

2023 ANNUAL REPORT



**BAY COUNTY
MOSQUITO CONTROL
BAY CITY, MI**





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Rebecca Brandt, Manager
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Matthew Mikolajczak, Field Supervisor
Alec Leppek, Field Supervisor
Melinda Moreno, Clerk
Chad Milkowski, Mechanic

ADMINISTRATION

Jim Barcia, Bay County Executive
Laura Ogar, Director, Bay County
Environmental Affairs & Community Development

BOARD OF COMMISSIONERS

Vaughn Begick, Chairman	Colleen Maillette
Thomas Herek, Vice-Chairman	Kaysey Radtke
Kathy Niemiec	Dennis Poirier
Tim Banaszak	

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John Hebert, Chairman, Bay County Resident
Norman Adams, Saginaw Valley Beekeepers Association
Steven Carlson, Michigan Department of Agriculture and Rural Development
Roger Garner, Midland County Resident
Joe Sova, Midland County Drain Commissioner
Emily Dinh, Michigan Department of Health and Human Services
Tom Putt, Bay County Resident
Kent Singer, Tuscola County Health Department
Jerry Somalski, Bay Landscaping
Kim Vaughan, Tuscola County Commissioner
Fred Yanoski, Midland County Public Health

MANAGER'S REPORT

December 1, 2023

On behalf of Bay County Mosquito Control, I am proud to present our 2023 Annual Report. Key highlights of our 2023 program include:

Aerial Treatment for *Coquillettidia perturbans* – After many years of surveillance and planning, we successfully completed an aerial treatment pilot project for control of *Cq. perturbans* larvae along the Hampton Township shoreline. Treatment efficacy for the project will be measured in summer 2024.

Eastern Equine Encephalitis Confirmed – Bay County's first confirmed case of EEE was identified in a mosquito sample from Hampton Township in late June, with a second positive occurring later in the summer in Bay City. West Nile Virus activity increased overall compared to 2022 likely due to an increase in *Culex* populations as a result of a wet summer.

Weather Events – A tale of two extremes, a very dry May and June meant low mosquito activity through the first couple months of the season. By the end of June, consistent rain events fell throughout the County through early September with regular totals of 1"-3" in rain gauges each week. Some portions of the County, particularly the very southern, received over 25" of rain from late June to early September keeping all program components active this summer.

New Staff – We welcomed Field Supervisor Matt Mikolajczak to Mosquito Control! Matt, a former seasonal employee-turned-9-1-1- dispatcher, has brought positive energy, a jack-of-all trades aptitude, and a willingness to learn to our program. He will also be taking the lead on managing GIS projects for our department.

Respectfully submitted,



Rebecca J. Brandt, Manager
Bay County Mosquito Control

About the Program

Bay County Mosquito Control is a community-wide public health program that seeks to protect the health and enhance quality of life of residents and visitors to Bay County by using an Integrated Mosquito Management (IMM) approach. Services are provided through a voter-approved millage (0.55 mills), renewed by Bay County residents in 2016 for 8 years. BCMC is overseen by numerous regulatory agencies that mandate strict adherence to federal and state laws to protect the public we serve.

Regulations

MDARD | Michigan Dept. of Agriculture & Rural Development

- Regulation 636 - pesticide applicators
- Regulation 637 - pesticide use
- Regulation 640 - bulk storage compliance

FIFRA | Federal Insecticide, Fungicide, & Rodenticide Act

- Federal regulations for pesticide use

EGLE | National Pollutant Discharge Elimination System

- 5 year certificate of coverage
- NPDES annual report
- Pesticide discharge management plan
- Self-certification summary
- Stormwater pollution prevention plan certification
- Sewage lagoon water treatment additive permit
- Rinsewater testing

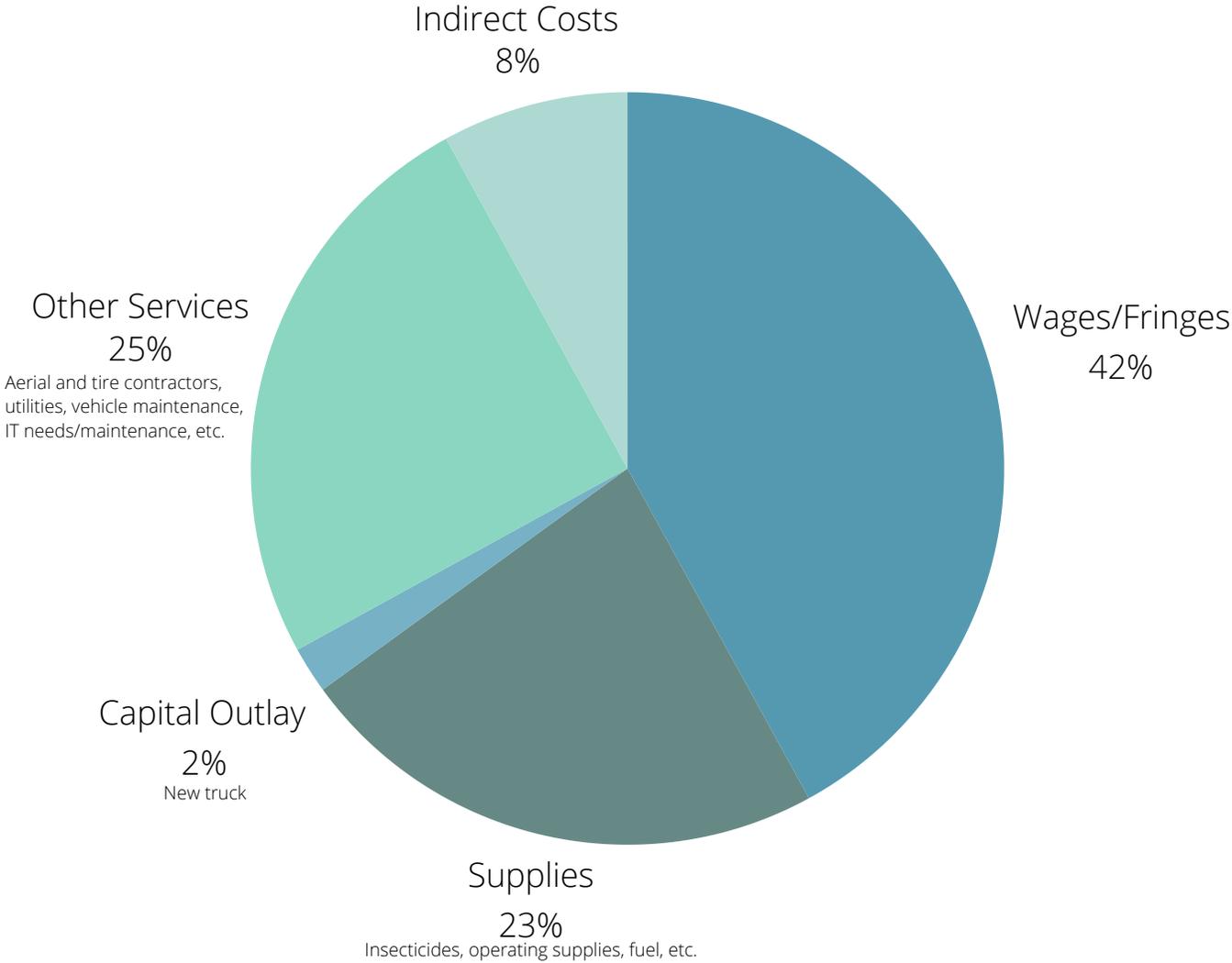
Collaborating Agencies

- American Mosquito Control Association
- Michigan Mosquito Control Association
- Mid-Michigan Technical Advisory Committee
- Saginaw, Midland, and Tuscola County Mosquito Control districts
- MDHHS, MDARD, EGLE, US Fish and Wildlife Service, CISMA
- MSU Entomology Department



BUDGET BREAKDOWN

TOTAL 2023 EXPENDITURES: \$1,671,907



Integrated Mosquito Management (IMM)

We acknowledge the importance of serving the public by providing mosquito control services without producing adverse impacts to the environment; therefore, our goal for mosquito “control” is not elimination of the insect, but rather an Integrated Mosquito Management (IMM) approach to minimize risk.

IMM uses a variety of methods to prevent and reduce the number of mosquitoes while minimizing impact to the environment. Emphasis is first placed on having a thorough knowledge of the pest life cycle and surveillance, as well as proactive measures including education, outreach, and reduction of breeding sources. The use of naturally-occurring bacterial products against the larval stages is prioritized, and the use of chemical control materials only occurs when deemed necessary by thresholds and evidence of mosquito-borne virus activity.



PROACTIVE

REACTIVE



Education/ Outreach

Prevention
Avoidance
Personal protection
Expectations
Surveillance

Source Reduction

Tire Drives
Removing
Draining
Dumping

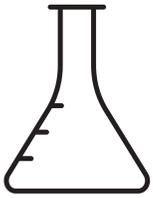
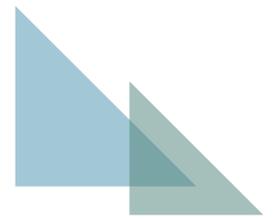
Larval Control

Biologicals preferred
Oils
Chemicals

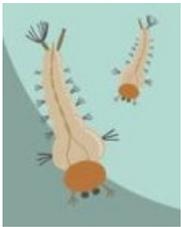
Adult Control

Ultra-Low
Volume fog

Proactive IMM Strategies



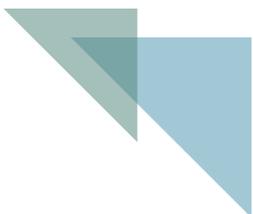
RESISTANCE MONITORING - Resistance is monitored through bottle bioassays to determine the response of adult mosquitoes to a given insecticide. The bottles are coated with insecticide, adult mosquitoes added, and time-mortality data collected, detecting possible resistance in order to verify control efficacy. Resistance tests run in 2023 showed no resistance to the permethrin products used for adult control at BCMC. Mortality averaged 90% within 15 minutes post-exposure and was 100% by 45 minutes. Results from MSU's Microbiology and Genetics Lab were similar when exposing *Culex pipiens* (reared from eggs) to permethrin (2019 test results).



PRODUCT EVALUATIONS - Evaluation of control materials and equipment is essential for BCMC to provide effective services, therefore product efficacy and operations are regularly evaluated. In conjunction with the product manufacturer and other local mosquito control districts, staff members participated in a product trial of ReMoa Tri in Saginaw County. This is a new insecticide developed for the control of adult mosquitoes using three active ingredients with three modes of control. Trial results showed effective control.



SOURCE REDUCTION - Scrap tire drives are a method of source reduction, which means the removal or elimination of breeding sources that have the potential to produce mosquitoes. Two community tire drives were held this season on June 3 and August 5, collecting 2,590 scrap tires. In 2023, our agency received an EGLE Scrap Tire Cleanup Grant for up to \$12,000 to assist in funding this service.



EDUCATION & OUTREACH

- Interviews - newspaper, television, radio
- Press releases
- Facebook posts
- Community events
- Staff training
 - Presentations and webinars
- Brochures
- BCMC Website
- General Industry OSHA training
- Bay C TV
- MDARD Community Outreach Plan
- Conferences
 - Michigan Mosquito Control Association
 - MMCA 7F Training Seminar
 - American Mosquito Control Association
 - MiCAMP GIS
 - Ohio Mosquito and Vector Control Assoc.



MEMBERSHIP & CERTIFICATION

- Michigan Mosquito Control Association
- American Mosquito Control Association
- Entomological Society of America
- MDARD - Category Core and 7F Certification
- Stormwater Pollution Prevention Plan Certification
- Mid-Michigan Mosquito Control Technical Advisory Committee



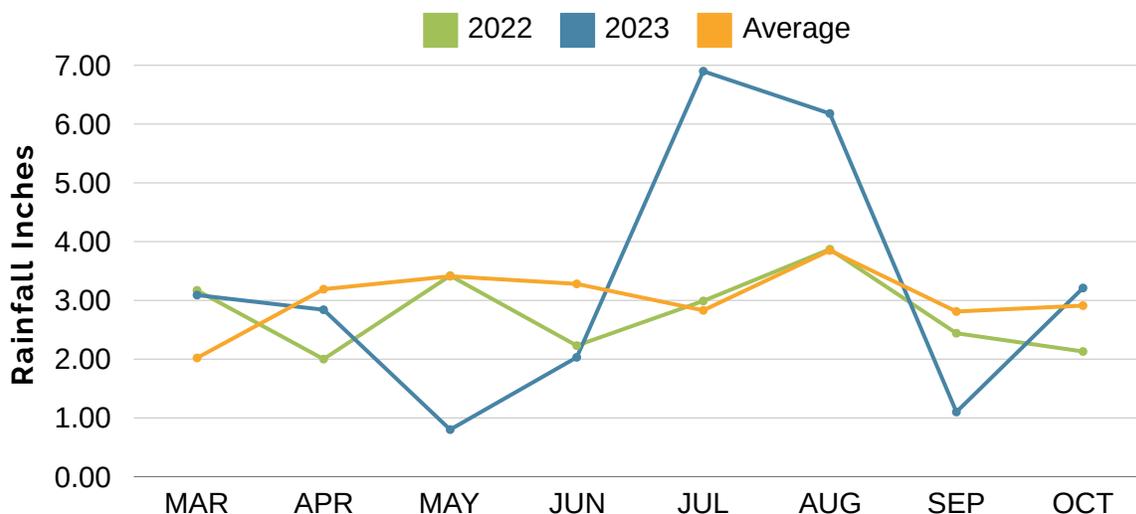


WEATHER

The relationship between rainfall and mosquito activity is important in understanding an IMM approach to mosquito control. Flooding rains create ideal breeding conditions for mosquitoes; standing water that remains for a week or more can lead to a significant influx of floodwater mosquito species. Therefore, monitoring rainfall is important for control operations and is accomplished by means of a network of county-wide rain gauges and online weather reports.

As in 2022, the 2023 season was characterized by a drier spring that thwarted significant flooding. Dry conditions remained through May and June, resulting in low mosquito activity. Numbers of the cattail mosquito were also lower in 2023, likely due to loss of habitat from a dry summer in 2022. However, from late June through early September, rains fell consistently with regular weekly totals from 1" to 3", causing frequent flooding and increased mosquito activity throughout the county for the rest of the season.

Bay County Seasonal Precipitation



Mosquito-Borne Virus Activity Bay County

The primary goal of BCMC is to decrease the risk of disease transmission by reducing mosquito numbers. Data collected during virus surveillance guides Mosquito Control to the areas of highest risk. Mosquito-transmitted pathogens are detected in Michigan every season. The main pathogens of concern include West Nile virus (WNV), St. Louis encephalitis (SLE), Eastern Equine encephalitis (EEE), LaCrosse encephalitis (LCE), Jamestown Canyon virus (JCV), and dog heartworm.

Captured mosquitoes are submitted to the Michigan Department of Health and Human Service's Bureau of Laboratories to be analyzed for pathogens they are potentially carrying; West Nile virus and Jamestown Canyon virus were detected again this season; Eastern Equine encephalitis was also detected for the first time in Bay County from two separate mosquito samples. Mosquitoes are submitted in groups of up to 50 mosquitoes of the same species collected from the same location. Results from the MDHHS are faxed within 7-10 days from when they are submitted.

All dead bird sightings are logged onto Michigan's Emerging Diseases website. Birds found suitable for testing are tested in-house using the WNV Vector Test™ kit.

WNV, SLE, JCV, and EEE Surveillance

- 1,528 pools containing 59,681 females
 - *Culex restuans*/*Culex pipiens* (723 pools/29,454 females)
 - *Coquillettidia perturbans* (529 pools/22,703 females)
 - *Anopheles* species (218 pools/5,279 females)
 - **29 WNV-positive *Culex restuans*/*pipiens* pools**
 - **1 WNV-positive *Anopheles* pools**
 - **5 WNV-positive *Coquillettidia perturbans* pools**
 - **2 EEE-positive pools (1 *Cq. perturbans*, 1 *Cx. restuans*)**
 - **2 JCV-positive *Anopheles* pools**
- 9 dead birds reported
 - 6 crows tested
 - 4 **WNV-positive birds**



50 mosquito pools
WNV-POSITIVE

2 mosquito pools
JCV-POSITIVE

2 mosquito pools
EEE-POSITIVE

Disease Activity Michigan

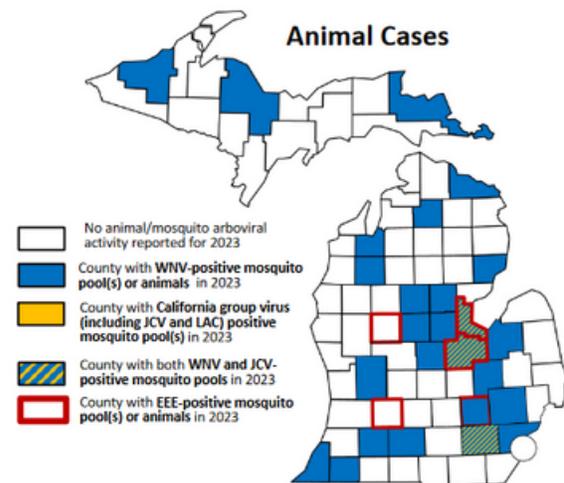
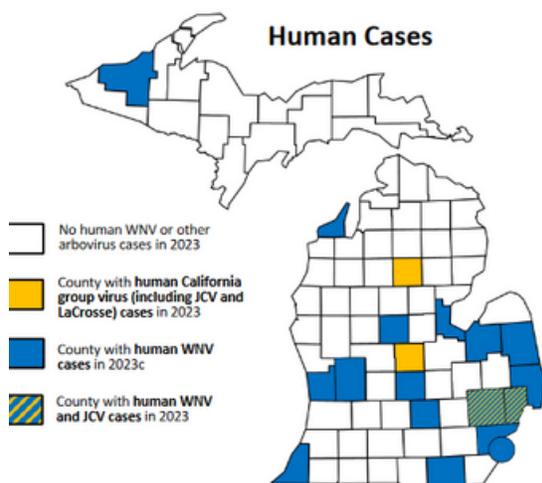
Historically speaking, human WNV cases were low for Michigan in 2023 with 21 cases reported (no fatalities). WNV was also detected statewide in 124 mosquito pools, 21 birds, 4 horses, and 1 camelid.

21 human WNV cases in Michigan

1 human WNV case in Bay County

Cases of Eastern Equine Encephalitis (EEE) were also reported in 2023 with EEE virus infecting 1 horse from Mecosta County and 1 deer from Livingston County. Four mosquito pools from Bay (2), Barry (1), and Saginaw (1) counties tested positive for EEE virus.

Additionally, 4 Michigan residents and 6 mosquito pools tested positive for Jamestown Canyon virus.



Michigan Department of Health & Human Services
Bureau of Infectious Disease Prevention
Emerging & Zoonotic Infectious Diseases (EZID) Section

For more information
www.michigan.gov/westnile

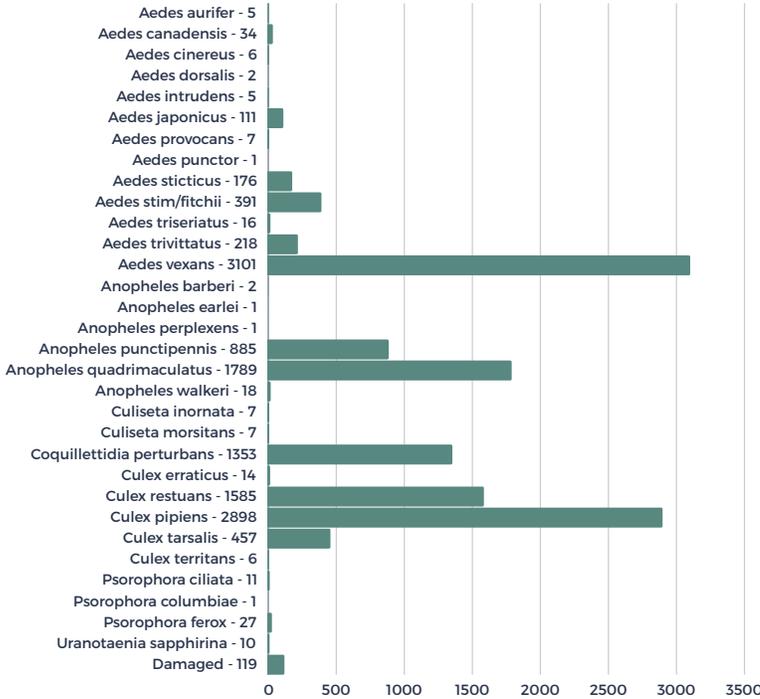
Adult Mosquito Collections



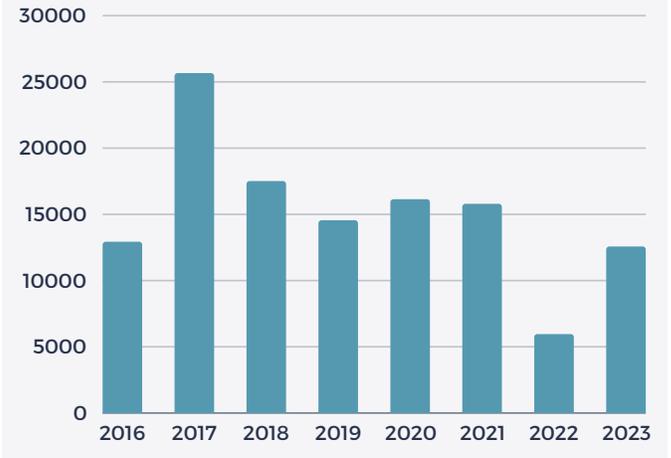
LIGHT TRAPS

Adult mosquito surveillance occurred from May-September through a network of 14 light traps. Total capture in light traps for the 2023 season was 13,264 mosquitoes, compared to the historical average of 14,479. Individual species data is shown below. Light traps captured 31 different species in 2023. The season was defined by a dry spring and below-average rainfall throughout the early summer. Consistent rains then fell from late-June through September causing frequent flooding and an influx of nuisance mosquitoes.

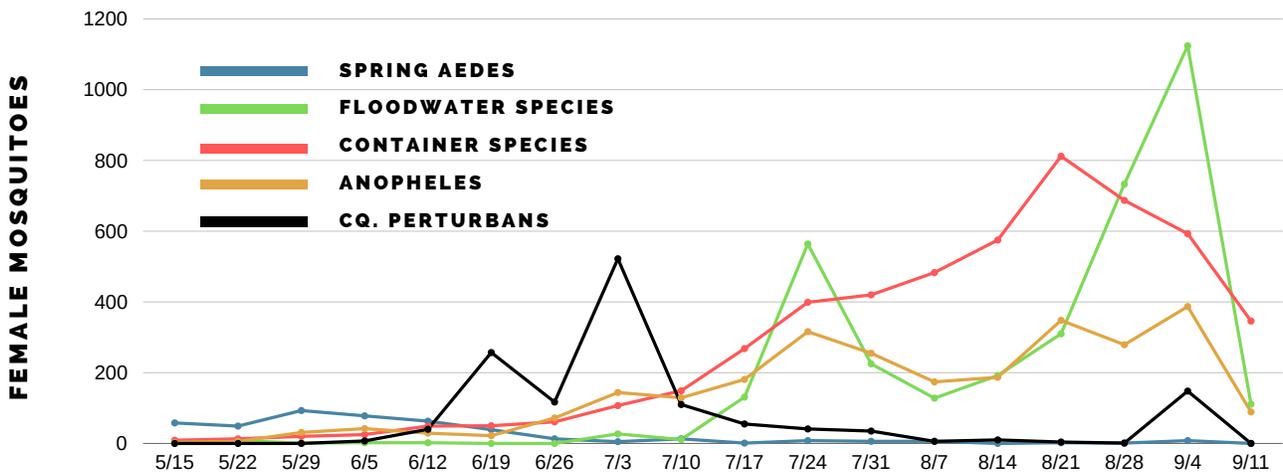
NEW JERSEY LIGHT TRAPS SPECIES COMPOSITION



NEW JERSEY LIGHT TRAPS HISTORICAL COLLECTIONS



WEEKLY CAPTURES



CDC TRAPS

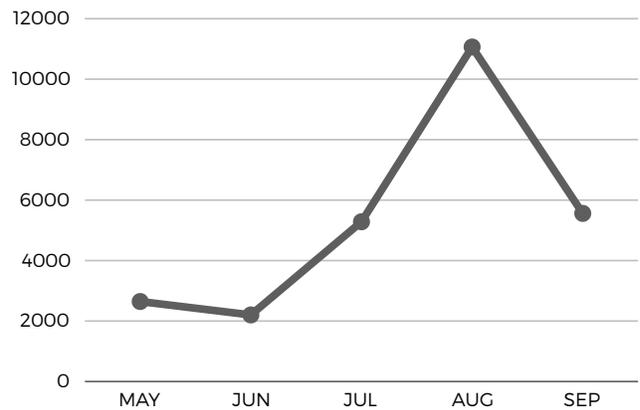
200 TRAP COLLECTIONS



26,755

TOTAL CAPTURE

The majority of female mosquitoes collected in CDC traps occurred in August with 11,063 captured; 70% were *Culex* species. Drought-like conditions in much of 2022 and early 2023 lead to a drastic decrease in *Cq. perturbans* numbers this season due to a dry-down of habitat. Consistent rain events from late-June through September caused a prevalence of floodwater and container species in late summer.

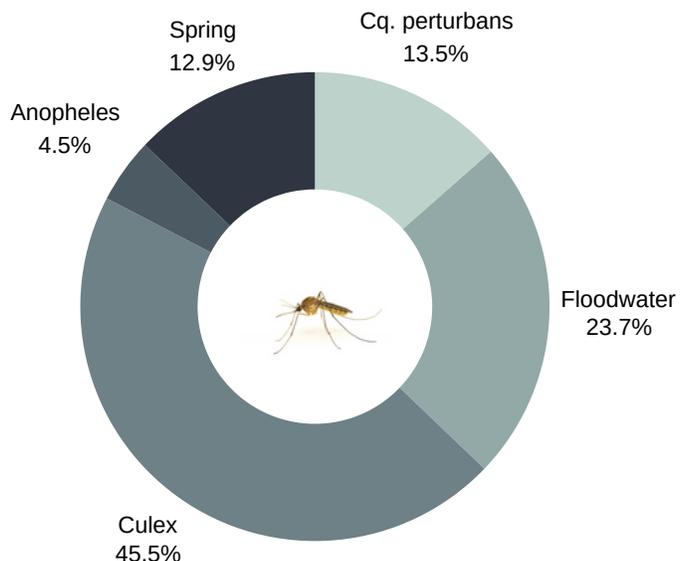


134

AVG. FEMALES PER TRAP

25

SPECIES COLLECTED



GRAVID TRAPS

84 TRAP COLLECTIONS

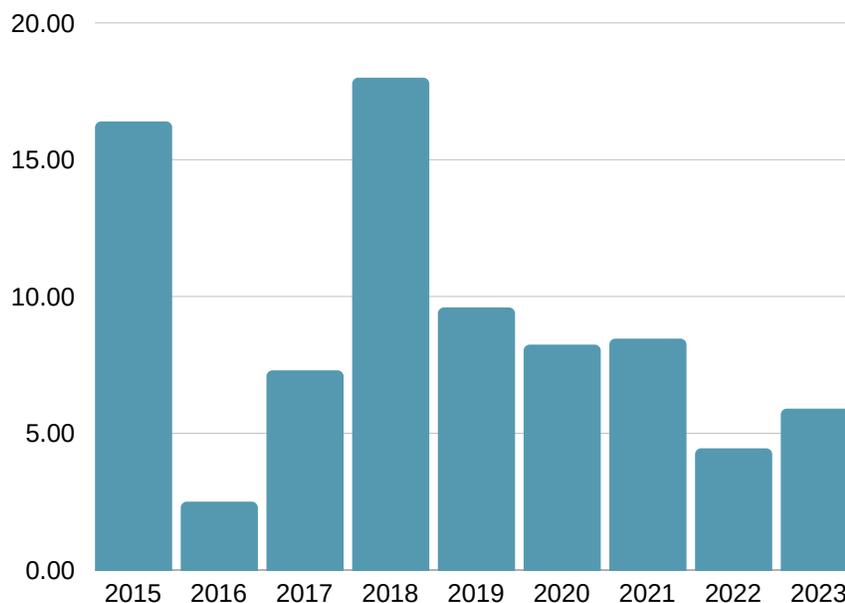
Gravid traps were used to monitor female Culex mosquitoes that are West Nile Virus (WNV) vectors. Culex mosquitoes who have taken a blood meal are then able to produce eggs and are attracted to gravid traps as a suitable place to lay those eggs (oviposit). Gravid traps were placed from June through September with 32 traps capturing 190 Culex females that were submitted for virus isolation analysis. Traps were placed in areas of past and current WNV activity. Trap placement, number of traps placed, and weather conditions, are the main factors influencing collections.



CULEX CAPTURED

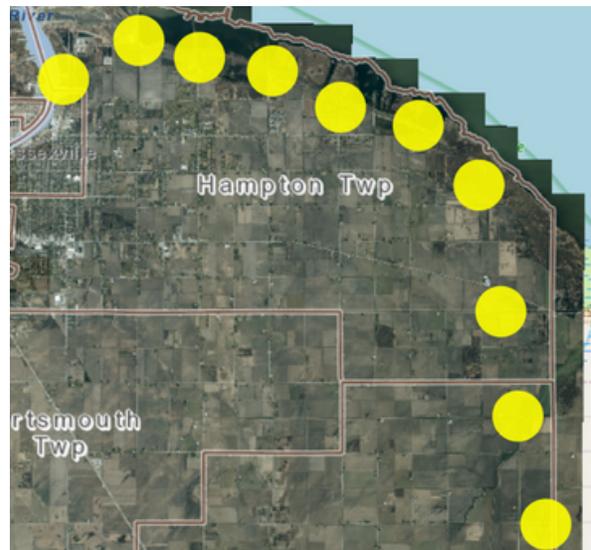
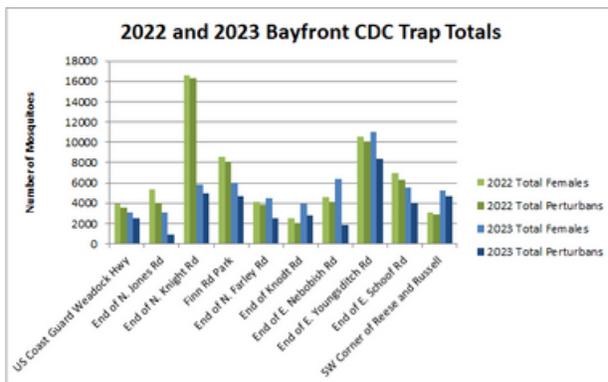
190

HISTORICAL AVERAGE CULEX PER GRAVID TRAP



COQUILLETIDIA PERTURBANS PILOT PROJECT

Bay County Mosquito Control continued working this summer to accumulate more data on known breeding sites of Cq. perturbans. After verifying in 2021 that Cq. perturbans were breeding in both cattail and phragmites habitat along the Saginaw Bay shoreline, staff expanded adult surveillance in this area in 2022 and 2023. This study of the Hampton Bayfront entailed weekly trapping at 10 consistent locations (approximately 1 mile apart) along the Saginaw Bay Shoreline in Hampton Township from June through mid-September. A total of 54,604 female mosquitoes were captured, of which 68.6% were Cq. Perturbans, mostly captured in July. High numbers of Cq. perturbans were found around the Knight Road and Finn Road area, which also had extensive habitat for the species to breed in. Emergence traps placed in this area in 2023 verified the habitat as a breeding site for Cq. perturbans. Using this data, an aerial treatment using VectoLex FG at 15#/acre took place in September. The 600 acres of habitat treated between Knight and Finn Roads at the shoreline aims to reduce adult mosquito counts for the following summer. This study will continue into 2024 to measure treatment efficacy.



CDC Trap Placement for Perturbans Study



Aerial Larval Control Treatment Area

2023 SPRING TREATMENT

SURVEILLANCE & TREATMENT

- 19 woodlots monitored; larvae first observed March 15
- Aircraft calibration April 14
- Quality control - monitored 30 woodlots
- 96.5% larval mortality achieved
- No non-target effects noted
- Pupae observed April 29; adult emergence by May 6
- Aerial treatment April 19-25
- Operation based out of James Clements Airport
- Applicator-Earl's Spray Service using 4 fixed wing aircraft
- Bti bacterium (VectoBac G) larval control product; 3 #/acre
- Spring field crews surveyed 298 sites, treating 39



AERIAL ACREAGE & CONTROL RESULTS

52,434
ACRES
TREATED

96.5%
LARVAL
MORTALITY

LARVAL CONTROL

BCMC's program focuses on routine larval surveillance and control to prevent adult mosquito emergence. From April through September, up to 20 certified technicians search the county daily, inspecting habitats, dumping containers, and controlling larvae as needed. Reducing breeding sources is the preferred method to eliminate mosquitoes. When controlling larvae, it is important to select the appropriate control material and formulation based on life stage present. Application dosage rate and timing are critical.

11,387
breeding site inspections

17%
sites requiring treatment

SEARCH AND DESTROY

Technicians conduct daily surveillance in a variety of habitats in a process known as Search and Destroy. Staff search for mosquito larvae in sites such as containers, pools, ponds, ditches, woodlots, fields, and drains. During yard inspections, staff educate homeowners on strategies to reduce mosquito breeding.



SEWAGE LAGOONS

Sewage lagoons are a prolific source of Culex mosquitoes because of their organic nature. Surface and emergent vegetation along a lagoon's edge provide shelter and food for developing larvae. White Birch Village Trailer Park sewage lagoon was monitored 6 times resulting in 3 larval treatments.



RETENTION & DETENTION PONDS

Mosquito Control inspects about 155 retention or detention basins that are designed to manage storm water runoff to prevent flooding. Floodwater and permanent water mosquito species breed in both habitats. Technicians completed 317 inspections, finding and treating larvae or pupae 23% of the time.



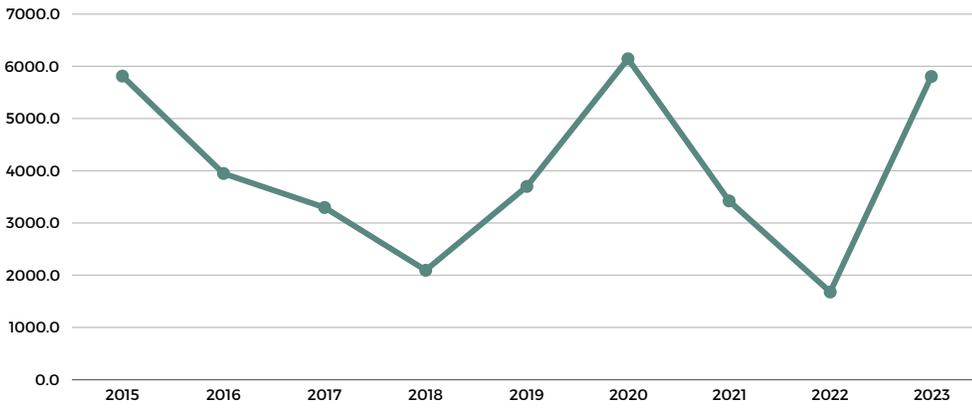
LARVAL CONTROL

ROADSIDE DITCHES

Ditch trucks logged 5,805 miles as technicians responded to ditches actively breeding mosquito larvae. This occurs when heavy rains create standing water that lasts long enough for mosquitoes to complete their life cycle. Just over 3,243 gallons of liquid Bti (VectoBac 12AS), 370.5 gallons of VectoLex WDG, and 226 pounds of VectoLex FG were dispensed.



DITCH TRUCK MILES



2023
5,805
DITCH MILES TREATED

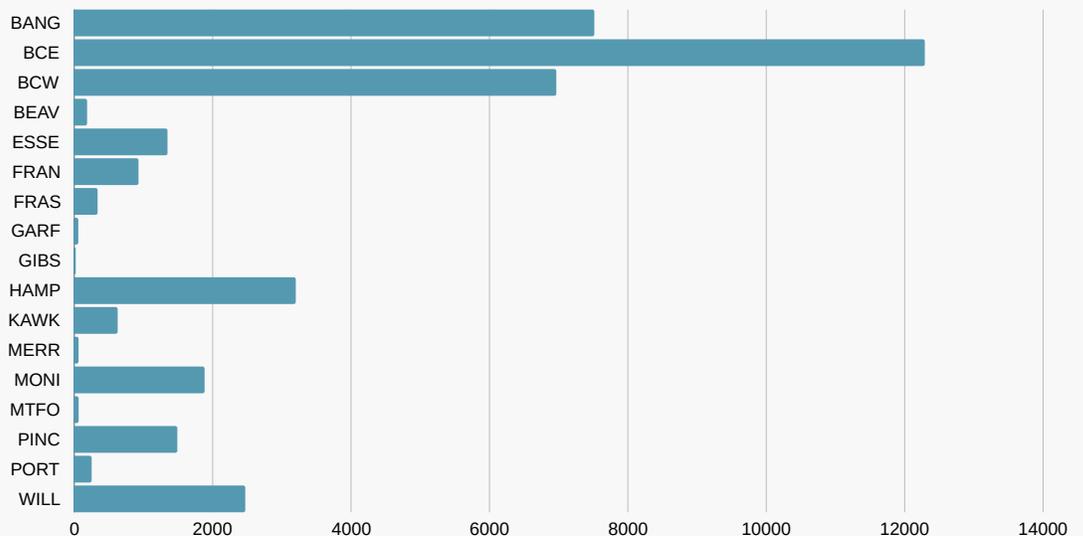
CATCH BASINS

Treatment of catch basins, or storm drains, helps control Culex mosquitoes, vectors of WNV and SLE. Basins were treated with VectoLex FG (1,002 lbs) or Natular XRT (6,454 tablets).



CATCH BASINS TREATED

2023
39,695
CATCH BASINS TREATED



ADULT MOSQUITO CONTROL

While larval control is the preferred method of treatment, it is virtually impossible to find and treat all breeding sites, so adult control, fogging to control adult mosquitoes in flight, is also a part of the control program.

Fogging adult mosquitoes includes the use of both gas-powered and electric Ultra-Low Volume (ULV) machines that allow a small amount of material to be dispensed from the spray unit. Truck-mounted units are fitted with flow control monitors that can adjust the flow rate of the insecticide pump based on truck speed.

Label recommendations are strictly followed to assure proper dosage rate and droplet size. To accomplish the latter, droplet measurements were taken several times throughout the season using a DC-IV droplet measuring device where a heated probe was inserted into the fog to measure droplet diameters.



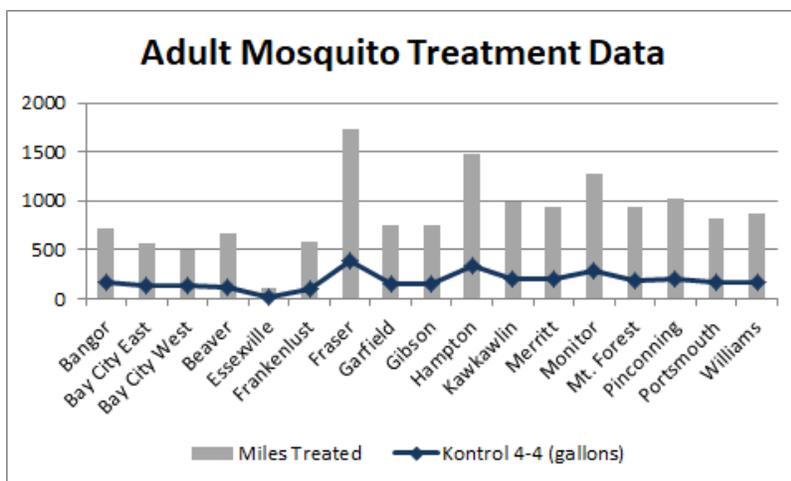
14,750
ROAD MILES FOGGED

135

**NO SPRAY PARCELS:
PROPERTIES OPTING
OUT OF TREATMENTS**

42

**EXTRA NEEDS PROPERTIES:
RESIDENTS WHO BENEFIT FROM
ADDITIONAL MOSQUITO
CONTROL, AS VERIFIED BY A
MEDICAL PROFESSIONAL**



ADULT CONTROL SERVICE REQUESTS

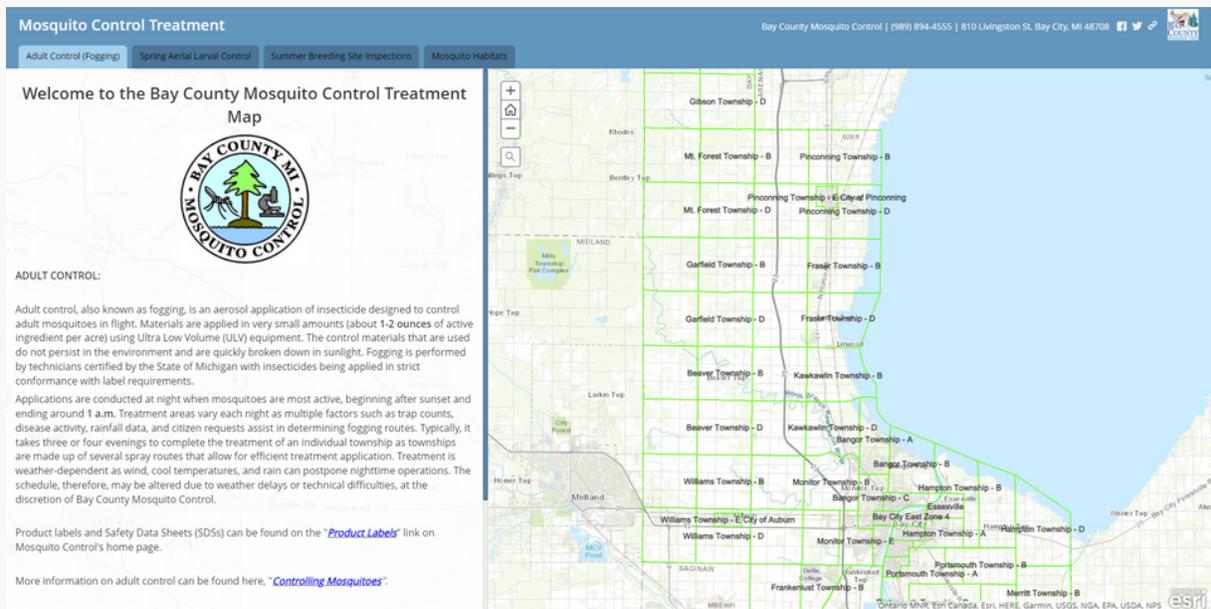
Localized adult mosquito control is done to reduce mosquito annoyance and disease vector populations, a process that supplements the larval control program. These adult mosquito control applications are performed after sampling detects mosquito populations meeting threshold levels in park and recreation areas, for public events, or in response to citizen reports of mosquito annoyance. Residents call to report mosquito issues on their property. The information is submitted to field staff and added to a daily service request log.

701
adult control requests

183
nuisance mosquito requests

518
yard spray requests for events

An online, interactive treatment map is also available on BCMC's webpage. The map allows residents to view when their neighborhood was last fogged and when future treatment is anticipated.



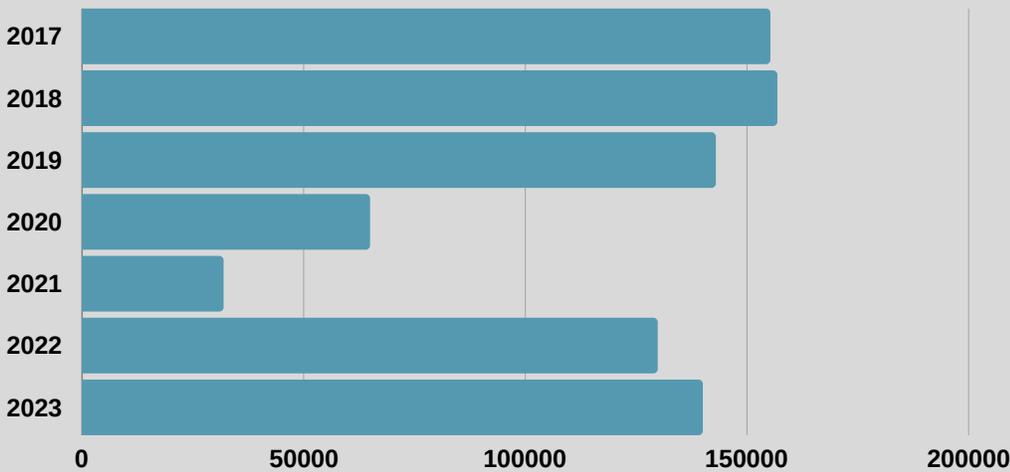
Control Materials

TRADE NAME	APPLICATION RATE	ACTIVE INGREDIENT DOSAGE	AMOUNT USED
Altosid® P35	2.5-20 lb/acre	0.106-0.85 lb methoprene/acre	160 lb
BVA2 Larvicide Oil	1-5 gal/acre	0.97-4.85 gal petroleum distillates/acre	64 gal
Sunspray Larvicide Oil	1-5 gal/acre	0.988-4.94 gal petroleum distillates/acre	1.47 gal
Summit Bti Briquets™	1 briquet/100 sq ft	7000 Aedes aegypti (AA) Bti ITU/mg	320 briquets
VectoBac® G	2.5-20 lb/acre	0.273-0.4555 billion Bti ITU/acre	157,600 lb
VectoBac® 12AS	0.25-2 pints/acre	0.15-1.21 billion Bti ITU/acre	254 gal
VectoLex® FG	5-20 lb/acre	0.115-0.46 billion BsITU/acre	10,239 lb
VectoLex® WDC	0.5-1.5 lb/acre	0.1495-0.4485billion BsITU/acre	111 lb
Natural™ XRT	1 tablet/CB	6.25% spinosad/tablet	5,982 tablets
Natural™ G30	5-20 lb/acre	2.5% spinosad	560 lb
Masterline® Kontrol 4-4	0.67 fl oz/acre	0.00175 lb permethrin/acre 0.00175 lb PBO/acre	3,184 gal

VEHICLE MAINTENANCE

Our state-certified mechanic maintains BCMC's 33-vehicle fleet, forklifts, foggers, various application equipment, and traps (see below). In 2023, 140,041 miles were driven, which falls below the 30-year average of 166,978. This is an indication of a dry, early-season and the extra treatment of roadside ditches which utilizes only 1 truck for 2 employees; the use of extended residual products and improved efficiency due to mapping improvements have also decreased driving. Three new 4WD trucks and a new Vortex granular blower were implemented in 2023 with plans to implement another Vortex in 2024.

Historic Fleet Miles



VEHICLE & EQUIPMENT REPAIR

- | | |
|------------------------------------|---|
| 1 Brake systems | 2 Body repairs |
| 1 Fuel systems | 1 Emission repairs |
| 1 Front end repairs | 1 Exhaust repairs |
| 25 Truck oil changes | 15 Maintenance/Service |
| 5 Electrical system repairs | 20 ULV repairs/oil changes |
| 0 Drive lines | 1 Ditch truck repairs |
| 8 New tires | 4 CDC traps/battery packs |
| 8 Used tire repairs | 1 Light traps |
| 3 Engine repairs | 0 Pumps |
| 0 Air conditioning | 6 Vehicle prep |
| 0 Coolant system repairs | 0 Truck wash bay |
| 4 Other equipment | 4 Air compressor |
| 4 Transmission repairs | 18 Repairs for other departments |



EQUIPMENT INVENTORY



FLEET

2000 FORD F150
2000 GMC SIERRA
2002 CHEVY SILVERADO
2004 FORD F250
2006 CHEVY SILVERADO
2006 CHEVY SILVERADO
2008 CHEVY SILVERADO
2009 CHEVY SILVERADO
2012 CHEVY SILVERADO
2012 CHEVY SILVERADO
2017 CHEVY SILVERADO
2018 CHEVY SILVERADO
2018 CHEVY SILVERADO
2018 CHEVY SILVERADO
2018 CHEVY TRAVERSE
2020 CHEVY SILVERADO
2021 CHEVY TRAVERSE
2022 CHEVY SILVERADO
2022 CHEVY SILVERADO
2022 CHEVY SILVERADO
2023 CHEVY SILVERADO
2023 CHEVY SILVERADO
2023 CHEVY SILVERADO

ULTRA-LOW VOLUME FOGGERS

GAS MACHINES

LECO GAS (~1990)
GRIZZLY GAS (1999)
GRIZZLY GAS (2000)
GRIZZLY GAS (2008)
GRIZZLY GAS (2010)
GRIZZLY GAS (2019)
GRIZZLY GAS (2019)
GAS MACHINE (REBUILT 2020)
GRIZZLY GAS (2020)
GRIZZLY GAS (2021)
GRIZZLY GAS (2021)

ELECTRIC MACHINES

DURAMIST ELECTRIC (2014)
DURAMIST ELECTRIC (2015)
DURAMIST ELECTRIC (2017)
DURAMIST ELECTRIC (2017)

LARVAL CONTROL POWER EQUIPMENT

STIHL BACKPACK BLOWER (2018)
STIHL BACKPACK BLOWER (2021)
11 TRUCK-MOUNTED LIQUID DITCH UNITS
2 VORTEX TRUCK-MOUNTED BLOWERS (2023)

SURVEILLANCE TRAPS

14 NEW JERSEY LIGHT TRAPS
26 CDC MINIATURE LIGHT TRAPS
10 GRAVID TRAPS
10 EMERGENCE TRAPS