SOUTH WALTON COUNTY MOSQUITO CONTROL DISTRICT REVIEW FINAL REPORT

September 2023

Prepared for

The Florida Legislature

Prepared by

The Balmoral Group

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Winter Park, FL 32789

Executive Summary

South Walton County Mosquito Control District (South Walton County MCD) is an independent special district that serves the area of Walton County, Florida south of Choctawhatchee Bay, totaling 123.3 square miles. South Walton County MCD maintains more than 30 miles of ditches that were dredged more than 50 years ago to assist in mosquito control. Historically, Walton County was largely rural, but development is encroaching rapidly on previously undeveloped areas. Population growth has been significant, especially since the COVID-19 pandemic.

South Walton County MCD was established in 1964 to be run by an elected board of three commissioners; all three seats are currently filled. They each serve a four-year term.

District operations largely focus on the prevention of mosquito infestation via surveillance, monitoring, larvicide, and targeted adulticide applications, along with operational research to improve the effectiveness and efficiency of South Walton County MCD activities. Tracking weekly and daily results from countywide mosquito traps and several strategically placed sentinel chicken coops allows the district to pinpoint areas in need of service rapidly and reduce chemical use. South Walton County MCD coordinates with North Walton Mosquito Control to avoid overlap and collaborate where efficiency opportunities arise.[1]

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, 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.

About 46,500 households paid ad valorem taxes to support district operations in Fiscal Year (FY) 2022-23 (October 1, 2022, through September 30, 2023). The most recent budget year included about $28 billion in taxable value, plus an additional $243 million from about 12,000 tangible personal property accounts that are subject to the district millage rate of 0.22.

The Balmoral Group worked in consultation with a mosquito control expert in the course of this review and found that South Walton County MCD follows industry standards for Integrated Pest Management and provides mosquito control services to residents as described in the Florida Statutes and Florida Administrative Code; its operations compare favorably to other publicly provided services and are not recommended for consolidation. South Walton County MCD does not have formally defined goals and objectives and does not formally track performance measures and standards; however, the district has kept arbovirus counts at zero and responded to all service requests during the current and past three fiscal years.

Based on its review, The Balmoral Group presents the following recommendations for improving mosquito control services in the South Walton County MCD:

[1] North Walton Mosquito Control operates as a separate entity to the South Walton County MCD.

- The district could expand and improve its facilities to be prepared for the expansion of services in the growing region.
- The Florida Mosquito Control Association could work with the South Walton MCD and other MCDs to explore policy options to create a statewide requirement for accessible inspection ports in new stormwater exfiltration systems for private sector developments so that MCDs would have access to conduct larviciding.
- The district could establish goals, objectives, and performance measures and standards through a strategic planning process to enable the district to consistently monitor and maintain performance information over time.
- The Legislature could consider directing 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 standards and measures to assist this state's MCDs with performance monitoring.

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1. Background

District Description

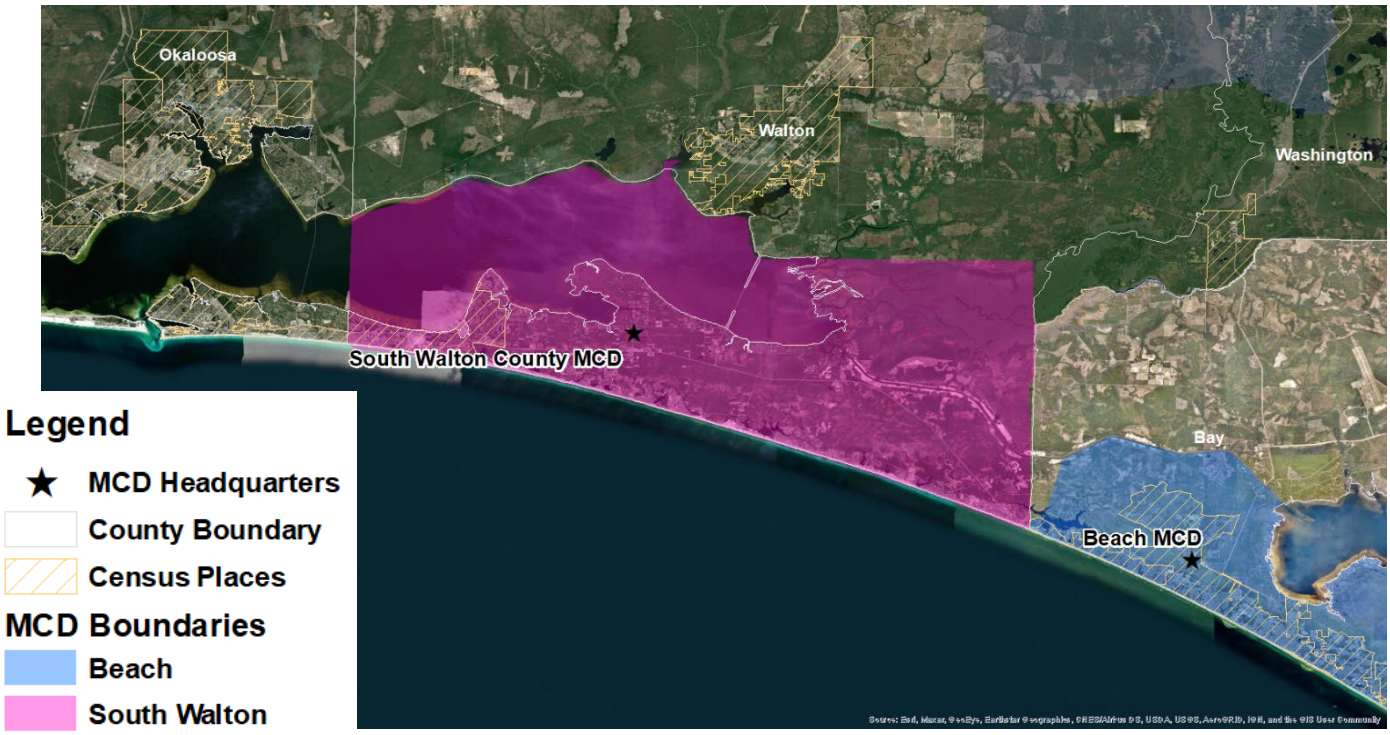
District Purpose

The mission of South Walton County Mosquito Control District (South Walton County MCD), as established in 1964, is to serve the residents of the South Walton County by suppressing both pestiferous and disease carrying mosquito populations to a tolerable level in the safest, most economical manner, utilizing a variety of methods to minimize potential effects on people, wildlife and the environment while maximizing the value to county taxpayers.

Service Area

South Walton County MCD services the area of Walton County that is south of Choctawhatchee Bay, a total area of 123.3 square miles. The district's headquarters is located at 774 N CO. HWY 393, Santa Rosa Beach, FL 32459. **Figure 1** shows a map of the district boundary, with the county boundary and South Walton County MCD's current headquarters marked.

Figure 1. South Walton County MCD Map

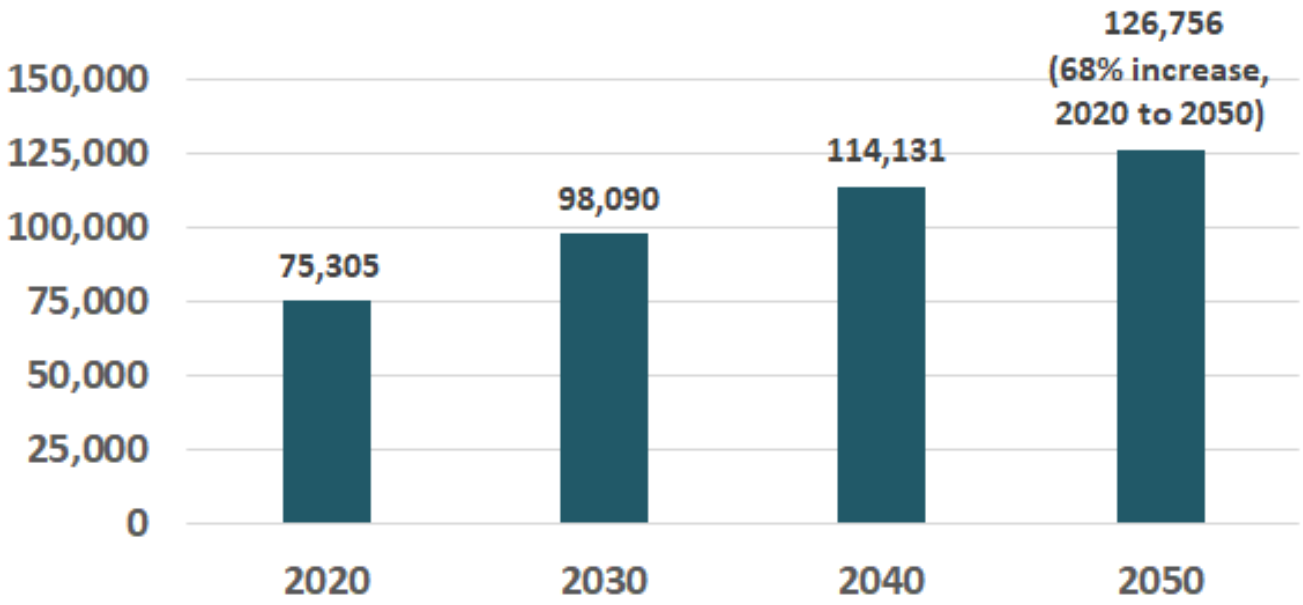


Source: The Balmoral Group (TBG) Work Product, ESRI, US Census, MCDs.

Population

South Walton County MCD had a population of 32,978 people in 2020 according to the latest available block-level United States (U.S.) Census Bureau data.[2] In 2022, Walton County's population was estimated at 83,304 according to the U.S. Census.[3] The Florida Legislature's Office of Economic and Demographic Research (EDR) projects Walton County's population to increase by 68% in 2050 to 126,756 residents compared to a 2020 baseline.[4] **Figure 2** shows Walton County's projected population estimates calculated by EDR.

Figure 2. Walton County Population Projection



Source: TBG Work Product, EDR.

District Characteristics

The South Walton MCD is located on a barrier island on the coast of Florida's panhandle, with about 27 miles of coastline on the Gulf of Mexico to the south and bordered by the Choctawhatchee Bay to the north. Adjacent counties include Okaloosa, Holmes, Washington, and Bay. The average annual temperature is about 63 degrees Fahrenheit and total rainfall is generally around 48 inches. South Walton County beaches are heavily visited by tourists, especially during spring break, and second homeowners from out of state.

South Walton County MCD has a system of ditches that were dug more than 50 years ago that connect to the Choctawhatchee Bay waters, providing drainage and assisting with mosquito source reduction. Extensive parkland on the barrier island has traditionally limited development in the South Walton County MCD service area, but this is changing. TBG's field visits found rapid clearing of former pine forests for new housing developments adjacent to South Walton County MCD ditches. Exfiltration systems are increasingly adopted by developers, which are underground tanks that are used to capture and distribute stormwater runoff across a lot or subdivision. The

[2] Block-level data compiled from Decennial Census P.L. 94-171 Redistricting Data Summary Files and matched to the MCD boundary in GIS.

[3] Population Estimates, July 1, 2022 retrieved from U.S. Census Bureau QuickFacts: United States.

[4] Based on 2021 Estimates, Population: 1970-2050, County projections retrieved from Population and Demographic Data - Florida Products (state.fl.us).

existence of such systems can result in lack of inspection ports for field inspectors to conduct larval testing; the district worked with local engineers to ensure inspection ports will be designed into systems going forward.

Exfiltration and stormwater systems are used to help manage stormwater, but with a lack of ports for technicians to get into them, the systems have become a problem for mosquito control. Moreover, TBG site inspections revealed several instances of conflict between newly constructed drainage structures and existing South Walton County MCD ditches, creating potential flood hazards. Walton County ditches also abut South Walton County MCD ditches in several locations and appear poorly maintained compared to the ditches that the district maintains, creating mosquito infestation hazards.

Meteorology is the primary driving force for producing mosquitoes with heavy rainfall events creating standing pools of water that serve as breeding grounds for mosquito species capable of transmitting several arboviruses. Changing water levels through tidal events can also produce such pools. Humans contribute to the problem by allowing water to stand in waste containers, garden pots, tires, and other vessels. The characteristics of the rapid development of the district and the meteorological conditions described above create an environment conducive to extensive mosquito habitats that require constant mosquito control. In addition, Walton County contains coastal dune lakes, which are rare ecosystems that occur in only a few places in the world and therefore mosquito control must be conducted in a highly technical and environmentally sensitive manner. The services needed to control mosquitoes include routine surveillance of mosquito-producing habitats, source reduction through aerial and/or ground treatments using bio-pesticides to treat areas known to have large mosquito populations, and regular testing for disease transmission in animals.

Real Property Data

South Walton County MCD receives ad valorem taxes to fund district operations. The total taxable value of properties within South Walton County MCD was almost $29 billion in the most recent fiscal year under a millage rate of 0.2200 (**Table 1**). Real property parcels subject to district millage have ranged from 44,184 to 46,523 parcels over the last four years (**Table 2**). The taxable value of real property parcels increased 34% in Fiscal Year (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 South Walton County MCD Millage

South Walton County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Millage Rate	0.2400	0.2400	0.2300	0.2200
Taxable Value of Parcels ($Mil.)	$18,667	$20,312	$22,947	$28,409
Taxable Value of Accounts ($Mil.)	$230	$249	$260	$243
Taxable Value of Centrally Assessed Property ($Mil.) [1]	$0	$0	$0	$0
Total Taxable Value ($Mil.)	**$18,897**	**$20,561**	**$23,207**	**$28,652**

Source: Florida Department of Revenue (FDOR).

[1] 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 South Walton County MCD Millage

South Walton County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Parcels ($Mil.)	$21,933	$23,521	$27,081	$39,528
Real Property Parcels Subject to Millage	44,184	44,950	45,459	46,523
Taxable Value of Parcels ($Mil.)	$18,667	$20,312	$22,947	$28,409

Source: FDOR.

Tangible Personal Property Data

In addition to real property, tangible personal property accounts subject to South Walton County MCD millage total 12,212 accounts in FY 2022-23, having grown over 8% since FY 2019-20 (**Table 3**). Taxable value of tangible personal property accounts also increased in FY 2022-23 by 5.8% compared to FY 2019-20 due to higher asset values.

Table 3. Tangible Personal Property Accounts Subject to South Walton County MCD Millage

South Walton County MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Accounts in Millions	$331	$358	$375	$365
Tangible Personal Property Accounts Subject to District Millage	11,217	11,709	11,960	12,212
Taxable Value of Accounts in Millions	$230	$249	$260	$243

Source: FDOR.

History and Composition

The South Walton County Board of County Commissioners (BOCC) adopted a Notice of Election on March 10, 1964, for a referendum to allow the voters to determine whether to approve the establishment of the South Walton County MCD. According to district representatives, the voters approved the referendum and the district was established on May 26, 1964, as an independent special district to control mosquito populations in the southern part of the county.[5] The district is 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 Florida Department of Agriculture and Consumer Services (DACS) for mosquito control program administration.

South Walton County MCD is governed by an elected board of three commissioners, each serving a 4-year term. One of the three seats was open from November 2022 to spring of this year, but the new commissioner has since been sworn in at the April 2023 board meeting. Board members are required to be residents of south Walton County.

Pursuant to Chapter 388, *Florida Statutes*, the powers and duties of the board of commissioners include:

- Performing all duties necessary for the control and elimination of mosquitoes and other arthropods of public health importance.

[5] SWCMCD-Creation-Document.pdf (southwaltonmosquitocontrol.org); SWCMCD-About Us (southwaltonmosquitocontrol.org).

- Being authorized to provide for the construction of canals, ditches, drains, dikes, fills, and other necessary works, and to install and maintain pumps, excavators, and other machinery and equipment.
- Preparing and adopting a district budget.
- Being authorized to hold, control, and acquire by gift or purchase for district use any real or personal property.
- Having all the powers of a body corporate, including the power to contract and employ a director, employees, and others.

As required by s. 388.151, *Florida Statutes,* the board of commissioners holds monthly meetings. In addition to regular monthly meetings, special meetings may be called to discuss the draft and final budget for the upcoming fiscal year, as well as one-off topics like district banking practices and aerial activities. **Table 4** summarizes the number of meetings held by the board over the review period, as provided by South Walton County MCD staff. Published information about meetings on the South Walton County MCD website is somewhat inconsistent for older periods. For example, while for calendar years 2022 and 2023 dates, agendas, meeting minutes, and packets are accessible online, only agendas are available for some months for calendar years 2020 and 2021. The board's meetings are open to the public and noticed and conducted in accordance with s. 189.015, Florida Statutes.

Table 4. South Walton County MCD Commissioner Meeting Counts

Commissioner Meetings	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Monthly Meetings	11	12	12	7
Special Meetings	0	7	7	0

Source: TBG Work Product, South Walton County MCD.
[1] 2023 YTD through April.

Intergovernmental Interactions

South Walton County MCD interacts with several government entities at the state and local levels. At the state level, the district provides detailed budgets tracking expected revenues and expenditures at the beginning of each fiscal year, along with monthly reports of actual earnings and expenses, to the Florida Department of Agriculture and Consumer Services (DACS). The district also works with the Florida Department of Emergency Management (DEM) on pre-storm and post-storm water dispersion and with State Forest and State Parks in the region to conduct operations on public lands. The district did not receive any state grants in FY 2022-23, or in the past three fiscal years.

South Walton County MCD also works closely with the Walton County Health Department and the Florida Department of Health (DOH) for arbovirus disease response by providing vector surveillance and efficient control methods. South Walton County MCD utilizes a sentinel chicken program to monitor for mosquito-borne diseases. Chickens are tested weekly, with blood being drawn and shipped to state testing facilities. DOH also assists in tracking mosquito-borne disease outbreaks for all districts.

At the local level, South Walton County MCD has been able to use Florida Sheriff's and state contracts to purchase trucks and equipment at significant discounts. The district also works with North Walton Mosquito Control to

make sure all areas are covered with no overlap, as well as Bay County Mosquito Control and Beach MCD for new developments that may affect operations near district boundaries.

Resources for Fiscal Year 2021-22

The published FY 2021-22 millage rate established by South Walton County MCD was 0.2300. The district received $5.5 million in revenues and spent $3.3 million in FY 2021-22. The district had 32 paid staff and owned or leased 18 vehicles and 5 buildings in FY 2021-22 (**Table 5**).

Table 5. South Walton County MCD Resources for FY 2021-22

Resource Item	FY 2021-22 Amount
Millage Rate	0.2300
Revenues	$5.5 million
Expenditures	$3.3 million
Number of Paid Staff	32 (including 3 commissioners and 1 contractor)
Vehicles	14 trucks and vans, 4 ATVs and Utility Vehicles
Equipment	Field equipment: 10 Lab equipment: 2 Office equipment: 17 Surveillance equipment: 22 traps, 15 sentinel chicken coops, and 90 chickens
Facilities	1 facility with 5 buildings

Source: TBG Work Product, South Walton County MCD.

2. Findings

Service Delivery

South Walton County MCD follows industry standards for Integrated Pest Management and provides mosquito control services that are within the scope of the Florida Statutes and Florida Administrative Code; its operations compare favorably to other publicly-provided services and are not recommended for consolidation.

To assess the delivery of services in the district, TBG requested 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, 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.[6] See attachment titled, "Integrated Pest Management" for more information. South Walton County MCD conducts activities in seven of the eight areas of IPM.

South Walton County MCD's mosquito surveillance activities include ground surveillance to pinpoint areas of concern and find, identify, and measure mosquito populations, as well as weekly mosquito trap collection and analysis from 21 sites. Over 50,000 mosquitoes were identified by species in FY 2021-22. The district also assesses landing rate counts at well-known adult mosquito habitats or newly discovered habitats to monitor mosquito population growth. South Walton County MCD aims to inspect and treat 100% of storm drains biannually during the mosquito season. The district's sentinel chicken program also enables weekly disease surveillance, with regular blood sample collection and submittal to local and state health departments.

The most common form of source reduction in South Walton County MCD is the ongoing maintenance of over 44 major drainage ditches dug by the district decades ago to manage vegetation and ensure moving water. Coordination of new development approvals is required to ensure compatibility of new and existing structures adjacent to drainage canals and help avoid conflicts that would inhibit access for maintenance or create hazards. Surveillance and source reduction activities are also aided by the reduction of waste tires and resident service request investigations in residential and public areas. South Walton County MCD provides several online portals for residents to submit service requests, service request surveys, and subscribe to spray notifications by phone or email.[7] The district also collects waste tires, which create extensive habitat for mosquito larva, and Walton County assists the district in the collection and disposal of tires.

South Walton County MCD conducts mosquito larvicide treatment by hand or truck to prevent adult mosquitoes from hatching in water sources. Water retaining areas or man-made systems used to manage stormwater that do not have flowing water are treated with biopesticides.

South Walton County MCD's adulticiding activities are carried out by truck via ultra-low-volume (ULV) spraying when adult mosquitoes are most active, most residents are inside, and non-target species are least active. Adulticide activities are only carried out when justified by mosquito activity during inspections and as evidenced by surveillance trapping and landing rate counts. Adulticides include PermaSease 3-15 and Fyfanon EW, both of which are approved by the EPA.

[6] Impoundment management is a source reduction strategy that controls saltmarsh mosquitoes by creating impoundments, which are earthen dikes that isolate salt marshes and swamps from an adjacent estuary. The impoundments are artificially flooded periodically for mosquito control, resulting in the elimination of breeding sites for saltmarsh mosquitoes.

[7] Contact Us - South Walton County Mosquito Control District (southwaltonmosquitocontrol.org)

Operational research to improve application efficiencies and investments in affordable technologies are also a focus of South Walton County MCD. For example, the district uses mechanical rakes to remove vegetation and reduce herbicide use in ditches, limiting the need for chemical treatments and saving money on chemical costs.

Outreach and education activities include an online Five D's of Protection from Mosquitoes (Drain, Dress, Dusk to Dawn, Defend) campaign and Entomologist's Corner, which explain the operations of South Walton County MCD and give examples of how residents can reduce mosquito production in residential areas.[8] Staff have also given presentations at elementary schools to teach kids about the life cycle of mosquitoes, the various sources of mosquitoes, and likely production grounds. Other interactions with the public typically occur through resident service requests and district board meetings.

A summary of the seven areas of IPM in which the district conducts activities is set forth in **Table 6**.

Table 6. South Walton County MCD Services Overview

Integrated Pest Management Service	South Walton County MCD Services Provided
Mosquito Surveillance	Weekly ground and aerial surveillance using trap collection and analysis
Disease Surveillance	Monitoring mosquito-borne diseases with regular blood sample collection from sentinel chickens and traps
Source Reduction	Ditch maintenance to manage vegetation and ensure moving water and coordination of new development approvals to ensure compatibility of structures or modifications adjacent to drainage canals
Larviciding	Application of larvicides in mosquito habitats to prevent the growth of adult mosquitoes using trucks, a drone, or by hand with appropriate protective equipment
Adulticiding	Delivery of ultra-low volume (ULV) insecticide using trucks
Mosquito Control Research	Ongoing research efforts to identify new methods and technologies to improve treatment efficiency and reduce costs
Outreach and Education	Education and outreach facilitated through several avenues, including schools, resident service requests, and public meetings

Source: TBG Work Product, South Walton County MCD.

Analysis of Delivery of Services

South Walton County MCD delivers services 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. TBG noted no services that fall outside applicable laws and rules. The Board of County Commissioners of Walton County has expressed support for South Walton County MCD and has no interest in assuming the duties of the district. 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.

[8] The Five D's of Protection from Mosquitoes - South Walton County Mosquito Control District (southwaltonmosquitocontrol.org)

Comparison to Other Services

South Walton County MCD provides similar services within the same county as North Walton Mosquito Control; each entity provides distinct services to different geographic areas of the county. TBG interviewed staff and reviewed documents available online to determine if services are redundant to or overlapping with county and municipal government services. Mosquito control in the parts of Walton County that are not covered by South Walton County MCD are handled through the North Walton Mosquito Control District headquartered in DeFuniak Springs and governed by the Walton County Board of County Commissioners (BOCC). North Walton Mosquito Control provides mosquito control services to all areas of the county that lie north of the Choctawhatchee Bay. As described above, South Walton County MCD is a district with several unique geographic, demographic, and natural characteristics that require very technical and environmentally sensitive approaches to mosquito control in the district. As a result, the district's operations have evolved to become fairly sophisticated, and the Walton County government has acknowledged that it benefits from the South Walton MCD's continued provision of these services. The county government has reported to district staff that it does not wish to take on duties that the district oversees and administers.

In addition, the Walton County BOCC approved Resolution 2023-29 in support of the South Walton County MCD on April 11, 2023, and outlined several reasons why the district is needed.[9] For example, the area of south Walton County served by the district is a major tourist destination that generates a high value of tourism revenues, estimated at over $2.7 billion annually, and associated sales and tourism tax revenues. In addition, over 30 species of mosquitoes are found within the district which can carry diseases that are harmful to human health, and the mosquito control provided by the district ensures the quality of life for tourists and residents is not diminished. The unique coastal dune lakes of the county require very technical and environmentally sensitive mosquito control approaches that the South Walton County MCD is well equipped to provide. The resolution states that the BOCC of Walton County expresses its unqualified support for the South Walton County MCD in the context of the performance review that OPPAGA has contracted to TBG to conduct and urges the Legislature to leave mosquito control responsibilities for south Walton County with the district.

In addition, TBG staff conducted field visits to South Walton County MCD and observed the mosquito control activities of the district, including maintenance of ditches that TBG staff compared to TBG's observations of county-maintained ditches, confirming that the district's maintenance is more extensive and superior to the county's activities and that active maintenance of these ditches is best served by the district. Unlike the county, the district regularly conducts research to stay apprised of new technologies that can provide environmentally sound mosquito control services, such as drones for aerial management, to help the district manage the very unique and environmentally sensitive coastal dune lakes of the district. While North Walton Mosquito Control provides similar services in the county north of Choctawhatchee Bay, the county's operations are significantly smaller and less sophisticated than those of the South Walton County MCD. For example, the North Walton Mosquito Control budget for FY 2022-23 was $948,298 with eight full-time equivalent employees, significantly lower than the budget and personnel for the South Walton County MCD.

[9] Walton County Resolution 2023-29.

Considerations for Consolidations

Consolidation of operations is not recommended for South Walton County MCD based on the findings of this review. As described above, South Walton County MCD operates independently of North Walton Mosquito Control. Given the geographic distribution of the different areas and the size of the county, TBG and the SME on this review did not identify cost savings that would result from consolidation of the districts. The high-value tax base and rising population and property values in south Walton County provide a sustainable funding base for the more complex and technical mosquito control operations required in the southern part of the county, which are not needed in the northern (and largely rural) parts of the county. As discussed above, the North Walton Mosquito Control has significantly fewer resources dedicated to mosquito control than South Walton County MCD and likely would not be able to absorb the additional costs to support the operations of the South Walton County MCD. TBG and the subject matter expert for this review have concluded that no benefit is seen to consolidating operations. Additionally, as described above, the Walton County BOCC approved a resolution in support of the district in April 2023; the resolution advocates for leaving mosquito control duties to South Walton County MCD.

Resource Management

South Walton County MCD is managing its resources in an efficient and effective manner but has not developed a strategic plan.

To assess the district's resource management, TBG analyzed information on revenue sources and revenue and expenditure trends; analyzed staffing trends; requested data on services delivered by district staff versus third-party contractors for the current and 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

During the review period, district revenues and expenditures were relatively consistent, with revenues exceeding expenditures every fiscal year. South Walton County MCD's fiscal year begins October 1st and ends September 30th. The district's funding is primarily comprised of ad valorem taxes. The Walton County Property Appraiser, with approval from the Florida Department of Revenue (FDOR), certifies the county's tax roll each year and provides the information to the Walton County Tax Collector, which in turn collects monies authorized under South Walton County MCD's taxing authority. Millage rates are set each year by the district's board of commissioners.

Revenues increased from $4.53 million in FY 2019-20 to $5.50 million in FY2021-22, the vast majority of which came from ad valorem taxes and a small amount from other sources (e.g., interest earnings and equipment sales) (**Table 7**). Expenditures also increased over the review period, rising from $1.82 million in FY 2019-20 to $3.33 million in FY 2021-22. Revenues have exceeded expenditures in each year of the review period. Excess revenues are designated for construction of new facilities to replace dated and damaged existing facilities.

While the millage rate declined from 0.2400 in FY 2019-20 to 0.2200 in FY 2022-23, the total taxable value of parcels increased by 34% during the same time period, which resulted in the increase in revenues to the district

in the current and last three fiscal years. Revenue and expenditure trends show the rise in development with the gain of millage revenue, and the rise in expenses associated with expansion of services for these new developments. One trend noted in rising costs was the significant rise in the cost of chemicals. This cost increase, coupled with more area requiring treatments, has significantly increased expenditures for chemicals. District staff provided TBG an invoice from one year ago and a current invoice; the invoices showed more than a 30% increase in cost per gallon of material.

Table 7. Revenues and Expenditures

Revenues and Expenditures (in $Mil.)	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Revenues	**$4.53**	**$5.05**	**$5.50**	**$6.30**
Ad Valorem	$4.34	$4.81	$5.21	$5.93
Other Sources	$0.192	$0.24	$0.29	$0.36
Expenditures	**$1.82**	**$2.04**	**$3.33**	**$1.73**
Administrative Costs	$0.77	$0.91	$0.82	$0.58
Direct Program and Activity Costs	$1.05	$1.24	$2.51	$1.15
Other Expenditures	$0.00	($0.12)	$0.00	$0.00

Source: TBG Work Product, South Walton County MCD.
[1] 2023 YTD through May.

Administrative Costs

Expenditures on administrative staff and other costs have fluctuated somewhat from FY 2019-20 through FY 2021-22, accounting for about 33% of total expenditures on average. As requested by TBG, South Walton County MCD provided a breakdown of total expenditures by administrative and other program costs for FY 2019-20 through May FY 2022-23.

Costs fell into several categories, with the highest administrative costs during the review period including the indirect personal services and personal service benefits, operating expenses, and land and buildings categories (**Table 8**). Travel, utilities, repair, & maintenance, and supplies and materials costs increased the most between FY 2019-20 and FY 2021-22. Administrative costs for FY 2022-23 through May were $586,772.

Table 8. Administrative Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$267,123	$316,855	$288,571	$47,396
Personal Service Benefits	$135,089	$179,064	$189,206	$162,477
Operating Expenses	$168,005	$283,306	$164,362	$197,275
Travel, Utilities, Repair, & Maintenance	$35,742	$61,738	$82,973	$54,851
Supplies and Materials	$9,439	$23,039	$23,172	$24,584
Land and Buildings	$151,949	$50,067	$69,190	$100,189
Total	**$767,346**	**$914,069**	**$817,474**	**$586,772**

Source: TBG Work Product, South Walton County MCD.
[1] Categorization of direct program costs was completed by South Walton County MCD based on an outline provided by TBG to ensure consistency across reports.
[2] 2023 YTD through May.

Direct Program Costs

Expenditures on direct program costs more than doubled from FY 2019-20 through FY 2021-22. On average, direct program costs accounted for about 67% of total expenditures during the last three complete fiscal years. As requested by TBG, South Walton County MCD provided a breakdown of total expenditures by direct program costs for FY 2019-20 through May FY 2022-23.

Expenditures on direct personal services increased by more than $100,000 each fiscal year between FY 2019-20 and FY 2021-22 largely due to increases in regular salaries and wages each year and hiring additional staff (**Table 9**). Supplies & Materials costs nearly doubled between FY 2019-20 and FY 2021-22, indicating a rise in need and cost of chemicals for spraying. In addition, the district's spending on machinery and equipment exceeded $1 million in FY 2021-22, far exceeding the two previous fiscal years, as numerous vehicles and outdated pieces of equipment were replaced. The vehicles and equipment were sold for $328,523, recouping some of the replacement cost.

Table 9. Direct Program Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$303,384	$472,964	$566,148	$51,009
Personal Service Benefits	$231,986	$230,472	$268,307	$174,380
Operating Expenses	$23,767	$15,944	$32,292	$21,744
Travel, Utilities, Repair, & Maintenance	$118,547	$81,655	$99,655	$99,939
Supplies and Materials	$247,891	$296,711	$512,141	$407,522
Machinery and Equipment	$126,576	$143,156	$1,033,650	$401,945
Total	**$1,052,151**	**$1,240,901**	**$2,512,193**	**$1,156,539**

Source: TBG Work Product, South Walton County MCD.
[1] Categorization of direct program costs was completed by the district based on an outline provided by TBG to ensure consistency across reports.
[2] 2023 YTD through May.

Contracts for Services

Contracted service costs were relatively consistent during the review period, with a reduction in Legal & Engineering Services bringing down costs in FY 2021-22. TBG reviewed documentation provided by South Walton County MCD to determine what services were contracted rather than being conducted in-house.

The district outsources several administrative services, including legal services and annual program audits; IT services are also outsourced due to the district not having the capacity or need for a full-time IT position. **Table 10** summarizes the costs for contracted services the district incurred in the past four fiscal years. Through May 2023, contracted services accounted for $44,468 of total expenditures for the most current fiscal year.

Table 10. Summary of Contracted Services

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Professional Services	$42,209	$25,020	$5,400	$2,845
Legal & Engineering Services	$72,378	$95,409	$22,579	$7,550
Accounting & Auditing	$12,720	$28,356	$14,359	$13,250
Other Contractual Services	$23,616	$14,489	$30,636	$20,823
Total	**$150,922**	**$163,274**	**$72,974**	**$44,468**

Source: TBG Work Product, South Walton County MCD Income Statement.
[1] Categorization of direct program costs was completed by the district based on an outline provided by TBG to ensure consistency across reports.
[2] 2023 YTD through May.

Staff

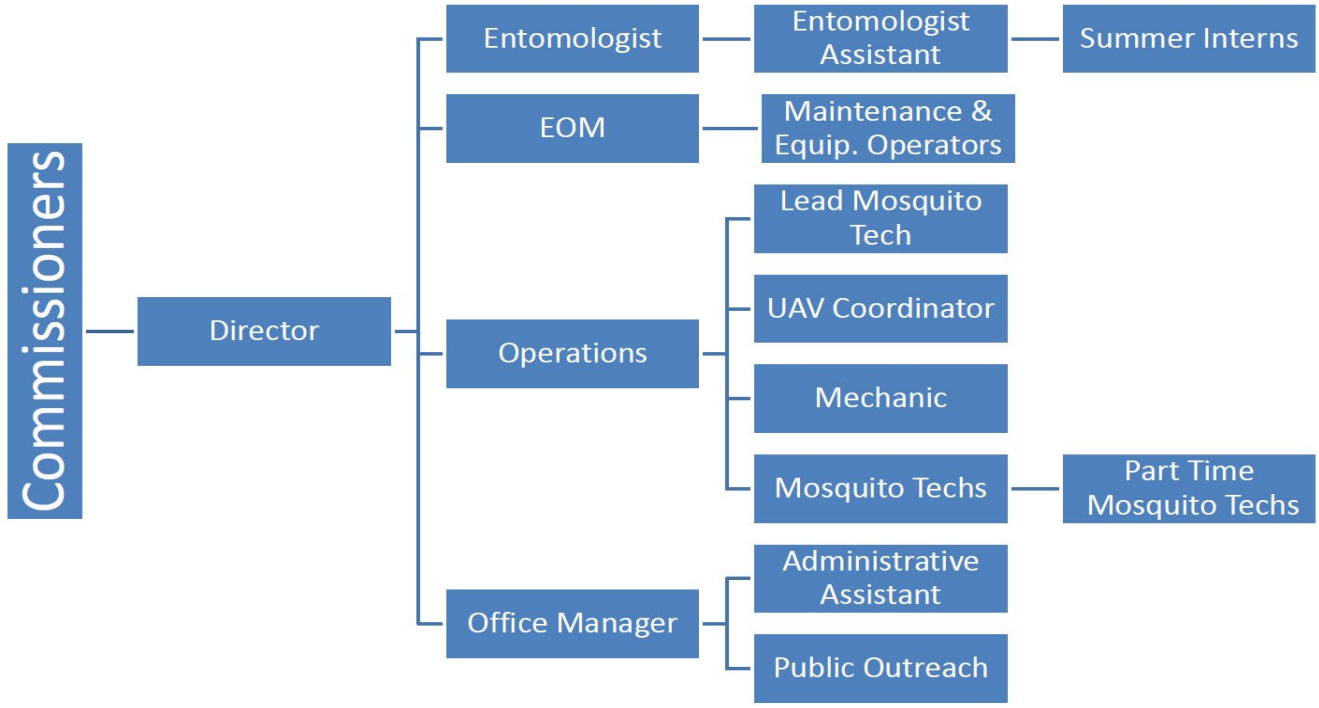
South Walton County MCD employed a variety of staff positions in FY 2022-23. TBG examined detailed staffing information provided by South Walton County MCD, as well as documentation available online and through DACS reporting and audits. In FY 2022-23, South Walton County MCD staff reported that it has several types of positions in the district, including commissioners, administrative staff, technical and scientific positions, maintenance staff, and interns (**Table 11**). South Walton County MCD does not work with volunteers, but does run an intern program to recruit new staff. See **Figure 3** for a district organizational chart**.**

Table 11. South Walton County MCD Staff Positions

• 3 Commissioners • Director • Environmental Operations Manager • Office Manager • Operations Manager • Lead Mosquito Technician • Administrative Assistant	• Heavy Equipment Operator Lead • Heavy Equipment Operator • Mechanic • Mosquito Control Technicians • Entomologist • Entomologist Assistant	• Maintenance • Part-Time Mosquito Control Spray Lead • Part-Time Mosquito Control Spray persons • Public Outreach • Unmanned Aerial Vehicle Coordinator • Interns

Source: TBG Work Product, South Walton County MCD.

Figure 3. South Walton County MCD Organizational Chart



Source: South Walton County MCD.

Analysis of Program Staffing Levels

South Walton County MCD had a stable number of employees over the review period with no current vacancies and has been appropriately staffed for the scale and scope of its operations; however, the district plans to hire more staff to meet the needs of the rapidly growing population in the county. To assess program staffing levels, TBG reviewed documentation provided by South Walton County MCD and interviewed staff.

In FY 2022-23, South Walton County MCD had 34 total positions, including three commissioners, 19 full-time staff, 11 part-time or seasonal, one contracted administrative assistant, no volunteers, and no vacancies. The majority of staff are involved in direct program operations according to the district. One commissioner seat that had been open for six months was filled in April 2023. South Walton County MCD has similar current staffing levels as compared to a similar district such as Citrus, which had 31 staff and similar expenditures to South Walton MCD in FY 2021-22.[10] While the district's staff appear to be appropriate for the current scale and scope of its operations, the rapidly growing population of the district will require additional resources. South Walton County MCD staff report that the district plans to increase its services as the population of Walton County rapidly expands and residential development continues. For example, with a new 200,000 home development undergoing construction in the service area, the additional demand for mosquito control is expected to be significant. As a result, the district anticipates a likely need to hire more staff, purchase more vehicles, and expand its operating capability to properly service the area in the future; these are not immediate plans but future expectations.

[10] South Walton County MCD's FY 2021-22 expenditures were $3.3 million and Citrus MCD's expenditures were $4.2 million in the same fiscal year.

Table 12 illustrates historical staff counts as well as vacancies.

According to South Walton County MCD, staff retention is good among most positions. The recruitment of drone pilots and mechanics can be challenging due to competition from the private sector, however, proximity to Eglin Air Force Base has provided a pool of qualified candidates. It should be noted that turnover rates were relatively higher in FY 2020-21 and FY 2021-22 compared to FY 2019-20 and FY 2022-23 through April. Post-COVID, as with many other industries, staff retention has been more challenging for entry level positions and more skilled, specialized expertise staff.

Table 12. South Walton County MCD Staff Counts

Employee Counts	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Commissioners	3	3	3	3
Full Time	16	17	17	19
Part Time/Seasonal	13	9	11	11
Contracted	0	1	1	1
Volunteers	0	0	0	0
Vacancies	2	1	2	0
Total	**34**	**31**	**34**	**34**
Annual Termination[2]	5	12	11	4
Turnover Rate	14%	40%	33%	11%

Source: TBG Work Product, South Walton County MCD.

[1] 2023 YTD through April.

[2] Estimated based on annual turnover rates provided by South Walton County MCD.

Equipment and Facilities

The district has increased purchases of vehicles and office equipment over the review period; the district is currently in need of an additional building and has experienced delays in facility construction. TBG analyzed documentation provided by South Walton County MCD and interviewed staff to review any trends or changes in the level of equipment and facilities purchased or maintained over the review period.

In FY 2019-20, South Walton County MCD set aside funds for a new facility, as the current facility has exceeded capacity and experienced damages due to repeated flooding. TBG witnessed significant flood damage in the existing building which remains from Hurricane Sally. Unfortunately, COVID-19 caused interruption to the construction schedule and due to varying factors, including the rapidly rising costs of building materials and architectural plans that exceeded budget expectations and had to be reworked for more practical approaches, the district has not yet built the new facility but reported that it is planning to break ground on construction in November 2023.

The district owned 23 vehicles, 29 pieces of equipment, and 20 mosquito traps in FY 2022-23 (through April). During the same period, the district utilized 12 coop sites for the county-wide sentinel chicken program. In addition, South Walton County MCD owned one facility in FY 2022-23 in Santa Rosa Beach, FL, which includes five buildings for daily operations, housing for vehicles and heavy machinery, maintenance and storage of equipment, chemical storage, and containers for mosquito-eating fish.

South Walton County MCD has used contracts of Florida Sheriffs and other Florida state term contracts in the past to purchase heavy equipment and vehicles, offering savings to the district. The district sold several pieces of older equipment in FY 2021-22 and replaced them with newer models. Some recent purchases include an Energreen Aspen tractor ($193,767) to replace a tractor and a side-arm mower, which had been inoperable for two years, and a larger excavator ($194,355) to replace a 2011 mini-excavator.

A summary of the number of vehicles, equipment, and facilities owned by South Walton County MCD are provided in **Table 13**, while surveillance equipment owned by the district is listed in **Table 14**.

Table 13. District Vehicles, Equipment, and Facilities

	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Vehicles	**17**	**17**	**18**	**23**
Helicopters	0	0	0	0
Boats	0	0	0	0
Trucks and Vans	15	15	14	18
ATVs and Utility Vehicles	2	2	4	5
Equipment	**17**	**24**	**29**	**29**
Field Equipment	9	9	10	8
Lab Equipment	2	2	2	2
Office Equipment	6	13	17	19
Facilities	**1**	**1**	**1**	**1**
Buildings	5	5	5	5

Source: TBG Work Product, South Walton County MCD.

[1] 2023 YTD through April.

Table 14. Surveillance Equipment

Equipment	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Mosquito Traps	**21**	**19**	**22**	**20**
Live Sample Traps	3	6	10	8
New Jersey Light	18	13	12	12
Sentinel Chicken Coops	16	16	15	12
Sentinel Chickens	94	96	90	48

Source: TBG Work Product, South Walton County MCD.

[1] 2023 YTD through April.

Strategic or Other Formal Plans for the District's Future

South Walton County MCD has no formal strategic plans but has begun to develop some general future plans with the district board. To assess South Walton County MCD's plans for the future, TBG reviewed documentation provided by the district and found on the district's website as well as information gleaned from interviews.

Although South Walton County MCD has not developed a formal strategic plan, the district has begun general planning discussions regarding future operations to be prepared for the rapid growth Walton County is currently experiencing, including the St. Joe housing community approved for over 200,000 new households with more than

10,000 storm drains that is currently under construction within service area boundaries. In addition, the district plans to establish a Bunker/Steelfield satellite office in the northeast corner of the district to better serve rapidly developing outlying areas; currently, the logistics of travel time and congestion in that area translate to lost hours of productivity when staff need to travel back and forth, as TBG witnessed firsthand. To that end, South Walton County MCD is setting aside funds to construct the new location. The district also plans to move forward with the planned construction of a new headquarters facility that will include a laboratory. The new facility will allow the district to expand its operational capabilities as it prepares for rapid new development in the county, and will also provide in-house testing capability for sentinel chicken blood samples, thereby allowing for quicker test results and faster district treatment responses when disease is detected. The district will continue submitting such samples on a weekly basis to the state lab for testing. South Walton County MCD is also researching a drone-powered treatment and surveillance program, as drones allow MCDs to cover more service area at a lower cost than using helicopters for surveillance and spraying.

Due to the extensive future plans the district is considering, a formal Strategic Plan is recommended.

Previous Performance Reviews, Financial Audits, and Resident Feedback Surveys

Financial audits of the district identified some material weaknesses and deficiencies prior to the hiring of current management; information on resident feedback was not available for review. Analysis of South Walton County MCD's financial audits was conducted for FY 2019-20 and FY 2020-21 as provided by the district and confirmed with the annual reports published on the Florida Auditor General's website.[11] The FY 2021-22 financial audit has not been published as of this writing.

The FY 2018-19 audit identified an error in the general ledger system that resulted in the amount of outstanding checks being in excess of $100,000. The district agreed with the finding and as of October 1, 2019, reported that it had changed its general ledger system to a more user-friendly software and had not identified similar issues with the new software. The FY 2019-20 audit found four issues, resulting in material weakness that the district could not produce relevant, quality financial information during 2020 for management and the board to make informed financial decisions. The audit recommended that the district's accountant ensure the district's books and records agree with the audited financial statements and that the district ensure that accounting personnel responsible for the books and records have the necessary skills, knowledge, and experience to properly perform their assigned duties. In the FY 2020-21 audit, the same findings were repeated and the audit stated that corrective actions had not been taken. District staff reported that new district management was hired in late FY 2020-21 and made corrective action changes for FY 2021-22. The district reported that its office manager would be responsible for entering all adjusting journal entries, which would in turn be reviewed and approved by the director and the district's board. The signed adjustment would be maintained for review by auditors. District staff report that the district has implemented these changes.

To gather performance feedback from residents and other stakeholders, the district's website includes links for residents to submit a Service Request Survey and teachers to submit a Classroom Education Survey. However, the district did not provide TBG with survey responses for inclusion in this review, which prevents an assessment of stakeholder feedback and satisfaction with district services.

[11] Florida Auditor General - E-Files (flauditor.gov)

No other performance review documents were identified by TBG.

Analysis of Management Reports/Data and Performance Information

South Walton County MCD actively manages performance of its operations and administration to measure results in a timely manner. To assess management reporting and performance information, TBG reviewed documentation provided by South Walton County MCD, observed computer systems onsite, and conducted interviews with staff.

One of the primary ways South Walton County MCD measures the success of its programs is the regular testing and monitoring for human cases of mosquito-borne diseases. The sentinel chicken program provides a metric for measuring the prevalence of mosquito-borne diseases in the county without potentially endangering human life. South Walton County MCD records trap counts, chicken coop inspection results, and the number of chicken and human cases of arbovirus on Mondays and Thursdays. On Monday, sentinel chicken blood samples are shipped to the state lab for testing, and results are known by Friday, allowing for treatment missions the same week as they are identified, before mosquitoes proliferate.

The district maintains an annual Surveillance Data Summary report in which it documents its activities and data related to mosquito surveillance. The district provided this report to TBG, which addresses district activities for calendar year 2022. The report details fairly extensive activities related to mosquito trap counts over the last three fiscal years and monthly spray missions, disease vector distribution, mosquito site counts, sentinel chicken virus detection, and other metrics for calendar year 2022. For example, the district monitored over 44,000 surveillance sites, set over 3,900 traps based on service requests, and identified over 50,000 mosquitoes from traps through the efforts of the district's current lab that allows for identification of mosquitoes caught in traps and conducted 227 spray missions in that year. The information on these activities indicates the district is performing its statutory function of providing mosquito control activities in the area.

On a day-to-day basis, South Walton County MCD uses FieldSeeker® software for field inspectors, who enter their location and surveillance results into tablets, with the information immediately updating Geographic Information System (GIS) data. The GIS data allows management to allocate resources and perform treatment missions according to larval or mosquito infestations in a timely fashion. At a given moment, management and field supervisors can assess what share of the service area has been inspected, treated, or shows conditions indicating that treatment is needed, including how many storm drains have been inspected or treated.

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

In general, new management at South Walton County MCD has demonstrated careful management of funds based on an analysis of annual budgets, financial audits, and income statements. The district has implemented a number of new methods to improve efficiencies and reduce costs. To assess cost, timing, and quality of program efforts, TBG reviewed documentation provided by South Walton County MCD, publicly available data and reports, and interviewed district staff.

South Walton County MCD has collected revenue significantly higher than the amount it expends to accrue construction funds for a new facility. TBG witnessed significant flood damage in the existing building which remains from Hurricane Sally, and construction of a new facility at a higher elevation is appropriate. Management has also taken steps to redesign and relocate the building footprint to constrain the costs of construction.

Program costs are carefully managed, and staff and management were clearly very involved in attempts to manage chemical inventory wisely, negotiate chemical purchase costs aggressively, and monitor program costs constantly. Current program efforts include surveillance, disease monitoring, larviciding, adulticiding, and research of new methods to increase efficiency. One current focus of South Walton County MCD is the development of a drone program to aid in aerial operations of treatments and surveillance. Drone efforts are being revisited in light of the new Florida legislation, but are expected to help offset increasing staff time lost to traffic congestion, and to increase efficient delivery of larvicide while maintaining effective treatment outcomes.

New management implemented software that allows real-time tracking of field staff to monitor progress and better understand how much time it takes to deliver services. Continuous performance monitoring was evident and shows effective deployment of resources to deliver a quality program.

Goals, Objectives, and Performance Measures and Standards

South Walton County MCD does not have formally defined goals and objectives and does not formally track and measure performance standards; however, the district has kept arbovirus counts at zero and responded to all service requests in the current and past three fiscal years.

To assess the district's goals, objectives, performance standards, and performance measures, TBG requested and reviewed the district's charter; requested 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 audits and requested district assessments of why (if applicable) the district failed to meet performance measures and standards and/or goals and objectives. 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

South Walton County MCD's enabling legislation does not delineate specific programmatic goals for the district, and the district does not have a strategic plan that specifies goals and objectives. Because the district does not have a formal strategic plan, TBG interviewed staff and reviewed documents prepared by district staff or available online to identify district goals. Using this information, TBG determined that the district's informal goals are as follows:

- Serving district residents by using a variety of methods to safely and effectively reduce pest and disease-carrying mosquito populations to a level that is tolerable.
- Controlling mosquito populations within the district using various methods to prevent mosquitoes from reaching adulthood.

- Controlling adult populations where prevention did not or could not occur.
- Minimizing any potential negative effects on people, wildlife, and the environment.
- Maximizing the value of district services to taxpayers.
- Maintaining and replacing district facilities to address current and future service needs.

Objectives

South Walton County MCD has not defined specific objectives for its operations but reports that it uses best practices and procedures to meet mosquito control objectives while limiting impacts to other non-target species and district residents and visitors. TBG conducted interviews with South Walton County MCD staff and reviewed documents prepared by the district or found online by TBG. Based on this review, TBG determined that the district's objectives are as follows.

- Ground surveillance and monitoring areas of concern, including weekly trap and sentinel chicken collections and landing rate counts.
- Expanding aerial surveillance and spraying capabilities using drones.
- Using larvicides (using products to kill mosquito larvae), adulticides (using products to kill adult mosquitoes), and source reduction best practices to eliminate potential mosquito breeding sites.
- Reviewing resident service requests to assist with resource allocation.
- Conducting numerous public outreach and educational programs to inform the public of the importance and impact of their actions.
- Coordinating with the Walton County Department of Health to distribute educational materials to elementary school age children.
- Setting aside funds to construct a new main facility and a satellite facility within the next few years.
- Coordinating with Northwest Florida Water Management District and other stakeholders to better monitor development adjacent to district properties and ditches.

The problems addressed by the district's goals and objectives relate to controlling mosquito populations in the district, reducing environmental impacts, and communicating effectively with the public. South Walton County MCD was founded to control mosquitoes that may be a nuisance or threat to public health, safety, and quality of life. The expected benefits of the districts goals and objectives are that the application of specific IPM practices and technologies will effectively manage mosquito populations in the district, that use of technology will reduce environmental impacts, and that communication with the public will improve through various outreach and communication activities. Some expected benefits of reducing mosquito populations are the prevention of disease, including serious illnesses like encephalitis, West Nile virus, Zika virus, yellow fever, and dengue fever. The general public welfare is also improved with the reduction of nuisance mosquito populations.

Performance Measures and Standards

South Walton County MCD has not established formal performance standards and measures but does maintain and track prevalence of human-borne arbovirus in the district and responses to service calls. The district does not have formally established performance standards and metrics associated with its goals and objectives, but it does monitor disease prevalence and service calls. TBG determined that the measures and standards for these activities are as follows.

1. **Measure:** Counts of arbovirus incidence in humans for the past four calendar years

   Standard: Zero recorded human cases or deaths related to arboviruses acquired in Florida and detected in South Walton County MCD in the last four years

   Unlike the encephalitis viruses, there are no useful early detection monitoring programs for Dengue, Chikungunya, or Zika viruses. Since these viruses are transmitted from mosquito to human, the only indication of virus in Florida is the reporting of a human case. Human case investigations involve determining when and where a disease was contracted. The Department of Health publishes a weekly report detailing any human cases in the State of Florida for all MCDs to monitor. It is important to note that while the low to zero incidence of arbovirus in humans in an MCD is an indicator of success for South Walton County MCD's activities, it is also possible that arbovirus could spread to an MCD at no fault of that MCD. For example, mosquito-borne illness could have originated in another Florida county or another country.

2. **Measure:** Number of service requests received via telephone or the district's website that are answered in a timely manner in the past four calendar years

   Standard: All service requests answered within 2 hours in the past four calendar years.

   The district uses resident complaints to identify where clusters of mosquitoes may be occurring to help make informed decisions about the level of response needed. Staff aim to answer service requests within 2 hours.

Analysis of Goals, Objectives, and Performance Measures

South Walton County MCD showed favorable performance with respect to keeping arbovirus counts low and responding to service calls. Based on the data reported in this review, South Walton County MCD has effectively curbed mosquito populations that may become a nuisance or a threat to public health within the current and last three fiscal years. Zero cases of local or international travel-associated arbovirus cases have been reported by Florida DOH in Walton County over the review period. Consequently, no human deaths have occurred.

South Walton County MCD has also improved its ability to implement IPM strategies through collaboration with Walton County and the Northwest Florida Water Management District to better monitor adjacent development and ensure compatible structures on adjacent properties. South Walton County MCD reworked plans for its new facility to control costs as well, and used in-house resources to rebuild its mosquito-fish pond, avoiding up to $25,000 in costs for a new fishpond structure.

The number of service calls made to the district decreased from 318 in FY 2019-20 to 168 in FY 2021-22. The district reported that it has responded to all service calls within two hours in each of the current and past three fiscal years of the review period.

Table 15 illustrates TBG identified performance measures that were able to be quantified by South Walton County MCD over the review period, including documented human arbovirus cases and district service calls and responses. A summary of South Walton County MCD performance measures and a brief assessment of whether standards were met is provided in **Table 16**.

Table 15. TBG Identified Performance Measures for South Walton County MCD

Performance Measure	CY 2020	CY 2021	CY 2022	CY 2023[1]
Arbovirus Cases (Florida)	0	0	0	0
Arbovirus Cases (Travel)	0	0	0	0
Arbovirus Deaths	0	0	0	0
	FY 2019-20	**FY 2020-21**	**FY 2021-22**	**FY 2022-23[2]**
Service Calls	318	364	168	163
Service Responses	318	364	168	163

Source: TBG Work Product, South Walton County MCD, Florida DOH.

[1] Florida DOH data is provided by calendar year (CY).

[2] 2023 YTD through April where provided.

Table 16. Assessment of TBG Identified Performance Measures and Standards for South Walton County MCD

Performance Measure	Performance Standard	Assessment
Human arbovirus disease cases	Zero human cases of arboviruses in South Walton County MCD	Standard was met.
Calls received and responded to	All service requests answered within 2 hours	Standard of responding to all service requests was met; standard of responding to all calls within two hours is indeterminate due to lack of data.

Source: TBG analysis, based on review of information provided by South Walton County MCD.

Perceptions of the District's Performance by Local Government Stakeholders, Residents, and Other Relevant Local Stakeholders

Perception of South Walton County MCD's performance appears positive based on a resolution from the Walton County BOCC and other limited stakeholder feedback. The BOCC expressed their support of South Walton County MCD, its board, and its staff through Resolution 2023-29.[12] Specifically, the resolution calls on the Florida Legislature to leave the district intact as an independent special district that has a primary focus of protecting the health, safety, and welfare of the residents of and visitors to South Walton County from mosquitoes and mosquito-borne diseases.

[12] Walton County Resolution 2023-29.

Although South Walton County MCD did not provide TBG completed resident surveys, residents encountered during TBG's field visit expressed appreciation for South Walton County MCD's efforts. In addition, the district has a Public Information Officer that supports outreach at schools, homeowner's association, and other activities, and district staff reported that public response to the outreach has been positive.

TBG contacted the Florida DOH in Walton County for stakeholder input, but received no response after multiple attempts. The Walton County Parks Department responded to TBG's request by reporting that the department is not familiar enough with South Walton County MCD's operations to comment. Other districts throughout the state were complimentary of South Walton County MCD's new management, in unprompted comments made to TBG; the new director is considered conscientious and innovative.

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. TBG recommends that the district expand and improve its facilities to be prepared for the expansion of services in the growing region. In addition, TBG determined that a statewide requirement for accessible inspection ports in new stormwater exfiltration systems would assist MCDs in conducting larviciding for private sector developments; the district could adopt formalized district goals, objectives, and performance measures and standards; and 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.

Facility Construction and Relocation: South Walton County MCD has experienced issues with facility flooding and lack of sufficient workspace, and facility improvements would be helpful to district operations. The existing facility has flooded several times; a structure at a higher elevation could better preserve and protect district assets with enhanced storm safety materials, even if costs are higher. Additional workspace would accommodate planned new positions to accommodate increased development.

In addition, the district should continue to pursue its plans to relocate a satellite office closer to the eastern service areas of the county. The current facility location results in inefficiencies for field inspections in other portions of the district's boundaries. Growth pressures, development, and traffic result in delays for service as development expands with an estimated 10,000 storm drains expected in the future. District staff reported that the district is under contract and is scheduled to break ground for construction of the new facility in November 2023.

Strategic Plan and Performance Measurement: South Walton County MCD does not currently have a formal strategic plan or formally established goals, objectives, or performance measures and standards. The district could adopt goals, objectives, and performance measures and standards through a strategic planning process to consistently monitor and maintain performance information over time. A successful strategic plan includes outlining the mission, vision, and background of the district as well as identifying the operational and growth needs to fulfill the future needs of mosquito control within the district in a timely manner with sufficient staff and

resources and within budget. A successful strategic plan outlines goals of the district over a specified time horizon, typically five years and may include identifying potential capital improvement projects and opportunities for the district to improve efficiencies.

The district could seek guidance on strategic planning processes and development of goals and objectives from other districts that have recently conducted such processes, such as Anastasia MCD or Indian River MCD. Florida's MCDs vary with regard to geography, incidences of species, and the scale and complexity of operations, however, there are similarities and opportunities for shared resources. Strategic planning processes such as those undertaken by Indian River MCD or Anastasia MCD could serve as a model for other MCDs.

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 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 the Florida Department of Agriculture and Consumer Services, the Florida Department of Environmental Protection, and the Fish and Wildlife Conservation Commission, the State Surgeon General, as well as representatives of federal agencies, the University of Florida Medical Entomological Research 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 standards and measures to assist MCDs with performance monitoring.[13]

Explore options to create a statewide requirement for accessible inspection ports in new stormwater exfiltration systems in private sector developments. While stormwater exfiltration systems routinely include inspection ports at the end of each run of pipe in FDOT- and other state-agency-funded projects, private sector development does not. Adopting a statewide requirement for private developers to include inspection ports would ensure sufficient access for MCDs to conduct larviciding as well as for future maintenance by MCDs and other entities needing to access stormwater inspection ports once construction and development are completed. There may be statutory and/or other regulatory changes that could be made to establish this requirement. The Florida Mosquito Control Association (FMCA) is a not-for-profit association in the state that addresses issues related to the policy and practice of mosquito control in the state and has made legislative and policy recommendations in the past.[14] The FMCA could work with the South Walton MCD and other MCDs in the state to further research and vet this issue and present recommendations to the appropriate authority for the establishment of such requirement.

Recommendations

Table 17 summarizes recommendations and associated considerations.

[13] Section 388.46, *F.S.*

[14] https://www.yourfmca.org/about-our-association/

Table 17. Recommendations with Associated Considerations

Recommendation	Considerations
The district should consider constructing its new facility at a substantially higher elevation. In addition, the district should move forward with plans for a satellite office closer to the eastern service areas.	• This recommendation would require planning by district staff, contracted services, and would have a moderate to high fiscal impact.
The Florida Mosquito Control Association could work with the South Walton MCD and other MCDs to explore policy options to establish a statewide requirement for accessible inspection ports in new stormwater exfiltration systems in private sector developments and make recommendations for such requirement to the appropriate authority.	• This recommendation would require the participation of the FMCA and time from its staff, which may result in additional administrative costs to the association. • This recommendation could cause a fiscal impact on private developers for increased supply or material costs and to local or state agencies if government inspections are required for these systems, but these impacts will depend on the specific policy recommendations that are developed. • While recommended policy changes that may result from this process could assist all MCDs, they could be of particular benefit to MCDs in rapidly developing areas where exfiltration systems are becoming more common for stormwater management.
The district could adopt goals, objectives, and performance measures and standards through a strategic planning process to consistently monitor and maintain performance information over time; the district could seek guidance from other districts that have conducted strategic planning processes.	• This recommendation would require additional staff time and may result in additional administrative costs to the district. • Staff in other districts may incur some additional workload if the district chooses to seek guidance from other districts regarding strategic planning processes.
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 develop model goals, objectives, and performance standards and measures to assist MCDs with performance monitoring.	• This recommendation would require a statutory change. • This recommendation would impose additional workload on council members and staff. • 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. • 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.

Source: TBG Work Product, based on review of information provided by South Walton 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. South Walton County MCD's response letter is provided on the following page.

SOUTH WALTON
MOSQUITO DISTRICT
ESTABLISHED IN 1964

South Walton Mosquito District

August 22, 2023

Valerie Seidel
The Balmoral Group

Valerie,

Good afternoon, please find our response to the performance review that was completed by your group.

The District agrees with the auditor's findings, and intends to take the following actions:

- Request FMCA and our local representatives to sponsor and advocate for the legislation to enable the District to more effectively provide source reduction services (inspection ports and tires) and to recoup existing state funding sources for such work (tires).

- Review and consider the strategic planning process used by Indian Review and Anastacia MCDs, and propose formal adoption of the goals, objectives and standards identified by this report.

If you have any questions, please let me know.

Sincerely,

Darrin Dunwald
Director

774 North County Hwy 393
Santa Rosa Beach, FL 32459
(850) 267-2112 Office
(850) 267-2712 Fax

Attachment 1

GLOSSARY OF TERMS
MOSQUITO CONTROL DISTRICT REVIEWS

September 2023

Prepared for

The Florida Legislature

Prepared by

The Balmoral Group

165 Lincoln Avenue

Winter Park, FL 32789

Attachment 1

Term	Definition
Adulticide	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)
***Aedes aegypti* mosquitoes**	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
***Aedes albopictus* mosquitoes**	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 *Aedes aegypti* mosquitoes
Altosid	The trade name for a mosquito larvicide that contains a synthetic version of the juvenile hormone insect growth regulator methoprene as the active ingredient
American Mosquito Control Association (AMCA)	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
***Anopheles* mosquitoes**	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
Arbovirus	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
Arthropod	As defined in Ch. 388, *Florida Statutes*, 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
Barrier island	Land that separates the ocean from the mainland; frequently an estuary or a lagoon will be located between the barrier island and mainland
Biogents	A company that produces mosquito traps with the goal of reducing mosquito populations that are produced in container-type habitats
***Bacillus thuringiensis israelensis* (*Bti*)**	A naturally occurring bacteria commonly used as a mosquito larvicide since the 1980s
Chikungunya	A mosquito-transmitted disease caused by a virus that originated in Africa and is transmitted by *Aedes* 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
***Culex* mosquitoes**	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.
***Culiseta melanura* mosquitoes**	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
Dengue	A mosquito-transmitted virus that causes sudden fever and acute joint pain; occasionally occurs in Florida where the mosquito vector is *Aedes aegypti* or *Aedes albopictus*
Dibrom	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
Dipper	An approximately 300 ml container attached to an extension pole that is used to sample for the presence of mosquito larvae in aquatic habitats
Eastern equine encephalitis virus (EEEV)	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

Term	Definition
	problems; in Florida, the freshwater swamp inhabiting mosquito *Culiseta melanura* is the primary vector of this disease
Fixed-wing aircraft	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
Florida Coordinating Council on Mosquito Control	An interagency council created in Ch. 388, *Florida Statutes,* 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
Florida Department of Agriculture and Consumer Services	The state agency that oversees and regulates mosquito control programs in Florida
Florida Department of Environmental Protection	The state agency responsible for coordinating efforts for intensified mosquito control on protected public lands when needed
Florida Department of Health (DOH)	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
Florida Fish and Wildlife Conservation Commission	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
Florida Medical Entomology Laboratory	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
Florida Mosquito Control Association (FMCA)	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,

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
Florida Sentinel Chicken Arboviral Surveillance Program	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
Genetically modified mosquitoes	*Ae. aegypti* 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 *Ae. aegypti* mosquitoes decreases
Geographic Information System (GIS)	Integrated computer hardware and software that stores, manages, analyzes, and visualizes geographic information
Good Laboratory Practices Program (GLP)	The goal of GLP is to ensure the quality and integrity of test data related to non-clinical safety studies
Granular application	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
Impoundment	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

Term	Definition
	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
Landing rates	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)
Larvicide	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
Light Detection and Ranging (LiDAR)	A remote sensing technology used to precisely detect objects, such as mosquitoes, in real space
Malaria	A life-threatening illness transmitted primarily in tropical locations by female mosquitoes in the genus *Anopheles* primarily in tropical locations; symptoms include fever, headache, and chills and usually occur within 10-15 days after a bite
Methoprene	A synthetic juvenile hormone, which is an insect growth regulator, that has been used as a larvicide since the mid-1970s
Millage	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
Mosquito Control District	A local government entity enabled through a voter-approved local or state legislative act to provide mosquito control services in a geographically defined area
Mosquito counts	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
Natular	The trade name for a larvicide that includes the bacteria spinosid as its active ingredient

Term	Definition
Nuisance mosquito	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
Pest resistance	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
Pyrethrum	A biochemical derived from a chrysanthemum plant that contains insecticidal properties; typically used in mosquito control as an adulticide
Rotary-wing aircraft	Aircraft that use a rotary blade rather than wings; a helicopter is the most common example
Rotational impoundment management	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
Saint Louis encephalitis virus	A virus most commonly transmitted by *Culex* mosquitoes that can affect the central nervous system when a human is infected
Source reduction	Refers to the elimination of habitats that can produce mosquitoes; ranges from the proper disposal of waste containers to the complicated management of impoundments
Spinosid	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
Sterile Insect Technique	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
Subcommittee on Managed Marshes	An interagency committee created in 1986 by the Florida Legislature in Ch. 388, *Florida Statutes,* to promote the wise management of Florida's wetlands for the mutual benefit of mosquito control and environmental enhancement
Ultra-low volume	A technique to dispense extremely small droplets of insecticide; while historically used for adulticiding, in some instances the technique is now used for larviciding

Term	Definition
United States Department of Agriculture (USDA)	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
United States Environmental Protection Agency	The federal agency that regulates mosquito control in Florida primarily through their approval and enforcement of chemical labels for insecticides
Unmanned Aerial System (UAS)	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
Vector	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
Vector surveillance	Monitoring for vectors that can be accomplished in several ways (e.g., various types of traps or landing rates)
Waste tires	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., *Aedes aeypti* or *Aedes albopictus*) lay their eggs in the standing water where the immature mosquitoes will develop to adulthood
Water management	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
West Nile virus (WNV)	Introduced into the United States in New York around 2000, the virus is carried by birds and primarily transmitted by *Culex* 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
Yellow fly trap	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

Term	Definition
Zika virus	A virus that originated in the Zika region of Africa and is transmitted by the mosquitoes *Aedes aegypti* and *Aedes albopictus;* 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.

Attachment 2

INTEGRATED PEST MANAGEMENT SUMMARY

September 2023

Prepared for

The Florida Legislature

Prepared by

The Balmoral Group

165 Lincoln Avenue

Winter Park, FL 32789

Attachment 2

Term	Summary
Integrated Pest Management	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.
Mosquito Surveillance	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.
Source Reduction	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. Current saltmarsh source reduction techniques in Florida include • 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 • 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.

Term	Summary
	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. 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.
Larvicides and Larviciding	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).
Adulticides and Adulticiding	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.

Term	Summary
Biological and Alternative Control	Biological control agents include microbial control agents (e.g., bacteria, such as *Bacillus thuringiensis* or *Bt*, 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 Gambusia mosquitofish to Collier County residents to release in standing water on their property to manage mosquito larvae. Alternative control methods include the sterile insect technique, trapping, repellents, and bug zappers.
Disease surveillance	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.
Mosquito Control Research	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.
Outreach and Education	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

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.