NEW ORLEANS MOSQUITO & TERMITE CONTROL BOARD

2018 ANNUAL REPORT

Aedes aegypti

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DIRECTOR'S REPORT

Report on the Activities of the City of New Orleans Mosquito, Termite, and Rodent Control Board from January 1 - December 31, 2018

Each year brings changes and new challenges, and 2018 was no exception. Mayor Cantrell's administration began in May. NOMTRCB continues to report to Homeland Security under the supervision of Col. Terry Ebbert. I had the pleasure of meeting Col. Ebbert in the Emergency Operation Center after hurricane Katrina, and we are fortunate to have the opportunity to work with him again.

The winter and spring seasons were relatively quiet due to the cool temperatures. However, as summer progressed, numerous mosquito pools tested positive for West Nile virus (WNV) on the East Bank of New Orleans, and two human cases were reported.

The Zika Enhanced Laboratory Capacity Grant activities consumed much of our time in 2018. One important outcome of these activities was the initiation of parish-wide assessment of insecticide resistance in *Aedes aegypti* (the Yellow Fever mosquito), which constitutes the most widespread assessment of resistance since 2005. Preliminary results indicate that resistance occurs on a very limited basis and that the insecticides in use are effective against this mosquito species. Another outcome is the successful development of ground larviciding methodology, which adds a layer of preparedness for combatting mosquitoes and arboviral epidemics. Mosquito control employees worked together to configure the equipment and conduct field trials to validate these methods.

Community and industry outreach remains an essential part of our program. The first annual NOLA BugFest was held in May and drew guests from throughout the city and metropolitan area. More than 30 exhibitors participated in the event. We continue to engage the community through education and promotion of integrated pest management practices and by emphasizing the importance of community participation in remediating conducive conditions for pest problems. In July 2018, we began city-wide notifications for mosquito control treatments, which provide transparency and are well-received by the public.

I would like to thank the employees of NOMTRCB for their hard work and dedication to the City of New Orleans and their desire to protect human health and property. Details of our 2018 activities and accomplishments can be found in this report.

Respectfully submitted,

Dr. Claudia Riegel, Director

OPERATIONS AND FACILITIES

CLAUDIA RIEGEL, Ph.D.

Board Members

The year 2018 commenced without Mr. Gary Meadows, who passed away on December 21, 2017. Mr. Meadows was an active member of the New Orleans Mosquito, Termite and Rodent Control Board for over 20 years and collaborated with NOMTRCB regarding termite control. He was a leading proponent of termite resistant materials and introduced this information to architects, engineers, and others in the construction market throughout the City of New Orleans. His contributions were numerous and included providing expertise during the design and construction of the Administration Building. His expertise will be difficult to replace on the Board, and he will be dearly missed.

Figure 1. Mr. Gary Meadows was co-chair of the NOMTCRB and a long-time member.

The Mayor and Council election introduced a new administration, and Councilmembers were installed in May 2018. New Board Members took the place of members from Mayor Landrieu's Administration. We thank Mayor Landrieu and his administration for supporting the priorities of the NOMTRCB.

New Board members include Gilbert Montãno (CAO), Cindi Nguyen (Council District D), and Dr. Jennifer Avegno (Health Director). Dr. Gary Balsamo (Louisiana Department of Health, Office of Public Health) resigned from the Board.

Employees

In 2018, We hired several employees. Dr. Jennifer Breaux (Fig. 2A) and Dr. Mohamed Sallam (Fig. 2B) both began in January 2018. Dr. Breaux (Entomologist I) was trained as a mosquito biologist and community ecologist where she focused on understanding how ecological interactions among mosquito larvae impact resulting adult life history and vector competence for pathogens, as well as how biotic and abiotic factors in artificial container systems affect invertebrate community dynamics and adult mosquito production. She was hired to assist with the Enhanced Laboratory Capacity Grant. Her main responsibilities at NOMTCRB in 2018 included investigation of mosquito biological control options in Orleans Parish, assisting with routine surveillance, staff instruction for larval identification, and investigating the public health risks associated with mosquito populations in discarded tires in New Orleans.

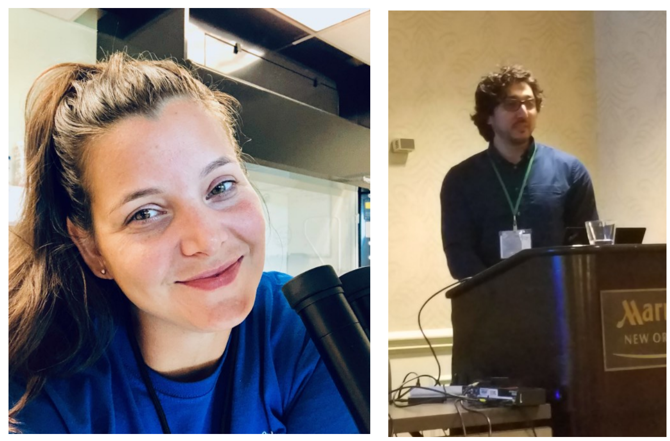


Figure 2. A) Dr. Jennifer Breaux and B) Dr. Mohamed Sallam joined NOMTRCB in January 2018.

Dr. Mohamed Sallam also joined NOMTCRB in January. Dr. Sallam has extensive experience in medical and urban entomology and geospatial analytics. In 2016, we worked together to evaluate southern house mosquito population dynamics and the risk of West Nile virus in New Orleans. At NOMTCB, his primary responsibility was to compile 13 years of surveillance data, a task which took nearly 8 months. His contributions will enable the use of a robust, multi-year database to better understand the relationships between mosquito populations and demographic and environmental variables such as land use, human population density, and climate, and to better understand how these factors contribute to the risk of arboviral transmission in New Orleans.

Unfortunately, Dr. Sallam was employed with our group for only a short time. In September 2018, he accepted a position with the Navy Entomology Center of Excellence in Jacksonville, FL. We continue to collaborate with him and several articles are currently being drafted for submission for peer review and publication in 2019.

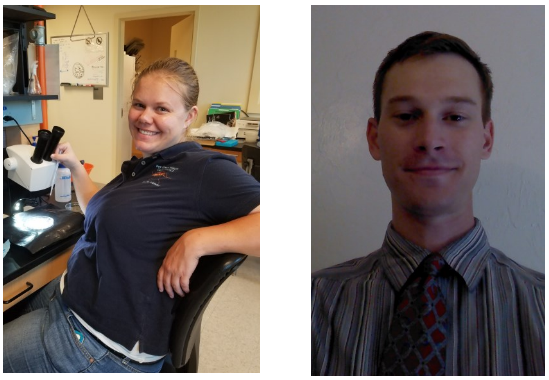


Figure 3. A) Alice Harman and B) Thomas Anderson began working in the summer and fall, respectively.

Alice Harman (Fig. 3A) joined NOMTRCB as a summer intern while in graduate school at Tulane University. Upon graduation in August, she started working full-time as a Pest Control Specialist I. Alice trains new staff on mosquito larval and adult identification, assists with weekly surveillance activities including mosquito identification and data management. She also manages the laboratory portions of the ELC-related tire and biological control projects and maintains the mosquito biocontrol agent colonies in the Administration Building insectary.

Thomas Anderson (Fig. 3B) joined NOMTRCB in the Fall of 2018 as a Pest Control Inspector 2. He has a strong background in mathematics, and his main responsibilities include managing mosquito data sets and conducting bottle bioassays for the ELC grant. He is also part of our core mosquito surveillance field team and participates in weekly mosquito collections and identification.

Mrs. Phuong Nguyen (Office Clerk Trainee) began working at NOMTRCB in the Fall of 2018 (Fig. 4). As a direct report to the director, she provides assistance with daily administrative duties. Her responsibilities included reviewing payroll and assisting with training academies, and much more.

Figure 4. Phuong Nguyen has been a great help and has been involved in many projects.

Princeton King won 1st place in a poster competition at the 61st Annual Louisiana Mosquito Control Association in Lafayette, LA. The title of his poster was, "Area-wide larviciding in an urban landscape, Orleans Parish". Princeton has been a leader in mosquito control field operations and is a dedicated and exemplary employee.

Figure 5. Princeton King won first place in the poster completion at the Louisiana Mosquito Control Association meeting in Lafayette, LA.

Dr. Sarah Michaels (Entomologist 1) resigned in August 2018 (Fig. 6). She worked with NOMTRCB for 7 years and was an essential part of the mosquito control team. Dr. Michaels took a position at Cornell University. She will be missed, and we wish her the best in her new endeavor.

Figure 6. Dr. Sarah Michaels inspects containers for larvae.

Light Duty

NOMTCB has continued to partner with Mr. Al Delaparte (Risk Management Director) to provide light duty work for city employees. Many departments do not have light duty available, in which case injured employees are not able to return to work. Approximately one year ago, NOMTRCB began hosting light duty employees from various departments across the city. We offer many types of light duty work depending on the restrictions of the candidate, and numerous people have worked in our department for varying lengths of time. The goal of this program is to get the employee back to work as soon as possible. The light duty employee's salary is paid from their originating department. This has been a highly successful program that has reduced costs for the city while successfully returning injured employees to the workforce.

Facilities

Administration building

Numerous events have been held in the training room in 2018. Examples include NOMTRCB departmental meetings, workshops, and training academies. A variety of City of New Orleans departments, including the Health Department, Civil Service and others, have utilized the space. Perry Ponseti (Pest Control Specialist II) has done an excellent job coordinating these events. The Greater New Orleans Pest Control Association also hosts their spring and fall re-certifications at our building.

The HVAC system was rebalanced in the Administration building. The humidity inside the building was above normal and at times high (>60%) In addition, the plenum attic was improperly installed. The plenum is not fully closed and outside is pulled into the building between the brick and the drywall. The Legal Department was contacted and a letter was sent to the contractor. This matter will be pursued in 2019.

Hanger

Capital Projects completed the plans for renovating the hanger. The project was put out to bid, the contractor was selected, and the contract was routed. The project is scheduled to begin in February 2019. Ed Foster (Aviation Supervisor) and Princeton King (Pest Control Specialist II) did a great job packing and moving the equipment and items from inside the hanger. Ellen Waguespack (Capital Projects) has been assigned to the project. She has performed several site visits and has set up regular meetings to discuss the project. The project is currently behind schedule, but once started, the construction is estimated to last a maximum of 180 days.

Figure 7. Several building and planning meetings were held at the NOMTCRB hanger.

Warehouses

The warehouses located at 5617 Hayne Blvd. now serve as the home base for our field operations. We moved from a much larger footprint and we are running low on space. In 2017, we purchased cargo containers and supplemented with one more in 2018. The containers provided more storage space. Despite preparing the warehouses for 3 days of freezing temperatures, the water line outside the mechanics shop froze and required repair. Eighteen feet of line was replaced.

Figure 8. In 2018, mosquito traps and supplies were organized at the NOMTCRB warehouse.

Jennifer Hamilton (Pest Control Specialist II), Joe Robert (Plant Maintenance Supervisor), and Brooks Hartman (Pest Control Specialist III) worked with ITI and the contractor to make the modifications required to install internet at the warehouse. An ADP time clock also installed. Having connectivity has greatly improved the efficiency of daily operations.

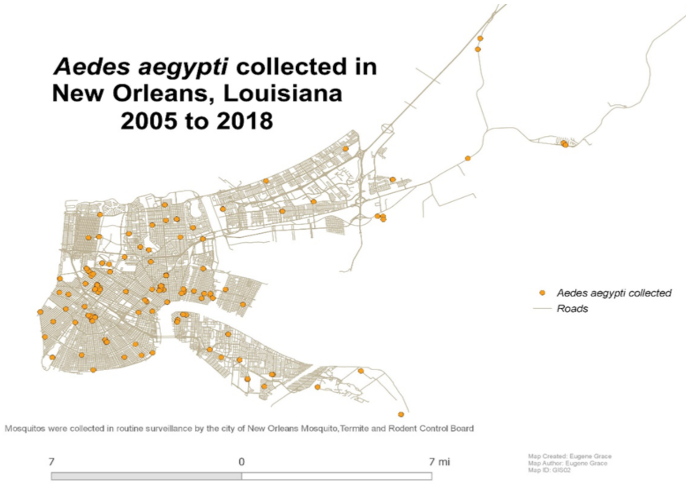


Figure 9. *Aedes aegypti* collected in New Orleans Parish from 2005-2018 during routine surveillance.

Operations

Mosquito Control

In 2018, a 13-year database of mosquito surveillance was compiled (Fig. 9) and we now have a complete, uniform, and electronic data set. Dr. Mohamed Sallam, James Beck (Pest Control Inspector II), and Thomas Anderson worked together to complete the project. The database is updated each week as new surveillance records are collected.

The database includes mosquito presence and abundance (host seeking and oviposition), arbovirus surveillance data from mosquito pools, aerial and spatial spraying events in each spray zone, and land use-land cover, climate, and socio-economic data layers. The reason to sustain a consistent data repository is to articulate all of this information to cover the gaps in our surveillance and control efforts. Accordingly, this will help to improve our understanding of spatiotemporal patterns of risk for mosquito bites or disease transmission and will inform strategies for intervention.

We had an active mosquito season in 2018. Two human West Nile virus cases were reported on the East Bank of Orleans Parish. Adulticiding and area-wide larviciding, yard inspections (outreach), and source reduction (removal of tires and other containers) were conducted to reduce the risk of human infection.

Our surveillance program utilizes 46 trap locations throughout New Orleans. Mosquito counts and the presence of arbovirus-positive mosquito pools are the primary metrics used for determining which control strategies will be chosen. Therefore, much effort is placed into conducting mosquito surveillance. Traps are set on Monday and collected on Tuesday before noon. The collected mosquitoes are sorted, counted, and identified to the level of species. A subset of the mosquitoes are combined into "pools" and delivered to the Louisiana Animal Disease Diagnostic Laboratory (LADDL) in Baton Rouge on Wednesday for arbovirus testing. By Friday afternoon, LADDL representatives report the presence of arboviruses such as West Nile virus if detected in the submitted mosquitoes.

A core team at NOMTCRB evaluates mosquito counts, arbovirus results, calls for service from the public, and weather each week to determine which control tactics will be implemented. In the spring, most of calls for service are for nuisance species and as the summer progresses, mosquitoes of medical importance such as *Culex quinqufasciatus* (the southern house mosquito), *Aedes aegypti* (the Yellow Fever mosquito), and *Aedes albopictus* (the Asian tiger mosquito) become the main species of concern.

One of our missions at NOMTRCB is to monitor arbovirus activity in sampled mosquito pools. The goal is not only to map the onset of disease-causing pathogens circulating in mosquito vectors, but also to delineate the geographical distributions of infected mosquitoes and the influence of control efforts on those distributions. Spatial statistics tools in the Arc-GIS toolbox were used to generate distribution maps before and after larvicide application in August 2018. The geographic distribution of the likelihood of positive pools was associated with increased mosquito density (Fig. 10).

Details of our mosquito, termite, and rodent control operational projects can be found in other sections of this annual report and associated appendices.

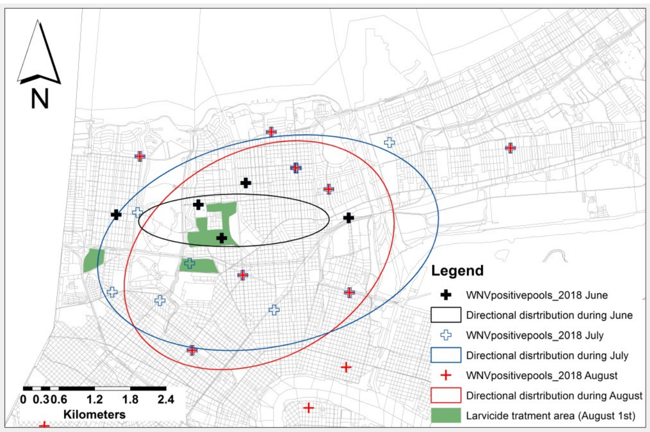


Figure 10. Geographic distribution pattern of positive mosquito pools before and after larvicide application.

Cooperative Projects

Enhanced Laboratory Capacity Grant

The US Congress appropriation bills fund Epidemiology and Laboratory Capacity (ELC) for infectious Disease Cooperative Agreements to strengthen the ability and capacity of public health agencies to respond to, prevent and control domestic infectious disease threats. In 2016, the Louisiana Department of Health, Office of Public Health, Infectious Disease, Epidemiology Section of the State of Louisiana partnered with the City of New Orleans to submit a proposal. The proposal was funded and $1,006,912 was awarded to the City of New Orleans.

In 2017, The Louisiana Department of Health, Office of Public Health, Infectious Disease, Epidemiology Section of the State of Louisiana and the City of New Orleans established a cooperative endeavor agreement for the value. The award was shared among the New Orleans Health Department, the Sanitation Department, Code Enforcement, and NOMTRCB. The majority of the funding was specifically for *Aedes aegypti* vector control.

The deliverables of the grant were to:

1) increase surveillance of *Aedes aegypti* and *Aedes albopictus* in Orleans Parish;

2) educate healthcare providers and the public regarding the risk, clinical manifestations, laboratory diagnosis, and prevention of Zika virus infections;

3) remove waste tires in Orleans Parish;

4) enhance enforcement of City Code for sustainable results and remediate overgrown lots;

5) develop localized and area-wide larvicide treatment optimization and economic feasibility for dense urban centers such as New Orleans;

6) investigate the use of biological control agents for larval control in permanent and semi-permanent containers; and

7) develop programs for insecticide resistance monitoring and management.

Great strides have been made since 2017 because of the funding provided by the ELC grant. Equipment purchased with grant funds has enhanced our infrastructure. Funding also allowed the evaluation of control strategies that are now used in general operations, and our overall level of preparedness has improved since the grant was awarded. Each of the deliverables are discusses in the Mosquito Control portion of the Annual Report.

Industry-supported Operational Research

NOMTRCB continues to work with a variety of organizations, including private industry. These projects generate revenue to purchase equipment and supplies, and the salaries of several part-time employees are funded by these projects. NOMTRCB has long-term agreements with several manufacturers in the urban and vector industry. Their available funding is variable and based on research priorities for that year.

MOSQUITO FIELD OPERATIONS

TAMER AHMED, FRIEDE BAUDER, JAMES BECK, JENNIFER BREAUX, Ph.D., ERIN CLOHERTY, TREVOR DUPREE, CYNTHIA HARRISON, PRINCETON KING, SARAH MICHAELS, Ph.D., AND MOHAMED SALLAM, Ph.D.

New Orleans had three consecutive days of below freezing (32 ˚F) temperatures in January of 2018. The cold winter and mild spring temperatures ushered in a slow start to the mosquito season. This allowed for additional time to purchase new equipment, plan additional treatment evaluations, and administer educational programs targeting a variety of audiences.

Surveillance

Routine surveillance includes a core team that performs weekly adult mosquito collections by placement and removal of traps at 46 locations throughout the City of New Orleans (Fig. 11). Gravid trap collection resumed for the season in late February 2018. Gravid traps (John Hock, Gainesville, FL) target *Culex* species seeking suitable locations inwhich to lay eggs. BG Sentinel traps (BioGents, Regensburg, Germany) were also placed at the same surveillance sites in order to collect *Aedes aegypti* and *Ae. albopictus*, the vectors of dengue and Zika viruses. In addition, ovitraps were placed at routine surveillance sites for collection of *Ae. aegypti* eggs for insecticide resistance testing. For routine surveillance, all adult mosquitoes were brought to the laboratory for identification. All *Culex* species from gravid traps are sorted, pooled, and prepared for transportation to the LADDL for weekly arbovirus testing.

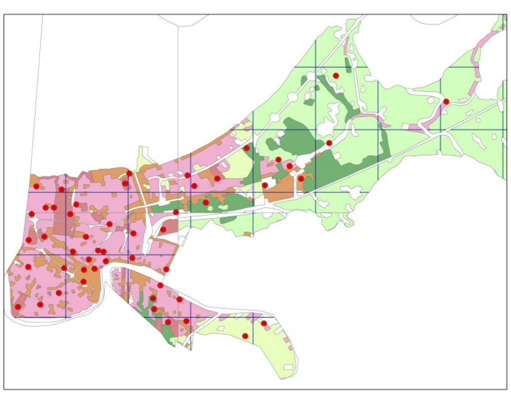


Figure 11. Forty-six sites across the City of New Orleans were used for routine mosquito surveillance.

Enhanced sites encompassed 15 additional treatment zones (based on ULV ground-truck applications) in the downtown, CBD, 7th Ward, Garden District, Uptown, Broadmoor, Mid-City and Hollygrove areas, and collections began for the season in early March. The number of eggs collected per week was monitored and eggs were stored until numerous enough for rearing to adulthood for bottle bioassay testing. Eggs collected in 2017 (from the West Bank and Upper and Lower 9th Wards) were hatched in March 2018 for the initial round of bottle bioassay testing in April 2018.

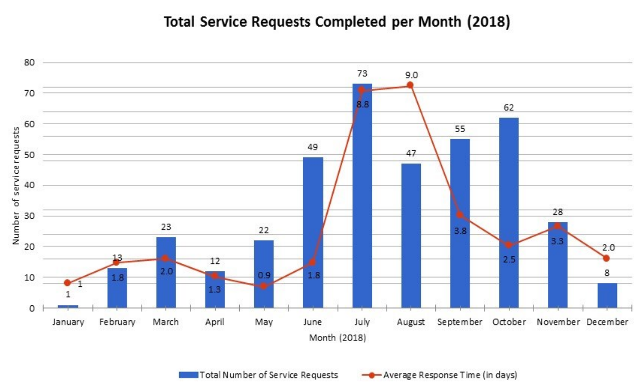


Figure 12. Mosquito service requests received by month in 2018.

Service Requests

Mosquito control inspectors responded to requests for service through 311 and by email. A total of 394 calls for service were received in 2018 (Fig. 12). The majority were requests for inspections of standing water near homes or for area-wide adulticide treatments. The first ground ULV treatments using Fyfanon® (FMC Agricultural Solutions, Philadelphia, PA) occurred in May in response to increasing numbers of *Cx. quinquefasciatus* in gravid trap collections.

Staffing

Funding provided by the Louisiana Office of Public Health and the Centers for Disease Control and Prevention through the Zika Enhanced Laboratory Capacity (ELC) grant allowed the hire of student interns for 3-month appointments beginning in February 2018. Student interns based both at NOMTCB and the New Orleans Health Department (NOHD), learned about vector ecology and biology, assisted with organizing, planning and participating in outreach events, and created a survey tool to assess the effectiveness of outreach activities. Student interns have included undergraduate and graduate students from Tulane University and Louisiana State University Public Health programs.

Community Outreach

In early March, NOMTCRB and NOHD met with representatives from the City's GIS program, The developer recommended creating a survey tool using the "Survey 1-2-3" application. This program integrated with existing city property data and other resources, and these collective data are displayed on a dashboard interface (Fig.13). The "Zika Community Outreach" survey included information on the property location, type, condition, observations of the number of water-holding containers, and the ability to designate whether follow-up was needed.

Outreach was conducted from March to June in 2018 (Fig. 14). New interns and employees were trained in property inspections and effective interview techniques. Household data were entered into "Survey 1-2-3", and residents were given door hangers with mosquito prevention information. A total of 957 properties were surveyed in 2018 (Fig. 15). When possible, a household member was interviewed regarding the property conditions, outdoor activities

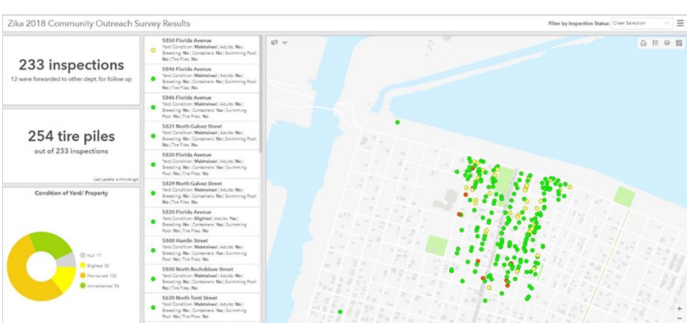


Figure 13. Survey dashboard with Survey 1-2-3 data collected by student interns in the Lower 9th Ward in March 2018.

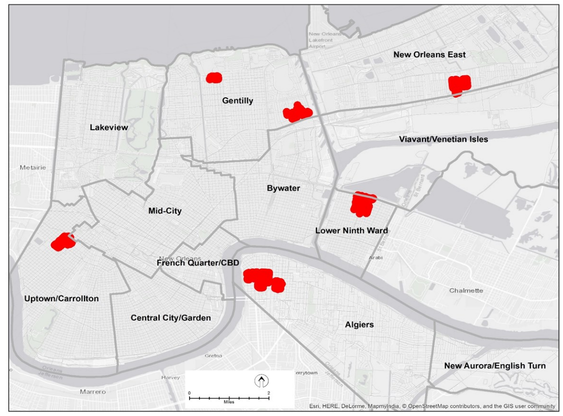


Figure 14 . Household surveys were completed to assess knowledge about mosquito breeding at the household level in New Orleans.

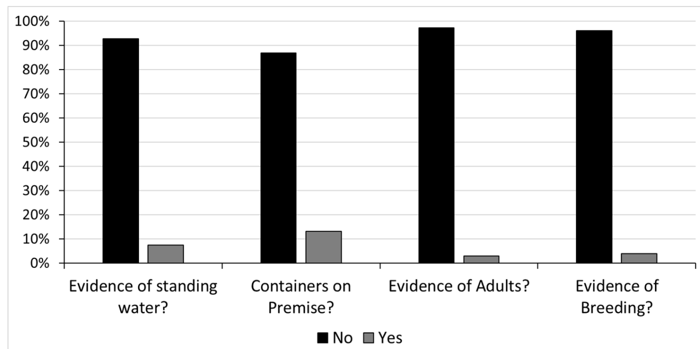


Figure 15 . Household surveys (n=957) from March to June 2018 determined that containers were found on approximately 12% of properties. During this time, larval mosquitoes were found in less than 5% of the containers inspected.

likely to expose residents to mosquito bites, and knowledge of common mosquito diseases. The properties were also inspected in order to determine the types of containers found and whether or not mosquito larvae were present.

Waste Tire Cleanup

The Department of Sanitation, NOHD and NOMTRCB removed waste tires throughout the City of New Orleans. Approximately 47,927 tires were collected and disposed of in 2018. NOMTRCB is permitted as a waste tire transporter by the Louisiana Department of Environmental Quality (LADEQ). NOMTRCB removes waste tires during neighborhood outreach events (Fig. 16), neighborhood sweeps (Fig. 17), and as a component of ELC grant-related projects.

Discarded tires represent a profitable breeding habitat for nuisance and vector mosquitoes. NOMTRCB received an Enhanced Laboratory Capacity (ELC) federal grant. Part of this grant is for mosquito habitat removal. Dr. Tamer Ahmed conducted waste tire monitoring and collecting. James Beck (Pest Control Inspect II), Princeton King (Pest Control Specialist II), among other staff members, made significant contributions to this project. Tires were transported to COLT Recycling. Larger piles were collected by the Department of Sanitation.

Figure 16. James Beck (Pest Control Inspector II) and Princeton King (Pest Control Specialist II) assisted with waste tire removal in the Lower 9th Ward in March 2018.

Figure 17. Entomologists Erin Cloherty and Dr. Jen Breaux stacked over 200 tires. Large numbers of tires are stacked curbside for collection by the Sanitation Department.

Many mosquito species prefer to breed in man-made water-holding containers such as discarded tires, which are highly abundant in New Orleans. NOMTCB participates in the location, sampling and removal of discarded waste tires from illegal dumping activity. Our staff compiled 311 service request data (Fig. 18) and performed active surveillance to locate discarded tires (Appendix A). Our core team (Ellyn Sterling, Alice Harman and Uyen Nguyen) then collected samples of the mosquito larvae inhabiting these tires. The larvae were brought to the laboratory for identification in order to better understand the potential public health risks these tire habitats pose. Other staff members then assisted in the removal of tires from these areas, an effort led by Tamer Ahmed (Fig. 19) and Dr. Jen Breaux (Fig. 17).

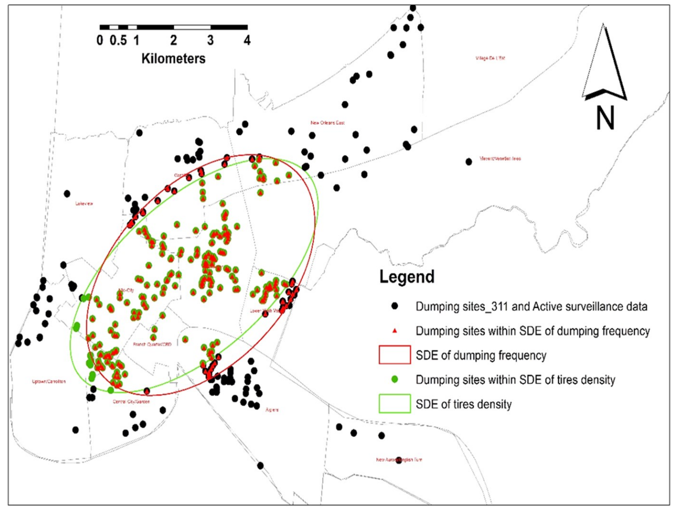


Figure 18 . Data obtained from 311 indicated that dumping occurs throughout New Orleans. Large piles occur on the periphery of New Orleans and dumping of smaller numbers occurred more frequently in the center portion of the city.

Figure 19. Dr. Tamer Ahmed led the effort to collect and sample tires in 2016-2018.

The species data from the tires were used to identify correlations between environmental and tire variables and key vector species abundances (Appendix B). We useD these data to evaluate the relative public health risk that tires pose in different areas of the city, to better predict the seasonal arrival of disease vector species, and to better understand the breeding habits and geographical distributions of medically important species. This information may help to inform operations by optimizing the strategy and timing for the application of control methods, thereby reducing the risk of mosquito-borne disease.

Area-wide larviciding

We continued to evaluate equipment to deliver effective area-wide larvicide applications (Appendix C). In March 2017, we evaluated a modified Buffalo Turbine CSM/3 Sprayer (BT) (Buffalo Turbine, Springville, NY) and Curtis Dyna-Fog Ag-Mister LV8™ Agriculture Low Volume Sprayer (LV8) (Curtis Dyna-Fog, Jackson, GA) for use in distributing VectoBac® WDG (Valent Biosciences, Libertyville, IL) at a mix rate of 1 lb per gallon of water in multiple field trials. Trials were conducted in both an open field and an urban neighborhood to evaluate effective application distances as well as our ability to target water-holding containers, which are common breeding habitats for mosquitoes, in both open and sequestered areas.

In open field trials, a single pass application was evaluated from each machine. Bioassay jars were set up in a grid of 5 rows at 50-foot intervals from the application site, up to 1,000 feet. Bioassay jars were left in the field 30 minutes post-application to allow for deposition of the product. The jars were then collected and taken to the Biological Control lab, where 200 ml of water and 15-1st instar laboratory-reared *Ae. aegypti* were added to each jar. The larvae were then monitored at 1, 24, and 48 hours, and the percent mortality was calculated at each time point. A neighborhood trial was also conducted to evaluate the distance covered by application in a common New Orleans neighborhood as well as the ability to deliver an effective application to open and sequestered locations in yards (Fig. 20).

Using the same methodology, in May 2018 we evaluated the use of an A1 Agricultural Mister (Valley Industries, Ponca, NE) for dispensing the larvicide VectoBac® WDG (Bti). We also tested an adapted Guardian ULV adulticide unit (Clarke, St. Charles, IL) for dispersal of methoprene (an insect growth regulator) in an open field trial (Appendix D). We compared results obtained in 2017 and 2018 to determine which type of equipment was optimal for specific application types and areas. On August 8, 2018, the first operational area-wide larvicide application was completed (Fig. 21).

Figure 20. A typical neighborhood was used for the larvicide trials. The red line indicated a double pass application route.

Figure 21. The first operational application of Vectobac WDG was conducted on August 8, 2018 for mosquito management.

Biological Control Field Trial

Operational Capacity

The ELC Enhanced Laboratory Capacity Grant has allowed for new supplies to be purchased. Pumps, 55 gallon drums, and other items needed for mass rearing were purchased. Additional staff were trained in maintenance and rearing. Copepods were used in select areas during outreach in the community and were placed in stagnant, permanent water-holding containers. However, the use of copepods was small-scale and the goal has been to increase their use across New Orleans.

Field Trial

We designed and implemented field trials for testing the efficiency and feasibility of copepods for use in the City of New Orleans to control mosquito larval populations. Copepods were placed in experimental tires in the field and sampled each week. The goals of this project were a) to describe the effects of biological control agents on the mosquito larvae; and b) to determine practical application and re-application rates under field conditions. This field trial was carried out over the course of the summer and the results from the project are currently being prepared for publication. A summary of the experimental design and project can be found in Appendix C.

Figure 22. Andra McClue counted and processed eggs collected in the ovicups.

Resistance Testing

The Centers for Disease Control and Prevention (CDC) bottle bioassay tests mosquitoes for resistance to pesticides. Insecticide resistance is defined as an ability of strains of insects to survive normally lethal doses of insecticide. The implication is that a lack of ability to control mosquito populations will result as an increase in public health risks and a decrease in the livability of communities (nuisance increase).

Figure 23. Alice Harman counted the eggs collected each week from routine surveillance sites.

The Biolab and items used for rearing were cleaned and reorganized. The mass numbers of mosquitoes required for bottle bioassays needed required the rearing areas to be organized and correctly labeled to avoid species and strain contamination. The Orlando strain of susceptible *Aedes aegypti* was used for bottle bioassays trials.

In 2017, a citywide evaluation of the susceptibility of *Aedes aegypti* to seven insectides was initiated. *Aedes albopictus* and *Ae. aegypti* were collected from the Westbank and Uptown areas. The mosquito eggs on the seed germination papers were counted (Figs. 22, 23) and stored at the Biolab (Fig. 24) for testing in 2018. Alice Harman (Pest Specialist I) and Andra McClue (Pest Control Inspector I) led the counting and processing of samples. As the temperature warmed in the spring, ovicups were again placed at routine sites and enhanced sites for egg collection to complete our collection of mosquitoes from spray zone across the City of New Orleans.

Figure 24. Cynthia Harrison devised a storage method for eggs collected in ovicups. Each box stored seed germination paper with eggs collected in a particular spray zone.

The CDC bottle bioassay measures the amount of time until mosquitoes die from exposure to pesticide. The mosquitoes are placed into a glass bottle coated with pesticide. The results can be compared with mosquitoes that are known to be susceptible to pesticides and historical data from previous bioassays. Mosquitoes with resistance take longer to die, as they have mechanisms to overcome the pesticide exposure.

In 2018, new equipment was purchased to evaluate resistance at the molecular level. A real time polymerase chain reaction (StepOnePlus™ Applied Bioassay ThermoFisher Scientific; Figure 25) and a Gen 3500 were purchased and placed in use. The StepOnePlus was used to determine knockdown resistance (kdr) in *Ae. aegypti* mosquitoes (Appendix E).

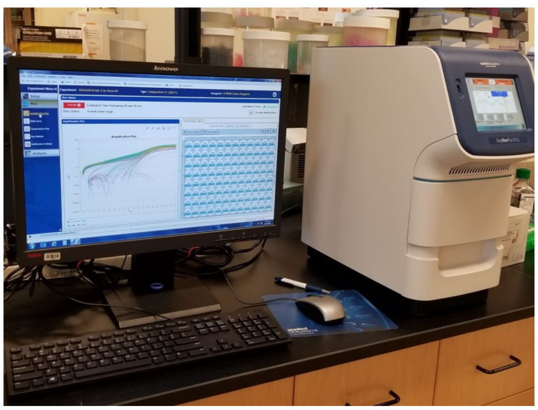


Figure 25. A real team polymerase chain reaction was purchased to evaluate knockdown resistance in *Aedes aegypti*.

These assays were conducted in conjunction with the bottle bioassays. Knockdown resistance is a target-site insensitivity caused by a mutation in the voltage – gated sodium channel. Early detection of resistance is critical for management of mosquitoes and to incite rotation of available insecticides. The goal of this work is to implement an integrated mosquito management program to prevent the development of insecticide resistance.

Overall, the *Aedes aegypti* from New Orleans showed low frequency of kdr alleles in molecular assays and low levels of insecticide resistance in the bottle bioassays.

Abandoned lots

The ELC grant allocated $60,000 for one-time grass cutting at abandoned lots. NOMTCRB and Code Enforcement worked with the Covenant House to remediate overgrown lots. The Covenant House's lot maintenance program provides employment and training for at-risk youth. By the end of 2018, 115 lots were cut.

Operational Research Partnerships

We have engaged in a collaboration with the Tulane Bywater Institute to seek external funding to evaluate how green infrastructure (GI) projects to relieve flood pressure in high-risk zones influences local mosquito populations. The goal is to understand the potential health risks of water retention in these zones and to mitigate the risk of mosquito-borne diseases in adjacent communities. NOMTRCB participates in community outreach in these zones to enhance public awareness of practices that reduce mosquito populations and increase community understanding of GI project goals in these areas.

Industry-Supported Research

We continue to conduct field research and laboratory bioassays as part of agreements made with collaborators in the private industry sector. These agreements allow us determine the best products on the market, to make contributions to the scientific community using best practices, and to supplement our budget. This year we are continuing studies with Drs. Janis Reed and Marie Knox (Control Solutions, Inc.) and Dr. Scott Gordon (BioGents, Inc.).

We verify the efficacy of the tested products by monitoring adult mosquito populations and egg production before and after treatment in the field. Dr. Tamer Ahmed (Pest Control Specialist II) has done an excellent job of collecting samples from field sites and identifying specimens in the lab. Laboratory bioassays (Fig. 26) allow us determine the residual efficacy of the insecticides tested. Cynthia Harrison (Entomologist I) and Andra McClue (Pest Control Inspector I) did a great job of maintaining lab colonies of adult mosquitoes. These trials allow us to determine the best products on the market for both consumers and industry workers.

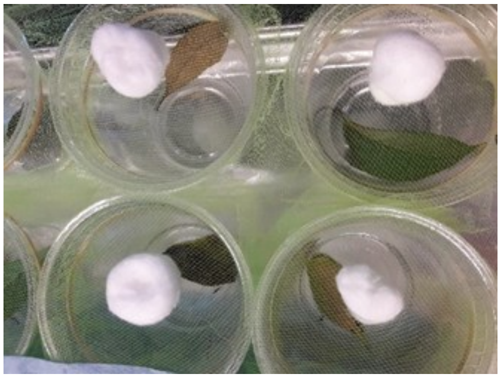


Figure 26. Leaf bioassay cups for a mosquito barrier treatment efficacy trial.

Mosquito Control Education and Outreach

Events

NOMTCB participated in several general public and elementary school outreach events in which informational booths were displayed, demonstrations were given, and literature was distributed. Alice Harman has played an instrumental role in presentations at public events. Alice Harman, Erin Cloherty and Dr. Jen Breaux attended the Audubon Insectarium 10th Anniversary Celebration, while Erin Cloherty and Dr. Jen Breaux gave a demonstration on mosquito biology, breeding habits, and biological control at Audubon Primary Academy (Fig. 27).

Figure 27. Dr. Jen Breaux spoke to young children regarding mosquito biology, breeding habits, and biological control at Audubon Primary Academy.

In January, we continued to assist with the Master Vector-Borne Disease Management Certification Course sponsored by the Western Gulf Center of Excellence for Vector-Borne Diseases, which is supported by funding from the CDC. The course is open to a variety of public health and vector control professionals and offers hands-on training on the components of Integrated Mosquito Management (IMM), including surveillance, biological control, chemical control (larvicing and adulticiding) and public education. The course was previously held in San Antonio, Houston, and Dallas, TX in 2017 and was held in Lake Charles, LA in 2018.

In April, NOMTCB hosted the 6th annual Mosquito Academy (Fig. 28). Mosquito Academy is an annual three-day workshop providing comprehensive training in topics including mosquitoes and mosquito-borne disease biology, pesticide management, and integrated vector control. The course serves primarily public health professionals and private or commercial pesticide applicators. This year's class was the largest so far with over 35 participants from many areas of Louisiana and nearby states. Our guest speaker was Andrew Ruiz from the National Center for Environmental Health at the Centers for Disease Control & Prevention. We would like to thank LMCA members for continued support and promotion of this workshop.

Figure 28. NOMTCB & LMCA Annual Mosquito Academy – hands-on laboratory training on bottle bioassays.

In April and May, NOMTRCB hosted additional hands-on mosquito workshops targeting public health professionals, including sanitarians, who want to learn more about mosquito control. The first workshop focused on surveillance and identification and the second on mosquito control and PPE. The workshop provided hands-on experience and upon completion, participants received a certificate and sanitarian CEU's were offered. The workshops were supported by the ELC grant, and additional workshops are planned in 2019.

AVIATION
ED FOSTER

We entered 2018 busily engaged in completing the annual maintenance on our aircraft and ground support equipment. This activity began in late 2017 as the mosquito season became less active. The aircraft was inspected nose to tail and preventive maintenance carried out. The spray systems and chemical loading equipment were also maintained. Additionally, preventive maintenance was completed on the hangar facility, air compressor, lighting, hangar door and HVAC system.

Our annually required aircraft operational plan was prepared, submitted to the Federal Aviation Administration and their approval received.

As we do each March, we attended the Gulf South Aviation Maintenance Seminar at Lafayette, LA in order to complete the requirement for FAA aircraft mechanic recertification.

Research continued into acquiring a replacement for our current aircraft due to its age and concerns for continued supportability. Military surplus aircraft have been identified as potential candidates. Discussions on the possibility of obtaining one, or more as Federal donations continued throughout the year.

We conducted our first aerial spray flight in early June and continued these through the end of October.

Hurricane season was relatively quiet, no great challenges were encountered, however Tropical Storm Gordon did come quite close and almost necessitated an evacuation of the aircraft as there was a risk of hangar flooding with rising tides. Fortunately, there were no issues.

We were excited to receive a new piece of equipment to replace our trusty, but aged aircraft tug which had been acquired many years ago as military surplus and had experienced the wrath of Hurricane Katrina. We purchased a heavy duty golf cart (Fig. 29) and made a few modifications to it that enable use as an aircraft tug. The old tug will be retained and possibly overhauled in the future.

As the 2018 mosquito system drew to a close, we began planning for 2019. Our hangar is scheduled for refurbishment and this will necessitate relocating the aviation operation to another location on the airport. In addition to performing the usual yearly aircraft maintenance, several safety enhancing modifications to the aircraft are also planned.

2019 is shaping up to be a very busy year.

Figure 29. A new airplane tug was purchased in 2018.

RODENT AND PEST CONTROL

JOYCE BROWN, ANGELO ANDERSON , ERIN CLOHERTY, ED FREYTAG, TIMMY MADERE, PERRY PONSETI, AND PHILIP L. SMITH

Service Requests

Service requests were received by 311, emails and calls made directly to NOMTRCB. NOMTRCB inspectors continue to work with 311 regarding all phone calls and transfer service requests sent by email. These service requests were recorded and issued to rodent inspectors where they were promptly addressed. Service requests are typically addressed within 3 business days.

NOMTRCB inspectors continue to service residential requests. We receive calls regarding mice, rats, raccoons, and other unwanted pests in yards and/or entering homes. Our employees inspect properties and educate residents about the conditions that are conducive to rodents and how to pest-proof their homes. If rodent burrows are found, treatment is provided with the permission of the resident. The service requests received in 2018 are listed by month in Table 1. The number of requests for service has decreased each year, and 2018 had the lowest number of requests for service with only 456.

Table 1. Rodent service requests received in 2018.

Month	Inspection	Re-inspection	Total
January	27	4	31
February	32	2	34
March	29	4	33
April	34	5	39
May	30	2	32
June	64	1	65
July	54	5	59
August	49	3	52
September	42	1	43
October	42	1	43
November	23	2	25
December	30	0	30
Total	456	30	486

French Quarter: Storm Drain Treatment

In January 2018, NOMTRCB inspectors treated 372 storm drains in the French quarter using 1,922 bait Final and Maki rodenticide blocks. A re-inspection (spot check) was performed and 45% bait consumption was observed. In June of 2018, a re-inspection and re-treatment was performed, during which 385 storm drains were treated using 2,310 rodenticide bait blocks. During the next mission, 403 storm drains were treated using 2,251 bait blocks. Spot checks were performed 2 weeks after each treatment and bait was replenished if significantly consumed. An inspection and treatment will be performed in February of 2019 before Mardi Gras.

Public Property Inspections and Treatments

NOMTRCB services city properties for all urban pests and disease vectors such as mosquitoes and rodents. Our inspectors work with city employees and management to correct the conducive conditions that cause the pest problems (Appendix F).

We continue to use integrated pest management (IPM) practices and change cultural practices among our civil servant staff throughout New Orleans. We used pest exclusion techniques to solve rodent problems at the Auto Pound on Conti Street and the Police Headquarters at Tulane and Broad. By trimming away vines, sealing damaged fascia boards, and improving sanitation practices, the NOMTRCB staff was able to control the rodent infestations at both locations (Figs. 30, 31).

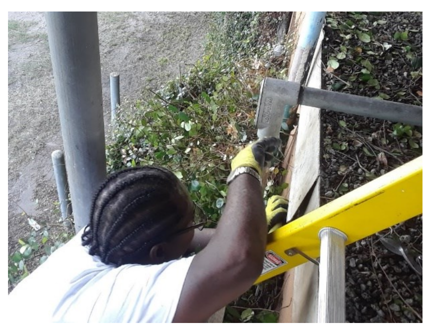


Figure 30. Vines were cleared from the fascia board and the fascia plate was fastened back in place to exclude rodents at an entry point at the Auto Pound.

Figure 31. A rodent entry point at the Police Headquarters. Vines were killed and removed and the building fascia replaced.

Figure 32. Rodent tail drags and foot prints provide the inspectors with vital information regarding trap placement. Note the trap at the top of the photograph.

Figure 34. Trash observed at a picnic area that contributed to a rodent infestation.

Figure 33. The results of good trap placement by seasoned NOMTRCB rodent technicians.

Figure 35. Vegetation at Margaret Place commonly used by rodents for harborage.

Our experience staff found rodent tail drags that led placement of snap traps (Fig. 32) and remediation of the infestation (Fig. 33).

Many times, pest problems are a direct reflection of poor sanitation practices and food availability (Fig. 34). Sanitation is the first step in rodent control. NOMTRCB staff continuously inform city employees, the public, and partnering agencies about the importance of good sanitation practices.

Numerous outdoor properties are serviced throughout the year. Poor sanitation, open garage cans, and lush or overgrown vegetation (Fig. 35) were the main factors contributing to rodent infestations. Typically, NOMTRCB inspectors speak directly with maintenance staff to offer suggestions. In many cases, the sites were cleaned or changes were made to trash collection practices. Removing landscape vegetation is a much larger challenge and was rarely addressed.

It is often a challenge to change human behavior. However, once cultural practices are changed the rodent problems are usually remediated. Cooperation is required to solve rodent problems.

SANITATION IS PEST CONTROL!

Clean Up Nola Initiative

In 2018, Mayor Cantrell launched an initiative called 'Clean Up Nola' that addressed trash, code enforcement violations, and many other problems along several major corridors throughout New Orleans. Full details of the initiatives and areas can be found at www.cleanuupnola.org. NOMTRCB participates in this initiative by inspecting many of the targeted areas in 2018 (Table 2). Joyce Brown (Rodent Control Supervisor) and Claudia Riegel (Director) led the effort with this projects. Our employees inspected the corridors for standing water, waste tires, conducive conditions for rodent issues. This initiative will continue and expand in 2019.

Rodent Division Efficacy Trials

NOMTRCB continued to conduct field operational research and efficacy trials as a part of agreements made with collaborators in the private industry. This year, Philip L. Smith (Pest Control Specialist I) and Dr. Claudia Riegel (Director) completed rodent-based studies with Dr. Joe DeMark (Corteva Agriscience, Agriculture Division of DowDupont), and Dr. Kyle Jordan, (BASF). After several years of conducting efficacy trials for rodent control, NOMTRCB has adopted the most appropriate methods for testing outside of the lab and applied this to field research.

Table 2. Clean Up NOLA corridor inspections.

Name.	Bounding Streets	Date checked
So. Claiborne Ave.	Martin L. King Jr. Blvd. to Napoleon Ave.	8/14/18
So. Broad St.	Poydras St. to Gentilly Blvd.	9/26/18
Crowder Blvd.	Morrison Ave. to Dwyer Blvd.	10/1/28
St. Claude St.	Elysian Field Ave to Delery St.	10/11/18
Wall Boulevard.	Gen. DeGaulle to Holiday Drive.	10/23/18
S. Carrollton Avenue.	Canal St. to Earhart Boulevard.	11/31/18
Chef Mentuer Hwy	Press Dr. to France Road.	11/7/18
No. Claiborne Ave.	Jourdan Ave. to Tupelo St.	11/28/18
N. Robertson St.	Elysian Field Ave. to Poland Ave.	10/10/18
St. Bernard Ave.	St. Claude Ave. to Broad Ave.	11/29/18
Elysian Field Ave.	N. Peters St. to Leon C. Simon Blvd.	12/12/18
S. Claiborne Ave.	Poydras St. to Poland Ave.	

This year, we have primarily focused on testing early detection products introduced by Corteva Agriscience and new rodenticides developed by BASF. The ActiveSense system unveiled at PestWorld 2018 in Orlando, an advancement of the ActiveSense™ system, is a technology that enables 24/7 remote monitoring to provide insight into pest activity, device tampering, temperature, and system health. NOMTRCB has been testing this product since 2017. The ActiveSense product is projected to be launched and available to the pest control industry in 2019.

The NOMTRCB staff also participated in a BASF seminar held in the French Quarter to train BASF staff on the use of Selontra bait and to discuss results from trials done in the New Orleans area. Dr. Claudia Riegel, Timothy Madere, Freiede Bauder, and Philip Smith worked closely with BASF in these efficacy trials conducted in 2017. The Rodent staff also offered night rodent tours in the French Quarter to provide hands-on training and education for BASF sales representatives (Fig. 36).

Figure 36. Timothy Madere led a BASF night rodent tour on the river walk.

Lakefront Airport Pest Control

NOMTRCB conducts the majority of pest control and all termite control services at the Lakefront Airport (Fig. 37) as part of a hanger space lease agreement established in 2016. We work with the airport staff and vendors to ensure good sanitation practices.

Figure 37. New Orleans Lakefront Airport.

Initially, tamper proof rodent stations were placed around the main building and dumpster areas, focusing on pest vulnerable areas (PVAs). Norway rat pressure was significantly reduced with treatment and improved sanitation. We continue to carefully monitor and place pressure on vendors to utilize best sanitation practices, which reduces conditions that are conducive to rodents. The Lakefront Airport management and maintenance staff have been very cooperative and have completed our requests to trim vegetation against the building and conduct pest proofing throughout the buildings.

NOMTRCB has also begun an extensive red imported fire ant treatment surrounding the airport grounds and most importantly, the runways. Safety is always a priority in pest control, and this is especially relevant at airports. Infiltration of red imported fire ants (RIFA) into tarmac lights has resulted in the frequent need for replacement of the lights. The goal has been to lower the RIFA pressure so that the lights are not damaged by ants.

Philip L. Smith spent the entire year addressing this situation and was able to get control of the ant problem that has plagued the airport for years. Using a

Figure 38. Philip L. Smith, escorted by the Lakefront Airport Fire Department, treated red imported fire ants on the tarmac.

four-wheeler and hopper (Fig. 38), he was able to treat the entire airport grounds for ants. The Fire Department located on the airport grounds escorted Mr. Smith onto the area adjacent to the tarmac to complete the treatment.

A large bee colony was found in the early spring at McDermott hangar. The bees had established a hive deep in the interior of the wall void (Fig. 39) and were interfering with operations. Ed Freytag (Research Entomologist), Philip L. Smith, and Friede Bauder were able to successfully remove the colony (Fig. 40).

Figure 39. A large honey bee hive was established deep into a hanger the Lakefront Airport.

Figure 40. NOMTRCB employees removed the bee colony.

School IPM

In 2012, NOMTRCB obtained a school IPM grant that implemented a verifiable IPM plan in 3 schools in New Orleans. Since that time, we have continued our efforts to provide fee-based services to schools, and we continue to service three schools. In 2013, Philip Smith became the IPM coordinator for schools. Since that time, we have been recognized for outstanding IPM work. Arise Elementary, a sister school to Mildred Osborne, was added to the contractual agreement along with the New Orleans Military and Maritime Academy. NOMTRCB has been implementing optimal IPM practices at the schools still under contract, and no significant pest issues have occurred at these schools since under contract.

Figure 41. Mr. Philip L. Smith at Mildred Osborne for spring red imported fire ant broadcast treatment.

Philip Smith conducted bi-annual broadcast treatment for ants at the schools in 2018 (Fig. 41). Red important fire ants are of great concern for school children due to possibility of anaphylactic reactions to the bites or stings. Monthly pest monitoring is carried out throughout the year, which allows for pest introductions to be found and addressed before becoming expansive in and around buildings. The reduction in infestations after several years of bi-annual deep clean, fall and spring ant treatments, monthly pest monitoring, and daily trash removal, demonstrates the efficacy of IPM practices for pest control.

Bed Bug Project

The pest control industry sends samples for identification on a regular basis. In 2018, we received several industry requests for inspections.

In 2018, NOMTRCB started conducting bed bug laboratory trials. The EPA issued new guidelines for bed bug insecticide testing and approval and as such, few laboratories are conducting these types of trials. The trials were supported by an insecticide manufacturer. Eric Guidry (Pest Control Specialist I) established a blood feeding system with the guidance of our university partners and has been instrumental in maintaining our bed bug colonies for these trials. Erin Cloherty (Entomologist I) was responsible for writing the protocol, conducting the trials, and completed the reports. The outcome of these studies helps us determine which insecticides are most efficient at killing bed bugs and to identify which products require further development.

These trials are important for addressing bed bug infestations within the City of New Orleans, thereby increasing the quality of life for our residents.

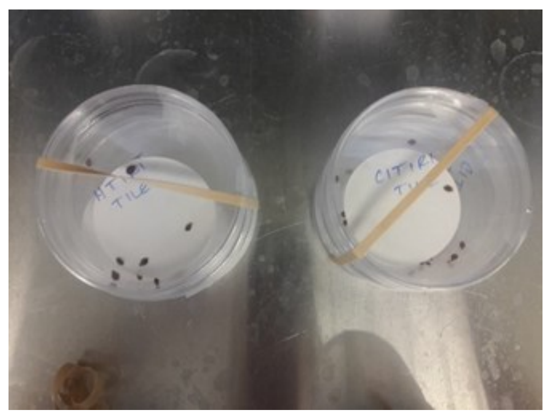


Figure 42. Bed bugs were placed in Petri dished and exposed to pesticides selected for evaluation.

Wildlife Disease Monitoring

A wildlife disease monitoring project was carried out in 2018 in order to better understand the zoonotic disease risk posed by raccoons. NOMTRCB (led by Erin Cloherty) partnered with Dr. Susanne Straif-Bourgeois (LSU Health Sciences) and Dr. Gary Balsamo (LA Department of Health) to complete this work.

Figure 43. Embryonated *B. procyonis* egg showing the developing larva inside. Right: Larva of *B. procyonis* hatching from an egg. Center: Raccoons are hosts for *Baylisascaris* roundworms.

Credit: DPDx, U.S. Fish & Wildlife Service .

Raccoons can become infected with the roundworm *Baylisascaris procyonis* by either ingesting eggs from the environment through foraging and grooming or by eating small mammals, such as rodents, that are infected with *B. procyonis* (Fig. 43). After ingestion, the roundworm eggs hatch and larvae develop into adult worms in the raccoon's intestines. Mature *B. procyonis* worms can produce millions of eggs daily. These eggs are passed with feces and must mature in the soil environment for 2-4 weeks before becoming infectious. Depending on the environmental conditions, these eggs may stay viable for years.

Between October 2014 and December 2017, 65 raccoons were trapped at various locations throughout New Orleans. Most locations were identified by calls to 311 or directly to our office. Trapped raccoons were brought to the Louisiana Society for the Prevention of Cruelty to Animals (LASPCA) where they were euthanized under the LASPCA's euthanasia protocol. Necropsies were then performed at NOMTRCB. Of the 65 trapped raccoons, 31 were female and 34 were male. Adult raccoons were defined as older than one year, which is estimated by tooth wear.

During necropsy, the lumen of each gastrointestinal tract was examined and any adult roundworms present were placed in 70% isopropanol for later identification. Fecal samples were stored in the refrigerator for later examinations. Adult roundworms were cleared using alcohol glycerin and viewed microscopically using both light and electron microscopy for morphologic identification. The study revealed 36.9% (24/65) infection prevalence. Fecal examination showed that 20 of the 63 fecal samples (31.7%) were positive for *B. procyonis* eggs. Five raccoon samples contained adult *B. procyonis* parasites but no roundworm eggs, and one fecal sample was positive for *B. procyonis* eggs, but no adult roundworms were found in the intestine. *B. procyonis*-infected raccoons were trapped throughout the city of New Orleans.

Humans can accidentally ingest roundworm eggs from contaminated soil. The resulting infection can cause neural, ocular or visceral disease with potential to produce severe sequelae or fatal outcomes. Findings from this study indicate that efforts toward surveillance and monitoring of urban wildlife should be enhanced.

Figure 46. Shaun dumped approximately 100,000 Formosan subterranean termites on the soil of the Tiny Termite House.

Formosan subterranean termites were collected n the field and approximately 500,000 termites were introduced into the soil over a period of several weeks (Fig 46). Initially, the termites were difficult to collect (January through March) due to the cold temperatures, but once warmer spring temperatures arrived we were able to collect sufficient numbers of termites from the collection sites.

One week after the final termite introduction, termite mud trails appeared on the slab. Over the course of the next fifty days, we took photos and videos of termite activity inside and outside of the house (Fig. 47). The house was built in modules, meaning that walls, second floor and roof could be removed to check for termite activity. A GoPro camera was used to shoot the damage and mud trails inside the first floor, and an endoscope was used to take pictures and video of the termite damage and activity on the floor joists supporting the house. For the final reveal, several members from PPMA, NPMA and Vault Communications flew to New Orleans to observe the teardown of the house. A professional video crew was also brought in to record the event, and Jim Fredericks, an entomologist with NPMA, hosted the tear down of the Tiny Termite House (Fig. 48).

Figure 47. Ed Freytag removing exterior walls of the Tiny Termite House to photograph termite activity and damage.

The Tiny Termite House was a complete success for NPMA and PPMA. Their website had record high number of views. The original intent was to have the reveal for Termite Awareness Week from March 11-17, 2018, but we were not able to collect enough termites in the winter and spring to meet this deadline. Fortunately, we provided them with enough weekly B-roll footage of termites to keep their audience motivated until the reveal towards the end of April.

Figure 48. Tear down of the Tiny Termite House revealing complete loss due to termite damage.

We were impressed by the way the Formosan subterranean termites attacked the Tiny Termite House. First, they searched for weak areas on the foundation after which they started to make shelter tubes. They attacked the flooring joists and bottom plates, bringing in moisture and causing the flooring to buckle. They then migrated into the interior of the house but only made shelter tubes on the base of the walls and floors. We never observed shelter tubes or mud trails on the outside of the walls, as is the case in full-scale homes. As termite activity and feeding continued, the termites moved into the second floor inside the walls, causing some of the wall covering “sheetrock” to buckle. They even incorporated the fiberglass insulation into their shelter tubes. During the reveal, we opened the wall coverings and found extensive damage to the studs, joists, doors frames, window frames and both interior and exterior walls

PHOTOGRAPHY, TERMITE INSPECTIONS AND TREATMENTS, AND CITY FACILITIES PEST MANAGEMENT
ED FREYTAG

Photography

The Tiny Termite House Project.

In late 2017, Cindy Mannes, Executive Director of the Professional Pest Management Alliance (PPMA), approached our Director with the idea of a "Tiny Termite House" project. The PPMA is an organization funded by donations from the pest control industry that markets the value of professional pest control to consumers. Their main goal is to increase awareness of the value of pest control services and to make an impact on the attitudes, opinions and buying decisions of residential and commercial markets. They have ongoing campaigns at national and local media with outreach projects, innovative advertising approaches, social media engagements, public service announcements and more.

Cindy Mannes and her team, which included some extremely talented people at Vault Communications, Inc., a Philadelphia-based company, dreamed up a social media campaign for termite awareness using a small model house built to scale that would ultimately get devoured by hordes of subterranean termites over time, all while recording the process with high definition photography and video. It was an ambitious project but one that we were sure we could tackle, so we accepted the challenge.

Following many meetings and phone conferences, a work plan, time line and deliverables were finalized. Jack Leonard and I ordered new digital Canon cameras, a GoPro camera, and tripods to make sure we obtained the best quality video and photography. We started filming termites in the laboratory and Shaun Broadley, a multitalented termite inspector working with the Termite Division, started the process of building the wooden model house in October of 2017. Shaun drew plans of a two-story house at a 16:1 scale and began construction by first pouring a concrete slab (also built to scale). The house was erected on the slab using yellow pine as the main building material (Fig. 44). All the framing including the joists, studs, rafters and sills was cut to precisely the right dimension using a table saw and a band saw. Windows, doors, stairs, flooring, roof and wall coverings were also hand made to fit and function as a full-scale house. The house included furniture, shelves, working doors and windows, a kitchen, functional plumbing, indoor lights, an attached garage with an overhead door, and a two porches with one overlooking a pool (Fig. 45). Building the house took several months, and we photographed every step of the construction as required in the protocol. A plywood base was constructed on cinder blocks to support the slab and house. The slab was placed on a two-inch layer of sand and soil over a Termimesh® stainless steel barrier to prevent the termites from escaping and feeding on the plywood base.

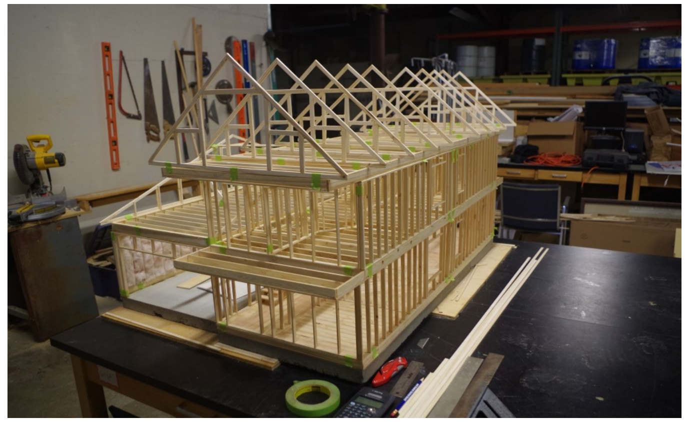


Figure 44. Temporary assembly of the framing on the slab to check fit and look.

Figure 45. The completed Tiny Termite House set on a slab on soil.

(Fig. 49). The termites were even able to locate a pine form stake that was purposely left through the garage slab, which they used to access an interior wall. This is a common cause of termite infestations in slab houses. The results of the Tiny Termite House project were presented in May at the NCUE (National Conference on Urban Entomology) in Cary, NC, and at the NPMA Pest World in Orlando, FL. The project was also published as a full article in the October 2018 issue of PCT magazine.

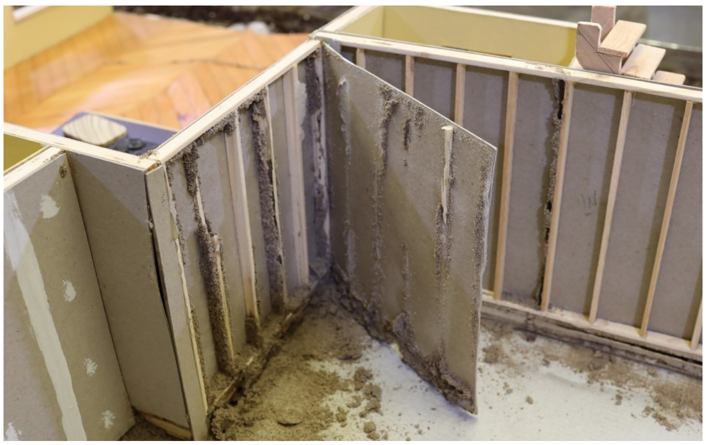


Figure 49. Formosan subterranean termite damage to interior wall studs in the Tiny Termite House. Note how only some studs were damaged and got covered with mud.

BASF

Dr. Jim Cink, Global Marketing Manager with BASF, contracted us to generate still images and videos of termite trophallaxis and Selontra rodent bait videos for marketing purposes. Jim wanted stills and videos of Formosan subterranean termites in the process of feeding each other (stomodeal or proctodeal trophallaxis) for use in their marketing department for a target audience in Asia. The stills and videos of rodents feeding on Selontra bait will be used in local markets.

In order to get the shots of termites feeding each other, I consulted with Stoy Hedges, PCT magazine writer and consultant. He suggested I leave some Formosan termites in a container without food for a week and then place them with well-fed nest mates and have the camera ready for the shots (he was able induce ants to feed using this technique). I was able to capture mouth-to-mouth feeding after several tries, but it was difficult because at very high magnification I could not maintain focus on moving ter-

Figure 50. Formosan subterranean termite workers feeding a soldier termite mouth-to-mouth (stomodeal trophallaxis).

mites for very long. Working with insects at high magnification and waiting for a specific action is time-consuming and requires patience and a lot of luck to get the shot in focus and with clear detail (Fig. 50).

A more challenging project with BASF included producing videos of wild rats feeding on the Selontra® rat bait inside a bait station outdoor next to a building. Dr. Cink wanted high definition, color videos of Norway rats feeding on the Selontra bait packets. To accomplish this, Shaun Broadley built a plywood bait station with a glass front so that I could shoot video at night on location. The first trials were carried out on a private residence that was infested with roof rats. A Moultrie trail camera was used to record rat activity on the plywood bait station, but these cameras use infrared light and low resolution images, so the resulting videos are not of

Figure 51. Roof rat feeding on sunflower seeds next to the Selontra bait packet inside the custom made plywood bait box.

Figure 52. Norway rat colony in back alley in downtown New Orleans. Note the large number of burrows in soil.

sufficient quality for marketing purposes. The roof rats were extremely shy of the new bait station so I had to encourage them to enter the bait station using sunflower seeds (Fig. 51) from bird feeders located at the residence. After several weeks, the rats began to enter the station. Once they became comfortable I set up a Canon 5D digital SLR camera with LED lights, but the resulting videos unfortunately did not show the roof rats feeding on the Selontra bait packet. The rats were apparently only interested in the sunflower seeds. A second site for filming was prepared in downtown New Orleans where a large colony of Norway rats had multiple burrows in an alley behind a large generator (Fig. 52). Phil Smith installed two plywood bait stations with glass panels with a Moultrie trail camera placed facing the bait box to record rat activity. It took over a month of “training” to get the Norway rats to enter the bait stations, and most of the images were of the rats exploring the bait station but not going inside. Some of the rats were very large, as shown in Fig. 53, but in spite of their large size, they were very shy of the new bait station and would not enter for at least a month. Eventually, the rats became accustomed to the stations and began entering and feeding on the Detex non-toxic bait. A Canon 5D digital SLR was set up with LED light panels and finally I was able to get color high definition videos (Fig. 54). Unfortunately again, the rats did not feed on the Selontra bait packets. It appears that when rats have a plentiful food source as in this case, they may not feed on a new artificial food material. The location had several trash dumpsters where discarded food from several restaurants was being placed, so the rats had a preference for hamburger meat and other human foods. Next year, we will attempt to make videos in locations where the food source is more limited, and will train rats on the new bait by using Selontra blank bait material.

Figure 53. Large Norway rat exploring the custom-made glass panel bait box.

Tree foaming videos for Florida A&M

We were approached by Dr. Ben Hottel, Assistant Professor with the Florida A&M University Center for Biological Control, to produce a series of short demonstration videos of inspecting and foaming trees for the treatment of Formosan subterranean termites. Dr. Hottel received grant funding from the USDA and was able to fund our department not only for the filming and production of the videos, but also for my travel to speak and conduct a field demonstration of tree foaming at the FAMU 42nd Annual Field Day & Workshop in Entomology. Jack Leonard shot and produced the videos while I demonstrated the inspection, drilling, calibration of the foaming

Figure 54. Camera setup for photographing Norway rats in the field inside a custom-made clear panel bait box.

machine, and foaming of the trees. Dr. Hottel intends to add the narration in his office at the university in Tallahassee. The following still shots (Figs. 55-58) were obtained from the final video productions.

Other photography and video projects in 2018 included:

- CDC bottle bioassay for testing mosquito insecticide resistance
- Bed bug insecticide susceptibility laboratory bioassays
- Mosquito, Termite and General Pest Academies
- Treated wood bioassays
- TERM termite barrier field trials
- Copper Care (Cu=Lam) barrier wrap field trials
- Transfer of picture database to Flicker web streaming services and making them available for downloading remotely
- Transfer of educational videos to YouTube and make them available for downloading remotely

Infrared (IR) Termite Inspections

We conducted only five infrared termite inspections this year, which is only about half of typical numbers. The Sanitation Department requested a termite inspection because they were concerned that termites may have attacked two double-wide trailers resting on hollow cinder blocks after noticing soft spots in the flooring. We did find signs of moisture on the flooring, but not termite activity or damage. There were signs of termite activity in scrap wood left under the trailers. This was the only inspection conducted in Orleans Parish, as the rest were located in Metairie, Pass Christian, MS, and Biloxi, MS. In all inspections we found signs of Formosan subterranean termites in the structure, even though in rural areas surrounded by woods we find native subterranean termites feeding on dead wood or firewood.

Figure 55. Drilling oak tree to provide inspection and treatment access to the interior of tree.

Figure 56. Using a flexible fiber optic borescope to determine termite activity and extent of termite damage.

Figure 57. Measuring foaming agent to calibrate unit to produce 15 gallons of foam per gallon of solution.

Figure 58. Applying foam plus termiticide to the interior of the tree to control the Formosan termites.

TERMITE CONTROL DIVISION
CARRIE COTTONE, Ph.D.

The following were the proposed goals of our Termite Control Division for 2018:

1. Gain knowledge of termite biology through research projects
2. Protect properties and trees from termite damage
3. Provide high-quality services
4. Continue extension services

The following pages detail how we achieved these goals.

Termite Research Projects

Industry-Supported Research

Our Termite Control Division continues to conduct field research and laboratory bioassays as part of agreements made with private industry and university collaborators. These agreements allow us to not only make nationally recognized contributions to the scientific community, but also help to supplement our budget. This year, we are continuing studies with Dr. Joe DeMark (Dow AgroSciences), Drs. Bob Davis, Kyle Jordan, and James Austin (BASF), Mr. Bill Abbott (Copper Care), Mr. Glenn Larkin (Michigan Technological University), Mr. Chris Barber (Timber Products Inspection), and FMC and Polyguard in conjunction with Dr. Phil Koehler (University of Florida). This year, we initiated new collaborative projects with Troy Chemical and the Professional Pest Management Alliance (PPMA).

Several field trials are designed to test the efficacy of new bait and liquid termiticide formulations against subterranean termites. We are able to verify the efficacy of the tested products by monitoring termite activity and comparing the DNA of termites present before treatment to that of termites that re-infest the treated area. This allows us to determine whether termites present after treatment belong to a colony that survived treatment or originated from a neighboring colony that was not exposed to treatment. Additional field trials test the effectiveness of wood treatments or physical barriers against termite attack on wood.

Our collaboration with PPMA this year involved creating a full scale model house and surrounding it with live termites to document how termites infest homes and the potential for damage. All the details on the “Tiny Termite House” project can be found in Mr. Ed Freytag’s report (pages 21-22). Ed Freytag and Shaun Broadley, who constructed the Tiny Termite House, served on an informational panel during the 2018 National Pest Management Association Annual Meeting in October to present the project and discuss their findings (Fig. 59).

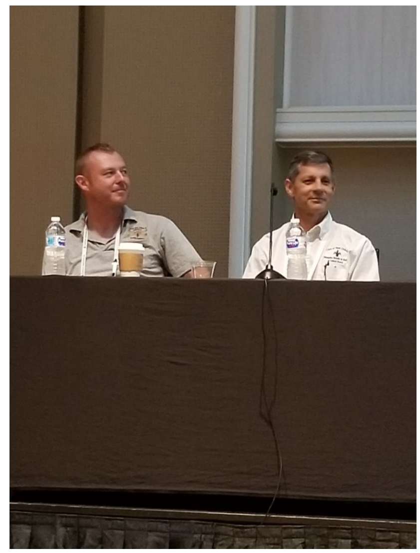


Figure 59. Shaun Broadley and Ed Freytag serve on a panel during NPMA to discuss the Tiny Termite House project.

Mr. Barry Yokum (Entomologist I) continues to do an excellent job of managing multiple field research sites for cooperators from Dow AgroSciences and BASF. Mr. Timmy Madere (Pest Control Specialist I) has done a fantastic job coordinating all the field research for Timber Products Inspection, Michigan Technological University, Copper Care, and Troy Chemical. Mr. Eric Guidry (Pest Control Specialist I) and Mr. Shaun Broadley (Pest Control Inspector III) have been instrumental in coordinating efforts with FMC and Polyguard.

Alate Monitoring

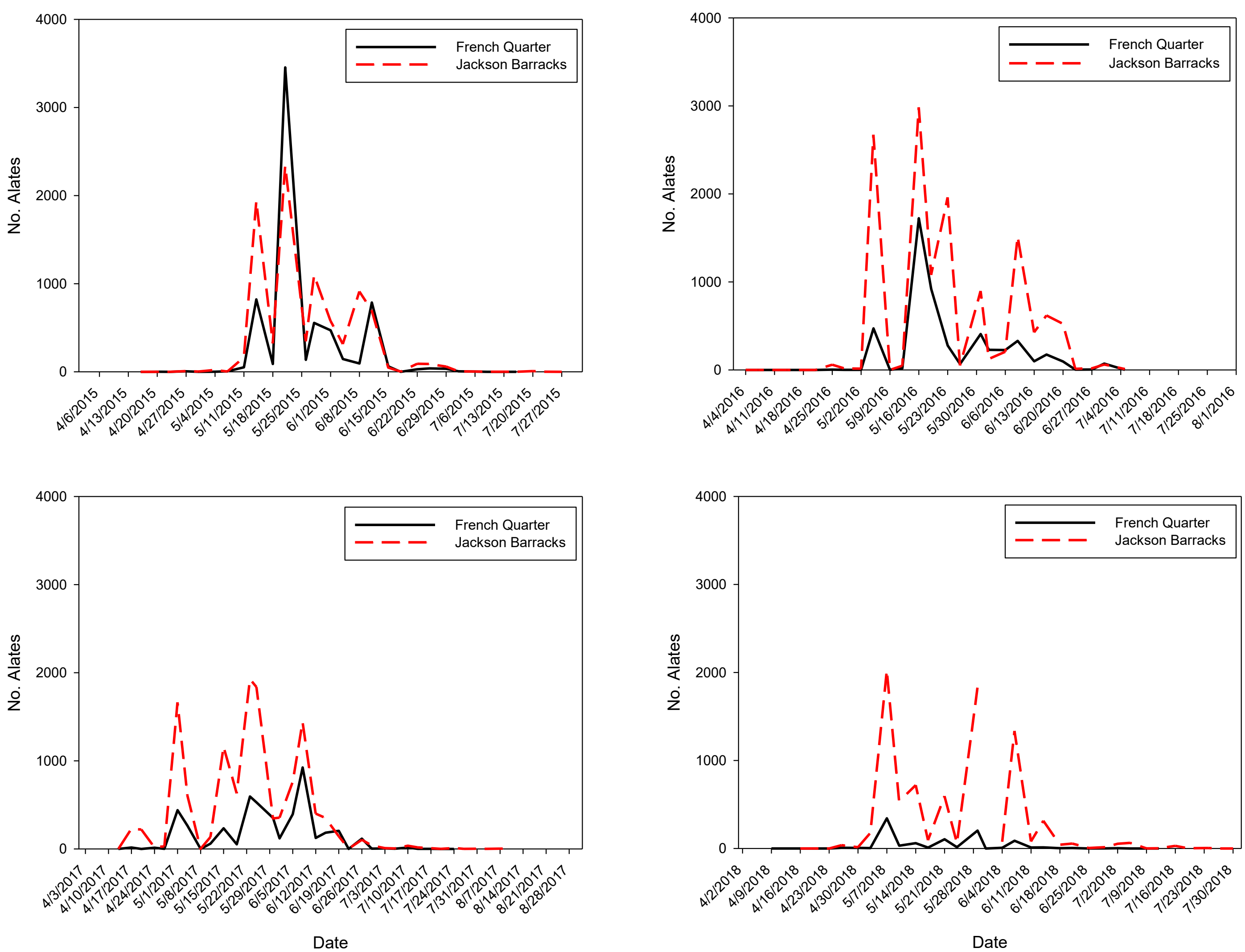
We continued to monitor Formosan subterranean termite alates, or swarmers, in the French Quarter and at Jackson Barracks during the 2018 swarm season. Every year, typically from April through June, winged reproductive termites take flight after dusk. They can be seen each spring flying in close proximity to the street lights to which they are attracted. In the past, the USDA SRRC conducted their own alate trapping in the French Quarter as part of Operation Full Stop. Because funding for Operation Full Stop ceased in 2012, it has been extremely important for us to continue monitoring termites in the French Quarter, as many historic buildings may now be unprotected against termite damage. Monitoring the alates at Jackson Barracks for the past year has allowed us to measure the relative termite pressure in the area, especially since we have installed Sentricon® bait stations around the majority of buildings on post. High numbers of swarmers in a baited area can indicate a threat of termites coming in from untreated neighboring areas.

Alate traps consist of glue boards mounted on clipboards and encased by a wire cage to prevent birds from becoming stuck to the traps while attempting to feed on termites. Mr. Frank DiGiovanni (Pest Control Inspector IV), Mr. Eric Guidry (Pest Control Specialist I), Mr. Shaun Broadly (Pest Control Inspector III), and Mr. Barry Lyons (Pest Control Specialist I) installed 35 traps in the French Quarter and 15 traps at Jackson Barracks. They changed the glue boards twice a week, identified alates on the traps, and collected data. A summary of our alate trap data can be seen in Figure 60.

Protecting Properties and Trees

We are still continuing to protect historically significant and city-owned properties by installing and servicing Sentricon® Recruit HD Always Active bait around structures and trees. Mr. Barry Lyons (Pest Control Specialist I), Shaun Broadley (Pest Control

Figure 60. Total alates collected on all glue boards in the French Quarter and Jackson Barracks from 2015—2018.



Inspector III), and Eric Guidry (Pest Control Specialist I) have been doing an excellent job at managing these sites. Servicing each site involves checking every in-ground bait station, evaluating it for current termite activity, looking for evidence of feeding, and replacing the baits when necessary. These sites are maintained throughout the year, though the actual inspections are conducted on an annual basis. Table 3 is a summary of all inspections that our group has completed this year.

This year, our group has installed termite bait stations at several new commercial sites. These include City Park properties and several more building located at Jackson Barracks. Because these are commercial sites, we are receiving funding to cover the cost of supplies and labor.

We are also performing tree treatments with termiticidal foam by injecting the foam into a central void created by termites. We are working through a list of trees suspected to have termite infestations given to us by NORDC and Parks and Parkways, as well as residential service requests. This is a temporary service, however, as the termiticide we are using was received by USDA after Operation Full Stop ended and it is in limited supply. It is also labor-intensive work, as many trees we inspect for termites are either not truly infested or lack a central void within the tree in which to inject foam.

Providing High-Quality Services

PestPac Reporting

All data collected from inspecting in-ground bait stations located at city facilities, historic sites, and commercial sites is logged and stored within the software, PestPac. This system also keeps track of whether sites are inspected on time and if all stations at each site are serviced during each inspection interval. Currently, none of our sites are past due and all site checks are complete.

Extension Services

Termite Academy

Our annual Termite Academy was held from March 6-8, 2018 and was extremely well-received by attendees. Guest speakers for this year's academy included Drs. Phil Koehler and Roberto Pereira (University of Florida), Mr. Milton Schleishmann (Louisiana Department of Agriculture and Forestry), Mr. Ernie Esteve (Billiot Pest Control), Ms. Holly Beard and Mr. Carlos Montoya (TERM, Polyguard), Dr. Bob Davis (BASF), Mr. Ron Landis (Terminex New Orleans), and Mr. William Robinson (Train2Build). We are very grateful to all of our speakers, especially those who return year after year with updated material. Members of NOMTRCB presenting at the academy included Dr. Carrie Cottone, Mr. Eric Guidry, Mr. Ed Freytag, Mr. Jack Leonard, and Dr. Claudia Riegel. Mr. Perry Ponseti, Mr. Timmy Madere, and Mr. Barry Lyons did an excellent job organizing the outdoor hands-on portion of the academy and food preparation. Mr. Eric Guidry did a fantastic job setting up the laboratory insect identification portion, Mr. Frank DiGiovanni organized all audio/visual logistics for the Academy, and Ms. Jennifer Hamilton and Ms. Soloma Condall did a great job organizing the learning materials and registration for the academy. All of our Academies are truly a team effort.

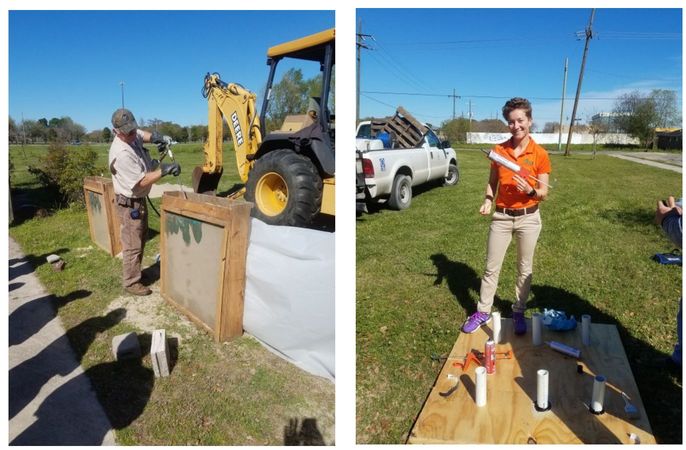


Fig. 61. Milton Schleismann (left) demonstrates best practices for rodding techniques with a liquid termiticide. Holly Beard (right) demonstrates the use of Polyguard sealant around plumbing penetrations to help prevent termites from entering a home.

Insect Identification

One of the services we provide is identification of insects brought to us by members of the pest control industry as well as members of the general public. Mr. Eric Guidry (Pest Control Specialist I) is an expert at insect taxonomy and identification and has identified approximately 150 samples brought to us this year.

Table 3. Termite inspections of protected properties during 2018 (continued on next page).

Site	Location	Month Inspected	Observations
Historic trees	City Park	January—December	Eight trees showed evidence of termites feeding on bait though no live termites were present
Jackson Barracks	6400 St. Claude Ave.	January—December	Evidence of termites feeding on bait though no live termites were present.
Federal City	2500 General Meyer Ave.	January—December	Live termites observed feeding on bait in two areas. Other areas showed evidence of termites feeding on bait, though no live termites were observed
City Park Stage Storage	1 Palm Dr.	January	Evidence of termites feeding on bait, though no live termites were observed
City Putt	1 Palm Dr.	February	Evidence of termites feeding on bait, though no live termites were observed
City Park Driving Range	1 Palm Dr.	March	No termite activity detected
Fire Station #18	778 Harrison Ave.	March	Evidence of termites feeding on bait, though no live termites were observed
Algiers Point Library	725 Pelican Ave.	March	Evidence of termites feeding on bait, though no live termites were observed
Latter Library	5120 St. Charles Ave.	March	No termite activity detected
New Orleans Criminal Court	2700 Tulane Ave.	April	Evidence of termites feeding on bait, though no live termites were observed
City Park Kidland	1 Palm Dr.	April	Evidence of termites feeding on bait, though no live termites were observed
Parker’s Café	1 Palm Dr.	April	Evidence of termites feeding on bait, though no live termites were observed
City Park Golf Clubhouse	1 Palm Dr.	May	No termite activity detected
City Park Tennis Center	951 Marconi Dr.	May	Live termites observed feeding on bait
Local History Building	519 Huey P. Long Ave.	June	No termite activity detected
Crescent Park	1008 N. Peters St.	June	Live termites observed feeding on bait
Joe Brown Maintenance	5601 Read Blvd.	June	Live termites observed feeding on bait
Joe Brown Gymnasium	5601 Read Blvd.	June	No termite activity detected
NOMMA	425 O’Bannon	June	Live termites observed feeding on bait
City Park Administration	1 Palm Dr.	June	No termite activity detected
Fire Station #7	1441 St. Peter St.	June	No termite activity detected
Lower Pontalba	500 St. Ann St.	June	Evidence of termites feeding on bait, though no live termites were observed
Madam John’s Legacy	623 Dumaine Ave.	June	No termite activity detected
City Hall	1300 Perdido St.	June	Evidence of termites feeding on bait, though no live termites were observed
Civil District Court	421 Loyola Ave.	June	No termite activity detected
Bella Luna	914 N. Peters St.	June	No termite activity detected
NORDC Administration	5420 Franklin Ave.	July	Evidence of termites feeding on bait, though no live termites were observed

Table 3. Termite inspections of protected properties during 2018 (continued).

Site	Location	Month Inspected	Observations
City Bark	1 Palm Dr.	July	No termite activity detected
HDLC	830 Julia St.	July	No termite activity detected
Perseverance Hall	901 N. Rampart St.	July	Evidence of termites feeding on bait, though no live termites were observed
Nix Library	1401 Carrollton Ave.	July	No termite activity detected
Vieux Carre	516 Chartres St.	July	No termite activity detected
S&W Board Building C	1107 Pacific Ave.	July	Evidence of termites feeding on bait, though no live termites were observed
Lakefront Airport	6001 Stars and Stripes	Aug-Dec	Evidence of termites feeding on bait, though no live termites were observed
City Park Catering	1 Palm Dr.	August	No termite activity detected
Marconi Meadows	1 Palm Dr.	August	Evidence of termites feeding on bait, though no live termites were observed
Cabildo	701 Chartres St.	August	No termite activity detected
Presbytere	751 Chartres St.	August	Evidence of termites feeding on bait, though no live termites were observed
Rosa Keller Library	4300 S. Broad St.	August	Evidence of termites feeding on bait, though no live termites were observed
Algiers Regional Library	3014 Holiday Dr.	September	Evidence of termites feeding on bait, though no live termites were observed
Upper Pontalba	500 St. Peters St.	September	Live termites observed feeding on bait
City Park Stage Storage	1 Palm Dr.	September	No termite activity detected
Flea Market	1235 N. Peters St.	September	Evidence of termites feeding on bait, though no live termites were observed
French Market Red Building	1235 N. Peters St.	September	No termite activity detected
Stern Tennis Center	4025 S. Saratoga	October	Evidence of termites feeding on bait, though no live termites were observed
Algiers Courthouse	225 Morgan	October	No termite activity detected
Algiers Fire Station #20	425 Opelousas Ave.	October	No termite activity detected
Jackson Square	601 Decatur St.	October	Evidence of termites feeding on bait, though no live termites were observed
Parks & Parkways Administration	2829 Gentilly Blvd.	October	Live termites observed feeding on bait
Municipal Academy	401 City Park Ave.	November	Evidence of termites feeding on bait, though no live termites were observed
Norman Meyer Library	30001 Gentilly Blvd.	November	Evidence of termites feeding on bait, though no live termites were observed
New Orleans East Regional Library	5641 Read Blvd.	November	No termite activity detected
Robert Smith Library	6301 Canal Blvd.	December	Evidence of termites feeding on bait, though no live termites were observed
City Park Train Depot	1 Palm Dr.	December	Evidence of termites feeding on bait, though no live termites were observed

Extension, Technology Transfer and Education

Presentations

Madere, T., January 5, 2018. Rodent biology and Control, January 5, 2018, LDAF Recertification for J&J Exterminating, Crowley, LA.

Riegel, C. January 12, 2018. Backyard mosquito control. Mosquito Joe Annual Conference, Cancun, Mexico.

Riegel, C. January 12, 2018. Mode of action. control. Mosquito Joe Annual Conference, Cancun, Mexico.

Riegel, C. January 12, 2018. PPE and best practices for mosquito control applicators. Mosquito Joe Annual Conference, Cancun, Mexico.

Madere, T., January 22, 2018. PPE and pesticide safety. Master Vector-borne Disease Management Certificate Course. Lake Charles, LA.

Madere, T., January 31, 2018. Using Old Techniques and New Technology For Rodent Control. National Wildlife Control Operators Association Annual Conference, New Orleans, LA.

Freytag, E., January 30, 2018. Mosquito biology and control. Nevada Pest Management Association Las Vegas Pest Expo. Las Vegas, NV.

Cloherty, E., February 6, 2018. PPE & Safety. GNOPCA Technician Recertification. Kenner, LA.

Riegel, C., and T. Madere. February 15, 2018. Pest control challenges in the French Quarter—A walking tour. Pest Cemeteries Conference. New Orleans, LA.

Freytag, E., February 20, 2018 Termite forecast: A crystal ball approach to controlling termites. NPMA Webinar. New Orleans, LA.

Madere, T., February 20, 2018. Rodent Biology, Behavior, and Identification, Using Rodent Cameras, Servicing Rodent Station, BASF Selontra Workshop, New Orleans, LA.

Michaels, S., February 23, 2018. Mosquito Control and arboviral disease response. Tulane School pf Public Health and Tropical Medicine, New Orleans, LA.

Madere, T., February 21, 2018. Rats, camera, action—rat videos. BASF—Solontra training. New Orleans, LA.

Madere, T., February 21, 2018. Bait stations. BASF—Solontra training. New Orleans, LA.

Madere, T., February 21, 2018. Rodent biology, behavior and identification. Solontra training. New Orleans, LA.

Riegel, C. February 21, 2018. Rodent challenges in the French Quarter. BASF—Solontra training. New Orleans, LA.

Michaels, S., February 27, 2018. Efficacy of area-wide larvicide application targeting *Aedes aegypti* in New Orleans, LA. American Mosquito Control Association, Kansas City, MO.

Freytag, E., March 6, 2018. Formosan termite biolo, gy and habits. LPMA Licensee Recertification. Kenner, LA.

Freytag, E., March 6, 2018. Termite inspections and inspection tools. GNOPCA membership meeting, Metairie, LA.

Madere, T., March 6, 2018. Economic impact of rodents. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 6, 2018. Rodent biology, behavior, and identification. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 6, 2018. Myths of rodent control. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 7, 2018. Rodent labels - use restrictions. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 7, 2018. Using cameras for rodent control. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 7, 2018. How to Conduct a rodent inspection. Texas Spring Rodent Academy. Dallas, TX.

Madere, T., March 7, 2018. Rodent baiting and trapping. Texas Spring Rodent Academy. Dallas, TX.

Cottone, C. March 7, 2018. Bait technology. NOMTCB and GNOPCA Termite Academy. New Orleans, LA.

Freytag, E., and C.J. Leonard. March 7, 2018. Inspections and inspection tools. NOMTRCB & GNOPCA Termite Academy. New Orleans, LA.

Freytag, E., March 7, 2018. Tree treatments. NOMTRCB & GNOPCA Termite Academy. New Orleans, LA.

Freytag, E., March 7, 2018. Post construction treatments. NOMTRCB & GNOPCA Termite Academy. New Orleans, LA.

Guidry, E. March 7, 2018. Wood destroying organisms. NOMTCB and GNOPCA Termite Academy. New Orleans, LA.

Cottone, C. March 8, 2018. The Label. NOMTCB and GNOPCA Termite Academy. New Orleans, LA.

Riegel, C., March 14, 2018. Pesticide resistance testing. NAACHO, Orlando, FL.

Michaels, S., March 15, 2018. Lessons learned: New Orleans Zika response. Mississippi Mosquito and Vector Control Association, Pearl, MS.

Cloherty, E. March 20-22, 2018. Raccoon diseases & wildlife trapping. Technician Recertification. New Orleans, LA.

Madere, T., March 20, 2018. Myths of Pest Control, Rodent Biology and Control, LDAF Recertification, Alexandria, LA.

Madere, T., March 21, 2018. Rodent control. Spring GNOPCA Recertification, New Orleans, LA.

Breaux, JA., March 22, 2018. Resistance monitoring, bottle bioassay demonstration and data management. March 22, 2018. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Breaux, JA., March 22, 2018. Mosquito anatomy and identification laboratory. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Breaux, JA., March 22, 2018. Mosquito biology and surveillance. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Madere, T., March 22, 2018. Rodent control. Spring GNOPCA Recertification, New Orleans, LA.

Breaux, JA., March 23, 2018. Larvicides: mode of action. Structural Pest Control Technician Re-certification. New Orleans, LA.

Breaux, JA., March 23, 2018. Mosquito control. Structural Pest Control Technician Re-certification. New Orleans, LA.

Madere, T., March 28, 2018. Rodent Biology and Control, Termite Control. LDAF Recertification, Monroe, LA.

Michaels, S., and T. Ahmed. April 4, 2018. New Orleans, Mosquito Control. Tulane School of Tropical Medicine, New Orleans, LA.

Breaux, JA., April 10, 2018. Mosquito anatomy and biology. NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Harrison, C., and JA Breaux. April 10, 2018. Microscope Instruction and Identification. NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Michaels, S., April 10, 2018. Bionomics and recognition of important species. NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

McGlynn, T., and T. Dupree. April 10, 2018. Mosquito surveillance. NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Michaels, S. April 11, 2018. Integrated mosquito management NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Harrison, C. April 11, 2018. Biological control. NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Breaux, JA., April 11, 2018. University collaborations and hypothesis-driven research.NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Madere, T., April 12, 2018. Safety in the Workplace, NOMTCB and LMCA Mosquito Academy. New Orleans, LA.

Riegel, C., April 12, 2018. Mosquito control best practices in New Orleans. American Association of Geographers, New Orleans, LA.

Michaels, S. April 13, 2018. Mosquito vector species and arboviruses in Louisiana. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Breaux, JA., and T. Dupree. April 13, 2018. Mosquito biology and surveillance. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Harrison, C., and JA Breaux. April 13, 2018. Mosquito anatomy and identification laboratory. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Ruiz, A., and JA Breaux. April 13, 2018. Resistance monitoring, bottle bioassay, demonstration and data management. Mosquito Training Workshop for Public Health and Pest Control Professionals. New Orleans, LA.

Smith, P.L., April 17, 2018. Techniques of the PCO-Rodent Baiting. BASF French Quarter rodent night tour. New Orleans, LA.

Breaux, JA., May, 2, 2018. What doesn't kill them makes them stronger: the impacts of larval ecology on adult mosquito biological traits. NOMTCB Departmental Seminar. New Orleans, LA.

Cloherty, E., May 7, 2018. Mosquito Biological Control. Ben Franklin Elementary School Environmental Outreach Day. New Orleans, LA.

Madere, T., May 8, 2018., Rodent biology and control. LDAF Recertification, Alexandria, LA.

Madere, T., May 8, 2018., Myths of pest control, LDAF Recertification, Alexandria, LA.

Madere, T., May 12, 2018. Dropping Science. NOLA BugFest. New Orleans, LA.

Cloherty, E., H. Romero, E. Guidry, S. Broadley, C. Harrison, D. Stewart, and C. Riegel. May 15, 2018. A Mechanical Insecticide Approach to Non-chemical, Low-cost Mosquito Control. Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, National Environmental Health Association, NEHA Virtual Conference.

Cloherty, E., S. Straif-Bourgeois, G. Balsamo, L. Garcia, C. Pulaski, C. Herrera, H. Pronovost, and C. Riegel. May 16, 2018. Prevalence of *Baylisascaris procyonis* and *Trypanosoma cruzi* in raccoons from New Orleans, LA. Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, National Environmental Health Association, NEHA Virtual Conference.

Smith, PL., C. Riegel, F. Bauder, T. Madere, and E. Freytag. May 23, 2018. The use of camera in rodent management. National Conference on Urban Entomology and Invasive & Pest Ants Conference. Cary, NC.

Freytag, E., Claudia Riegel, Carrie Cottone, Shaun Broadley, Jack Leonard, Cindy Mannes, Patty Stofanak. The National Pest Management Association Tiny Termite House Project. May 23, 2018 National Conference on Urban Entomology and Invasive & Pest Ants Conference. Cary, NC.

Cottone, C., K. Jordan, B. Hickman, and C. Riegel. May 22, 2018. Efficacy of Trelona® Compressed Bait for Area-wide Control of Subterranean Termites in Historic Buildings in Mobile, AL. National Conference on Urban Entomology. Raleigh, North Carolina.

Freytag, E., June 4, 2018. Termites in trees. Allpoints. Webinar, New Orleans, LA.

Freytag, E., June 4, 2018 Inspection tools. Allpoints Webinar. New Orleans, LA.

Madere, T., June 4, 2018. Using Old Techniques and New Technology to Control Rodents. Allpoints Webinar. New Orleans, LA.

Madere, T., June 4, 2018. Trapping and Baiting Techniques. Allpoints Webinar. New Orleans, LA.

Madere, T., June 4, 2018. How to Inspect for Rodents Allpoints. Webinar. New Orleans, LA.

Madere, T., June 4, 2018. Roach control methods. Allpoints. Webinar. New Orleans, LA.

Madere, T. June 5, 2018. Rodent Biology and Control. LDAF Recertification, Raceland, LA.

Cloherty, E., H. Romero, E. Guidry, S. Broadley, C. Harrison, D. Stewart, and C. Riegel. June 19, 2018. A Mechanical Insecticide Approach to Non-chemical, Low-cost Mosquito Control. International Conference on Green Chemistry and Technology: Sustainable Technologies and Modern Approaches in Green Chemistry. Dublin, Ireland.

Riegel, C. June 19, 2018. Control of termites using termite baiting systems in New Orleans. International Conference on Green Chemistry and Technology: Sustainable Technologies and Modern Approaches in Green Chemistry. Dublin, Ireland.

Freytag, E. June 20, 2018. Termite biology and control. NOMTRCB & GNOPCA Pest Control Academy. New Orleans, LA.

Cloherty, E. and JA. Breaux. July 24, 2018. Mosquito Biological Control, Audubon Pre-School. New Orleans, LA.

Brown, J., July 24, 2018. French Quarter and downtown area rodent inspections and treatments. State Sanitarians Rodent training. New Orleans, LA.

Madere, T., July 24, 2018. Kitchen inspections and tips. State Sanitarians Rodent training. New Orleans, LA.

Smith, P., July 24, 2018. IPM pest proofing. State Sanitarians Rodent training. New Orleans, LA.

Riegel, C., July 24, 2018. An integrated approach to commensal rodent management in New Orleans. State Sanitarian Rodent training. New Orleans, LA.

Broadley, S., E. Guidry, C. Cottone, and C. Riegel. August 5-10, 2018. Survey of Ant (Hymenoptera: Formicidae) Biodiversity in New Orleans, Louisiana. International Union for the Study of Social Insects. Guaruja, Brazil.

Cottone, C., K. Jordan, B. Hickman, and C. Riegel. August 5-10, 2018. Efficacy of Trelona® Compressed Bait for Area-wide Control of Subterranean Termites in Historic Buildings in Mobile, AL. International Union for the Study of Social Insects. Guaruja, Brazil.

Guidry, E., B. Yokum, C. Cottone, and C. Riegel. August 5-10, 2018. Incipient Formosan Subterranean Termite, *Coptotermes formosanus* (Blattodea: Rhinotermitidae), Colonies in a Laboratory Environment. International Union for the Study of Social Insects. Guaruja, Brazil.

Breaux, JA., August 28, 2018. Bionomics and recognition of important species. Western Gulf Coast Center for Excellence in Vector-borne Diseases Master Training Course in Vector-borne Disease Management.

Breaux, JA., August 28, 2018Vector-borne diseases. Western Gulf Coast Center for Excellence in Vector-borne Diseases Master Training Course in Vector-borne Disease Management.

Madere, T., September 10, 2018. Roof rat biology and control. NOMTCB and GNOPCA Rodent and Wildlife Academy. New Orleans, LA.

Madere, T., September 11, 2018. Inspection techniques. NOMTCB and GNOPCA Rodent and Wildlife Academy. New Orleans, LA.

Smith, P.L., September 12, 2018. Pest proofing. NOMTCB and GNOPCA Rodent and Wildlife Academy. New Orleans, LA.

Madere, T., September 11, 2018. Dropping science. NOMTCB and GNOPCA Rodent and Wildlife Academy. New Orleans, LA.

Cloherty, E. and J.A. Breaux. September 30, 2018. Mosquito Biological Control. Audubon Insectarium 10th Anniversary Celebration. New Orleans, LA.

Cottone, C., October 9, 2018. General Entomology. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Freytag, E., October 9, 2018. Termite biology and control. NOMTRCB & GNOPCA Pest Control Academy. New Orleans, LA.

Guidry, E., October 9, 2018. Ant biology and identification. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Guidry, E., October 9, 2018. How to use a microscope and dichotomous key. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Cottone, C., October 10, 2018. Filth flies. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Madere, T., October 9, 2018. Rodent biology and control. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Madere, T., October 10, 2018. Dropping science. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Madere, T., October 11, 2018. Kitchen Inspections. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Freytag, E. October 11, 2018. Termite inspections and available technology. NOMTCB and GNOPCA Pest Control Academy. New Orleans, LA.

Cottone, C. October 18, 2018. General Pest Control. GNOPCA and NOMTCB Technician's Recertification. New Orleans, LA.

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Breaux, JA., November 14, 2018. Ecological and geospatial dynamics of mosquito populations in waste tires in New Orleans. Entomological Society of America 2018 Annual Meeting. Vancouver, BC, Canada.

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Breaux, JA., December 4, 2018. Ecological and geospatial dynamics of mosquito populations in waste tires in New Orleans. Louisiana Mosquito Control Association Annual Meeting. Lafayette, LA.

Cloherty, E. December 5, 2018. Evolution of Insecticide Resistance. Louisiana Mosquito Control Association, LMCA, Annual Meeting. Lafayette, LA.

Anderson, ET. Bottle bioassays. December 5, 2018. Evolution of Insecticide Resistance. Louisiana Mosquito Control Association, LMCA, Annual Meeting. Lafayette, LA.

Cottone, C. December 5, 2018. Molecular Diagnostics for Insecticide Resistance. Louisiana Mosquito Control Association. Lafayette, LA.

Riegel, C., December 6, 2018. ELC grant deliverables. Louisiana Mosquito Control Association, LMCA, Annual Meeting. Lafayette, LA.

Abstracts

Survey of Ant (Hymenoptera: Formicidae) Biodiversity in New Orleans, Louisiana
Shaun Broadley, Eric Guidry, Carrie Cottone, and Claudia Riegel. The Formicidae is a very diverse family of social insects that are a very important component of the ecosystem. There are approximately 140 known species in Louisiana, but not all have been documented within the city of New Orleans. Though we have already collected ant species representing 16 different genera, an extensive survey focusing on ant diversity in New Orleans has not yet been conducted. For this preliminary survey of ants in New Orleans, we sampled within three types of environments found within the city: forested, urban, and greenspaces. Sampling was conducted at each of these areas twice a week for three months using active sampling techniques, pitfall traps, baiting, and Berlese funnels. All collected ants were identified to species and counted to determine diversity of species and their relative abundance.

Efficacy of Trelona® Compressed Termite Bait for Area-wide Control of Subterranean Termites in Historic Buildings in Mobile, AL
Carrie Cottone, Kyle Jordan, Bob Hickman, and Claudia Riegel. The Formosan subterranean termite is a structural pest of major economic importance throughout the southeast United States. In 2017, members of New Orleans Mosquito, Termite, and Rodent Control Board were given the unique opportunity to assist the city of Mobile, AL to protect some of their historic buildings from further termite attack. We worked with local pest management professionals to install Advance® Termite Bait System in-ground stations around the Exploreum Science Center and the History Museum. These buildings occupy an entire city block and have a history of termite infestation. The first three months after station installation acted as a monitoring phase, in which monitoring devices without active ingredient were introduced into the stations. During this time, stations were checked monthly for termite activity. By the end of the monitoring phase, ten stations were active with Formosan subterranean termites, *Coptotermes formosanus*, and one station was active with native subterranean termites, *Reticulitermes* sp. These colonies were delineated using microsatellite genotyping. At the end of the initial three month period, monitoring devices were replaced with two cartridges of Trelona® Compressed Termite Bait containing 0.5% novaluron and the stations were checked quarterly. Within three months after baiting, we observed only three stations that contained actively foraging termites. We also observed fewer termites and reduced bait consumption within each station when compared to the same stations during the monitoring phase. Termites are actively feeding on the bait and the results of this will be presented.

Incipient Formosan Subterranean Termite, *Coptotermes formosanus* (Blattodea: Rhinotermitidae) Colonies in a Laboratory Environment
Guidry, E., B. Yokum, C. Cottone, and C. Riegel. The Formosan subterranean termite (FST), *Coptotermes formosanus* Shiraki (Blattodea: Rhinotermitidae) was introduced into the United States from southeast China following World War II. Initially discovered in Lake Charles, LA and New Orleans, LA via military cargo ships returning from the Pacific Theater, this destructive pest

has gradually expanded its range across the southeastern United States. Formosan subterranean termite colony expansion is facilitated with the aide of human transport of termite-infested timbers (i.e. railroad ties, building lumber, mulch), and through its natural alate dispersal during flight season. In New Orleans, and the surrounding metropolitan area, these termites swarm during April, May, and June and disperse into the environment. During the flight season in May and June 2017, containers were placed outside one suburban location to collect reproductive pairs of FST. The containers were constructed with features attractive to the alates. Thirty small containers, termed nuptial chambers, containing damp wood and cardboard stacks were placed in a large bin with mulch. Four incandescent lightbulbs were installed above the nuptial chambers as an attractant for the swarming termites. A total of 113 mated pairs were sampled during the three nights that the containers were placed outside. After removing the tandem pairs from the original collection chambers, mated pairs were transferred to a second housing unit, and raised in a controlled environment for future laboratory studies. Currently 42 of the original 113 pairs of FST remain alive and the majority have successfully reproduced.

Education

Seminars at NOMTCB

NOMTCB employees continued to participate and attend seminars, trainings and workshops given by NOMTCB specialists every third Wednesday of the month from 9:00-10:00am. These seminars enhance the knowledge and experience of the inspectors and all who attend. Guest speakers from all over the country provide continued education covering all types of pest control. The rules and regulations of pest control are always changing, and it is important to keep our staff up-to-date. NOMTRCB inspectors are responsible for attending all seminars and weekly meetings (CAO Policy meetings, LDAF recertification classes, Hazwoper and OSHA recertification classes and general staff meetings). In pest control, “The Label is the Law”, and these seminars help us remain in compliance after changes to regulations and policies.

Outreach

The Garden Show (April 7, 2018)

New Orleans Mosquito/Termite and Rodent inspectors participated in the 2018 Garden Show, where verbal and educational displays were provided. A first place ribbon was won in the educational division (Fig. 62).

Figure 62. The NOMTCB educational display (left) won first place (right) in the educational division at the Garden Show.

Magic On The River (May 7, 2018)

Rodent and Mosquito Inspectors participated in Magic On The River, which is an educational experience teaching youth the importance of connections between agriculture, the environment, and their lives. NOMTRCB provided a display on mosquito/rodents/termites and general pests.

NACCHO: (July 2018)

Inspectors participated in the NACCHO fair (Fig. 63). The mission of National Association of County and City Health Officials is to improve the health of communities by strengthening and advocating for local health department. Rodent inspector displayed mosquitoes, rodents, and general pest to educate the public.

Really Wheelin, Make a Difference Day Fair, October 28, 2018, 1829 Caffin Ave., New Orleans, LA

Figure 63. The NOMTCB educational display at the NAACHO meeting in New Orleans.

Publications

Moise, K. I, C. Riegel and E. J. Muturi. 2018. Environmental and social-demographic drivers of *Cx. quinquefasciatus* mosquito densities in New Orleans, Louisiana. Parasites and Vectors 11:249.

Rael, R., A. Peterson, B. Ghersi, C. Riegel, A. Lesen, M. Blum. 2018. The distribution and prevalence of rat lungworm (*Angiostrongylus cantonensis*) infection in rodents across post-Katrina New Orleans. Emerging Infectious Disease, EID-18-0056.R3.

Committees

Bordes, E. Board member of the Greater New Orleans Pest Control Association
Cottone, C., Tulane Institutional Biosafety Committee.
Madere, T., Quality Pro Rodent Program Committee, NPMA
Riegel, C., Quality Pro Core Team, NPMA
Riegel, C. EPA's PPDHC Workgroup Member
Riegel, C. Board member of the Greater New Orleans Pest Control Association
Riegel, C. Board member of the Louisiana Mosquito Control Association

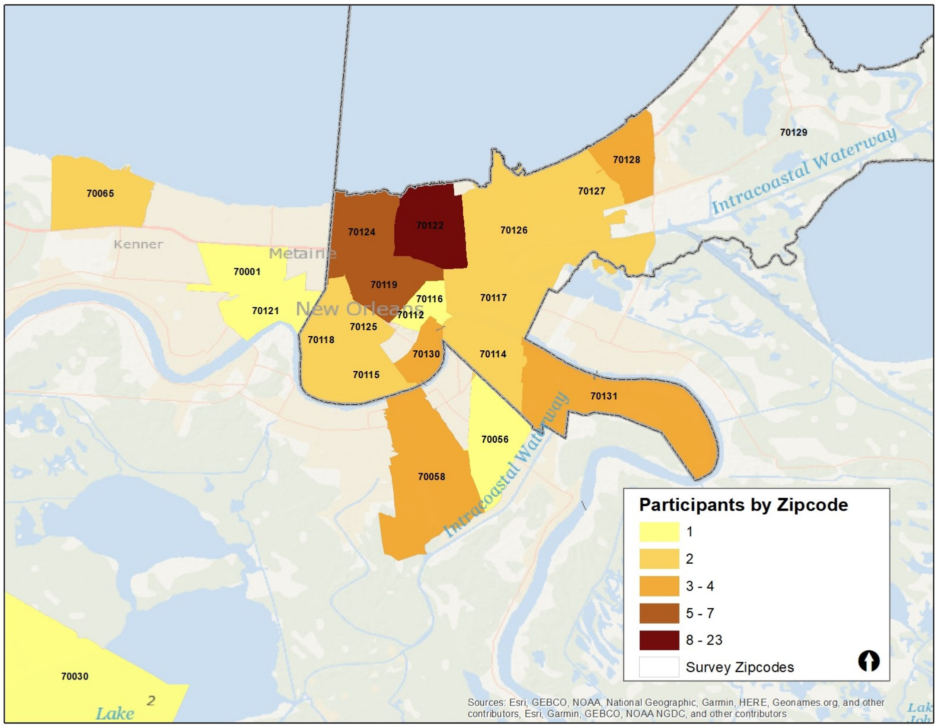

Figure 64. BugFest drew people from the entire metropolitan area.

NOLA BugFest

The first New Orleans 'Bugfest' insect festival took place on a Saturday, May 12 at the our facility grounds. It was hosted by the our department, the Audubon Butterfly Garden and Insectarium, and the Greater New Orleans Pest Control Association. This free event showcased the beauty and diversity of insects, spiders, rodents and other animals found in and around your home and garden.

With more than 30 organizations and 40 educational booths and activities, visitors had the opportunity to interact with entomologists and other scientists to learn about the fascinating world of insects, spiders, and wildlife found in the New Orleans area. Sponsors contributed approximately $15,000 for the event. Nearly 600 guests from the city of New Orleans and metropolitan area attended (Fig. 64). BugFest 2019 is scheduled on November 2, 2019, and we hope that this will become an annual event.

We had the great fortune of having a wonderful sunny day for taking pictures of the event. Following are pictures of the great fun everyone had at the NOLA BugFest (Figs. 65-74). The festival included family-friendly and fun activities like face painting, bug racing, sandbag throwing, storytelling, drawing and building insects, as well as many educational booths and crafts.

Fig. 65. Mosquito education.

Fig. 66. Audubon Insectarium bug race.

Fig. 67. Face painting.

Fig. 68. Outdoor booths and activities

Fig. 69. Bean bag toss.

Fig. 70. Butterfly life cycle activity.

Fig. 71. Insect displays.

Fig. 72. Insect biology sessions

Fig. 73. Audubon Zoo

Fig. 74. Timmy the termite.

APPENDIX A

Spatial Distribution of Illegal Discarded Vehicle Tires and Their Influence on *Aedes albopictus* and *Culex quinquefasciatus* populations in New Orleans, Louisiana

M. Sallam, T. Ahmed, B. Carter, I. Moise and C. Riegel

Discarded vehicle tires play an important role in the proliferation of container mosquito populations, particularly the introduction and expansion of mosquito species. We sampled 169 sites with 1,784 discarded tires in 13 planning districts from January 2015 to January 2018. We aimed to assess spatial distribution in illegally discarded tires and the influence of total of 13 land use-land cover (LULC) and demographic variables on discarded tires frequency and density within macro- (100 m^2) and microhabitats (2 km^2) using geospatial statistical tool in ArcGIS and generalized regression models.

Spatial clustering of discarded automobile tires (Z-score = 1.76, p<0.10) was found. Most of these discarded tires were in areas of the 13 planning New Orleans districts (Figure A1-1). In contrast, the density of discarded tires showed a random spatial distribution (Z-score value = -0.17, p>0.05). However, the concentration center of illegal discarded tire frequency and density was in Mid-city. We also found that certain areas of New Orleans have an elevated risk for discarded tires in both frequency and density. This area covers a total area of 24.8 km^2 (5.64%) and 23.3 km^2 (5.31%) of the total land area of New Orleans and are mostly located in 11 planning districts.

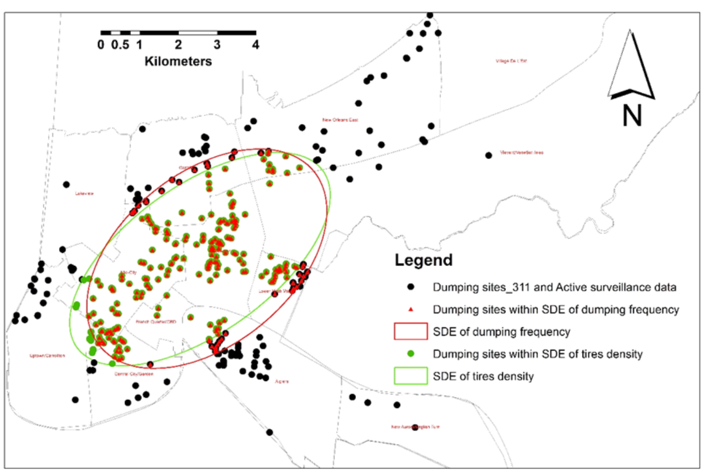

Figure A1-1. Standard Deviational Ellipse (SDE) for dumping frequency and tires density showing dumping sites within SDE polygons.

Sampling for mosquito immatures from tires system were undertaken during November 2016 January 2018 in different landscapes in the City of New Orleans. The number of mosquito immatures were reported using 5ml syringe. Total of 5 to 150 ml water volume were sampled from tires, with average of 15 ml. Mosquito immatures were transferred in Whirl pack bags to our laboratory at New Orleans Mosquito, Termite Control Board (NOMTCB) for further samples assortment, rearing, and identification. Mosquito immatures were left in plastic mosquito breeders until emergence into adult stages for identification to species level using the taxonomic keys. A total of 405 dumping sites with a total of 6,491 tires were reported during the current study representing the 13 planning zones in the city of New Orleans. Only 169 sites (~41.73%) were actively surveyed for mosquito immatures. The other 236 (~58.27%) sites with a total of 4,707 tires were reported by 311 service. Dumping sites reported by 311 service could not be surveyed for mosquito immatures because tires at these sites were removed by department of sanitation of the city of New Orleans. Out of 1,784 surveyed tires, a total of 1,298 (~72.76%) were found to contain water. Only 760 (~58.55%) of water containing tires were positive breeding habitats for mosquito immatures.

Total of 65 sampling sites were positive for mosquito colonization/breeding in the sampled tires with total of 5,960 mosquito immatures (larvae/pupae). These tires provided suitable colonization habitats for twelve mosquito species: *Ae. albopictus* (44.63%), *Ae. aegypti* (9.63%), *Anopheles crucians* (0.07%), *An. punctipennis* (0.02%), *An. quadrimaculatus* (0.59%), *Cx. nigripalpus* (17.65%), *Cx. restuans* (0.67%), *Cx. salinarius* (1.75%), *Cx. territans* (0.10%), *Cx. quinquefasciatus* (24.83%), *Orthpodomyia signifera* (0.05%), *Toxorhynchitus rutilius* (0.02%). Colonized *Ae. albopictus* populations was the highest, followed by *Cx. quinquefasciatus* (24.83%) and *Cx. nigripalpus* (17.65%). Both *Ae. albopictus* and *Cx. quinquefasciatus* populations dominated 65 and 32 sites, respectively.

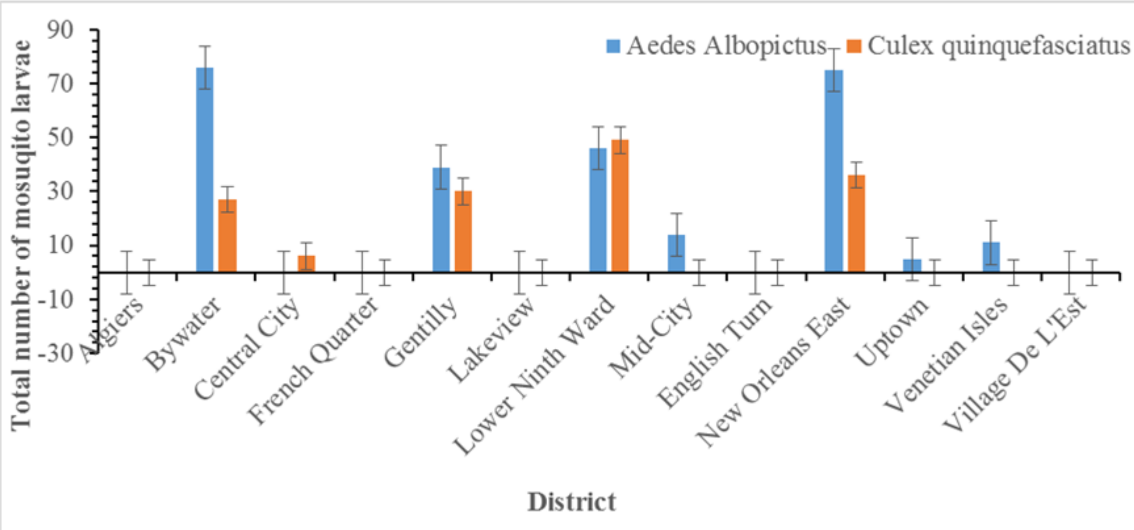

Figure A1-2. Spatial distribution of mosquito populations in city of New Orleans

Dominance *of Ae. albopictus* populations also was demonstrated on spatial scale, as it was collected from seven districts (~54%). *Culex. quinquefasciatus* was documented in five districts (~39). Both species co-existed in 21 sampling sites from four planning districts: Bywater, Gentilly, Lower Ninth Ward, and New Orleans East.

Spatial Characteristics of Illegal Discarded Vehicle Tires

Within the 100 m^2 radius around dumping sites, only six factors were significantly associated with illegal discarded tire frequency. Average housing density and human population density were highly associated with illegal discarding tire frequency and four land use land cover, LULC, types (non-forested, industrial, forested, and developed open space areas) shared reduced negative influence on discarded tire frequency. Within the 2 km^2 radius, three predicting variables were found to be associated with dumping frequency. Areas around streams, canals, and lakes were positively associated with tire frequency but developed medium intensity areas and average housing density were found to be negatively associated with illegal discarded tire frequency.

In summary, our results indicate that although the problem of discarded vehicle tires is widespread (both in frequency and density) in 13 planning districts, their center of concentration was found to be in Mid-city. We identified 12 mosquito species from 65 sites (39%) representing 1,298 (~73%) sampled tires that uses discarded tires in seven planning districts in New Orleans. The two most dominant mosquito species, *Ae. albopictus* and *Cx. quinquefasciatus*, were found to co-exist in 21 sampling sites (~32%). The clustered spatial distribution polygons of *Ae. albopictus* and *Cx. quinquefasciatus* were found to be in seven and five planning districts, respectively. This reflects the spatial dominance of the former species in tire habitats on the expense of other mosquito species. Both species were significantly predicted by microhabitat characteristics rather than macrohabitats, especially *Ae. albopictus*.

This is a critical step towards understanding the contribution of mosquito vectors in sustaining disease pathogens in their hosts, especially during relaxation of transmission cycle. In addition, adds to the growing body of research that indicates that different factors found in the tire environments influence oviposition or larval performance.

APPENDIX B: TIRE ECOLOGY PROJECT

Jennifer Breaux, Ph.D.

Illegal dumping is a significant problem in the city of New Orleans (Fig. A2-1). Tires represent a public health risk because they serve as supplementary breeding habitat, and many container-breeding mosquitoes play roles in vector-borne disease cycles. This project aims to generate a better understanding of mosquito population dynamics in tires and the potential for adult vector production in tires and other container-breeding habitats.

Methods

The New Orleans Mosquito, Termite and Rodent Control Board collected data from discarded tires from illegal dumping locations throughout the city. From March—November 2018. Tires were located through 311 calls and active surveillance. Tires at sites were counted, and a subset was destructively sampled by sieving all content. Microhabitat environmental variables were measured and all invertebrates were identified and counted, including mosquitoes. All organic and synthetic detritus from containers was also collected, dried, weighed and sorted into classes for correlational analysis.

Figure A2-1. Example of a typical tire dumping site located through surveillance. New Orleans East, June 2018.

Data Analysis

We used AIC-based model selection and random forest regression to test for correlations between mosquito larval abundances in tires and microhabitat-level variables, as well as between mosquito species composition and abundances and macrohabitat-level demographic, social, or land-use variables.

Results

We found ten mosquito species and ten non-mosquito taxa occupying tires in the city of New Orleans (Table A2-1). Temporal species turnover was evident in preliminary analyses (Fig. A2-2), although these data were compiled over the entire city, which ignores any potential spatial trends.

MOSQUITO SPECIES	NON-MOSQUITO TAXA
Anopheles crucians	Copepods
Culex salinarius	Water mites (Hydrachnidae)
Culex quinqufasciatus	Freshwater oligochaetes (*Dero* sp.)
Culex restuans	Ostracods
Culex coronator	Chirominidae
Culex nigripalpus	Ceratopogonidae
Aedes albopictus	Psychodidae
Aedes aegypti	Notonectidae
Ochlerotatus triseriatus	*Daphnia* spp.
Toxorhynchites rutilus	Branchiopoda (Conchostraca)

Table A2-1. Mosquito species and non-mosquito taxa found in tires throughout the City of New Orleans in 2018.

Ecological data analyses using AIC and random forest regression showed positive correlations between percent canopy cover, total organic detritus, water volume and the abundance of the most common mosquito species in tires (*A. albopictus, A. aegypti, C. salinarius,* and *C. quinquefasciatus*). Mosquito larval abundances in general were positively correlated with commercial and urban land use and NDVI values (=vegetation index). Further data collection and evaluation of these correlations may inform operations by helping us to understand how environmental factors influence mosquito species composition and the seasonal arrival of vector species. This in turn can help us to determine the appropriate methodology, timing, and geographical locations for application of larval control methods in tires and other container habitats.

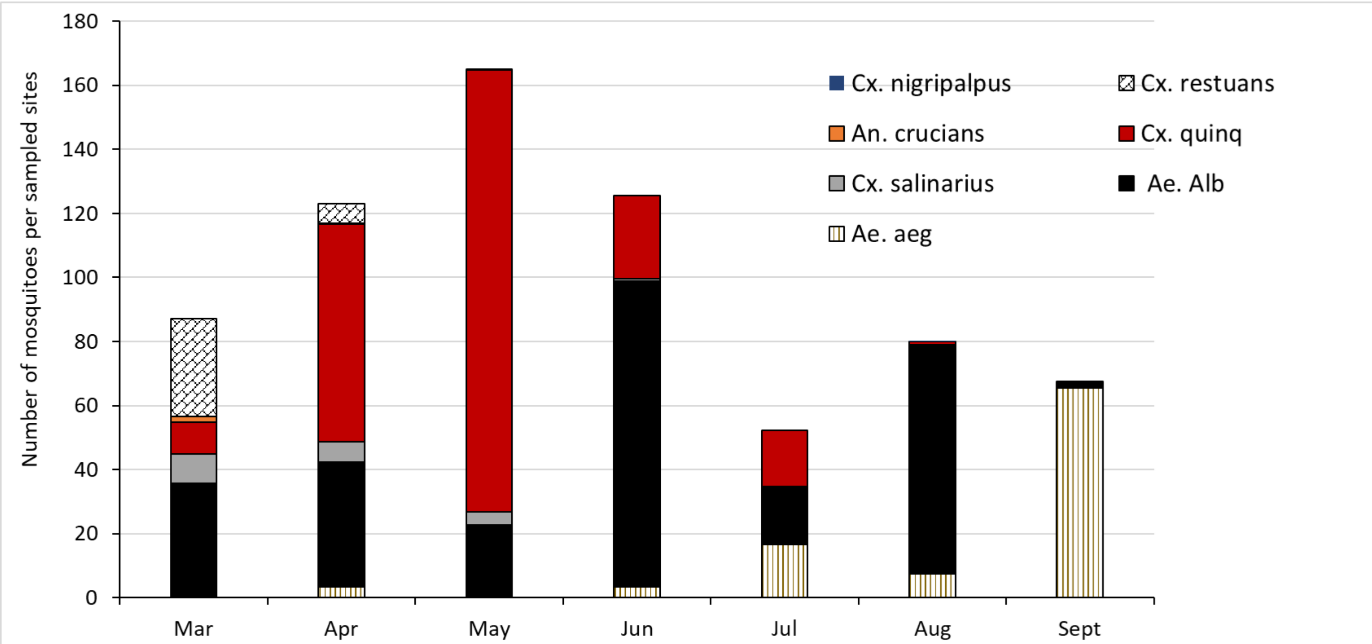

Figure A2-2. Temporal species turnover by month throughout out the city of New Orleans from March to September 2018.

APPENDIX C
Area-wide larviciding in an urban landscape for *Aedes aegypti* management.

The use of truck-mounted larvicides has been shown to reduce mosquito populations in urban areas. When this method was used as part of an integrated program for managing *Aedes albopictus* in a highly urban area, mosquito collections were reduced after program implementation. Numerous examples have shown that a high level of preparedness is essential to prevent and respond to mosquito-borne disease. In 2016, Miami-Dade County, FL alternated the use of adulticides and larvidices was critical in stopping local transmission of Zika virus.

Optimization of field procedures is required to produce standard operating procedures that can be replicated and to have the efficacy to support the use of these control methods. The cost for aerial and ground area-wide application is prohibitive, therefore finding effective methods at affordable prices is crucial for incorporation of proactive treatment methods to reduce the risk of local transmission of mosquito-borne diseases both prior to and during an outbreak.

Field trials were conducted with truck-mounted equipment for area-wide applications of larvicide through open-field and a neighborhood sites. Open field trials evaluate the distance of application in unobstructed conditions, while neighborhood trials evaluate both distance and ability to reach obstructed locations in an area representative of common housing structure in New Orleans.

Three types of truck mounted units were evaluated: 1) Ag-Mister LV8™ Agriculture Low Volume Sprayer (Curtis Dyna-fog, Westfield, IN) (Fig. AC-1A), 2) Buffalo Turbine CSM/3 Sprayer (Buffalo Turbine, Springville, NY) (Fig. AB-1B) and, 3) the A1 Agricultural Mist Sprayer (A1 Mist Sprayers, Ponca, NE) (Fig. AC-1C). Each unit was modified from factory standards. The larvicide used in the field trials was VectoBac® WDG (Valent Biosciences, Libertyville, IL at ½ pound per acre (tank mix of 1 pound per gallon).

Applications were conducted between 6-8 am with the temperatures ranging from 70 to 90 ˚F, depending on time of the year of the application. The applications were made when precipitation was absent. Wind, relative humidity and temperature were recorded prior to, during, and post-application using the Kestrel 4500 Pocket Weather Tracker.

Trials were conducted in both an open field and an urban neighborhood to evaluate effective application distance and ability to target both open and sequestered areas.

Open field trials: In open field trials, a single pass application was evaluated from each machine. Bioassay jars were set up in a grid of 5 rows at 50' intervals from the application site, up to 1,000 feet (Fig. AC-2). Red dye was added to the tank mix in order to count and measure the droplets.

Neighborhood trials: A neighborhood trial evaluated distance of application in a common New Orleans neighborhood type as well as the ability to deliver an effective application to open and sequestered locations in yards (Fig. AC-3).

Bioassays

Empty bioassay jars were opened just prior to application and remained in the field for 30 minutes post-application to allow for larvicide droplet deposition. The jars were collected and taken immediately to our Biological Control Laboratory. Two hundred milliliters of charcoal filtered water and 15, first-instar laboratory-reared *Ae. aegypti* were added to each bioassay jar (Fig. AC-4) and larval mortality was recorded at 1, 24, and 48 hours.

Buffalo Turbine:

Open field trial: The average mortality of *Ae. aegypti* at 0-50 feet was 41.3% when larvicide was applied with the Buffalo Turbine (Fig. AC-1). At 50-300 feet, mortality increased to 80-100%. Past 300 feet, little to no larval mortality was observed. In both runs, average droplet counts supported mortality observations.

Figure AC-1A. Ag Mister-LV8.

Figure AC-1B. Buffalo Turbine.

Figure AC-1C. A1 Mist Sprayer.

	$X2_{1000'}$	**$X_{1000'}$**	**$X_{1000'}$**	
	$X2_{900'}$	$X_{900'}$	$X_{900'}$	
	$X2_{800'}$	$X_{800'}$	$X_{800'}$	
	$X2_{700'}$	$X_{700'}$	$X_{700'}$	
	$X2_{600'}$	$X_{600'}$	$X_{600''}$	
	$X_{550'}$	$X_{550'}$	$X_{550'}$	
	$X2_{500'}$	$X_{500'}$	$X_{500'}$	
	$X2_{450'}$	$X_{450'}$	$X_{450'}$	
	$X2_{400'}$	$X_{400'}$	$X_{400'}$	
	$X2_{350'}$	$X_{350'}$	$X_{350'}$	
$X1_{300'}$	$X2_{300'}$	$X_{300'}$	$X_{300'}$	$X_{300'}$
$X1_{250'}$	$X2_{250'}$	$X_{250'}$	$X_{250'}$	$X_{250'}$
$X1_{200'}$	$X2_{200'}$	$X_{200'}$	$X_{200'}$	$X_{200'}$
$X1_{150'}$	$X2_{150'}$	$X_{150'}$	$X_{150'}$	$X_{150'}$
$X1_{100'}$	$X2_{100'}$	$X_{100'}$	$X_{100'}$	$X_{100'}$
$X1_{50'}$	$X2_{50'}$	$X_{50'}$	$X_{50'}$	$X_{50'}$
$X1_{0'}$	$X2_{0'}$	$X_{0'}$	$X_{0'}$	$X_{0'}$
Row 1	Row 2	Row 3	Row 4	Row 5

Figure AC-2. Open field plot design to evaluate the distance of the larvicide application.

Figure AC-3. A neighborhood trial evaluated distance of application in a common New Orleans neighborhood.

Figure AC-4. Bioassays conducted at the Biocontrol Laboratory determined the efficacy and deposition of the larvicide applied with the spray equipment.

Neighborhood trials:
Buffalo Turbine: Bioassay cups placed were placed in open and sequestered locations on properties in the Holy Cross area of the 9th Ward (AC-3). The furthest distance from the center point of the street to the backyard was approximately 150 ft. The average mortality of *Ae. aegypti* ranged from 65.5 -100%, depending on the location of the cups (Fig. AC-5, Table AC-1). A double pass was made in the neighborhood using a snake pattern (Fig. AC-3).

A1 Mist Sprayer
Open field trial: Larvicide reached every container in the trial when the A1 Mist Sprayer was used. The average mortality of *Ae. aegypti* at 0-600 ft was 100%. At 700, 800 and 900 ft from the point of application, mortality was 87, 83, and 100%, respectively.

Neighborhood trials: Bioassay cups were placed in the same open and sequestered locations on properties in the Holy Cross area of the 9th Ward. The average mortality of *Ae. aegypti* ranged from 98.5-100%, depending on the location of the cups (Table AC-2).

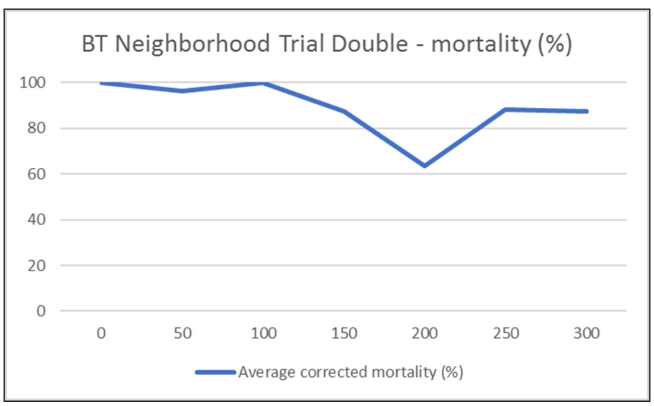

Figure AC-5. The open field plot design to evaluate distance of application and larval mortality. A) The LV8's optimum distance was between 0-50 ft. of point of release. B) The Buffalo Turbine's (BT) optimum range was between 50-300 ft.

Three spray units were evaluated to determine their ability to deposit Vectobac WGD in containers placed in open and sequestered locations. The A1 Mist Sprayer with the rotary atomizer (Fig. AC-6)

Distance (in ft)	Average corrected mortality (%)
Front Open	100.0
Front Sequestered	89.5
Back Open	82.3
Back Sequestered	65.5

Table AC-1. Mortality of *Aedes aegypti* from bioassays conducted after treatment of Vectobac WDG using the Buffalo Turbine. The cups were placed in open placed in open and sequestered locations range was between 50-300 ft.

Distance (in ft)	Average corrected mortality (%)
Front Open	100
Front Sequestered	100
Back Open	99.3
Back Sequestered	98.5

Table AC-2. Mortality of *Aedes aegypti* from bioassays conducted after treatment of Vectobac WDG using the A1 Mist Sprayer. The cups were placed in open placed in open and sequestered locations.

had the best performance in trials carried out in the open field and in a typical New Orleans neighborhood. The field trials allowed NOMTCB to understand the limitations of each unit so that each can be utilized in mosquito control operations.

All three units have been used, however, the A1 Mist Sprayer was the first choice for urban areas due to its ability to deliver the larvicide to distances far from the point of release and due to its ability to change the direction and angle of application during a spray mission (Fig. AC-6). A 500-gallon nurse tank (Fig. AC-7) was recently purchased that will allow for greater operational efficiency.

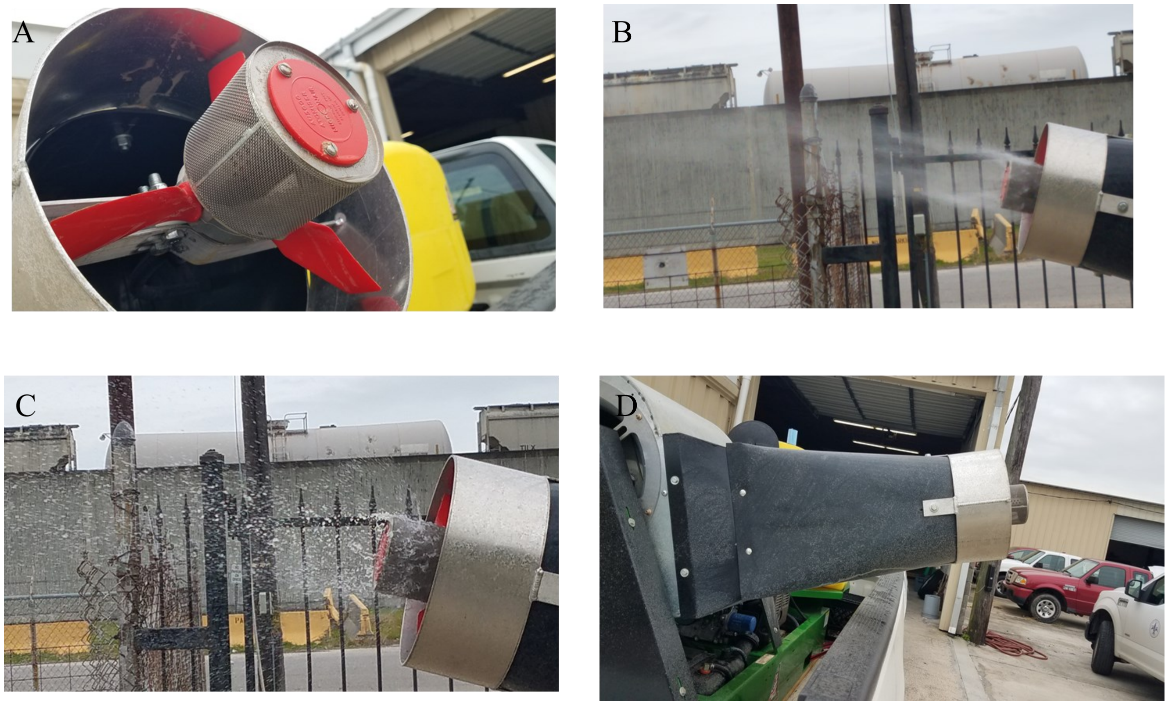

Figure AC-6 A-D. The A1 Mist Sprayer has a rotary atomizer (A) that assists in obtaining more uniform droplet sizes (B, C). The fan rotation gear can be adjusted (D) during operation to redirect the spray to the intended target.

Figure A2-7. A 500-gallon nurse tank was purchased to mix the larvicide and to reload the A1 Mist Sprayer while in the field.

APPENDIX D: BIOLOGICAL CONTROL FIELD TRIALS

Jennifer Breaux, Ph.D.

The New Orleans Mosquito, Termite and Rodent Control Board performed field trials testing the effectiveness of the freshwater copepod *Mesocyclops longisetus* as a biological control agent of mosquito larvae. Our field trials utilized discarded tires, which can be thought of as a proxy for any artificial container.

The goals of this project were:

1. to describe the effects of biological control agents on mosquito larval abundances and species composition;
2. to determine copepod population growth curves over time;
3. to determine optimal timing of biological control agent application; and
4. to establish potential re-application rates.

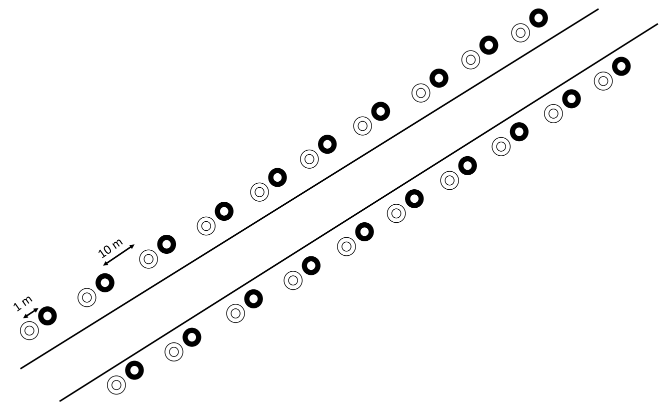

Figure AD-1. Transect configuration for the biocontrol field trial using copepods. The black circles represent experimental tires (+ 40 copepods) and the white circles represent control tires (no copepods). The distance between paired tires was 3 m, and the distance between pairs was 10 m. Tires were sampled at 2, 4, and 6 weeks post-copepod addition.

Field Trials

Two linear transects were established along the I-10 service road in New Orleans East between Lake Forest and Bullard Ave. Tires were collected, power washed, dried, and placed in pairs along ~1.5 km linear transects on both sides of the road with a distance of 3 meters between the experimental tire (+ 40 copepods) and control tire (no copepods) (Fig. AD-1). The initial water level was set to 2 L and water level was restored each week if necessary (Fig. AD-2A). Five pairs of tires were destructively sampled each week. All mosquitoes were identified to species and copepods were counted in a 200 ml subsample (Fig. AD-2B).

Biocontrol Data Summary

Mean copepod density per tire roughly doubled each two weeks (Fig. AD-3), however copepod densities over time among tires were highly variable, and some populations crashed. Larval densities of *Aedes albopictus* and *Culex quinquefasciatus* larvae were significantly reduced in containers with copepods compared to controls after four and six weeks; however, the predatory mosquito *Toxorhynchites rutilus* was also highly abundant at the site and because *Toxorhynchites* larvae and copepods co-inhabited most containers, under this experimental design we were not able to determine whether the observed results were due to *Toxorhynchites* or copepods occupying the tires.

There are two mechanisms by which predators reduce larval abundances in containers. First, predators can reduce prey mosquito abundances directly via consumption. Second, predators can impact mosquito larval abundances indirectly through effects on the behavior of mosquito larvae or ovipositing adults. *Culex* mosquitoes, in particular, are known to be capable of detecting the presence of predators in breeding habitats and to avoid ovipositing in those containers. Thus, the mechanism of the reduction in *C. quinquefasciatus* or *A. albopictus* could be a) due to consumption by either copepods or *Toxorhynchites*; or b) because *Culex* avoid ovipositing into containers with predators.

One way to determine which mechanism has caused the observed reduction in mean mosquito densities per tire is via a cage oviposition choice assay, in which mosquitoes are fed a blood meal and placed singly into cages with two possible oviposition substrates: one with predators and one without. If the mosquitoes avoid placing eggs into containers with predators, this suggests that they may also avoid placing eggs into field containers with biological control agents.

Figures AD-2 A, B. A) The initial water level was set to 2 L and water level was restored each week if needed. B) Copepods were placed into experimental tires by Dr. Jen Breaux.

NOMTCB began laboratory ovipostion trials in October 2018, and is currently testing egg laying responses of three mosquito species: *Aedes albopictus*, *Culex quinquefasciatus*, and *Aedes aegypti.* These results should help us to better understand whether the addition of predators will be effective in reducing mosquito populations, or whether they may unintentionally cause behavioral changes in vector species that drive them to breed in more cryptic habitats.

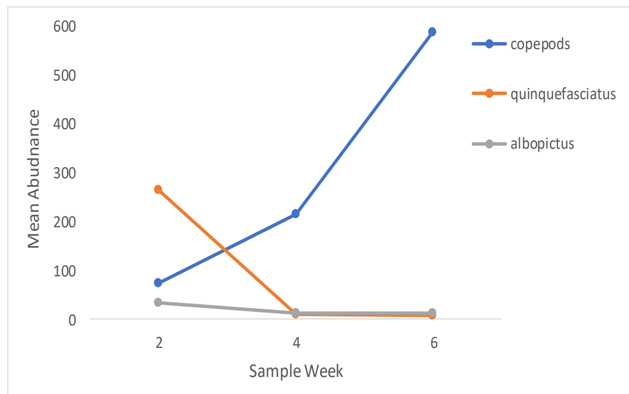

Figure AD-3. Changes in the densities of the most abundant prey mosquito species and copepods over the duration of the experiment.

APPENDIX E: RESISTANCE TESTING

Thomas Anderson, Friede Bauder, Jennifer Breaux, S. Broadley, Erin Cloherty, Carrie Cottone, Eric Guidry, Cynthia Harrison, Andra McClue, Sarah Michaels, Claudia Riegel, and Mohamed Sallam

Protocol

NOMTCB conducted insecticide resistance testing using bottle bioassays on *Aedes aegypti* mosquitoes as part of the Enhanced Laboratory Capacity grant. Through these lab studies we can determine if our local populations are resistant to insecticides in use and selected active ingredients on the market for mosquito control. Friederike Bauder (Pest Control Inspector 3) drafted the initial protocols for the bottle bioassay test with the guidance of Dr. Phil Koehler (University of Florida), Dr. Janet McAllister (CDC), Dr. Claudia Riegel (NOMTRCB), and Dr. Mohamed Sallam (NOMTRCB). E. Thomas Anderson (Pest Control Inspector 2), made minor changes to the protocol after several bioassays to address issues encountered.

Rearing for Bottle Bioassay

Rearing mosquitoes for bottle bioassays is a laborious endeavor (AE-1). Cynthia Harrison and Andra McClue reared the mosquitoes for the assays. The team is thankful to the field crew for their weekly collections and hard work. Without the surveillance crew, it would not have been possible to obtain the mosquitoes needed for the test. This project has been a team effort across NOMTRCB.

Field collected mosquitoes were counted and brought to the lab for storage. Seed germination paper with mosquito eggs were regularly checked for egg collapsing. Once zones were picked for testing, egg papers were dropped (placed in warm water to induce hatching), the larvae were sorted and identified. After identification, larvae were reared to adults (F0). The F0 mosquitoes were for blood feeding in order to obtain the F1 generation. Generation eggs were then reared to adults for bottle bioassays. The F1 generation mosquitoes were used in order to obtain enough mosquitoes for the bioassays for the zone evaluated.

Bottle Bioassays

Seven active ingredients (Fig. AE-2) were tested against *Aedes aegyptii.* These insecticides represent two different classes of insecticide, pyrethroids (permethrin, bifenthrin, lamda-cyhalothrin, deltamethrin, and etofenprox) and organophosphates (naled and malathion). The individuals performing the bioassays include Thomas Anderson, Carrie Cottone, Eric Guidry, Erin Cloherty, and Shaun Broadley (Fig. AE-3).

Figure AE-1. Friederike Bauder and Andra McClue feeding larvae for larvae identification from spray zones.

Figure AE-2. Technical grade insecticides used for the bottle bioassays.

Figure AE-3. Shaun Broadly evaluating mosquito mortality in a bottle bioassay test.

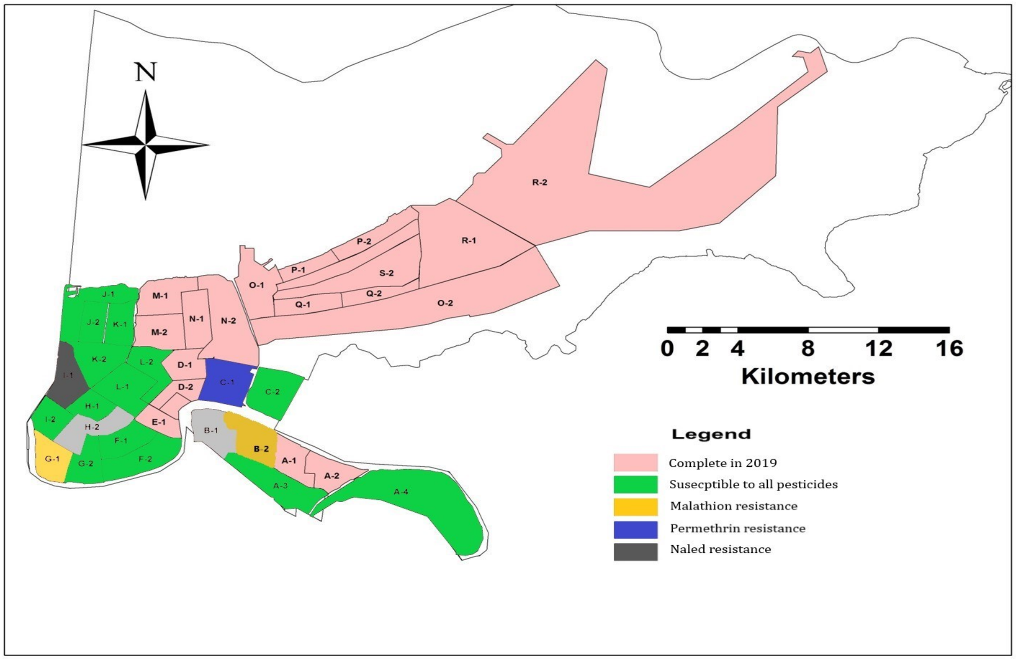

Figure AE-4. Spray zone map showing the status of resistance testing of *Aedes aegypti*.

Bioassay Data Summary

The bottle bioassays conducted with *Aedes aegypti* mosquitoes across spray zones in Orleans Parish were started in 2018 and will be completed by April 2019. Preliminary results indicate resistance was observed in limited zones (Fig. AE-4). The majority of the *Ae. aegypti* evaluated were susceptible to the panel of insecticides selected for evaluation. Resistance to naled was observed in Zone I1 (Fig AE-4) . Though, still considered susceptible, resistance of *Ae. aegypti* to naled in zones B1 and H2 is developing (Fig. AE-5). A full summary of the results can be found in Table AE-1.

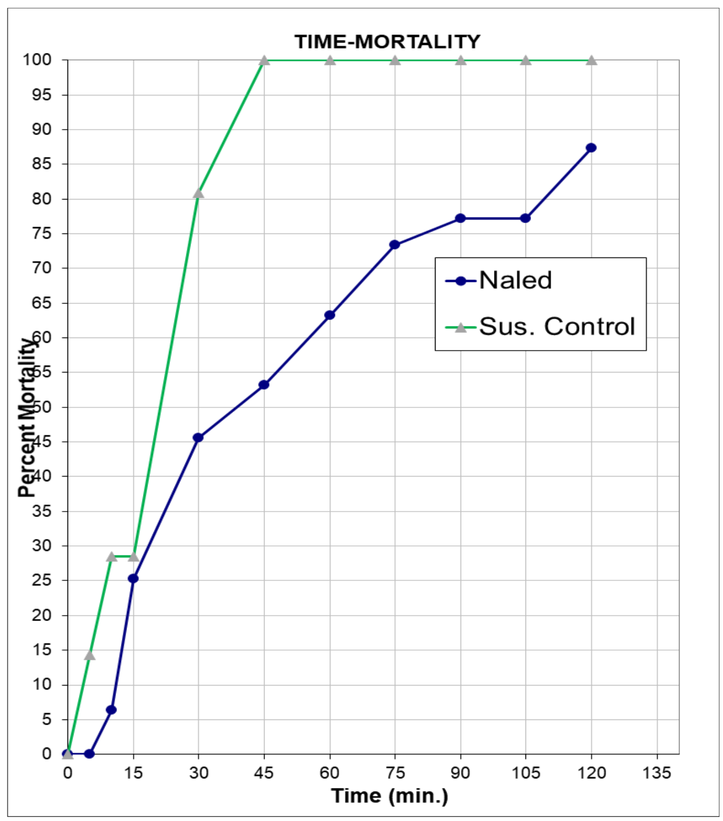

Figure AE-5. Results in Zone I1 indicate resistance to naled in *Aedes aegypti* mosquitoes. Tested 12/12/18

Table AE-1. Technical grade insecticides used for the bottle bioassays.

Zone	Status
A1	Complete in 2019
A2	Complete in 2019
A3	SUSCEPTIBLE
A4	SUSCEPTIBLE
B1	Developing resistance to naled
B2	Resistant to malathion
C1	Resistant to permethrin (*small sample*)
C2	SUSCEPTIBLE
D1	Complete in 2019
D2	Complete in 2019
E1	Complete in 2019
E2	Complete in 2019
F1	SUSCEPTIBLE
F2	SUSCEPTIBLE
G1	Developing Resistance to malathion (a *further test did not replicate this result)*
G2	SUSCEPTIBLE
H1	SUSCEPTIBLE
H2	Developing resistance to naled
I1	Resistant to naled
I2	SUSCEPTIBLE
J1	SUSCEPTIBLE
J2	SUSCEPTIBLE
K1	SUSCEPTIBLE
K2	SUSCEPTIBLE
L1	SUSCEPTIBLE
L2	SUSCEPTIBLE
M1	Complete in 2019
M2	Complete in 2019
O1	Complete in 2019
O2	Complete in 2019
P1	Complete in 2019
P2	Complete in 2019
Q1	Complete in 2019
Q2	Complete in 2019
R1	Complete in 2019
R2	Complete in 2019
S1	Complete in 2019
S2	Complete in 2019

Molecular Diagnostics for Insecticide Resistance

Within our spray zones in Orleans Parish, we have almost 40 trap sites used for routine surveillance. At each location, there is a gravid trap, BG Sentinel trap, and ovicups to collect *Aedes aegypti* eggs. The eggs from the ovicups in each collection location are being reared to the F1 generation for bottle bioassays and subsequent molecular testing of adults. Our goal is to determine if insecticide resistance is occurring throughout the city using bottle bioassays as well as testing for knockdown resistance (kdr) to pyrethroids. Only *Ae. aegypti* mosquitoes are being tested at this point.

Knockdown resistance testing is done using real time PCR (qPCR) followed by a melt curve. The equipment used for this is a StepOnePlus™ Applied Bioassay ThermoFisher Scientific). Real time PCR works much like regular PCR, in that it is used to amplify a segment of target DNA. However, during real time PCR, a fluorescent dye is added that binds to double-stranded DNA. At the end of the PCR run, the thermal cycler starts at a preset temperature and gradually becomes warmer while continuously measuring fluorescence. Different DNA segments will melt, or become single stranded, at different temperatures, depending on their sequence. As the temperature continues to increase the double stranded DNA denatures and become single stranded, and the fluorescent dye is dissociated. The continuous measurement of fluorescence generates distinct peaks for alleles that confer resistance in *Ae. aegypti*.

The protocol that we are using to test *Ae. aegypti* for pyrethroid resistance was developed by Alden Estep and Christy Waits (Navy Entomology Center of Excellence and Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, FL). Christy Waits even visited our lab to give us some hands-on training (Fig.AE-6).

We use molecular diagnostics to test two different alleles that confer resistance if there is an amino acid mutation. We use known resistant and susceptible strains of *Ae. aegypti* to generate peaks and compare the peaks generated by the mosquitoes we are testing to the known controls (Fig. AE-7).

So far, we have tested 1,667 individual mosquitoes, and only 6 have shown that they carry alleles that can confer resistance.

Figure AE-6. Carrie Cottone, Christy Waits, and Friederike Bauder perform kdr testing at the NOMTCB genetics laboratory.

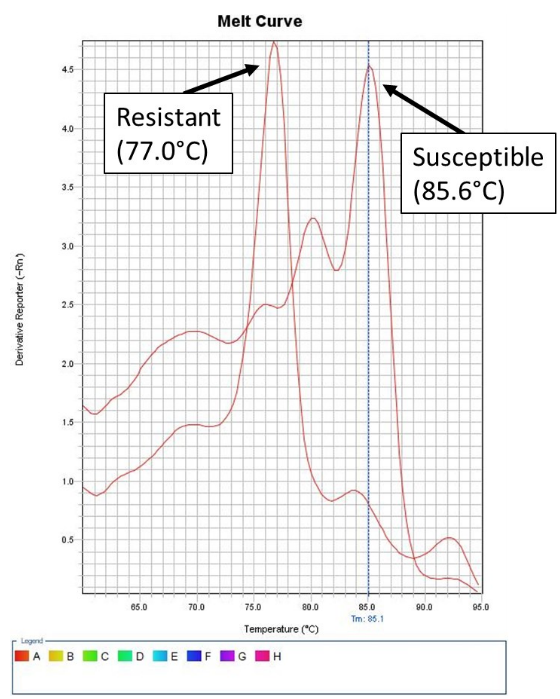

Figure AE-7. Peaks generated by known susceptible and resistant mosquitoes.

APPENDIX F: PEST CONTROL AT CITY FACILITIES

Table AF-1. City facilities inspected in 2018.

St. number	Street	City facility	Room number	Pests	Date
501	N. Rampart Street	1st District police		Roof rats, crazy ants	09/24/18
1930	MLK	6th District police		Mice	01/05/18
1930	St. Peter Street	6th District police		Mice	01/09/18
225	Morgan Street	Algiers Court House	105	Ants	07/17/18
225	Morgan Street	Algiers Court House	1st Floor	Rover ants, jumping spiders	10/31/18
10200	Almonaster Avenue	Almonaster Auto Pound	Trailer	Mice	11/29/18
10200	Almonaster Avenue	Almonaster Auto Pound		Wasps, bees	06/12/18
10200	Almonaster Avenue	Almonaster Auto Pound		Mice	11/25/18
701	N. Rampart Street	Armstrong Park		Honey bees	04/19/18
1111	Newton Street	Arthur Monday		Rat snake	04/04/18
400	N. Claiborne Ave.	Auto Pound		Rodents	05/30/18
10200	Almonaster Avenue	Auto Pound		Mice	11/20/18
400	N. Claiborne	Auto Pound		Mice	11/27/18
400	N. Claiborne	Auto Pound		Rats	11/30/18
913	Napoleon Ave.	Children Resource		Ants	12/06/18
1300	Perdido Street	City Hall	1W05	Fruit flies	04/04/18
1300	Perdido Street	City Hall	1W15/ 1W34	Phorid flies	05/08/18
1300	Perdido Street	City Hall	1W30	Mice	03/28/18
1300	Perdido Street	City Hall	1W37	Biting insects	06/11/18
1300	Perdido Street	City Hall	2W85	Fleas, biting insects	05/30/18
1300	Perdido Street	City Hall	2W87	Fleas	05/17/18
1300	Perdido Street	City Hall	2W89	Wasps	03/13/18
1300	Perdido Street	City Hall	2W89	Roaches	08/22/18
1300	Perdido Street	City Hall	4E01	Ants, spiders	05/31/18
1300	Perdido Street	City Hall	5th floor	Spiders	10/30/18
1300	Perdido Street	City Hall	7th floor	American cockroaches	03/27/18
1300	Perdido Street	City Hall	Dumpster Area	Rats	03/27/18
1300	Perdido Street	City Hall	Dumpster area	Rats	04/03/18
1300	Perdido Street	City Hall	Dumpster area	Rats	04/12/18
1300	Perdido Street	City Hall	Dumpster area	Rats	04/18/18
1300	Perdido Street	City Hall	Dumpster area	Rats	05/03/18
1300	Perdido Street	City Hall	Dumpster area	Norway rats	05/15/18
1300	Perdido Street	City Hall	Dumpster area	Rats	06/29/18
1300	Perdido Street	City Hall	First floor	Norway rats	03/15/18
1300	Perdido Street	City Hall	Garage	Cellar spiders	07/31/18
1300	Perdido Street	City Hall	Lobby	Mosquitoes	08/22/18
1300	Perdido Street	City Hall, City Planning	7W03	Cockroaches	06/18/18
421	Loyola Street	Civil Court	402 - 4th floor	Bugs/ biting insects	06/26/18

Table AF-1. City facilities inspected in 2018, continued.

St. number	Street	City facility	Room number	Pests	Date
2700	Tulane Ave.	Court House	200	Termites	02/20/18
727	S. Broad Street	Court House	200/300	Termites	05/22/18
2700	Tulane Ave.	Criminal Court	Sec. K	Possum (baby)	05/17/18
2700	Tulane Ave.	Criminal Court		Ants	09/28/18
6600	Virgilian Street	Digby Playground	Concession	Roof rats	05/16/18
2222	Simon Bolivar Ave.	Edna Pilsbury	2nd floor	Hunstman spider	06/20/18
2020	Jackson Avenue	Edna Pilsbury Clinic/ Allie Mae		Mice	03/14/18
3818	Alvar Street	EMD		Fire ants	03/13/18
3001	Earhart Blvd.	EMS		Rover ants, fire ants, gnats	05/18/18
987	Robert E. Lee	Engine 13	TV room	Termites	05/01/18
987	Robert E. Lee	Engine 13		Mice	02/12/18
987	Robert E. Lee	Engine 13		Termites	07/02/18
773	Harrison Ave.	Engine 18		Rats	05/03/18
2118	Elysian Fields Ave.	Engine 27		Mice	01/09/18
2118	Elysian Fields Ave.	Engine 27		Rats, mice	08/02/18
964	N. Carrollton Ave.	Engine 35		Rover ants, gnats	08/02/18
2500	Gen. De Gaulle Dr.	Engine 40		Wasps, rats	06/21/18
4550	Old Gentilly Road	Engine 6		Rats	03/19/18
4550	Old Gentilly Road	Engine 6		Roaches, mice	10/12/18
4550	Old Gentilly Road	Engine 6		Mice	11/01/18
1441	St. Peter Street	Engine 7		Flies, ants	05/31/18
1441	St. Peter Street	Engine 7		Rodents, roaches	08/02/18
1441	St. Peter Street	Engine 7		Termites	10/04/18
449	Esplanade Avenue	Engine 9		Rats	05/03/18
1116	Magnolia Street	Evidence Room	Narcotics	Rats	04/09/18
1116	Magnolia Street	Evidence Room	Narcotics	Rats	04/12/18
1116	Magnolia Street	Evidence Room	Narcotics	Rats	04/18/18
1116	Magnolia Street	Evidence Room	Narcotics	Rats, mice	05/03/18
1116	Magnolia Street	Evidence Room	Narcotics	Rats	05/15/18
1116	Magnolia Street	Evidence room	Narcotics	Rats	06/29/18
2118	Elysian Fields Ave.	Fire Station		Mice	01/17/18
1008	N. Peters Street	French Market Corp.		Norway rats	02/21/18
700	Decatur Street	French Market Corp.		Norway rats	03/14/18
700	Decatur Street	French Market Corp.		Rats	04/18/18
1008	N. Peters Street	French Market Corp.		Rats	05/17/18
1008	N. Peters Street	French Market Corp.		Rats	06/13/18
1008	N. Peters Street	French Market Corp.		Rats	07/18/18

Table AF-1. City facilities inspected in 2018, continued.

St. number	Street	City facility	Room number	Pests	Date
1008	N. Peters Street	French Market Corp.		Rats	08/15/18
1008	N. Peters Street	French Market Corp.		Rats	09/12/18
1008	N. Peters Street	French Market Corp.		Rats	10/17/18
1008	N. Peters Street	French Market Corp.		Rats	11/14/18
1008	N. Peters. Street	French Market Corp.		Rats	12/04/18
545	St. Charles	Gallier Hall	4th Floor + Bath-room	Drain flies, ants	11/28/18
700	Decatur Street	Jackson Square		Norway rats	01/30/18
4300	S. Broad Street	Library		Mice	11/28/18
5420	Franklin Ave.	Milne Rec. center		Mice	12/03/18
317	Decatur Street	NOFD HQ	2nd Floor	Mice, ants	11/27/18
715	S. Broad Street	NOPD HQ	1st Floor	Rats	07/26/18
715	S. Broad Street	NOPD HQ	2nd Floor	Biting insects	08/21/18
715	S. Broad Street	NOPD HQ	Child Abuse	Norway rats	01/09/18
715	S. Broad Street	NOPD HQ		Rats	05/31/18
715	S. Broad Street	NOPD HQ		Rats	06/13/18
	Broad & Lafitte	NORD	In Trailer	Rats, mice	08/29/18
5420	Franklin Avenue	NORD HQ		Ants	05/04/18
2751	Gravier Street	Old Orleans Parish Prison		Ants, rodents	07/12/18
7200	Dreaux Street	Pradat Playground		Termites	06/11/18
4300	S. Broad Street	Rosa Keller Library		Brown widows, rover ants	08/02/18
2829	Elysian Fields Avenue	Sanitation Conference Trail-er		Termites	11/27/18
1899	Tchoupitoulas	Special Ops Warehouse		Squirrels	07/27/18
1500	Lafreniere Street	St. Bernard Gym/ Center		Fruit flies	09/13/18
1600	Gentilly Blvd.	Stalling in Gentilly		Rats	03/26/18
	Dreaux Ave. and Ca-mellia Str.	Swimming Pool	Football Storage	Termites	07/02/18
13400	Old Gentilly Road	Taxi Cab		Snake	07/25/18
520	St. Peter Street	Upper Pontalba	Balcony	Termites	07/11/18
1601	Perdido Street	VA Hospital	2nd floor	Bed bugs	03/12/18
1601	Perdido Street	VA Hospital	Exterior	Noway rats	09/07/18
1601	Perdido Street	VA Hospital	Exterior	Norway rats	10/08/18
1601	Perdido Street	VA Hospital	Exterior	Norway rats	11/30/18
6500	Press Street	Wesley Barrow Stadium	Consessions	Wasps	09/25/18
6500	Press Street	Westly Barrow Stadium	Conference Room	Termites	05/22/18
1100	Milton Street	Youth Study Center	150	Mice, rats	11/02/18
1100	Milton Street	Youth Study Center	150, 151	Rats, mice, snakes	10/19/18
1100	Milton Street	Youth Study Center	150-151, 152	Mice	10/25/18
1100	Milton Street	Youth Study Center	Entrance Door	Wasps.	08/17/18
1100	Milton Street	Youth Study Center	Front Lobby	Ants	06/28/18
1100	Milton Street	Youth Study Center		Rover ants, fire Ants	05/31/18
1100	Milton Street	Youth Study Center		Wasps	09/21/18
1100	Milton Street	Youth Study Center		Gnats, rodents	12/05/18

Table AG-1. BugFest was a collaboration with more than 30 organizations.

CITY OF NEW ORLEANS

City of New Orleans Mosquito, Termite and Rodent Control Board & Audubon Butterfly Garden and Insectarium

Audubon Butterfly Garden and Insectarium
A Facility of Audubon Nature Institute

DATE
Saturday May 12, 2018

LOCATION
2100 Leon C. Simon Blvd
New Orleans, LA 70122

TIME
10 AM TO 4 PM

Children under 12 participating in the event will receive a free t-shirt, snowball, and other buggy items while supplies last. Crafts and other interactive activities will be available.

For more information please contact the City of New Orleans
2100 Leon C. Simon Blvd
New Orleans, LA 70122
Phone: 504-658-2440
www.nola.gov/mosquito

Event presentations and displays are subject to change without notice.

The 1st annual NOLA BugFest will be held May 12, 2018 on the grounds of the City of New Orleans Mosquito, Termite and Rodent Control Board facility. This free event will showcase the beauty and diversity of insects, spiders and other animals found in and around your home and garden. With more than 30 organizations and 40 educational booths and activities, you will have the opportunity to interact with entomologists and other scientists to learn about the fascinating world of insects, spiders, and wildlife found in the New Orleans area.

Everyone will have the opportunity to look at live and preserved insects. A variety of activities will be available to learn about insect life cycles and insect biology.

EVENT SPONSORS

PLATINUM
Greater New Orleans Pest Control Association

GOLD
BASF
Bell Laboratories
Corteva Agriscience
DA Exterminating
Nisus Corporation
Terminix Metairie Branch

SILVER
Clarke
Control Solutions Inc
T-Mobile

BRONZE
Mosquito Joe of New Orleans-Northshore
Pied Piper Pest Control
Polyguard Products Inc
Purple Monkey Design
Univar USA

PRESENTATIONS

10:30 am	Termite biology and control
11:00 am	Rodent control basics
11:30 am	Edible insects
12:00 pm	Arthropod petting zoo
1:00 pm	Bugology
1:30 pm	Edible insects
2:00 pm	Wildlife found in your backyard
2:30 pm	Termite biology and control
3:00 pm	Mosquito control
3:30 pm	Rodent control basics

ENTERTAINMENT

Bug rap
Beetle races
Story telling

Table AG-1. BugFest was a collaboration with more than 30 organizations, continued.

CITY OF NEW ORLEANS

City of New Orleans Mosquito, Termite and Rodent Control Board & Audubon Butterfly Garden and Insectarium

Audubon Butterfly Garden and Insectarium
A Facility of Audubon Nature Institute

TOPICS & ACTIVITIES

- Butterfly garden
- Rodent biology and control
- Mosquito biology and control
- Zika virus and other mosquito borne diseases
- Termite control
- Pest exclusion
- Entomology and wildlife biology books at the library
- Keeping your house safe from termites
- Greater New Orleans Pest Control Association
- Exotic insects
- Spiders
- Cooking with insects
- Keeping your pets safe and healthy
- Interactive GIS map
- Spray truck and other mosquito control equipment
- Tree sale
- Pesticide safety
- Insect photography
- Raccoons and other wildlife in the urban environment
- Bat biology and exclusion
- Beetle races
- Bug rap
- Ask the Entomologist (bring your bug to have it identified)
- Audubon Bugmobile
- Learn how to use a microscope
- Beekeeping
- Insect tattoo station
- Turn into a butterfly
- Caterpillar life cycle
- Fossilized insects
- Face painting
- Buggy photo station

BUGFEST 2018 PARTICIPANTS

Audubon Butterfly Garden and Insectarium
BASF
Bell Laboratories
ByWater Institute, Tulane University
City of New Orleans Library, Pop-up Library
City of New Orleans Mosquito, Termite and Rodent Control Board
Clarke
Corteva Agrisciences
DA Exterminating
Greater New Orleans Pest Control Association
Louisiana Department of Agriculture and Forestry
Louisiana Department of Health, Office of Public Health
Louisiana Department of Wildlife and Fisheries
Louisiana Master Naturalists GNO
Louisiana SPCA
Louisiana State University, Entomology Department
Louisiana State University, Agriculture Extension
Louisiana State University Health Sciences Center School of Public Health, Epidemiology Program
Mosquito Joe of New Orleans - Northshore
National Pest Management Association
New Orleans Health Department
New Orleans Parks and Parkways
Nisus Corporation
NOLA Tree Project
Polyguard Product Inc
Terminix Metairie Branch
T-Mobile
Tulane University, Department of Tropical Medicine
Univar USA
University of Florida, Entomology and Nematology Department
University of Miami, Geography Department