tank modifications on both Douglas DC-3C-TP aircraft (N146RD, N198RD)</li> <li>6. Build chemical storage building for loading systems, waste and partial chemical drum storage</li> </ol> <p><b>Manager, Fleet Maintenance</b></p> <ol style="list-style-type: none"> <li>7. Continue all maintenance service to over 100 vehicles and provide timely service and field retrieval of damaged or wrecked vehicles</li> <li>8. Continue fabricating aircraft parts, machine parts and vehicle parts for optimal performance and quick repair saving time and money versus outside contracting for these services</li> </ol> <p><b>Chief Pilot</b></p> <ol style="list-style-type: none"> <li>9. Build a flight simulator to reduce training costs and increase the volume of critical Crew Resource Management training (CRM)</li> <li>10. Continue to transition to <i>Helistream Flight Training</i> for helicopter training to include the use of night vision goggles training when the Airbus training credits expire (goal is to alternate training, one year at Airbus and the next year at <i>Helistream</i>)</li> <li>11. Pilot Certification training - continued efforts to increase the number of flight instructors and fixed-wing Captains within the flight department</li> <li>12. Increase the depth of the on-call pilot pool to include both helicopter and fixed-wing pilots able to eventually execute any mission</li> <li>13. Choose one airframe for the fixed-wing operation. Currently, there are three platforms. This will simplify training and time to for staff to obtain captain-level in the fixed-wing operation</li> <li>14. Refine the tower project and work with <i>Ag-Nav</i> to improve the graphics to make the towers more visible.</li> </ol> <p><b>Unmanned Aerial Systems (UAS)</b></p> <ol style="list-style-type: none"> <li>15. Reset UAS department fleet</li> <li>16. Replace all UAS with Department of Management Services-compliant devices</li> </ol>

Department	Goal	Objectives
		<ol style="list-style-type: none"> <li>17. Apply for new Certificate of Authorization with new aircraft</li> <li>18. Complete electrical integration of charging stations in the UAS Van</li> <li>19. Increase acreage treated by 130% minimum to 585 acres treated in 2023</li> <li>20. Improve communication and workflow with larvicide department to aid field inspectors’ recognition of potential UAS treatment sites</li> <li>21. Conduct comparative analysis of <i>TruWeather Solutions</i> predictions versus actual weather conditions for Aerial Adulticide pre-mission planning</li> <li>22. Continue calibrating larvicide treatment drone for all granular products</li> <li>23. Stitch together all acquired LiDAR data sets for hydrological modeling to incorporate rainfall and tidal data</li> <li>24. Explore new technologies in UAS for mapping and inspection including multispectral, hyperspectral, thermal, RGB (red, blue, green) + digital zoom, AI integration</li> <li>25. Conduct aerial adulticide cage trials for site-specific application</li> <li>26. Collaborate with product manufacturers on product label language for UAS use</li> <li>27. Connect with other governmental and non-governmental agencies in Lee County utilizing drones for continued networking, education, and shared experience flying drones in the field</li> <li>28. Fulfill necessary parameters for flights over people and limited Beyond Visual Line of Sight operations</li> </ol>
<b>Public Information and Education</b>	Maximize outreach to various private and governmental organizations, media, the Lee County school system, and state representatives to provide top-notch education and information ensuring that citizens understand mosquito control and why it is necessary	<ol style="list-style-type: none"> <li>1. Grow the annual coordination of meetings, visits, and tours with members of the local legislative delegation to maintain collaborative relationships</li> <li>2. Complete the permanent Lee County MCD interactive display at the IMAG History &amp; Science Center in Fort Myers</li> <li>3. Continue frequent print, television, and online media interviews regarding District operations throughout the year</li> <li>4. Establish regular mosquitofish giveaways at various locations throughout the county using the district’s “Skeeter Eater” outreach trailer</li> <li>5. Create and post fun and educational videos on social media highlighting the work of the MCD’s various departments throughout the district</li> </ol>





Department	Goal	Objectives
		<ol style="list-style-type: none"> <li>6. Reestablish a robust internship program for the district’s school-based education programs and operational departments through existing partnerships with local colleges and universities</li> <li>7. Update the Lee County Mosquito Education Program’s dedicated website, implementing branding and curriculum changes, and maintain ADA compliance for both websites</li> <li>8. Implement an interactive data collection platform into classroom lessons to increase school-to-home engagement</li> <li>9. Increase communication, feedback, and data collection by implementing easy-to-use assessments/surveys for school programs at all levels</li> <li>10. Plan and execute annual in-service trainings for school district teachers to promote district school-based programs and inquiry-based learning</li> <li>11. Research and incorporate additional best practices and learning accommodations for students with disabilities and language barriers throughout the MCD’s school-based educational programs</li> </ol>

<b>Operations</b>	<p>Operations is committed to improving the quality of life, facilitating outdoor activities, and protecting the public health in the community by implementing environmentally sound practices and using cutting-edge technologies to detect viruses and apply material that control mosquitoes throughout the district.</p>	<p><b>Assistant Director MCO</b></p> <ol style="list-style-type: none"> <li>1. Work with local, state, and federal land managers to refine and increase treatment abilities on managed lands in Lee County</li> <li>2. Increase A1 sprayer capacity and develop routes to target disease vectors on a wider scale in hard to treat areas</li> <li>3. Complete ULV sprayer upgrades for all ULV fleet to maximize efficiency</li> <li>4. Work with <i>Leading Edge Aerial Technologies</i> to further develop and refine <i>MapVision</i> (the district’s data management program) with enhancements to maximize efficiency</li> <li>5. Establish ground ULV capabilities on Upper Captiva Island</li> <li>6. Continue expansion of aquatic weed mosquito habitat identification and work with the Hyacinth Control District to increase response and foster working relationships with land/agricultural owners and managers</li> <li>7. Further develop the district’s working relationship with the Department of Environmental Protection and Waste Pro to remove tires that are breeding mosquitoes in the county</li> </ol>
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Department	Goal	Objectives
		<ol style="list-style-type: none"> <li>8. Work with County Code Enforcement and Building Permitting to establish a plan to reduce <i>Culex</i> mosquito development in construction dumpsters and homes under construction</li> <li>9. Fully develop UAS and LiDAR operational capabilities and implement into MapVision for daily operations</li> <li>10. Implement the ability for aerial adulticiding offsets to be modified from the cockpit based on local wind conditions</li> <li>11. Implement a standardized training protocol for newly hired ground larviciding personnel</li> </ol> <p style="text-align: center;"><b>Mosquito Control and Scientific Intelligence</b></p> <ol style="list-style-type: none"> <li>12. Bring back a full-time position</li> <li>13. Establish a designated BLS-2/3 laboratory cleanroom specifically for RT-PCR testing</li> <li>14. Implement use of new PCR machine for more accurate and timely analysis of mosquito pools for arbovirus detection</li> <li>15. Implement the use of new technology for a more accurate and timely analysis of sentinel chicken samples for arbovirus detection</li> <li>16. Replace old centrifuge equipment to quicken analysis of mosquito pools and sentinel chicken sample processing</li> <li>17. Replace old autoclave equipment for proper sterilization of equipment used for arbovirus testing</li> </ol> <p style="text-align: center;"><b>Sterile Insect Technique</b></p> <ol style="list-style-type: none"> <li>18. Transition from pupal irradiation to adult irradiation to allow greater flexibility in the MCD’s schedule and possibly an improvement in male mosquito fitness</li> <li>19. Initiate releases of sterile male <i>Aedes aegypti</i> in Fort Myers to begin suppression of this population</li> <li>20. Further scale-up mosquito production to achieve one million sterile male <i>Aedes aegypti</i> per week</li> </ol>
<b>Facilities</b>	Renovate existing buildings and heliports to improve the safety, storm worthiness, and functionality of district facilities while improving the storm worthiness of existing buildings	<ol style="list-style-type: none"> <li>1. Develop and implement maintenance help desk with existing <i>Agile Project Management</i> program</li> <li>2. Pave south runway drive and install new gate at Sunset Road</li> <li>3. Rebuild Winkler, Woodstock, and Bowman heliports to full operational capacity</li> <li>4. Obtain architect drawings and remodel Miller Building</li> <li>5. Establish heliport in NW Cape Coral</li> <li>6. Spot repairs to North Runway surface</li> </ol>



Department	Goal	Objectives
	and heliports to better support mosquito control operations for the citizens of Lee County.	<ol style="list-style-type: none"> <li>7. Replace 50-ton chiller with 70-ton chiller for backup air conditioning during emergencies</li> <li>8. Remodel old ULV building to UAS drone office and storage</li> <li>9. Clean out and remodel apartment space above pilot's office</li> <li>10. Replace two aircraft shade hangers on ramp</li> <li>11. Add building (similar to mix load building) for large vehicle storage across from Fleet</li> <li>12. Add two large screen cages for operational field testing</li> <li>13. Fence in additional lot next to Homestead house</li> </ol>
Research	Field Validation will continue to test new mosquito control commercial technologies and chemicals from industry and universities to ensure efficacy and cost competitiveness among rival products to provide the district with the best value for its money and help with the patenting process as district personnel develop new products in-house.	<ol style="list-style-type: none"> <li>1. Identify and evaluate <i>Pythium</i> species for effects on larvae</li> <li>2. Evaluate VectoBac 12AS as replacement for temephos (larvicide)</li> <li>3. Evaluate efficacy of new products with novel modes of action against local mosquito populations</li> <li>4. Assess insecticide product resistance in local mosquito populations from various locations across Lee County</li> <li>5. Continue surveillance for invasive mosquito species</li> <li>6. Improve WNV response plans and treatments and develop a mathematical model to help direct control efforts</li> <li>7. Monitor Imperium aduicide to confirm use as a rotation product by air</li> <li>8. Establish microplate assay capabilities to increase accuracy of resistance testing</li> <li>9. Evaluate effects of aduicide-treated plants on non-target host development</li> </ol>

Source: TBG Work Product, Lee County MCD.

### Performance Measures and Standards

Lee County MCD has had some performance measures and standards in place for several years that are relevant and useful; narrative information in the new strategic plan provides some information about performance measurement but is not consistent across objectives. The numerous goals reported in the table above were developed within the past year and therefore do not have performance data associated with them yet. TBG reviewed narrative summaries in the strategic plan that indicate performance measures that the district is monitoring, but the information has not been reported consistently across a well-defined set of measures. Examples are provided in the analysis section that follows. The district has established many measurable objectives in order to monitor its performance going forward.



For the current and past three fiscal years, Lee County MCD reported to TBG that it monitors performance for two district-wide standards, maintaining zero incidence of arbovirus in the county and responding timely to service requests throughout the year.<sup>8</sup> Such performance measures and standards are commonly used across the 14 other MCDs reviewed by TBG and are relevant and useful to evaluate whether a program is meeting its overarching objective of controlling the mosquito population in its area.

(1) **Standard:** Zero human cases or deaths due to arboviruses acquired in Florida and detected in the district.

**Measure:** Lee County MCD conducts weekly arbovirus surveillance, submits blood samples from sentinel chickens to Tampa DOH's lab, and analyzes weekly DOH reports. The numbers of human cases are monitored and recorded for possible treatment areas.

(2) **Standard:** Respond daily to all citizen service requests year-round.

**Measure:** All service requests are addressed. The district maintains a data management program that indicates a request has been addressed when adulticide treatments are conducted.

### ***Analysis of Goals, Objectives, and Performance Measures***

**Lee County MCD has largely been achieving its performance standards that monitor presence of arbovirus and responses to service calls; additional performance measures and standards could be established consistently for new goals and objectives in the district's strategic plan.** On a day-to-day basis, Lee County MCD uses a myriad of approaches to monitor and measure its effectiveness. Lee County MCD monitors on a real-time basis the completion rate of missions, the areas treated by truck, manually, or aurally, and other parameters. Screens in the district's operation center constantly update data reflecting current performance across the operation. A few examples include the ongoing monitoring of percentage completion of surveillance areas for the month and percentage complete of service requests responded to within 24 hours.

The district should continue monitoring these two performance standards. Also, as discussed above with respect to the district's strategic plan, additional performance metrics could be added to monitor progress consistently across the numerous new goals and objectives for each district department. A review of narrative in the recently developed strategic plan indicates that the Lee County MCD's achievement of goals set forth in the plan already show favorable performance. For example, the district's Chief Financial Officer reported completing goals of (a) setting up a scan tag system for capital asset inventory control, (b) converting Lee County MCD's payroll General Ledger/Inventory/Payroll systems to *Tyler Incode*, and (c) overhauling the monthly financial report to include more operational information and Retiree Health Insurance Trust Fund statements. An operational goal was to increase yearly acreage treated, which was successfully achieved, increasing from 63 acres treated in 2020 to 175 in 2021 and 444 in 2022. The district's goal for the upcoming year is to increase acres treated by a minimum of 30% to 585 acres treated in 2023. As another example, executive management reported achieving final payment of the Airbus helicopter fleet four years ahead of time in September 2022, saving an estimated \$690,000 in interest payments. The recently established goals and objectives of the district are consistent with the district's activities to date and should be achievable within the district's adopted budget.

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<sup>8</sup> While the Lee County MCD has established goals and objectives for each of its departments, information on the district's performance measures and standards is available at the district level only.

**Table 17** reports service delivery metrics and disease prevalence within the Lee County MCD over the review period.

**Table 17. Performance Measures for Lee County MCD**

Performance Measure	CY 2020 <sup>1</sup>	CY 2021 <sup>1</sup>	CY 2022 <sup>1</sup>	CY 2023 <sup>1</sup>
Arbovirus Cases (Florida)	1	0	0	0
Arbovirus Cases (Travel)	1	0	32	1
Arbovirus Deaths	0	0	0	0
	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23 <sup>2</sup>
Service Calls	5,189	4,820	3,201	3,877
Service Responses	5,189	4,820	3,201	3,877

Source: TBG Work Product, Lee County MCD, Florida DOH.

<sup>1</sup> Florida DOH data is provided by calendar year (CY).

<sup>2</sup> YTD through April.

Assessment of performance measures and standards for Lee County MCD are summarized in **Table 18**.

**Table 18. Assessment of Performance Measures and Standards for Lee County MCD**

Performance Measure	Performance Standard	Assessment
Counts of human arbovirus cases acquired in Florida based on DOH data	Zero non-travel-related human cases or deaths due to arboviruses in Lee County	Standard met in the current and two of the past three calendar years; standard was not upheld in calendar year 2020.
All service requests and responses	Respond to all citizen service requests year-round	Standard met.

Source: TBG Work Product, based on review of information provided by Lee County MCD.

### **Perception of District's Performance**

**Perceptions of Lee County MCD's performance by stakeholders is positive.** Lee County Parks and DOH both responded positively to inquiries about Lee County MCD's performance. Both reported positive working relationships, and that the Lee County MCD has "proved themselves to be efficient and effective." Lee County MCD Commissioners spoke with TBG and indicated high regard for the effective leadership and program management in place at Lee County MCD.

Among its peers, Lee County MCD is considered a leader in effective mosquito control. Representatives of other MCDs interviewed by TBG routinely commented (without prompting) on Lee County MCD's effectiveness and leadership in mosquito control. They have achieved this level of quality and respect while controlling costs in an aggressive manner. Lee County MCD is keenly monitoring costs to mitigate the impacts of (a) an ever-expanding area of residential development that is immediately adjacent to mosquito-prolific natural areas, and (b) increasing chemical costs for all larvicide and adulticide products. Lee County MCD has focused on researching and developing new methods to combat mosquitoes more efficiently and with reduced cost.

# 3. Recommendations

## Discussion and Analysis

**TBG analyzed findings by fiscal year to determine if revisions to district organization or administration can improve the efficiency, effectiveness, and/or economical operation of the district and presents several recommendations for the Legislature’s consideration and for consideration by Lee County and Fort Myers Beach MCDs.** TBG determined that the district and Fort Myers Beach MCD could work with a professional licensed surveyor or take other action as appropriate to determine the correct boundaries for the districts. TBG also determined that the Lee County MCD could consider consolidation with the Fort Myers Beach MCD. In addition, TBG presents a recommended statutory change to allow the district access to solid waste management grant funds from DEP that could help improve efficiency of the district’s operations by reducing costs for the important and never-ceasing source reduction activity of waste tire collection and disposal. TBG also determined the district could develop additional performance measures and standards. Finally, TBG determined that the Legislature may wish to consider directing the Florida Coordinating Council on Mosquito Control to develop model goals, objectives, and performance measures and standards to assist MCDs in this state.

*District boundaries:* The map that depicts the boundaries of Lee County MCD as shown in Figure 1 of this report represents what the district reported to TBG as its current boundaries and is based on a map from the Lee County Supervisor of Elections Office. The boundaries of this map conflict with the boundaries shown in the report and presented in Figure 1 of the concurrent review of Fort Myers Beach MCD. Professional surveyors and mappers determine property boundaries and are licensed through the Florida Board of Professional Surveyors and Mappers and DACS.<sup>9</sup> To determine the correct boundaries for the districts, the district could work with Fort Myers Beach MCD and a professional licensed surveyor or take other action as appropriate.

*Consolidation:* As TBG found in the course of its review of the Fort Myers Beach MCD, the catastrophic damage that occurred in Fort Myers Beach due to Hurricane Ian caused the district to lose all of its facilities, records, and systems. No apparent disaster recovery plan was in effect, and Fort Myers Beach MCD staff are currently operating as two individuals manually inspecting properties for abandoned pools and larval habitat, on foot. If merged with the Lee County MCD, Fort Myers Beach MCD would have access to additional resources, equipment, funding, and the well-established operations of the Lee County MCD, which could help improve service delivery within the Fort Myers Beach area.

TBG’s analysis identified potential efficiencies and economies of scale that could be achieved with the merger of the two districts. Lee County MCD reported that it would be able to absorb the operations of the Fort Myers MCD at nominal cost, whereas the expense for Fort Myers Beach MCD to rebuild its operations is anticipated to cost at least \$2 million. In addition, existing resources, equipment, and treatment processes established by Lee County MCD would provide immediate benefits to mosquito control activities in Fort Myers Beach at nominal additional costs to Lee County MCD. Given the economies of scale that could be achieved with the Lee County MCD, it is likely a better use of taxpayer funds to consolidate Fort Myers Beach MCD operations into Lee County MCD and coordinate treatment processes and procedures with existing Lee County MCD protocols. The consolidation of

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<sup>9</sup> <https://www.fdacs.gov/Business-Services/Surveyors-and-Mappers>



these two districts could provide more resources and operational capacity to the residents of Fort Myers Beach. The consolidation could occur through one of the two following processes, which are outlined in detail in the Florida Special District Handbook, published by the Department of Economic Opportunity's Special District Accountability Program.<sup>10</sup>

1. The Legislature could consider merging the Lee County MCD and the Fort Myers Beach MCD by special act. Section 189.073, *Florida Statutes*, establishes that the Legislature, by special act, may merge independent special districts created and operating pursuant to special act. The special act merging the special districts must be approved at separate referenda of the impacted local governments by a majority of the resident electors. The special act merging the special districts must include a plan of merger that addresses transition issues such as the effective date, governance, administration, powers, pensions, and assumption of all assets and liabilities.
2. The Lee County MCD and Fort Myers Beach MCD could choose to jointly merge into a single independent special district. Section 189.074, *Florida Statutes* establishes that two or more special districts may elect to merge into a single independent special district provided they are contiguous, have similar functions, and have elected governing bodies. The merger proceedings can be initiated through a Joint Merger Plan by Resolution, which is initiated by the governing body of each special district, or through a qualified elector initiative, which is initiated by the electors of each special district. The merger must be approved at separate referenda of the impacted local governments by a majority of the resident electors.

A consideration for this recommendation is that the two districts currently have a disparity in their millage rates, with Fort Myers Beach MCD having a rate of 0.1123, which is lower than that of Lee County MCD at 0.2300. If the merger were to occur at the current Lee County millage rate, the residents of Fort Myers Beach would face a heavier tax burden (e.g., for a property with a taxable value of \$500,000, the taxes assessed at the 0.1123 rate for the Fort Myers Beach MCD would be \$56.15 and at the 0.2300 rate for the Lee County MCD would be \$115). The voters will be informed of the millage rate issue and a majority must approve the merger before it may take effect. Timing may be sensitive for this issue as TBG was advised that Fort Myers Beach MCD intended to issue a request for proposal for architectural services to design the new building within 30 days after the date of TBG's field visit in March 2023.

*Waste Tire Collection and Disposal Fees:* Waste tires are commonly found scattered throughout residential and commercial areas across the state, and the design of tires makes them ideal habitat for mosquito larva, particularly for species of mosquito that are known to be important disease vectors. The removal of waste tires can help reduce populations of these disease-carrying mosquitoes and reduce the threat of diseases like dengue and Zika. However, the problematic mosquito-producing habitats created by waste tires are difficult to manage through routine chemical applications but can be managed through proper disposal. Lee County MCD staff reported that they routinely collect waste tires abandoned around the county and bring them to the local public landfill where the district is charged tire disposal fees. District staff reported that the district collected approximately 1,200 tires during FY 2022-23 and spent approximately \$8,500 on tire disposal fees.

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<sup>10</sup> [The Florida Special District Handbook, October 2022.](#)

In Florida, DEP regulates the disposal of waste tires by creating requirements for the collection and disposal of waste tires at solid waste management facilities and waste tire processing facilities across the state.<sup>11</sup> These facilities typically charge fees for the disposal of waste tires, which frequently cannot be waived due to bond requirements for the facilities. MCDs must pay these fees if the districts choose to collect and dispose of waste tires.

The state currently collects a waste tire fee of \$1 per each new tire sold at retail.<sup>12</sup> These funds are allocated in different amounts defined in statute to various activities related to solid waste management in the state, including funds that DEP is directed to use for general solid waste activities.<sup>13</sup> DEP currently uses a portion of this funding to reimburse counties for hosting waste tire amnesty events during which residents may bring in waste tires for disposal free of charge (businesses are not eligible for participation). DEP opens this opportunity annually from July through May to all counties in the state, and any county may apply for the assistance through the department by providing a scope of work including a description of how the amnesty event will be held, how many tires the district anticipates receiving, and other information. According to DEP representatives, the department advertises this funding opportunity specifically to counties; however, DEP has also allowed MCDs to apply and receive the funding for waste tire amnesty events. For example, the Florida Keys MCD and East Flagler MCD, as discussed in their reports, received such funding in FY 2022-23.

For districts in which waste tires present a significant mosquito control challenge, the availability of funding to support waste tire abatement would be beneficial. Although DEP in its discretion has allowed MCDs to apply for the waste tire amnesty event funding in the past, advertising for the funding is not directed toward MCDs, and the department is not required by statute to continue to offer such funding in the future. Moreover, some MCDs would benefit from the reimbursement of waste tire disposal fees and other costs incurred by the district for tires collected and disposed of by district staff, in addition to funding for hosting waste tire amnesty events. Facilitating increased and consistent access to waste tire disposal funds by MCDs could help increase tire collections around the state, which has benefits beyond mosquito control, including general pollution reduction and beautification.

To allow regular access to waste tire abatement funding by MCDs, facilitate increased waste tire collection by MCDs around the state as a means of mosquito control, and increase the hosting of events like waste tire amnesty days by MCDs, the Legislature could consider amending section 403.709(1), *Florida Statutes*, to require a portion of the funds currently administered by DEP for solid waste activities to be allocated to waste tire abatement activities by MCDs.

*Performance Standards and Measures:* Lee County MCD has developed a formal strategic plan with clear goals and objectives, but has not developed formal performance measures and standards tied to each district goal and objective. The district could establish clearly defined performance measures and standards with which to assess its progress toward achieving its goals and objectives.

*Florida Coordinating Council on Mosquito Control:* During TBG's review of the 15 independent MCDs, TBG found that most districts have not developed sufficient goals, objectives, or performance measures and standards. The Florida Coordinating Council on Mosquito Control was established by the Legislature to foster maximum efficient

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<sup>11</sup> Sections [403.717](#) and [403.718](#), F.S. and Rule Chapter [62-711](#), F.A.C.

<sup>12</sup> Section [403.718](#), F.S.

<sup>13</sup> Section [403.709\(1\)](#), F.S.



use of existing resources and to assist entities involved in mosquito control with best management practices. Membership on the council includes the agency heads for DACS, DEP, and the Fish and Wildlife Conservation Commission, the State Surgeon General, as well as representatives of federal agencies, the University of Florida’s Florida Medical Entomology Laboratory, Florida MCDs, and others. The Legislature could direct the council to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model MCD goals, objectives, and performance measures and standards to assist MCDs with performance monitoring.<sup>14</sup>

## Recommendations

**Table 19** summarizes TBG’s recommended changes to improve operations, reduce costs, or reduce duplication.

**Table 19. Recommendations with Associated Considerations**

Recommendation	Considerations
<p><b>The district could work with Fort Myers Beach MCD and a professional licensed surveyor or take other action as appropriate to determine the correct property boundaries of each district.</b></p>	<ul style="list-style-type: none"> <li>• This recommendation would require the Lee County MCD and Fort Myers MCD to coordinate efforts to obtain the review of a professional licensed surveyor or take other action.</li> <li>• The districts may incur costs to retain a surveyor or take other action.</li> </ul>
<p><b>The Legislature could consider merging the Lee County MCD and the Fort Myers Beach MCD by special act, which is provided for by s. 189.073, Florida Statutes.</b></p>	<ul style="list-style-type: none"> <li>• This recommendation would require the Legislature to enact a special act for the consolidation. This would further require a local referendum and approval by a majority of resident electors.</li> <li>• The tax rates are currently different for the two MCDs. This issue will need to be addressed at the local level and ultimately by the voters.</li> </ul>
<p><b>The Lee County MCD and Fort Myers Beach MCD could jointly consider merging into a single independent special district, which is provided for by s. 189.074, Florida Statutes.</b></p>	<ul style="list-style-type: none"> <li>• This recommendation would require agreement to the merger by both districts and a local referendum and approval by a majority of resident electors.</li> <li>• The tax rates are currently different for the two MCDs. This issue will need to be addressed at the local level and ultimately by the voters.</li> </ul>
<p><b>The Legislature could consider amending section 403.709(1), Florida Statutes, to require a portion of the funds currently administered by DEP for solid waste activities to be allocated to waste tire abatement activities by MCDs.</b></p>	<ul style="list-style-type: none"> <li>• This recommendation would require a statutory change.</li> <li>• This recommendation would require DEP staff to communicate information about resources available through the department for waste tire collection and disposal assistance to MCDs and might add nominal additional administrative costs for the department.</li> <li>• This recommendation could lead to additional expenditures by the department from the Solid Waste Management Trust Fund; department staff</li> </ul>

<sup>14</sup> Section 388.46, F.S.

Recommendation	Considerations
<p>The district could formalize additional performance measures and standards that would allow the district to monitor and track progress toward all its goals and objectives. Such performance information would facilitate the district in consistently monitoring its progress.</p>	<p>reported that there tend to be unexpended funds from this funding source each year.</p> <ul style="list-style-type: none"> <li>This recommendation would require additional staff time and may result in additional administrative costs to the district.</li> </ul>
<p>The Legislature could consider amending s. 388.46, <i>Florida Statutes</i>, to direct the Florida Coordinating Council on Mosquito Control to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model goals, objectives, and performance measures and standards to assist MCDs with performance monitoring.</p>	<ul style="list-style-type: none"> <li>This recommendation would require a statutory change.</li> <li>This recommendation would impose additional workload on council members and staff.</li> <li>The council’s membership could assemble a subcommittee with a broad range of expertise that could be ideal for the development of such model performance information.</li> <li>While this guidance will assist all MCDs, it will be of particular benefit to MCDs that lack staff resources for the development of such performance information.</li> </ul>

Source: TBG Work Product, based on review of information provided by Lee County MCD.

## 4. District Response

Each independent MCD under concurrent review by TBG was provided the option of submitting a formal response letter for inclusion in the final published report. Lee County MCD’s response letter is provided on the following page.

**BOARD OF COMMISSIONERS**

WILLIAM P. BURKE, CHAIRMAN  
THOMAS HART, VICE CHAIRMAN  
STEPHEN R. BOWEN, SECRETARY-TREASURER  
ED BRANTLEY  
W. MICHAEL ELLIS  
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[VSeidel@balmoralgroup.us](mailto:VSeidel@balmoralgroup.us)

August 28<sup>th</sup>, 2023

Dear Ms. Seidel:

Thank you and the Balmoral Group for your efforts working with the Lee County Mosquito Control District (LCMCD) in producing an accurate and positive report on our district for the Office of Program Policy Analysis and Government Accountability. We feel the report accurately captured the assessment of our operations, policies, and finances.

Our district has one clarifying suggestion to the report for your consideration:

Fort Myers Beach Mosquito Control District contracts with LCMCD annually to provide aerial larviciding and adulticiding services as needed at the cost of \$60,000 per year. The boundary separating our two districts was surveyed by a professional engineering company many years ago, Johnson Engineering. LCMCD routinely provides truck-based mosquito control in a neighborhood that did not exist at the time of the Johnson Engineering survey and, we think, belongs to Fort Myers Beach MCD. To clarify the exact boundary between our districts, we suggest the Lee County Surveyor of Lands survey the Ft. Myers Beach MCD area of responsibility to remove any discrepancies between our districts' boundary.

Please don't hesitate to call if you have further questions or enquiries into this matter.

Sincerely,

A handwritten signature in black ink that reads "David F. Hoel".

David F. Hoel, Executive Director  
Lee County Mosquito Control District



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# GLOSSARY OF TERMS MOSQUITO CONTROL DISTRICT REVIEWS

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**September 2023**

**Prepared for**

**The Florida Legislature**

**Prepared by**

**The Balmoral Group**

**165 Lincoln Avenue**

**Winter Park, FL 32789**

Attachment 1

Term	Definition
<b>Adulticide</b>	A chemical that kills adult insects, which is usually applied as a spray; depending on the circumstances, adulticide applications can be made from the ground (most commonly with ultra-low volume spray trucks) or from the air (with either fixed- or rotary-wing aircraft or helicopters)
<b><i>Aedes aegypti</i> mosquitoes</b>	The primary type of mosquitoes (commonly referred to as yellow fever mosquitoes) that spread Zika, dengue, chikungunya, and other viruses; because these mosquitoes live near and prefer to feed on humans, they are more likely to spread these viruses to humans than other types of mosquitoes
<b><i>Aedes albopictus</i> mosquitoes</b>	Although competent vectors of dengue, eastern equine encephalitis, and other viruses that affect humans, these mosquitoes (commonly referred to as Asian tiger mosquitoes) feed on animals as well as humans and are, thus, less likely to spread viruses to humans than <i>Aedes aegypti</i> mosquitoes
<b>Altosid</b>	The trade name for a mosquito larvicide that contains a synthetic version of the juvenile hormone insect growth regulator methoprene as the active ingredient
<b>American Mosquito Control Association (AMCA)</b>	A professional association that includes individuals working for mosquito control programs, academics conducting research on mosquitoes and other disease vectors, and industry representatives who support mosquito control efforts around the world; the AMCA is active in member training and educating the public on the health importance of mosquito control in the U.S. and beyond; the association is international in scope and has approximately 1,500 members
<b><i>Anopheles</i> mosquitoes</b>	A genus of mosquitoes with more than 400 species; female mosquitoes in approximately 40 of these species transmit malaria; this is the only genus of mosquitoes that can transmit malaria
<b>Arbovirus</b>	Arthropod-borne viruses that are transmitted to humans primarily through the bites of infected mosquitoes, ticks, sand flies, or midges; includes West Nile virus, eastern equine encephalitis virus, St. Louis encephalitis virus, dengue, chikungunya, Zika, California encephalitis group viruses, and malaria
<b>Arthropod</b>	As defined in Ch. 388, <i>Florida Statutes</i> , titled “Mosquito Control,” “arthropods” are insects of public health or nuisance importance, including all mosquitoes, midges, sand flies, dog flies, yellow flies, and house flies



## Attachment 1

Term	Definition
<b>Barrier island</b>	Land that separates the ocean from the mainland; frequently an estuary or a lagoon will be located between the barrier island and mainland
<b>Biogents</b>	A company that produces mosquito traps with the goal of reducing mosquito populations that are produced in container-type habitats
<b><i>Bacillus thuringiensis israelensis (Bti)</i></b>	A naturally occurring bacteria commonly used as a mosquito larvicide since the 1980s
<b>Chikungunya</b>	A mosquito-transmitted disease caused by a virus that originated in Africa and is transmitted by <i>Aedes</i> mosquitoes; symptoms include fever, joint pain, and rash; the name chikungunya comes from the African Makonde language and means “to bend over in pain,” which is the stance that many who contract this disease exhibit
<b><i>Culex</i> mosquitoes</b>	A genus of mosquitoes, several species of which serve as vectors of one or more important diseases of birds, humans, and other animals; the diseases they vector include West Nile virus, Japanese encephalitis, and St. Louis encephalitis.
<b><i>Culiseta melanura</i> mosquitoes</b>	A species of mosquitoes (commonly referred to as the black-tailed mosquito) that is significant due to its role in the transmission cycle of eastern equine encephalitis virus and potentially West Nile virus; these mosquitoes primarily feed on birds but can spread arboviruses to mammals as well
<b>Dengue</b>	A mosquito-transmitted virus that causes sudden fever and acute joint pain; occasionally occurs in Florida where the mosquito vector is <i>Aedes aegypti</i> or <i>Aedes albopictus</i>
<b>Dibrom</b>	The trade name for an organophosphate insecticide with the active ingredient naled; used in mosquito control as an adulticide and is typically applied with aircraft
<b>Dipper</b>	An approximately 300 ml container attached to an extension pole that is used to sample for the presence of mosquito larvae in aquatic habitats
<b>Eastern equine encephalitis virus (EEEV)</b>	A mosquito-transmitted virus that is rare but very dangerous when contracted by a horse, human, or other mammal; an average of 13 cases per year were reported in the United States from 2018-2022; approximately 30% of people with EEEV die and many survivors have ongoing neurologic

Attachment 1

Term	Definition
	problems; in Florida, the freshwater swamp inhabiting mosquito <i>Culiseta melanura</i> is the primary vector of this disease
<b>Fixed-wing aircraft</b>	Commonly referred to as an airplane, these aircraft include stationary wings that provide lift for the aircraft; in mosquito control, these aircraft are commonly used for larvicide and adulticide applications
<b>Florida Coordinating Council on Mosquito Control</b>	An interagency council created in Ch. 388, <i>Florida Statutes</i> , in 1986, primarily to address issues concerning mosquito control applications, possible environmental impacts of control actions, and mosquito control management on State of Florida-owned lands
<b>Florida Department of Agriculture and Consumer Services</b>	The state agency that oversees and regulates mosquito control programs in Florida
<b>Florida Department of Environmental Protection</b>	The state agency responsible for coordinating efforts for intensified mosquito control on protected public lands when needed
<b>Florida Department of Health (DOH)</b>	The state agency responsible for implementing the Florida Sentinel Chicken Surveillance Program, reporting weekly data on the prevalence of arboviruses in this state, issuing public health arbovirus advisories and alerts, conducting or participating in arbovirus epidemiologic investigations, distributing weekly arbovirus epidemiology summary reports for mosquito control agencies, healthcare agencies, researchers, and others, and reporting human and animal arbovirus cases to the national arbovirus surveillance database
<b>Florida Fish and Wildlife Conservation Commission</b>	The state agency responsible for maintaining a database that enables the surveillance of bird mortality from arboviruses and for providing assistance and information on arboviruses in wildlife
<b>Florida Medical Entomology Laboratory</b>	A University of Florida laboratory (within the Institute of Food & Agricultural Sciences) that conducts research primarily on the control of mosquitoes; for the past 70 years, research at this lab has been instrumental in assisting mosquito control programs in Florida and elsewhere
<b>Florida Mosquito Control Association (FMCA)</b>	Created in the 1920s, the FMCA is Florida’s professional association that includes individuals working for mosquito control programs, academic personnel conducting research on mosquitoes and other disease vectors,



Attachment 1

Term	Definition
	and industry, which supports mosquito control efforts in Florida; the FMCA is active in the training of members and educating the public on the public health importance of mosquito control
<b>Florida Sentinel Chicken Arboviral Surveillance Program</b>	A program of the DOH that provides laboratory assistance to local agencies to monitor for the transmission of mosquito-transmitted viruses; sentinel chickens are stationed at locations throughout the state; when the chicken is bit by an arbovirus-transmitting mosquito, the chicken develops antibodies to the virus (the chicken does not become sick and cannot spread the virus to other mosquitoes); blood samples obtained from the sentinel chickens are submitted to DOH’s lab in Tampa to be examined for the presence of antibodies; when present, the results indicate that arbovirus-transmitting mosquitoes are circulating in the location, enabling the increase of mosquito control efforts to reduce the risk of humans and animals from becoming ill
<b>Genetically modified mosquitoes</b>	<i>Ae. aegypti</i> mosquitoes that have been genetically modified to carry two genes: 1) a self-limiting gene that prevents female mosquito offspring from surviving to adulthood; and 2) a fluorescent marker gene that glows under a special red light, thereby allowing researchers to identify the genetically modified mosquitoes in the wild; because the female offspring die before becoming adults, the population of <i>Ae. aegypti</i> mosquitoes decreases
<b>Geographic Information System (GIS)</b>	Integrated computer hardware and software that stores, manages, analyzes, and visualizes geographic information
<b>Good Laboratory Practices Program (GLP)</b>	The goal of GLP is to ensure the quality and integrity of test data related to non-clinical safety studies
<b>Granular application</b>	Granular applications of chemicals differ from liquid applications by having a solid particle carrying the insecticide, which can better penetrate vegetation; this application is primarily used for larvicides to deliver mosquito toxin to the water where mosquito larvae are developing
<b>Impoundment</b>	Impoundments along Florida’s central-east coast were created in the 1950s and 1960s by building earthen dikes around salt marshes known to produce mosquitoes; this allows the mosquito control program to manage the water level within the impoundment to prevent saltmarsh mosquitoes from laying





## Attachment 1

<b>Term</b>	<b>Definition</b>
	their eggs in these areas, thus effectively reducing their populations with a minimum need for pesticides; approximately 40,000 acres of impoundments were constructed from Volusia County south to Martin County; the impoundments remain a source reduction control method in the region
<b>Landing rates</b>	A surveillance method to determine the extent of a mosquito problem, where a person stands in a specific location and counts the number of mosquitoes that land on them within a designated period (such as 60 seconds)
<b>Larvicide</b>	A chemical that kills insects in their larval stages; for mosquitoes, larvicide must be introduced into the water where the larvae are developing; depending on the circumstances, larvicide applications can be made from the ground or from the air with either fixed- or rotary-wing aircraft or drones
<b>Light Detection and Ranging (LiDAR)</b>	A remote sensing technology used to precisely detect objects, such as mosquitoes, in real space
<b>Malaria</b>	A life-threatening illness transmitted primarily in tropical locations by female mosquitoes in the genus <i>Anopheles</i> primarily in tropical locations; symptoms include fever, headache, and chills and usually occur within 10-15 days after a bite
<b>Methoprene</b>	A synthetic juvenile hormone, which is an insect growth regulator, that has been used as a larvicide since the mid-1970s
<b>Millage</b>	A tax rate on property expressed as the number of dollars assessed for each \$1000 of property value; for example, the property owner of a house valued at \$250,000, which is assessed at a millage rate of 1.0, would be charged \$250
<b>Mosquito Control District</b>	A local government entity enabled through a voter-approved local or state legislative act to provide mosquito control services in a geographically defined area
<b>Mosquito counts</b>	Surveillance of mosquito populations using a variety of techniques (e.g., traps or landing rates); this term is usually used in reference to adult mosquitoes rather than immature ones
<b>Natular</b>	The trade name for a larvicide that includes the bacteria spinosid as its active ingredient

Attachment 1

Term	Definition
<b>Nuisance mosquito</b>	A term used to designate a mosquito that typically does not transmit a pathogen such as a virus; these mosquitoes are in contrast to disease-transmitting mosquitoes that are readily capable of transmitting a pathogen
<b>Pest resistance</b>	The situation in which mosquitoes are no longer killed by the standard dose of an insecticide or manage to avoid coming into contact with the insecticide
<b>Pyrethrum</b>	A biochemical derived from a chrysanthemum plant that contains insecticidal properties; typically used in mosquito control as an adulticide
<b>Rotary-wing aircraft</b>	Aircraft that use a rotary blade rather than wings; a helicopter is the most common example
<b>Rotational impoundment management</b>	A management technique common in saltmarsh impoundments along Florida’s Indian River Lagoon where the impoundment is artificially flooded during part of the spring and summer to prevent mosquitoes from laying their eggs in the marsh and is opened for the remainder of the year through culvert pipes to provide a hydrological connection between the impounded marsh and adjacent estuary or lagoon
<b>Saint Louis encephalitis virus</b>	A virus most commonly transmitted by <i>Culex</i> mosquitoes that can affect the central nervous system when a human is infected
<b>Source reduction</b>	Refers to the elimination of habitats that can produce mosquitoes; ranges from the proper disposal of waste containers to the complicated management of impoundments
<b>Spinosid</b>	A naturally occurring bacteria that contains insecticidal properties; is commonly applied as a larvicide; Natular is a commercial product that uses spinosid as its active ingredient
<b>Sterile Insect Technique</b>	A method whereby male insects are sterilized by radiation or other means; when the sterilized male mates with the female insect, viable offspring are not produced
<b>Subcommittee on Managed Marshes</b>	An interagency committee created in 1986 by the Florida Legislature in Ch. 388, <i>Florida Statutes</i> , to promote the wise management of Florida’s wetlands for the mutual benefit of mosquito control and environmental enhancement
<b>Ultra-low volume</b>	A technique to dispense extremely small droplets of insecticide; while historically used for adulticiding, in some instances the technique is now used for larviciding



## Attachment 1

Term	Definition
<b>United States Department of Agriculture (USDA)</b>	Through its national Agricultural Research Service, the USDA participates in Florida mosquito control efforts largely with the Center for Medical, Agricultural and Veterinary Entomology, a laboratory in Gainesville, Florida, that conducts research on the biology and control of mosquitoes and other insects
<b>United States Environmental Protection Agency</b>	The federal agency that regulates mosquito control in Florida primarily through their approval and enforcement of chemical labels for insecticides
<b>Unmanned Aerial System (UAS)</b>	Aerial vehicles and associated equipment that do not carry a human operator and are remotely piloted or fly autonomously; drones are an example of a UAS
<b>Vector</b>	A living organism that transmits a pathogen (e.g., virus, plasmodium, nematode) from an infected animal to a human or another animal; mosquitoes are an example of a vector
<b>Vector surveillance</b>	Monitoring for vectors that can be accomplished in several ways (e.g., various types of traps or landing rates)
<b>Waste tires</b>	Vehicle tires that are no longer of value and that have been improperly disposed in a manner that allows water to collect in the tires; some species of mosquitoes (e.g., <i>Aedes aegypti</i> or <i>Aedes albopictus</i> ) lay their eggs in the standing water where the immature mosquitoes will develop to adulthood
<b>Water management</b>	In mosquito control, this term refers to a source reduction technique to minimize the production of mosquitoes in a particular aquatic habitat; the management of saltmarsh impoundments and some ditches are examples of water management projects
<b>West Nile virus (WNV)</b>	Introduced into the United States in New York around 2000, the virus is carried by birds and primarily transmitted by <i>Culex</i> mosquitoes; humans who contract the virus can develop a fever and other symptoms including headache, body aches, joint pains, and rash; most recover completely but symptoms can linger for weeks to months
<b>Yellow fly trap</b>	A sticky-type trap used to entangle yellow flies, a type of biting fly that occurs regularly in the Florida Panhandle, to reduce their population without insecticides

## Attachment 1

Term	Definition
Zika virus	A virus that originated in the Zika region of Africa and is transmitted by the mosquitoes <i>Aedes aegypti</i> and <i>Aedes albopictus</i> ; humans who contract the virus can have symptoms similar to dengue such as fever, rash, headache, and joint pain; Zika passed from a pregnant woman to her fetus can result in birth defects including microcephaly and other brain abnormalities

Source: TBG work product.



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# INTEGRATED PEST MANAGEMENT SUMMARY

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**September 2023**

**Prepared for**

**The Florida Legislature**

**Prepared by**

**The Balmoral Group**

**165 Lincoln Avenue**

**Winter Park, FL 32789**

Term	Summary
<b>Integrated Pest Management</b>	<p>Most mosquito control programs use an Integrated Pest Management (IPM) approach to control mosquito populations, which targets the different stages of a mosquito’s life cycle with various prevention and control measures. IPM addresses eight areas. Surveillance of mosquito populations is an essential component of all IPM programs with chemical treatments based on the surveillance findings. IPM can also include source reduction (e.g., container disposal and water/impoundment management), larviciding and adulticiding (using ground and/or aerial treatments), biological and alternative controls, and disease surveillance. Research and education are also important components of IPM programs.</p>
<b>Mosquito Surveillance</b>	<p>The general approach to surveillance is to define area-specific problems with mosquitoes through the establishment of a mosquito surveillance program. The program assists in determining the types of mosquito control efforts needed in each area so that pesticide applications are used only when necessary. Service requests made to mosquito control programs serve as one means of surveillance. Other means for adult mosquito surveillance include monitoring the landing rates and counts of mosquitoes in traps to determine when and where they are most prevalent and observing the effects of adulticide, larvicide, and source reduction efforts. Immature mosquito surveillance is conducted by collecting eggs, larvae, and pupae. Surveillance may also include inventorying and mapping data and using emerging technologies such as geo-referenced maps, geographic information systems (GIS), smart traps (e.g., a trap with an electronic device that differentiates mosquitoes from other insects, counts them, and wirelessly transmits the results), and unmanned aerial vehicles.</p>
<b>Source Reduction</b>	<p>Source reduction, also known as physical or permanent control, is considered the most effective mosquito control technique and is accomplished by eliminating larval habitats in salt marshes, freshwater habitats, temporarily flooded locations, and containers.</p> <p>Current saltmarsh source reduction techniques in Florida include</p> <ul style="list-style-type: none"> <li>• construction of shallow ditches that enhance drainage and thus eliminate mosquito-producing sites and create connectivity among water bodies to allow larvivorous fish (fish that feed upon insect larvae) access to mosquito habitats; and</li> <li>• management of impoundments by maintaining a sheet of water across a saltmarsh to prevent mosquitoes from laying eggs on the soil; this achieves saltmarsh mosquito control with minimum insecticide use.</li> </ul>

Term	Summary
	<p>Source reduction is also conducted in freshwater habitats and is based on the principle that manipulating water levels in low-lying areas will eliminate or reduce the need for insecticide use. The primary strategy used is reducing the amount of standing water or reducing the length of time that water can stand in low areas following significant rainfall.</p> <p>Another important area of source reduction is through aquatic plant management, which can be accomplished using chemical, biological, or mechanical control methods. Waste tire management is also a significant activity for many mosquito control districts because the proliferation and accumulation of discarded tires throughout the state continues to create habitats highly favored by mosquitoes, and these tires can be costly and labor-intensive to remove. Removing any receptacles that can contain water is beneficial in controlling mosquitoes.</p>
<p><b>Larvicides and Larviciding</b></p>	<p>Larvicides are insecticides used to kill insects in the larval stage. Most mosquitoes spend three to five days of their life cycle in the larval stage when they are highly susceptible to predation and control efforts; therefore, well-planned and timed larviciding is important for efficient operations to save labor costs and reduce chemical use. This also requires understanding the local mosquito ecology and patterns of arbovirus transmission to select the appropriate control techniques. Equipment used for ground application of larvicide can include trucks with sprayers mounted on the front bumper, all-terrain vehicles (ATVs), boats, and various hand-held and backpack sprayers. Aerial application uses various devices such as nozzles and metered systems that are attached to fixed-wing or rotary-wing aircraft (i.e., helicopters).</p>
<p><b>Adulticides and Adulticiding</b></p>	<p>Adulticides are insecticides used to kill adult mosquitoes. The majority of adulticiding in Florida is conducted using ultra-low volume (ULV) spraying during which an aerosol spray is released by specialized spray equipment mounted in aircraft, on the back of trucks or ATVs, or carried by hand or in a backpack. The spray drifts through the air and is effective only while it remains airborne; thus, having a short-term effect only. Where a longer-term effect is needed, residual sprays are applied to barriers or surfaces such as a stadium, park, or resident’s yard and are often applied with a modified vehicle-mounted hydraulic sprayer. The mosquito must land on the surface where the residual insecticide has been deposited for it to be effective. Equipment operators must be properly trained in equipment maintenance and adulticide application because timing, targets, and thresholds for the application are based on numerous factors and can be challenging to establish.</p>

Term	Summary
<b>Biological and Alternative Control</b>	<p>Biological control agents include microbial control agents (e.g., bacteria, such as <i>Bacillus thuringiensis</i> or <i>Bt</i>, that can be sprayed over waterbodies to kill developing mosquito larvae), invertebrate arthropod mosquito predators (e.g., small aquatic crustaceans, such as copepods, that eat insect larvae), and vertebrate mosquito predators (e.g., larvivorous fish and birds). It is common for mosquito control districts in Florida to provide larvivorous fish as a service to the public. For example, Collier Mosquito Control District provides <i>Gambusia</i> mosquitofish to Collier County residents to release in standing water on their property to manage mosquito larvae.</p> <p>Alternative control methods include the sterile insect technique, trapping, repellents, and bug zappers.</p>
<b>Disease surveillance</b>	<p>Because of its geographic location and proximity to the Caribbean, Florida is vulnerable to the introduction of new vector-borne pathogens as occurred with the introduction of Zika virus in 2016 in South Florida. Disease surveillance includes monitoring for human cases of mosquito-borne arboviral diseases including dengue, chikungunya, West Nile virus, St. Louis encephalitis, and others. In addition, many mosquito control programs conduct regular blood testing of sentinel chickens. The state established the Florida Sentinel Chicken Arboviral Surveillance Program (FSCASP) in 1977 to provide laboratory services to local agencies to monitor the transmission of certain vector-borne diseases. The services are primarily used by mosquito control programs around the state. The programs submit sentinel chicken blood samples to the Florida Department of Health’s Bureau of Laboratories in Tampa, where an antibody test is performed to identify if the chicken has been exposed to one of several viruses. Results are provided to participating agencies on a weekly basis.</p>
<b>Mosquito Control Research</b>	<p>Mosquito control programs must base their activities on sound and up-to-date scientific research in order to provide safe, effective, and efficient mosquito control services. Research that is either conducted or reviewed by mosquito control programs is essential to developing and implementing new and innovative methods and technologies. Numerous federal, state, and other entities conduct mosquito control research, as do several mosquito control districts in this state.</p>
<b>Outreach and Education</b>	<p>Increasing the public’s understanding of the work of the mosquito control districts is an important component of overall mosquito control efforts. Public education helps people understand what is involved in mosquito control, the biology of mosquitoes, ecological issues, arboviral disease transmission, and actions that can be taken to prevent mosquito bites and reduce mosquitoes in yards and</p>



## Attachment 2

Term	Summary
	neighborhoods. When adequately informed, the public is in a better position to protect themselves and support mosquito control efforts. This state’s mosquito control programs and other entities, such as the Florida Department of Agriculture and Consumer Services, Florida Mosquito Control Association, and the University of Florida’s, Institute of Food and Agricultural Sciences-Florida Medical Entomology Laboratory, dedicate significant efforts toward education.

Source: TBG work product.