ANASTASIA MOSQUITO CONTROL DISTRICT REVIEW FINAL REPORT

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Prepared for

The Florida Legislature

Prepared by

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Executive Summary

The Anastasia Mosquito Control District of St. Johns County (Anastasia MCD) is an independent special district that serves the entirety of St. Johns County, Florida, totaling 609 square miles. Anastasia MCD is among the larger MCDs in the state, serving a population of about 306,841 residents in Fiscal Year (FY) 2021-22 (October 1, 2021 through September 30, 2022).

St. Johns County boasts thousands of acres of federally and state-owned environmentally protected areas, which produce mosquitoes prolifically and have associated restrictions on Anastasia MCD operations. About 152,700 households paid ad valorem taxes to support Anastasia MCD operations in FY 2022-23. For this same year, the taxable value of real property parcels was about $39.5 billion, plus $1.4 billion in taxable value for about 9,600 tangible personal property accounts.

Due to geographic scale, coordination efforts with protected areas, and high tourist activity, mosquito control is very important to the quality of life for residents and visitors in Anastasia MCD. The district conducts comprehensive Integrated Pest Management methods, and operations largely focus on the prevention of mosquito infestation via surveillance, monitoring, larvicide, and targeted adulticide, along with applied research to improve the effectiveness and efficiency of Anastasia MCD's services. In recent years, Anastasia MCD has invested in helicopters for aerial spraying, along with mosquito traps to monitor mosquito populations and sentinel chickens to surveil disease. Anastasia MCD has made investments that provide efficiencies, such as its Sterile Insect Technology facility which will provide biological control of mosquitoes and reduce the need for chemical costs.

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.

Anastasia MCD routinely works with industry, state and federal government, international non-governmental organizations, and the World Health Organization for research and product development and is an industry leader in applied research. Anastasia MCD is the only district in Florida with a dedicated educational center. The district places a heavy emphasis on research and education through its many collaborations with national and international researchers and extensive educational and training programs locally.

The Balmoral Group worked in consultation with a mosquito control expert in the course of this review and found that Anastasia MCD delivers a wide variety of mosquito control services effectively and efficiently within the scope of the MCD's charter and applicable laws and regulations. The district is managing its resources in an efficient and effective manner to achieve its goals and objectives. Anastasia MCD has engaged in a strategic planning process and has several clearly defined and measurable goals and objectives that adequately address the district's statutory purpose, provide sufficient direction to the district, and are achievable within budget; the district tracks

its performance and has largely been meeting its performance standards. The district could establish additional performance metrics.

Based on its review, The Balmoral Group presents the following recommendations for the improvement of mosquito control services in the Anastasia 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 formalize additional performance measures and standards that would allow the district to monitor and track progress toward all its goals and objectives.
- The Legislature could consider directing the Florida Coordinating Council on Mosquito Control to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model goals, objectives, and performance measures and standards to assist this state's MCDs with performance monitoring.

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1. Background

District Description

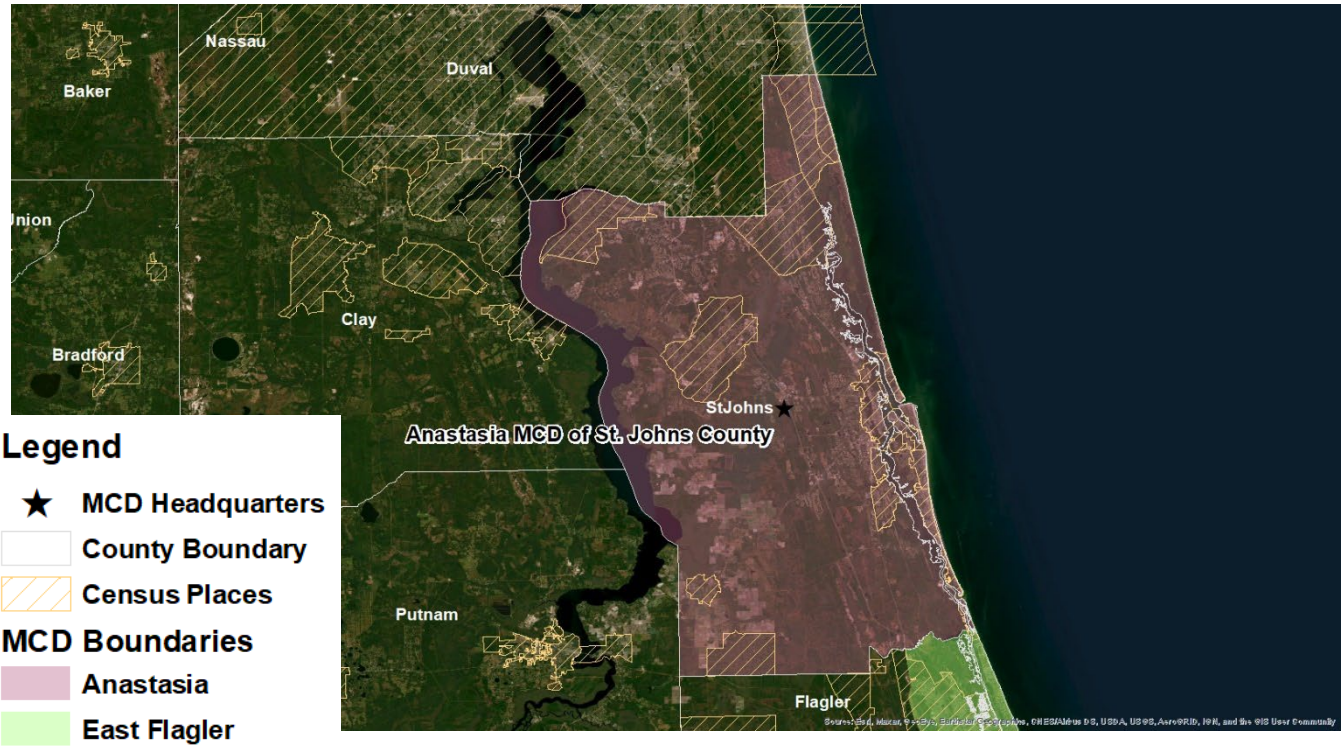
District Purpose

The purpose of the Anastasia Mosquito Control District of St. Johns County (Anastasia MCD) is to reduce the threat caused by both nuisance and disease-vectoring mosquitoes throughout the incorporated and unincorporated areas of St. Johns County, Florida. District representatives have reported that Anastasia MCD has worked since inception to provide a safe and fiscally responsible public health service to all residents of the district utilizing proven Integrated Pest Management methods that are efficient, effective, and environmentally sound in order to minimize the impact of both nuisance and disease-vectoring mosquitoes on the health and welfare of the community.

Service Area

Anastasia MCD serves the entirety of St. Johns County, Florida, totaling 609 square miles.[1] Anastasia MCD's headquarters is located at 120 EOC Drive, St. Augustine, Florida 32092. **Figure 1** is a map of the Anastasia MCD boundary, with the county boundary and the MCD headquarters marked.

Figure 1. Anastasia MCD Map



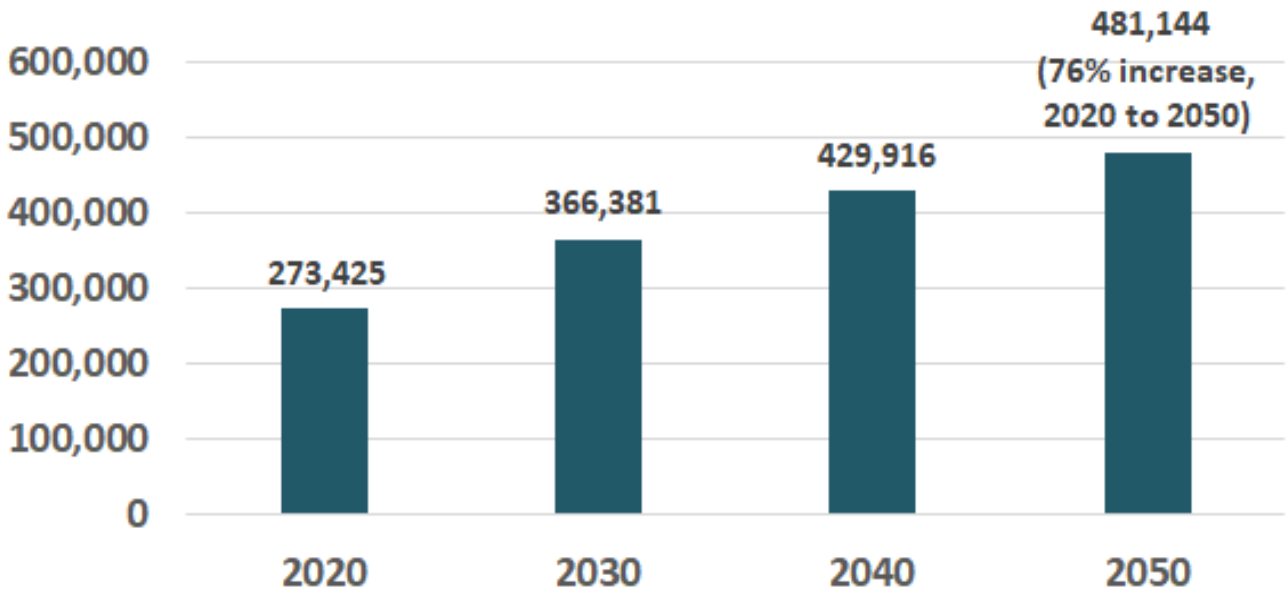
Source: The Balmoral Group (TBG) Work Product, ESRI, US Census, MCDs

[1] Anastasia MCD's service area was expanded in 2003 from 17 square miles to address the entirety of St. Johns County.

Population

St. Johns County's population was estimated at 306,841 persons in 2022 according to the United States (U.S.) Census.[2] The Florida Legislature's Office of Economic and Demographic Research (EDR) projects St. Johns County's population to increase by 76% through 2050 to 481,144 residents compared to a 2020 baseline.[3] **Figure 2** shows St. Johns County's projected population estimates calculated by EDR.

Figure 2. St. Johns County Population Projection



Source: TBG Work Product, EDR.

District Characteristics

Anastasia MCD comprises all of St John's County, which is located on the northeast coast of Florida, with approximately 42 miles of beaches along the Atlantic coast. Adjacent counties include Duval to the north, Flagler to the south, Putnam to the southwest, and Clay to the west. The average annual temperature is 71 degrees Fahrenheit and total rainfall is about 50 inches for the year. Anastasia Island, the namesake of the Anastasia MCD, is a large barrier island which supports a high population of seasonal tourists. The County has two incorporated cities: St. Augustine (where the district's headquarters are located) and St. Augustine Beach. Founded in 1565, St. Augustine is the oldest continuously inhabited European-established settlement in the United States, and consistently brings in in significant numbers of tourists to the area.

Most of the population of St. John's County is concentrated in its coastal region, with the majority of its land mass being rural land in the western regions. St. John's County is also bordered to the west by the St. John's River, separating it from Clay and Putnam Counties. The population has risen from about 30,000 in 1970 to just over 300,000 in 2022, a tenfold increase. Most of these residents live on or near Anastasia Island, with the challenge of controlling mosquito populations around the island with federal and state protections in place for natural lands

[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).

posing a significant roadblock to the operations of Anastasia MCD. Trends of rapid urban and residential development in the eastern part of the county are predicted to continue, making the need to control mosquito populations and aquatic larval habitats important to the quality of life in the county. In addition, there are several state parks and aquatic preserves throughout the county, including the Guana Tolomato Matanzas National Estuarine Research Reserve, which is jointly operated by the Florida Department of Environmental Protection (DEP) and the National Oceanic and Atmospheric Administration and covers over 76,000 acres of conservation lands that include coastal and estuarine ecosystems and salt marshes.

Meteorology is the primary driving force for producing mosquitoes with heavy rainfall events creating standing pools of water that serve as breeding grounds for mosquito species capable of transmitting several arboviruses. Changing water levels through tidal events can also produce such pools. Humans contribute to the problem by allowing water to stand in waste containers, garden pots, tires, and other vessels. The characteristics of the large natural aquatic and estuarine areas of the district, combined with continued rapid development in the coastal areas of the district and the meteorological conditions described above, create an environment conducive to extensive mosquito habitats that require constant mosquito control efforts. The services needed to control mosquitoes include routine surveillance of mosquito-producing habitats and numbers of adult mosquitoes, source reduction, aerial and/or ground treatments using pesticides to treat areas known to have large larval or adult mosquito populations, and regular testing for disease transmission in animals. Other services are described in greater detail later in the report.

Real Property Data

Anastasia MCD receives ad valorem taxes to fund district operations. The total taxable value of properties within Anastasia MCD was almost $41 billion in the most recent fiscal year under a millage rate of 0.1900 (**Table 1**). Real property parcels subject to district millage exceeded 152,000 parcels in FY 2022-23, an increase of 11% since FY 2019-20 **(Table 2**). Taxable value of real property parcels increased 44% in FY 2022-23 compared to FY 2019-20, following changes in property values.

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

Anastasia MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Millage Rate	0.2100	0.2050	0.2000	0.1900
Taxable Value of Parcels ($Mil.)	$27,524	$30,587	$33,493	$39,527
Taxable Value of Accounts ($Mil.)	$1,046	$1,178	$1,266	$1,418
Taxable Value of Centrally Assessed Property ($Mil.)[1]	$38	$37	$38	$41
Total Taxable Value ($Mil.)	**$28,608**	**$31,802**	**$34,798**	**$40,987**

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 Anastasia MCD Millage

Anastasia MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Parcels ($Mil.)	$38,331	$42,722	$46,920	$64,228
Real Property Parcels Subject to Millage	138,126	142,296	147,342	152,760
Taxable Value of Parcels ($Mil.)	$27,524	$30,587	$33,493	$39,527

Source: FDOR.

Tangible Property Data

In addition to real property, 9,599 tangible personal property accounts were subject to Anastasia MCD millage in FY 2022-23, slightly up since FY 2019-20 (**Table 3**). The just value of tangible personal property accounts increased 28% in FY 2022-23 compared to FY 2019-20, while the taxable value of tangible property accounts increased 36% over the same period.

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

Anastasia MCD	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Just Value of Accounts ($Mil.)	$1,400	$1,544	$1,634	$1,790
Tangible Personal Property Accounts Subject to Millage	9,568	9,569	9,559	9,599
Taxable Value of Accounts ($Mil.)	$1,046	$1,178	$1,266	$1,418

Source: FDOR.

History and Composition

Anastasia MCD was established in 1948 pursuant to Chapter 390, *Laws of Florida* (1941), and continued by the Florida Legislature in Chapter 99-449, *Laws of Florida,* which is the most recent legislative enactment governing the district. The board originally consisted of three members but was expanded to five members in 1961 pursuant to Chapter 61-2745, *Laws of Florida* (1961). The board currently has no vacancies. In 2003, the boundaries of the Anastasia MCD were expanded to include all of St. Johns County.

Anastasia MCD is also subject to Chapter 189, *Florida Statutes*, given its status as an independent special district; Chapter 388, *Florida Statutes*, setting forth the requirements for creating and operating MCDs in this state; and Chapter 5E-13, *Florida Administrative Code*, setting forth rules adopted by the Department of Agriculture and Consumer Services (DACS) for mosquito control program administration.

Members of the board of commissioners are required to be registered electors residing within the district. Chapter 99-449, s. 6, *Laws of Florida,* states "District powers. -- The provisions of chapter 388, Florida Statutes (1997), entitled 'Mosquito Control,' . . . shall govern the functions of the Anastasia Mosquito Control District of St. Johns County, except where the same is inconsistent with the provisions of this act." The board's duties are not further addressed in the chapter law and the district reported that the board members' duties do not expand beyond those specified in Chapter 388, *Florida Statutes*.

Section 388.151, *Florida Statutes,* requires the board of commissioners to hold regular monthly meetings. The board met six times during the seven months between October 1, 2022 and April 30, 2023. Anastasia MCD staff reported that the meeting in November 2022 was canceled due to the annual Florida Mosquito Control Association meeting occurring at that time. In the current and past three fiscal years, the board has not held a

November meeting, and the board did not meet in April 2020 due to COVID-19 concerns. **Table 4** summarizes meeting counts by fiscal year, including special meetings, which are public budget hearings.

Table 4. Anastasia MCD Commissioner Meeting Counts

Commissioner Meetings	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Monthly Meetings	10	11	11	6
Special Meetings	2	2	2	0

Source: TBG Work Product, MCD.

[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*. Each board member serves as the chair of one of five committees (Financial and Audit, Operations, Education, Applied Research, and Planning Committees), and each of these committees typically holds at least two to three meetings during the calendar year.

Intergovernmental Interactions

Anastasia MCD interacts with state and federal entities through the district's applied research and education program. In FY 2020-21, Anastasia MCD reported in its financial statements $781,457 in grants from the DEP for research. It has also received grants from agencies such as the U.S. Department of Agriculture (USDA), the Department of Defense (DOD), the Center for Disease Control and Prevention (CDC), Florida Department of Health (DOH) and DACS. Per Anastasia MCD staff, collaboration with these agencies is for training and applied research. The district also collaborates with the Navy Center for Excellence in Entomology for training and applied research, such as equipment demonstration and tick population surveillance. The district also coordinates with DOH for public education and FEMA for hurricane reimbursement. In addition, Anastasia MCD has a recognized laboratory per the U.S. Environmental Protection Agency (EPA) and CDC requirements and is recognized by the U.S. EPA for Good Laboratory Practices for evaluation of public health insecticides. It is uncommon among other MCDs to have an U.S. EPA-certified laboratory.

Anastasia MCD provides emergency assistance to county fire rescue programs using the district's aerial equipment and facilities, and cooperates with the St. John's County Health Department to evaluate suspected human cases of mosquito-borne diseases.

Anastasia MCD's boundaries are located in close proximity to Guana Tolomato Matanzas National Estuarine Research Reserve, Matanzas State Forest, and Anastasia State Park, each of which have their own regulations and policies regarding mosquito control treatments, which necessitates coordination between the district and the state and federal entities that oversee these natural areas in order to conduct mosquito control activities there. This process requires district staff time to conduct coordination and communication with the federal entities managing the reserve, DACS, and DEP regarding any treatments for these lands, which can be time-consuming.

Anastasia MCD also partners with the University of Florida, the University of Miami, the University of North Florida, and other academic institutions (both nationally and internationally) for research evaluating the efficacy of existing and new mosquito control methods that may reduce operational costs. For example, researchers with the district have collaborated with scientists at the University of Science, Techniques, and Technology of Bamako, Mali to conduct research on natural repellents against vector mosquitoes. The district hosted 12 visitors from the

Pan African Mosquito Control Association to discuss possible collaborations and training opportunities. District researchers are regularly invited to speak at international conferences and events such as the International Congress of Entomology, International Congress of Mosquito Biology and Control, and vector ecology. The district participates in a collaborative effort with the University of Florida and DEP on saltmarsh management at Fish Island and works with the University of North Florida's College of Public Health to provide training for students and instruction for the Department of Biology.

Resources for Fiscal Year 2021-22

The published FY 2021-22 millage rate established by Anastasia MCD was 0.2000. The district received $7.2 million in revenues and spent $8.07 million in FY 2021-22. Expenditures were higher than revenues due to the construction of the education building and Sterile Insect Technique building. Additionally, Anastasia MCD had $2.5 million in fund reserves for the fiscal year. Anastasia MCD had 41 paid staff (five commissioners, 26 full-time, four grant-contracted, four part-time, and two contracted) and owned or leased 48 vehicles, numerous equipment, and one facility with 10 buildings and three outdoor enclosures (**Table 5**).

Table 5. Anastasia MCD Resources for FY 2021-22

Resource Item	FY 2021-22 Amount
Millage Rate	0.2000
Revenues	$7.21 million
Expenditures	$8.07million
Number of Paid Staff	41
Vehicles	3 helicopters, 2 boats, 35 trucks, 10 utility vehicles
Equipment	Field equipment: 333 items Lab equipment: 68 items Office equipment: 115 items Surveillance equipment: 151 traps, 9 coops, 54 chickens
Facilities	1 facility with 10 buildings and 3 outdoor enclosures

Source: TBG Work Product, FDOR, Anastasia MCD.

2. Findings

Service Delivery

Anastasia MCD delivers a wide variety of mosquito control services effectively and efficiently within the scope of the MCD's charter and applicable laws and regulations.

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; 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. Anastasia MCD conducts activities in each of the eight areas of IPM.

The district's **mosquito surveillance** activities include ground and aerial surveillance to determine areas within the district that warrant treatment due to larval and mosquito populations exceeding established thresholds. Surveillance methods include conducting weekly mosquito trap collection and analysis of the number and species of mosquitoes collected through the surveillance methods used. The Anastasia MCD sets traps on Mondays and collects the traps after 24 hours in the field. If the number of mosquitoes in the trap meets a certain threshold, treatment is initiated in the area. Monitoring the general population and types of mosquitoes in the area helps direct resources and appropriate treatment options on an ongoing basis. In addition, the district conducts daily larval surveys and determines larval counts in flooded areas as needed. In addition, larval mosquito populations are monitored at known and reported sites. Depending on the size of the treatment area and location in the county, field inspectors may employ backpack sprayers on foot or by truck, or request the aerial department treat the area via helicopter. The adult mosquito population is monitored by 41 CDC light traps baited with octenol. From April to November 2022, a total of 14,156 mosquitoes, 28 species were collected. Twelve Biogents (BG) Sentinel traps baited with BG Lure and CO2 were used for *Aedes albopictus* and *Aedes aegypti* surveillance for a total of 7,506 collected from January to December 2022. A total of 49,022 mosquitoes from 32 species were collected with BG trapping. A total of 63,178 mosquitoes were trapped by both methods.

The district conducts **disease surveillance** by obtaining blood samples from sentinel chickens to conduct in-house testing initially and then sending them to the DOH laboratory in Tampa where they are tested for confirmation of antibodies to certain arboviruses. If a chicken has antibodies against one of the viruses, the district knows that virus is circulating in the local mosquito population and that treatment is needed to reduce the number of mosquitoes. The district also conducts regular weekly mosquito pool testing where district staff will check stagnant bodies of water for mosquito larva throughout the year.

Source reduction activities include routine collection of waste tires abandoned around the county as they are a prime habitat for several mosquito species. Currently, local landfill fees must be paid for waste tires picked up by Anastasia MCD. District staff also empties containers in and near residential yards. District staff reported that the district collected 799 tires on average annually in the current and prior three fiscal years and spends on average approximately $2,000 per year on waste tire collection and disposal. In addition, the district reported that, due to labor and tire processing needs, the district currently limits the number of tires it collects from residential properties to ten tires per property and that the district has not sought or received any additional funds to help support tire collection and disposal efforts nor is it exempt from local landfill fees. The district is currently incurring

costs and inefficiencies in managing waste tire collection and disposal, which is an important source reduction activity.

The district conducts **larviciding** using ground equipment and helicopter platforms to reach coastal marshes and rural inland areas to apply granular and liquid material targeting mosquito larvae.

Adulticiding activities include ground spraying of ultra-low volume (ULV) insecticide as well as aerial applications. Nighttime aerial adulticide activities using helicopter platforms are conducted to deliver ULV sprays during the hours when adult mosquitoes are most active. Aerial spraying tends to be the most effective treatment method where trucks cannot easily access or where the spray may not reach mosquito populations. However, truck or backpack spraying is most often used. Typical sprayings will result in reductions of mosquito numbers in traps.

Biological and alternative control methods are also employed. The district provides the public with Gambusia fish that eat mosquito larvae for use in retention ponds and ditches. In addition, the district implements the Sterile Insect Technique, which is the deployment of male insects sterilized via radiation treatment to prevent viable offspring. After mating, the female insects' eggs do not hatch.

District staff conduct numerous ongoing research activities and collaborate with a number of different local, state, national, and international entities on **mosquito control research**. As described in the "Intergovernmental Interactions" section above, the district engages in collaborative activities with universities in Florida and around the world and conducts applied research on mosquito control techniques and technologies. For example, the district is currently conducting a research project to evaluate a new larvicide and another project that investigates the influence of water quality on the distribution of a particular species of mosquito, (*Aedes aegypti*) to better understand the factors that influence its distribution. The district conducts research in a number of different areas to develop new methods and technologies to improve mosquito control efficiency and effectiveness, including mosquito behavioral responses to various treatment approaches; evaluation of new control methods, tools and equipment; and evaluation of surveillance methods and insecticide resistance. District staff reported that the collaborations with international researchers have benefited their disease surveillance and mosquito control efforts through new ideas, grants, technology, tools, techniques, and equipment that the international mosquito control professionals have brought to the district.

The district conducts a number of **educational, training, and outreach activities** related to mosquito control. The district educates and informs the public about mosquito control through coordination with the St. Johns County School Board for school-based education programs, on-site tours and field trips, science fair project assistance, community service hours, and paid and unpaid internships for high school students. In addition, Anastasia MCD coordinates education for the public through outreach programs and presentations to local civic groups and tours of district headquarters. The district provides annual mandatory training for its full-time employees and new hires and partners with various local educational institutions to provide internship training to high school and university students. In addition, the district has organized the Annual Arbovirus Surveillance and Mosquito Control Workshop since 2004, which attracts over 200 participants from Florida and other states and countries and includes presentations on research and findings for new and innovative mosquito control technologies. This workshop also provides 20 continuing education credits for district employees as well as other professional workshop participants who hold public health pest control licenses.

Anastasia MCD recently constructed the Disease Vector Education Center, which is dedicated to mosquito control education and training activities. The education center is the only center of its size and scope among MCDs in this

state. The center is designed to provide hands-on training about surveillance, prevention, and control of mosquitoes and mosquito-borne diseases for the general public, mosquito control professionals, and students of all ages and educational levels. District staff report that the center will provide training to young professionals working in or interested in mosquito control and will provide education to the general public on mosquito prevention techniques including mosquito biology and behaviors and control of vector-borne diseases. The district reports that it plans to continue to provide the types of training symposia and workshops at the education center that it has historically hosted which have attracted state, national, and international participants for many years.

The district constructed the Disease Vector Education Center at a total cost of $3.1 million as of September 30, 2022. The district held a building dedication ceremony on December 8, 2022, but has not opened the center to the public yet (at the time of this writing). As of June 2023, district staff reported that approximately 60% of the educational displays inside the center are complete and they expect the center to be ready to open to the public by December 2023. The center has been open by appointment only since October 2022, and since that time, district representatives report that tours of the facility have been provided to over 700 people. TBG requested information on any cost-benefit analyses that were conducted prior to the construction of the center, and district staff provided general information that cited costs from other studies that estimated the economic cost of adult illness due to West Nile virus or dengue fever to be approximately $24,000 per person due to time lost from work and medical care costs.

The district indicates that the center is intended to serve as a source of revenue in the future but will remain available for school groups at no cost. Revenues will continue to be generated through fees for the annual workshop that the district hosts, which district staff report has historically generated from $8,000 to $10,000 annually in profits after accounting for expenses for district supplies, materials, and other costs. District staff reported that the anticipated costs to run the center will be approximately $70,000 per year, which includes one part-time receptionist and maintenance fees. The district anticipates that these costs will be covered through a combination of entry fees, workshop registration fees, donations, volunteers, and grants.

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

Table 6. Anastasia MCD Services Overview

Integrated Pest Management Service	Anastasia MCD Services Provided
Mosquito Surveillance	Weekly ground and aerial surveillance using trap collection and analysis
Source Reduction	Routine waste tire collection and disposal at local landfills
Larviciding	Application of larvicides in coastal marsh areas from the ground and using helicopters
Adulticiding	Nighttime delivery of ultra-low volume (ULV) insecticide with trucks and aerial ULV adulticiding using helicopters
Biological and Alternative Control	Use of the Sterile Insect Technique and distribution of mosquito fish
Disease Surveillance	Regular blood sample collection from sentinel chickens; in-house mosquito pool testing; and submittal of samples to the state laboratory in Tampa for confirmation of arbovirus
Mosquito Control Research	Ongoing research efforts to identify new methods and technologies to improve treatment efficiency
Outreach and Education	Numerous education programs and outreach efforts coordinated with the county; a newly constructed education center; ongoing employee training

Source: TBG Work Product, Anastasia MCD.

Analysis of Delivery of Services

Anastasia MCD delivers several mosquito control services across all main areas of IPM that are within the scope of its charter and purposes outlined in applicable laws and regulations. Anastasia MCD provides services in all eight 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, Anastasia MCD covers a unique service area that includes rapidly developing residential and commercial areas adjacent to extensive aquatic natural areas capable of producing mosquitoes. Anastasia MCD conducts source control, including removal of containers such as tires that can create larval habitat. Tires create problematic mosquito-producing habitats that are difficult to manage through routine chemical applications but can be managed through proper disposal. 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.[4] These facilities typically charge fees for the disposal of waste tires, which most MCDs are required to pay if they choose to collect and dispose of waste tires. These facilities may not be able to waive the fees they charge due to bond requirements for their facilities. Anastasia MCD budgeted $5,000 in its FY 2022-23 DACS budget for waste tire disposal activities. While the extent to which waste tires are collected in the district is currently unknown, Anastasia MCD could benefit from additional sources of funding to help incentivize continued collection of waste tires in the county.

Comparison to Other Services

Anastasia MCD operations compare favorably to other publicly provided services; similar services are not provided by municipalities within the district or St. Johns County. 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. Anastasia MCD coordinates with and trains staff of other MCDs as well as directors of county-run programs. According to several professional organizations and agencies, the district is considered a leader in the industry, with an international reputation for training, education, and research contributions. For example, Anastasia MCD has been recognized nationally for its educational offerings as the MCD is a host for mosquito control training and certification programs for organizations like the American Mosquito Control Association, National Association of County and City Health Officials, CDC Southeastern Center for Excellence in Vector-borne Disease, Entomological Society of America, and the CDC-funded Public Health Entomology for All program. Anastasia MCD operations are fairly sophisticated, and other local governments are likely not equipped to deliver the services that the district oversees and administers. TBG did not identify other entities in the county that provide similar services.

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.

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 stakeholder responses after multiple contacts.

[4] Sections 403.717 and 403.718, *F.S.* and Ch. 62-711, *F.A.C.*

Considerations for Consolidations

Consolidation of operations is not recommended for Anastasia MCD based on the findings of this review. Anastasia MCD operates throughout the entirety of St. Johns County and no other comparable service has been identified for consolidation.

Resource Management

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

To assess the district's resource management, TBG analyzed information on revenue sources, revenue and expenditure trends and their possible causes; analyzed staffing trends and their possible causes; requested data on services delivered by district staff vs third-party contractors for the last three fiscal years; analyzed equipment inventory and capital investment trends; reviewed the activities the district conducts to manage costs and to plan for its personnel; requested but did not receive information on resident feedback survey data related to finances and spending by the district; reviewed audits; and interviewed district staff and board members.

Current and Historic Revenues and Expenditures

Revenues and expenditures have steadily increased during the review period and revenues exceeded expenditures in two of the past three full fiscal years. The district's funding is primarily comprised of ad valorem taxes but the district also receives funds from other sources including grants, interest earnings, rents and royalties, sales of equipment and other assets, and miscellaneous revenues including proceeds from the district's Annual Arbovirus Surveillance and Mosquito Control Workshop. The St. Johns County Property Appraiser, with approval from the Florida Department of Revenue (FDOR), certifies the county's tax roll each year, and the county collects the monies for the district. Millage rates are set each year by the district's board of commissioners.

To review current and historic revenues and expenditures of the Anastasia MCD, TBG requested and received information from the district for FY 2019-20 through FY 2022-23. In addition, TBG interviewed Anastasia MCD staff and reviewed documentation both online and as provided from Anastasia MCD's accounting and operation systems. Revenues increased by over $1 million during the review period, from $6.52 million in FY 2019-20 to $7.88 million in FY 2022-23 (**Table 7**).

Expenditures increased from $4.85 million in FY 2019-20 to $8.07 million in FY 2021-22. Expenditures in FY 2022-23 were $6 million through May. The increased expenditures in FY 2021-22 were attributable to the construction of the Disease Vector Education Center and contracted grant-funded positions. The district is also in the process of constructing a Sterile Insect Technique (SIT) building. As of September 30, 2022, the district's total expenditures for the education center and the SIT building were $3.1 million and $1.04 million, respectively. Additionally, the district had around $550 thousand in other costs related to non-cash depreciation.

Table 7. Revenues and Expenditures

Revenues and Expenditures (in $Mil.)	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Revenues	**$6.52**	**$7.10**	**$7.21**	**$7.88**
Ad Valorem	$5.81	$6.28	$6.70	$7.39
Other Sources	$0.71	$0.81	$0.51	$0.49
Expenditures	**$4.85**	**$5.97**	**$8.07**	**$6.00**
Administrative Costs[2]	$0.75	$0.93	$1.30	$1.03
Direct Program and Activity Costs	$3.58	$4.48	$6.22	$4.96
Other Expenditures	$0.53	$0.55	$0.55	$0.00

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

Anastasia MCD revenues exceeded expenditures during two of past three full fiscal years. The excess revenues have been used to steadily repay debt associated with the Disease Vector Education Center, and while expenditures exceeded revenues by $0.86 million in FY 2021-22, this was due to the district's continued efforts to cover the costs of the capital outlay for the education center as well as the SIT center. District staff reported that as of June 2023, the district has no debt associated with the education center. Even though the millage rate decreased from 0.2100 in FY 2019-20 to 0.1900 in FY 2022-23, revenues collected by the Anastasia MCD during the current and previous three fiscal years continued to increase, largely due to continued development in the region and rising property values. The increasing revenues have helped the district manage costs of new facilities and pay off the debt associated with the construction of the education center. The district will continue to generate revenues from visitors to the education center and proceeds from its annual workshop and education-related grants. Thus far in FY 2022-23, revenues have exceeded expenditures by $1.88 million. These trends suggest the district's financial stability will continue into the future.

Administrative Costs

Expenditures on administrative staff and other costs increased substantially from FY 2019-20 through FY 2021-22 mostly due to construction costs. Anastasia MCD provided a breakdown of total expenditures by administrative and other program costs.

Table 8 summarizes the detailed administrative cost data provided by the district. Administrative Personal Services expenditures marginally increased from $297,829 in FY 2019-20 to $343,426 in FY 2021-22, and Personal Service Benefits also increased during the same period due to an increase in grant-funded personnel. Costs for Land and Buildings increased substantially from $150,020 in FY 2019-20 to $551,190 in 2021-22, which is largely attributable to the construction costs associated with the new education center and the SIT Building.

Table 8. Administrative and Other Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$297,829	$330,398	$343,426	$233,916
Personal Service Benefits	$137,755	$164,093	$182,253	$144,816
Operating Expenses	$37,402	$46,603	$49,359	$55,854
Travel, Utilities, Repair, & Maintenance	$43,327	$57,767	$69,589	$65,961
Supplies and Materials	$79,061	$98,658	$101,432	$92,317
Land and Buildings	$150,020	$237,397	$551,190	$441,759
Total	**$745,394**	**$934,916**	**$1,297,249**	**$1,034,622**

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

Direct Program Costs

Expenditures on direct program costs increased substantially from FY 2019-20 through FY 2021-22 mostly due to construction costs as well. Anastasia MCD provided a breakdown of total expenditures by direct program costs, which are summarized in **Table 9**. Direct Personal Service expenditures increased from $1.43 million in FY 2019-20 to $1.65 million in FY 2021-22 and direct Personal Service Benefits increased as well during the same period due to an increase in grant-funded personnel. Another large direct expenditure category, Supplies and Materials, saw cost increases in FY 2021-22 compared to the prior two fiscal years. Total direct costs increased between FY 2019-20 and FY 2021-22 by 74%. Capital Outlay costs more than tripled from FY 2019-20 to FY 2021-22, largely attributable to the construction of the Disease Vector Education Center and the SIT Center.

Table 9. Direct Program Cost Data

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Personal Services	$1,428,553	$1,584,772	$1,647,262	$1,121,988
Personal Service Benefits	$660,747	$787,080	$874,184	$694,618
Operating Expenses	$179,402	$223,534	$236,754	$267,904
Travel, Utilities, Repair, & Maintenance	$207,822	$277,084	$333,786	$316,385
Supplies and Materials	$379,220	$473,217	$486,526	$442,803
Capital Outlay	$719,580	$1,138,688	$2,643,814	$2,118,923
Total	**$3,575,324**	**$4,484,375**	**$6,222,327**	**$4,962,622**

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

Contracts for Services

Anastasia MCD contracts for legal and engineering services, accounting and auditing, and other services; contracted service costs were relatively consistent during the review period, except for FY 2021-22 when previously outsourced aerial operations changed. To understand the operations of the district, TBG interviewed Anastasia MCD staff to review the details of their operations. Costs for legal and engineering services and accounting and auditing services have remained fairly constant through the review period while other contractual

services have fluctuated slightly over the review period. The district enhanced in-house aerial operations with the purchase of two military surplus helicopters in January 2021. Anastasia MCD maintains an annual contract for aerial emergency support with fixed-wing aircraft for $300,000, but due to the district's current aerial capability and emphasis on aerial larvicide and treatment of hot spots following heavy rainfall events, the district has not needed to use an aerial emergency contractor for adulticiding in the past several years, thus saving the district $300,000 annually. **Table 10** summarizes contracted services activity by the Anastasia MCD for the period of review.

Table 10. Summary of Contracted Services

Expenditure Category[1]	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[2]
Professional Services	$0	$0	$0	$0
Legal & Engineering Services	$16,762	$18,653	$21,362	$8,734
Accounting & Auditing	$12,000	$11,500	$12,500	$13,300
Other Contractual Services	$51,478	$94,919	$99,338	$66,630
Total	**$80,240**	**$125,072**	**$133,200**	**$88,664**

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

Staff

Anastasia MCD had 26 full-time paid in-house staff and four contracted and four seasonal part-time staff in FY 2021-22. TBG examined detailed staffing information provided by Anastasia MCD, as well as documentation available online and through DACS reporting and audits. In FY 2012-22, Anastasia MCD had 26 full-time, four grant-contracted, and four seasonal part-time staff. In addition, Anastasia MCD had 14 volunteers (seven college interns, four high school interns, and three adjunct professors). Anastasia MCD employs staff across a number of different administrative and technical positions requiring a variety of skills and expertise. Staff positions are reported in **Table 11**.

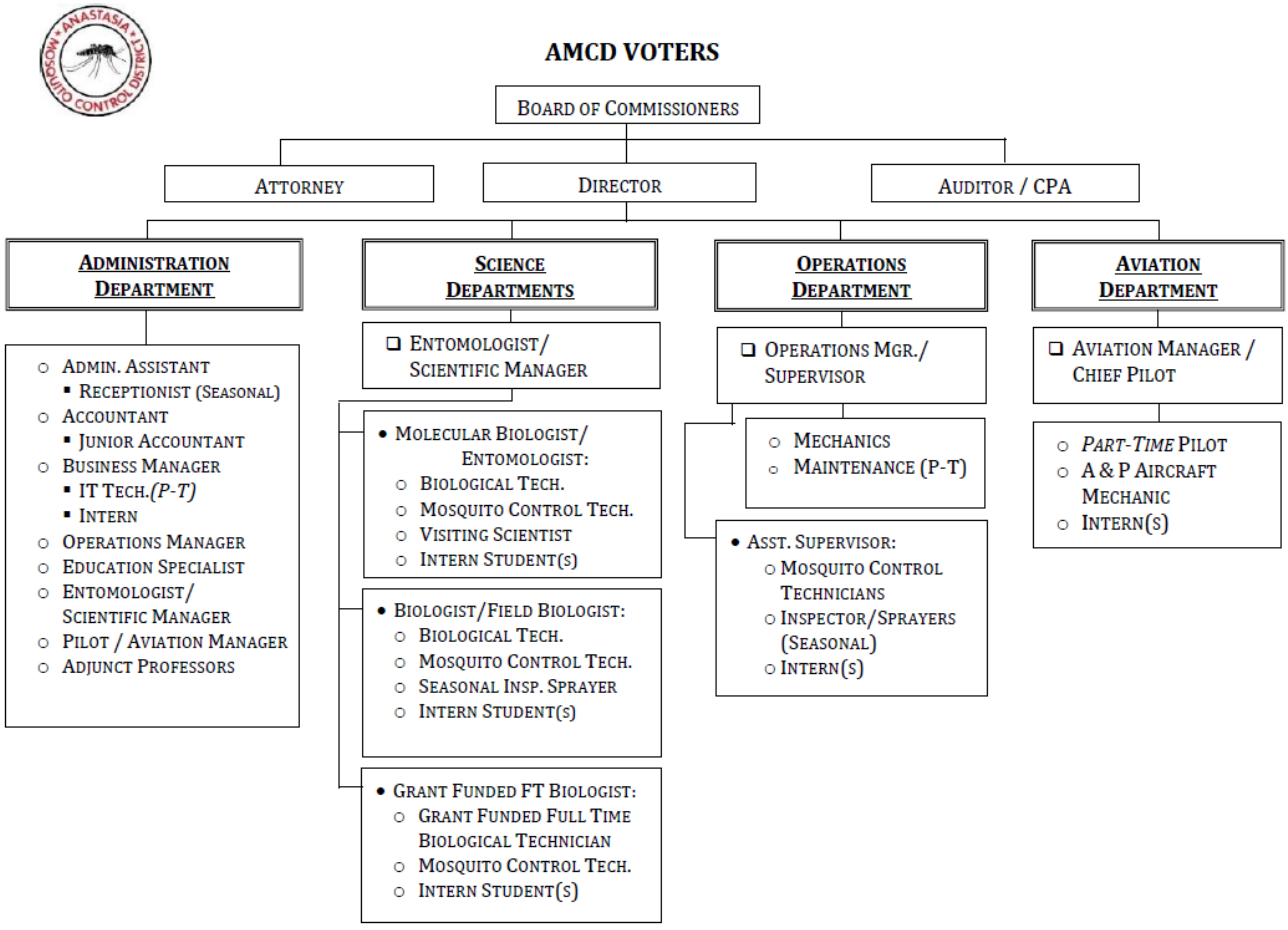
Table 11. Anastasia MCD Staff Positions

• **Accountant/ Bookkeeper**	• **Field Biologist**	• **Pilot**
• **Biologist**	• **Helicopter Mechanic**	• **Supervisor**
• **Bio Tech**	• **IT Specialist**	• **Inspector Sprayer Seasonal**
• **Business Manager**	• **Mechanic**	• **Public Relation Assistant**
• **Chief Financial Officer**	• **Molecular Biologist**	• **Seasonal Maintenance**
• **Director**	• **Mosquito Control Tech**	• **Interns, Special Projects**
• **Education Specialist**	• **Operations Manger**	
• **Entomologist/ Scientific Mgr.**		

Source: TBG Work Product, Anastasia MCD.

An organizational chart is provided in **Figure 3**.

Figure 3. Anastasia MCD Organizational Chart



Source: Anastasia MCD.

Analysis of Program Staffing Levels

Anastasia 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. Data provided by the district shows successful recruitment of qualified staff and achievement of high levels of retention for the current FY and three previous FYs. Full-time employees have been 25 or 26 every year, with only one or two vacancies open (**Table 12**). In addition, Anastasia MCD routinely employs several part-time, grant-funded, and contracted workers. A dozen or more volunteers assist Anastasia MCD each year as well. Staff turnover rate has been low all four fiscal years, with the rate being 2% or lower every year. For FY 2022-23, Anastasia MCD has the same number of full-time positions and increased part-time staff by two and volunteers by three. Grant-contracted staff decreased by two positions. Upward mobility is common as well, with some staff having started out of high school and college and rising to higher positions over their years of service. However, higher turnover is experienced with many of Anastasia's interns and those in the educational specialist roles because Anastasia MCD serves as a facility for training others in the industry. The higher turnover is expected and not seen as problematic. Long-term staff have access to training, continuing education, and operational research

opportunities to better serve the residents of St. Johns County. Anastasia MCD's staffing practices, positions, and organization are appropriate for the scale and scope of its operations compared to other similarly sized MCDs in the state, such as Citrus MCD and Manatee MCD that had 26 and 29 full-time staff in FY 2022-23, respectively.

Table 12. Anastasia MCD Staff Counts

Employee Counts	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Commissioners	5	5	5	5
Full Time	26	25	26	26
Part Time	5	3	4	6
Grant Funded	2	3	4	2
Contracted	2	2	2	2
Volunteers	16	11	14	17
Vacancies	1	2	1	1
Total	**57**	**51**	**56**	**59**
Turnover Rate	2%	2%	2%	1%

Source: TBG Work Product, FDOR, MCD.

[1] 2023 YTD through April.

Anastasia MCD staff reported that new positions will be needed to implement its strategic plan for areas of operational expansion including future drone operations and administration and maintenance of the new Disease Vector Education Center. District staff reported that the district plans to hire one additional administrative staff and one maintenance staff position for the education center.

Equipment and Facilities

Anastasia MCD has a higher number of equipment and vehicles relative to other similarly sized districts, which can be partially attributed to its more extensive research and educational activities as compared to other similar districts; the facility and buildings are sufficient to meet district needs and continue to expand. Anastasia MCD owns three Bell 206B3 helicopters (two 1995 models and one 2003 model); one Landau boat (1979 make); one Alumitech air boat (2012 make); 35 trucks/cars; and 10 all-terrain vehicles and utility task vehicles. The Bell 206B3 helicopters were purchased for $184,832 each in 2021 from military surplus for a fraction of what the helicopters would have cost on the open market. In addition, Anastasia MCD owns one facility site with 10 buildings and three outdoor enclosures as of FY 2022-23. Buildings are designated for different purposes, including laboratory testing, greenhouses, and research facilities.

Anastasia MCD owns sufficient equipment to maintain operations, including 333 pieces of field equipment, 68 lab items, and 115 pieces of office equipment. Anastasia MCD staff indicated that assessments for new equipment haven't been done for FY 2022-23. The district has a higher number of vehicles, equipment compared to similarly staffed districts like Citrus and Manatee MCDs. In FY 2022-23, Citrus MCD had 38 vehicles and 87 pieces of equipment and Manatee MCD had 33 vehicles and 153 pieces of equipment. A summary of the number of vehicles, equipment, and facilities owned by Anastasia MCD is provided in **Table 13** and a summary of surveillance equipment is in **Table 14**. The district has a higher number of vehicles and equipment compared to similarly staffed districts like Citrus and Manatee MCDs. In FY2022-23, Citrus MCD had 38 vehicles and 87 pieces of equipment and Manatee MCD had 33 vehicles and 153 pieces of equipment.

Table 13. District Vehicles, Equipment, and Facilities

Category	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Vehicles	**47**	**48**	**50**	**50**
Helicopters	0	3	3	3
Boats	2	2	2	2
Trucks and Vans	37	35	35	35
ATVs and Utility Vehicles	8	9	10	10
Equipment	**451**	**403**	**516**	**516**
Field Equipment	302	247	333	333
Lab Equipment	71	57	68	68
Office Equipment	78	99	115	115
Facilities	**1**	**1**	**1**	**1**
Buildings	11	11	11	13

Source: TBG Work Product, Anastasia MCD.

[1] 2023 YTD through April.

Table 14. Surveillance Equipment

Category	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Mosquito Traps	**151**	**151**	**151**	**151**
CDC Light Traps	54	54	54	54
CDC Gravid Traps	12	12	12	12
Biogents Traps	24	24	24	24
Ovitraps	24	24	24	24
Sentinel Chicken Coops	10	10	9	9
Sentinel Chickens	60	60	54	54

Source: TBG Work Product, Anastasia MCD.

[1] 2023 YTD through April.

In FY 2018-19, Anastasia MCD's capital outlay was $2.2 million, primarily for building construction activities. In FY 2019-20, the amount of budgeted capital outlay dropped as there was a smaller share dedicated to buildings, but this trend increased for the next two fiscal years, with the majority of capital outlay for buildings in FY 20-21 ($1.2 million). For FY 2021-22, Anastasia MCD expended $3.2 million in capital outlay, which included $2.5 million for buildings and $369,000 for the purchase of two additional Bell 206B3 helicopters and one 206B helicopter in FY 2020-21. These purchases and investments increased the district's facility's inventory of buildings and equipment since FY 2019-20 to 13 buildings, three outdoor enclosures, 45 vehicles, two vessels, and three helicopters in FY 2022-23. Building expenditures have primarily been for the Disease Vector Education Center and the SIT building. The education building's interior displays are under development and expected to be finished in late fall of 2023. The SIT building project is also estimated to be completed by late 2023 and the district plans to fully operate the SIT Building in Spring 2024.

Strategic or Other Formal Plans for the District's Future

Anastasia MCD has created a strategic plan outlining its objectives for 2021-2025, including plans to standardize and continue to improve services, tools, and methods. Anastasia MCD developed a five-year strategic plan for 2021 through 2025 that establishes five objectives to expand and improve mosquito control operations in St. Johns County. The objectives include standardization of certain operating procedures and surveillance methods, improvements to arbovirus surveillance, promoting good laboratory practices, and promoting education and evaluation of public outreach tools.

The strategic plan outlines several steps in the district's work plan that it plans to accomplish each year. Such steps include continuing to provide training and certification for vector-borne disease professionals from other states, continuing to review and update arthropod control plans with related agencies, and exploring and implementing a drone operation program which would include the purchase of several drones for surveillance, larviciding, and the release of sterilized male mosquitoes and mapping, among many other uses. Additionally, Anastasia MCD staff indicated that a meeting was held in March 2023 about the development of the next five-year strategic plan.

Review of Performance Reviews, Financial Audits, and Resident Feedback Surveys

Anastasia MCD audits report no material findings nor weakness in internal controls and no performance reviews have been conducted; the district conducts customer satisfaction surveys. Analysis of Anastasia MCD's financial audits was conducted by reviewing financial audits provided by the district. Review of the Independent Auditors' Reports from the last three fiscal years (FY 2019-20 through FY 2021-22) showed no findings or issues. Auditors report that the statements fairly represent Anastasia MCD's financial position. Anastasia MCD's revenues routinely cover costs, and the district's financial position is sound indicating financial stability and accountability.

Anastasia MCD has a number of forums through which resident feedback is received. The district routinely presents to community groups/civic associations and runs school-based education programs to teach about mosquito control. Residents have several direct ways to contact the Anastasia MCD, including by phone, apps, social media, email, and at monthly commissioner meetings. Anastasia MCD conducts regular customer satisfaction surveys for its services. In its 2022 Annual Report, the district reports that almost 90% of respondents strongly agree that the district's staff are professional and informative, and slightly more than 90% of respondents strongly agree that the district responds to service requests within 1 to 2 business days. The report does not specify how the survey is distributed or the total number of survey respondents. Per district representatives, no performance reviews have been conducted in the past five years. The district had planned to conduct a program review in April of 2020, but it was cancelled due to the COVID-19 public health emergency.

Analysis of Management Reports/Data and Performance Information

Anastasia MCD actively manages performance success or failure of its operations and administration against goals, and has effective reporting mechanisms in place to measure results on a timely basis. To assess management reporting and performance information, TBG reviewed documentation provided by Anastasia MCD, including the five-year strategic plan and annual reports. The audited financial statements, annual reports, and board packets reviewed reflect regular monitoring of performance, identification of issues as they arise and discussion of opportunities to improve efficiency and effectiveness. For example, at board meetings, board members discussed the progress of the construction of the education center, staffing updates, updates on new

grant-funded research being pursued by staff to evaluate effectiveness of various mosquito control practices, and other items.

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

Anastasia MCD manages program costs and quality effectively and efficiently. To assess cost, timing, and quality of program efforts, TBG reviewed documentation provided by Anastasia MCD, publicly available data and reports, interviewed Anastasia MCD staff, and visited the district's facilities. Current program efforts include continuous monitoring of programs for effectiveness, including monitoring of insect resistance to specific chemicals as well as product-efficacy testing for the EPA and CDC, and in-house building and maintenance of equipment to improve the efficiency of operations and reduce costs. The district purchased two helicopters in the past several years, reducing their reliance on contracted costs of $300,000 annually for aerial treatment services. The district runs an extensive research and education program with numerous collaborators among agencies, professional organizations, and academic institutions worldwide to continually learn about and work on new techniques and technologies to improve effectiveness of mosquito control programs and reduce costs.

While most MCDs in Florida do not have their own labs, the Anastasia MCD has in-house lab testing of sentinel chicken blood and mosquito pool testing, which can reduce the time to receive results for the analysis of disease-bearing mosquitoes. As a result, necessary missions to treat mosquito populations can be carried out quickly after detecting that disease-carrying mosquitoes are present. With mosquitoes able to multiply rapidly, and in a highly populated and tourism-dependent area, the ability to rapidly react is valuable and effective. In addition, the district will have a space dedicated to sterilized insect operations to advance mosquito control efforts in the near future. The Sterilized Insect Technique is a biological control practice that could reduce costs by reducing reliance on chemicals and continued research into its effectiveness is an effort the district is currently undertaking.

Anastasia MCD has noted that statutory purchasing requirements add delays for the procurement of equipment for aircraft maintenance. Pursuant to s. 287.057, *Florida Statutes*, commodities and services in excess of $35,000 must be procured through a competitive solicitation process that requires time for advertisement, review, and award, as well as time to address challenges to the solicitation process if filed. According to district representatives, parts for aircraft maintenance routinely exceed $35,000, requiring 90 to 120 days for the solicitation process. This process delays the conduct of aircraft maintenance and prevents MCDs from making quick repairs and operating efficiently.

Goals, Objectives, Performance Measures and Standards

Anastasia MCD has three general goals and several measurable objectives that adequately address the district's statutory purpose, provide direction to the district, and are achievable within budget; the district tracks performance and has been meeting standards for some measures but could establish additional performance metrics.[5]

[5] Information on the Anastasia MCD's goals, objectives, problems or needs addressed, expected benefits, and performance measures and standards is available at the district level only.

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

Goals

Anastasia MCD has established the following three overarching goals at the district level:

- Protecting the public from the nuisance of mosquitoes and mosquito-borne diseases in St. Johns County;
- Educating the populace on the importance of mosquito control; and
- Researching, and providing training on, new practices in mosquito control.

To address its goals, Anastasia MCD focuses on surveillance and ground and aerial operations. The district has multiple programs including inspections, arbovirus, mosquito population and environmental surveillance, larviciding, and adulticiding. Ground operations divide the county in 13 zones to inspect potential areas with large mosquito populations. Aerial operations are used for spraying pesticide in needed areas. Beyond field operations, Anastasia MCD also has education, research, and customer service programs.

Objectives

The district's 2021-2025 Strategic Plan establishes the following objectives to assist the district in achieving its goals and improving the district's performance:

1. Standardize the district's customer services, develop standard operating procedures (SOPs), and analyze the last five to eight years of service request data to continue to improve customer services.
2. Standardize all surveillance tools and methods, develop SOPs, and conduct a feasibility study/analysis of the in-house capability for arbovirus surveillance (mosquito pooling for virus detection, sentinel chickens, and new detection methods).
3. Develop SOPs for ground and aerial applications of larvicides and adulticides and analyze ground and aerial operations to improve their efficiencies.
4. Promote the Good Laboratory Practices Program (GLPP) through applied research and evaluation and develop collaboration with the CDC, World Health Organization (WHO), and Innovation Vector Control Consortium for the Collaboration Center of Evaluation for Prevention and Control of Vector-borne

Diseases. As discussed previously in this report, the district is currently constructing a new building to conduct Sterilized Insect Technique testing, and with this objective, aims to provide sterilized male mosquitoes to other counties in Northeastern Florida who are interested in this technique.

5. Promote public education and evaluate/justify the effectiveness and impact of tools used in public outreach. Develop the collaboration center to provide training to staff from the CDC, WHO, and mosquito control professionals from African nations.

These goals and objectives address several problems. Anastasia MCD was founded to combat nuisance and disease-carrying mosquitoes within the county boundary. As human development disturbed larval habitats and the county built a reputation for coastal tourism, the Anastasia MCD has been called upon to reduce the threat caused by mosquito populations in those locations. In addition, chemicals used by the Anastasia MCD do not pose unreasonable risks to human health according to the EPA. Expected benefits of these goals and objectives include reduction in mosquito-borne disease and reducing the nuisance of mosquitoes. Anastasia MCD also tracks disease prevalence in the county, using the Florida Department of Health (DOH) disease incidence reports published on DOH's website weekly.[6] Education and research have a large presence in Anastasia MCD as well. A more active and educated populace as well as a center of research for international mosquito control science has been developed at Anastasia MCD.

Performance Measures and Standards

Anastasia MCD has not established formal performance measures and standards tied to each district goal and objective but does maintain and track performance over time for responses to service calls and prevalence of human-borne arbovirus in the district; it also tracks its research and education activities in its annual report. The district does not have formally established performance measures and standards associated with each district goal and objective but has monitored service calls and responses and disease prevalence for the current and past three fiscal years. The following is a summary of the district's current performance measures and standards.

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

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

2. **Standard:** Zero human cases or deaths related to arboviruses acquired in Florida and detected in St. Johns County.

   Measures: Counts of arboviruses disease cases in humans as reported by DOH. TBG's review of counts for the past four calendar years identified one domestic case in St. Johns County. Anastasia MCD conducts weekly arbovirus surveillance, submits sentinel chicken blood samples for disease detection, and analyzes DOH reports to measure the success of their disease prevention efforts. Through both the DOH Laboratory and in-house capabilities, Anastasia MCD monitors West Nile virus (WNV), eastern equine encephalitis virus (EEEV), Saint Louis encephalitis virus (SLEV), Highland James virus (HJV), and California Group virus, using nine sentinel chicken sites around St. Johns County.

[6] Mosquito-Borne Disease Surveillance | Florida Department of Health (floridahealth.gov)

3. **Standard:** To be a state, national, and global leader in mosquito control through active efforts for the advancement of applied research and education.

   Measures: Number of publications, amount of research grant funds, reputation among professional organizations and agencies, and professional activities such as hosting workshops and providing training for professionals and students.

Analysis of Goals, Objectives, and Performance Measures

For the current and past three fiscal years, Anastasia MCD shows favorable performance with respect to responses to service calls, maintaining a very low incidence of human arbovirus cases acquired in Florida, and demonstrating leadership in mosquito control research and education. While the district does not have formally established performance measures and standards for each district goal and objective, the district monitors service calls and responses and disease prevalence. In addition, the district has established a performance standard to be known as a leader in mosquito control research and education.

Anastasia MCD has responded to all service calls placed in the current and past three fiscal years. Anastasia MCD staff reported that in FY 2021-22, district staff responded to 4,364 requests with an average response time of 1.4 days. Service requests are received via phone, email, website, and phone app, with more than 75% of service requests coming in through the phone app and web interface. The district reported in its strategic plan that it aims to track data on average response time and improve average response times to service calls. District staff reported to TBG that they reviewed annual response time data over the current and prior three fiscal years and that the time to respond to service requests has been reduced from approximately two days to less than one day. While it appears, based on information reported by the district, that it has successfully improved response times over the review period, it is not possible to fully assess this performance standard because the district did not provide annual data on service request average response times when requested by TBG.

Disease tracking is provided through coordination with the county health department to monitor for mosquito borne diseases, as well as through the in-house laboratory capabilities. These efforts help determine where surveillance should be conducted and determine where further cases may arise, as well as which types of mosquitoes to monitor and treat. As of this writing, there have been no arbovirus-related deaths in St. Johns County. The only Florida-acquired human case detected in St. Johns County that has been recorded in the last 19 years occurred in 2022.

The district is clearly demonstrating its leadership in mosquito control research through the wide variety of research activities and collaborations it continually conducts, numerous educational activities provided through its annual training workshop and internship opportunities, and the educational events it has regularly conducted with local partners for the current and past three fiscal years. The district has over 200 publications evaluating spatial repellents/topical repellents, repellent devices, different formulations of larvicides and adulticides, surveillance tools, spray devices, and novel technologies and has received over $2 million in grant funds from the DOD, CDC, USDA, State of Florida, and industry through collaborative research. The district has also recently been recognized as a GLPP-capable testing facility, which provides the district with opportunities to continue advancing research in the disease vector research space on behalf of the EPA and CDC. Anastasia MCD also organizes the Annual Arbovirus Surveillance and Mosquito Control Workshop, which has recently completed its 18th year. Collectively, these continuing education efforts have resulted in the certification of over 100 professional

mosquito control educators and professionals nationwide, training for college-level students, over 80 internships, and more than 360 CEU credits for vector control professionals.

The district should continue monitoring these three performance standards; these measures indicate that the district is making progress toward its three overarching goals of protecting and educating the public and conducting research activities to advance mosquito control methods. In addition, Anastasia MCD has completed the purchase of additional helicopters to expand operations and provide additional services and capacity to maintain mosquito control and has constructed new facilities to improve operational and educational capacity. The district's goals and objectives are consistent with the district's activities to date and appear achievable within the district's budget. While the district is generally demonstrating progress towards the achievement of its goals and objectives, it could develop more specific programmatic goals and objectives and develop performance measures and standards that would improve its ability to track future progress.

Table 15 reports service delivery metrics and disease prevalence within the Anastasia MCD for the current and past three fiscal years. **Table 16** summarizes performance measures and standards assessment.

Table 15. Performance Measures for Anastasia MCD

Performance Measure	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23[1]
Service Calls	1,540	2,560	4,364	2,300
Service Responses	1,540	2,560	4,364	2,300
	CY 2020	**CY 2021**	**CY 2022**	**CY 2023**[1]
Arbovirus Cases (Florida)	0	0	1	0
Arbovirus Cases (Travel)	0	1	3	0
Arbovirus Deaths	0	0	0	0

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

Table 16. Assessment of Performance Measures and Standards for Anastasia MCD

Performance Measure	Performance Standard	Assessment
Number of service requests received and addressed with improved average response times	Address citizen requests for mosquito control efforts in a timely manner	Performance standard to respond to all service requests met; standard to improve response times over time partially met based on district information that average response time has been reduced from about 2 days to less than 1 day, but lack of annual data on average response times does not allow full assessment of standard.
Counts of arboviruses disease cases in humans as reported by DOH	Zero human cases or deaths from arboviruses acquired in Florida and detected in St. Johns County.	Standard met in CYs 2020 and 2021 and through April of CY 2023; not met in CY 2022.
Evidence of professional activities including publications, research grant funds, reputation among professional organizations, hosting workshops and providing training for professionals and students	To be a state, national, and global leader in mosquito control through active efforts for the advancement of applied research and education	Standard met.

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

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

Perceptions of the Anastasia MCD's performance by stakeholders appear to be mostly positive; some negative feedback was received regarding the costs to construct the Disease Vector Education Center. As discussed above, Anastasia MCD conducts resident surveys and has received positive feedback via emails, public events, and through commissioner meetings. The district has also shown the Disease Vector Education Center to 700 visitors, who included representatives of the DOH, the school board, state and federal agencies, and local community organizations. Most expressed positive feedback as well as support for the programs and the new center. District staff also report receiving some negative feedback from individuals who felt the cost of the center was too high. 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 stakeholder responses after multiple contacts.

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

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.

Anastasia MCD staff reported that the district collected 799 tires annually on average in the current and prior three fiscal years and spends on average approximately $2,000 per year on waste tire collection and disposal. In addition, the district reported that due to labor and tire processing needs, the district currently limits the number of tires it collects from residential properties to ten tires per property. The district has not sought or received any additional funds to help support tire collection and disposal efforts nor is it exempt from local landfill fees. The district is currently incurring costs and inefficiencies in managing waste tire collection and disposal, which is an important source reduction activity. Although Anastasia 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.[7] 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.[8] 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.[9] 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

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

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.

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

Florida Coordinating Council on Mosquito Control: During TBG's review of the 15 independent MCDs, TBG found that most districts have not developed sufficient goals, objectives, or performance measures and standards. The Florida Coordinating Council on Mosquito Control was established by the Legislature to foster maximum efficient use of existing resources and to assist entities involved in mosquito control with best management practices. Membership on the council includes the agency heads for DACS, DEP, and the Fish and Wildlife Conservation Commission, the State Surgeon General, as well as representatives of federal agencies, the University of Florida's Florida Medical Entomology Laboratory, Florida MCDs, and others. The Legislature could direct the council to form a subcommittee consisting of mosquito professionals and researchers from around the state to develop model MCD goals, objectives, and performance measures and standards to assist MCDs with performance monitoring.[10]

Recommendations

A summary of TBG's recommendations to improve operations, reduce costs or reduce duplication is provided in **Table 17.**

[10] 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 formalize additional performance measures and standards that would allow the district to monitor and track progress toward all its goals and objectives. Such performance information would facilitate the district in consistently monitoring its progress.	• This recommendation would require additional staff time and may result in additional administrative costs to the district.
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 that lack staff resources for the development of such performance information.

Source: TBG Work Product, based on review of information provided by Anastasia 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. Anastasia 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.