MOSQUITO ABATEMENT

ST. TAMMANY PARISH

INTEGRATED

mosquito management

St. Tammany Parish Mosquito Abatement

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1 Introduction

1.1 Mission

Our mission is to protect the health and quality of life of the residents of St. Tammany Parish by minimizing the risk of mosquito-transmitted diseases and managing nuisance mosquitoes to a tolerable level.

1.2 Action

We achieve this mission by sensitively monitoring mosquito abundance or indicators of mosquito-transmitted diseases and controlling larval and adult mosquitoes with environmental modification or the selective use of public health pesticides.

1.3 Plan Purpose

The objective of this plan is to define the operational strategy and tactics for controlling nuisance and vector mosquitoes in St. Tammany Parish. Though this plan defines specific thresholds and triggers for certain activity, STPMAD withholds the right to provide mosquito management outside of the parameters of this document when certain circumstances dictate.

2 Integrated Mosquito Management

St. Tammany Parish Mosquito Abatement operates under the best practices of Integrated Mosquito Management (IMM), which provides a multi-modal framework for achieving nuisance reduction and mosquito-transmitted disease risk mitigation. Public education, source reduction, surveillance, and insecticide applications which target adult and immature mosquitoes are all critical elements of IMM which STPMAD engages in to achieve its operational mission. Additional elements of IMM include insecticide resistance monitoring and evaluation of control efforts.

2.1 Mosquito & Arbovirus Surveillance

2.1.1 Objectives

1. Timely detection of enzootic arbovirus transmission to guide intervention efforts to prevent human arbovirus infections.
2. Monitor, record, and analyze arbovirus occurrence and intensity to increase the local arbovirus ecology knowledgebase and inform intervention efforts.
3. Monitor, record, and analyze mosquito population parameters to increase the local ecological knowledgebase and inform intervention efforts.
4. Monitor the effectiveness of mosquito abatement efforts on enzootic arbovirus transmission and mosquito abundance.

Four arboviral pathogens, *Eastern equine encephalitis virus* (EEV), *La Crosse encephalitis virus* (LEV), *St. Louis encephalitis virus* (SLEV), and *West Nile virus* (WNV), have been historically observed and occasionally result in human infections in St. Tammany Parish, LA. Some of these pathogens (EEEV, SLEV, and WNV) share certain ecological similarities such as enzootic cycling (non-human animal transmission) primarily among avian hosts and mosquito vectors. Though similarities exist among each pathogen, the intrinsic abilities of specific hosts and vectors to transmit pathogens along with local host and vector utilization patterns likely determine the spatial and temporal occurrence of enzootic transmission.

As most observed arbovirus activity in St. Tammany Parish and the United States within the past decade has been due to WNV, the St. Tammany Parish Mosquito Abatement District's (STPMAD) Arbovirus Surveillance Plan will focus on providing advanced detection of enzootic WNV transmission as an indicator of elevated risk of human WNV infection. Recent epidemics of Chikungunya virus (CHIKV) starting in 2014 and Zika virus in 2016 in the Western Hemisphere have required an adjustment to local arbovirus surveillance. Due to the emergence of these pathogens a separate response plan has been created to monitor these pathogens and to mitigate the local risk of these pathogens (see Chikungunya, Dengue or Zika virus response plan). As arboviruses evolve continuously, arbovirus prevalence may exhibit high inter-annual variability with years of no observed transmission and years of marked human epidemics. As such this surveillance plan is intended to be revised in accordance with the changing epidemiological importance of arboviral pathogens in St. Tammany Parish as necessary.
Advanced detection of enzootic cycling of arboviral pathogens, such as WNV is critical to preventing human infections. Of the four traditional surveillance methods used to detect WNV in animal populations described by the Centers for Disease Control and Prevention (2013) only diagnostic testing of mosquitoes for arboviruses provides timely and reliable results at relatively low resource costs. For these reasons the collection and subsequent testing of mosquitoes for arboviruses is the primary tactic employed by STPMAD for advanced warning of elevated human WNV risk.

Nuisance mosquitoes are defined as any mosquito that can bite people but may not be competent vectors of pathogens. These mosquitoes can reduce quality of life, as many of these species are persistent biters in tree lines, marshes, and around the house. We perform larval control for nuisance mosquitoes year-round when larvae are present and adult nuisance mosquito control when our thresholds for these species are triggered.

2.1.2 Strategy

This Mosquito & Arbovirus Surveillance Plan has been drafted in accordance with the best practices and strategies outlined in several documents including the CDC publication *West Nile virus in the United States: Guidelines for Surveillance, Prevention, and Control* (2013) and the Association of State and Territorial Officials (ASTHO) publication *Before The Swarm: Guidelines for the Emergency Management of Mosquito-Borne Disease Outbreaks* (2008) as well as a synthesis of peer-reviewed scientific articles. Finally, the considerable knowledge of local arbovirus and vector ecology accumulated by STPMAD employees was used to draft the most sensitive and efficient surveillance strategy.

2.1.3 Sample Frame

All areas within the political boundaries of St. Tammany Parish will be monitored for the risk of arbovirus transmission to humans. Since St. Tammany Parish is a relatively large parish with considerable land use diversity and focally dense human populations, a systematic spatially stratified sample strategy will be employed. This hybrid sampling strategy allows for optimal spatial coverage of the most densely populated regions of the parish while providing limited data from less populated areas. The primary disadvantage of this sampling strategy is that it may not be representative of human arbovirus risk across all space. The strategy chosen is intended to be the most *sensitive indicator* of potential human arbovirus risk in St. Tammany Parish – not necessarily *representative* of human arbovirus risk across the parish.

2.1.4 Spatial Resolution

St. Tammany Parish Mosquito Abatement conducts insecticide treatments only when data indicates a need for the application. Applications of insecticides to manage adult mosquitoes (adulticides) by truck are arranged in 119 zones across the Parish.

2.1.5 Temporal Resolution

The frequency with which certain sites are trapped within the existing STPMAD surveillance varies, but each site is generally trapped once on a two-week collection period between March and November, and in warm weather from November through February (predicted to be >58°F at 4PM and >45 F° overnight low).

2.1.6 Site Selection

There are 131 sites in the existing STPMAD surveillance network, each of which is trapped at least once every two weeks, with problematic areas trapped more frequently.

In addition, heightened surveillance is performed at areas that experience a high concentration of outdoor human activity including ballparks and high school stadiums and ball fields. Routine inspections occur throughout the year to assess larval and adult mosquito presence and abundance at these sites. Evening landing counts are conducted at randomly selected ball parks to assess nighttime biting mosquito populations.

2.1.7 Target Species

The primary enzootic vector of WNV in St. Tammany Parish is *Culex quinquefasciatus*; therefore, arbovirus surveillance will primarily target the collection of this species. *Culex salinarius, Cx. erraticus, Cx. nigripalpus, Aedes albopictus,* and *Ae. vexans* may also be found in St. Tammany infected with WNV and may contribute to WNV transmission.

2.1.8 Collection Methods

STPMAD uses CO_2-Baited (dry ice) CDC No Light Traps (originally described by Sudia & Chamberlain, 1962) as the primary tool used to monitor adult populations of many vector mosquito species from a variety of habitats. Dry ice sublimates into CO_2 and attracts many host-seeking mosquitoes, and removal of light is particularly effective for capturing *Culex* species females (McNamara et al. 2020).

Traps that collect eggs from ovipositing mosquitoes (ovitraps) are set to monitor container-inhabiting species from July-October each year. Year-to-year surveillance is performed in areas containing and immediately adjacent to known *Aedes aegypti* populations. Every third year ovitrap surveillance is expanded parish-wide to better document container-inhabiting mosquito species distribution. Additionally, as more container-inhabiting species invade Southern Louisiana and virus transmission is better understood, parish-wide surveillance may be needed.

Since many important mosquito species are not readily collected in traps, landing rates are important indicators of mosquito activity in an area. During a landing rate, an individual remains motionless in a shaded area and counts/identifies the mosquitoes which land on them over the course of one minute. Landing rates will be suspended when the vector index (arbovirus risk) is elevated at a high-risk level. When mosquitoes are difficult to identify or numerous, the biologist may use an aspirator to retrieve mosquitoes from the area and bring them to the lab for identification and numeration.

Other collection methods that may occasionally be used for the detection of arboviruses include CDC Gravid Traps, CDC Light Traps, CDC Resting Box traps, and aspirators.

BG traps are routinely set across the parish in conjunction with the BG-Counter, a sensor that counts mosquitoes which enter it. The counter transmits the number of mosquitoes trapped in 15-minute increments wirelessly and remotely to our employees, who use that data to inform spray decisions.

2.1.9 Collection Schedule

The specimen collection schedule may be dependent on the diagnostic testing schedule set by the Louisiana Animal Disease Diagnostic Laboratory (LADDL). Currently LADDL requires submission of mosquito pools by Wednesday for test result reporting on the following Friday. Traps will be set on Mondays and Tuesdays each week pending favorable weather. This results in 80-120 trap periods per two-week collection period.

2.1.10 Arbovirus Diagnostic Testing

Collected mosquitoes will be identified to species, enumerated, and placed in vials in groups (or pools) of up to 100 mosquitoes. Mosquito pools will be tested for arboviruses in the STPMAD laboratory via quantitative PCR.

2.1.11 Arbovirus risk map

The risk level for each zone in St. Tammany is a calculated vector index. The vector index is the current arbovirus infection rate in mosquitoes multiplied by the number of vector mosquitoes collected in local traps. This measure of risk is updated weekly throughout the year as new data is received. For the most up to date risk map, visit our website at: https://stpmad.org/arbovirusmap/

2.1.12 Data Entry

Mosquito population data (species, abundance, etc.) is entered onto a database the day after it has been identified. Mosquito pool data will be entered onto the VectorSurv database as well as an internal spreadsheet file during the week of specimen submission.

2.2 PUBLIC EDUCATION

Our team consists of qualified professionals trained in the areas of entomology, biology, ornithology, and public health. With a broad knowledge of mosquito biology and ecology, our staff frequently give presentations to the public. We are committed to educating citizens of St. Tammany regarding the threat posed by mosquitoes, how we respond to that threat throughout the year, and what individuals can do to protect themselves.

We routinely attend local festivals to educate our citizens about mosquitoes. We collaborate with the St. Tammany Parish School Board to teach mosquito biology and ecology throughout the year in schools across the parish. We have presented programs to local environmental groups, hobbyist beekeepers, libraries, and frequently give tours of our facilities to citizens of St. Tammany. We collaborate with and provide training to government and non-profit agencies. Complementary to in-person education, we also maintain an educational website and social media site. In addition, we create original pamphlets, trifolds, and brochures for public distribution.

2.3 Source Reduction

Source reduction involves the removal of a potential breeding source, most often the dumping of water from small containers in and around the house. Field biologists evaluate water sources as potential breeding sites throughout the day, and in cases where water can be removed from the system, source reduction is our first method of mosquito abatement. This occurs routinely throughout each weekday but is particularly important when field biologists are responding to requests for service from our citizens.

Source reduction is a vital and environmentally friendly avenue of mosquito abatement, but it cannot be performed in isolation. Containers holding water around the house often are refilled by rain and sprinklers shortly after being dumped, resupplying mosquitoes with breeding sources soon after removal. Source reduction cannot work without public education regarding sources of stagnant water (gutters, ditch water, potted plants, tarps, general yard detritus, etc.) and alternative methods of control.

The primary vector of West Nile virus, *Cx. quinquefasciatus*, prefers to lay its eggs and rear its young in sewage-polluted water. Replacing outdated septic systems or maintaining aerated treatment units is an important part of reducing the production of this mosquito. On occasion, STPMAD conducts door-to-door inspections of septic systems and aerated treatment units to reduce or eliminate the production of C*x. quinquefasciatus.*

Floating vegetation is another conducive breeding habitat for several species of mosquitoes. Controlling this vegetation is paramount in controlling Mansonia and Coquillettidia species. Physical removal, biological control, and herbiciding will be used for the purpose of limiting this type of vegetation. Herbiciding is performed by certified individuals according to label requirements.

2.4 Insecticide Applications

Insecticide applications are divided into two categories: insecticides that target larval mosquitoes (larvicides) and insecticides that target adult mosquitoes (adulticides). Insecticide applications are a last resort but are frequently the only actionable way of achieving mosquito abatement. All insecticide applications, whether larvicides or adulticides, follow U.S. EPA-mandated label requirements. As WNV transmission is a perennial problem in St. Tammany Parish, most of STPMAD's operations described in this plan are designed to mitigate the risk of WNV transmission to humans. Operational procedures designed to mitigate the risk of other mosquito-transmitted diseases are described in detail in the separate Chikungunya, dengue, or Zika virus Response Plan. Mosquito control operations are also conducted to manage nuisance mosquitoes.

2.4.1 Larval Mosquito Treatments

When reducing the sources of mosquito production is not possible or practical, STPMAD treats larval mosquito habitats with insecticides to kill immature mosquitoes. A variety of mosquito species and habitat types require specific tactics and larvicide products tailored to each environment and infestation problem.

2.4.1.1 Septic ditch habitats

St. Tammany Parish contains over 600 linear miles of septic ditches in which *Cx. quinquefasciatus* females, the primary WNV vector in the Parish, preferentially choose to lay their eggs. Field biologists and larviciders surveil known breeding sites routinely throughout the week and treat breeding ditches with varied products and at different rates depending upon time of the year and presence of WNV.

2.4.1.1.1 Frequency of larvicide application

As temperatures increase throughout the year, *Cx. quinquefasciatus* development time decreases, population abundance increases, and risk of WNV transmission increases. In response to these changing pressures, STPMAD has developed *Cx. quinquefasciatus* larval management tiers throughout the mosquito season.

Tier 1 Development time > 15 days.
Justification: Low temperatures slow development, and cold weather mosquitoes (*Culex restuans, Culiseta inornata*) require infrequent control. Bti is used in cold weather months.
Duration: Approximately from Nov. 15 – Mar. 1
Tactics: Treat all ditches with Bti or spot treatments with larvicide oil on an as-needed basis, or once every two weeks.
Workforce: Field biologists are sufficient.

Tier 2 Development time 8-15 days.
Justification: Rapid development and the onset of viral activity increases frequency of application.
Duration: Approximately from Mar. 1 – May 15 and Oct. 1 – Nov. 15
Tactics: Treat septic ditches with Bti at accelerated frequency, up to once per 5 days.
Workforce: Larviciders primarily treat with a 32-hour work week, supplemented by field biologists.

Tier 3 Development time ≤ 7 days, or in response to WNV activity/holiday gaps.
Justification: Most rapid development, highest adult abundance, and peak viral activity/onset of human cases requires highest frequency of application.
Duration: Approximately from May 15 – Oct. 1, or in response to public health emergencies.
Tactics: Treat with *Bacillus sphaericus* and *Bacillus thuringiensis israelensis* at least once every 5 days. Respond to human cases or holidays with residual septic larvicides. Larviciders treat with possible overtime. Use of wide area larviciding can be implemented in direct response to WNV positives (see below).

2.4.1.2 Floodwater habitats

Floodwater mosquitoes tend to emerge simultaneously in residential and wooded areas in response to rainfall. Floodwater mosquitoes such as *Psorophora ferox, Aedes vexans*, and *Ae. atlanticus* are largely nuisance species and are infrequently found to be important vectors of disease. The persistence and abundance of these mosquitoes can greatly impact resident's quality of life. Extended release larvicides such as Altosid briquettes (methoprene) are deployed in ground pools. Field biologists take landing rates at known floodwater sites daily, which together with weekly trap data inform where floodwater mosquitoes may be originating from and where reapplication of larvicides may be necessary. All areas that hold water that are within a quarter mile of residence, dwelling, park or place of business are routinely assessed for the production of mosquitoes (see section 2.1.6). Standing water in ground pools is treated in February and again in the fall months if necessary. Due to high evapotranspiration rates in the spring, summer and fall these areas typically do not hold water during these seasons, but often will hold water in the winter and early spring. St. Tammany Parish residents are encouraged to report the presence and location of areas that hold water for more than five days either by calling our office ((985) 643-5050) or by filling out the Standing Water Registry webform (https://survey123.arcgis.com/share/4facffdb81d841839409a95d610b09f6).

2.4.1.3 Marsh habitats

Marsh mosquitoes including *Aedes sollicitans* and *Culex salinarius* tend to emerge simultaneously and in large volumes on the coast in response to changes in the tide. While most marsh mosquitoes contribute to annoyance on the coast, generally these species are not important vectors of disease. Marsh inspections are performed bi-weekly by ground, truck, and airboat beginning in April and ending in October. When populations of mosquito larvae are found, larvicides may be applied by hand, truck, airboat, or helicopter. All inspections and treatments within wildlife refuges are coordinated with the wildlife refuge manager.

2.4.1.4 *Sewage package plants*

Centralized sewage management facilities have been observed to produce large populations of mosquitoes when improperly maintained. In cooperation with Tammany Utilities, STPMAD inspects all known package plants for mosquito breeding at least twice per year, once in the spring and again in fall. When surveillance in neighboring areas indicates large populations of septic-preferring mosquitoes are present, field biologists reinspect and treat potentially breeding package plants with residual larvicides.

2.4.1.5 *Property inspections*

Public requests for service due to mosquito concerns are inspected individually by a trained field biologist often within 24 hours of receipt. During each inspection, a field biologist will measure mosquito landing rates, locate breeding sources, and discuss their findings with the resident. When the situation warrants treatment, a field biologist may treat standing water with larvicides or apply adulticides selectively where adult mosquitoes are found.

2.4.1.6 *Door-to-door mosquito inspections*

STPMAD will inspect multiple residences within a neighborhood when WNV is detected repeatedly in an area or in response to large numbers of localized requests for service. Door-to-door inspections involve a team of field biologists gaining permission from residents to surveil and treat possible mosquito breeding sites on personal property.

2.4.1.7 Wide-Area-Larviciding

Containers and other water holding objects are preferred sites for some mosquito species to lay their eggs. These sites are often found performing service requests and are treated by granular forms of larvicide or by dumping the water out. We understand not all water holding containers can be accounted for. In the event of a WNV positive pool or human case, wide area larviciding using a truck mounted unit can be deployed. This unit will project aerosolized liquid *Bti* or *B. sphaericus* into the air allowing the product to drift into backyard, water holding containers and roadside ditches where larvae are present. This process is most effective in higher density neighborhoods.

2.4.2 Adult Mosquito Treatments

Adult mosquito abundance and risk of virus transmission fluctuate throughout each mosquito season. When surveillance indicates, STPMAD will perform missions (via truck or aircraft) to control adult populations of vector and nuisance mosquitoes. STPMAD has developed adult mosquito management thresholds (including mosquito abundance and presence of infected vectors; see Tables 1 & 2) which guide decision-making for insecticide applications to control adult mosquitoes. Certain circumstances may warrant exceptions to treatment thresholds defined in this document due to arbovirus risks or nuisance mosquitoes. Applications are performed to meet label requirements and minimize resistance development. Forecasted temperatures within the 3-hour treatment period must be greater than 58˚F in accordance with insecticide label requirements. Individuals who request to be alerted (https://stpmad.org/request-notification/) prior to adulticide applications are notified by phone, text or email on the day of treatment.

2.4.2.1 Arbovirus vectors

As temperatures increase throughout the year, mosquito development time decreases, population abundance increases, virus replication rates grow exponentially (Kilpatrick et al. 2008), and human risk of arboviruses increases. In response to these changing pressures, STPMAD has developed adult mosquito management thresholds that must be met to trigger adult mosquito control operations from May-October (see Tables 1 & 2 below). Temperature-based treatment thresholds for West Nile virus vectors are based on a seasonal (May-October) average abundance over a four-year period.

2.4.2.2 Nuisance mosquitoes

Though only a fraction of the mosquito species that inhabit St. Tammany Parish are known to contribute to the local transmission of arboviruses, many of the other species can disrupt outdoor activities. When daily average temperatures exceed 58 ˚F for multiple consecutive days (early Spring, Summer, to late Fall), adult mosquito treatment applications for nuisance species are warranted when >500 mosquitoes are collected per trap per night, >8 mosquitoes are encountered during a one-minute landing rate, or >1 public mosquito concerns have been documented within a treatment zone. When daily average temperatures are less than 58 ˚F (winter months) nuisance mosquito treatments are warranted when more than one treatment threshold is met and forecasted temperatures are expected to be unseasonably warm for at least an additional two days. Since resident's experience with nuisance mosquitoes is relative and to bring responsive service to areas not often receiving treatment, nuisance thresholds will be halved for areas that have not received adulticide treatment in 60 days during the mosquito season.

2.4.2.3 Frequency of applications and thresholds for treatment

Mosquito treatments are prescribed on an as-needed basis when thresholds have been met, not according to a schedule or rotation. As temperatures increase, time between mosquito generations shortens, and the rate of virus amplification within vectors grows exponentially. As a result, STPMAD has developed a temperature-based threshold system for determination of where and how frequently areas are treated in response to vector mosquito species. In brief, the daily average temperature over the last 14 days informs the number of mosquitoes required to be found prior to treatment, as well as the retreatment interval between consecutive treatments in an area. Threshold values and temperature modifiers can be found in Tables 1 & 2 below. STPMAD does not apply temperature-based thresholds for nuisance mosquitoes.

Adult mosquito management thresholds are based on a variety of criteria designed to indicate when and where arbovirus risk is elevated, or a nuisance mosquito problem exists. Certain exceptions to thresholds apply when arbovirus risk is elevated.

Mean 14-day temp. (°F)	WNV-infected pools	Abundance modifier	Adult mosquito abundance		
			Culex quinquefasciatus	*Culex nigripalpus*	*Culex salinarius*
< 66	-	2x	58	84	122
66-72	1	1.2x	35	50	73
73-79	1	1x	29	42	61
> 79	1	0.8x	23	34	49

Table 1. Adult vector mosquito thresholds for adult treatment are based on season May-October) and average daily temperature for the previous 14 days due to the temperature-dependent development of arboviruses within mosquitoes.

Mean 14-day temp. (˚F)	Number of days to retreat area			
	with the same insecticide class	with active arbovirus	with different insecticide class	with active arbovirus
< 55	------------------No treatments------------------			
57-65	10	1	5	1
66-72	7	1	3	1
73-79	7	1	3	1
> 79	5	1	3	1

Table 2. The number of days between adult mosquito treatments is also governed by average daily temperature for the previous 14 days. Rotating across classes of insecticide limits the development of resistance to these insecticides.

2.4.2.4 Aerial adult mosquito treatment requirements

Application of adult mosquito insecticides by airplane or helicopter is performed under a strict set of criteria. Applications start one-half hour after sunset. The wind must be <18 mph at altitude for optimal deposition, with no forecasted storms for aerial safety concerns. Surveillance must indicate that thresholds have been met that warrant application over one or more contiguous zones. All aerial adulticide applications are conducted at >200’ release altitude.

2.4.2.5 Nighttime truck adulticide requirements

Truck adulticiding is primarily performed starting one-half hour after sunset, when non-target insects are least active and mosquitoes are most active, ending no later than 3 hours post-sunset. Applications are performed under a strict set of criteria. Wind must be between 1 and 10 mph. Vehicle speed must not exceed 20 mph. Surveillance must indicate thresholds have been met that warrant application Sprayer should be turned off in the vicinity of humans. All truck adulticide applications are tracked via GPS.

2.4.2.6 Daytime truck adulticide requirements

In compliance with label requirements and to prevent non-target effects, STPMAD only adulticides during the day under a strict set of criteria. Applicators follow a flowchart regarding the presence of mosquitoes and absence of pollinators to determine whether daytime adulticide is appropriate for every application.

2.4.2.7 Adulticide operations at public spaces

Adulticide thresholds described above (section 2.4.3.2) are also applicable for all operations at parks, recreational facilities, schools, and other public spaces. In general, service requests, complaint calls, trap data, and landing rate data will all be used to determine when to treat public spaces for adult mosquitoes.

Adulticide operations will be carried out by ATV, UTV, truck, fixed-wing plane, or helicopter. The preferred time to perform adulticide missions is 30 minutes after sunset. Many public spaces are difficult to treat at this time due to the amount of human traffic and outdoor activities. Adulticide missions will be conducted before sunrise or after sunset depending on the availability of access and resident activity. When traditional space adulticide sprays are not feasible due to nighttime access, treatments may occur during daytime hours with the use of a residual adulticide product as long as the described thresholds have been met. Residual adulticide products are not applied more frequently than once every thirty days.

To reduce the risk to non-target pollinators, applications of residual adulticides should be stopped at least 5 feet prior to treating budding, blooming, edible, or fruiting plants. Due to larger droplet size, “low volume” applications have reduced drift profiles, but efforts should still be made to avoid the product drifting into non target areas. No residual insecticide should be used within an area marked as “restricted/ no spray/ bees” on the STPMAD maps unless there is a mosquito-transmitted disease risk in the area.

2.5 TREATMENT EVALUATIONS

Verification that mosquito abatement interventions worked as intended are critical components of an effective IMM plan. Adulticide treatment evaluations can be accomplished by comparing landing rates, traditional mosquito trap catches, truck trap collections, or mosquito age by parity dissection from before and after application. Adulticide treatments that do not achieve a >50% reduction in mosquito abundance and remains higher than the abundance threshold, measured by pre-to-post evaluation of abundance within 48 hours of each evaluation, are eligible to be re-treated immediately using a different insecticide. Larvicide treatment evaluations can be accomplished by comparing total mosquitoes found per dip in both treated and untreated water sources before and after application. Verification of intervention is critical, but also time and resource intensive. As a result, STPMAD performs treatment evaluations in response to approximately 10% of applications.

2.6 Insecticide resistance monitoring

St. Tammany Parish Mosquito Abatement monitors mosquito populations for the development of insecticide resistance multiple times during each year at specific sites. Insecticide resistance, akin to antibiotic resistance in the pharmaceutical industry, occurs with repeated use of a killing agent over time through selection of individuals that can survive. We monitor resistance to both larvicides and adulticides.

Larvicide resistance is evaluated by exposing mosquito larvae to varied concentrations of insecticide in a known volume of water, comparing the concentration of insecticide it takes to kill an average larva (LC_{50}).

Adulticide resistance is evaluated by topical exposure of insecticide onto the mosquito thorax, comparing the dose of insecticide it takes to kill an average mosquito (LD_{50}) between populations. Mechanisms underlying adulticide resistance are tested enzymatically and genetically.

Results from resistance trials are published annually in a resistance report addendum to the laboratory report. Results inform treatment thresholds, and which insecticides are appropriate to use in our rotations. Thresholds and decreased frequency of applications in general, and insecticide rotations, help curb resistance development by shifting which insecticides mosquitoes are exposed to on what schedule. This practice limits the number of repeated treatments of one active ingredient over a given stretch of time, as well as provides time for susceptibility toward that active ingredient to recover.

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