ANASTASIA MOSQUITO CONTROL DISTRICT

OF ST. JOHNS COUNTY

ANNUAL PROGRAM REPORT FOR 2021

As an essential business AMCD continued all operations through the Covid-19 pandemic.

120 EOC Drive,
St. Augustine,
FL 32092

(904) 471-3107

www.amcdsjc.org

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Message from Chairperson of the Board of Commissioners

In 2021, our district continued to provide excellent service during the COVID-19 pandemic. The Board of Commissioners voted/awarded the Disease Vector Education building construction to Compass Group in March, and awarded the SIT building to Harrell Construction Company in August. The millage rate was reduced from 0.205 to 0.200. AMCD had a successful open house on April 1. The District received the Special District/Technology and Innovation/Citizenship Category award about the App software for the improvement of customer service from the AT&T Governmental Technology in November. Commissioner Trish Becker was elected as the FMCA Commissioner's section Secretary. Thanks to all dedicated employees for their hard work.

Mrs. Jeanne Moeller

Message from The Director

There was no travel-related or locally-acquired mosquito-borne diseases in St. Johns County in 2021. St. Johns County residents have been free of any locally-acquired mosquito-borne diseases for 18 years. AMCD continued the DoD grant (2nd year) to study evidence-based decision action thresholds, CDC collaborative grant (2nd year) with the University of Florida to study smart sensors for mosquito adulticiding testing, and FDACS collaborative grants with UF about non-target and nanoparticle formulation of adulticides (In 2021 AMCD received $780,000 in grant funding). AMCD finished the cooperative FDACS/CDC/DOH grant projects about SIT for *Aedes aegypti* control in downtown St. Augustine with UF and USDA/CMAVE. Mr. Dana Smith received the Special District/Technology and Innovation/Leadership award for his efforts to save over one million dollars to purchase two helicopters, and parts from military surplus from the AT&T Governmental Technology. Mrs. Kay Gaines received the FMCA's merit award and Mr. Richard Weaver was elected as the FMCA Vice President. I have been appointed as the National Association of City and County Health Officers (NACCHO)'s Vector Control Working Group member. I have also been elected as the American Mosquito Control Association (AMCA)'s Vice President. I thank and appreciate the board, all employees, and collaborators for their strong support and help in 2021.

Dr. Rui-De Xue

Board of Commissioners

Mrs. Catherine Brandhort
Seat 1
2021-2024

Mrs. Jeanne Moeller
Seat 2
2007-2022

Mrs. Gina LeBlanc
Seat 3
2017-2024

Mrs. Panagiota K. "Trish" Becker
Seat 4
2019-2022

Mrs. Gale Gardner
Seat 5
2021-2024

Appionted Offices

Mr. Wayne Flowers
Attorney Since: 11-9-10

Ms. Julieann Klein
CPA Since: 9-11-03

Dr. Rui-De Xue
Hired: 4-14-03
Director Since: 2005

Full Time Employees

Johns Freddie Allen

Mechanic
7-08-2002 to Present

Steven Kyle Arber

Mosquito Control Technician
5-01-2017 to Present

Dr. Vindhya Aryaprema

FT Grant Funded Term Limited Biologist
8-05-2019 to 7-15-2023

Dena Autry

Supervisor of Operations
8-24-2015 to Present

Kai Blore

Biological Lab Technicians
4-02-2019 to Present

Ralph Bruner

A&P Aircraft Mechanic
9-03-2019 to Present

Lea Bangonan

FT Grant Funded Biological Technician
6-03-2019 to Present

Morgan Duett

Mosquito Control Technician, Surveillance
2-06-2017 to Present

Dr. Muhammad Farooq

Field Biologist
9-16-2019 to Present

Marcia Kay Gianes

Operations Manager
8-07-2000 to Present

Scott Hanna

Accountant/
Chief Financial Officer
7-03-2007 to Present

Cathy Hendricks

Mosquito Control Technician
7-08-2002 to Present

Jerry Iser

Mosquito Control Technician
2-02-2015 to Present

Dr. Steven Peper

Molecular Entomologist/Biologist
3-23-2020 to Present

Michael Phillips

Pilot
2-24-2020 to Present

Dr. Whitney Qualls

Entomologist/
Scientific Manager
10-28-2019 to Present

Dana Smith

Chief Pilot/
Aviation Manager
4-27-2020 to Present

Steven Smoleroff

Biological Technician
10-02-2017 to Present

Aye McKinney

Accountant
1-04-2021 to Present

Rick Stockley

Information Technology (IT)
2-04-2013 to Present

David Strickland

Mosquito Control Technician
3-10-1997 to Present

Olivia Sypes

FT Grant Funded Term Limited Biological Technician
4-06-2020 to 7-15-2023

Heather Ward

Biological Technician
4-27-2020 to Present

Richard Weaver

Business Manager
4-14-2003 to Present

Dazmond Hackney

Mosquito Control Technician
2-02-2021 to Present

Jeremy Wohlforth

Mosquito Control Technician
2-06-2017 to Present

James Wynn

Mechanic
3-04-1996 to Present

Dr. Rui-De Xue

Director
4-14-2003 to Present

Taylor Ballantyne

Education Specialist
10-4-2021 to Present

Madeline Steck

FT Grant Funded Term Limited Biological Technician
10-01-2020 to 9-30-2022

2021 Resigned

Allison Hartnett
Administration Assistant
2-08-2021 to 4-20-2021

Edward Zeszutko
Education Specialist
5-13-2019 to 8-4-2021

Courtney Cunningham
Mosquito Control Technician
4-06-2020 to 8-6-2021

Full Time Seasonal (6 month) Employees

James Stokley
Inspector/Sprayer
5-03-2021 to 7-24-2021

Philip Vaughn
Inspector/Sprayer
5-03-2020 to 10-29-2021

Kyle Graham
Mosquito Control Technician
5-03-2021 to 8-19-2021

Jennifer Dentmon
Mosquito Control Technician
5-17-2021 to 10-28-21

Interns and Volunteers

Alexis Middelton
AMCD Lab Intern
5-3-2021 to 8-20-21

Taylor Ballantyne
UF/AMCD Lab Intern
4-26-2021 to 10-01-2021

Laryssa Fanney
AMCD Lab Intern
5-10-2021 to Present

Holly Usina
AMCD Lab Intern
5-10-2021 to 11-24-2021

Heather Keating
AMCD Administration Intern
5-03-2021 to 9-24-2021

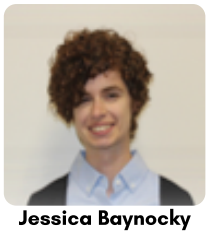
Dylan Rodriguez
AMCD Lab Intern
1-4-2021 to 5-18-2021

Zachary Janszen
AMCD High School Volunteer
Ponte Vedra High School
6 week

Ellie DeVault
AMCD High School Volunteer
Ponte Vedra High School
6 week

Mira Schmidt
AMCD High School Volunteer
Ponte Vedra High School
6 week

Genevieve Chaon
AMCD High School Volunteer
Ponte Vedra High School
6 week



Jessica Baynocky
AMCD Lab Intern
1-10-2021 to 3-20-2021

Adjunct Professors

Dr. Stephen Dobson
Adjunct Senior
Entomologist
March 2020

Dr. Gunter Muller
Adjunct Senior
Vector Entomologist
October 2018

Dr. Michael Turell
Adjunct Senior
Arbovirologist
October 2018

Administration Personnel and Recognitions

Personnel

Mr. Dazmond Hackney was promoted as a full time MCT and started February 2, 2021. Mrs. Aye McKinney was hired on as an accountant and started January 4, 2021. Ms. Taylor Ballantyne was hired on as the Education Specialist and started October 4, 2021. The grant funded, limited time, full time positions this year: Dr. Vindhya Aryaprema, Biologist (7-15-2023), Ms. Olivia Sypes, Biological Technician (7-15-2023), Ms. Madeline Steck, Biological Technician (9-30-2022), and Lea Bangonan, Biological Technician (12- 31, 2022).

The seasonal interns that worked for AMCD were: Ms. Jessica Baynocky (1-10-2021 to 3-20-2021), Mr. Dylan Rodriguez (1-4-2021 to 5-18-2021), Ms. Alexis Middelton (5-3-2021 to 8-20-2021), Ms. Taylor Ballantyne (4-26-2021 to 10-01-2021), Ms. Laryssa Fanney (5-10-2021 to Present), Mrs. Holly Usina (5-10-2021 to 11-24-2021).

Mr. Edward Zeszutko, Education Specialist and Ms. Courtney Cunningham, Mosquito Control Technician, resigned on August 6, 2021. Miss Allison Hartnett, Administration Assistant worked for 3 months.

Recognitions and Awards

The following AMCD personnel received an award for their years of service with the District:

- Mr. James Wynn, Mechanic, 25 years

The Management Choice Award this year went to Mr. James Wynn, and Dr. Muhammad Farooq for their significant contributions and dedication to the District throughout the year. AMCD received the Citizen Service Award by use of the EMS App to improve service requests by the Governmental Technology, AT&T (Fig. 1).

Mr. Dana Smith was given an award for his leadership (Fig. 2), and saving AMCD money by purchasing military surplus helicopter parts. Mrs. Kay Gaines was given the Merit Award from FMCA.

Mr. Richard Weaver was elected as the FMCA Vice President. Dr. Rui-De Xue was elected as the AMCA Vice President.

Figure 1. **Citizen Service Award**

Figure 2. **Dana Smith Leadership Award**

Committee Members 2021

SAFETY COMMITTEE

Business Mgr. (Safety Coordinator)	Richard Weaver (Chair)
Operations Mgr.	Mrs. Marcia Kay Gaines
Supervisor	Mrs. Dena Autry
A&P Aircraft Mechanic	Mr. Ralph Bruner
Biological Technician	Mr. Steven Smoleroff
MC Technician, Surveillance	Mr. Morgan Duett
IT Specialiost	Mr. Rick Stockley
Mechanic	Mr. John "Freddie" Allen
Molecular Entomologist	Dr. Steve Peper

APPLIED RESEARCH COMMITTEE

Commissioner	Mrs. Jeanne Moeller (Chair)
Entomologist/Scientific Mgr.	Dr. Whitney Qualls
Business Mgr.	Mr. Richard Weaver
Molecular Entomologist	Dr. Steve Peper
Biological Lab Technician	Mr. Kai Blore
Field Biologist	Dr. Muhammed Farooq

EDUCATION COMMITTEE

Commissioner	Mrs. Trish Becker (Chair)
Education Specialist	Mr. Edward J. Zeszutko
Operations Mgr.	Mrs. Marcia Kay Gaines
Supervisor	Mrs. Dena Autry
Biological Technician	Mr. Steven Smoloeroff & Ms. Heather Ward
Entomologist/Scientific Mgr.	Dr. Whitney Qualls

PLANNING COMMITTEE

Commissioner	Mrs. Gina LeBlanc (Chair)
Director	Dr. Rui-De Xue
Operations Mgr.	Mrs. Marcia Kay Gaines
Business Mgr.	Mr. Richard Weaver
Supervisor	Mrs. Dena Autry
Chief Pilot/ Aviation Mgr.	Mr. Dana Smith
Entomologist/Scientific Mgr.	Dr. Whitney Qualls

FINANCIAL/AUDIT COMMITTEE

Commissioner	Mrs. Gayle Gardner (Chair)
Director	Dr. Rui-De Xue
Accountant	Mr. Scott Hanna
Business Mgr.	Mr. Richard Weaver
Chief Pilot / Aviation Mgr.	Mr. Dana Smith
Operations Mgr.	Mrs. Marcia Kay Gaines

EMERGENCY RESPONSE COMMITTEE

Operations Mgr.	Mrs. Marcia Kay Gaines (Chair)
Field Biologist	Dr. Muhammad Farooq
Business Manager	Mr. Richard Weaver
Entomologist/Scientific Mgr.	Dr. Whitney Qualls
MC Technician	Mr. Morgan Duet
Education Specialist	Mr. Edward J. Zeszutko
Chief Pilot/Aviation Mgr.	Mr. Dana Smith
Pilot/Technician	Mr. Michael Phillips

OPERATIONAL COMMITTEE GROUND/AERIAL

Commissioner	Mrs. Catherine Brandhorst (Chair)
Director	Dr. Rui-De Xue
Chief Pilot/Aviation Mgr.	Mr. Dana Smith
Field Biologist	Dr. Muhammad Farooq
Operations Mgr.	Mrs. Marcia Kay Gaines
Business Mgr.	Mr. Richard Weaver
Supervisor	Mrs. Dena Autry
Entomologist/Scientific Mgr.	Dr. Whitney Qualls

Program Overview

AMCD Mission, Values, Vision, and Programs

Our Mission: To protect all people from the nuisance of mosquitoes and mosquito-borne diseases in St. Johns County, Florida.

Our Values: Service Driven, Scientific Based, Professional, Justified, Environmentally-friendly, Collaborative, Compassionate, Accountable, and Sustainable Excellence.

Our Vision: AMCD of St. Johns County will be among the healthiest in the Nation -- a well-served community, enjoyed by all and supported by all partners.

Our Programs: Customer Service, Operations (including Surveillance and Control by Ground and Aerial Application), Education, and Applied Research.

The American Mosquito Control Association's (AMCA) 87th annual meeting was held virtually March 2nd through March 5th, 2021. AMCD's 17th Annual Arbovirus Surveillance and Mosquito Control Workshop was canceled again due to concerns from COVID-19.

The annual FMCA meeting in November 2021 was held at Hawks Kay in Duck Key, FL.

On July 8th, 2021 the building permit of the Education Center Building was issued. The Education Center Building is projected to completed by July of 2022.

As we have done since 1949, AMCD has continued to provide many services to the citizens of St. Johns County. These services included but were not limited to: mosquito inspections, population and arbovirus surveillance, public outreach and education, the assistances of local organizations, larviciding, adulticiding, applied research and evaluations of new control tools and techniques, and employee training.

Budget

Ad Valorem (real property) Current Year Taxes, the primary source of revenue, $6,283,021 comprised of, approximately, 89% of the total Revenues, $7,096,016.

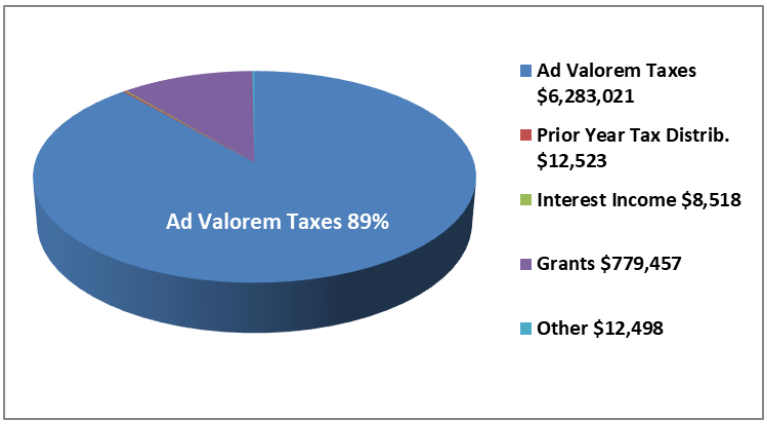
Grant Revenues, from Applied Research, totaling $779,457, shows an, approximately, 85% increase over the prior year.

Interest Income Return on Investment, SBA Fund, non-current Operating Funds, yielded $8,518.

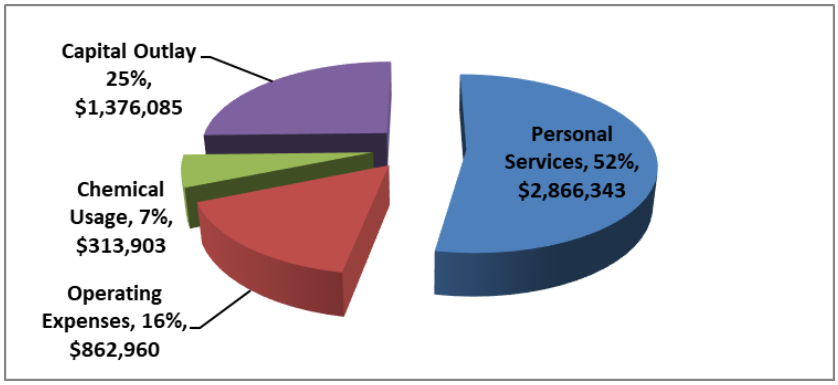
Other Revenues, were predominantly comprised of $7,293 Surplus Sales, and $5,205 Dorm Rents.

The District's millage rate for the General Operating Budget was 0.2050 for the year.

FY 20/21 District Revenues Oct. 1, 2020 through Sept.30, 2021 Total $7,096,016. Millage Rate: 0.2050



FY 20/21 District Expenditures Total $5,419,291



Expenditures for the year were comparatively less than Revenues. The majority were attributed to Personal Services, (52%), with Capital Outlay, Operating Expenses, and Chemical Usage comprising of 25%, 16%, and 7%, respectively.

Administration and Supply

Board Business:
The AMCD staff provided many documents to Board members and the Board's attorney and for Committee meetings in 2021. The District hosted 14 Board meetings, including the annual First and Final Public Hearings, and a special meeting about helicopter incident and insurance in September for the 2021/2022 fiscal year budget and millage rate.

Administration & Finance:
The Board approved an IT Technician, Receptionist, Chief Pilot/Aviation Manager, Pilot, Adjunct Senior Vector Biologist, and Mosquito Control Engineer. On July 15, 2021 the Board discussed DACS Work Plan Budget for FY 21/22.

Policies:
The Board updated the policy on military leave on July 15, 2021. The Board approved the policies for Board members who are not eligible to use District education fund to support the degree, and Commissioners to contact legislators and media report.

Inventory:
The monthly tire inventory and chemical inventory were completed as required. Two vehicles (Ford Pickup truck, and Chevy Colorado) were surplused on the FY 20/21 surplus inventory along with other pieces of equipment and miscellaneous items. The annual physical inventory was approved at the October 14, 2021 Board meeting and the FY 20/21 surplus items were approved December 9, 2021.

Contracts:
The Board awarded/signed the contract for education building between AMCD and the Compass Group in March. The Board awarded/signed the contract with Harrell Construction for building the SIT mass rearing facility in August. Approval was given on May 13, 2021 for the contract between UF/FMEL and AMCD for collection of mosquitoes in NE region. Both approval for renewing the agreement between AMCD and DOH of St. Johns County, and the Summer Internship Partnership between Career Academies and AMCD was given on May 13, 2021. On June 17, 2021 the Board approved the renewal of the auditor contract FY 20 /21. The Board renewed the Cintas Uniform Contract on September 9, 2021. The Board approved the agreement between AMCD and Mobisoft for data serve hosting on October 14, 2021.

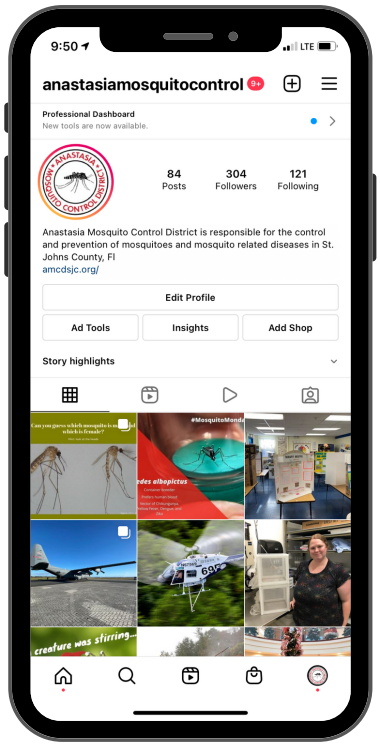
RFPs & BIDs:
February 11, 2021 the Board approved the BID for Fluorescence Spectrophotometer for pesticide analysis. March 16, 2021 the Board approved the award of an RFP and then approved the contract to Compass Group for Disease Vector Education center. On June 17, 2021 the Board discussed and approved the RFP for the SIT mass rearing facility.

Insurances:
The Board approved the helicopter insurance renewal on May 13, 2021. Renewal of the Fleet/Liability and Workers Compensation Ins. with Thompson Baker Ins. Co., and the Health, Dental, and Life Insurance for the calendar year 2022.

Customer Service

AMCD Website:

AMCD's website: www.amcdsjc.org is an important tool for providing information to the public, other mosquito control districts, and staff. The site contains important information including public notices, meeting dates, mosquito-borne disease advisories, training opportunities, education, and employment opportunities. One of the most important links on the AMCD website is the service request button. At this link, St. Johns County citizens can enter requests for service. This service request is linked to the District's database, Geomosquito, and immediately notifies the AMCD technicians in the field that a request for service has been requested. This page on the website will also allow customers to access and review the status of a service request and see if there is any adulticide (fogging) scheduled in their area. AMCD also keeps the public engaged using social media and has a presence on Facebook, Twitter, and Instagram. AMCD has also developed a free app (EMS) to enter service requests, to check for adulticiding, and the ability to get important notifications from the District. This free app is available for iPhone and Android phone users.



Scan QR code to access AMCD's website

AMCD responded to 1,938 service requests in 2021. The average response time for a service request was 1.9 days. Service requests were received by the District office via phone, email, website, and phone app with more than 75% of service requests coming in through the phone app and web interface.

AMCD staff continued conducting detailed tours of the AMCD facility and research buildings to members of the public, local and state officials, members of the education system, and other government agencies especially other mosquito control districts.

AMCD continued to provide service and to educate St. Johns County residents on many things such as adult and larval mosquitoes, adulticiding, and larviciding. The AMCD staff also dispensed valuable information pertaining to the identification of mosquitoes, pesticide safety and other insects, mosquito prevention and pesticide applications, personal protection methods, as well as commercial mosquito traps, repellents, insecticides, and assisting residents with concerns about no spray treatment areas, including bee-keepers' properties or personal/health conditions that require no treatments be made.

AMCD strictly adheres to the Florida Statutes, Chapter 388, and 5E-13 of the Florida Administrative Code. The District also follows all Florida Department of Agriculture and Consumer Services and Environmental Protection Agency rules. Labels and Safety Data Sheet instructions are closely followed, as well as, the District's own policies and procedures. AMCD is committed to public safety while providing the important public service of larviciding, and adulticiding in order to reduce the spread of vector disease, and nuisance mosquitoes.

Cooperative Organizations/Professional Services

AMCD works in cooperation with a number of related local-, state-, federal- agencies, international-, private-, commercial- organizations, and members of the medical community. Those listed below briefly describe the work associations with AMCD in 2021 to prevent and control vector-borne diseases in Florida.

International Cooperation and Activities:

The collaboration with Dr. Gunter Muller, the University of Science, Techniques, and Technology of Bamako, Mali working on Attractive Toxic Sugar Baits (ATSB) against vector mosquitoes was continued.

The collaboration with Dr. Tong-Yan Zhao, Beijing Institute of Microbiology and Epidemiology to continue working on rice field mosquito management and organized 7th International Forum for Surveillance and Control of Mosquitoes and Vector-borne Diseases.

November 9th, 2021 AMCD hosted three visitors from Pan African Mosquito Control Association to discuss possible collaboration and training.

Dr. Xue continues to serve the World Mosquito Control Association as their Executive Director.

Dr. Xue continues to collaborate with several Scientists from the Collaboration in Sciences and Technology (COST), Europe Commission for research and development of nanotechnology and treated textiles against mosquitoes, AMCD's database analysis. Dr. Xue gave a presentation for the COST training program May 18, 2021 (Virtual).

Dr. Xue has continued to serve the Board of the Investigation and Mathematical Analysis of Avant-garde Disease Control via Mosquito Nano-Tech Repellents (IMAAC) related to the COST program in 2021.

Dr. Xue has continued as the Expert Committee member for the International Standard Organization (ISO).

Dr. Xue was invited to give a presentation about vector control response at the Jiangsu Vector Control meeting by virtual on May 24, 2021.

Cooperative Organizations/Professional Services (Cont'd)

State Agencies and Services:

Florida Department of Environmental Protection: AMCD collaborated with state parks and environmental education centers for salt marsh management grant applications in Fish Island.

Dr. Qualls serves as the DACS/FCCMC's research review subcommittee member since September 2021.

Mr. Weaver continues to serve as the FMCA financial member and was elected as the Vice President.

Dr. Xue serves as the FMCA's Publication Committee Chair, Editor of the JFMCA., Chair of the FMCA Exchange program committee, and on the By-law's committee.

Dr. Qualls serves as the FMCA Scholarship Committee Chair and as the Dodd short course committee Co-chair.

Mrs. Moeller serves as the FMCA legislation committee member.

Dr. Peper serves as the Wing Beats Advertising Director and serves on the FCCMC Imperiled Species committee .

National and Federal Agencies & Associations:

The collaboration with USDA/CMAVE to organize the annual workshop and SIT for control of *Aedes aegypti* and other studies was continued.

The collaboration with Dr. Jerry Zhu at USDA/ARS for natural repellent evaluation was continued.

The collaboration with the DoD's NECE, Jacksonville, FL to evaluate ULV spray systems and new formulations of insecticides was continued.

Collaborated with the DoD's AFPMB for control action threshold grant and co-organize symposium for AMCA annual meeting, March 2021 (Virtual).

Collaborated with CDC about developing a smart cage and SIT study under subcontracts with UF.

AMCD is a sustaining member of the AMCA and an AMCA/EPA PESP member.

AMCD is continuing the collaboration with the CDC.

AMCD continued their collaboration with the CDC Southeastern Center for Excellence in Vector-borne Disease for training intern students.

Dr. Xue continues to serve the SOVE Board as the Regional Director.

Dr. Xue, Dr. Qualls, Dr. Farooq, and Dr.Peper reviewed numerous numbers of manuscripts for the ESA's Journals, AMCA's JAMCA, SOVE's JVE, Acta Tropic, PLoS one, Parasite & Vectors, Insects, and several other journals at their editors' requests.

Dr. Peper serves on the AMCA Training and Member Education committee.

Dr. Qualls is the AMCA Publications Committee Chair.

Cooperative Organizations/Professional Services (Cont'd)

Companies And Other Districts:

AMCD collaborated with several local mosquito control programs in the northeast region to share mosquito and mosquito-borne disease information.

AMCD demonstrated and provided the blueprint of our complex to serval districts and programs.

AMCD collaborated with Lee CMCD to train pilots and helicopter mechanics.

AMCD collaborated with Dyna Trap on new trap and spatial repellent device evaluations.

AMCD collaborated with Central Life Sciences on spatial repellent device, larvicide, and adulticide product evaluations.

AMCD collaborated with DNW Global LLC on new larvicide evaluations and EPA registration of their new larvicide.

AMCD collaborated with MosquitoMate on a SIT project proposal.

AMCD collaborated with New Mountains: New Trap Evaluations.

AMCD collaborated with American LongRay: New Trap Evaluations.

AMCD collaborated with Kim Benz for repellent doses and new formulation.

Agencies and Universities:

AMCD cooperated with the University of Florida Department of Entomology and Nematology with Dr. D Hahn on the SIT grant.

AMCD collaborated with UF, Department of Electrical Engineering with Dr. W. Eisenstadt on the CDC grant for developing a smart cage.

AMCD collaborated with UF Dr. R. Dinglasan at EPI for intern training.

AMCD collaborated with UF, Department of Entomology and Nematology with Dr. Koehler, and Dr. Baldwin for a non-target study and nanoparticles of adulticides and to train Ph.D. student Mr. Blore.

Dr. Xue serves, as a voluntary professor for the University of Miami School of Medicine and continues to collaborate with Dr. John Beier for ATSB and biology and control of mosquitoes.

AMCD renewed the contract with the University of North Florida's College of Public Health for training intern students.

AMCD provided many mosquito samples for several universities nationwide.

Surveillance

Mosquito-borne Diseases:
AMCD continuously cooperates with the Florida Department of Health to monitor imported mosquito-borne diseases through local health providers.

Through the Florida Department of Health Laboratory and in-house capabilities, AMCD monitored West Nile Virus (WNV), Eastern Equine Encephalitis Virus (EEEV), Saint Louis Encephalitis Virus (SLEV), Highland James Virus (HJV), and California Group Virus, using ten sentinel chicken sites around St. Johns County. AMCD personnel bled chickens once a week for testing from April through November.

In 2021, a total of 22 sentinel chickens tested positive for arboviruses, 10 for EEEV and 12 for WNV. In 2021, there were no travel-related or locally acquired human cases of Zika, Chikungunya, Dengue, or malaria in St. Johns County.

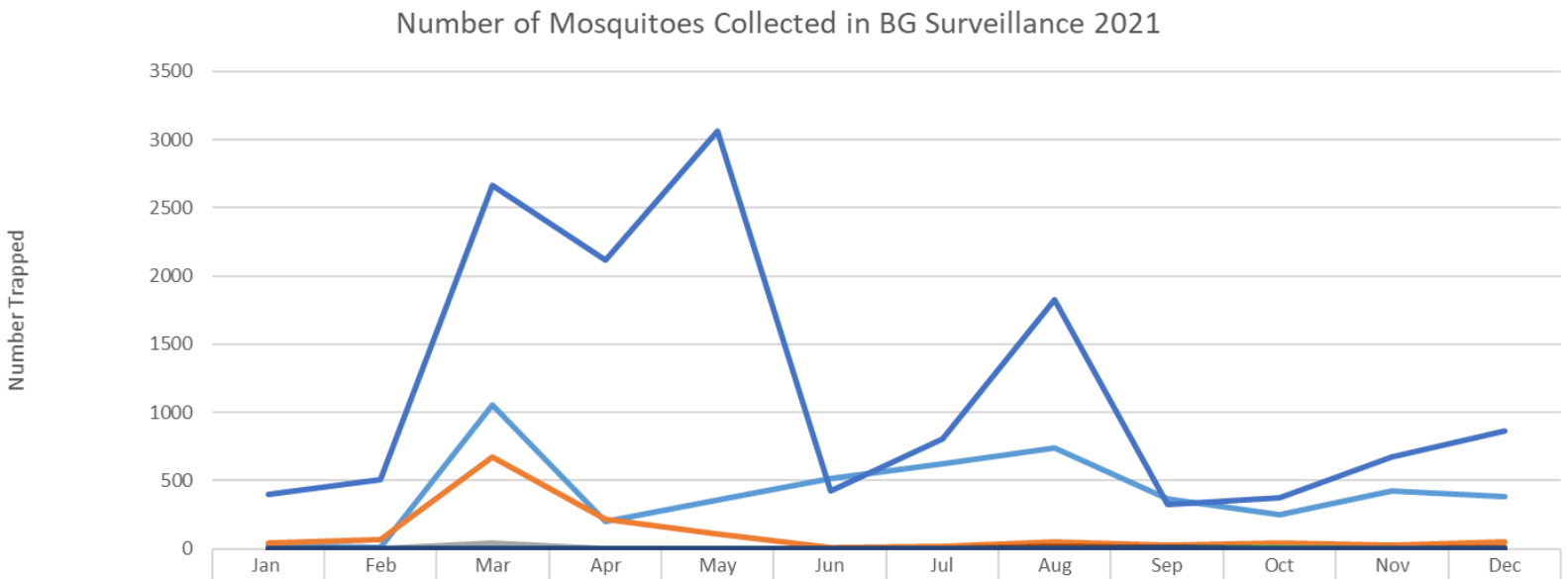
Mosquito Population:
The adult mosquito population was monitored by 41 CDC light traps baited with Octenol from April to November, 2021 and a total of 18,611 mosquitoes, 33 species were collected. Twelve BG Sentinel (Fig. 1), two traps baited with BG Lure and CO2 were used for *Aedes albopictus* and *Aedes aegypti* surveillance for a total of 2,601 collected from January to December, 2021. A total of 20,447 mosquitoes, 32 species were collected from BG trapping. A total of 39,058 mosquitoes were trapped by both methods.

Larval surveys were conducted on a daily basis by dipping flooded areas as needed. A total of 25,947 dips were conducted and 2,643 dips were positive with 40,462 larvae found.

Environmental Parameters:
The total average monthly rain fall for St. Johns County in 2021 was 4.24 inches with a total of 51.62 inches for the year per the St. Johns River and Water Management Districts Hydrologic Charts.

Figure 1. **BG Sentinel Trap**

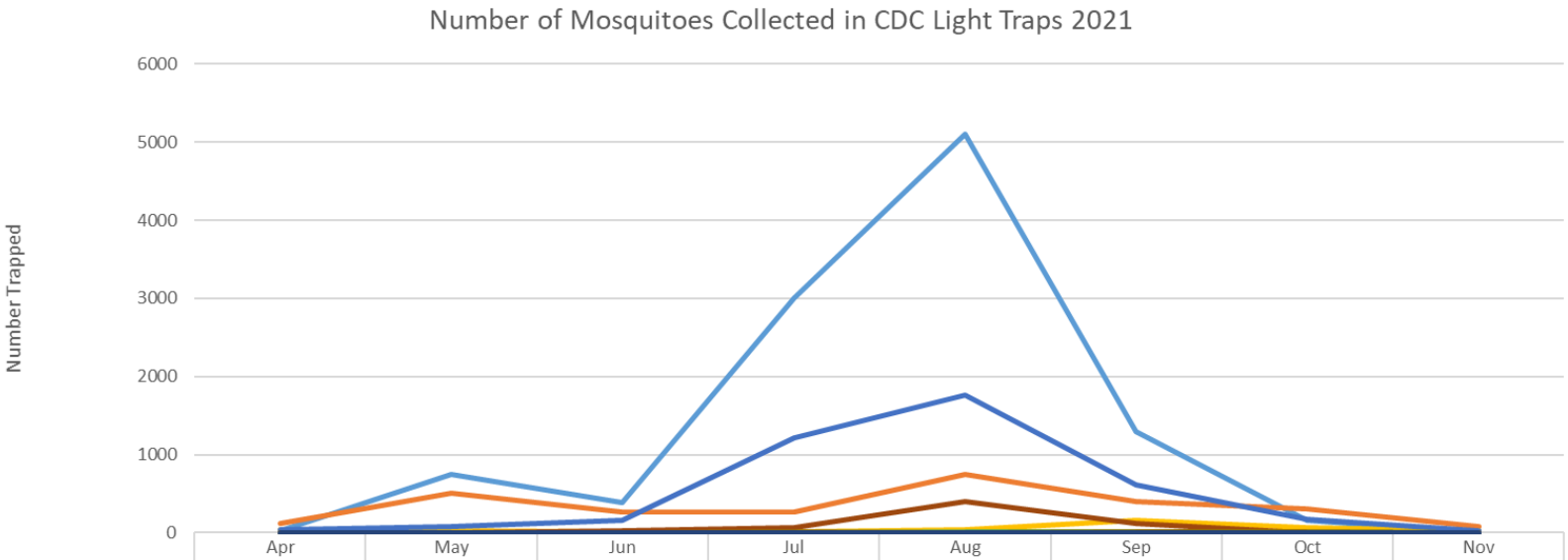
Surveillance (Cont'd)



Genus Trapped	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aedes	23	9	1052	199	359	517	625	740	368	247	427	382
Anopheles	41	67	672	216	112	7	15	47	25	44	26	49
Coquillettidia	0	0	42	0	0	0	0	0	0	0	4	0
Culiseta	0	4	0	0	0	0	0	1	0	0	0	0
Culex	399	510	2663	2116	3058	420	808	1822	323	374	671	865
Mansonia	0	0	0	0	0	0	0	2	6	6	1	3
Orthopodomyia	1	0	0	0	1	0	0	0	0	0	0	0
Psorophora	0	0	0	0	0	0	3	21	8	2	3	7
Toxorhynchites	0	0	0	0	0	0	1	0	0	1	0	0
Uranotaenia	0	0	0	0	0	0	0	0	0	0	0	0
Wyeomyia	0	0	0	2	0	3	1	1	8	0	3	2

Figure 1. **Total mosquitoes collected throughout 2021 by month and genus in BG-Sentinel Traps**

Surveillance (Cont'd)

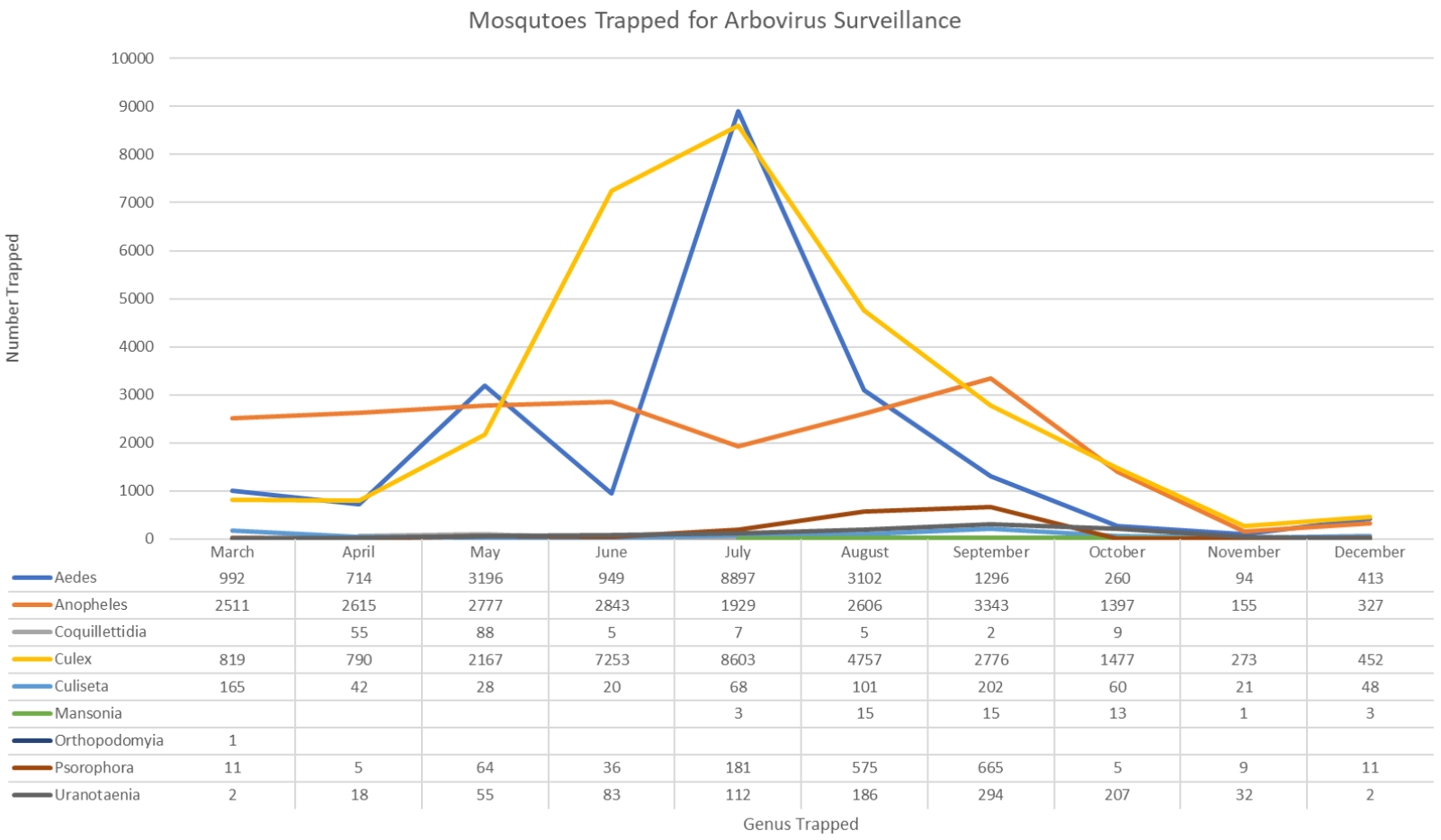


	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Aedes	29	743	385	3007	5104	1301	154	4
Anopheles	125	506	269	262	742	394	305	80
Coquillettidia	3	3	11	4	7	2	1	0
Culiseta	38	28	12	12	35	155	65	24
Culex	39	74	164	1213	1759	619	179	24
Mansonia	1	0	1	3	18	10	13	0
Orthopodomyia	0	0	0	5	0	0	0	0
Psorophora	2	1	31	71	396	124	3	0
Toxorhynchites	0	3	0	0	0	0	0	0
Uranotaenia	4	2	5	18	5	7	7	0
Wyeomyia	0	0	0	0	0	0	0	0

Genus Trapped

Figure. **2 Total mosquitoes collected throughout 2021 by month and genus in CDC Light Traps**

Surveillance (Cont'd)



	March	April	May	June	July	August	September	October	November	December
Aedes	992	714	3196	949	8897	3102	1296	260	94	413
Anopheles	2511	2615	2777	2843	1929	2606	3343	1397	155	327
Coquillettidia		55	88	5	7	5	2	9		
Culex	819	790	2167	7253	8603	4757	2776	1477	273	452
Culiseta	165	42	28	20	68	101	202	60	21	48
Mansonia					3	15	15	13	1	3
Orthopodomyia	1									
Psorophora	11	5	64	36	181	575	665	5	9	11
Uranotaenia	2	18	55	83	112	186	294	207	32	2

Figure. 3 **Total mosquitoes collected throughout 2021 by month and genus in Operational Surveillance. Mosquitoes collected using gravid traps using hay infusion water and CDC light traps baited with dry ice.**

Operational Control

Larvicides and Larviciding:

In 2021, the District primarily used *Bacillus thuringiensis israelensis* to kill mosquito larvae, as well as methoprene products in areas where BTI was not applicable. Mosquito Control Technicians treated 1,291 times for a total of 4,270.33 acres. The aerial program made 22 applications for a total of 388 acres treated.

Adulticides and Adulticiding:

Mosquito Control Technicians continued to use Aqualure 20-20 (Permethrin) and Mosquitomist Two (Chlorpyrifos phosphorothioate) for ground ULV spraying and treated 162 times on a total of 110,153.54 acres for adult mosquito control. DUET was used in the hand thermal foggers to handle service requests and other areas 71 times for a total of 9,396.17 acres. Talstar P was used as an adult mosquito control barrier treatment in parks, special areas, and for service requests a total of 222 times equaling 104.83 acres.

Larvicides and Adulticides Used in 2021

Larvicides	Amount Used		Area Treated		Times applied
Altosid WSP	17,097	ea	52.98	acre	313
Altosid XR	488	ea	1.07	acre	32
Altosid XRG	2,610	lb	435	acre	58
Altosid XRG (air)	13,840	lb	384	acre	21
BTI Briquets	1,608	ea	3.66	acre	93
Cocobear	3,620	fl oz	9.43	acre	89
Natular DT	31	ea	0	acre	5
Sustain MBG	5,280	lb	704	acre	127
Sustain MBG (air)	40	lb	4	acre	1
VectoBac 12AS	49,211	fl oz	3,064.19	acre	574
Adulticides	**Amount used**		**Area Treated**		**Times applied**
Aqualure 20-20	19,688.67	fl oz	76,214.16	acre	121
Dibrom (air)	41,576	fl oz	59,408.06	acre	30
Duet 50%	14,752	fl oz	9,396.17	acre	71
Mosquitomist Two	22,400	fl oz	33,939.38	acre	41
Talstar P	35.17	gal	104.83	acre	222

Source Reduction & Biological Control:

A total of 200 used tires were collected and removed throughout the year by AMCD staff and personnel as a means of source reduction.

Empty containers in-and-around residential yards were emptied numerous times when AMCD staff and personnel performed their inspections.

AMCD provided the public with the mosquito larval eating fish (*Gambusia*) for use in retention ponds and ditches 15 times for a total of 173 fish provided.

Applied Research

Arbovirus Detection Techniques & Influencing Factors:

We developed in-house confirmation testing of the antibody-positive sentinel chicken samples with a turnaround of results of a day or two, which is a drastic improvement of the several weeks to months to receive confirmation from the state lab. We figured out that the room temperature does not impact the sentinel chicken sera within a few days. We use mosquito pools to detect the presence of WNV, EEEV, and SLEV. Over 10,000 mosquitos were tested from 825 pools which represented ten local vector species. Two pools tested positive for WNV (one pool of *Culex quinquefasciatus* and one pool of *Culex nigripalpus*).

Good Laboratory Practices (GLP) /DNW Study:

In partner with DNW Global LLC., our science team evaluated a new larvicide product in the laboratory against three species of mosquitoes that are found within our district - *Aedes aegypti*, *Anopheles quadrimaculatus*, and *Culex quinquefasciatus* (Fig.1). This study was conducted under Good Laboratory Practices (GLP) which is the highest level of standards to assure the quality and integrity of the study. GLP studies are required by the EPA for new product registrations. We will continue this study in the Spring as we move into semi-field trials.

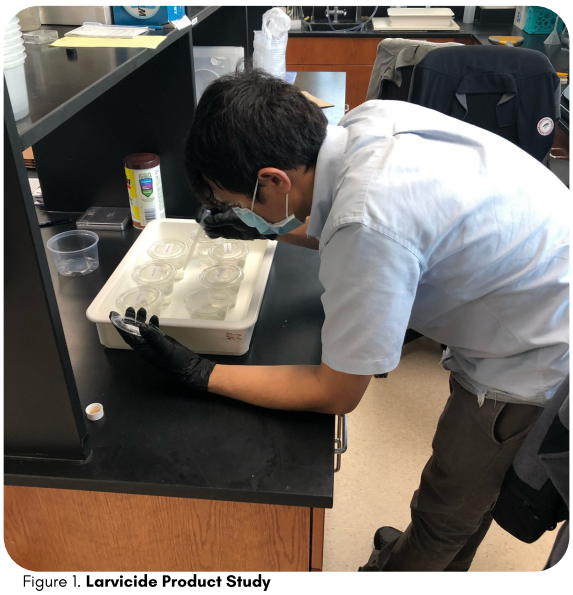


Figure 1. **Larvicide Product Study**

Developed War Fighter Protection program (DWFP) of the Department of Defense (DoD):

Funded by the DWFP/DoD, we started a research on the "Establishing evidence-based action thresholds for *Aedes*, *Culex*, and *Anopheles* mosquito abundance in different operational environments of deployed war fighters of the United States". We successfully completed a preliminary questionnaire survey on the identification of mosquito control programs in different continental regions and US military units which have set action thresholds for mosquito control. A follow-up survey with selected programs which claimed to have set action thresholds was stated in November 2021 and on-going. We developed several statistical models on action thresholds for different mosquito groups using AMCD historical mosquito abundance data and associated meteorological data. A systematic literature review on mosquito control action thresholds was in preparation and still on-going.

CDC & UF Collaborative Grant about Smart Cage (2nd year):

The effectiveness of adulticides and spray delivery systems have traditionally been evaluated with bio-assays cages. These evaluations have reported varying levels of success ranging from excellent to dismal performance. The reasons for non-effectiveness could be that spray did not reach the cage or the pesticide is not toxic enough and it is difficult to decide between the two. One way to resolve that is to determine how much spray is delivered to the site of the bioassay cage by droplet size measurement or by spray quantification. Results from both of these methods are not readily available. Smart cage is being developed to estimate the amount of spray reaching the cage and deliver the results in real time. The prototype cage or spray collector consists of laser droplet counter, memory card, processor, antenna, and power source. The unit is able to measure droplets up to 10 µm and is able to deliver wirelessly in real time to a PC in the laboratory. The cage will be calibrated to cover full droplet size spectrum of a ULV spray by comparing with spray quantified using dyes and fluorimeter.

Applied Research (Cont'd)

Evaluation of Thermal Fogger for Larvicide-Adulticide Mixture Application Efficacy:

The efficacy of dual application of adulticide (permethrin) and larvicide (BTi) as a mixture using hand-held thermal fogger was studied in the field. The Longray model TS-35A(E) thermal fogger capable of delivering water-based products was used to apply a mixture of VectoBac 12AS (larvicide) and Aqualuer 20-20 (adulticide) at 2 gallons per acre. Adulticide was applied at maximum label rate of 0.5 oz/acre whereas larvicide was applied at 8, 24, 36 and 48 oz/acre. In general, larval mortality decreased with increasing distance from spray and increased with increasing application rate. The larval mortality at all distances was strongly correlated with application rate. The highest rate used produced 64 -95 % larval mortality at all distances. The results indicate that both applications can be made simultaneously if the highest application of both is used.

Figure 1. **ULV Adulticide Application**

Evaluation of Three Backpack Sprayers:

Three battery powered backpack sprayers, Field King 190515, Ryoby One+, and Spray Mate, were evaluated in the open field for their potential to apply ULV adulticide applications. Effectiveness of these sprayers was assessed up to a distance of 50 ft from the spray line using 8 bio-assay cages hanged 4 ft above ground in two rows of 4 cages in each (Fig. 1). Each cage had 25, 5-7 days old female *Aedes aegypti* and their mortality after 24 hours was used as the effectiveness indicator (Fig.2). The results indicated that sprayers were effective up to 10 ft from the spray line whereas further downwind, the mortality from all sprayers was less than acceptable. Among the sprayers, Spray Mate provided highest mortality, followed by Ryobi, and Field King provided the least mortality. If a short distance control is acceptable, a ULV application using Spray Mate is the best option.

Figure 2. **Adult Mortality**

Evaluation of Contact and Spatial Repellents:

Five natural oils, Clove oil, Eucalyptus oil, Geraniol, Immortelle oil and Lemongrass oil were evaluated using the True Choice Olfactometer (Fig. 1). BG Lure was used as an attractant. Overall, the Clove oil, Eucalyptus oil, Geraniol, Immortelle oil and Lemongrass oil had 65, 54, 63, 41, and 65% repellency, compared to 42% by BG lure. Individually, 62.5 µL of Lemongrass oil, 125 µL of Eucalyptus oil, 250 µL of Clove oil and Geraniol, and 500 µL of Immortelle oil had highest repellency.

Twelve new formulations containing medium-chain fatty acids, six each having decanoic acid (C10) and lauric acid (C12) derived from palm oil and coconut oil, provided by Onedrings Lavender Farm (OLF), Clarksville OH were evaluated in olfactometer for spatial repellency against *Aedes aegypti* mosquitoes. Among all decanoic acid formulations tested, the concentration of 2.25 %(wt) indicated the best level of spatial repellency. None of the lauric acid concentrations showed any level of spatial repellency.

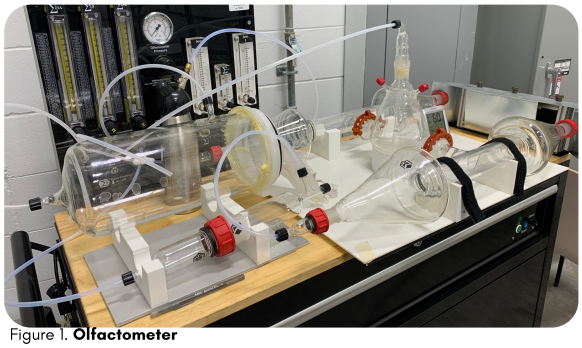
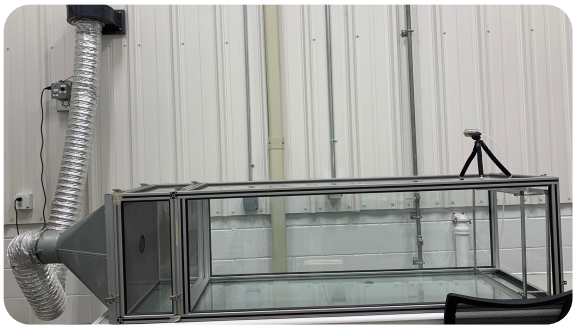


Figure 1. **Olfactometer**



Applied Research (Cont'd)

Sterile Insect Technique (Collaborative Grant with UF, USDA/CMAVE)

This grant starts from 2019 and end by the end of the year 2021.The goal is to evaluate the effects of mass release of irradiated *Aedes aegypti* in reducing the population density in the treatment site in downtown St. Augustine, FL.

Irradiated *Aedes aegypti* were shipped from USDA/CMAVE to the AMCD for release twice a week from mid-February up to mid-November. A total of 70 releases were completed during 2021 (Fig. 1). Weekly entomological monitoring, with 24 BioGents Sentinel traps and 34 ovi-traps per site, in treatment and control sites were conducted since the first week of January until the second week of December. The field activities of the operational pilot study were thus completed. The population was gradually reduced.

Figure 1. **SIT Release**

Applied Research (Cont'd)

Collaborative, Ongoing, and Completed Applied Research Projects for 2021 (Cont'd):

Evaluation of trap design (Internal Sponsor)

Evaluate the efficacy of BG Counter (Internal Sponsor)

Detection of hemoglobin in mosquitoes (Herb Nyberg Sponsor)

Stability of chicken serum (Internal Sponsor)

Development of in-house IR assay (Internal Sponsor)

Evaluation of BIGSHOT Nanopesticide as a repellent for ticks (BIGSHOT Sponsor)

Evaluation of BIGSHOT Nanopesticide as acaricide (BIGSHOT Sponsor)

Thermal Fogger tp apply adulticide and larvicide as a mixture (Internal Sponsor)

Spatial candle evaluation in screened enclosures (Central Life Science Sponsor)

New larvicide and adulticide study (Central Life Science Sponsor)

Attractant Study (Woostream Sponsor)

Evaluation of candidate products for thermacell unit (Thermacall Sponsor)

Evaluation of repellents (Onedrings Sponsor & RepelettesTM)

Natural oils as spatial repellents (Internal Sponsor)

Evaluation of battery-powered misters as ULV sprayers (Internal Sponsor)

Bio-Efficacy of REXCU-S as a Larvacide against three species of mosquitoes (DNW Global Sponsor)

Evaluate the educational focus of vector-borne diseases (Internal Sponsor)

Education Program

AMCD Education and training

Annual training was done in-house in February for full-time employees and again in May, and June for those that needed to make up any training and for new hires. In April 2021, Mr. Dana Smith, Mr. Morgan Duet, Mr. Ralph Bruner, Dr. M. Farooq, Mr. S. Smoleroff, and Mr. Mike Phillips attended the Lee County Mosquito Control Aerial Workshop. Four AMCD employees attended the Hazardous Materials Operations/OSHA Level II training in September 2021 and received a certificate of completion. Numerous AMCD employees attended the Virtual DODD Short Courses from February 1st to 5th, 2021. Nine employees, and four commissioners attended the FMCA annual meeting in November, 2021.

Community Events/Public Outreach

AMCD was involved with: Cracker day, National Night Out (Fig. 1), Ancient City Kids Day, and St. Augustine Christmas Parade (Fig. 2 & 3). AMCD created new educational videos with 2,389 cumulative views. AMCD was involved with the Meeting with the Academy of Coastal and Water Science Advisory Board. Dr. Qualls & Commissioner Mrs. Becker gave a talking about GMO for Round Table, Dr. Qualls gave a presentation for Kiwanis Club, Dr. Xue and Commissioner Mrs. Moeller gave a talking at Flagler County Board meeting, Dr. Xue and Mr. Weaver gave a talking about education center for the Rotary Club and was interviewed by TV channel 4. Commissioner Mrs. Becker gave several talking at local community. Dr. Qualls, former education specialist and Commissioner Becker were interviewed by local radio stations. Local Newspaper and other papers /publications published about AMCD education center, helicopters. AMCD was active on social media platforms: Instagram, Twitter, and Facebook. Many events that AMCD normally attended in past years were canceled due to COVID-19.

Figure 1. **National Night Out**

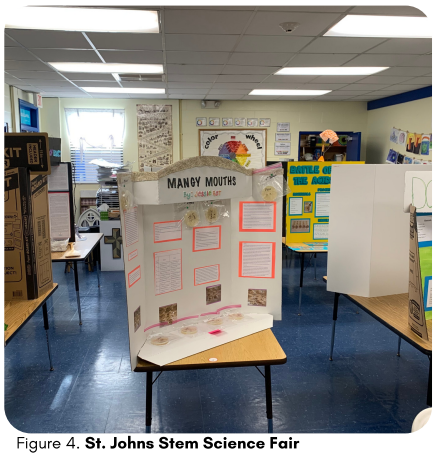


Figure 4. **St. Johns Stem Science Fair**

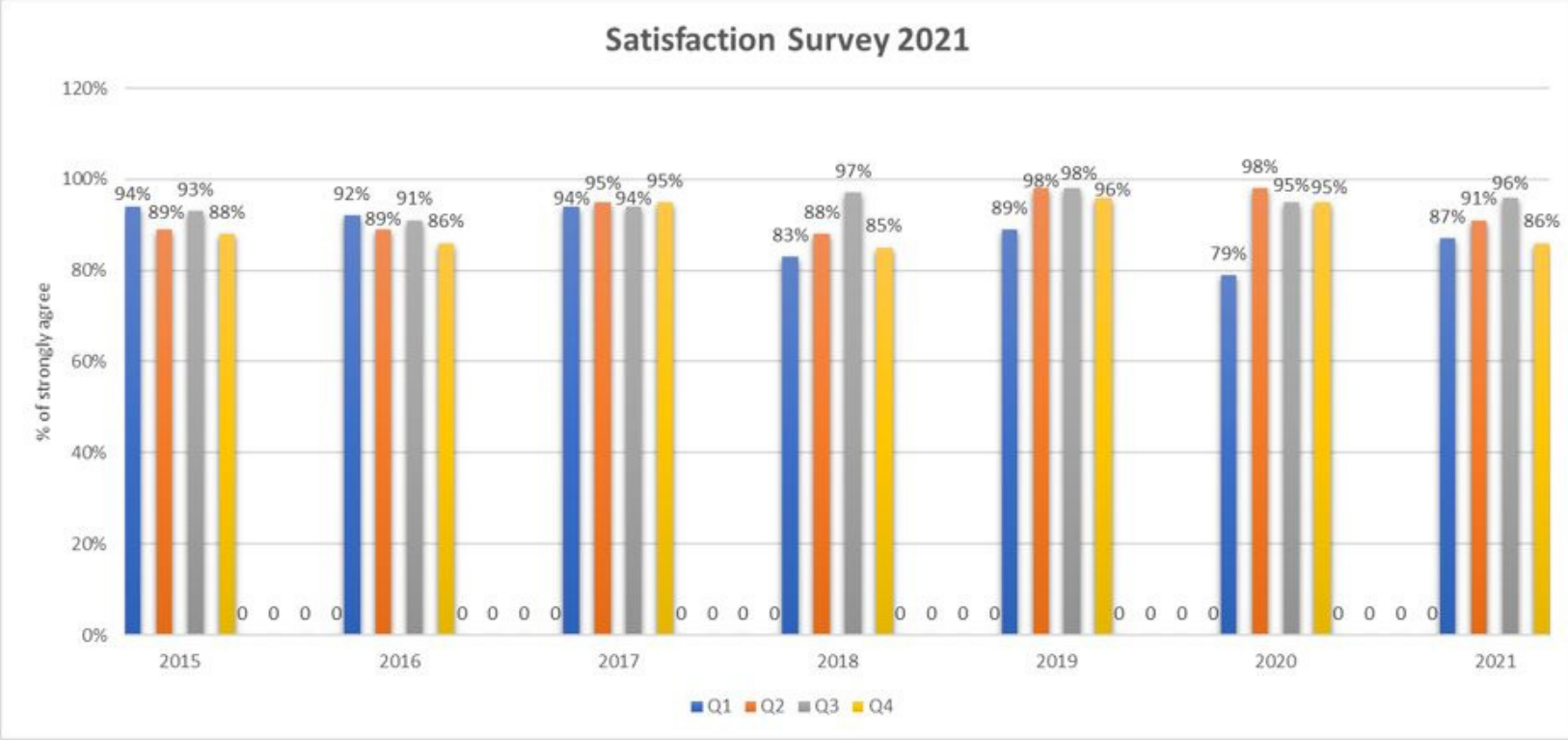

Figure 2. **Christmas Parade**


Figure 3. **Christmas Parade**

St. Johns County School Program

In 2021, AMCD taught a BTI lab at St. Johns Technical High. The District was once again asked to judge the St. Johns County STEM Fair (Fig.4).

Education Program (Cont'd)



Satisfaction survey questions

Q1- I am aware of and actively participate in the DRAIN and COVER method: Drain standing water and cover your skin with clothing and repellent.

- The number of people who respond "strongly agree" has declined since 2015

Q2- The AMCD staff were professional.

- The number of people who respond "strongly agree" has increased since 2015

Q3- AMCD responds to my service requests within the standard 1-2 business days.

- The number of people who respond "strongly agree" has increased since 2015

Q4- The AMCD staff were informative.

- The number of people who respond "strongly agree" has remained steady since 2015

Professional Meetings, Symposiums, & Workshops

Organized and Attended by AMCD Staff and Commissioners

O. Sypes. Presented a poster for Research Day, Emerging Pathogens Institute. University of Florida/EPI, Innovative *Aedes aegypti* control in St. Augustine, Florida using irradiated mosquitoes. Virtual, Feb 2021

V. Aryaprema. Presented on the "Utilization of irradiated *Aedes aegypti* by the Anastasia Mosquito Control District, St. Augustine, FL. DODD Short Courses presented by FMCA, Virtual. January 2021.

S. Peper, BM Rendon, Webb C Reinoso, SJ Johnson, CD Gleasner, BG Bolling, and SM Presley. Evidence of West Nile virus and Saint Louis encephalitis virus in pools of mosquitoes testing negative for both viruses using real-time PCR. American Mosquito Control Association Annual Conference, Virtual. 1-5 March 2021.

S. Peper, WA Qualls, M Farooq, and RD Xue. Development and validation of in-house arbovirus detection capacity for screening of West Nile virus antibodies during a pandemic. American Mosquito Control Association Annual Conference, Virtual. 2-5 March 2021.

R.D. Xue, and K Gaines gave a presentation on AMCD's decision-making-based action threshold. Action-threshold symposium organized by Dr. Xue. American Mosquito Control Association, Virtual. 1-5 March 2021.

R.D. Xue. Collaboration with military organizations benefit to AMCD program. AMCA's Military and Local Mosquito Control Programs symposium, AMCA annual meeting, virtual. 1-5 March 2021.

R.D. Xue. Conference President address: Response of mosquito control during COVID pandemic. 7th International Forum for Surveillance and Control of Mosquitoes & Vector-borne Disease. virtual. 15-18 August. 2021.

W. Qualls. AMCD applied research program overview. 7th IFSCMVD. Virtual. 15-18 August 2021.

R.D. Xue. Education, economic, public health, and its impact. COST meeting. Virtual. March 2021.

R.D. Xue. Control action and response to population outbreak. Jangsu Vector Control Association meeting. Virtual. May 2021.

R.D. Xue. Response for reinvasion of *Aedes aegypti* in St. Augustine, Florida. Society of Vector Ecology annual meeting, virtual, September 2021.

S. Peper. In-house capabilities for arbovirus surveillance at AMCD. Florida Mosquito Control Association Annual Conference, Duck Key, Florida. 15-18 November 2021.

W. Qualls, R. Connelly, CDC, organized a symposium at the 87th AMCA Annual meeting entitled " CDC Hurricane Cooperative Agreement funding: Enhancing Mosquito Control Capacity for Response to Natural Disasters", 1-5 March, 2021.

W. Qualls. Enhancing resources and capacity of entities that do mosquito control in Texas. 87th AMCA Annual meeting (virtual), 1-5 March 2021.

W. Qualls. Chaos after the Storm at 87th AMCA Annual meeting (virtual). March 1-5, 2021.

W. Qualls. Ground and Aerial Calibration—Tips and Tricks, FMCA/DODD (virtual) , January 2021.

M. Farooq. Droplet Size Measurements. Lee County Mosquito Control District, April 11-14, 2021.

M. Farooq. Evaluation of Hand-held Thermal Fogger for Larvicide-Adulticide Mixture Application at FMCA Annual Meeting, Duck Key, FL. 15-18, November ,2021

S. Smoleroff. Surveillance report about mosquito population in St. Johns County at FMCA Annual Meeting, Duck Key, FL, 15-18, November 2021.

H. Ward. Mosquito pooling for arbovirus surveillance at FMCA annual meeting, Duck Key, 15-18, November 2021.

W. Qualls. AMCD's collaborative projects at FMCA meeting, Duck Key, 15-18, November 2021.

K. Blore presented essential oils against mosquitoes at FMCA annual meeting, Duck Key, 15-18, November 2021.

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Sanchez-Arroyo, H, Pereira, RM, Xue, RD, Moser, BA, Koehler, PG. 2021. Different toxicity of pyrethroid and organophosphate insecticides to *Apis mellifera* and *Aedes aegypti*. JFMCA 68:67-75.

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Marcia Kay Gaines
Operations Manager

Scott Hanna
Accountant/ CFO

Taylor Ballantyne
Education Specialist

Dena Autry
Supervisor of Operations

Richard Weaver
Business Manager

As always, we would like to thank all residents of St. Johns County for their support, as well as the AMCD Board of Commissioners, the District's attorney, and CPA, all employees, colleagues, and all contractors, cooperative organizations, and agencies for their help in 2021.

ANASTASIA MOSQUITO CONTROL DISTRICT