

Saginaw County Mosquito Abatement Commission 2017 Program Plan



Your Mosquito Control at work...

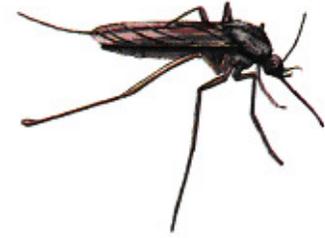


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Detailed reports on file at:

211 Congress
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www.scmac.org

Introduction

The Saginaw County Mosquito Abatement Commission's (SCMAC) 2017 Program Plan portrays methods and techniques for mosquito arbovirus surveillance and mosquito control. SCMAC is a County Governmental Agency which serves to control nuisance and disease vectoring mosquitoes for all 816 square miles of Saginaw County. Careful consideration and attention is given to environmental concerns. SCMAC is dedicated to a quality environment for both man and animals.



The Board of Trustees for SCMAC determines policies for the agency and meets on a monthly basis. The Board of Trustees and the agency are advised by a Technical Advisory Group (TAG) composed of some of Michigan's leading biologists, entomologists, conservationists, and scientists. Within the TAG are two State Consultants from Michigan State University, the Saginaw County Environmental Health Services Director, and the Saginaw County Public Works Commissioner.

SCMAC's funding is provided by the citizens of Saginaw County through a 10 year millage approved in 2014, receiving 81% approval. The millage rate is 0.64 of a mil per \$1,000.00 of state equalized value (SEV). The average cost per homeowner is approximately \$32.00 per year. SCMAC is committed to controlling mosquitoes, which requires us to apply insecticides to the environment. However, insecticide applications are only made when necessary, in efforts to minimize input into the environment.



SCMAC has embraced the concept of Integrated Mosquito Management (IMM) for many years. This multifaceted approach uses a combination of methods to reduce the level of nuisance and disease bearing mosquitoes. Control strategies are chosen after careful consideration of efficacy, health effects, ecological effects, and cost benefit analysis of various options. Mosquitoes will never be eliminated but can be controlled to tolerable levels. The basis for all our programs is disease prevention. Today's nuisance mosquitoes may be tomorrow's disease vectoring mosquitoes.

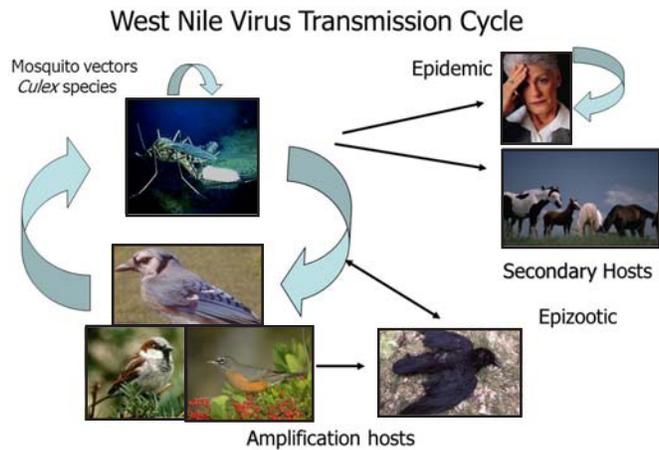
Should you desire additional information about a specific aspect of the program, please contact the office at (989) 755-5751. Visitors are always welcome to tour our facility. We encourage you to visit our web site at www.scmac.org and follow our activities on Facebook. Any suggestions, comments, and/or questions may be submitted through our e-mail address info@scmac.org.



During 2016, the agency's disease surveillance program noted 12 positive West Nile virus (WNV) corvids; and 4 WNV positive mosquito samples.

There were no human cases of mosquito-borne disease reported in Saginaw County. During 2016, the State of Michigan reported 41 human WNV cases resulting in 2 deaths. There were also 24 birds, 51 mosquito samples, and 1 horse case of WNV positives reported. Additionally, there were 2 human and 3 horse cases of Eastern Equine Encephalitis (EEE) reported. There were no human

cases of St. Louis Encephalitis (SLE) or La Crosse Encephalitis (LAC) reported. These results and others demonstrate that WNV and other mosquito-borne disease continue to maintain its presence within the State of Michigan. Nationally in 2016, there were 1,491 human cases of WNV with 69 deaths. The mosquitoes that transmit these diseases are found throughout Saginaw County. Fortunately, SCMAC substantially suppresses the number of disease transmitting mosquitoes thus providing benefit to the public health of Saginaw County.



Zika virus has become a public concern over the last year. The mosquitoes that transmit this virus are currently unable to survive our cold winters, so the possibility of acquiring Zika through mosquitoes within the State of Michigan is extremely low. The added concern of this virus's ability to be transmitted sexually does add a before unknown layer to mosquito disease transmission. In order to protect the citizens of Saginaw County, we continually conduct surveillance for mosquito transmitted disease. Even though in 40 years of surveillance we have never trapped a species of mosquito known to be capable of transmitting Zika, we are now utilizing traps that are specifically designed to attract these mosquitoes. All confirmed human cases of Zika virus in the State of Michigan have been travel related.

SCMAC is continuously aware of the presence and importance of pollinators in Saginaw County. A



major portion of our insecticide budget is for biological larvicides which are applied directly to the water and do not affect pollinators. Additionally to adequately protect honey bee colonies and other pollinators from possible pesticide exposure, community

ULV treatment begins after sunset, well after the time most bees have returned to their hives. SCMAC works with the Saginaw Valley Beekeepers Association to follow the best management practices for bee colony/pollinator health in Saginaw County.

Personnel

SCMAC employs 10 permanent staff members. In addition, 59 seasonal employees are hired among the following positions: 5 clerk typists, 5 biology assistants, 46 vector control technicians (4 part-time), 2 source reduction technicians, and 1 education assistant. All seasonal employees (except 4 part-time) work approximately 40 hours per week for 18 weeks, depending upon the program needs. Beginning the first week in April, a few seasonal staff are employed to evaluate our Aerial Larviciding Program through sampling before and after treatment. The remaining staff begins work as they become available May through the middle of June.



Shift Times

The biology assistants and the education assistant work 8:00 a.m. to 4:30 p.m. The field vector technicians and source reduction technicians are assigned to one of two shifts: 7:00 a.m. to 3:30 p.m. or 4:00 p.m. to 12:30 a.m. Shift times may vary in order to adapt to program needs such as a disease outbreak, mosquito densities, sunset times, etc.

Office Hours

From May 1st through September 30th the office is open from 7:00 a.m. to 10:00 p.m. Monday - Friday.



Shift times are 7:00 a.m. to 3:00 p.m. and 2:30 p.m. to 10:00 p.m. During the month of September hours may vary due to inclement weather. The remainder of the year the office is open from 8:00 a.m. to 4:30 p.m. Monday - Friday. Hours may vary depending on agency needs. SCMAC is closed for all County holidays.

Qualifications for Seasonal Employees

The Commission follows guidelines set forth by Saginaw County and agency policy. SCMAC is an equal opportunity employer and makes no discrimination pertaining to race, sex, age, or religion. Seasonal recruitment begins in December and applicants must meet the following requirements:



1. At least 18 years of age with a high school diploma or GED by June 15th of each year.
2. Must have a valid Michigan driver's license, at the time of application, with no more than five points on their record and be insurable by the Commission.
3. Must pass a drug test, physical examination, and criminal background check.

The Commission is under no obligation to rehire past seasonal employees.

Training

Annual training begins with a day and a half session to take place on Friday, March 31 and Saturday, April 1, 2017. All new and 1st year returning employees in the Biology, Field, and Source Reduction



Departments are required to pass a written test administered by the Michigan Department of Agriculture and Rural Development (MDARD) on Saturday, April 1, 2017 or prior to employment. All new employees must pass an examination covering the National Pesticide Applicator

Certification core manual to become a “registered pesticide applicator”. An intensive ten days of “hands-on” training begins the first day of work. All 1st year returning employees must pass the “Mosquito Control” 7F test to become a “certified pesticide applicator”. Training continues throughout the season covering policies, safety, products, and methods. Each employee is furnished an Employee Training and Resource Manual which covers all aspects of employment at SCMAC.

Personnel Evaluations

The purpose of these evaluations is to highlight the employee’s strengths and weaknesses. Evaluations will be scheduled within the last 30 days of employment. Additional evaluations may be completed if an employee’s supervisor deems it necessary. Evaluations are reviewed in confidence with the employee and become part of the employee’s personnel file. A satisfactory evaluation does not commit the Commission to the rehiring of any seasonal employee.

Moving Violations

Any moving traffic violations, citations, corresponding fines, etc. incurred from law enforcement agencies during employment at SCMAC, are the sole responsibility of the driver. The driver must inform his or her supervisor and fill out an incident report immediately.



Safety

Each technician is issued personal safety equipment with specific instructions for their proper use. Safety vests are required for specific tasks for identification purposes. Every employee is required to attend regularly scheduled safety meetings. Instructions are given in reference to the Employee Right to Know Law which includes Safety Data Sheets (SDS) and potential hazards in the building.



Administration

The Administrative Department has a multitude of responsibilities. Some of the most essential roles are coordinating activities with the Field and Biology Departments, as well as generating reports and citizen service requests on a daily basis. This department handles the day-to-day business of the agency. A variety of citizen requests and questions are handled ranging from: larviciding and adulticiding requests; mosquito-borne disease concerns and questions; reports of dead birds, scrap tires and neglected swimming pools; to general questions about the agency and mosquito related problems. In addition to accounting support services, generating letters, and clerical functions, this department notifies residents on the State Pesticide Sensitive Registry prior to all pesticide treatment in their immediate area. Some other responsibilities include: maintenance of the service schedules and program records; generating vehicle maintenance and fueling records; logging all pesticide application records; and the distribution of *Bti* product. SCMAC is a governmental agency in the business of applying insecticides. Therefore, the agency is required to keep permanent public records of all insecticide applications. SCMAC utilizes a Microsoft Access database to track all insecticide usage. Further responsibilities include the assembling and upkeep of employee files, identification cards, employee manuals, and no spray books.



Medical Certification Program

The agency has developed a special program for residents who exhibit severe reactions to mosquito bites. Residents must fill out a Medical Certification (Medcert) Request Form and obtain a doctor's stamp or prescription confirming that severe allergies are present or special medical needs exist yearly. Residents meeting SCMAC requirements receive yard treatment when a ULV zone sweep is conducted in their township (no more than once every 10 days). Any treatment that requires the technician to drive off the designated driveway requires the resident to sign a Liability Release Form. This form states that SCMAC and the County of Saginaw are not held responsible for damages associated with any treatment requested not on the property owner's driveway. This form is dispersed, recorded, and tracked by the Administrative Department.



No Spray Program

Residents may request their property not be treated by completing a No Spray Request Form annually. Reflective yellow signs are furnished to no spray residents to post along the road at each end of their property line. The property owners' information is located in the agency's no spray book which indicates the exact location of the no spray area.



Long Drive Program

To promote effective ULV applications, long drives are treated when requested by the homeowner if the following criteria are met: home must be 300 feet or greater from the edge of the road; provide adequate turnaround; and possess significant vegetation providing mosquito harborage. Upon request



SCMAC inspects and may add the address to the “Long Drive Program” if qualifications are met. All approved long drives are designated on ULV route maps and reflective markers are placed at the end of their driveways.



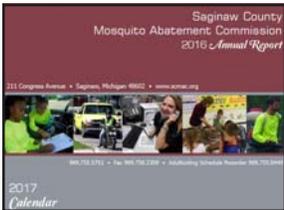
Bti Distribution Program

As part of our self-help larviciding program, SCMAC solicited participation for the *Bti* granular distribution program. In 2016, eighteen townships and two villages participated in this program. In addition, citizens were encouraged to pick up *Bti* granules during normal business hours at SCMAC headquarters. Each citizen is given an instruction packet including the product label regarding the proper procedure for applying the product.



Winter Work

Once the mosquito control season ends, a vast amount of reports are generated, compiled, and the data is analyzed. The department begins working on the yearly Annual Report/Calendar. The calendar serves as an annual report and is distributed in December to the SCMAC Board, SCMAC Technical Advisory Group members, and Saginaw County Board of Commissioners. The Program Plan must be updated and ready for distribution by March of each year. Additionally, the plan is sent to the Michigan Department of Agriculture and Rural Development to fulfill our yearly outreach responsibilities as described in Regulation 637, Rule 11 (5)(b)(ii). The layout, design, copying, and assembling of these reports are completed in-house. Both the Annual Report and the Program Plan are available to view online at www.scmac.org.



The months of December through March are used for planning and preparing for the next mosquito control season. Treatment maps are updated; state and federal permits are obtained for the aerial larviciding program, as well as recruitment letters are sent to Saginaw County high schools and colleges throughout the State of Michigan. Interviewing and hiring for our seasonal workforce is completed by the end of March.

Biology

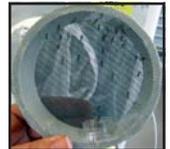
Mosquito-borne disease surveillance is a very important part of our work as it promotes public health within Saginaw County. Monitoring virus activity and mosquito populations throughout the season dictates SCMAC's control strategies both preventive and responsive as well as public notification and education. SCMAC samples for mosquito-borne viral activity, which includes St. Louis Encephalitis (SLE), Eastern Equine Encephalitis (EEE), La Crosse Encephalitis (LAC), and West Nile virus (WNV).



An arboviral disease testing laboratory was established through a cooperative agreement between SCMAC and Michigan State University (MSU). MSU's lab tests mosquito pools for mosquito control districts, public health departments, and other interested parties.



Quality control is another important element of the Biology Department's operation. Mosquito control products are scrutinized, as are application crews, to ensure effective, consistent, and high quality mosquito control. New insecticides and formulations are tested routinely to ensure the most environmentally acceptable and effective products are utilized. Monitoring insecticide resistance and changing management strategies is critical to ensuring effective mosquito control and maintaining a successful control program.



Research is conducted by SCMAC yearly. Only through improved knowledge and understanding of mosquitoes, mosquito-borne diseases, insecticides, and application equipment and techniques are we able to enhance our integrated mosquito management program.

Adult Surveillance

Routine adult mosquito surveillance is conducted using five trapping methods: New Jersey Light Traps, Centers for Disease Control (CDC) Traps, Gravid Traps, BG Sentinel 2 Traps, and Collection Bottle Rotator (CBR) Traps. Adults collected are used for species density information and all primary disease vectoring mosquitoes are processed and shipped to MSU for PCR testing to determine if they are carrying EEE, LAC, SLE, or WNV. Approximately 2,000 - 2,500 samples are collected yearly.



The New Jersey Light Trap (NJLT) Program is conducted every Monday, Wednesday, and Friday during the mosquito season. Twenty-five of these traps are placed at geographically assigned locations throughout Saginaw County and manned by citizens. These traps monitor changes in local nuisance mosquito populations.



The CDC Trap Program is conducted Monday through Thursday during the mosquito season. Spring *Aedes* mosquitoes are highly attracted to carbon dioxide (CO₂) released by the dry ice. Five CDC traps are placed in tandem with gravid traps. Up to 5 additional CDC traps are placed individually at locations where increased mosquito population resolution is needed. Ten CDC traps allow us to survey 4 townships a night.



Elevated CDC traps are used to monitor disease, efficiently sampling summer *Culex* mosquitoes which are the primary vectors of West Nile virus. These customized traps baited with CO₂ are placed 15-20 feet off the ground into the tree canopy where the *Culex* feed on birds (primary host). Elevated trapping begins in June and occurs Monday through Thursday, utilizing up to 6 elevated CDC traps nightly.



Gravid traps are used to monitor disease in Saginaw County. Gravid traps use highly organic water to attract female mosquitoes, especially *Culex*, looking to lay their eggs. These female mosquitoes have taken a blood meal and therefore are capable of vectoring arboviruses. Deployment occurs Monday through Thursday with 5 gravid traps paired with 5 aforementioned CDC traps.



The BG Sentinel 2 traps are deployed on Tuesday and run until Thursday, each week. The traps are baited with the BG lures. The BG Sentinel 2 and its lure are designed to attract and catch *Aedes aegypti* and *Aedes albopictus*. This is an important tool for Zika vectors should populations migrate into the Saginaw Bay region.



The “Collection Bottle Rotator” (CBR) Trap is a modified CDC trap baited with CO₂/light. It has a specialized motorized platform with 8 bottles attached. A timer determines how long each bottle is placed under the trap, thus allowing us to make collections for specific time periods. A data logger placed with the CBR monitors temperature and relative humidity. This allows SCMAC to determine when various mosquito species are active. The CBR trap is placed weekly throughout Saginaw County.



Ovitraps are used to monitor the egg laying behavior of container breeding mosquitos. They are placed at select sites in early June and monitored on a weekly basis. The eggs can be collected and reared in the lab for identification.



Larval and Pupal Surveillance

The Biology Department samples flooded woodlots pre and post aerial larviciding treatment in March and April. This monitoring ensures correct timing and application efficacy of the spring aerial program.

Catch basins are routinely checked for infestation. Once an area's infestation is 25% or higher, the entire area is treated.



The Biology Department routinely samples all types of breeding habitat. Sampled sites are logged and specimens identified. This assists in the development of breeding site maps. Larval presence and densities aid in identifying control priorities.

Dead Bird Reporting

Birds in the *Corvidae* family, which include Crows and Blue Jays, are very susceptible to WNV. This often results in death for these birds. Residents of Saginaw County



are encouraged to report dead Crow and Blue Jay sightings. Depending on the condition and location of the dead bird, an oral swab is taken by biology staff. The swabs are sent to the Diagnostic Center for Population and Animal Health at Michigan State University for WNV testing. This further allows the agency to monitor WNV activity in Saginaw County.



Mass Median Diameter

Insecticide droplets produced by the agency's Ultra Low Volume (ULV) ground equipment must be within a 12-20 micron size range in order to be effective against mosquitoes. Insecticides that the Commission utilizes are a contact spray. This means a certain number of droplets must come into contact with the mosquito in order for it to be absorbed into its body resulting in mortality. Monthly tests are conducted to determine the mass median diameter (MMD) droplet size of the ULV equipment. MMD is defined as the diameter of the drop which divides the spray volume into 2 equal parts. Fifty percent of the volume of droplets are below the MMD and 50% are above. MMD's are also completed on all repaired ULV equipment before it is returned to service. By determining the MMD's, the biology staff knows if the equipment is producing droplets within the optimal range, and meeting adulticide label requirements.



Insecticide Resistance

Adult mosquitoes from various areas within the district are routinely tested for resistance by exposing them to lethal doses of various insecticides. If resistance appears to be present or developing in a given mosquito population, control strategies are altered to lessen the likelihood of future or continued resistance. If exposure to the insecticide in question is lessened or ceased there is a chance that resistance may subside, and a pesticide may be used again in the future. Mosquito populations can and have developed resistance to insecticides. Their ability to have many generations during a given year or season along with the consistent or prolonged exposure over many years to a single insecticide or group of insecticides may result in pesticide resistance. A resistant population is harder to control and resistance may be amplified if the use of the insecticide is continued.

SCMAC views pesticide resistance as a critical issue to our program's effectiveness. As a result, a variety of EPA approved pesticides are utilized by SCMAC to combat this real concern. This strategy includes using biological insecticides, varying chemical groups, and using formulations in various combinations for differing habitats, mosquito developmental stages, and times throughout the season.

Bottle bioassays are utilized by the Biology Department to expose mosquitoes to a



given insecticide. A certain number of mosquitoes are placed in a bottle coated with a known amount of pesticide, mortality is monitored



over time. Multiple replicates (bottles) and control bottles are used to better define susceptibility within a population. The more bioassays performed on a mosquito species or population the better the ability of SCMAC to monitor and define resistance within the County. Resistance testing is a continuing program within SCMAC to ensure effective and responsible use of pesticides.

Caged mosquito tests are performed to ensure current adulticides control mosquitoes in the field. Adult mosquitoes are placed in cages and subjected to truck mounted ULV treatment. Mosquito species collected from different areas of Saginaw County are tested for susceptibility to not just current but new adulticide formulations. Testing new formulations allows for an operational understanding and expectation for the adulticide prior to incorporation into field services. The amount of mosquito mortality in the treated cages also allows SCMAC to watch for insecticide resistance. Multiple cage tests are completed each season to better evaluate adulticides.



Mosquito-Borne Virus Surveillance

All female mosquitoes from the species listed below are submitted to Michigan State University for their respective virus testing using PCR.

<u>Species</u>	<u>Virus Tests</u>
<i>Aedes triseriatus</i>	La Crosse Encephalitis
<i>Aedes japonicus</i>	West Nile virus, La Crosse Encephalitis
<i>Culex erraticus</i>	West Nile virus, Eastern Equine Encephalitis
<i>Culex pipiens</i>	West Nile virus, St. Louis Encephalitis
<i>Culex restuans</i>	West Nile virus, St. Louis Encephalitis

Township West Nile Activity 2002-2016				
Township	Corvids	Mosquitoes	Bird Bloods	Total
Albee	3	3	0	6
Birch Run	7	11	1	19
Blumfield	6	6	0	12
Brady	0	13	8	21
Brant	0	4	13	17
Bridgeport	21	11	3	35
Buena Vista	17	16	1	34
Carrollton	20	45	7	72
Chapin	0	5	1	6
Chesaning	6	9	1	16
Frankenmuth	8	16	6	30
Fremont	3	8	4	15
James	4	8	0	12
Jonesfield	1	8	0	9
Kochville	9	9	2	20
Lakefield	1	3	1	5
Maple Grove	2	8	0	10
Marion	0	2	0	2
Richland	7	7	5	19
Saginaw City	52	47	26	125
Saginaw	94	7	11	112
Spaulding	2	8	0	10
St. Charles	2	3	0	5
Swan Creek	6	2	5	13
Taymouth	2	4	5	11
Thomas	19	5	19	43
Tittabawassee	11	1	0	12
Zilwaukee	9	6	1	16
Total	312	275	120	707

Special Projects

The following is an overview of special projects initiated by the Biology Department:

1. SCMAC and MSU have an ongoing cooperative study to determine if resistance to *Bti* is developing in Spring *Aedes* mosquitoes.
2. The effectiveness of ULV treatment at 15 miles per hour was studied.
3. ULV spray residual studies were conducted to determine where, how much, and how long detectable amounts of insecticide can be found after adulticiding.
4. A cooperative study with MSU was conducted to determine how cold water temperatures affect feeding of Spring *Aedes* mosquitoes and the dose response curves to *Bti*.
5. A joint study with SCMAC/MSU/Clarke Mosquito Control was conducted to evaluate residue levels of permethrin after ULV application on objects found in parks or residential backyards. The following are examples of objects that were used: picnic table, swing, slide, basketball, grill, water fountain, etc.
6. A joint study with MSU was conducted to look at the efficacy of 3 larviciding products (B.s., *Bti*/B.s. combination, and methoprene) in urban catch basins. As well as a cooperative study with MSU was conducted on the ecology of catch basins.
7. The effectiveness of ULV spraying in rural areas against Spring *Aedes* mosquitoes was examined.
8. The effectiveness of Natular® XRT in neglected swimming pools against *Culex* mosquitoes was studied.
9. The effectiveness of extended release larvicides (Natular® XRT and FourStar® 180) in catch basins was studied.
10. The efficacy of single brood larvicides (ProVect 4E, Natular™ 2E.C., and Agnique® MMF) in roadside catch basins was studied.
11. The combined efficacy of bacterial larvicide (Vectobac® WDG and Vectolex® WDG) in roadside catch basins.
12. Feasibility of water-based adulticides for season long truck-mounted ULV applications.
13. Evaluation of residual barrier treatment on adult mosquito populations.
14. Evaluation and use of TrapTech adult mosquito lure to collect more vector species.
15. Increased surveillance for *Aedes albopictus* and *Aedes aegypti*.

Field

Larviciding

Larviciding involves the introduction of control products into aquatic habitats. The mosquito larva is the least mobile, most concentrated and accessible stage of the mosquito. By targeting larvae in ditches, flooded fields, flooded woodlots, neglected swimming pools, sewage lagoons, retention ponds, agricultural drains, and catch basins countless mosquitoes are destroyed before they reach the adult biting stage.



Spring Larviciding

Aerial larviciding of seasonally flooded woodlots is tentatively scheduled to begin April 17, 2017. Fixed-wing aircraft treat approximately 45,000 acres of mosquito breeding habitat using granular *Bacillus thuringiensis* variety *israelensis* (*Bti*), Serotype 14 attached to ground corn cob, at the application rate of 2.5 to 3 pounds per acre.



Bti is a naturally-occurring soil bacterium. The bacterium produces proteins in a crystalline form. When mosquito larvae eat these crystals, the proteins cause a cellular breakdown in the alkaline midgut which results in rapid death. *Bti* has a highly specific mode of action and is widely considered to be of minimal environmental concern. *Bti* biodegrades quickly and leaves no residue. This larvicide will not kill pupae.



SCMAC employs two methods to ensure the efficient, accurate, and effective dispersal of larvicide into these woodlots. First, the fixed-wing aircraft utilized a Global Positioning System (GPS) for electronic guidance. This system ensures there is neither any overlap of treatment nor any missed areas. This GPS system is web-based allowing for real-time monitoring and the ability to record and review all treatment. Second, the pilots use maps developed with ArcMap, a computer-based Geographic Information System (GIS) mapping program, which depicts targeted woodlots.

Seasonal vector control technicians begin larviciding immediately following the completion of aerial treatment. They concentrate on woodlots infeasible to treat by aircraft such as small woodlots less than 5 acres. Ground crews will use *Bti* or larviciding oil for this treatment depending on the mosquitoes' stage of development.



“Summer” Larviciding

Larviciding is the “first line of defense” for any environmental mosquito management program. Twelve hours of SCMAC’s 16-hour workday is spent larviciding.

Most roadside ditches are checked 1 to 3 times during the control season and treated when necessary. They are routinely checked after a significant rainfall as this often produces larval activity. Moving water is never treated. Ditches are treated using truck-mounted “ditch guns” which are capable of “shooting” granular *Bti* or methoprene through vegetation to the water below. If late fourth instar larvae or pupae are present, larviciding oil is sprayed into the water with a hand-held wand. If the ditch cannot be accessed by a truck, treatment is made using broadcasters for granular material or compression sprayers for larviciding oil.

All villages, cities, and townships with urban development have catch basins. SCMAC recognizes these catch basins can be a significant source of *Culex* mosquito breeding and are larvicided whenever an area’s infestation is 25% or greater. The agency uses a fleet of specially equipped mopeds capable of treating nearly 100,000 catch basins annually. Most catch basins are treated 2 to 3 times during the season. A mix of 2 bacterial larvicides (Vectobac® WDG and VectoLex® WDG) are applied at a rate of 1 ounce per catch basin. Occasionally Altosid® briquets are used to treat catch basins. SCMAC continues to search for catch basins located off the road in residential backyards, school grounds, apartment and athletic complexes, and parks. These catch basins are treated with Altosid® pellets.



Currently, Saginaw County has 13 sewage lagoon sites with a total of 45 cells. The Field Department monitors infestation rates throughout the summer and the sites are checked and treated, if necessary, 2 to 4 times.



Saginaw County has floodwater habitat that routinely floods and produces nuisance mosquitoes after substantial rain events during the spring and summer months. These sites may be treated multiple times; amount and duration of rain dictates amount of mosquito nuisance. These floodwater habitats include flooded fields, yards, woodlots, and floodplains. Field crews check and treat, as needed, known floodwater habitats after rain events. SCMAC has a substantial catalog of these known floodwater sites that can be a major source for breeding of *Aedes vexans*. Larvicide products used to treat these habitats include *Bti*, Natular®, and larviciding oil.



Adulticiding

Even the most rigorous larviciding program may not be able to keep adult mosquito populations at acceptable levels. For instance, Saginaw County has a species of mosquito which is very difficult to control in its aquatic stages; larvae of the cattail marsh mosquito *Coquillettidia perturbans* attach to aquatic plant roots to obtain oxygen. Another factor is Saginaw County has State and Federal Wildlife lands located in the center of the County which is not accessible to larviciding in the summer.

ULV Adulticiding

Adulticiding is the introduction of control products into the air to kill adult mosquitoes while they are in flight using truck mounted Ultra Low Volume (ULV) sprayers or the application of residual barrier sprays to kill adult mosquitoes when they rest on treated surfaces. Each ULV unit is carefully calibrated once a month to dispense only 0.5 of an ounce of active ingredient per acre. It is important for these machines to break down insecticides into proper droplet sizes, which is 12-20 microns. All trucks are equipped with GPS tracking that monitors location, speed, and spray activity.



ULV treatment normally takes place from sunset to approximately 12:30 a.m., Monday - Friday to coincide with peak mosquito activity. If mosquito densities are high, a second spray shift is conducted in early morning hours during the second peak of mosquito activity. ULV applications are less effective at temperatures below 55°F, if winds are greater than 10 mph, or in heavy rain. Due to these factors, ULV operations cannot be performed every evening.

Adulticiding is performed after careful analysis of biological data from traps, disease surveillance, and citizen complaint calls. Saginaw County is divided into 9 zones based on city, village, or township boundaries. These zones are adulticided when adult mosquito populations warrant treatment. Our principal adulticiding material is 4% permethrin.

Adulticiding of Mosquito Harborage Areas

SCMAC utilizes a Buffalo Turbine sprayer to treat 75 predetermined sites scheduled for foliar adulticiding treatment. These sites consist of parks, sportsman clubs, golf courses, campgrounds, etc. and are visited weekly on a designated day (weather permitting). This method controls resting mosquitoes during the daylight hours. The sites are treated only if adult mosquito populations are warranted. The insecticide used is Mavrik® Perimeter, mixed 8 ounces of product to 100 gallons of water. The final mix applied to foliage is a .01% active ingredient solution.



Pollination Awareness

SCMAC is continuously aware of the presence and importance of pollinators and works with the Saginaw Valley Beekeepers Association to follow the best management practices for bee colony/pollinator health in Saginaw County. With this in mind our control efforts are designed around Pollinator Best Management Practices, using an Integrated Mosquito Management Program.

In order to adequately protect honey bee colonies and other pollinators from possible pesticide exposure, there must be effective communication and cooperation from those involved. It may be necessary to control adult mosquitoes in areas known to



have bee colonies. Bees and many pollinators are most active between 8:00 a.m. and 8:00 p.m. Our treatment schedule in these areas begins after sunset, which is after the time most bees have returned to their hives. A major portion of the insecticide budget is for larvicide (*Bti*) that is applied directly to the water and does not affect pollinators.

Spray equipment is carefully calibrated to dispense proper droplet size to impact mosquito sized insects, not the larger insects like butterflies, bees, or beetles. The spray is a contact insecticide, once released it breaks down rapidly. The treatment has a short range, 300 feet on each side of the treatment path, depending on wind direction and speed.

Best Management Practices for pollinator/mosquito control interaction

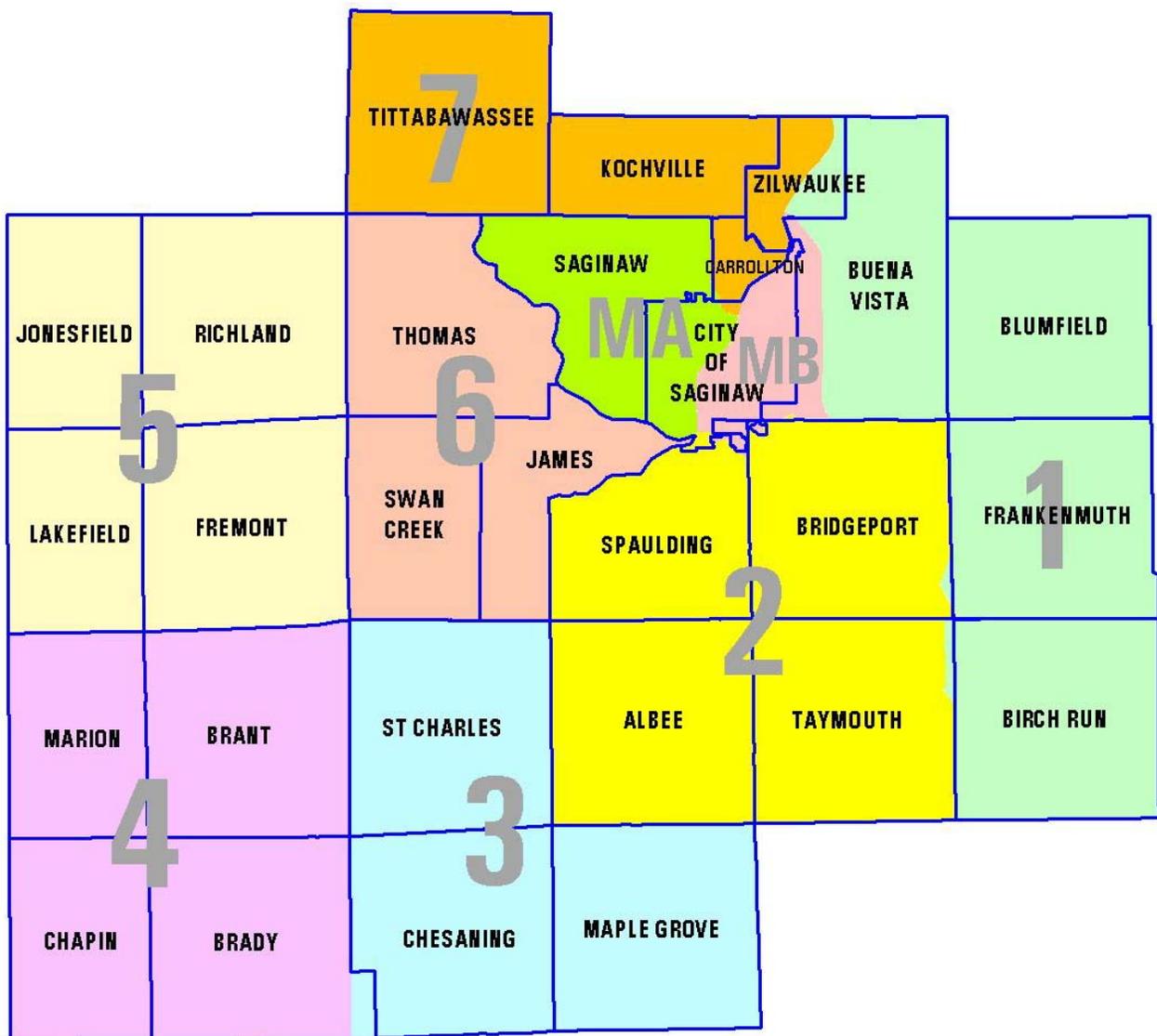
Mosquito Control

- Locate apiaries annually, communicating regularly with local beekeepers
- ULV treatment when bees are not flying, late evening/night
- Let beekeepers know the insecticide we are using
- Avoid direct application of spray to flowering plants
- Monitor and time treatment related to wind direction with respect to colonies

Bee Keepers

- Report colony movement (location) to mosquito control
- If possible, locate hives 300 feet from the roads
- Beekeepers are responsible to manage health of their colonies; healthy hives are less susceptible to disease and possible damage from pesticides

Saginaw County Zone Map
816 Square Miles



Summary of Insecticides/Biologicals

Altosid® XR Briquets (2.1% (S)-Methoprene) - larvicide used in catch basins. 1 Briquet/CB

Altosid® Pellets (4.25% (S)-Methoprene) - larvicide used in catch basins at 3.5 grams/CB or 1 WSP/CB. Active ingredient = 0.1 lbs. Ai/A

Bti (Serotype 14) - corn cob granule - 2.5 - 5 lbs./acre - larvicide used in woodland pools and roadside ditches. Active ingredient = 0.01 lbs. Ai/A

DeltaGard® (2.0% Deltamethrin) - adulticide used in urban and suburban areas during mid to late summer months at 10.5 - 12 fl.oz./minute. Active ingredient = 0.00045 to 0.00067 lbs. Ai/A

Fourstar® Briquets - 180 Day (6% Bs & 1% Bti)- larvicide used in neglected swimming pools at 2 briquets per 100 sq. ft.

Larviciding Oil (BVA2) - used where pupation has occurred at 3 - 5 gallons/acre.
Active ingredient = 2.95 lbs. Ai/A to 4.91 lbs. Ai/A

Mavrik® Perimeter (22.3% Tau-fluvalinate) - foliage treatment for adult mosquitoes. Mixed 8 fl.oz. of product to 100 gallons of water. Active ingredient = 0.283 lbs. Ai/A

MetaLarv® S.PT (4.25% (S)-Methoprene) - larvicide used in floodwater habitats at 2.5 to 10 lbs./acre.
Active ingredient = 0.11 to 0.43 lbs. Ai/A

Natular™ 2EC (20.6% Spinosad) - larvicide used in catch basins and artificial habitats at 2.8 oz/acre.
Active ingredient = 0.045 lbs. Ai/A

Natular® G (0.5% Spinosad) - pre-hatch larvicide used in summer floodwater habitats at 3.5 to 6.5 lbs./acre. Active ingredient = 0.018 to 0.033 lbs. Ai/A

Natular® G30 (2.5% Spinosad) - extended release larvicide used in summer floodwater habitats at 5.0 to 12 lbs./acre. Active ingredient = 0.13 to 0.30 lbs. Ai/A

Permethrin 4 - 4 (4% Permethrin) - used as an adulticide in all temperatures at 5 - 10.5 fl.oz./minute.
Active ingredient = .002216 - .003024 lbs. Ai/A

VectoBac® WDG (37.4% Bti) - larvicide used in roadside catch basins at 1.75 oz/acre.
Active ingredient 0.04 lbs. Ai/A

VectoLex® WDG (51.2% Bs) - larvicide used in roadside catch basins at 8.0 oz/acre.
Active ingredient 0.26 lbs. Ai/A

Public Information and Education

Public education is an important part of SCMAC's Integrated Mosquito Management Program. It is important for residents to understand the primary purpose of our control efforts are the reduction of mosquito-borne diseases. With this awareness citizens gain a clearer understanding of the methods used to safeguard their families during the mosquito season here in Saginaw County.

Educational Programs

SCMAC's educational program provides educational presentations to pre-K thru college level students. The classroom presentations are a combination of a PowerPoint presentation and interactive displays. The presentations' goals include



understanding mosquito development and habitat; mosquito borne disease; surveillance methods; insecticide safety; and methods for personal protection and control. These presentations are designed to



incorporate current Grade Level Content Expectations and Common Core State Standards. Students become familiar with simple ways to reduce habitat around their yard and neighborhood, and thus help reduce mosquito populations in their communities. Supporting informational activity materials are provided to each student following presentations.

SCMAC sponsors an annual "Mosquito Abatement Challenge" for 3rd, 4th, and 5th grade Saginaw County students. Through designing a poster or writing a short story, students express their understanding of the importance of mosquito control, and how they can help control mosquitoes around their homes and community.

Our Education Coordinator is available to speak to community service groups and organizations about the importance of our program and how to make a difference by helping control mosquitoes in their neighborhoods.

Community Outreach

SCMAC's keeps the community current with our program and mosquito control by having an accessible and effective presence in the community. SCMAC



attends community events such as Friday Night Live, Saginaw Children's Zoo, Saginaw County Park Programs, and the Saginaw County Fair. SCMAC provides informational brochures that address frequently asked questions. The goal of our community outreach is to address citizen concerns by providing current information; which promotes community participation and awareness resulting in better mosquito control.

Educational Tools

SCMAC's web site, www.scmac.org, contains a wealth of information about our program and related mosquito topics; including educational links to



brochures, product labels, and Safety Data Sheets (SDS).

Seasonal employment opportunities, agency brochures, and links to additional mosquito related information are also available on our web site. Our Facebook page, www.facebook.com/saginaw.mosquito.control, provides the most up-to-date information on agency's operations, disease surveillance, and recent mosquito control developments.



Materials and Resources

Current materials on mosquitoes and mosquito related issues are developed by SCMAC. Employees and Trustees stay abreast of current studies and information on a routine basis. Attending conferences, classes,



and seminars increases staff knowledge and awareness. Our Technical Advisory Group (TAG), is made up of university professors, representatives from the Michigan Department of Community Health, Michigan Department of Agriculture and Rural Development, and

leaders in the field of mosquito control. They provide the agency with new developments and important data in the areas of biological and environmental sciences as they pertain to our operations.

Cooperative Relationships

The Saginaw County Public Health Department, particularly the Environmental Health Division, has been helpful in utilizing the Public Health Code to resolve nuisance problems involving sanitation, and neglected swimming pools.



Additionally, SCMAC works cooperatively with other professional associations, such as the American Mosquito Control Association (AMCA), the Michigan Mosquito Control Association (MMCA), and the Michigan Pest Management Association (MPMA) to ensure that our staff receives the most current information available regarding new control products and technologies.

SCMAC carefully tracks proposed legislation as it relates to mosquito control. Members of our permanent staff serve on Michigan regulatory committees and work groups when needed.

Source Reduction

Source Reduction (SR) is the permanent removal of mosquito breeding habitat through the elimination of standing water. The removal of standing water is the most effective way to control mosquitoes around the home and community. SCMAC's Source Reduction Program seeks to reduce the amount of mosquitoes and mosquito-borne disease within communities through education and habitat removal. The following source reduction strategies are employed to achieve this goal:

1. Homeowner education and consultation
2. Search and Inform Program
3. Household Scrap Tire Collection Program
4. Neglected Pool Program
5. Monitoring and treatment of SCMAC historic projects

Mosquito breeding habitat (standing water) comes in various forms; it can be artificial like a bucket of water used to collect rain water or large flooded field. In either case, the elimination of these sources of mosquitoes is possible; simply dump or remove the container or look for drainage solutions for standing water. Drainage is not always possible for natural habitats such as floodplains, flooded fields, swamps, and woodlots, as they may be protected wetlands.



Public Education

Homeowner Consultations

Citizens will occasionally ask questions in regard to draining water from yards, woodlots, or ditches. SCMAC looks to provide them with information as to possible drainage solutions. Mosquito Control with the help of the Public Works Department can provide homeowners guidance through information or site consultations.

Search and Inform Program

SCMAC prides itself in providing residents with information that can help control mosquitoes around their yard and community. Our technicians canvas neighborhoods looking in yards for sources of mosquito breeding; specifically artificial habitats that can be simply emptied or removed. This program often targets urban and suburban areas where these habitats are both abundant and pose a public health concern. The following mosquito habitats are frequently encountered by technicians: buckets, tarps, old boats, bird baths, toys, tires, swimming pools, flower pots, trash cans, kiddie pools, and ornamental ponds.



Household Scrap Tire Collection

In 2004 legislation was passed in Michigan making it illegal to dump scrap tires into landfills. This action has resulted in an abundance of tires dumped in ditches, fields, woods, and yards. In an effort to reduce the number of tires and the resultant mosquito breeding they promote, SCMAC with the help of the Saginaw County Solid Waste Management Committee seeks to reduce scrap tires within the environment. Prior to 2015, funding assistance for this program was provided through Saginaw County Solid Waste. Since 2015, annual funding assistance is sought through the Michigan Department of Environmental Quality's Scrap Tire Cleanup Grant. This funding helps offset costs associated with our Household Scrap Tire Collection Program.



As a service to Saginaw County residents and an effort to reduce the number of mosquitoes, SCMAC operates two, week-long household scrap tire drives along with tire drop-off at our facility. Tire collection at our facility runs from **May 1st through August 31st** with all collected tires transported to Environmental Rubber Recycling where they are shredded and utilized in various capacities. Tires are limited to a total of 10 household tires, passenger size only (car and pickup truck) per address, per year. Semi, tractor, and heavy equipment tires are not accepted.

Neglected Pool Program

Neglected or idle swimming pools are capable of breeding very large populations of *Culex* mosquitoes, the primary West Nile virus vector. Mosquito Control, along with the Public Health Department, takes these habitats very serious as they pose a threat to public health. Pools are monitored for mosquito breeding bi-weekly throughout the season, as well as kiddie pools, hot-tubs, and ornamental ponds. This program has achieved much success with many pools removed or reopened.



Historic Source Reduction Projects

SCMAC has drained a large amount of standing water over the last few decades. Mosquito Control provided engineered drainage solutions, prior to 2015, to qualified residents through a SCMAC funded drainage program. This program was eliminated due to engineering and construction costs far exceeding those associated with larviciding. Nearly 400 projects were completed with over 1000 catch basins placed to eliminate standing water in yards, parks, churches, ball fields, and other community areas. It is important that SCMAC monitor these projects and treat the catch basins for mosquitoes.



Vehicle and Equipment Maintenance

SCMAC’s Vehicle Maintenance Department performs both major and routine vehicle maintenance repairs on the agency’s fleet as well as 12 other Saginaw county departments. This totals approximately 141 vehicles. Departments are billed quarterly for parts and labor at a cost that is beneficial to everyone. This cooperative relationship allows SCMAC to employ two full-time State of Michigan Certified Mechanics.



Additional responsibilities include the repair, fabrication, and maintenance of the following: Ultra low volume (ULV) adulticide sprayers, compression sprayers, granular applicators, fleet of 10 mopeds, truck mounted granular larviciding equipment (ditch guns), tire trailers, and other agency equipment. The work is completed in a fully equipped 2,500 square foot vehicle maintenance facility. The facility consists of 4 bays (1 hoist, 1 wash bay, and 2 oil change pits).



Preventive Maintenance

The agency utilizes a vehicle and equipment maintenance sheet that is reviewed by the staff at the start of each shift to ensure the equipment is in proper working condition. Seasonal employees assigned a vehicle must complete a “Daily Truck Checklist.” This guides them through a thorough inspection of the vehicle which includes: checking fluid levels, taillights, blinkers, strobe lights, headlights, tire conditions, tire pressure, etc.

Vehicle Repairs

SCMAC’s takes pride in the appearance of our trucks and equipment; therefore, a refinishing and detailing shop was built in the main building. Employees not only paint new vehicles, with our “trademark” optic yellow color, they repair dents, dings, and scratches which occur throughout the season. Most vehicle repairs are performed during the winter months saving the agency money.



Fuel Facilities

SCMAC operates a secure 24 hour fueling depot providing gasoline for mosquito control, as well as 13 other county departments. SCMAC utilizes a Fuel Master system which is supplied by a 6,000 gallon above ground tank. The system logs all fuel transactions using a ProKey and pin number combination.



Mosquito Outbreak Emergency Response Guidelines

L E V E L	CRITERIA	RESPONSE
I	<p><u>Normal to Below Normal Mosquito Populations</u> All New Jersey Light Traps less than 200 mosquitoes per night CDC Traps average less than 100 mosquitoes/trap/night Complaint/Service Calls average less than 100 per day</p> <p><u>Disease Detection</u> No Detection of Disease</p>	<p>Control operations target nuisance and/or disease vectoring mosquitoes in locations of highest mosquito densities Continue routine mosquito, dead Crow, and Blue Jay surveillance All Priorities accepted: 50 Thursday/Friday and 25 Monday – Wednesday Medcerts treated routinely with zone sweeps</p>
I	<p><u>Normal to Below Normal Mosquito Populations</u> Fewer than 3-5 New Jersey Light Traps greater than 200 mosquitoes per night CDC Traps average less than 250 mosquitoes/trap/night Complaint/Service Calls average 100-175 per day</p> <p><u>Disease Detection</u> Occasional positive detections in dead Crows and Blue Jays Mosquito pools at levels considered normal for time of year</p>	<p>Control operations target nuisance and/or disease vectoring mosquitoes in locations of highest mosquito densities Monitor potential hot spots using various surveillance methods All Priorities accepted: 50 Thursday/Friday and 25 Monday – Wednesday Medcerts treated routinely with zone sweeps</p>
I	<p><u>Elevated Mosquito Populations</u> 3-5 New Jersey Light Traps greater than 200 mosquitoes for two consecutive nights CDC Traps average greater than 250 mosquitoes/trap/night Complaint/Service Calls average 175-200 per day</p> <p><u>Elevated Disease Detection During Weekly Testing Period</u> Crows and Blue Jays positive for WNV 20% above historic data or 3 fold increase in dead birds reported over previous years and time period Minimum Field Infection Rate (MFIR) 10-20</p>	<p>Repeated nightly spraying in high risk areas Increased larval surveillance in areas most likely to breed disease vectoring mosquitoes Continue spraying nuisance mosquitoes in areas with high mosquito densities Increased disease surveillance in areas with high levels of mosquito disease activity News Release sent to Media encouraging citizens to use personal protection Reduce Priorities reduced: 25 Thursday/Friday and 10 Monday – Wednesday Priorities for civic/community events, not for Complaint Calls Medcerts treated routinely with zone sweeps AM spray shift implemented</p>
I V	<p><u>Mosquito Populations Substantially Above Historical Levels</u> New Jersey Light Traps with more than 5 traps greater than 200 mosquitoes for two consecutive nights CDC Traps average greater than 500 mosquitoes/trap/night Complaint/Service Calls average greater than 200 per day</p> <p><u>Highly Elevated Disease Detection During Weekly Testing Period</u> Single human case of mosquito borne disease Crows and Blue Jays positive for WNV 30% above historic data Minimum Field Infection Rate (MFIR) 20-30</p>	<p>Focus control efforts to high risk mosquito populations and areas commensurate with arbovirus indicators for risk Control operations will continue to target nuisance mosquitoes in locations of highest mosquito densities Increased disease surveillance to obtain estimates of mosquito transmission frequency in targeted areas News Release sent to Media encouraging citizens to use personal protection Total ban on accepting new Priorities (ONLY honoring requests already in system) civic/community events treated Medcerts treated no more than once every 10 working days (treated as a long drive only if within 10 day time frame) Night Shift (adulticiding only): 6 days a week Sunday - Friday AM and weekend spray shift implemented (weather dependent)</p>
V	<p><u>Mosquito Populations Extremely Elevated</u> New Jersey Light Traps greater than 200 mosquitoes in 5 or more traps for two consecutive nights CDC Traps average greater than 500 mosquitoes/trap/night Complaint/Service Calls average greater than 200 per day</p> <p><u>Extremely Elevated Disease Detection During Weekly Testing Period</u> Multiple human cases of mosquito borne disease Crows and Blue Jays positive for WNV 75% above historic data Minimum Field Infection Rate (MFIR) greater than 30</p>	<p>Aggressive adulticiding and larviciding efforts to high risk mosquito populations and areas commensurate with arbovirus indicators for risk Consider aerial adulticiding Consider strategies for increased disease surveillance: canceling outdoor events, closing parks, etc. Consider control on protected lands such as no sprays and Federal/State refuges Increase surveillance to obtain estimates of mosquito transmission frequency in targeted areas Increase News Releases encouraging citizens to use personal protection Total ban on Priorities except civic/community events Total ban on Medcerts Night Shift (adulticiding only): 6 days a week Sunday - Friday AM and weekend spray shift implemented (weather dependent) Consider requesting assistance from Centers for Disease Control (CDC) for increased disease surveillance Consider requesting for State and Federal Emergency (FEMA) support for mosquito control operations</p>

Final decision in regards to status levels is at the discretion of the Director

Updated 2/12/2016