BEACH MOSQUITO CONTROL DISTRICT REVIEW FINAL REPORT

September 2023

Prepared for

The Florida Legislature

Prepared by

The Balmoral Group

165 Lincoln Avenue

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Executive Summary

Beach Mosquito Control District (Beach MCD) serves Panama City Beach and an estimated population of 46,500 as of 2020. Beach MCD operates within a 79 square mile zone, in the area west of Hathaway Bridge, south of the intracoastal waterway, and east of Walton and Bay county lines. The district has about 27 miles of coastline on the Gulf of Mexico. Panama City Beach is a very popular tourist destination and includes a coastal, densely developed community with residential and commercial uses and also natural, undeveloped areas. The district is also surrounded by other natural areas, salt marshes, estuaries, and bays, and the urbanized area of Panama City lies across the bay to its east.

Beach MCD was founded on October 14th, 1952, by the local voters in Panama City Beach and was originally formed as the Gulf Mosquito Control District. The district was renamed Beach MCD in 1997. Governance is provided by three commissioners elected to four-year terms. Beach MCD is dedicated to controlling disease-carrying arthropods, particularly mosquitoes and yellow flies.

Property taxes are collected to fund the district's program. About 47,000 households pay ad valorem taxes to support Beach MCD's operations, and the most recent budget year included about $12.6 billion in taxable value. Beach MCD is among the smaller MCDs in the state in terms of its budget and staffing, with annual expenditures in the most recent three full fiscal years ranging from $1.8 to $3.68 million and annual staffing counts around 20.

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 Beach MCD delivers IPM services that are within the scope of the MCD's charter and applicable laws and regulations and that the district's operations compare favorably to other publicly-provided services and are not recommended for consolidation. The district has demonstrated effective management of its revenues and expenditures but could hire additional staff to meet district needs and should continue to address prior audit findings to improve internal financial management controls. While Beach MCD does not have clearly defined goals, objectives, or performance measures and standards, it has kept arbovirus cases low 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 Beach MCD:

- The Legislature could consider amending section 403.709(1), *Florida Statutes*, to require a portion of the funds currently administered by DEP for solid waste activities to be allocated to waste tire abatement activities by MCDs.

- The district 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 control professionals and researchers from around the state to develop model goals, objectives, and performance measures and standards to assist this state's MCDs with performance monitoring.
- To address staffing vacancies, the district could hire an assistant entomologist and two seasonal mosquito technicians to fulfill the district's staffing needs. In addition, in response to prior financial audit findings, Beach MCD should continue the board's review of the district's financial activities and could hire additional administrative staff to strengthen system internal controls.

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1. Background

District Description

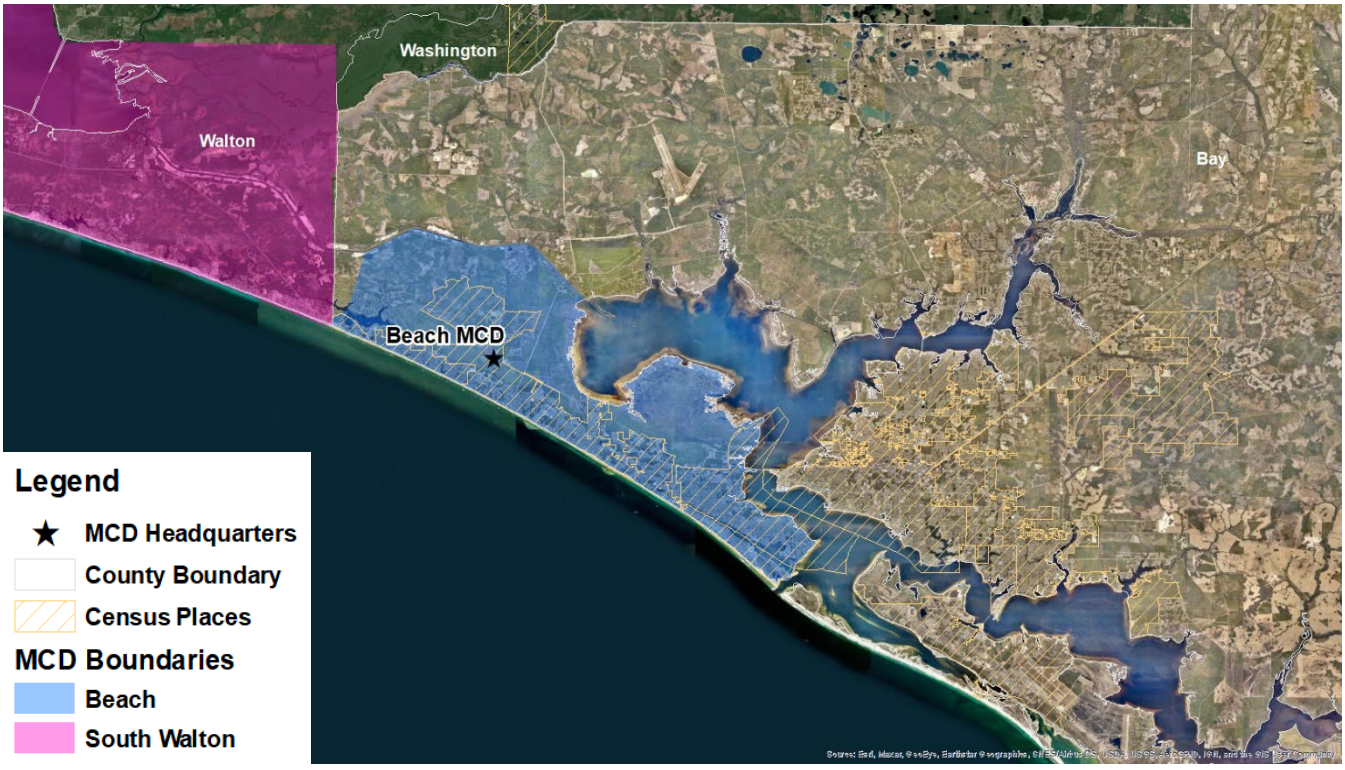
District Purpose

According to district representatives, the purpose of Beach Mosquito Control District (Beach MCD), as established in 1952, is to protect the public health, safety, and welfare by using science-based, environmentally sensitive, integrated mosquito control techniques employing public education, surveillance, source reduction, biological control, and the judicious use of pesticides to enhance the quality of life for Beach MCD residents.

Service Area

Beach MCD serves Panama City Beach, Florida, totaling 79.31 square miles in the area west of Hathaway bridge, south of the intracoastal waterway, and east of Walton and Bay county lines. Beach MCD's headquarters is located at 509 Griffin Blvd, Panama City Beach, FL 32413. **Figure 1** is a map of the Beach MCD boundary, with the county boundary and Beach MCD's current headquarters marked.

Figure 1. Beach MCD Map

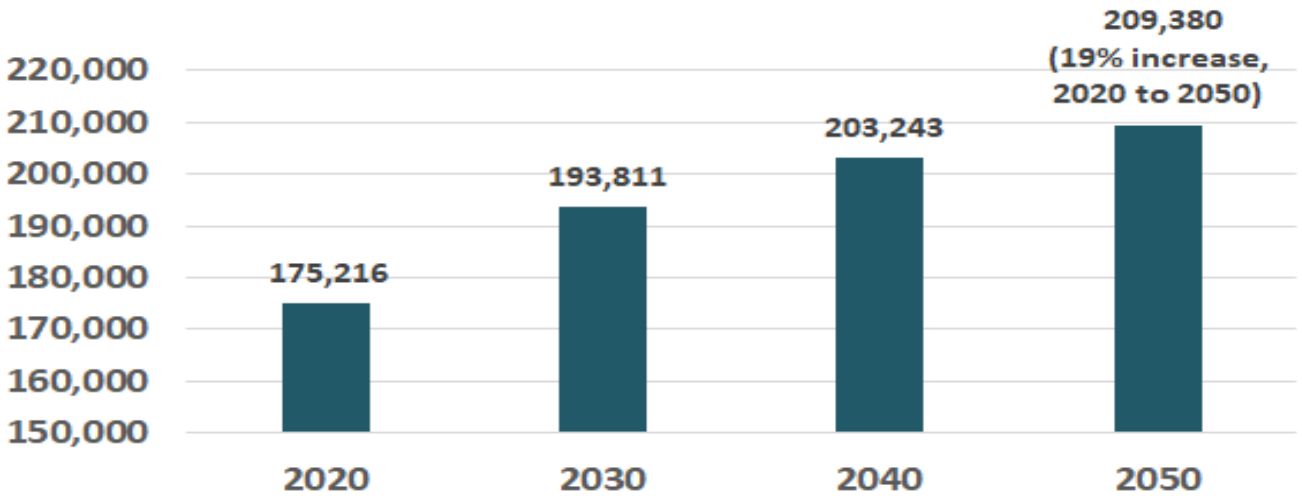


Source: The Balmoral Group (TBG) Work Product, ESRI, US Census, MCDs.

Population

Beach MCD had a population of 46,500 people in 2020 according to the latest available block-level United States (U.S.) Census data.[1] In 2022, Bay County's population was estimated at 185,134 according to the U.S. Census.[2] The Florida Legislature's Office of Economic and Demographic Research (EDR) projects Bay County's population to increase by 19% in 2050 to 209,380 residents compared to a 2020 baseline.[3] **Figure 2** shows Bay County's projected population estimates calculated by EDR. With increased development and population, Beach MCD no longer qualifies for state assistance to smaller districts.

Figure 2. Bay County Population Projection



Source: TBG Work Product, EDR.

District Characteristics

Panama City Beach is located in Bay County on the west coast of Florida's panhandle, with about 27 miles of coastline on the Gulf of Mexico. Panama City Beach is a very popular tourist destination, particularly well-known as a spring break destination for visitors from around the country. Adjacent counties include Walton, Washington, Jackson, Calhoun, and Gulf Counties. The average annual temperature is about 69 degrees Fahrenheit and total rainfall was just over 58 inches in 2022. Beach MCD includes a coastal, densely developed community with residential and commercial uses and also includes natural, undeveloped areas. The district is also surrounded by other natural areas, salt marshes, estuaries, and bays, and the urban area of Panama City lies across the bay to its east. Natural areas commonly include larval habitat, so controlling mosquito populations in these areas is critical to quality of life in Panama City Beach.

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

[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).

allowing water to stand in waste containers, garden pots, tires, and other vessels. The characteristics of the coastal areas and developed community surrounded by natural areas of the district, combined with the growing population of the district and its meteorological conditions, create an environment conducive to extensive mosquito habitats that require constant mosquito control. The services needed to control mosquitoes include routine surveillance of mosquito-producing habitats and source reduction through larviciding and adulticiding.

Real Property Data

Beach MCD receives ad valorem taxes to fund Beach MCD operations. The total taxable value of properties within Beach MCD was $12.6 billion in the most recent fiscal year under a millage rate of 0.2200 (**Table 1**). Real property parcels subject to Beach MCD millage have exceeded 46,000 for the last two years (**Table 2**). Taxable value of real property parcels increased 40% in FY 2022-23 compared to 2020, following changes in property values.

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

Beach MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Millage Rate	0.5240	0.3500	0.3000	0.2200
Taxable Value of Parcels ($Mil.)	$9,046	$9,920	$10,849	$12,625
Taxable Value of Accounts ($Mil.)	$0	$0	$0	$0
Taxable Value of Centrally Assessed Property ($Mil.)[1]	$0	$0	$0	$0
Total Taxable Value ($Mil.)	**$9,046**	**$9,920**	**$10,849**	**$12,625**

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 Beach MCD Millage

Beach MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Parcels ($Mil.)	$10,838	$12,047	$13,301	$16,572
Real Property Parcels Subject to Millage	45,722	45,925	46,507	46,905
Taxable Value of Parcels ($Mil.)	$9,046	$9,920	$10,849	$12,625

Source: FDOR.

Tangible Personal Property Data

Beach MCD has no tangible personal property accounts subject to Beach MCD millage (**Table 3**). Taxable value of tangible personal property reflects the lack of millage derived from tangible personal property accounts.

Table 3. Tangible Personal Property Accounts Subject to Beach MCD Millage

Beach MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Accounts ($Mil.)	$0	$0	$0	$0
Tangible Personal Property Accounts Subject to Millage	$0	$0	$0	$0
Taxable Value of Accounts ($Mil.)	$0	$0	$0	$0

Source: FDOR.

History and Composition

Beach MCD was established in 1952 as an independent special district by a resolution adopted by the Bay County Board of Commissioners to control mosquito populations in the Panama City Beach area.[4] Originally the Gulf Mosquito Control District, the district's name was changed to Beach Mosquito Control District during a Board of Commissioners meeting in 1997 (Resolution 97-1).[5] Beach 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 Administrative Code,* setting forth rules adopted by the Department of Agriculture and Consumer Services (DACS) for mosquito control program administration.

The Board of Commissioners for Beach MCD is comprised of three elected members, each serving a 4-year term. Currently, all three seats are filled. The positions include a chairperson, secretary, and treasurer. Members of the Board of Commissioners are required to be resident registered electors.

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 to employ a director, employees, and others.

As required by s. 388.151, *Florida Statutes,* the board of commissioners holds monthly meetings. The board has met this requirement in the current and past three fiscal years, with the exception of June 2022 due to the illness of two commissioners (**Table 4**). All meeting minutes, agendas, dates, and budgets are published on the Beach MCD website. The board's meetings are open to the public and noticed and conducted in accordance with s. 189.015, Florida Statutes.

Table 4. Beach MCD Commissioner Meeting Counts

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

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

[4] Resolution Creating Beach MCD.
[5] Beach MCD Name Change Resolution.

Intergovernmental Interactions

Beach MCD did not receive any state grants in FY 2021-22, or in the past three fiscal years. Beach MCD provides spraying services for the federal Naval Support Activity Base in Panama City and receives payment for its services ($15,251 in FY 2021-22). Bay County has a separate mosquito control department, with which Beach MCD coordinates treatment missions but does not share resources. Beach MCD also interacts with Bay County Health Department regarding potential disease outbreaks. Beach MCD cooperates with Panama City Beach and Bay County during emergency events such as major hurricanes, utilizing an onsite generator to power the building in case of outages.

Resources for FY 2021-22

The published millage rate in FY 2021-2022 was 0.3000. Beach MCD received $3.1 million in property tax revenue and spent $1.8 million in FY 2021-22. Beach MCD had 20 total staff positions available in FY 2021-22, three of which were commissioners, one was a contracted helicopter pilot, and three were vacant. Beach MCD owned 22 vehicles, numerous equipment, and one building (**Table 5**).

Table 5. Beach MCD Resources for FY 2021-22

Resource Item	FY 2021-22 Amount
Millage Rate	0.3000
FY 2021-22 Revenues	$3.14 million
FY 2021-22 Expenditures	$1.82 million
Number of Paid Staff	20 (3 commissioners and 3 vacancies included)
Vehicles	2 helicopters, 18 trucks and vans, 2 utility vehicles
Equipment	Field equipment: 47 Lab equipment: 16 Office equipment: 10 Surveillance equipment: 37 traps, 3 coops, 18 chickens
Facilities	1 facility with 1 building

Source: TBG Work Product, FDOR, Beach MCD.

2. Findings

Service Delivery

Beach MCD delivers IPM services that are within the scope of the MCD's charter and applicable laws and regulations; 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 interviewed district staff and management and 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. See attachment titled, "Integrated Pest Management" for more information. Beach MCD conducts activities in six of the areas of IPM.

Beach MCD tracks the mosquito population in the district on a regular basis. Beach MCD staff report that on an ongoing basis the district monitors landing rates (i.e., the number of times a mosquito lands on a person in a minute) and light traps to monitor mosquito populations. Beach MCD staff report that they monitor locations that are known to be areas of high mosquito prevalence. When there is an increase in landing rates and light trap counts, the district increases the rate of spraying.

Beach MCD provides adulticide and larvicide services in response to all service requests and conducts ground and aerial spraying of locations known to be larval habitats. Beach MCD staff have stated there is no optimal number of times to spray or amount to apply when spraying, but the district increases control activities in areas when service requests are received.

Beach MCD monitors the rate of infectious diseases in the district. A weekly report of results from blood samples from the sentinel chicken program is sent to the Tampa Department of Health lab for testing every Friday and is used to monitor which diseases are spreading and what response actions are needed, if any. The district also monitors weekly counts of arbovirus incidence in humans from Florida Department of Health (DOH) data as published on DOH's website.

The district conducts source reduction through collection of containers that hold water and create larval habitat, including waste tires, which staff reported have been a problem in their area. The district also conducts public outreach events to provide education about mosquito control in the community. District staff reported that waste tires have been a consistent problem over time, and that the district received DACS funds when it qualified in the past to help support the cost of waste tire disposal; however, the district has not received state funds for the past four fiscal years. The district most recently budgeted $6,000 for waste tire disposal in its FY 2022-23 budget presented to DACS District staff reported that the district has spent on average $4,500 annually for waste tire disposal and collected an average of 80 to 100 tires in each of the current and past three fiscal years and that additional state funds to support this activity would help incentivize collection of more tires. The district is currently incurring costs and inefficiencies in managing waste tire collection and disposal, which is an important source reduction activity. Districts like Beach MCD would benefit from additional sources of funding to help incentivize continued collection of waste tires in the district.

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

Table 6. Beach MCD Services Overview

Integrated Pest Management Service	Beach MCD Services Provided
Mosquito Surveillance	Ground and aerial surveillance using trap collection and analysis
Disease Surveillance	Regular blood sample collection from sentinel chickens and submittal of samples to the state laboratory in Tampa
Source Reduction	Elimination of larval mosquito habitats such as tires, pools, tarps, etc.
Larviciding	Application of larvicides from the ground and using helicopters, including spraying for Bay County MCD in times of emergency
Adulticiding	Delivery of nighttime ultra-low volume (ULV) insecticide spraying via spray trucks and helicopters, including spraying for Bay County MCD in times of emergency
Outreach and Education	Numerous education programs and public outreach events; ongoing employee training

Source: TBG Work Product, Beach MCD.

Analysis of Delivery of Services

Beach MCD delivers several mosquito control services across several areas of IPM that are within the scope of its charter and purposes outlined in applicable laws and regulations. Beach MCD provides services in several areas of IPM as described above, and all district services are directed toward the abatement and control of mosquitoes. No services were noted that fall outside the district's charter or applicable laws and regulations. As described above, Beach MCD covers a fairly unique service area, which includes a densely developed area that is a popular tourist destination surrounded by aquatic areas. 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.

Comparison to Other Services

While Beach MCD provides services that are similar to those provided by the Bay County Mosquito Control Department, each entity provides services to distinct geographic areas of Bay County, and Beach MCD offers support to the county on an as-needed basis and conducts more extensive public education, outreach, and research activities than the county. Beach MCD is a well-established MCD that has been in operation for over 70 years and provides mosquito control services in a densely populated coastal community that is surrounded by natural areas that create extensive larval habitat. Bay County also has a Mosquito Control unit that provides similar services within Bay County, however, the county and Beach MCD are each responsible for different geographic areas of the county. The Bay County Mosquito Control Department reports that it provides professional mosquito control services including adulticide and larvicide treatments, source reduction, arbovirus surveillance, and testing. Beach MCD provides these services in addition to others. For example, Beach MCD reports that it also conducts extensive public education and outreach and also has a long-standing research program. Beach MCD has collaborated with researchers since the mid-1960s through various iterations of research laboratories in the area, which district staff reported are likely located there because of the presence of a well-regarded and capable MCD

in the area, i.e., Beach MCD (which was then known as Gulf MCD before its name change). For example, Beach MCD has worked with the Florida Medical Entomology Laboratory and Florida State University's laboratory that was previously located in Panama City. The district would help set traps to collect specimens for university research. In addition, the district provides annual training to other MCDs in the Panhandle to provide continuing education and practical application of mosquito control activities.

While Beach MCD and Bay County Mosquito Control are responsible for different geographic areas, Beach MCD has provided contracted aerial adulticiding services over the years for Bay County that were needed outside the Beach MCD boundaries but within Bay County Mosquito Control's jurisdiction. Beach MCD has provided additional services to aid in Bay County's mosquito control efforts in the past several years. For example, following Hurricane Michael in 2018, Beach MCD loaned one of the district's helicopters to the Bay County Sheriff's Office for approximately one month to assist with transporting workers around the county due to the impassable nature of the roadways following the storm. In addition, Beach MCD has provided storage services to Bay County for the storage of its Bell Helicopter while the county's new hangar was under construction. District staff reported that they are available to assist Bay County and any other entity that may need help following hurricanes or other major storms and has a generator to run its building in times of emergency.

According to the Director of the Beach MCD, the Bay County Mosquito Control serves an area containing 416,746 acres at a budget of $2.2 million in FY 2022-23. Beach MCD has expended between $1.82 million and $3.68 million in each of the past three fiscal years. While the district and county have comparable budgets for their operations, Beach MCD staff reported that the county mosquito control programs do not have sufficient travel budgets and the district therefore assists with control activities with trainings in its facilities. This provides another example of services that Beach MCD provides to support the county and is also an indication that county funds would not likely be sufficient to fully absorb the operations of Beach MCD. The property values and growing population of the area provide a sustainable funding base to support Beach MCD's operations into the future. As described above, Beach MCD serves a densely populated area with high levels of tourism surrounded by natural areas conducive to extensive mosquito habitats that require constant mosquito control.

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. The director of Bay County Mosquito Control reported that he did not feel properly equipped to assess Beach MCD's expenditures or their efficiency of service delivery but that they do provide similar services in different areas of the county. The county manager of Bay County reported that the Bay County Mosquito Control office operated in all of Bay County with the exception of the areas within Beach MCD's jurisdiction. The county manager reported that if the Beach MCD was dissolved, the Bay County MCD would assume jurisdiction and taxing authority. Neither the Bay County Mosquito Control Director nor the county manager issued an opinion regarding whether efficiency improvements or reductions in expenses would occur if Beach MCD ceases operations.

Considerations for Consolidations

Consolidation of operations is not recommended for Beach MCD based on the findings of this review. Bay County and Beach MCD provide similar mosquito control services within Bay County. However, as described above, each entity serves distinct geographic regions of the county; Beach MCD provides education, outreach, and research services not provided by the county; Beach MCD provides assistance to the county and other entities

when needed; and the district provides training and continuing education to county mosquito control professionals. In addition, Beach MCD has a sustainable funding source for its operations that the county would likely not be able to absorb if consolidation were to occur. Lastly, Beach MCD serves a densely populated area with unique demographic, geographic, and natural characteristics that requires constant mosquito control, particularly as the population of the area is expected to continue to grow rapidly. For these reasons, consolidation is not recommended at this time.

Resource Management

Beach MCD has demonstrated effective management of its revenues and expenditures but could hire additional staff to meet district needs and should continue to address prior audit findings to improve internal financial management controls.

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

Beach MCD revenues fluctuated during the past five years due to changes in millage rates to fund construction of a facility with one building in FY 2019-20 but revenues appear to be sustainable to support future operations. Beach MCD's fiscal year begins October 1st and ends September 30th. Beach MCD's funding is primarily comprised of ad valorem taxes. The Bay County Property Appraiser, with approval from the Florida Department of Revenue, certifies the county's tax roll each year and provides the information to the Bay County Tax Collector, which in turn collects monies authorized under Beach MCD's taxing authority. Millage rates are set each year by Beach MCD's board of commissioners.

To analyze revenues and expenditures of Beach MCD, The Balmoral Group (TBG) requested and received financial information from Beach MCD for FY 2019-20 through FY 2022-23. In addition, TBG interviewed Beach MCD staff and reviewed documentation both online and as provided from Beach MCD accounting and operation systems. Revenues have decreased from $5.21 million in FY 2019-20 to $3.14 million in FY 2021-22 (**Table 7**). Revenues were $2.65 million as of June 2023. The vast majority of revenues in each of the current and past three fiscal years has come from ad valorem taxes. Expenditures have also decreased over time, from $3.5 million in FY 2019-20 to $1.82 million in FY 2021-22. Year-to-date expenditures for FY 2022-23 were $1.2 million as of June 2023.

Table 7. Revenue and Expenditures

Revenue and Expenditures[1] ($Mil.)	FY 2019-20	FY 2020-21	FY 2021-22	FY 22-2023[2]
Revenues	**$5.21**	**$3.35**	**$3.14**	**$2.65**
Ad Valorem	$4.53	$3.33	$3.11	$2.58
Other Sources	$0.68	$0.03	$0.03	$0.07
Expenditures	**$3.50**	**$3.68**	**$1.82**	**$1.21**
Administrative Costs	$2.20	$0.63	$0.57	$0.33
Direct Program and Activity Costs	$1.29	$3.05	$1.25	$0.88
Other Expenditures	$0.001	$0.001	$0.001	$0.001

Source: TBG Work Product, Beach County MCD. 2023 YTD through June.
[1] Categorization of administrative costs was completed by Beach MCD based on an outline provided by TBG to ensure consistency across reports; some totals may look higher or lower due to rounding in the underlying data.
[2] FY 2022-23 reflects YTD as of June 2023.

Beach MCD had a substantially higher millage rate in FY 2019-20 than in other fiscal years of the review period due to the need to fund construction of a new $4.2 million facility with one building. Millage rates have subsequently decreased annually from 0.5240 in FY 2019-20 to .2200 in FY 2022-23, explaining the fairly substantial decrease in revenues over time. Expenditures have followed this same trend and have been less than revenues in all but one year of the review period.

Expenditures exceeded revenues by approximately $327,000 in FY 2020-21, but revenues exceeded expenditures by $1.31 million in the following year, more than making up for the prior year's deficit. The district foresees that it will maintain stable millage rates moving forward to maintain a reserve for hurricane impacts and does not have current plans for additional significant investments that would impact the millage rate. The most expensive planned purchases will be truck replacements every other year. The district's revenues appear to be sustainable and will allow the district to maintain lower millage rates for future operations given the recent trend in increased property values and number of taxable properties.

Administrative Costs

Beach MCD provided a breakdown of total expenditures by administrative and other program costs such as debt service and depreciation. **Table 8** summarizes the detailed administrative cost data provided by the district. Travel, utilities, repair, & maintenance costs have increased the most between FY 2019-20 and FY 2021-22 followed by personal services. Operating expenses have decreased year-over-year while supplies and material costs have fluctuated. As mentioned elsewhere in the report, expenditures in FY 2019-20 were significantly higher than in other years due to the construction of a new building. Year-to-date administrative costs for FY 2022-23 through June were $326,843.

Table 8. Administrative Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$133,839	$157,661	$168,432	$116,876
Personal Service Benefits	$80,341	$98,448	$108,076	$66,376
Operating Expenses	$106,835	$109,448	$94,430	$69,230
Travel, Utilities, Repair, & Maintenance	$64,999	$80,283	$119,650	$62,469
Supplies and Materials	$19,401	$39,072	$15,033	$11,891
Land and Buildings	$1,796,089	$144,186	$61,868	-
Total	**$2,201,504**	**$629,098**	**$567,490**	**$326,843**

Source: TBG Work Product, Beach County MCD. 2023 YTD through June.
[1] Categorization of administrative costs was completed by Beach MCD based on an outline provided by TBG to ensure consistency across reports; some totals may look higher or lower due to rounding in the underlying data.
[2] FY 2022-23 reflects YTD as of June 2023.

Direct Program Costs

Beach MCD provided a breakdown of total expenditures by direct program costs, which are summarized in **Table 9.** Direct Personal Services costs have remained fairly stable, increasing only 5% between FY 2019-20 and FY 2021-22. The Travel, Utilities, Repair, & Maintenance category is where costs have increased the most. In FY 2021-22, costs were 133% higher than in FY 2019-20. Items such as travel and per diem, freight and postage, rentals and leases, auto maintenance, and office equipment maintenance all were significantly higher. For FY 2022-23 these costs are already higher than in FY 2019-20 and FY 2020-21. However, overall direct costs in FY 2021-22 were similar to those in FY 2019-20 due to lower supplies and materials, and machinery expenditures.

Table 9. Direct Program Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$435,962	$448,728	$458,987	$358,500
Personal Service Benefits	$268,968	$280,199	$292,207	$222,216
Operating Expenses	$6,457	$8,233	$9,852	$2,287
Travel, Utilities, Repair, & Maintenance	$118,787	$124,618	$276,677	$173,766
Supplies and Materials	$245,265	$124,902	$188,092	$109,713
Machinery and Equipment	$217,865	$2,064,682	$22,327	$13,675
Total	**$1,293,304**	**$3,051,362**	**$1,248,142**	**$880,156**

Source: TBG Work Product, Beach County MCD. 2023 YTD through June.
[1] Categorization of direct program costs was completed by Beach MCD based on an outline provided by TBG to ensure consistency across reports; some totals may look higher or lower due to rounding in the underlying data.
[2] FY 2022-23 reflects YTD as of June 2023.

Contracts for Services

Beach MCD's contracted services costs were relatively constant during the review period; the district contracted for several different types of services. Beach MCD contracts for 300 hours of pilot services annually. In FY 2022-23, Beach MCD contracted the previous office manager on a part-time basis to train the new office manager. **Table 10** summarizes contracted services from the district's income statements. In FY 2022-23, contracted services have totaled $28,119, and in the previous three years have averaged $35,476 per 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	$8,103	$3,816	$4,776	$8,261
Legal & Engineering Services	$5,007	$2,669	$6,266	$4,631
Accounting & Auditing	$15,240	$17,535	$18,650	$13,000
Other Contractual Services	$6,457	$8,058	$9,852	$2,227
Total	**$34,806**	**$32,078**	**$39,544**	**$28,119**

Source: TBG Work Product, Beach MCD. 2023 YTD through June.
[1] Categorization of contracted services was completed by Beach MCD based on an outline provided by TBG to ensure consistency across reports; some totals may look higher or lower due to rounding in the underlying data.
[2] FY 2022-23 reflects YTD as of June 2023.

Staff

Beach MCD employs a variety of staff positions. In FY 2022-23 Beach MCD reported that it has multiple types of positions in the district, including commissioners, administrative staff, and technical and scientific staff positions (**Table 11**). Beach MCD has no volunteers. An organizational chart of positions was not received from the district.

Table 11. Beach MCD Staff Positions

• Commissioners • Director • Office Manager • Mosquito Control Tech I (vacant)	• Mosquito Control Tech II • Entomologist • Helicopter Pilot • Seasonal Mosquito Control Tech I (vacant)	• Maintenance Team Leader • PR and Education Team Leader • Entomologist Assistant (vacant) • Operations Team Leader

Source: TBG Work Product, MCD.

Analysis of Program Staffing Levels

Staff vacancies have existed in Beach MCD since FY 2019-20, resulting in insufficient staff to meet the district's needs. To assess program staffing levels, TBG reviewed documentation provided by Beach MCD and interviewed Beach MCD staff. As of FY 2022-23, there are 22 positions in the district, including two contracted helicopter pilots, one contracted accounting service worker, three commissioners, 12 full-time and one part-time staff, and three vacancies. The district has reported staffing vacancies since FY 2019-20. The vacant positions reported by the district for FY 2022-23 include an assistant entomologist, a mosquito control technician, and a seasonal temporary mosquito control technician. Some information about turnover is known, including that Beach MCD experienced the departure of an entomologist who had been with the district for eight years. The district has since hired a replacement. Additionally, previous audits have reported deficiencies in the size of the district's accounting and administrative staff that have led to the lack of segregation of duties and weakness in internal controls. The district has reported that it is not cost efficient to hire additional accounting or administrative staff to address these deficiencies and that it addresses this issue by having the board conduct financial oversight of district financial activities. The district currently appears to remain understaffed with insufficient administrative staff and as noted above and insufficient entomology and mosquito technician staff to meet district needs. Regarding salaries, Beach MCD reported a total salary expense (including executive salaries, regular salaries and wages, and special pay) of

$606,389 in FY 2019-20. For FY 2021-22 reported salaries increased to $629,579. For October 2022 through April 2023, Beach MCD reported salaries of $424,598.**Table 12** summarizes staff counts by fiscal year.

Table 12. Beach 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	12	12	12	12
Part Time	1	1	1	1
Contracted	1	1	1	3
Volunteers	0	0	0	0
Vacancies	3	2	3	3
Total	**20**	**19**	**20**	**22**

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

Equipment and Facilities

Beach MCD's equipment and facilities counts have been fairly stable during the current and past three fiscal years and appear to meet the district's needs. Beach MCD currently owns one new facility with one building, after recently having sold the district's former facility. The new facility was funded by revenues from higher millage rates in FY 2019-20 that have been decreased since payment of the new facility's cost was completed. The previously increased millage rates also helped purchase a new helicopter for Beach MCD. Other planned purchases are truck replacements every other year.

Beach MCD owned, leased, or rented two helicopters, 18 pickup trucks and vans, one forklift, one tractor, and two helicopters in FY 2022-23. In addition, Beach MCD owned one facility in FY 2022-23. Beach MCD staff indicated that the district does not have a laboratory that is certified by the EPA or CDC, but the laboratory is operated in accordance with best management practices from EPA. A summary of the number of vehicles, equipment, and facilities owned by Beach MCD are provided in **Table 13** by fiscal year.

Table 13. District Vehicles, Equipment, and Facilities

Counts	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Vehicles	**19**	**22**	**22**	**22**
Helicopters	1	2	2	2
Trucks and Vans	16	18	18	18
ATVs and Utility Vehicles	2	2	2	2
Equipment	**65**	**71**	**73**	**73**
Field Equipment	40	46	47	47
Lab Equipment	15	15	16	16
Office Equipment	10	10	10	10
Facilities	**1**	**1**	**1**	**1**
Buildings	1	1	1	1

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

Beach MCD has 37 mosquito traps and three sentinel chicken coops at three sites each with six sentinel chickens. **Table 14** summarizes the surveillance equipment by fiscal year.

Table 14. Surveillance Equipment

Equipment	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Mosquito Traps	**37**	**37**	**37**	**37**
Canopy Traps	3	3	3	3
Exit Traps	3	3	3	3
Gravid Traps	14	14	14	14
Light Traps	17	17	17	17
Sentinel Chicken Coops	3	3	3	3
Sentinel Chickens	18	18	18	18

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

Strategic or Other Formal Plans for the District's Future

Beach MCD has not developed a strategic plan. TBG interviewed staff and reviewed documents provided by Beach MCD and available online. Beach MCD staff reported that while the district does not have a formally developed strategic plan, the district's activities are generally guided by the statement that the district is dedicated to the control of disease-bearing arthropods and nuisance insects for the betterment, comfort, health, welfare, and prosperity of Beach MCD inhabitants.

Previous Performance Reviews, Financial Audits, and Resident Feedback Surveys

Previous financial audits of Beach MCD identified several deficiencies. Previous audits have highlighted problems in payroll, material errors, and other irregularities. For example, some wages were not reported properly, resulting in a refund of $357 to an employee. Previous audits have reported deficiencies in the size of the district's accounting and administrative staff that have led to the lack of segregation of duties and weakness in internal controls. The audits recommend that the district board remains involved to provide financial oversight and independent review functions and that management should continue to review the segregation of duties where possible to strengthen system internal controls. The district's response to each audit has been that it is not cost efficient to hire additional staff to provide the segregation of duties and that it is mitigating the issue by continuing to have the board review financial activities of the district and include their approval and/or comments in monthly board meeting minutes. No performance reviews or resident feedback surveys were provided.

Analysis of Management Reports/Data and Performance Information

Beach MCD lacks formal performance measures and standards and maintains limited data on performance. To assess management reporting and performance information, TBG reviewed documentation provided by Beach MCD and interviewed district staff. Interviews with Beach MCD representatives determined that the district has no formal performance measures and standards, and that operations are conducted on an as-needed basis with no recordings of performance in place. While blood tests from chickens are used, and landing rates and light traps were said to be followed, tracked data on these measures were not provided by the district.

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

Beach MCD does not collect performance metric data to accurately track the quality of current program efforts; the district has demonstrated some financial management improvements but some deficiencies remain. To assess cost, timing, and quality of program efforts, TBG reviewed documentation provided by Beach MCD, publicly available data and reports, and interviewed Beach MCD staff. Beach MCD uses landing rates, number of service requests, and a weekly report of sentinel chicken blood test results to monitor the success of the district's programs. More comprehensive efforts need to be taken to adequately determine the success of the district's work. However, Beach MCD has demonstrated effective management of its finances in that revenues have exceeded expenditures in the current and two of the past three fiscal years. In addition, Beach MCD has routinely brought costs down since FY 2019-20. The district sold off equipment and other assets to bring in revenue and manage costs. Since the construction of its new facility, the district has lowered millage rates and in FY 2021-22 was projected to operate below projected revenues. However, findings from prior financial audits identified deficiencies in internal control that need to be addressed.

Goals, Objectives, Performance Measures and Standards

Beach MCD does not have clearly defined goals, objectives, or performance measures and standards but has kept arbovirus cases low in the current and past three fiscal years.

To assess the district's goals, objectives, and performance measures and standards, 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 (if applicable) 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; 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

Beach MCD does not have formally defined goals. District staff reported that the activities of the district are guided by the general purpose of the district to control of disease-bearing arthropods and nuisance insects for the betterment, comfort, health, welfare, and prosperity of Beach MCD inhabitants.

Objectives

Beach MCD's objectives are to conduct activities including ground and aerial surveillance, larvicide (using products to kill mosquito larvae), adulticide (using products to kill adult mosquitoes), and source reduction (elimination of potential mosquito production sites). Beach MCD also conducts numerous public outreach and education programs to inform the public about mosquito control.

Performance Measures and Standards

Beach MCD monitors performance using information on responses to service calls and arbovirus prevalence in the district but does not have additional formally defined performance measures or standards. The district tracks performance based on determination of treatment needs and timing and disease prevalence but does not have additional formally established performance measures and standards.

Analysis of Goals, Objectives, and Performance Measures

Beach MCD does not have clearly defined goals, objectives, or performance measures and standards; it has performed well with respect to keeping arbovirus cases low and responding to service calls in the current and past three fiscal years. Beach MCD has not established clear goals or objectives. To monitor its performance, the district tracks responses to service requests and counts of Florida-borne arbovirus in the district but does not have any other formally defined performance measures and standards. With respect to the general goal of keeping arbovirus low in the district and responding to service calls, the district has performed favorably. However, without additional detailed goals, objectives, or standards, it is not possible to fully assess how well the district is performing. TBG's review of DOH arbovirus weekly reports shows that the district had one human case acquired in Florida and detected in the district in the year of the review period but zero cases in calendar years 2021 and 2022 and through April of calendar year 2023.

Table 15 illustrates the informal performance measures that were able to be quantified by Beach MCD for the current and past three fiscal and calendar years, including documented human arbovirus cases from the Florida DOH and district service calls and responses. A summary of Beach MCD performance measures and a brief assessment of whether standards were met is provided in **Table 16**.

Table 15. Informal Performance Measures for Beach MCD

Performance Measure	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Service Calls	179	149	123	22
Service Responses	179	149	123	22
	CY 2020[2]	**CY 2021[2]**	**CY 2022[2]**	**CY 2023[2]**
Arbovirus Cases (Florida)	1	0	0	0
Arbovirus Cases (Travel)	0	0	0	0
Arbovirus Deaths	0	0	0	0

Source: TBG Work Product, MCD, DOH.
[1] 2023 YTD through April.
[2] Florida DOH data is provided by calendar year (CY).

Table 16. Assessment of Informal Performance Measures and Standards for Beach MCD

Performance Measure	Performance Standard	Assessment
The district responds to all service requests	Provide adulticide and larvicide services in response to all service requests	Standard met.
Disease prevalence counts in humans	Reduce cases of infectious mosquito-borne diseases in the district	Standard met.

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

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

Information on the perception of Beach MCD's performance by the public and other stakeholders is not available. Beach MCD does not have information from the public on the district's performance. 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 but did not receive any information on how those stakeholders view the district's performance beyond what is reported in the "Analysis of Services" section above. Stakeholders did not provide opinions regarding the effectiveness of the district; instead, the stakeholders reported only that the district provides services similar to those provided by Bay County MCD but in different parts of the county.

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 a statutory change to allow MCDs to access solid waste management grant funds from DEP that could help improve the efficiency of the district's operations by reducing costs for the important and never-ceasing source reduction activity of waste tire collection and disposal. TBG also determined 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. Finally, TBG recommends that the district address staff vacancies.

Waste Tire Collection and Disposal Fees: Waste tires are commonly found scattered throughout residential and commercial areas across the state, and the design of tires makes them ideal habitat for mosquito larva, particularly for species of mosquito that are known to be important disease vectors. The removal of waste tires can help reduce populations of these disease-carrying mosquitoes and reduce the threat of diseases like dengue and Zika. However, the problematic mosquito-producing habitats created by waste tires are difficult to manage through routine chemical applications but can be managed through proper disposal.

Beach MCD staff reported that the district has spent on average $4,500 annually for waste tire disposal and collected an average of 80 to 100 tires in each of the current and past three fiscal years, and that additional state

funds to support this activity would help incentivize collection of more tires. The district is currently incurring costs and inefficiencies in managing waste tire collection and disposal, which is an important source reduction activity. Although Beach MCD has had excess revenues in two of the past three fiscal years, it is important for any public entity like an MCD to keep funding reserves to be prepared for unexpected expenditures that could result from disease outbreaks.

In Florida, DEP regulates the disposal of waste tires by creating requirements for the collection and disposal of waste tires at solid waste management facilities and waste tire processing facilities across the state.[6] These facilities typically charge fees for the disposal of waste tires, which frequently cannot be waived due to bond requirements for the facilities. MCDs must pay these fees if the districts choose to collect and dispose of waste tires.

The state currently collects a waste tire fee of $1 per each new tire sold at retail.[7] These funds are allocated in different amounts defined in statute to various activities related to solid waste management in the state, including funds that DEP is directed to use for general solid waste activities.[8] DEP currently uses a portion of this funding to reimburse counties for hosting waste tire amnesty events during which residents may bring in waste tires for disposal free of charge (businesses are not eligible for participation). DEP opens this opportunity annually from July through May to all counties in the state, and any county may apply for the assistance through the department by providing a scope of work including a description of how the amnesty event will be held, how many tires the district anticipates receiving, and other information. According to DEP representatives, the department advertises this funding opportunity specifically to counties; however, DEP has also allowed MCDs to apply for and receive the funding for waste tire amnesty events. For example, the Florida Keys MCD and East Flagler MCD, as discussed in their reports, received such funding in FY 2022-23.

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

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

Strategic Plan and Performance Measurement: Beach MCD does not currently have a formal strategic plan or formally established goals, objectives, or performance measures and standards. The district could adopt goals,

[6] Sections 403.717 and 403.718, *F.S.* and Rule Chapter 62-711, *F.A.C.*
[7] Section 403.718, *F.S.*
[8] Section 403.709(1), *F.S.*

objectives, and performance measures and standards through a strategic planning process and 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 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 measures and standards to assist MCDs with performance monitoring.[9]

Staffing: The district has reported staffing vacancies since FY 2019-20. The vacant positions reported by the district for FY 2022-23 include an assistant entomologist, a mosquito control tech, and a seasonal temporary mosquito control tech and therefore current staffing is not sufficient to meet district needs. In addition, previous audits have identified staffing issues in Beach MCD and the need to expand current staff to have proper segregation of duties. The audits have recommended that the district board remain involved to provide financial oversight and independent review functions and that management should continue to review segregation of duties where possible to strengthen system internal controls. The district's response to each audit has been that it is not cost efficient to hire additional staff to provide the segregation of duties and that it continues to mitigate the issue by continuing to have the board review financial activities of the district and include their approval and/or comments in monthly board meeting minutes.

Recommendations

Table 17 summarizes recommendations and associated considerations.

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

Table 17. Recommendations with Associated Considerations

Recommendation	Considerations
The Legislature could consider amending section 403.709(1), *Florida Statutes*, to require a portion of the funds currently administered by DEP for solid waste activities to be allocated to waste tire abatement activities by MCDs.	• This recommendation would require a statutory change. • This recommendation would require DEP staff to communicate information about resources available through the department for waste tire collection and disposal assistance to MCDs and might add nominal additional administrative costs for the department. • This recommendation could lead to additional expenditures by the department from the Solid Waste Management Trust Fund; department staff reported that there tend to be unexpended funds from this funding source each year.
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 Beach 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 measures and standards 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, like Beach MCD, that lack staff resources for the development of such performance information.
To address staffing vacancies, the district could hire an assistant entomologist and two seasonal mosquito technicians to fulfill its staffing needs. In addition, in response to prior financial audit findings, Beach MCD could hire additional administrative staff to strengthen system internal controls and oversight of the district's financial activities.	• This recommendation will have a fiscal impact to the district due to the hiring of additional administrative staff; the three technical positions are budgeted positions and therefore may not create a higher fiscal impact than originally budgeted.

Source: TBG analysis, based on review of information provided by Beach 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. Beach 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

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.