AMELIA ISLAND MOSQUITO CONTROL DISTRICT REVIEW FINAL REPORT

September 2023

Prepared for

The Florida Legislature

Prepared by

The Balmoral Group

165 Lincoln Avenue

Winter Park, FL 32789

Executive Summary

The Amelia Island Mosquito Control District (Amelia Island MCD) is an independent special district that serves the portion of Nassau County that is east of the Intracoastal Waterway; i.e., Amelia Island plus the communities of Marsh Lakes and Piney Island located west of the Intracoastal. Amelia Island MCD is among the smallest mosquito control districts (MCD) in the state, totaling approximately 19 square miles. In Fiscal Year (FY) 2022 (October 1, 2021 through September 30, 2022), About 17,800 households paid ad valorem taxes to support Amelia Island MCD operations. The most recent budget year included about $6.82 billion in taxable value of real property parcels, plus an additional $650 million in taxable value from about 1,350 tangible personal property accounts that are subject to district millage.

Amelia Island MCD was established in 1951 to control mosquitoes on Amelia Island and is run by an elected board of three commissioners. The board is actively engaged in review of operational success, financial stewardship, and efficiency. Due to geographic scale, coordination efforts with protected areas and high tourist activity, Amelia Island MCD has committed to Integrated Mosquito Management methods. Operations largely focus on prevention of mosquito infestation via surveillance, monitoring, larviciding, and targeted adulticiding.

SCOPE

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

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

The Balmoral Group worked in consultation with a mosquito control expert in the course of this review and found that Amelia Island MCD follows several industry standards for Integrated Pest Management and provides mosquito control services to residents in accordance with the Florida Statutes. Mosquito control services are not provided by the county or a municipality located within district; thus, similar services have not been identified for consolidation. The district has had steady revenues and expenditures, has routinely covered costs, and has provided services with a relatively small staff during the review period. The district has not conducted a strategic planning process and does not have formally defined goals, objectives, and performance measures and standards; however, the district has kept arbovirus counts for cases acquired in Florida and detected in the district at zero and has responded to all service calls in the current and past three fiscal years.

Based on its review, The Balmoral Group presents the following recommendations for the improvement of mosquito control services in the Amelia Island MCD:

- 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.

- The Legislature could consider amending s. 388.46*, Florida Statutes*, to direct the Florida Coordinating Council on Mosquito Control to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model goals, objectives, and performance measures and standards to assist MCDs with performance monitoring.

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1. Background

District Description

District Purpose

According to district representatives, the general purpose of the Amelia Island Mosquito Control District (Amelia Island MCD) is to control and abate mosquitoes within the district boundaries, to prevent the spread of mosquito-borne diseases, and to manage the nuisance posed by adult mosquitoes. The district's stated purpose on its website is "to improve the quality of life on beautiful Amelia Island, Florida, through the control of pestiferous and disease-bearing mosquitoes."

Service Area

Amelia Island MCD is approximately 19 square miles, which includes the portion of Nassau County that is east of the Intracoastal Waterway: specifically, Amelia Island plus the communities of Marsh Lakes and Piney Island located west of the Intracoastal. The Amelia Island MCD's headquarters are located at 2500 Lynndale Road, Fernandina Beach, Florida 32035. **Figure 1** is a map of the Amelia Island MCD boundary, with the county boundary and Amelia Island MCD headquarters marked. Amelia Island includes the Amelia Island Trail, which is part of the larger East Coast Greenway. The Fernandina Beach Municipal Airport is located here, which is used at times by the Navy, Coast Guard, and the Florida Air National Guard. The southern half of the beaches on Amelia Island is marked as Critical Wildlife Area, which means the beaches will be closed during breeding seasons. Eagan's Creek, which is located within the district, is a common source of nuisance mosquitoes.

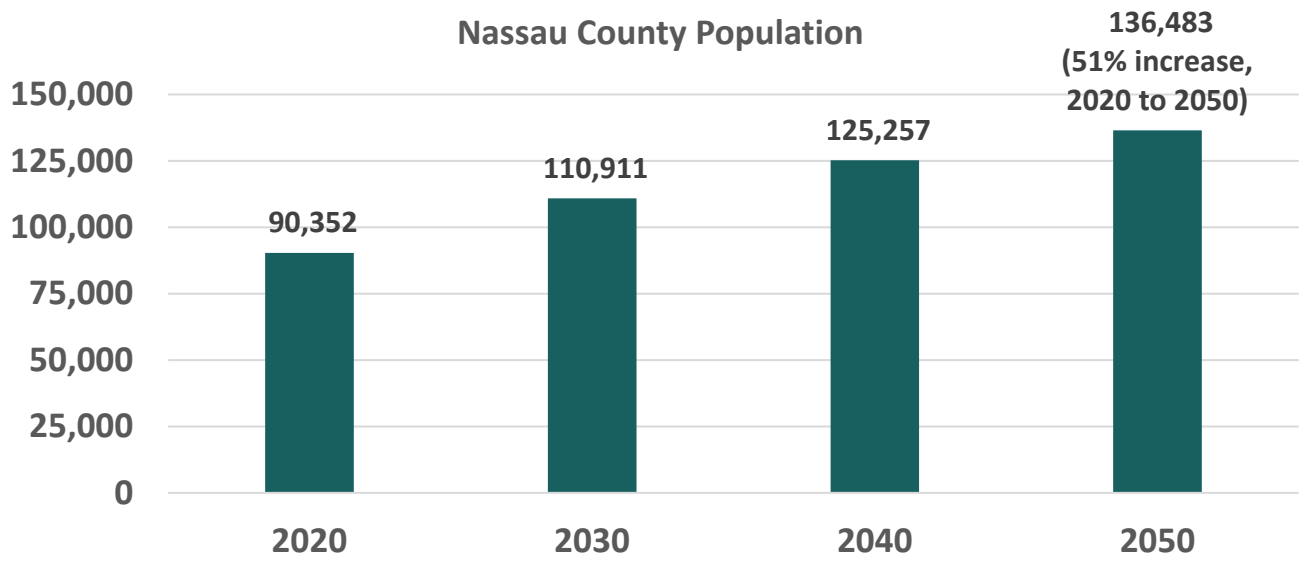
Figure 1. Amelia Island MCD Map

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

Population

Amelia Island MCD's population was 22,977 in 2020 according to the U.S. Census.[1] A large portion of the district is located in Fernandina Beach in the northern part of the island. Other areas include the unincorporated beach communities of American Beach and Amelia City. Nassau County's population was estimated at 97,899 persons in 2022 according to the latest available U.S. Census data.[2] The Florida Legislature's Office of Economic and Demographic Research (EDR) projects Nassau County's population to increase by 51% through 2050 to 136,483 residents compared to a 2020 baseline.[3] **Figure 2** shows Nassau County's projected population estimates calculated by EDR.

Figure 2. Nassau County Population Projection



Source: TBG Work Product, EDR.

District Characteristics

Amelia Island MCD includes Amelia Island and Marsh Lakes and Piney Island. Located in the eastern parts of Nassau County, Amelia Island is a relatively small part of the county. While much of the island is made up of beaches and golf courses, Eagan's Creek is a major source of nuisance mosquitoes. The population tends to be concentrated in the north, but much of the island is includes residential and commercial developments, including resorts. The southern part of the island includes some protected beaches.

Weather conditions are the primary driving force for producing mosquitoes with heavy rainfall events having the greatest impact. Changing water levels through tidal events can also produce mosquitoes in large numbers. Humans are also a major contributor to the problem with waste containers, tires, and other water collecting vessels being prime producers of mosquito species that are capable of transmitting several arboviruses. The characteristics of the natural areas of the district, combined with the growing population in urban areas of the

[1] Block-level data compiled from Decennial Census P.L. 94-171 Redistricting Data Summary Files and matched to the MCD boundary in GIS.
[2] Population Estimates, July 1, 2022, retrieved from U.S. Census Bureau QuickFacts: United States.
[3] Based on 2021 Estimates, Population: 1970-2050, County projections retrieved from Population and Demographic Data - Florida Products (state.fl.us).

district and the weather conditions described above, create an environment conducive to extensive mosquito habitats that require constant mosquito control. The services to control mosquitoes include routine surveillance of mosquito-producing habitats, source reduction, ground treatments, and aerial treatments contracted through Jacksonville Mosquito Control. These treatments use pesticides to treat areas known to have large breeding mosquito populations, regular testing for disease transmission in animals, and others described in greater detail later in the report.

Real Property Data

Amelia Island MCD receives revenue from ad valorem taxes to fund district operations. The total taxable value of properties within Amelia Island MCD was about $7.5 billion in the most recent fiscal year under a millage rate of 0.1151 (**Table 1**). Real property parcels subject to district millage have exceeded 17,000 parcels for most of the last four years, excluding FY 2021-2022 (**Table 2**). The just value of real property parcels increased 49% in Fiscal Year (FY) 2022-23 compared to FY 2019-20, while the taxable value of real property parcels increased 30% over the same period, following changes in property values.

Table 1. Millage Rates and Total Taxable Value of Properties Subject to Amelia Island MCD Millage

Amelia Island MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Millage Rate	0.1412	0.1331	0.1277	0.1151
Taxable Value of Parcels ($Mil.)	$5,247	$5,645	$4,295	$6,816
Taxable Value of Accounts ($Mil.)	$473	$513	$485	$651
Taxable Value of Centrally Assessed Property ($Mil.)[1]	$4	$9	$5	$5
Total Taxable Value ($Mil.)	**$5,724**	**$6,166**	**$4,785**	**$7,471**

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 Amelia Island MCD Millage

Amelia Island MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Parcels ($Mil.)	$6,895	$7,488	$8,229	$10,293
Real Property Parcels Subject to Millage	17,551	17,687	17,904	17,795
Taxable Value of Parcels ($Mil.)	$5,247	$5,645	$4,295	$6,816

Source: FDOR.

Tangible Personal Property Data

In addition to real property, 1,346 tangible personal property accounts were subject to Amelia Island MCD millage in FY 2022-23, up 2% since FY 2019-20 (**Table 3**). The just value of tangible personal property accounts increased 24% in FY 2023 compared to FY 2019-20, while the taxable value of tangible property accounts increased 37% over the same period.

Table 3. Tangible Personal Property Accounts Subject to Amelia Island MCD Millage

Amelia Island MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Accounts ($Mil.)	$762	$798	$836	$946
Tangible Personal Property Accounts Subject to Millage	1,320	1,322	1,275	1,346
Taxable Value of Accounts ($Mil.)	$473	$513	$485	$651

Source: FDOR.

History and Composition

According to district representatives, the Amelia Island MCD was established in 1951 by a special referendum. The Amelia Island MCD Board of Commissioners is comprised of three elected commissioners who serve four-year terms. Members of the board are required to be resident registered electors. In the current and previous three fiscal years, board seats were filled, except when a commissioner resigned in June 2022. A new commissioner was sworn in during January 2023.

Amelia Island MCD 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 Administration Code*, setting forth rules adopted by the Department of Agriculture and Consumer Services (DACS) for mosquito control program administration. 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.
- 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.

According to Amelia Island MCD staff, the district holds monthly meetings as well as an annual budget meeting (**Table 4**). In addition to regular monthly meetings, special meetings may be called to discuss the draft and final budgets for the upcoming fiscal year, as well as for special topics such as district banking practices and aerial activities. **Table 4** summarizes meeting counts by fiscal year, including special meetings for the past three fiscal years.

Table 4. Amelia Island MCD Commissioner Meeting Counts

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

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

The board's meetings are open to the public and noticed and conducted in accordance with s. 189.015, *Florida Statutes.*

Intergovernmental Interactions

Amelia Island MCD coordinates with the Nassau County Public Health Department and the Florida Department of Health (DOH) to monitor for mosquito-borne disease outbreaks and with the City of Fernandina Beach with respect to operations. Amelia Island MCD has collaborated with the Town of Hillard, the Jacksonville-Duval County Mosquito Control Division, and the Anastasia MCD as needed for emergency situations.

Resources for Fiscal Year 2021-22

The published FY 2021-22 millage rate established by the Amelia Island MCD is 0.1277 (**Table 5**). Amelia Island MCD had 11 paid positions in FY 2021-22, 18 total vehicles, 36 pieces of equipment, and 1 facility including 4 buildings. Revenues totaled $811,800 in FY 2021-22 and expenditures were $708,529 in FY 2021-22.

Table 5. Amelia Island MCD Resources for FY 2021-22

Resource Item	FY 2021-22 Amount
Millage Rate	0.1277
FY 2021-22 Revenues	$811,800
FY 2021-22 Expenditures	$708,529
Number of Paid Staff	11 (including 3 commissioners)
Vehicles	A total of 18 vehicles; 1 boat, 13 trucks, and 4 utility vehicles
Equipment	Field equipment: 18 Lab equipment: 9 Office equipment: 9 Surveillance equipment: 43 traps, 1 sentinel chicken coop
Facilities	1 facility, 4 buildings

Source: FDOR.

2. Findings

Service Delivery

Amelia Island MCD follows several industry standards for Integrated Pest Management and provides mosquito control services to residents as established in the Florida Statutes.

To assess the delivery of services in the district, The Balmoral Group (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; and 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. See attachment titled, "Integrated Pest Management" for more information. Amelia Island MCD conducts mosquito control activities across five areas of IPM.

Amelia Island MCD conducts surveillance through regular monitoring of mosquito larvae and adults. Field staff conduct surveillance using Centers for Disease Control and Prevention (CDC) traps and through service requests received by the district. District staff also use Geographic Information Systems (GIS) to help monitor mosquito population numbers over time and to target larval habitats for treatment.

The district also conducts ongoing surveillance of mosquito-borne diseases to prevent transmission by working with the local health department and using sentinel chickens to monitor the rate of disease transmission by mosquitoes in the district. Cases of mosquito-borne diseases are monitored statewide by DOH with case rates provided in weekly DOH reports that are reviewed by the district. Nassau County Health Department conducts testing of blood samples from the district's sentinel chickens, providing local results for several mosquito-transmitted pathogens (e.g., St. Louis encephalitis, West Nile virus, and eastern equine encephalitis).

The district conducts source reduction activities through water management, including ditching, diking, and the elimination of standing water in containers such as waste tires. Tires collecting water create problematic mosquito-producing habitats that are difficult to manage through routine chemical applications but can be managed through proper disposal or modification. Amelia Island MCD routinely picks up waste tires abandoned around the district as tires are prime larval habitats for mosquitoes. TBG requested but did not receive information on the number of tires collected or the funds spent by the district on waste tire collection.

The district regularly conducts adulticide and larvicide operations to mitigate mosquito populations based on mosquito counts. District staff monitor landing rates, service requests, and traps to determine the best times to conduct larviciding and adulticiding. Active monitoring of counts of mosquitoes from CDC mosquito traps serves as the quantitative measure for the effectiveness of adulticide operations and secondarily for the district's larviciding operations.

Amelia Island maintains communication with the public by responding to service requests and obtaining feedback from the public. Area residents communicate directly with sprayers in the field and give feedback on effectiveness and potential areas of improvement, as well as provide service requests or complaints. Feedback is also secured through the district's website.

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

Table 6. Amelia Island MCD Services Overview

Integrated Pest Management Service	Amelia Island County MCD Services Provided
Mosquito Surveillance	Ground and aerial surveillance using trap collection and analysis
Source Reduction	Ditch maintenance, diking, and elimination of the length of time water stands in low areas
Larviciding	Application of larvicides in mosquito habitats to prevent the growth of adult mosquitoes
Adulticiding	Delivery of ultra-low volume insecticide
Disease Surveillance	Monitoring mosquito-borne diseases with regular blood sample collections from sentinel chickens and traps
Outreach and Education	Informing the public about what is involved in mosquito control efforts

Source: TBG Work Product, Amelia Island MCD.

Analysis of Delivery of Services

Amelia Island MCD delivers several mosquito control services across all main areas of their service area that are within the scope of its charter and purposes outlined in applicable laws and regulations. Amelia Island MCD provides services in five areas of IPM as described above. None of the services fall outside applicable laws governing the district. The district has significant need for mosquito control given the extensive natural areas, including marshlands, that surround the island and create ideal larval habitats for mosquitoes. Amelia Island MCD staff reported positive relationships with the local population, and the public is given opportunities to provide feedback to the district for treatment needs. Amelia Island reported mapping mosquito producing areas and taking proactive steps to reduce mosquito populations.

Comparison to Other Services

Other local government entities located wholly or partially within Amelia Island MCD do not provide similar mosquito control services. TBG interviewed staff and reviewed documents available online to establish if services could be or are redundant to or overlapping with county and municipal government services. Services similar to those provided by Amelia Island MCD are not provided by county and municipal governments located within the district. TBG requested information from the Nassau County Board of County Commissioners, the county health department, and local parks and recreation unit to assess their perceptions of the district's delivery of services but did not receive any response following multiple contact attempts. 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.

Considerations for Consolidations

Consolidation of operations is not recommended for Amelia Island MCD based on the findings of this review. No similar services provided by the county or a municipality located wholly or partially within the Amelia Island MCD have been identified.

Resource Management

Amelia Island has had steady revenues and expenditures, has routinely covered costs, and has provided services with a relatively small staff during the review period; the district has not conducted a strategic planning process.

To assess the district's resource management, TBG analyzed information on revenue sources and on revenue and expenditure trends and their possible causes; analyzed staffing trends and their possible causes; requested data on services delivered by district staff versus third-party contractors for the current fiscal year and previous 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; requested and, if applicable, reviewed performance reviews and audits; and interviewed district staff and board members.

Current and Historic Revenues and Expenditures

Revenues have consistently covered expenditures for the past three fiscal years and should be stable and adequate to cover future expenditures at current levels. Amelia Island MCD's fiscal year begins October 1st and ends on September 30th. Amelia Island MCD's funding is primarily comprised of ad valorem taxes. The Nassau County Property Appraiser, with approval from the Florida Department of Revenue (DOR), certifies the county's tax roll each year and provides the information to the Nassau County Tax Collector, which in turn collects monies for the Amelia Island MCD.

To analyze revenues and expenditures, TBG requested and received annual financial reports from the Amelia Island MCD for FY 2019-20 through FY 2022-23. In addition, TBG interviewed MCD staff and reviewed documentation both online and as provided from Amelia Island MCD's accounting and operation systems.

Revenues have remained fairly constant during the review period, only fluctuating slightly between $782,457 in FY 2019-20 to $785,760 in FY 2022-23, with the majority of revenues in each year coming from ad valorem taxes and a relatively small percentage from other sources (**Table 7**). Expenditures also fluctuated slightly, increasing from $714,732 in FY2019-20 to $762,247 in FY 2020-21, then decreasing to $708,529 in FY 2021-22. FY 2022-23 is ongoing and as of April 2023, expenditures were $403,720. Revenues have exceeded expenditures in each year of the review period.

Table 7. Revenue and Expenditures

Revenues and Expenditures	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Revenues	**$782,457**	**$791,089**	**$811,776**	**$785,760**
Ad Valorem	$781,423	$787,662	$811,132	$784,359
Other Sources	$1,034	$3,427	$644	$1,401
Expenditures	**$714,732**	**$762,247**	**$708,529**	**$403,720**
Administrative Costs	$354,743	$402,166	$363,168	$240,200
Direct Program and Activity Costs	$359,989	$360,081	$345,361	$163,517
Other Expenditures	-	-	-	-

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

The millage rate has decreased in each year of the review period, but with the trend in increasing taxable value and number of parcels, the district is likely to have a sustainable revenue stream to support its future operations.

Administrative and Direct Program Costs

While an accurate breakout of administrative costs was not possible due to lack of data, some information was available to allow identification of some administrative cost categories. As shown in **Table 7,** above, Amelia Island MCD provided a breakdown of total expenditures by broad categories of administrative, direct, and other program costs. In addition, the district provided TBG with a breakdown of expenditures by detailed category for FY 2019-20 through FY 2021-22. However, without additional information from the district, it is not possible to present an accurate breakout of administrative versus direct costs of the district in each of these categories.

For example, the category of personal services is likely to contain salaries for field staff, which would be considered a direct cost, but it also would include salaries of administrative staff, which would constitute an administrative cost. **Table 8** summarizes the detailed expenditure data provided by the district and includes TBG's assessment of whether the cost category is likely to include administrative costs, direct costs, or a combination of both.

TBG's analysis identified that the majority of the expenditure categories include both administrative and direct program costs, with the highest expenditures in the personal services, personal services benefits, operating expenses, travel/utilities/service, and materials and supplies categories during the review period. Operating expenses remained fairly constant at approximately $63,000 in FY 2019-20 and FY 2021-22. Personal service benefits expenditures increased slightly from $149,882 in FY 2019-20 to $170,457 in 2021-22, as did personal services expenditures going from $347,709 in FY 2019-20 to $386,890 in FY 2021-22. TBG's assessment is that it is likely that the majority of the personal service expenditures are for field staff and would be considered direct costs.

Some direct program costs could be identified. These include materials and supplies, gas/oil/lubricants, and chemicals. Materials and supplies costs increased from $9,015 in FY 2019-20 to $12,872 in FY 2021-22. The cost of gasoline, oil and lubricants fluctuated during the review period, increasing from $10,214 in FY 2019-20 to $14,964 in FY 2020-21, then decreasing to $2,354 in FY 2021-22. Financial data was not available in a format that would allow administrative costs and direct program costs to be determined for each district program and activity.

Table 8. Administrative and Direct Program Cost Data

Expenditure Category[1]	TBG's Cost Type Categorization	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Personal Services	Admin & Direct	$347,709	$408,013	$386,890	$191,507
Personal Service Benefits	Admin & Direct	$149,882	$191,264	$170,457	$100,181
Operating Expenses	Admin & Direct	$63,912	$60,288	$63,774	$46,440
Travel/Utilities/Service	Admin & Direct	$61,070	$65,294	$69,144	$51,444
Materials and Supplies	Direct	$9,015	$13,011	$12,872	$6,148
Gasoline, Oil, and Lubricants	Direct	$10,214	$14,964	$2,354	$1,083
Chemicals and Solvents	Direct	$3,173	$-138	$3,036	$0
Capital Equipment	Admin & Direct	$69,754	$9,550	$0	$0
Total		**$714,732**	**$762,246**	**$708,527**	**$396,803**

Source: TBG Work Product, MCD annual financial reports. 2023 YTD through March.
[1] Categorization of contracted costs was completed by Amelia Island MCD based on an outline provided by TBG to ensure consistency across reports.
[2] 2023 YTD through April.

Contracts for Services

Amelia Island MCD staff used a small number of contractors across the current and previous three fiscal years. In FY 2019-20 and FY 2020-21, there were two contracts for services, in FY 2021-22 no contracts, and through April in FY 2022-23 there have been three contracts for services. The services were from companies that do general maintenance such as electricity, air conditioning, security, or fencing and from an attorney and a CPA. Costs for contracted services of Amelia Island MCD were not received at the time of writing.

Staff

Amelia Island MCD employs a relatively small staff of management, technical, and scientific positions. In FY 2022-23, Amelia Island MCD had eight paid staff members as well as three commissioners for a total of 11 paid in-house positions (**Table 9**).

An organizational chart was requested but had not been received at the time of this writing.

Table 9. Amelia Island MCD Staff Positions

• Director • Office Manager	• Commissioners • Field Technicians	• Entomologist/Biologist

Source: TBG Work Product, Amelia Island MCD.

Analysis of Program Staffing Levels

Amelia MCD had a stable number of commissioners and employees over the review period and is appropriately staffed for the scale and scope of its operations compared to other similarly sized MCDs in Florida. Amelia Island MCD currently is staffed to maintain operational performance as a relatively small MCD with a smaller geographic scope than other MCDs. The Amelia Island MCD is currently taking steps to provide continuing education for its employees. Additional staffing requirements of positions may be required as the Amelia Island MCD researches drone and GIS Applications. Amelia Island MCD employs about 11 in-house employees (including the three commissioners) a year and contracts with an attorney and a CPA. For the scale of Amelia Island MCD's operations and considering the small region to which the Amelia Island MCD provides service, the current amount of staff is

sufficient to provide sufficient mosquito control services to the residents of Amelia Island. Districts similar to Amelia, such as Beach MCD and South Walton MCD, have comparable staff sizes and geographical areas. South Walton is larger in budget, with $3.3 million in expenditures, but with a relatively proportional staff size, 32 staff positions. Amelia Island MCD is also comparable to Beach MCD's expenditures at $1.82 million and 18 staff positions.[4]

Vacancies are minimal and quickly filled when they arise. Amelia Island MCD staff indicated that the turnover rate over the past four years is zero (**Table 10**).

Table 10. Amelia Island MCD Staff Counts

Employee Counts	FY 2019-20	FY 2020-21	FY 2021-22[1]	FY 2022-23[2]
Commissioners	3	3	3	3
Full Time	7	8	8	7
Part Time	0	0	0	0
Contracted	2	1	0	3
Volunteers	0	0	0	0
Vacancies	1	0	0	1
Total	**13**	**12**	**11**	**14**
Turnover Rate	0%	0%	0%	0%

Source: TBG Work Product, MCD.
[1] One commissioner resigned in June 2022, leaving the board with two commissioners for the remainder of the fiscal year.
[2] 2023 YTD through April.

In FY 2019-20, total gross pay for staff (excluding commissioners) was $333,310. This increased 17% for FY 2020-21 to $391,302 and then declined 5% to $371,808 for FY 2021-22. The decline was due to one of the staff taking over the position of one of the commissioners, filling the vacancy that was open in June 2022 as mentioned previously. Through April of FY 2022-23, the total gross pay is $209,452.

Equipment and Facilities

Equipment and vehicles owned by Amelia Island MCD are sufficient for current operations compared to similarly sized mosquito control districts and are being serviced regularly to maintain and maximize efficiency in operational capabilities. TBG analyzed documentation provided by Amelia Island MCD and interviewed staff to review any trends or changes in the levels of equipment and facilities purchased or maintained over the review period. Amelia Island MCD purchased a 2022 Honda side-by-side in FY 2020-21. The Amelia Island MCD also currently owns 10 trucks for spraying and larviciding, one tractor, and a backhoe.

South Walton MCD and Beach MCD have similar vehicle counts. South Walton MCD has 18 vehicles in total, while Beach MCD has 22. Amelia Island MCD having 16 vehicles in total is an expected amount for them in comparison.

A summary of the number of vehicles, equipment, and facilities owned by Amelia Island MCD are provided in **Table 11** by fiscal year. Information was not received for FY 2022-23.

[4] TBG reviewed FY 2021-22 expenditures and total available staff positions across the 15 MCDs as part of this review and categorized districts as follows: very small districts are those with expenditures less than $1 million and staff under 10 (Buckhead Ridge, Fort Myers Beach, and Moore Haven MCDs); small districts are those with expenditures between $1 and $5 million and staff between 11 and 49 (Amelia Island, Beach, Citrus, East Flagler, Indian River, and South Walton County MCDs); moderately-sized districts are those with expenditures between $5 and $10 million and staff between 11 and 49 (Anastasia, Manatee, and Pasco MCDs); and large districts as those with expenditures over $11 million and more than 50 staff positions (Collier, Keys, and Lee MCDs).

Table 11. District Vehicles, Equipment, and Facilities

	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Vehicles	**13**	**15**	**16**	**Not provided**
Helicopters	0	0	0	Not provided
Boats	0	1	1	Not provided
Trucks and Vans	12	13	14	Not provided
ATVs and Utility Vehicles	1	1	1	Not provided
Equipment	**53**	**54**	**54**	**Not provided**
Field Equipment	39	40	40	Not provided
Lab Equipment	4	4	4	Not provided
Office Equipment	10	10	10	Not provided
Facilities	**1**	**1**	**1**	**1**
Buildings	4	4	4	4

Source: TBG Work Product, Amelia Island MCD.
[1] TBG requested but did not receive this information.
[2] 2023 YTD through April.

Amelia Island MCD's surveillance equipment consists of one sentinel chicken coop and 43 mosquito traps that are used to monitor and track the populations of mosquitoes in the district (**Table 12**). Amelia Island MCD has one sentinel chicken flock, but further information was not received on their counts of sentinel chickens.

Table 12. Surveillance Equipment

Equipment	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Mosquito Traps	10	10	43	43
Sentinel Chicken Coops	1	1	1	1
Chicken Counts[1]	Not provided	Not provided	Not provided	Not provided

Source: TBG Work Product, MCD. 2023 YTD through April.
[1] TBG requested but did not receive this information.

Strategic or Other Formal Plans for the District's Future

Amelia Island MCD does not have a strategic plan but reported that it is developing future plans; details of the planning process are currently unknown. Amelia Island MCD staff reported that the district is developing future plans to improve and modernize operations and provide continuing education for employees. The district is also researching the potential use of drones and currently integrating the use of GIS software to identify target areas for larval habitats. Amelia Island MCD reported that it has some formal measures documented but has not shared documentation with TBG. While the district appears to be managing its resources effectively and efficiently based on its management of finances and ability to keep arbovirus counts low, it could improve its operations by developing a strategic plan and establishing clear and measurable goals and performance standards.

Previous Performance Reviews, Financial Audits, and Resident Feedback Surveys

Amelia Island MCD had no identified issues with financial audits from FY 2018-19 to FY 2020-21; local resident feedback has been positive. The audits of the financial statements from FY 2018-19 to FY 2020-21 found no issues and that they fairly represented the Amelia Island MCD's financial position. Revenues have regularly exceeded

expenditures. Amelia Island MCD staff reported in interviews that they regularly interact with residents of Amelia Island during field operations, as the director of the district also serves as a field technician. Amelia Island MCD has indicated that they have a good rapport with local citizens and they provide feedback when they are spraying and through public outreach. TBG requested but did not receive any information regarding whether any performance reviews or resident feedback surveys had been conducted during the review period.

Analysis of Management Reports/Data and Performance Information

Amelia Island MCD does not appear to actively track performance success or failure of its operations and administration against goals and does not have effective reporting mechanisms in place to measure results on a timely basis. Reports from local residents appear to be the only measure of reports that the Amelia Island MCD uses.

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

Amelia Island MCD conducts some activities to keep costs low and improve timing and quality of program efforts. To assess cost, timing and quality of program efforts, TBG reviewed documentation provided by Amelia Island MCD, publicly available data and reports, and interviewed Amelia Island MCD staff. As reported above, district expenditures fluctuated somewhat during the review period, with revenues regularly exceeding expenditures, demonstrating that the district is able to manage costs within its resources. In addition, the district is making efforts to improve the timing and quality of its programs. Current program efforts include the testing of sentinel chicken blood samples by the Nassau County DOH office, which can reduce the time to receive results indicating disease-bearing mosquitoes are present and in turn facilitate faster treatments. Additional program efforts include the provision of continuing education for employees, and integration of GIS software. Service operations are expanding with GIS usage.

Goals, Objectives, Performance Measures and Standards

Amelia Island 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 calls in the current and past three fiscal years.

To assess the district's goals, objectives, performance standards, and performance measures, TBG requested 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 requested and reviewed previous performance reviews and audits; 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

Amelia Island MCD does not have enabling legislation that delineates specific programmatic goals for the district, and the district does not have a strategic plan that specifies goals and objectives. TBG requested but did not receive documentation of the special referendum that created Amelia Island MCD, and there is not documented enabling legislation that delineates programmatic goals for the district. District staff report that the district's general goals are to control mosquito populations through spraying and responding to service requests.

Objectives

Amelia Island County MCD has not defined specific objectives for its operations. Amelia Island MCD has not formally defined objectives for its operations.

Performance Measures and Standards

Amelia Island MCD has not established formal performance standards and measures but does maintain and track prevalence of human arbovirus cases in the district and responses to service calls. The district does not have formally established performance measures and standards 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 arboviruses cases found in humans as reported by DOH.

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

2. **Measure:** Number of service requests received and addressed with improved average response times.

   Standard: Address citizen requests for mosquito control efforts in a timely manner.

Analysis of Goals, Objectives, and Performance Measures

Amelia Island MCD showed favorable performance with respect to keeping arbovirus counts low and responses to service calls timely. Based on the data reported in this review, Amelia Island 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 arbovirus cases that were acquired in Florida have been reported by Florida DOH in Amelia Island MCD over the review period. Consequently, no human deaths have occurred.

The number of service calls made to the district has fluctuated annually during the review period but has decreased overall from 323 in FY 2019-20 to 215 in FY 2021-22. The district reported that it aims to decrease average response times over time but did not provide data on response times during the review period

Table 13 illustrates TBG identified performance measures that were able to be quantified by Amelia Island MCD over the review period, including documented human arbovirus cases and district service calls and responses.

Table 13. Performance Measures for Amelia Island 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	1
Arbovirus Deaths	0	0	0	0
	FY 2019-20	**FY 2020-21**	**FY 2021-22**	**FY 2022-23[2]**
Service Calls	323	188	215	34
Service Responses	323	188	215	34

Source: TBG Work Product, Amelia MCD, Florida DOH.

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

[2] 2023 YTD through April.

Table 14 displays these performance standards and their assessments of success.

Table 14. Assessment of Performance Measures and Standards for Amelia Island MCD

Performance Measure	Performance Standard	Assessment
Cases of Domestic Arbovirus	One case of dengue fever reported in Nassau County determined to be travel related, no domestic cases of any arbovirus in Amelia Island MCD for the last four years.	Standard met.
Service Requests	Respond to all service requests and improve average response time.	Standard met for responses to all service requests; improved average response times is indeterminate due to lack of data.

Source: TBG analysis, based on review of information provided by Amelia Island MCD.

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

Perceptions of the Amelia Island MCD by the general public appear positive. Amelia Island MCD staff reported that they have good rapport with locals and receive positive feedback from the public from face-to-face interactions while conducting field operations. District staff reported that local residents have expressed satisfaction with Amelia Island MCD services. TBG requested information from the Nassau County Board of County Commissioners, the local county health department, and local parks and recreation units to assess their perceptions of the district's delivery of services but did not receive any stakeholder responses following multiple contact attempts.

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 two recommendations. TBG determined that the district could adopt formalized goals, objectives, and performance measures and standards, and that the Legislature may wish to consider directing the Florida Coordinating Council on Mosquito Control to develop model goals, objectives, and performance measures and standards to assist MCDs in this state.

Strategic Plan and Performance Measurement: Amelia Island 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 the goals of the district over a specified period, 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 DACS, 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's Florida Medical Entomology Laboratory, Florida MCDs, and others. The Legislature could direct the council to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model MCD goals, objectives, and performance standards and measures to assist MCDs with performance monitoring.[5]

Recommendations

A tabular display of TBG's recommendations to improve operations, reduce costs or reduce duplication can be seen in **Table 15**.

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

Table 15. Recommendations with Associated Considerations

Recommendation	Associated Considerations
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 Amelia Island MCD 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 to 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 analysis, based on review of information provided by Amelia Island 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. Amelia Island MCD did not provide TBG with a response letter for inclusion in the final report.

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.