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TABLE OF CONTENTS

Contents

SUMMARY OF 2019 PROGRAM GOALS & CHANGES	1
STAFFING	2
FIELD OPERATIONS	3
Spring Larviciding (April 10 — May 15)	3
Ground Larviciding.....	3
Aerial Larviciding.....	4
Summer Operations (May 15 — September 15).....	4
Catch Basins	4
Scrap Tires.	4
Small Ditch	5
Roadside Ditch.....	5
Mosquito Adulticiding	6
LABORATORY OPERATIONS	7
Encephalitis Virus Surveillance	7
Mosquito Surveillance	7
Adult Mosquito Surveillance	7
Larval Surveillance	7
Research.....	7
TECHNOLOGY	7
SOURCE REDUCTION	8
COMMUNITY OUTREACH	8
FACILITY UPGRADES.....	8

SUMMARY OF 2019 PROGRAM GOALS & CHANGES

- Continue into second year the partnership with Ten16 Recovery Network to hire individuals participating in the Fresh Start program as field technicians. Up to four technicians can be hired in 2019.
- Hire a Foreman due to the retirement of Andy Lowry.
- Continue to monitor the implementation of automatic on/off system Real-time tracking for aerial contract aircraft during spring larviciding program.
- Add to the aerial program a treatment block of approximately 500 acres to Jasper Township.
- Convert to electronic log sheet for aircraft load tracking during spring aerial program.
- Purchase and incorporate 800 Mhz digital radios for communication to replace analog system.
- Purchase and incorporate electronic iPads for use in each truck.
- Evaluate Duplex G for spring foot crew treatment in select woodlots.
- Evaluate sample residual products for control of resting adult mosquitoes.
- Purchase and begin operation of an electric ULV unit for use in campgrounds and other sensitive sites.
- Convert nighttime truck fogging data recording from paper to ESRI application.
- Continue development of GIS collection and analysis of treatment and biology data.
- Carry out various facility upgrades – LED lighting throughout facility; new flooring in hallway, break room and lab; replace seating in breakroom, conference room and offices.

STAFFING

Midland County Mosquito Control (MCMC) employs a full-time staff of four individuals: Director, Operations Supervisor, Biologist and Office Manager and two Foremen who work nine months of the year.

Approximately twenty seasonal employees will be added to the staff for the mosquito control season (April to September). Employment with MCMC is contingent upon obtaining pesticide applicator 7F certification or registration through the Michigan Department of Agriculture and Rural Development (MDARD). New technicians will participate in a formal two-day training session, April 1-2. Technicians will be instructed using the national “core” training manual and MDARD personnel will administer the registered applicator’s exam at the MCMC office on April 3.

During the spring season all technicians will work day shift and conduct larviciding operations. Separate day and night crews will be formed on or around May 12. After that time, day-crew technicians conduct surveillance and larviciding while the night technicians participate in larval control operations for the first part of their shift, and then switch to mosquito adulticiding.

On February 6, 2018 the Midland County Board of Commissioners (BOC) approved a pilot program with Ten16 Recovery Network. The program will allowed for Ten16 to refer certain individuals to Midland County Mosquito Control for seasonal employment consideration as mosquito control technicians. This program was determined to be a success and will continue in 2019 with an expansion of opportunity for up to four Fresh Start participants.

After over twenty years of dedicated service to Midland County and MCMC, Andy Lowry resigned (retired) effective 19 February 2019. The process of hiring a replacement is occurring at the writing of this report. The replacement will be announced by the time of the Technical Advisory Committee meeting in March 2019.

Field Staff	Hours in the Field	Activity
Day Crew	8:00 a.m.— 4:30 p.m.	Larviciding
Night Crew	4:30 — 8:00 p.m. and 8:30 —11:30 p.m.	Larviciding Adulticiding
Part-Time and Sunday	8:30 —11:30 p.m.	Adulticiding

FIELD OPERATIONS

FIELD OPERATIONS SCHEDULE												
Operation	April		May		June		July		August		September	
	1 st	15 th	1 st	15 th	1 st	15 th	1 st	15 th	1 st	15 th	1 st	15 th
<i>Spring Season</i>												
Woodlot (Bti)												
Woodlots (MLO)												
<i>Summer Season</i>												
Woodlots (MLO)												
Roadside Ditches (Bti)												
Summer Sites (Bti, MLO)												
Catch-basins (BS, Altosid PG)												
County Drains (Bti)												
Adulticiding (Permethrin)												

Spring Larviciding (April 10 — May 15)

Ground Larviciding The 2019 program will begin in April when supervisory personnel and seasonal technicians start treatment of woodland sites. Field personnel will treat approximately 3,000 acres of woodland pools. Vectobac® 12AS (liquid *Bti*) will be the primary larvicide used in woodlands during this period. BVA-2 MLO (Mosquito Larvicide Oil) will be used after the spring *Aedes* species mosquitoes begin to pupate. Select woodlots will be treated with granular BTI (Vectobac® G) utilizing the Stihl motorized backpack units. Duplex™ G will be applied to flooded woodlot sites in some areas of the county, primarily in high value sites in relatively highly populated areas of Midland. Duplex™ G is a high priced option but its formulation should provide a number of weeks of larval control and will hopefully prevent the need for repeat treatments in the event of late spring rain events.

Aerial Larviciding. A total of 57,791 acres of woodlots are scheduled for aerial treatment this year consisting of 28,216 acres treated with liquid *Bti* and 29,575 acres with granule *Bti*. Treatment area will be approximately the same as 2018 with the exception of an added block in Jasper.

Vectobac®G granules and Vectobac® 12AS liquid *Bti* will be used in 2019. Application service will be contracted to Hatfield Spraying Services of Nunica, Michigan.

The application rates will remain 4 lb/acre granule and 1 pint/acre liquid. The three granule aircraft and two liquid aircraft will be equipped for automatic on/off of material delivery. 2017 was the first year with this capability.

The contractor is also working towards real-time tracking of aircraft so that treatment can be more closely tracked at the MCMC office and via online log in. This will be a useful capability for the office staff when receiving phone calls about the progress and location of aircraft.

The precision of the automatic on/off technology has allowed for some areas within treatment blocks to be excluded from the treatment “cut”. Examples of these areas include dry portions of the woods, fields and residences. Five hundred acres of these areas will be redirected in 2019 to a newly-established aerial block in Jasper township, which was the only township in the county that was not previously included in the aerial program.

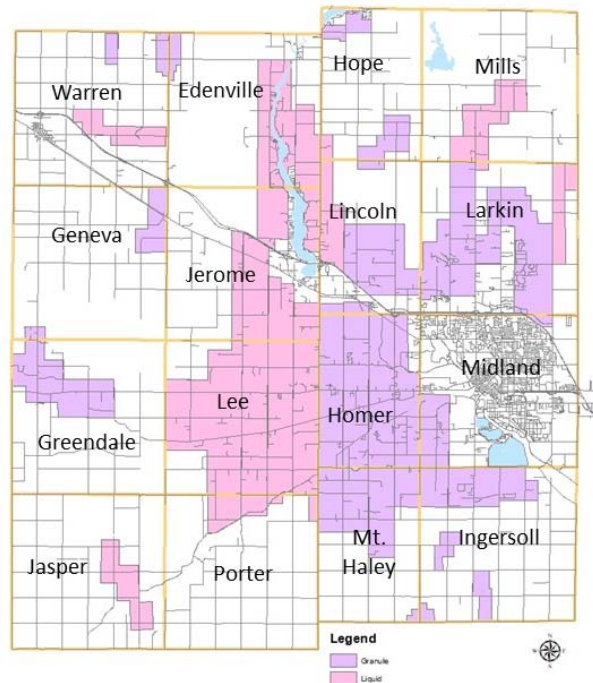
The effort to integrate ESRI geographic information technology tools to MCMC operations will include in 2019 implementation of an electronic log sheet for tracking aircraft loads created in the ESRI application Survey 123. Data from this survey will be searchable, available for easy data analysis and archivable.

Summer Operations (May 15 — September 15)

Catch Basins. With the continuing presence of West Nile virus in the Midland area, special attention will be directed to catch basins, a prime *Culex* habitat. Treatments of catch basins will be scheduled according to larval development. Separate control materials will be rotated into the catch basin program. Altosid® (methoprene), and Bs (Vectolex®) will be used to provide control by different modes of action in an attempt to minimize development of resistance among mosquito larvae.

Scrap Tires. Scrap tires produce *Culex* species mosquitoes, *Aedes triseriatus*, *Aedes japonicus* and other species, and are of prime concern as a possible source of West Nile virus bridge vectors. Abate® granules, Bs and Mosquiron® pellets will be applied to tires and efforts will continue to support the removal of scrap tires from the environment (see Source Reduction section).

2019 Aerial Larvicide Program



Small Ditch. Pre-treatment of dry ditches will be done with the product Metalarv™ S-PT. Pretreatment allows for material to be placed in ditches that periodically flood and are activated with water pools. Following summer rain events there is often abundant area to treat and limited personnel to dispatch; therefore, pretreatment allows crews to focus on areas not already pretreated.

Roadside Ditch. Roadside ditch larviciding will be conducted as usual with continued emphasis on treating *Aedes vexans* after summer rains using *Bti* (Vectobac® 12AS) liquid from truck mounted hydraulic sprayers.

Insecticide	Active Ingredient
Vectobac® G	<i>Bacillus thuringiensis israelensis</i>
Vectobac® 12AS	<i>Bacillus thuringiensis israelensis</i>
Duplex™ G	<i>Bacillus thuringiensis israelensis</i> , Methoprene
Altosid® XR Briquets	Methoprene
Altosid® P35	Methoprene
Altosid® WSP	Methoprene
Spheratax® SPH / Vectolex® FG	<i>Bacillus sphaericus</i>
Spheratax® WSP / Vectolex® WSP	<i>Bacillus sphaericus</i>
Abate® 5%	Temephos
Metalarv™ SP-T	Methoprene
Mosquiron®	Novaluron
BVA-2 MLO	Mineral oil
Evoluer 4-4	Permethrin
Kontrol 4-4	Permethrin

SUMMER LARVICIDING SITES			
Site	Description	Treatment Interval	Control Material
Catch Basins	Crocks along city streets	2 - 3 times yearly	Methoprene, <i>Bs</i> or <i>Bti</i>
Roadside Ditches	Borrow ditches along county roads	Following flooding rains	Methoprene, spinosad or <i>Bti</i>
County Drains	Large ditches that transfer water to rivers	As needed	<i>Bti</i>
Small Ditches	Shallow ditches along residential lawns	May-June / after major rains	Spinosad, methoprene or <i>Bti</i>
Seepage Runoff	Small bodies of water high in organic content	Every 10 days as needed	<i>Bti</i> or larviciding oil
Sewage Lagoons	Larger bodies of organic water	Every 10 days as needed	<i>Bs</i> , larviciding oil
Tires	Discarded tires capable of holding water	Twice yearly	<i>Bs</i> , temephos or novaluron
Containers	Barrels, buckets, etc. holding water	As needed and encountered	<i>Bs</i> , <i>Bti</i> or oil
Ponds	Permanent pools with some open water	As needed (uncommon)	<i>Bti</i>
Flooded Fields	Shallow, temporarily flooded areas	Following major rains	<i>Bti</i> , methoprene or larviciding oil
Cattail March	Cattail marshes and/or brush-covered areas	Following major rains	<i>Bti</i> or larviciding oil
Swamps	Permanently-flooded areas with emergent vegetation	As needed	<i>Bti</i>

Mosquito Adulticiding Kontrol 4-4 (permethrin) and Evoluer 4-4 (permethrin) ultra low volume (ULV) technology will be utilized during 2019 adulticide operations. Truck-mounted ULV fogging is conducted evenings during the period of peak mosquito feeding activity as the mosquito population dictates and weather permits. Throughout most of the year this period goes from sunset to midnight, however, spring *Aedes* species and *Aedes vexans* are sometimes most active earlier in the evening. During these times, night-time fogging may begin before sunset. A one-mile no-treatment zone is maintained around known honeybee locations until sunset.

Pre-designated routes, which provide an estimated 10-day turnaround throughout the county, will be followed. Based on field inspections, landing counts, trap results and disease surveillance, treatment will be concentrated in areas where problems persist and reduced in areas with minimal adult mosquito activity. In compliance with Regulation 637, campgrounds and major parks will be permanently posted informing the public that these sites receive periodic treatment to control mosquitoes.

Letters were sent out in late 2018 to individuals who receive long driveway service who we did not have a currently signed form authorizing our treatment on their property. The residents were requested to sign the form and return prior to 1 March 2019. Any forms received after 1 March but by 1 May will be reevaluated for inclusion in the fog route based on 2019 criteria. Starting in 2019, any long drive requests submitted after 1 May will be considered for route inclusion in the following year's route.

MCMC plans to purchase a truck-mounted electric ULV unit from Clarke. The unit's output is equivalent to the gas-powered machines but is considerably quieter during operation. This unit will be useful for areas such as campgrounds where people are in close proximity and have limited blockage from the noise given off from the truck unit. Special consideration for notifying the public of this change is anticipated as several rely on hearing the sound of the gas units to be assured that fogging treatment has occurred in their area.

Day-crew technicians will conduct adulticiding with hand-held thermal foggers in special circumstances during the day. Areas that may be treated in this way include city/county parks, and woodlots around suburban areas. A half-mile no-treatment zone is maintained around known honeybee locations while thermal fogging.

MCMC plans evaluations of residual products during the 2019 season. Residual insecticides target resting adult mosquitoes and may be useful in some instances where fogging is limited. The products to evaluate are Demand® CS and OneGuard®.

LABORATORY OPERATIONS

Encephalitis Virus Surveillance

An active disease surveillance program increases the chance of early detection of virus activity, allowing the most time possible to develop an appropriate response.

Light traps, landing collections and gravid traps will be used to capture adult mosquitoes. VecTOR Test (VecTOR Test Systems, Inc., Thousand Oaks, CA) field test kits will be used to check *Culex*, *Coquillettidia* and other mosquitoes for evidence of West Nile Virus, St. Louis Encephalitis or Eastern Equine Encephalitis. Surveillance for West Nile Virus will also involve collection of reports of dead birds and monitoring of reports from surrounding areas. Results of MCMC surveillance efforts and communication with other agencies will be used in a continuing evaluation of mosquito-borne disease risk as outlined in the CDC guidelines.

Mosquito Surveillance

Adult Mosquito Surveillance Adult mosquito surveillance is used to guide the selection and timing of control strategies and is used in estimation of disease transmission potential. New Jersey Light Traps will be maintained at seven locations in Midland County. Collections will be picked up three times weekly. CDC traps will be used in areas not covered by New Jersey traps.

Additionally, adult landing counts will continue in 2019 by night crew technicians before truck-mounted adulticide activities commence as well as other times. Human-based surveillance is the most accurate measurement of biting pressure to county residents and thus an important surveillance technique.

Larval Surveillance The numbers, species and location of immature mosquitoes also influence the selection and timing of control strategies. Biology and field staff will sample many aquatic sites and samples will be returned to the lab for identification. Major emphasis will be placed on sampling the habitat appropriate to each season, i.e. woodlots in the early spring, followed by grasslands and summer sites. Container habitat will be surveyed as often as possible to monitor the presence and range of container breeding species such as *Aedes triseriatus* and *Aedes japonicus*.

Research. MCMC will be continuing its insecticide resistance monitoring program. Various wild populations of species under insecticide pressure will be surveyed and tested with the CDC bottle assay for resistance phenotypes. If resistance is detected, extra efforts to implement various resistance management techniques will be administered.

TECHNOLOGY

MCMC continues to look to ways to make operations more efficient and effective. One such way is to incorporate GIS technology into various biology and field operations. As mentioned previously an electronic log sheet was developed for use at the airport during the spring larviciding program. Also, starting in 2019 iPad tablets will be used by technicians with sufficient numbers for each fleet truck. Operations targeted for first conversion to this technology from paper include nighttime truck fogging and catch basin treatments. Precision mapping with iPads will be available this year more than in previous seasons due to the purchase of eleven additional tablet units. Larval counts and landing counts will be GIS mapped and analyzed.

Due to changing infrastructure in the county, MCMC converted to 800 MHz digital radios for communication replacing the analog units in 2019. These units have higher power so will no longer be

truck mounted but all handheld radios. This will be an advantage in that technicians working in the field can have a radio on them and will be much more readily contacted.

Drone technology continues to develop and is an option for delivery of pesticides. A number of companies sell drones and applicators for this purpose. MCMC will research this as a potential option for application to dense larval sites that are hard to access and effectively treat with foot crews.

SOURCE REDUCTION

Midland County recognizes that source reduction is one of the most effective ways to control mosquitoes. Through cooperation with and education of property owners and other agencies, many mosquito breeding sites are eliminated or improved. MCMC will schedule and host two scrap tire drives and will continue to encourage property owners to eliminate scrap tires and other mosquito habitat from the landscape. Funding for these drives was sought through a Michigan Department of Environmental Quality scrap tire removal grant. Mosquito Control will also recommend priority areas for drain work to the Midland County Drain and Road Commissions.

COMMUNITY OUTREACH

Community outreach is an important part of the MCMC Integrated Mosquito Management (IMM) program. Property owners are notified of scheduled treatments with direct mailings, telephone notification of local property owners with special security needs, postings on social media and websites and door-to-door personal contacts. Print and display advertising are purchased throughout the year to notify County residents of control operations and to direct residents' questions and concerns. Presentations are provided to community groups on request. The MCMC website, a special telephone line (832-NEWS) a website and Facebook page provide up-to-date treatment schedule information and news on special events.

FACILITY UPGRADES

Various projects will be completed in 2019 to upgrade MCMC facility. An electrical contractor will be converting all lights throughout the facility to energy efficient LED units. This program utilizes the Consumers Energy Small Business Energy Efficiency program, which offers rebates on upgrade installation and material costs. Tile replacement will be done through the hallways, breakroom and lab areas. Additionally, new seating was purchased for office spaces, the breakroom and conference room.