Warren County Mosquito Extermination Commission

2024 ANNUAL REPORT

January 1, 2024 - December 31, 2024

J. Necina & S. Giordano collecting ticks
Fall 2024

J.Necina, R. Hagerty, P. Brake
Helio Ag 210 Training
October 2024

Culex pipiens molestus pupa
2024

Emerging *Cx restuans*
July 2024

Culex restuans
2024

2024 Seasonal staff stream clearing
July 2024

Stacey Giordano with tick drag
Fall 2024

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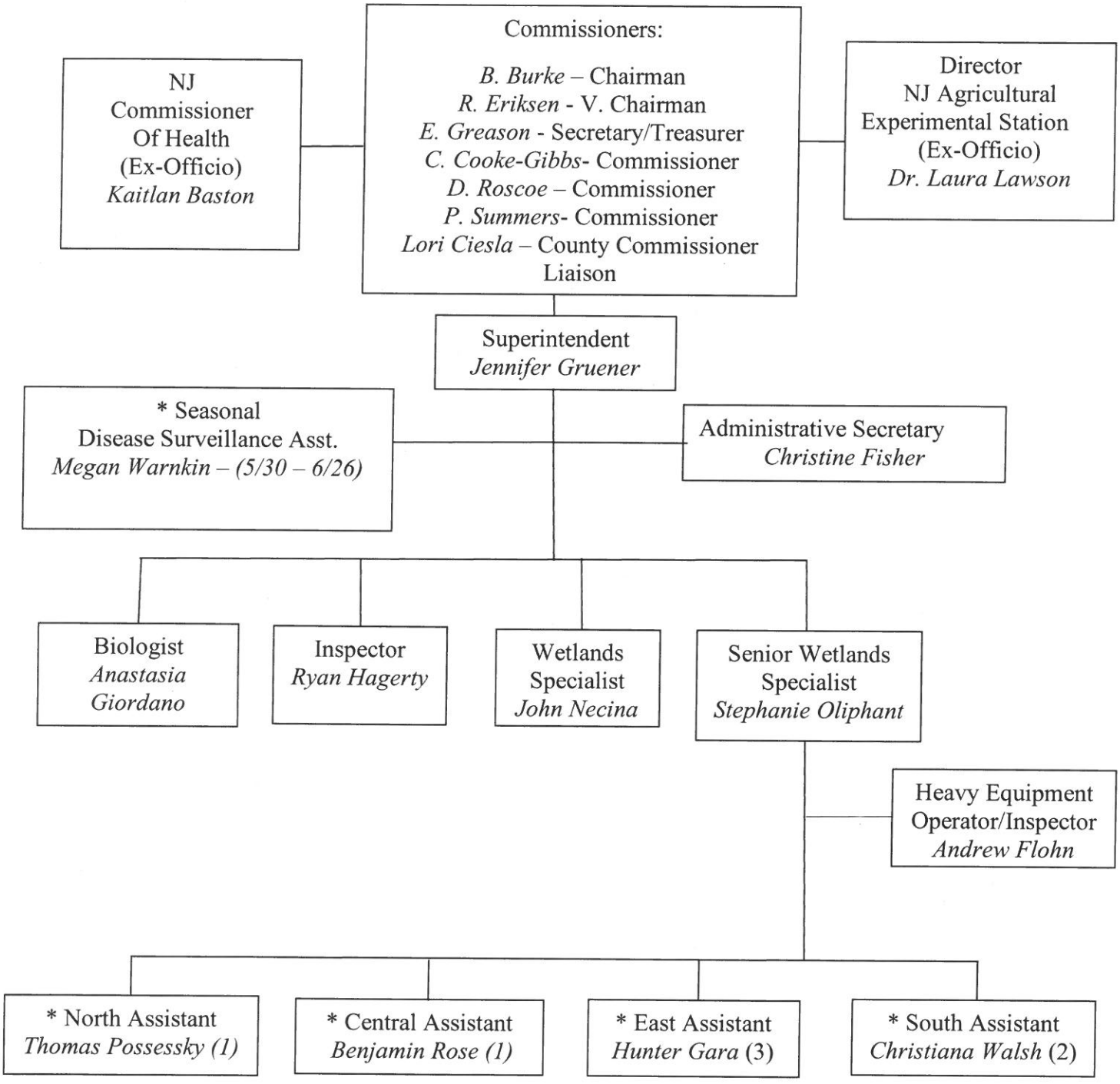
2024
WARREN COUNTY MOSQUITO COMMISSION
ORGANIZATIONAL CHART



* Seasonal Position
(*x*) Indicates number of seasons worked

I. ADMINISTRATION

A. Budget/Treasurer's Report

Following the body of this report are the final Budget and Treasurer's reports (Figures 1 & 2, respectively) for the year, which reflect the Commission's expenditures and financial status as of December 31, 2024.

Eighty-eight thousand, five hundred dollars ($88,500) from reserve funding was applied to the 2024 budget to contribute towards the following year's budget; most of this funding was used for the purchase of a replacement pickup truck and a treatment UAS (with associated software and hardware). However, a portion of the funding ($8,500) was applied to the 2024 employer pension contribution due to an unexpected 24% increase from the previous year for this liability. The Commission went out to bid for the treatment UAS and the contract was awarded in May; the small treatment UAS was received in early October. The Commission had budgeted to replace truck #352 but in August, truck #353 was in an accident that resulted in a total loss; therefore, the replacement of that truck was prioritized instead.

As of December 31, 2024, there was $84,698.83 unencumbered from the 2024 budget. This combined with $11,170.78 in miscellaneous receipts, less the balance of the 2023-24 Tick Grant expended in 2024, $10,073.01, plus the balance of the 2023-24 Tick Grant received $8,309.50, and plus the $27,974.80 left in reserves brought the total balance in reserve funding to $122,080.90. An effort to keep these funds in reserve for capital purchases and unforeseen emergencies will be made.

In 2024, an audit was performed on the 2023 financial records by Nisivoccia & Company LLP, Newton, New Jersey with no recommendations made regarding the accounting procedures.

B. Personnel

1. Staff

At the start of 2024, two of the previous year's five seasonal staff had indicated they were interested in returning, leaving at least three temporary positions open. Advertisements for the seasonal positions were posted on the County's Facebook page, shared on Community Facebook sites, shared with municipal clerks for posting on their websites and/or social media, shared at all the local area colleges through their career centers and with department professors at some of the colleges.

Initially, two applications were received, both were interviewed in February, and one applicant was hired. The positions were then re-advertised in all previous outlets. Additionally, advertisements were taken out with NJ.com and the Warren Reporter. This time, the disease surveillance assistant position was advertised as part-time in hopes to attract more applicants. Two new applications were received, both were interviewed, and both were hired: one for a part-time disease surveillance position and the other as a part-time assistant inspector for one of the larval routes. Start dates ranged from May 13, 2024, to June 13, 2024. The new employees received their initial in-house training during the first two days of employment followed by two weeks of field training. The returning seasonal employees received refresher training on safe pesticide use, as well as on FieldSeeker software, and were then able to start working independently on their respective larval routes. Full-time staff continued to cover the north route on days the part-time assistant inspector was not scheduled. The employee in the assistant disease surveillance position was separated from employment on June 26, 2024. Full-time staff, primarily the Biologist, were strapped with the additional workload. One of the seasonal staff ended employment early in August to take a work study position on campus at the college she attended. Two of the seasonal staff were able to work through most of August and one of the seasonal staff was able to stay into the second week of October, which was helpful.

The Commission operated with seven (7) full-time employees for most of 2024; Superintendent, Administrative Secretary, Senior Wetlands Specialist, Biologist, Inspector, Heavy Equipment Operator/Inspector, and Wetlands Specialist. However, late in December of 2024, the Senior Wetlands Specialist resigned to pursue a graduate degree in Botany. This led to a reassignment of responsibilities, an internal promotion, and an open Inspector Trainee position to be advertised in 2025.

2. Education/Training

The Commission makes a significant investment in their employees in terms of training, education, and attendance at professional meetings.

- **Mosquito Biology & Control/DEP Licensing Training/Tick Biology & Control/ IPM/Vector-borne Disease**

  In order to expedite pesticide applicator/operator licensing, an in-house training program was developed in 2002 and was approved by NJDEP- Pesticide Control Program. This program has been updated, revised, and modified over the years to keep current with changing pesticide regulations and requirements. The Basic Pesticide Training Program along with 40 hours of on-the-job training fulfills the NJDEP requirements for pesticide operator licensing. Currently, Jennifer Gruener provides this training to new staff along with general mosquito biology, and Right-to-Know/HazCom training. General safety and respirator training were given by Ms. Oliphant in 2024. Defensive driving, anti-discrimination and harassment training are provided online from PMA Companies Websource for all new staff. After their initial in-house training is completed, staff are accompanied by full-time staff to learn specific surveillance routes.

  All full-time staff, except the Administrative Secretary, are certified by the NJDEP to be commercial pesticide applicators with their core pesticide license as well as category 8B, specifically for mosquito control. New seasonal staff are trained and tested to obtain certification as pesticide operators. If a seasonal staff returns for multiple seasons, they are encouraged to obtain certification as a full applicator. Ms. Gruener is certified by the NJDEP to perform in-house core training and holds additional certifications in categories 8A (Public Health), 10 (Demonstration & Research), and 11(Aerial Applications). Since Ms. Oliphant directs the aerial larviciding program she is also certified in category 11. Mr. Necina holds certification in category 11 and category 10 in addition to category 8B in order for use in the UAS program. Mr. Hagerty also obtained his category 11 certification in 2024 to prepare for the unmanned aerial systems program and future coordination of the aerial larviciding program.

  Additional virtual and in-person training sessions were attended to provide instruction on vector biology, vector borne diseases, basic pesticide safety, pesticide applications, and to obtain recertification credits, which apply for the requirements for maintaining pesticide applicator licenses. Those courses follow:

- Warren County MEC, "Basic Pesticide Safety Training": B. Rose, M. Warnkin, T. Possessky
- New Jersey Mosquito Control Association (NJMCA), "Northern Recertification Training Session", St Elizabeth University: D. Flohn, S. Oliphant, S. Giordano, R. Hagerty, & J. Necina
  - "Southern Recertification Training Session", Golden Nugget, A.C.: J. Gruener
- American Mosquito Control Association, "Best Practices for Integrated Mosquito Management", virtual training: J. Necina
- NJDOH, "Tick Surveillance Training", Day 1, Rutgers School of Public Health, Somerset: S. Oliphant, A. Giordano, & R. Hagerty
  - "Tick Surveillance Training", Day 2, Eco-Preserve, Piscataway: S. Oliphant, A. Giordano, & R. Hagerty

- IPM Symposium Series, "Endangered Species Act & EPA: What's Changing & Why", webinar: J. Gruener
- IPM Institute, "Biovigilant Research Supporting the Development of IPM Programs for the Two Invasive Insects in British Columbia, Canada", webinar: J. Gruener
- IPM Working Group, "Tick Academy", Day 1 virtual training: A. Giordano, R. Hagerty, J. Necina
    - "Tick Academy", Day 2 virtual training: A. Giordano, R. Hagerty, J. Gruener
    - "Tick and Tickborne Disease Surveillance in the Twin Cities Metropolotan Area of Minnesota", webinar: A. Giordano
- AMCA, "Investigating the Ecology of Culicoides Biting Midges", webinar: J. Gruener, A. Giordano, & J. Necina
    - "Evidence Based Control of Mosquito Vectors in an Insecticide Resistance Landscape" webinar: J. Gruener & A. Giordano

- **- Right-To-Know/Hazard Communication Training**

  Due to training requirements implemented in 2004, a written Hazard Communication Program with an in-house training program (incorporating information from prior Right-to- Know training requirements) was developed in 2005. This program is updated annually by Mrs. Gruener. All new staff members receive a copy of this written program. A list of Hazardous Substances and all of their Safety Data Sheets are also updated annually by Mr. Hagerty. Hazard communication and Right-to-know training is provided on the first day of work by Mrs. Gruener. Information is also supplied as necessary to contractors. Refresher training is given to staff once every two years along with Bloodborne Pathogens Awareness Training. PMA Companies provided this refresher training in 2024 to all staff that were due.

  The annual Right-To-Know survey distributed by the New Jersey Department of Health and Senior Services was completed. This survey catalogs all hazardous materials used by the Warren County Mosquito Extermination Commission. Online reporting for the Right-To-Know Survey has been required since Survey Year 2013. The 2023 Right to Know Survey was completed by the 2024 deadline by Mrs. Gruener and Mr. Hagerty.

- **Respirator Training**

  A written respiratory program and corresponding training program was developed in 2006 due to a label change requiring the use of N-95 respirators while handling *Bti* products. The program was put into policy format, reviewed and adopted as Commission policy in 2007. This policy was thoroughly reviewed and revised in 2019, and a new training program was developed. Fit testing and training take place annually for anyone who has the potential to need a respirator during that particular year. Jennifer Gruener and Stephanie Oliphant are trained to perform fit testing.

- **Other Training (Safety, Purchasing, Pensions, Water Management/Stormwater, etc)**

- PMA, "Workplace Harassment": B. Rose, T. Possessky, & M. Warnkin
- PMA, "Sexual Harassment: What Employees Need to Know": B. Rose, T. Possessky, & M. Warnkin
- PMA, "Defensive Driving": B. Rose, T. Possessky, & M. Warnkin
- Ellis Mowers & More, "EVEAGE 15.5: 4000 psi 2 in 1 pressure washer surface cleaner", YouTube: J. Necina
- Junkyard Dave, "Testing the EVEAGE Undercarriage Pressure Washer Attachment", YouTube: J. Necina
- Rutgers University, "Stormwater Management Regulations, Policies, and Ordinances", webinar: S. Oliphant

- Rutgers Cooperative Extension & Pinelands Preservation Alliance, "Rain Gardens 101", webinar: S. Oliphant
- NJIIF, PMA Companies, "Fire Extinguisher Safety Training": J. Gruener, C. Fisher, A. Flohn, S. Oliphant, A. Giordano, R. Hagerty, & J. Necina
    - "Forklift Recertification": J. Gruener, A. Flohn, S. Oliphant, A. Giordano, R. Hagerty, & J. Necina
    - "Chainsaw Safety Training": R. Hagerty, J. Necina, B. Rose
- NJ League of Municipalities Mini conference, "Sick time Payout" presentation: J. Gruener
    - "Procurement Updates"
    - "Latest Developments in OPRA"
    - "Future-proofing Governance", presentation: J. Gruener
- NJ Association of Counties, Virtual Series "Avoiding Wage & Hour Pitfalls", Zoom: J. Gruener
- NJ Start, "NJ Start 101", webinar: J. Gruener

- **Computer Software/New Technologies/UAS**

- MSU Extension, "Field Crops virtual Breakfast: Drones for Spraying Pesticides", recorded webinar: R. Hagerty & J. Necina
- Review Prodigy, "Stop Birds Attacking Your Drone with One Thing", recorded video: J. Necina
- Jays Tech Vault, "Finally DJI Mini 4 Pro, Mavic 3, and Air 3 Automated 3D Drone Mapping & Photogrammetry", recorded video: J. Necina
- GeoDelta Labs, "An Absolute Beginner's Guide to QGIS", YouTube: J. Necina
    - "Developing a 3D Model using QGIS"
    - "Deriving River Network & Catchments from a DEM using QGIS"
    - "How to Add Google Maps & Google Satellite as a Base Layer in QGIS"
    - "Importing CSV Coordinates into QGIS"
    - "Creating 3D Maps & Animations using QGIS"
    - "Calculating Shortest and Fastest Paths using QGIS (ORS Tools)"
    - "Shortest & Fastest Routes. Isochrome Maps, Time-Distance Matrix using QGIS"
    - "Visualizing Geospatial Data with Pie Charts using QGIS 3"
    - "How to Download Vector Data from OpenStreetMap using QGIS"
    - "Creating a Heatmap using QGIS"
    - "How to Create Cross Sectional Profiles using QGIS (ASTER vs SRTM)"
    - "How to Make a Map using QGIS 3
    - "Extracting Cross Sectional Profiles using QGIS"
    - "How to Create 3D Terrain with QGIS and GIMP"
    - "Geospatial Data Conversions: ArcGIS/QGIS/Google Earth"
    - "Extracting Raster Values using Points, Polygons, & Lines"
    - "How to Make a Map in QGIS 3"
    - "Generating a World Map Shapefile in QGIS"
    - "Landsat 8 Image Classification using QGIS", recorded videos: J. Necina
- Joshua Bardwill Livestream Clips, "Looking Back at a Decade of FPV! Where Did Bardwell Expect FPV to Go? – FVP Questions", recorded video: J. Necina
- Programming with Mosh, "Python for Beginners – Learn Python in 1 Hour", recorded video: J. Necina
- HikingGuy.com, "Garmin Custom Maps – How To", YouTube: J. Necina
- WebCatcher, "how to Download Free Trail Maps on Garmin GPS", YouTube: J. Necina
- Masserano Labs Software, "What is WebODM? Drone Mapping Software", YouTube: J. Necina

- Rich Charpentier, "A Second Look at WebODM – Open source Drone Mapping Software": YouTube: J. Necina
- UCANR-IGIS, "DroneCamp 2020: Open Source Data Processing with OpenDroneMap", YouTube: J. Necina
- UAV Central, "Basic Introduction to WebODM", YouTube: J. Necina
- Max on Tech, "PyCharm Tutorial", "Introduction to PyCharm/Basics in 10 Minutes", YouTube: J. Necina
- AMCA Roundtable, "FAA Public Aircraft Operator, Processing an Application for a COA", recorded webinar: J. Gruener
- Jeremy Maurer, "Mapping with Drones – Introduction to Photogrammetry", YouTube: J. Necina
- Forrest Blank, "Lenovo P340 Think Station Tour", YouTube: J. Necina
- Pix4D Agriculture, "Introduction to the dashboard", recorded videos: J. Necina
    - "PIX4Dfields Beginner Tutorials"
    - "Creating and Processing a Project"
    - "PIX4Dfields Beginner Tutorials, Field Boundaries"
    - "PIX4Dfields Beginner Tutorials, Vegetation Indices"
    - "PIX4Dfields Beginner Tutorials, Zonation and Prescriptions in PIX4Dfields"
    - "PIX4Dfields Beginner Tutorials, Annotations and Comparison Tool"
    - "PIX4Dfields Beginner Tutorials, Exporting and Sharing Layers"
    - "PIX4Dfields Beginner Tutorials, Your Camera is not Supported at this Time"
    - "PIX4Dfields Beginner Tutorials, Magic Tool", recorded videos: J. Necina
- Visual Joy, "WebODM Not Enough Memory Issue" YouTube: J. Necina
- Dylan Gorman, "How to Create Accurate Maps with GCP's Drone Photography, YouTube: J. Necina
- Drone University, "Drone Deploy is Easier to Use. Why Should I Go for PIX4D", YouTube: J. Necina
- Avios Media, "3D Modeling – End to End in Dronelink and WebOMD", YouTube: J. Necina
- GM6 Drone Mapping, "Photogrammetry/Drone Mapping Mistakes You Should Avoid", YouTube: J. Necina
- Rich Charpentier, "Setting up GCP's for Web ODM – An Imperfect Example", YouTube: J. Necina
- Geografif, "OpenDroneMap Part 3: Drone Image Processing in WebODM", YouTube: J. Necina
- Klas Larlsson, "QGIS User 0041 – Backend (WebODM)", YouTube: J. Necina
    - QGIS User 0021 – "Dynamic Layout Calculations", YouTube: J. Necina
- MPM Drone Media, "WebODM 3D Image Flyover Tutorial", YouTube: J. Necina
- Drone University, "Which is Better Modeling Platform – Drone Deploy or Pix4D": J. Necina
- ESRI, "A Beginners Guide to Drone2Map": J. Necina
- QGIS, "QGIS 3.36 Release Party": J. Necina
- PUTvision, "Deepness – Deep Neural Remote Sensing QGIS Plugin", YouTube: J. Necina
- Frontier Precision, "What's New in FieldSeeker 2024", webinar: S. Oliphant & J. Gruener
- Frontier Precision, "Hylio AG-210 Training", on site: J. Necina & R. Hagerty
    - "How FieldSeeker Uses ArcOnline Data & Maps", webinar: J. Gruener
    - "New FieldSeeker Core Mobile App for Mosquito Control", webinar: J. Gruener, S. Oliphant, A. Giordano, R. Hagerty, & J. Necina

3. Commercial Driver's License Testing Program

Our heavy equipment operator is the Commission's CDL holder. The employee working in this title is included in with the County pool of employees to be randomly tested for drugs and alcohol, which is required by Federal DOT regulations.

4. Employee Assistance Program

The Commission staff members were able to utilize the Employee Assistance Program (EAP) in 2024, which is made available through the NJ Intergovernmental Insurance Fund, NJIIF. This program offers assessment, counseling, and referrals for a variety of personal and work-related problems, including those related to drug and alcohol abuse. EAP services are available by calling 1-888-243-5744 or visiting www.sandcreekeap.com; anonymity and confidentiality are assured.

C. New Jersey Mosquito Control Association (NJMCA)

The New Jersey Mosquito Control Association is the oldest mosquito control association in the country and celebrated its 111th Year Anniversary in 2024. The NJMCA is a state-wide professional organization comprised of members from the 21 county mosquito control agencies, the NJDEP Office of Mosquito Control Coordination, the State Mosquito Control Commission, Rutgers University's Center for Vector Biology, and other interested parties. The purpose of the NJMCA is to promote and encourage close cooperation among those directly and indirectly concerned with mosquito control work, stimulate educational activities to increase the knowledge of mosquito control, and advance the cause of mosquito control and related environmental concerns in the State of New Jersey and elsewhere. The NJMCA's primary goal is to promote, encourage, develop, and record safe, effective, and environmentally sound mosquito control activities in order to protect the health and welfare of the citizens of New Jersey, and to make this information available to all who may be interested or concerned with mosquito control activities. The strength of the mosquito control community in New Jersey is reflected in the strength and activity of this association.

In 2024, the NJMCA Conference was held at the Golden Nugget in Atlantic City from March 20 – March 22 with the following staff in attendance: J. Gruener, R. Hagerty, & J. Necina. The theme of the meeting was, "The Many Hats of Mosquito Control" and presentations focused on the variety of tasks that local mosquito control agencies must master in order to be effective. The NJMCA program included a short film festival for the first time in 2024 and Mr. Necina participated with two short teaching films, one showing how to solder when fixing traps and the other on how to properly pin mosquitoes for collections. At the 2024 Annual Business Meeting of the NJMCA, Jennifer Gruener was re-elected Treasurer of the Association and Christine Fisher was reappointed as Bookkeeper for the Association. The pair maintained the Association's accounting, produced quarterly reports, filed the annual taxes, and developed a budget for the following year's activities.

Ms. Gruener serves as Trustee on the NJMCA Board with Ms. Oliphant as alternate. In addition, the following staff members were named to various committees including:
Jennifer Gruener: Convention Arrangements Committee, Editorial Committee, Legislative Committee
Christine Fisher: Membership Committee
Stephanie Oliphant: Editorial Committee
John Necina: Archives Committee, Research and Development Committee
Ryan Hagerty: Legislative Committee

D. Associated Executives of Mosquito Control Work in New Jersey (AEMCNJ)

The regular membership of the Associated Executives of Mosquito Control Work in NJ consists of Superintendents and Directors of the county and state mosquito agencies, as well as representatives from the NJ Agricultural Experiment Station. Associate members may also be voted in but must be technical full-time mosquito control professionals. The main purpose of this Association is to promote, preserve, and protect professional standards of full-time mosquito control employees throughout the state. As a member of this operationally oriented organization in New Jersey, Jennifer Gruener attended most of these monthly meetings throughout the year. Association meetings in 2024 were a combination of in person and virtual meetings. Ms. Gruener served her second year as Vice-President of the Association in 2024.

Commission members who were named to the following committees:
Jennifer Gruener: Vector-borne Disease Working Group, Legislative Committee (chair)

E. American Mosquito Control Association (AMCA)

The AMCA is a professional association of individuals and organizations interested in mosquito and other vector control comprised of members from over 50 countries. The Commission maintains sustaining membership in the national association, which directly supports legislative and regulatory advocacy. Membership also includes but is not limited to lowered rates for attendance at national meetings, web access to member only information, technical advisor services, the *Journal of the American Mosquito Control Association*, *Wingbeats* - magazine for mosquito control, the *AMCA Newsletter*, monthly e-newsletters, and free webinars throughout the year on numerous relevant subjects. Starting in 2023, the AMCA technical advisor began sharing a monthly curate report with membership, which includes links to local legislation pertaining to mosquito control, pesticides, pollinators, and unmanned aerial systems. In 2024, the AMCA formed a drone program to create clear and consistent regulatory compliance processes for AMCA members to use UAS (drones) safely, legally, and responsibly. They plan to also provide accessible and relevant training resources for AMCA members and encourage the advancement of technologies that benefit our members.

F. Northeast Mosquito Control Association (NMCA)

NMCA is a non-profit educational organization of nearly 250 mosquito research and control professionals from New England, New York, New Jersey, and Pennsylvania. Their objectives are to promote the efficiency of mosquito abatement and related activities, through the encouragement of research, development of procedure, and the interchange of information; to circulate among its members and other interested parties' pertinent knowledge relative to mosquito abatement and related subjects, and to encourage field trips and meetings of its members.

G. Entomological Society of America (ESA)

Membership in this association began in 2007 and continues annually. This membership allows our Commission access to valuable literature in multiple professional journals.

H. Public Tick IPM Working Group

Superintendent Gruener continued to participate in the Public Tick IPM Working Group, which is composed of tick experts, tickborne disease advocates, medical professionals, vector control professionals, and other interested parties. Ms. Giordano also attended several calls from the working group in 2024. The group collaborates (via a monthly conference call) on Integrated Pest Management related activities, exchanges knowledge, and shares resources to expand the network and reduce the public's risk of exposure to infected ticks. This work is supported by the USDA National Institute of Food and Agriculture, Crop Protection and Pest Management Program through the North Central IPM Center.

I. U.S. EPA - Pesticide Environmental Stewardship Program

At the end of 1997, the New Jersey Mosquito Control Association (NJMCA) approved an extensive mosquito control strategy document for the Pesticide Environmental Stewardship Program (PESP) to be submitted under the American Mosquito Control Association's PESP partnership. The New Jersey document was based on the approved strategy document from the AMCA (the national organization) but goes beyond in specific areas of surveillance, biological control and water management, some of which were pioneered in New Jersey and all of which are employed today. The New Jersey strategy document was accepted by the AMCA in March of 1998 establishing New Jersey as an official sub-partner. This document is frequently referred to around the country to outline details of a comprehensive mosquito control program. Warren County's current programs are consistent with the strategies outlined in this document and the Commission usually participates in the annual PESP

survey from the EPA. However, in 2024 the link to the survey was not shared until April 25th, at which time the Commission staff were busy with ground and aerial larviciding work that took priority over the survey.

J. Safety Coalition

The Mosquito Commission is represented on the Warren County Safety Coalition where current safety related topics are discussed and information is disseminated. The Commission was not aware of any safety coalition meetings in 2023.

Mosquito Commission staff safety meetings are also held on occasions when appropriate. Superintendent Gruener meets with PMA Companies safety representative, Tim Weir, annually to ensure compliance with safety standards and to plan for safety training for employees. Safety training is listed in part B.2. under "other training" and a hard copy of safety training logs are kept in the office.

K. Records Retention

A request and authorization for records disposal was completed on the New Jersey Division of Archives and Records Management website, *Artemis* in 2024 for disposal of appropriate records. This request was forwarded first to Nisivoccia & Company LLP for necessary signatures, then uploaded to *Artemis* for final approval prior to our disposing of old records. Certain documents are considered permanent and will remain in our central files. Pesticide application records are retained in accordance with the NJ Pesticide Regulations and the NJPDES Pesticide General Permit, which combined, result in a 5-year retention of all pesticide records.

L. Insurance

In 2017, the Commission became an independent member of the NJ Intergovernmental Insurance Fund, NJIIF. The Commission had been insured through the County of Warren's policies with the NJIIF for its Public Officials/Employer Liability, Workers Compensation, General Liability, Excess Liability, and Automobile Liability coverages from 2004 through 2016 but had held its own separate policy for Pollution Liability with a different carrier. Confusion with a minor workers compensation claim spurred discussions with the County and the Insurance brokers, and it was decided that the Commission would be better served if it had its own policies under the NJIIF, separate from the County's. Now all the Commission's insurance policies, including Pollution Liability and Cyber Liability, are under the Commission's account with the NJIIF. All claims are managed through PMA Companies, which also offer a variety of training resources.

II. FACILITIES/EQUIPMENT

A. Facilities

The Commission continues to utilize the county owned building and grounds at 2 Furnace Street in Oxford, New Jersey. The building is shared with the Department of Weights & Measures and the grounds are shared with the Oxford division of the County Road Department. A 44' aluminum shipping container is located in the yard behind the building and is used for storing all of the dry, non-flammable pesticides. Liquid pesticides are stored in a temperature controlled chemical storage building located between the building and the shipping container.

Both office and yard space are extremely limited, so efforts are being made to make the best use of the space we have. The breakroom serves as an office to both the Senior Wetlands Specialist and the Heavy Equipment Operator/Inspector and the laboratory serves as an office to the Inspector, Biologist, and Wetlands Specialist as well as an overflow area for seasonal staff. Storage sheds have been purchased for materials and supplies that need to be out of the elements but that can withstand the extreme temperatures of winter and summer. There is a storage shed designated for public relations, one for fish supplies, one for trapping supplies, one for water management supplies, and one more for utility supplies. There is also a carport for storing the Polaris Ranger, the Forklift, and items tagged for

the annual county auction. There is now an additional carport to provide cover for the fish holding tanks. The placement of this carport lessens the maintenance requirements on the tanks by reducing the amount of debris that fall into the holding tanks, and it provides shade, reducing algal growth in the tanks. Efforts are also made to keep vehicles and equipment under cover to extend their usable life; however, the larger excavator, bulldozer, Eager Beaver Trailer, the utility trailers, and all the service vehicles are currently stored out of doors due to limited garage space. The Commission-owned dump truck is kept in the garage as much as possible.

In March of 2023, the director of Public Works held a meeting with the superintendents of Weights & Measures and the Mosquito Commission to discuss the building and space needs of both entities. Several possibilities were discussed but the superintendent is not aware of any existing plans to address the issues.

B. Equipment

1 a. State Equipment

The following equipment is provided by the State Mosquito Control Commission (SMCC) for the Commission's use under an annual equipment use agreement:

1980 John Deere 350C Bulldozer
2003 Kobelco Low Ground Pressure Excavator with Powertilt
1988 Bausch & Lomb Stereo Zoom 7 Microscope with Fiber-Lite Illuminator
1990 Eager Beaver 20-Ton Tagalong Trailer
2001 Revco Freezer
2023 EmTek Equipment Mats 4.5" x 42" x 14'

The heavy equipment is the mainstay of our water management program. The excavator, along with the eager beaver trailer, are regularly utilized. (See the *Water Management section* for program description and current activities). The John Deere bulldozer is too underpowered to be useful on most projects. Therefore, the Commission surrendered the bulldozer to the SMCC in 2023, however, the SMCC equipment use agreement states that the Commission is responsible for storing and ensuring the equipment under the agreement until the SMCC has an acceptable location to move it to. Early in 2024, the SMCC decided they were willing to invest a substantial amount of money to refurbish this 44-year-old piece of equipment and the WCMEC staff was tasked with obtaining at least 3 quotes from vendors listed on the state purchasing portal, NJ Start, to this end. Ms. Oliphant and Mr. Flohn identified acceptable vendors and transported the state-owned bulldozer around the state to obtain the quotes. The quotes have been submitted to the SMCC and the WCMEC is awaiting further instruction. In 2024, the SMCC also approved the refurbishment of the Kobelco Excavator, which followed a similar procedure for obtaining quotes, but this project moved along much faster. This work was approved and completed in 2024. Early in 2024, it was noted that the powertilt swivel on the Kobelco was leaking hydraulic fluid, so a repair request was sent to the SMCC and repairs were approved. A & S Hydraulics replaced the bearing, resealed the barrel, and polished the rod cylinder. However, when it came time to reattach the powertilt to the machine, it was noted that two of the bolt holes that attach the powertilt onto the boom were stripped out. Quotes for this repair were sought and sent to the SMCC and are still awaiting approval. It is also worth mentioning that the SMCC purchased new EmTrek equipment mats for use with the Kobelco towards the end of 2023. These mats were lent to Middlesex County MEC in June and they remain on loan at this time.

The ultra-low temperature freezer is used for storing mosquitoes that are submitted for disease monitoring. This freezer also allows for the extended storage of the dry ice that is used for our surveillance program. The SMCC officially stopped supporting the Revco freezers in 2017; however, they have allowed the freezer to remain on the state lease agreement for the Commission's use. The Commission contracts to have preventative maintenance performed on the freezer twice each year but

it is over 20 years old. Following costly repairs in 2023, the Revco freezer began tripping the circuit breaker in April of 2024. The County electrician inspected the circuitry and replaced the circuit breaker; however, the issue was not resolved. The vendor that completed the repairs in 2023 was contacted several times and finally resolved the issue in early July. This caused some inconveniences for trapping and sample storage in the spring and early summer season as staff had to compensate by picking up dry ice from the vendor in Easton, Pennsylvania, twice a week and storing it in portable coolers. Additionally, the trapping schedule was condensed in an effort to consolidate dry-ice trapping days.

1 b. Commission Owned Equipment

The following surveillance/treatment equipment is owned by the Warren County Mosquito Commission. The Commission also owns numerous small pieces of surveillance, collection, and treatment equipment that are too cumbersome to list in this report.

2006 Polaris Ranger – Utility Vehicle
2006 16 ft Ringo Trailer
2013 AcrEase 44" Trail Mower
Cougar ULV Sprayer with GPS/SmartFlow Assembly
2012 London Fog ULV Sprayer
Bausch & Lomb – Stereo Zoom 5 Microscope
Southern Precision Microscope
AmScope Fiber Optic Illuminator
Tuttnauer 7-inch tabletop Autoclave
RAMP Virus Testing System
Maruyama Gas-powered Backpack Sprayer
Maruyama Battery-powered Backpack Sprayer
2007 Clark Forklift
Red Lion Aluminum 6.0 hp Trash Pump & hose (2015)
Northstar Tank Sprayer
2020 Clarke Electric Promist ULV Sprayer with GPS/SmartFlow Assembly
2021 Leica S8 APO Stereozoom Microscope with View 4K digital camera & software
2022 EBY DO14K Aluminum Equipment Trailer
DJI Mavic 3E with support hardware & software
Yale wire rope air hoist

The Yale wire-rope air hoist in the garage failed annual inspection in early 2024 and was in need of repair. The hoist reversing contactor had burnt out, torn the pendant, and blew the triple fuses. The repairs were complete, and all three fuses were replaced and the hoist seems to be in good working order; however, it may need a new brake coil in the near future.

2. Vehicles

The Commission has a fleet of 4WD pickup trucks and a dump truck to utilize in its operations. Annual inspections of all our vehicles are performed prior to the end of January, before our season begins, in the event repairs are necessary as a safety measure and to avoid untimely delays during our busy season. Two of the commission's larviciding route trucks have been slated for replacement for the past couple of years but due to limited availability of compact pickup trucks that suit the Commission's needs, those purchases were delayed. However, late in the summer of 2024 one of those trucks was in an accident that resulted in a total loss and the truck was taken out of service. Compact 4-wheel drive pickup trucks are ideal for the larviciding routes but were not available on the state contract or any cooperative pricing systems that the Commission was a member. Therefore, the Commission went out

to bid for a compact 4-wheel drive pickup truck that best fit its needs. After two attempts, no bids were received, and the Commission was able to purchase the specified truck by contracting with a vendor under the pertinent bid exemption rules, N.J.S.A. 40A:11-5(3). The new truck is expected to be delivered in late February 2025.

Almost all vehicles are kept equipped with 2-way radios utilizing the county frequency, lockable storage boxes, and a full complement of inspection, safety/emergency equipment and informational materials for distribution. The notebooks containing pesticide labels in each vehicle are updated annually with current labels for each of the products we use.

3. Computers

The Commission staff currently utilizes 7 desktop workstations, 2 laptops, and a Chromebook linked together by a local area network (LAN), which is held on an in-house server. The Superintendent, Administrative Secretary, Biologist, Inspector, Senior Wetlands Specialist, and Wetlands Specialist each have their own workstations. All computer workstations are set up with upgraded battery backup units (Uninterrupted Power Supply- UPS) to protect against data loss in the event of power problems. This computer system has become integral to the daily operations of the Commission and is maintained by an outside IT company. As particular workstations age and become outdated, they are replaced. A new network server was installed in 2023 with the internal backup operating properly; however, the external backup was found to be incompatible with the new system. An alternate external backup was installed in 2024.

The primary laptop is used for the Superintendent to work away from the office and with our LCD projector for educational purposes. The other laptop is shared by the Heavy Equipment Operator/Inspector, Seasonal Inspectors, Research Interns, and the Disease Surveillance/Laboratory Assistant as needed. Since the Coronavirus pandemic, the Commission has maintained software subscriptions that enable staff to remotely log into their computers from home, when necessary. Originally this service was provided by AnyDesk but was changed to LogMeIn late in 2022 with significant cost savings. The Commission has also maintained a subscription for GoToMeeting to allow for virtual Commission meetings and gives staff the ability to host other virtual meetings as needed.

The Commission website and staff email continue to be hosted by My Corporate Hosting service, which is updated quarterly and provides added security and support. Office 365 subscriptions are maintained for each desktop, which provides a more secure email for each member of staff and the original email addresses were preserved. The Commission website was transferred to My Corporate Hosting service, which gets updated quarterly and provides added security and support.

The Commission continued to use the FieldSeeker GIS data collection system from Frontier Precision for the 2024 season with 6 iPads and 3 Mesa III tablets. The software seemed to perform much better on the iOS platform, which resulted in less downtime in the field.

The Wetland Specialist's computer is currently being used for QGIS work, Ortho imagery flight planning, data acquisition and processing (DJI Mavic 3 Enterprise), as well as drone treatment planning (Hylio AG-210). The Wetland Specialist donated a stick of ram (16gig) which was compatible with his work computer. This doubled the installed ram and was done to decrease the processing time of Ortho imagery captures with the DJI M3E. Other enhancements were made as well, a 2tb SSD (solid state drive) was added to reduce the data footprint on the server, decrease network traffic, and increase the speed in which Ortho imagery is processed. These are all stop-gap measures used until new workstations can be purchased in 2025.

4. Inventory

A comprehensive item inventory with corresponding replacement values was developed in 1996 and is maintained. The inventory list is modified as items are purchased or sold at the Warren County auction. A separate inventory is maintained for pesticides, which incorporates delivery and billing records to ensure loss prevention. Pesticide inventory is documented in excel and verified with product usage in FieldSeeker.

III. COMPLAINT RESPONSE

Service requests are directed to our office to complain of standing water, abandoned swimming pools, mosquitoes, and other related concerns. Specific information is obtained directly from the caller to deal with the problem most efficiently. Service requests are entered into the FieldSeeker database when received. The database automatically maps the request, and it becomes available on all the handhelds once they are synced with the FieldSeeker database. Each request is assigned to an inspector depending on the nature of the request and its location within the county. The inspector can complete the entire request digitally via the handheld, and then each request is closed by either the Senior Wetland Specialist or the Superintendent. A paper copy of each request is still generated and kept on file to ensure completion.

Our staff investigates all spray requests to verify the presence of adult mosquitoes before the Commission will apply insecticides with truck-mounted sprayers. In addition, staff work to locate the source of the problem (the water where the larval mosquitoes are developing) and then apply appropriate control measures (larvicides with ground equipment or by aircraft; fish stocking and/or water management) to control the immature stages of the mosquitoes when necessary.

Service request numbers remained low throughout 2024 with a few minor flurries of activity following the late summer rains in August. In total, there were only 133 service requests for the year, which was down from the 215 received in 2023. The breakdown on 2024 service requests is as follows: 54.9% adult mosquitoes, 15% standing water, 12.8% swimming pools, 6% containers/tires, 3.8% stream blockages, and 7.5% other (fish requests, abandoned property concerns, black flies, and inquiries regarding operational procedures).

IV. VECTOR BORNE DISEASE

In 2024, the NJ Public Health & Environmental Laboratory (PHEL) continued panel testing for several viruses. All samples that are tested for West Nile virus (WNV) are automatically and simultaneously tested for Eastern equine encephalitis (EEE), Jamestown Canyon virus (JCV), and St. Louis encephalitis (SLE). The Commission's written trap placement plan was slightly revised in 2024 to reflect changes in disease activity. This plan has been modified as needed for other mosquito-borne disease surveillance in the past and is updated periodically when the need arises. The plan merges the trapping schedules and trap placements for all disease surveillance, which is done primarily by the Disease Surveillance/Laboratory Assistant. The plan provides for standard trap sites that have had a history of, or have a high potential for, disease activity. The 2024 Disease Surveillance Trapping Schedule is provided in Figure 3. In addition to these standard sites, random sites throughout the county are also trapped for disease testing. This procedure enhances our ability to detect mosquito-borne disease activity in the county. In 2024, routine trapping for Asian tiger mosquito (ATM) continued on an as-needed basis with the disease trapping schedule and those sites are also indicated on Figure 3. This is discussed further under Section V. A. 5 – BG Traps. The collections from these traps are often sent in for WNV, EEE, JCV, and SLE panel testing but other panel testing, specific to ATM such as the Zika, chikungunya, and dengue panel or the La Crosse panel are available if the need arises.

A. Disease Response Guidelines

The Commission's Mosquito Borne Disease Response Guidelines were reviewed and revised in 2018 to provide consistency and to respect state restrictions on the use of identifiable personal information with respect to human disease involvement. These guidelines are based on the current knowledge regarding West Nile virus and take into consideration other potential disease detection. The current version can be found in Figure 4. This serves as a guide for communication, surveillance, and control when evidence of mosquito borne disease is noted in Warren County.

B. Vector Borne Disease Working Group (VBDWG)

This interagency group is comprised of representatives from the State Health Department, the State Public Health Laboratory, the NJ Office of Mosquito Control Coordination, the military, State Epidemiologists, the NJ Department of Agriculture-Division of Animal Health, US Department of Agriculture, Rutgers Center for Vector Biology, local epidemiologists, NJ Health Officers Association, and the Associated Executives of Mosquito Control in NJ (AEMCNJ). The superintendent is one of the AEMCNJ representatives for the group. The group typically meets every month during the active season (with sub-committees meeting during the off months) to discuss current activities and guide each agency in enhanced activities that would help address important public health issues caused by vector-borne disease in the state. Meetings in 2024 were held monthly from April through October with an additional meeting in December. They were a mix of in-person and virtual meetings.

Since 2021, the VBDWB has updated the Disease Surveillance Guidelines for the state and distributed these guidelines to the 21 county mosquito agencies annually. These guidelines outline the species and ideal number of mosquito samples (pools) per week for each disease that the county agencies should aim to submit to the state testing laboratory to provide an accurate account of the presence of mosquito borne disease throughout the state.

C. VectorSurv

In 2024, New Jersey continued to utilize CalSurv for statewide arbovirus data management. This database system was developed by the University of California, Davis as a collaboration between the state, university, and county public health entities. The NJ Vector-borne Disease Working Group worked with the developers to customize the system for use by the NJ counties, creating JerseySurv. The Centers for Disease Control funded the entire effort, and more states/territories have joined, so the system has been renamed "VectorSurv". Now the PHEL and the 21 counties, as well as Rutgers University and the NJ Office of Mosquito Control, have free access to this system.

Mosquito control and public health agencies who use the VectorSurv system do so through the Gateway, which is an online interface for managing and analyzing surveillance and control data related to mosquitoes, ticks, arboviruses, and insecticide resistance monitoring. The Gateway requires login credentials for each user, who must belong to an identified agency. Each agency maintains all the privileges to manage its own data and user accounts, and higher-level aggregate reporting functions are managed by the state. The counties enter the sample information for the specimens being sent to PHEL (or the Cape May laboratory) for disease testing and when the laboratory receives the samples and tests them, they enter the results. VectorSurv has the capacity to handle all trap data (including NJ light trap data) not just disease surveillance data. This system increases efficiency and communication between the various agencies and allows for data sharing and data analysis. In 2024, tick surveillance data and pools were also entered into this system.

Mosquito and tick testing results submitted from Warren County to the state are reported in the Vector-borne Surveillance Report produced by the NJ Department of Health, Communicable Disease Survey. This report is shared publicly along with an interactive dashboard that provides information on vector-borne disease incidence and trends as well as mosquito and tick activity. A year-end summary of mosquito borne disease taken from this report can be found in Figure 5.

D. West Nile Virus, Eastern Equine Encephalitis, St. Louis Encephalitis, and Jamestown Canyon Virus

A chart showing real time disease activity by municipality is included on the Commission's website to keep residents informed. Mosquito-borne disease surveillance activities are described below. The Commission has been monitoring for West Nile virus since its introduction into New Jersey in 1999; therefore, most historical disease data pertains to WNV. A map showing the locations of all cumulative WNV activity in Warren County to date (including mosquitoes, birds, and horses) can be found on the WNV Cumulative Positive Map, Figure 6. Locations of confirmed human cases are not publicly disclosed; therefore, these points are not shown on Figure 6. As mentioned earlier, in 2024 all samples submitted for WNV were simultaneously tested for EEE, SLE, and JCV. Although the Commission has periodically been able to test for these and other viruses before, the panel testing allows for a much more comprehensive surveillance program.

1. Bird Testing

The bird testing regime followed since 2001 was discontinued in 2016. This service is no longer available through the NJ Department of Health and Human Services; however, the NJ Department of Agriculture does occasionally test birds for WNV. In Warren County, dead bird reports are entered as service requests, and the area is trapped as soon as possible for mosquitoes that are likely to be carrying the virus. The mosquitoes caught from those areas are submitted for testing.

2. Mosquito Sampling/Testing

In 2024, a total of 488 pools (samples) of mosquitoes comprised of 12,117 mosquitoes from Warren County were submitted to the NJ PHEL for virus testing. The State Mosquito Control Commission covered the total costs of testing for each county (up to 20 pools per week). Please refer to Figure 6a, Mosquito Samples by Species Submitted to PHEL for Mosquito-borne Disease Testing to see the species and counts of mosquitoes submitted. A map of all the sites where mosquitoes were collected and submitted to PHEL in 2024 for disease testing can be found on Figure 6b, Mosquito-borne Disease Trapping Locations.

a. West Nile Virus

Currently, West Nile virus (WNV) is the primary mosquito-borne virus of concern in Warren County; therefore, the methodology of our disease surveillance program is centered on this disease. For West Nile virus surveillance, gravid traps were placed at locations throughout the county to target *Culex* mosquitoes, the primary vector of WNV. These traps were set beginning April 30 through October 29 in 2024. All municipalities were sampled multiple times starting with sites on the trapping schedule, then supplemented with sites that had a high disease potential to fill geographic voids. Neighborhoods with positive WNV indicators were also focused on to assess the general mosquito activity as well as the WNV activity in those areas. *Culex* species (mostly *Cx. pipiens* and *Cx. restuans*) were tested since they are the known amplification vectors of WNV. If any of those pools tested positive, then additional trapping and/or testing was done to include other species that may bridge the disease to humans.

In 2024, Warren County had 28 WNV positive mosquito samples out of the 485 samples that were tested for WNV. This is the second consecutive year that WNV activity has been more than double the 1999-2022 county-average of 12 WNV positive samples per year. The first WNV positive pool of the year was collected from Washington Township on May 22. This was the earliest WNV has ever been detected in Warren County. The final WNV positive pools of the year were collected from Alpha Borough and Greenwich Township on August 27, 2024. The twenty-eight (28) mosquito samples that tested positive for WNV from Warren County in 2024 were from the following townships: Allamuchy (1), Alpha (4), Belvidere (1), Franklin (1), Greenwich (2), Hackettstown (3), Harmony (2), Liberty (2), Lopatcong (4), Oxford (1), Phillipsburg (6), and Washington Township (1). The species that tested

positive for mosquito-borne disease in 2024 were *Culex pipiens/restuans/salinarius mix* (26), *Aedes albopictus* (1), and *Culex erraticus* (1). This information can be found in Figure 6a and both positive and negative trap locations are mapped in Figure 6b.

Statewide, 2024 was also an above average year for WNV activity in the mosquito population. There were 995 positive pools (as opposed to 847 positive pools in 2023). West Nile virus was detected earlier than ever in the state in 2024 with two pools from week 18 (April 28- May 4, 2024) testing positive from Gloucester County. The virus was also detected later than ever with a mosquito pool testing positive in week 45 (November 3-9, 2024). Every county in the state reported at least one WNV positive mosquito sample with the highest positive mosquito activity being reported from the suburban corridor (Bergen, Hudson, Middlesex, Somerset, Hunterdon, Union, and Mercer Counties). Ninety-two percent (92%) of the WNV positive mosquito samples were *Culex* species and the remaining eight percent (8%) comprised 7 different species (*Aedes albopictus*, *Ae. japonicus, Ae. triseriatus, Ae. vexans, An. punctipennis, Cq. perturbans, and Cs. melanura*).

b. Eastern Equine Encephalitis

To better conform to the Mosquito and Vector Surveillance Submission guidelines, the goal was to have some pools submitted for testing each week that would target Eastern equine encephalitis and Jamestown Canyon virus vectors in addition to West Nile virus vectors. For Eastern equine encephalitis, the target species are *Culiseta melanura* and *Coquillettidia perturbans*, the primary vectors of EEE. In 2024, there were five pools of *Cq. perturbans* (totaling 136 specimens) and one pool of *Cs. melanura* (totaling 1 specimen) collected and submitted for testing. Since the inception of panel testing at PHEL, all samples submitted for the WNV testing panel are also tested for EEE; therefore, 459 mosquito pools (11,950 mosquitoes) were tested for EEE. None of the mosquito samples from Warren County tested positive for EEE in 2024. If positive mosquitoes were to be found in any samples, more extensive trapping would have followed to determine the best course of action.

Statewide, 2024 was consistent with 2023's EEE activity. There were seventeen (17) positive mosquito pools, whereas there were eighteen (18) EEE positive mosquito pools in 2023. The breakdown is as follows: Bergen (1), Camden (1), Cape May (2), Gloucester (2), Hunterdon (1), Morris (4), Monmouth (2), Salem (1), Somerset (1), and Union (2). Nine positive pools were *Cs. melanura*, six positive pools were *Culex* species, and 1 positive pool each were *Cq. perturbans* and *Cs. morsitans*.

c. Jamestown Canyon virus (JCV) and St. Louis encephalitis (SLE)

In Warren County, specific trapping for JCV was done early in the season, beginning April 9, 2024. Between April 9 and April 30, CDC traps baited with dry ice were set at snowpool habitats throughout the county to target early season *Aedes* species. Collections included *Anopheles crucians, Anopheles punctipennis, Anopheles quadrimaculatus, Aedes canadensis, Aedes cinereus, Aedes sticticus, Culiseta melanura,* and *Culex* species. Jamestown Canyon virus is included in the West Nile virus multi-plex panel, so in the end, 459 pools (11,950 mosquitoes) submitted for WNV panel testing were also tested for JCV and SLE yielding no positive pools in Warren County for either of the two viruses. However, statewide Jamestown Canyon virus was detected in four mosquito samples in the following counties: Cumberland (2) and Monmouth (2). There was no Saint Louis encephalitis activity in NJ in 2024.

3. Equine Cases

No horses were confirmed to have WNV in Warren County in 2024. There were four confirmed EEE positive horses reported in 2024; one from Atlantic County, two from Ocean County, and 1 from Salem County.

4. Human Cases

The Commission is kept abreast of human cases being tested for mosquito-borne diseases via regional meetings (Associated Executives of Mosquito Control in NJ, Vector-borne disease working group, and NJMCA Board meetings). If the superintendent was notified of suspect human cases in Warren County via phone calls from the State Mosquito Control Commission, this would then prompt contact with the county health department for additional information. Information about each individual case is shared between the county health department and the mosquito commission superintendent. If a case is confirmed positive for mosquito-borne virus, the superintendent notifies the Commissioners as well as the County Board of Commissioners.

There were two human cases of WNV in Warren County in 2024; dates of onset were August 16th and September 1, 2024. Mosquito surveillance was conducted at both residences as soon as possible following notification. Backyard larval mosquito habitat was found nearby for both cases and treated accordingly. Yard audits were conducted in both neighborhoods and residents were educated on mosquito bite prevention. Adult mosquitoes were trapped and sent to the NJ PHEL for testing. Adult mosquito control applications were done in both neighborhoods to decrease the likelihood and additional transmission.

Fortunately, there were no human cases of EEE, JCV, or SLE detected in Warren County in 2024.

Statewide, there were 37 human cases of WNV reported in 2024: Bergen (6), Burlington (2), Camden (5), Cape May (1), Cumberland (2), Essex (2), Hudson (1), Hunterdon (1), Mercer (2), Middlesex (3), Monmouth (4), Ocean (3), Union (2), and Salem (1). There were seven associated deaths in Bergen, Camden, Cumberland, Mercer, Middlesex, Monmouth, and Ocean Counties.

One human case of JCV was reported from Sussex County in week 19 of 2024 (May 5-May 11).

There were no reported confirmed human EEE or SLE cases in the state of NJ in 2024.

5. National Recreation Area Cooperation

The lines of communication are open regarding detection of mosquito-borne disease in the Delaware Water Gap National Recreation Area (DWGNRA) and surrounding areas. Provisions have been made to allow for limited control measures to be taken in the park if mosquito-borne disease occurs there. National Park Service Collection Permits were received for the 2024 season, but limited mosquito sampling was done in the DWGNRA in 2024. However, three of the exploratory sites for the grant-funded tick surveillance program were in the DWGNRA. That information is included in the Grant Funded Tick Surveillance Project found in the Research & Field Studies section VIII.D.

D. <u>Chikungunya Virus (CHIKV) and Dengue Virus (DENV) and Zika Virus (ZIKV)</u>

Humans can serve as a reservoir for chikungunya (CHIKV), dengue (DENV), and Zika (ZIKV) viruses. Therefore, a mosquito can actually acquire enough virus from an infected person (while obtaining a blood meal) to pass that virus onto another person. Unlike WNV, these viruses do not require a bird reservoir. *Aedes aegypti* and *Aedes albopictus* are both able to transmit the virus. *Ae. aegypti* is not present in Warren County but *Ae. albopictus* has become increasingly more abundant.

To date, there have not been any locally transmitted cases of CHIKV, DENV, or ZIKV in New Jersey; however, there have been travel related cases of all three viruses in the state. Year 2024 was a particularly high year for travel-related Dengue cases in NJ following extremely large outbreaks of the disease, especially in Latin American countries. It is theoretically possible for local transmission to occur in Warren County in areas where *Ae. albopictus* are abundant (when travel related cases are present). Therefore, when reports of travel-related cases are reported to the Commission, follow up mosquito surveillance occurs as soon as possible and a request for testing is submitted to the State Mosquito Control Commission.

In 2024, there were four reports of possible human dengue cases in Warren County at three locations. Adult mosquito surveillance was conducted and limited populations of *Aedes albopictus* were found. A total of three pools of *Ae. albopictus* were submitted for CHIKV/DENV/ZIKV panel testing in response to these reports; the results were all negative. Upon investigation by the Warren County Health Department, one report was disregarded as that person was not a resident of the County. The other three human cases were confirmed to be travel related. Larval and adult mosquito surveillance in the immediate area was conducted and control efforts were performed when *Aedes albopictus* were found to decrease the likelihood of local transmission.

A detailed Zika Action Plan was developed and approved by the Commission in 2017. The Plan follows the recommendations set forth by the CDC for Zika Vector Control in the Continental United States and incorporates properties of the NJ DOH Interim Zika Virus Concept of Operations Plan and the AMCA Best Management Practices for Integrated Mosquito Management. The Commission's Zika Action Plan outlines the preparations and responses to various scenarios of a Zika virus epidemic. The actions laid out in this plan would also be applicable to many other vector-borne disease outbreaks.

E. La Crosse Encephalitis (LAC)

Mosquito testing for La Crosse encephalitis was made available through the NJ PHEL for 2019 by choosing a separate LAC/WNV panel test instead of the WNV/EEE/SLE/JCV panel testing. There was no suspected LAC activity in Warren County in 2024; therefore, no specific trapping was done for LAC. However, to adhere to the Mosquito and Vector Submission Guidelines that suggest 1-2 pools per week for LAC surveillance, pools were submitted for LAC testing as often as possible. *Aedes triseriatus*, the Tree hole Mosquito, is the primary vector species for LAC and it is seldom caught in high numbers in Warren County traps; however, the greatest single collection in 2024 was 59 specimens from a CDC trap set on August 30 in Knowlton Township. Nearly all pools were derived from gravid traps. In 2024, a total of 26 pools (totaling 141 mosquitoes) were submitted for LAC testing; all samples tested negative for LAC.

Statewide, there were no positive pools of La Crosse detected. There were no confirmed human cases of La Crosse in NJ in 2024.

F. Tickborne Disease

Since 2000, the number of tickborne diseases in Warren County has markedly increased. The tickborne diseases reported to the NJ State Health Department from Warren County include Lyme disease, alpha-gal syndrome, babesiosis, *Borrelia miyamotoi*, ehrlichiosis/anaplasmosis, Rocky Mountain spotted fever, and Powassan virus. The State Health Department has not released the final number of cases per county of the aforementioned tickborne diseases for 2024 as of the date of this report; however, once finalized it can be found at: http://www.nj.gov/health/cd/statistics/reportable-disease-stats/index.shtml.

From 2010-2019, Warren County was consistently one of the top three counties for the highest incidence of Lyme disease in the state and experienced the highest incidence in both 2016 and 2017. Increasing numbers of other tickborne illnesses are also occurring and unfortunately, in 2013, there was a fatal case of Powassan virus that occurred in Warren County. The Board of County Commissioners passed a resolution in 2019 designating the county mosquito commission as the appropriate agency for tick surveillance in Warren County should funding become available. The Commission sought and has been awarded grant funding for tick surveillance since 2021.

One goal of the grant-funded tick surveillance project is to calculate the density of infected ticks in Warren County for a variety of tickborne pathogens. There were significant delays in developing and validating the tick testing methods at the NJ Public Health and Environmental Laboratory (NJ PHEL) which left the data from 2021 incomplete (the fall submissions were only tested for Powassan virus).

The tick testing panels were finalized in 2023. All associated collection data and disease testing data are entered into VectorSurv.

Detailed information about the tick surveillance project can be found in Section VIII. D. Grant Funded Tick Surveillance.

V. SURVEILLANCE

Surveillance is the foundation of all the Commission's efforts and is a necessity to make sound, scientifically based decisions. Rainfall surveillance guides our efforts and allows for the most efficient use of Commission time. Rainfall events are tracked throughout the county so that inspection efforts are concentrated where the most flooding potential exists. Adult and larval mosquito surveillance is time-consuming, but it is an integral part of any integrated pest management (IPM) approach. County-wide mosquito surveillance not only provides the data needed to make control decisions but also provides an overall picture of mosquito productivity in the county. This information is useful in identifying where future problems may occur, such as invasive mosquito species and the potential introduction of emerging infectious diseases.

A. Adult Mosquito Surveillance

Routine surveillance for adult mosquitoes occurs at predetermined surveillance stations utilizing stationary New Jersey light traps. The locations of the 2024 Warren County surveillance stations can be seen in Figure 7. These stations are vital to our mosquito abatement efforts. They provide adult mosquito population data to direct and justify control measures and provide follow-up data to evaluate the control measures employed. The detailed 2024 seasonal synopsis of mosquito species collected from the routine surveillance stations can be found in Figure 7a. A summary of the overall number of mosquitoes collected from these stations is graphed on the New Jersey light trap Figure 7b.

In addition to routine surveillance, randomized adult mosquito surveillance is done throughout the county utilizing gravid traps, CDC traps, and BG sentinel traps. These traps are often set in response to resident complaints of biting mosquitoes or for disease testing. Figure 8, The Five-Year Summary of the 2024 Disease, Complaint, and Field Study Surveillance Synopsis, shows a summary of the mosquitoes collected from these traps. Please note that only complete data was used to calculate the mosquitoes per trap night and species abundances beginning in 2022; that is, all malfunctioning traps and their collections (or lack thereof) were removed from the equation. If a trap was set and yielded no collection but was functioning upon retrieval, then it was included in the calculation. In 2024, there were eighteen malfunctioning traps disregarded from the collection data.

Calls from residents are not necessarily used as a surveillance method themselves; however, they can help bring attention to areas with adult mosquito problems. Inspections made at the site of these service requests often include setting adult collection traps (usually CDC traps baited with CO_2 or BG traps baited with SweetScent and CO_2) to ascertain the mosquito species present and the extent of the problem. Occasionally it occurs where the CDC trap doesn't collect any mosquitoes, but the complaint persists. In those cases, residents are urged to gently swat and collect adult mosquitoes that are present and call our office so that a staff member can pick up what they have collected. If the collection includes biting mosquitoes, surveillance efforts can be repeated.

1. NJ Light Traps

Seven New Jersey light trap (NJLT) surveillance stations were maintained in Warren County in 2024. All NJLTs were in operation from May 6, 2024, through October 15, 2024. Some of these traps have been monitoring the same areas for over 25 years. The consistency of placing light traps in an area for several years is beneficial to obtain a long-term picture of the mosquito production in that area. Mosquitoes from these traps are collected regularly by the cooperators and then picked up weekly by Commission staff. The collections are then sorted in the lab to isolate the mosquitoes from the other

insects trapped. After prompt identification, the count and species information are entered directly into the New Jersey VectorSurv platform. Totals of all the NJLT collections for 2024 are found in Figure 9.

The top five mosquito species sampled through our NJLT surveillance in 2024 were: *Culex spp.* (44.52%), *Ae. vexans* (15.25%), *An. punctipennis* (9.04%), *An. crucians* (7.72%), and *An. quadrimaculatus* (6.55%). There was an average of 14.28 mosquitoes per trap night (T/N), which is a 54.0% decrease from the average number of mosquitoes per trap night collected in 2023 (31.01 mosquitoes/TN). In 2024, 16,200 mosquitoes were trapped in NJLT's compared to 34,952 mosquitoes in 2023 showing that overall populations were remarkably lower than the previous year. The greatest species diversity was observed at both Ivaseczko's on Post Lane in Independence Township and Zellar's on Bear Creek Road in Allamuchy Township; both traps collected 21 different species throughout the course of the season (although some species were only collected in singular abundance at either location). The least diverse trap in 2024 was Woronowicz's on Pequest Road in Oxford Township (11 species collected). Other traps ranged from 14 to 20 species collected over the course of the season. Compared to 2023, whose traps ranged in diversity from 18 to 21 different species, the 2024 season saw less species diversity.

With funding from the State Mosquito Control Commission, Rutgers Center for Vector Biology began a statewide NJLT Surveillance program in 2003. This program ran for almost 20 years but ended at the conclusion of 2022. Included in this statewide program were three traps from Warren County: Pequest Road in Oxford Township (Woronowicz - Trap 2A); Young's Island Road in Independence Township (Ivaseczko - Trap 5), and Bear Creek Road in Allamuchy Township (Sehulster - Trap 4A). The three chosen traps from Warren County, along with three chosen traps from Sussex County, represented the Northwest Rural region figures on the state report. No reports were produced in 2024 from the Center for Vector Biology; however, 2003-2022 weekly summaries are made available to all mosquito control agencies in the state as part of the NJ State Surveillance program reports and can be found at: http://vectorbio.rutgers.edu/surveillance.php

2. Portable Carbon Dioxide Baited Light Traps

Historically, landing rates were used at our regular surveillance stations to augment the New Jersey light traps by collecting mosquito species that are not readily attracted to light. *Aedes trivittatus* is one of our primary summer nuisance species and falls into this category. With the onset of West Nile virus, it was deemed too dangerous to conduct regular landing rates. So, CDC traps baited with dry ice became a substitute for the human landing rates and were conducted regularly at NJLT locations for many years. However, the increased presence of *Aedes albopictus* in Warren County along with the increased demands of setting, identifying, and processing the disease surveillance traps made it burdensome to continue with the CDC trapping at our regular New Jersey light trap surveillance sites. There was very little to no new information being gleaned from double trapping each NJLT location with a CO_2-baited trap; therefore, in 2019, we ceased setting these additional traps. Nonetheless, CO_2-baited traps continue to be used for the majority of our service request/complaint trapping when host-seeking mosquitoes are being targeted. These traps are also used alongside our gravid traps for disease surveillance when species other than *Culex* are being sought as well as for conducting field studies near highly productive sites.

In 2024, CDC traps were set in response to residential complaints and service requests to validate an adult mosquito problem. CDC traps were also set on occasion in response to positive West Nile virus samples and to target early season species that may be involved in Jamestown Canyon virus transmission. When looking at Figure 8 (Surveillance Synopsis), it is important to take these trap uses into consideration, namely being that CDC traps are not 100% synonymous with service requests.

3. Landing Rates

As previously stated, the presence of mosquito-borne diseases eliminated the use of landing rates as a routine means of surveillance. However, over the last couple of years, the commission has transitioned back to using landing rates when adult activity is high to expedite the flow from service request to adult mosquito control. This not only increases response turnaround but also alleviates pressure in the lab when trap counts can be overwhelming. In 2024, only one landing rate was taken in response to service requests as opposed to setting a CDC trap.

4. Resting Boxes

Resting boxes are primarily used to assess population levels of *Culiseta* species mosquitoes. *Culiseta melanura* is the primary species implicated in the amplification of Eastern equine encephalitis. After years of trapping *Cs. melanura* utilizing resting boxes in various sites throughout Warren County, this species was only found occasionally, which led to resting box surveillance being terminated in 2009. Resting boxes can be set periodically if requested by the state, but we have had better success collecting *Cs. melanura* from the NJLTs and CO_2-baited traps.

5. BG Sentinel Traps

BG sentinel traps are the standard trap type used to monitor *Aedes albopictus.* This type of trap is known to collect higher numbers of *Ae. albopictus* than the other traps mentioned because they are set low to the ground and are more in line with the flying height of a host seeking *Ae. albopictus,* they are baited with an additional human scented lure, and they use high contrast coloring. BG sentinel traps can be cumbersome to set and do not produce quality results if left out in the rain, so collections are often supplemented with other trap types. In the past, there have been several years when CDC traps collected significantly more *Ae. albopictus* than BG traps did; however, as *Aedes albopictus* has become more established, that trend has ceased. There has also been preferential trap selection for BG sentinel traps for service requests in residential areas where *Aedes albopictus* is the assumed nuisance species. As a result, in 2024, fully operational BG traps collected 1231 adult *Aedes albopictus* females, whereas fully operational CDC and gravid traps combined only yielded 309 *Aedes albopictus* adult females.

In 2024, BG Sentinel traps were deployed at set locations throughout the county to monitor the spread of *Ae. albopictus* (refer to Figure 3). Locations were chosen in areas with established populations as well as locations that had small or no prior collections of *Ae.albopictus*. BG traps were set bi-weekly in Alpha, Belvidere, Blairstown, Hackettstown, Independence, Phillipsburg, Washington Borough, and White Township. In 2024, *Aedes albopictus* adults were collected from every routine BG trap except for the BG trap located in Blairstown. There was 611 adult *Ae. albopictus* females collected at these routine locations in 2024.

Because Phillipsburg has an established *Aedes albopictus* population, BG traps have been the primary device used to monitor the adult mosquito population in that portion of the county. Over the past two seasons, a transition has been made to primarily use BG traps in Phillipsburg so that the trap data between locations is consistent and can be compared from site to site and from season to season. There are six trap locations with historical data that are used to compare the populations from year to year and are generally trapped in preparation for an area wide adulticide following large influxes of residential service requests. In 2024, four of these locations were visited, but the primary drive for justifying adult control measures in the region was derived from service requests.

Over the past couple of seasons, *Aedes albopictus* has been found sporadically in municipalities where it was not previously established or collected in great abundance; if samples continue to be collected in these areas, it is likely that *Ae. albopictus* will be established county-wide. BG traps were chosen for this routine trapping so that populations could be easily compared to trapping done in other counties.

6. Ovitraps

Ovitraps are a unique surveillance method that targets the egg stage of container-type mosquitoes. The traps are simply small containers baited with organically rich water and are lined with egg laying paper or seed germination paper. It is a very labor-intensive trapping method, and since *Ae.albopictus* can be easily collected with other trap methods, it was decided to abandon the use of ovitraps as a regular surveillance method. However, ovitraps have been used to varying degrees since 2017 when there was a need to collect *Ae.albopictus* eggs for insecticide resistance workshops (see Research & Field Studies section VIII. A. Insecticide Resistance for more information). Commission staff have also been interested in utilizing lethal ovitraps as a control method for *Ae.albopictus* (see the Research and Field Studies section VIII. E. Lethal Ovitraps for more information).

7. *Aedes albopictus*

The most recent invasive species, *Aedes albopictus*, also called the Asian Tiger Mosquito (ATM), was first detected in Phillipsburg (at the Filmore Street Cemetery) on August 28, 2012, in both a gravid trap and a portable light trap which had been set following the report of a dead crow. Warren County was the last county in the state to fall prey to this invasive species. *Ae. albopictus* is a potential vector of several mosquito-borne diseases and unfortunately requires non-conventional means to control. Up until 2017, Commission staff were able to contain this species to the townships near Phillipsburg; however, in 2017 samples were collected in Washington Borough several times throughout the season and one sample was collected from the Pollution Control Financing Authority (PCFA) in White Township. The extreme weather conditions of 2018 led to a population explosion and northward advancement throughout the county. In 2024, *Aedes albopictus* was collected in all but four municipalities (Blairstown Township, Frelinghuysen Township, Hardwick Township, and Hope Township). Frelinghuysen, Hardwick, and Hope remain as the only municipalities in the county to not have any historical collections of *Ae. albopictus*. Liberty Township saw its first *Aedes albopictus* collection since 2019, a singular adult female collected in the NJLT located on Tamarack Road. See Figure 10 for a map of *Ae. albopictus* collections in 2024.

In 2024, *Aedes albopictus* collections were the highest they have ever been. A total of 1540 adult female *Ae. albopictus* mosquitoes were collected across the following functioning trap types: CDC, BG, and gravid. This is a 400% increase from the 308 adult females collected in 2023! Out of 568 total traps set in 2024 (including functional GT, BG, and CDC traps), a total of 183 traps (32.22%) collected *Ae. albopictus* (either males, females, or both). A total of 128 functioning traps (including BG, CDC, and gravid traps) were set in response to service requests; fifty-one (39.84%) of those traps were positive for *Aedes albopictus*. Although the goal is to put forth a regular and consistent effort towards monitoring ATM populations throughout the Phillipsburg and surrounding areas where *Aedes albopictus* represents the greatest nuisance threat, the heightened disease activity in 2024 placed a greater emphasis on trapping in areas affected by positive mosquito pools. As a result, traps set in response to service requests were the driving force for conducting adulticide specifically for *Aedes albopictus* nuisance. There was one area wide adulticide that occurred in the Phillipsburg area using this data approach.

B. Rainfall Monitoring

The State Climatologist's Office reported the annual average precipitation for the state was 5.04" below the 1991-2020 normal at 42.52" with below normal precipitation being recorded for 8 months of the year. The fall of 2024 was the driest fall on record (back to 1895) with September being the 3rd driest September on record and October being the driest of any month of the past 130 years. The statewide average annual temperature was 2.2° F above the 30-year normal at 55.8°F and ranks as the 2nd warmest year since 1895. Above average temperatures were recorded for eleven months of 2024 in NJ. Nine of the 10 warmest years on recorded in the state have occurred since 2006.

The rain gauge located in Oxford at the Commission office collected a total of 46.53 inches of

precipitation for the year 2024. Rainfall amounts from this gauge are shown in Figure 11 for the months of April through September and reflect the rainfall that fell in the county in 2024. Please refer to Figure 11 for the ten (10) years of rainfall data from the Oxford rain gauge for the above-mentioned months.

The beginning of the 2024 mosquito season was shaping up to be a busy one as the county was on track with the 10-year average rainfall for the early spring months. However, in June there was a dramatic shift when the Oxford rain gauge recorded the lowest rainfall it had in the last ten years (1.37 inches)! Although August rainfall just barely exceeded the ten-year average for that month, the dry conditions that were sustained since June kept maintenance of larval inspection routes manageable throughout the season. The fall saw exceptionally low levels of rainfall; in fact, there was no rain recorded at the Oxford rain gauge for the entire month of October.

While the records kept at our office are helpful in comparing one year to the next, it does not provide accurate knowledge of what goes on in other parts of the county. The Community Cooperative Rain, Hail and Snow (CoCoRaHs) network was identified in 2009 as a source of real time precipitation data. This nationwide network had an increase in sites in 2009, in part due to newspaper coverage regarding this network. Cooperators in the county include Secretary Christine Fisher and Superintendent Jennifer Gruener in addition to our Oxford office. The CoCoRaHs precipitation maps were referred to almost daily and served well in 2024 to identify rainfall patterns that needed attention in various parts of the county.

C. Larval Mosquito Surveillance

1. Breeding Site Inspections

A detailed route system for our four districts is followed to monitor larval mosquito populations. Eleven thousand two hundred and thirty inspections were performed on mosquito breeding habitat throughout Warren County in 2024. Each year new sites must be added and sites that no longer pose a problem must be deleted from the site logbook and the detailed inspection route system. Inspection data is recorded in the field with handheld tablets. Site specific data is collected for every inspection and treatment, as per NJ Pesticide Control Regulations, and this data is then downloaded into the database at the end of every day. The FieldSeeker system allows for additional data to be recorded in the field or in the office, such as ownership information, site access, and inspector comments. Inspection and treatment history are stored on the tablets and are available to the inspector in the field at the touch of a button. The Activity Summary chart on Figure 12 contains a breakdown of inspections and control measures in the field by township for the 2024 season.

2. Larval Dip Counts

Larval samples are taken at every location when possible. Larvae are transported back to the laboratory and reared to 4th instar or adult so accurate identifications can be made. This information serves as justification for the pesticide application as well as documentation for permit applications for water management projects. Larval identifications are later entered into the FieldSeeker database for each site collection. Larval identification paper slips are also kept on hand for five years.

The first larvae of the season were collected March 11, 2024, in woodland pool habitats within Independence Township and included collections of *Aedes canadensis*. Spring collections were dominated by *Aedes canadensis*, although there were occasional collections of other characteristic early spring and snow pool species, including *Aedes stimulans, Aedes cinereus,* and *Aedes excrucians*. There is a continuing trend of early collections of *Aedes vexans*, a common summer species that is now being regularly collected as larvae throughout April; the mild winter conditions in 2024 led to several collections of *Aedes vexans* in March! There was only one significant rainfall event in August,

otherwise, larval collections were minimal because of a lack of available habitat. *Aedes vexans* and *Culex* species were the most abundant collected larval species.

D. Species List

The full New Jersey Species List (64 species), with Warren County species (46 species) bolded, can be found on Figure 13. There have been no new additions during the 2024 season. The most recent addition, *Aedes tormentor*, a floodwater species, occurred in 2021. Adult and larval collections of this species has been sporadic since then and there were no documented *Aedes tormentor* adults or larvae collected in 2024.

Even though there was one adult female *Aedes infirmatus* collected in September of 2021 from a New Jersey Light Trap in Independence Township, there have been no collections of *Aedes infirmatus* since. As a result, it remains unclear currently if there is an established population. Continued surveillance efforts must be made to collect additional adults and larvae before adding this species to Warren County's list.

VI. CHEMICAL CONTROL

All pesticide applications comply with pesticide regulations established by the NJ Department of Environmental Protection as well as the Pesticide General Permit of the NJ Pollutant Discharge Elimination System. The Recommendations for Insecticide Use in New Jersey, provided by the New Jersey Agricultural Experiment Station, are no longer followed for guidance in product selection and use since they are dangerously outdated (last publication 2012).

Particular insecticides have the ability to alter cholinesterase levels of exposed individuals. So, baseline cholinesterase levels are documented pre-season for each new employee that would be in contact with these insecticides. Currently, the only product in use in Warren County that would fit these criteria is Fyfanon ULV used for adult mosquito control (active ingredient malathion). Mid-season blood work is done when appropriate to check cholinesterase levels for employees who handle Fyfanon ULV regularly during the season. Appropriate action, if any, is taken based on test results. In 2024 Fyfanon ULV was used in rotation with the synthetic insecticide Zenivex in the adult mosquito control program. Employees deemed susceptible to the cholinesterase-inhibiting product avoided contact with it.

In 2010, a comprehensive plan was developed and put into place to address the New Jersey pesticide regulations that deal with the requirements of the School Integrated Pest Management (IPM) Act. A complete list of public and private schools was compiled. Any known breeding sites on any of these properties were designated for long term briquets and preparations are in place for notification to be made before these are applied in the spring. After year-end, annual reports are sent to affected schools listing insecticide applications. In 2024, nine sites located on school properties required pesticide treatments.

Under the US Clean Water Act administered by the US Environmental Protection Agency, the New Jersey Department of Environmental Protection developed a Pesticide General Permit (PGP), which included a use pattern for mosquito control to operate under. The draft general permit went into effect in November of 2011 with renewals being issued every five (5) years. On February 13, 2020, a final reissued General Permit under the PGP category was issued by the Department of Environmental Protection, which went into effect on March 1, 2020. The Commission received their permit on April 3, 2020. This permit expires on February 28, 2025. A renewal application was submitted in the fall of 2024, as required. The general permit authorization is issued in accordance with the NJPDES Regulations (N.J.A.C. 7:14A-1 et seq.). This permit authorizes the applications of biological and chemical pesticides in water when such applications are made in, over, or near surface waters of the State for certain pesticide use patterns (including mosquito control). The PGP required the

Commission to develop and operate under a Pesticide Discharge Management Plan (PDMP). The PDMP is updated annually and revised as necessary. Other forms were developed (ex: adverse incident report) or existing forms modified (ex: adult mosquito control application cover sheet to allow conversion of application to acreage) to satisfy requirements of the General Permit.

A. Larviciding/Pupiciding

Controlling mosquito larvae before they can emerge as adult mosquitoes and cause problems remains the primary focus of our operations. Larviciding is performed when source reduction, water management, and/or biocontrols cannot be employed.

1. Ground Applications

Ground larviciding is a major component of our abatement program. The Biologist, Senior Wetlands Specialist, Wetland Specialist, Inspector, and Heavy Equipment Operator along with the four seasonal inspectors manage the inspection routes during the season. The full-time staff members manage the ground larviciding before and after the seasonal staff are onboard and assist them during the seasonal peak. The seasonal inspectors carry out the bulk of the ground larviciding from June-August. This staffing allows us to keep up with inspecting and treating over 1000 sites currently. These districts and the number of sites in each township are shown in Figure 14, Inspection Districts & Site Breakdown. Inspection and treatment data for each site is recorded in the field with the use of the handheld tablets and that data is transferred into the FieldSeeker database at the end of every day. Treatment records can be quickly retrieved by site, date, inspector, insecticide, or municipality.

The majority of larval sites are treated with a liquid *B.t.i.* formulation using hand-pump compression sprayers. Extended release briquets are also utilized primarily in situations where there is a hazard or access concerns and in sites that are on school property. These briquets are utilized in the spring and provide season long control at these sites. Beginning in 2024, eight sites were selected from inspection district 3 for extended-release granular treatments. These sites were selected to provide more effective control of larval mosquitos and were treated three times during the season. In 2024, ground applications for larval mosquito control took place from late March through the middle of October, albeit a majority of larval treatments concluded by mid to late September. A portion of treated sites were backchecked to determine insecticide effectiveness and to make sure seasonal inspectors were visiting the correct sites and correctly applying the insecticides.

Starting in 2012, a relatively new and innovative way to apply larvicides for *Aedes albopictus* control was used. Area-wide applications of Altosid Liquid Larvicide were performed utilizing a truck-mounted ultra - low volume (ULV) sprayer. This method allows the product to settle in small pockets of water that are not practical to treat using traditional methods; however, the application is extremely expensive in both dollars and time. A standard procedure for this unusual type of application was tested and published by the Rutgers Center for Vector Biology. Area-wide notification utilizing the County's alert system (RAVE mobile safety) was done prior to the applications as well as notification postings on the Commission's and pertinent town's websites and social media accounts. Only one ULV larvicide application was performed in 2024. This application took place on August 8th in conjunction with an area-wide adulticide in parts of Alpha Boro and Phillipsburg.

2. Catch Basins

Catch basins, also referred to as roadside storm drains, are numerous and provide perfect larval habitat for *Culex* and other container breeding mosquito species. Throughout the years, the county's catch basins have been inspected and the hundreds of basins that consistently hold water have been indicated on paper maps. Those paper maps are still referred to, but now the catch basins that the Commission treats are also mapped with the FieldSeeker GIS database system and treatments are logged in real-time. The approximate number of basins that need to be treated on each route are as follows: Central –

63 basins, East – 552 basins, North – 47 basins, South – 819 basins. Insecticides that provide 30-60 days of larval control are typically used for catch basin treatments. Ideally, commission staff aim to treat catch basins at least three times during the active season. It typically takes two staff members about a week to complete the south basins, three-four days for the East route basins, one day for the North route basins, and one or two days for the Central route basins.

In 2024, catch basin treatments were completed three times during the active season starting on May 29th with the South route basins. North, Central, and East basins were done concurrently. All basins were treated a second time starting in mid-July and then a third time at the end of August.

3. Aerial Larviciding

Large tracts of larval habitat that cannot practically be treated by ground applications are indicated for treatment with fixed wing aircraft. Aerial larviciding is contracted annually. Bid specifications are revised and undergo attorney review during the off-season each year. In 2024, the bid packet was approved by the Commission at their December 2023 meeting and bid advertising occurred January 5, 2024. Bid opening occurred on February 6, 2024; Wings Aerial was awarded the Aerial Larviciding Contract by the Commission at their regular meeting on February 15, 2024.

All our aerial larviciding sites are digitally mapped and uploaded to an onboard navigation program, AgNav, which the pilot uses to accurately record his applications. The pilot uses these digital maps to pinpoint individual sites. In 2024, aerial larviciding sites were primarily inspected by the Senior Wetlands Specialist with help from other staff as needed. Following significant rainfall events, sites were inspected and when sites met the criteria, they were added to the list for the pilot to perform aerial treatment. A granular formulation of *B.t.i.* was used in all aerial applications during the year.

There was a total of three airsprays between April and August in 2024. In early April, more than three inches of rain was recorded at the Oxford rain gauge, which triggered a small airspray of 713 acres on April 14th. The beginning of August saw another three inches of rain recorded at the Oxford rain gauge resulting in another small airspray totaling 592 acres on August 10th. On August 19th, an additional 2.30 inches was recorded at the Oxford rain gauge triggering the largest and final airspray of the season covering 1,418 acres.

In 2024, aerial larviciding took place in Allamuchy, Frelinghuysen, Independence, Liberty, Oxford, and White Townships. Figure 15 maps the locations of the aerial sites and shows the number of times each airspray site was treated in 2024. Figure 15a contains a summary of the aerial larviciding applications that took place throughout the year as well as the acres aerially larvicided each year since the beginning of the Commission's aerial larviciding program in 1987. The graph shows the trend line of increasing aerial acreage over time.

B. <u>Adult Mosquito Control</u>

Our adult mosquito control program continues to be based on our surveillance program. Ideally, large hatches of emerging adult mosquitoes are detected by staff and treated quickly to keep the adult mosquitoes from entering the populated areas and generating complaints. However, this does not always occur and does not account for species utilizing container source habitat. Service requests from the public are responded to and investigated as soon as possible. Prior to any adult mosquito control applications taking place, adult mosquito surveillance is conducted to justify the applications. Surveillance includes the setting of CO_2-baited portable light traps, landing rate collections, or disease monitoring. Spraying for adult mosquitoes is dependent upon the number and species of mosquitoes collected and/or if any mosquito-borne virus is present in the area.

1. Notification

The legal notice for area wide adult mosquito control was reviewed and updated for 2024. The

schedule was developed for publication of this advertisement throughout the season in two newspapers (a legal ad in one paper, a display ad in the other) to best cover the entire county in accordance with pesticide regulations. Our advertising in 2024 continued to utilize two daily papers for better exposure.

Due to increased notification requirements as of November 2001, a Question-and-Answer Sheet on our Commission's program was developed and approved by NJDEP- Pesticide Control Program (PCP) in April 2002. This fact sheet was updated in 2015 and reapproved by the PCP. It is assembled with other required packet components (information on any product we may use in a given year for adult mosquito control, a copy of our legal advertisement, etc.) and sent to each municipality in the county prior to March 31st each year. In 2024, a copy of the entire municipality packet was posted to the Commission website, mailed to each municipality, and emailed to each municipal clerk to facilitate easy access by the residents. At the request of the Hunterdon County Mosquito Control, notification of Hunterdon County's Black Fly Treatment Program on the Musconetcong River was included with the Pohatcong Township municipal packet in 2024.

Since 2006, our website has been utilized to supply countywide adult mosquito control treatment information. Adult mosquito treatments are posted (by township) at least 12 hours prior to the scheduled treatment. All registered beekeepers within the county and three miles of the county border were notified by email 24 hours prior to any ground adult mosquito control treatments. Pesticide regulations require beekeeper notification of applications of products that are toxic to bees and occurring within a three-mile range of the hives; however, Commission staff sends a blast email to all registered beekeepers for every adult mosquito control application. The blast email is much more efficient than identifying which hives are within three miles of each treatment for every application and is more useful to beekeepers that transport their hives around the County. Twelve-hour notification calls were made to those residents who requested pre-notification. In highly urbanized areas, the county's alert (RAVE) system was used to alert residents of the upcoming adult mosquito control treatments. In compliance with the School IPM Act, schools are notified of planned adult mosquito control applications on their property in advance to allow them to conduct the required 72-hour notification to parents.

Aerial approval forms were sent to municipalities where aerial larviciding takes place. This was done in preparation for the possible need to aerially treat adult mosquitoes in case of mosquito-borne disease control in 2024 with the expectation that aerial applications would only be required in the municipalities with huge mosquito production areas. This approval is necessary to comply with FAA regulations if the area could be determined to be congested. Copies of the signed approvals that were obtained were forwarded to the contracted pilot prior to any aerial taking place in the respective municipalities.

2. Ground Treatments for Adult Mosquito Control

Our ground treatments for adult mosquito control operations ran from May 6, 2024, through September 30, 2024. A summary of our adult mosquito control applications by township can be found within the Activity Summary on Figure 12. Typically, adult mosquito control efforts begin in May in response to flood water species, followed by permanent water and container breeding species; this again held true in 2024. All WNV positive samples were responded to with targeted adult mosquito control applications to break the disease cycle and prevent human transmission. Since the 2024 season had above average WNV activity, a large portion of adult mosquito control efforts were in WNV response.

After the two primary ULV sprayers were mounted on the trucks (but before they were used) flow rate and droplet size were calibrated to ensure that each sprayer was performing according to label specifications. Flow rate calibration for the Cougar sprayer was conducted on May 1, 2024 and the Promist ULV sprayer was calibrated on May 2, 2024. Droplets were calibrated using the DCIII AIMS machine for the Cougar and Promist ULV sprayers on May 3, 2024.

3. Aerial Adult Mosquito Control

Aerial adult mosquito control applications were not necessary again in 2024.

VII. BIOLOGICAL CONTROL

A. Predatory Fish

The NJ State Mosquito Control Commission bio-control program was utilized again in 2024. Stocking fish in permanent/semi-permanent wet areas to control larval mosquito populations remains a vital part of our integrated pest management approach. Mosquito-eating fish are an excellent alternative to pesticide applications in certain situations. A total of 118,270 fish were stocked throughout Warren County in 2024 to control mosquito larvae. Stocking primarily occurred on the following dates: April 9, April 24, April 26, May 1, June 6, and September 6 (see Figure 12).

There were 87,158 *Pimephales promelas* (fathead minnows) stocked in Warren County in 2024. Fathead minnows have been utilized in our biological control efforts at sites that connect to streams and other bodies of water where native fish populations exist as per DEP regulations.

Gambusia affinis (mosquito fish) continue to work well in habitat types that retain water long enough to support the fish population, but stocking is limited to sites that are not connected to streams and don't have potential for overflow since this species is not native. Under correct conditions mosquito fish reproduce rapidly to establish a substantial population. A total of 28,072 *Gambusia affinis* were stocked at 8 sites on April 9th and at an additional 10 sites on September 6th.

For the 2024 season, *Lepomis macrochirus* (Bluegill sunfish) were made available for stocking and were received from the Hackettstown State Fish Hatchery. On June 27th there were 3,040 Bluegills stocked in two sites in Warren County. The sites selected were more permanent water bodies capable of supporting long term fish populations. By establishing stable, long term fish populations demand for resources such as pesticides and valuable personnel time can be reduced.

The Commission utilizes two 300-gallon livestock water tanks as temporary holding ponds for *Gambusia affinis* and fathead minnows after initial stocking is complete. The fish are held in these tanks until they are needed to stock areas as needed during the breeding season. This is extremely useful when stocking small amounts of fish in abandoned swimming pools. Rescue operations are performed when we know of an area that is in danger of drying down and those fish are relocated temporarily into our holding tanks. We use one purchased 30-gallon transportation tank, along with two fabricated 100-gallon transportation tanks, for our in-house stocking and fish rescue.

VIII. RESEARCH & FIELD STUDIES/COLLECTIONS

A. Insecticide Resistance Studies

Insecticide resistance is a heritable decrease in the sensitivity of an insect population to a particular insecticide or class of insecticides. It is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label directions for that species. Resistance usually occurs when the insect population is repeatedly exposed to the same or very similar insecticides over many years. With a limited number of insecticide choices available to mosquito control professionals, great care must be taken to manage insecticide resistance and monitor local mosquito populations for any sign of resistance. Building an effective monitoring program takes an investment of time, staff, and funding. It should be noted that insecticide resistance in mosquitoes is species specific and can be very localized. Additionally, baseline data for most species is not available.

Resistance to adult mosquito control products is the primary concern at this time since adulticide products in the United States have been limited to active ingredients with two modes of action for an extended period of time (organophosphates and pyrethroids). Resistance to both groups has been detected in mosquito populations in the United States. It has been hypothesized that at least some of this resistance stems from exposure due to non-public health uses, which are heavily biased towards pyrethroids.

There are several different ways to test for insecticide resistance in populations of adult mosquitoes. One of the most common ways currently in the United States is the CDC Bottle Bioassay. In this laboratory experiment, bottles are coated with a pre-determined dose of an active ingredient and mosquitoes are introduced to the bottle for 2 hours while the number of dead and alive mosquitoes is recorded at regular time intervals. Resistance is determined by the percentage of mosquitoes that die (mortality rate) at the pre-determined threshold time (diagnostic time). The test is run for the entire 2 hours unless all mosquitoes have died earlier than the 2 hours.

The SMCC funded workshops for counties to learn and practice the CDC Bottle Bioassay technique and establish baselines for their local populations in 2017, 2018, and 2019. Commission staff participated in those workshops and results indicated that local populations of Culex mosquitoes in Warren County showed varying degrees of susceptibility to the products being used. Those initial workshops showed the Commission staff the importance and the possibility of performing their own in-house bottle bioassay testing.

Additionally, the Northeast Regional Center for Excellence in Vector-borne Diseases (NEVBD) at Cornell University has offered insecticide resistance testing on adult *Culex pipiens* and/or *Aedes albopictus* samples collected by public health agencies for several years. The samples are collected as eggs and/or larvae, shipped to the NEVBD, and raised there to the adult stage. The adult mosquitoes are tested using the CDC Bottle Bioassay technique. The commission first participated in NEVBD's program in 2019 with *Aedes albopictus*; the results showed moderate resistance of *Aedes albopictus* to etofenprox, an active ingredient in one of the adulticide products (Zenivex E4). Several collection and submission attempts for this species have been made each year since; however, due to the time investment it requires and the competing demands of daily operations in mosquito control, not enough *Aedes albopictus* eggs have been successfully submitted to repeat the testing.

The Commission has also made attempts to collect *Culex pipiens* eggs and submit the larvae to NEVBD to raise and test for resistance. Results from our first submission of *Culex pipiens* to the program in 2021 indicated populations collected from Washington Township, Belvidere, and Hackettstown were exhibiting resistance to etofenprox. Fortunately, *Culex pipiens* populations from Washington Township submitted in 2022 showed no resistance to malathion (the alternative active ingredient used in Fyfanon ULV) indicating that that product would remain effective.

Unfortunately, collection efforts in 2023 did not yield the species of interest nor abundance needed to submit to the monitoring program, but CDC bottle bioassays were conducted in house against *Culex restuans*. There is no published diagnostic time for *Culex restuans* because there is not a susceptible colony (one that has not been exposed to insecticides in the past). All results were compared to the published diagnostic times for *Culex pipiens*. All three sites tested in 2023 mirrored similar results; *Culex restuans* were susceptible to malathion (an organophosphate) but exhibited high levels of resistance to etofenprox (a synthetic pyrethroid).

There were 10 egg collection events in 2024 between May 17 and July 19 between four collection sites. The primary site of interest continued to be Meadow Breeze Park in Washington Township (7 collections) since there are now multiple season's worth of bottle bioassay data against its *Culex* populations. Additionally, there was one collection event each at East Baldwin Street (Hackettstown), 7th Ave Quarry (Alpha), and the Belvidere Cemetery (Belvidere) in an effort to collect *Culex pipiens* to submit to the NEVBD testing program. A total of three-hundred-twenty-nine egg rafts were collected; ninety-four percent of the egg rafts collected were *Culex restuans* (309 egg rafts), three percent were *Culex pipiens* (10 egg rafts), and three percent were non-viable or contaminated (8 egg rafts). *Culex pipiens* egg rafts were collected from Meadow Breeze Park (1 egg raft), 7th Ave Quarry (2 egg rafts), and Belvidere Cemetery (7 egg rafts). Some of the identified egg rafts were reared to adult mosquitoes for use in bottle bioassays against active ingredients. In all bottle bioassays, there was a control bottle and three replicates. The data that follows represents the average mortality exhibited by these species when exposed to these ingredients.

The most plentiful collection of *Culex pipiens* egg rafts (7 total) was from the Belvidere Cemetery (Belvidere) on July 19. These egg rafts, in addition to *Culex restuans* egg rafts collected from the same location on the same day were shipped to Cornell University for the NEVBD pesticide resistance monitoring program. Both species were tested in bottle bioassays against etofenprox and malathion. The *Culex pipiens* exhibited high resistance to etofenprox but were susceptible to the malathion. Although there is no accepted diagnostic time for *Culex restuans*, their percent mortality mirrored that of the *Culex pipiens* in both circumstances.

The NEVBD were also able to perform enzyme testing of the *Culex pipiens* from Belvidere. The enzyme testing can provide insight into the mechanism of insecticide resistance being used by that particular resistant population. There are three primary mechanisms of insecticide resistance: metabolic resistance, altered target site resistance, and penetration resistance. For metabolic resistance, the components of an insect's metabolic system can adapt to more effectively breakdown insecticides (esterases, oxidases, glutathione-s transferases). When particular enzyme activity is higher than expected (compared to a susceptible population) the test indicates that this enzyme pathway is contributing to that population's insecticide resistance. The Belvidere population did not have elevated oxidase enzymes nor did it have elevated esterase enzymes (see Appendix 1, Pesticide Resistance Monitoring Report 2024). The lack of elevated enzyme activity indicates the Belvidere *Culex pipiens* populations are likely resistant to etofenprox by utilizing altered target-site resistance, also known as knockdown resistance. This information is extremely helpful operationally for managing these resistant populations.

Culex pipiens and *Culex restuans* egg rafts collected from the 7th Ave Quarry in Alpha on July 12 were reared to adults and tested in bottle bioassays conducted in-house against etofenprox and malathion on July 30. When exposed to malathion, *Culex pipiens* exhibited 100% mortality at the accepted 45-minute diagnostic time, showing this population susceptible to that active ingredient. The *Culex restuans* exhibited 97% mortality at the same time. In the assay against etofenprox, the *Culex pipiens* exhibited 47% mortality at the 15-minute diagnostic time; ninety-two percent mortality was exhibited after 60 minutes of exposure, three times the threshold, indicating high levels of resistance to etofenprox. The *Culex restuans* did not exhibit mortality greater than 90% until after 120 minutes of exposure.

Culex restuans collected on June 22 from Meadow Breeze Park (Washington) were used in bottle bioassays conducted in-house on July 11. In the assay against malathion, there was 100% mortality

achieved in 45 minutes. Two bottle bioassays were conducted against etofenprox; one solution was prepared in acetone and the other solution was prepared in ethanol (both are accepted preparation methods). Greater than 90% mortality was achieved between 30-45 minutes, suggesting resistance is occurring within the population.

An additional assay of the Meadow Breeze *Culex restuans* against etofenprox was conducted after the mosquitoes were exposed to the PBO (piperonyl butoxide) synergist in an effort to understand the mechanism of resistance. PBO inhibits oxidase activity, preventing a mosquito's enzymes from functioning properly to detoxify the pesticide. If this is the mechanism that is causing resistance in the mosquito population, one could expect that those exposed to PBO prior to pesticide exposure will exhibit higher rates of mortality earlier in the assay because their metabolic system is not working the same way. In the bioassay, greater than 90% mortality was exhibited after 30 minutes of exposure, but the mortality after concluding the assay at 120 minutes was equivalent to the assays conducted without exposure to a synergist.

A majority of the *Culex restuans* collected from Meadow Breeze Park on June 22 were saved and reared to adults for use in a caged-field trial against new product, ReMoa Tri in coordination with Valent BioSciences. In 2024, the rearing process took place within the lab and hallway so that the environment was temperature regulated. The larvae received daily care after hatching, including weekends, to ensure proper nutrition was provided. The inspector and biologist transported the adult mosquitoes to the Mercer County Mosquito Control office, where the adult mosquitoes were aspirated into holding cages. The wetlands specialist and other mosquito control professionals from various counties and the state participated in conducting the actual experiment. Results showed that when applied at 0.79oz/acre, ReMoa Tri exposure resulted in 93% mortality of our *Culex restuans* population up to 200 feet.

Now that commission staff have found techniques and strategies to successfully rear large abundances of robust, healthy adult mosquitoes, a future goal would be to revisit conducting our own caged-field trial. However, it is a very time-consuming process, not only leading up to the experiment but also during implementation. It must be noted that the information that can be gleaned from this kind of experiment is not to be undermined. After identifying resistance in our *Culex* populations, the commission has been cognizant of product rotation. Thus, continuing to test these populations would prove valuable. Selection pressure from mosquito control adulticides favoring resistance to etofenprox has been removed in these areas and can be used to determine if the degree of resistance is maintained or diminished in future years.

B. Mosquito Rearing Colony

There are often occasions when live mosquito larvae and/or adults are needed for insecticide studies and public outreach events. Since most events often occur during the off season, it is sometimes difficult to find live samples that are uniform in age. In the past, live larvae and/or aged adults were obtained from Rutgers University; however, they no longer maintain mosquito colonies for outreach purposes. In 2015, a colony cabinet was built and assembled in the laboratory for rearing mosquitoes in house. Initially, *Aedes atropalpus* eggs were taken from Rutgers stock and raised. This species is ideal for colonization since females can lay their first batch of eggs without a blood meal and those eggs are resistant to drying out. However, the *Ae.atropalpus* colony was finicky and required daily maintenance (including weekends), so in 2016, a colony of *Culex pipiens molestus* was started as a replacement. This species is also able to lay its first batch of eggs without a blood meal; however, the eggs must stay wet in order to remain viable. This colony has been very successful and is much easier to maintain.

The colony continued to be maintained in 2024 with the goal of continuing maintenance throughout 2025.

In 2024, adults raised in colony were used in a bottle bioassay conducted in-house as a point of comparison and evaluation to previous years' data. It had come to the commission's attention that the colony had originally been collected from a population that was already showing resistance, previously conducted bottle bioassays confirmed this. On March 28, colony mosquitoes that had been separated from the colony as egg rafts (to control the age of the adults being tested), were included in two assays against etofenprox; one solution was prepared in acetone, and the other was prepared in ethanol. Neither assay achieved the intended goal of greater than 90% percent mortality within the length of the assay (120 minutes). In nearly all replicates, mortality was inconsistent over the course of the experiment but at the accepted diagnostic time of 15 minutes for etofenprox, the average mortality across both assays was merely 27%. These results indicate that the colony has high level of resistance to this pyrethroid and will likely exhibit resistance to other related pyrethroids. Even though there is no selective pressure on the colony to maintain this resistance, without introducing new specimens to diversify the genetic pool, it is expected that this resistance will continue. Unfortunately, this limits how the colony can be used for insecticide resistance testing.

C. Unmanned Aircraft Systems (UAS)/Unmanned Aerial Vehicles (UAV) – Drones

In 2023, Warren County Mosquito Control Commission initiated a transformative step by trialing unmanned aerial systems (UAS), or drones, into our operations. This marked a significant potential enhancement in our capabilities for mosquito control and environmental mapping to improve our inspection, treatment, and data management processes. An integral part of this program was the acquisition of the FAA Part 107 certification by both the Wetlands Specialist and the Inspector, enabling legal and safe commercial drone operations.

In 2024, mapping and inspections continued with the DJI Mavic 3E for its first full season in use. This generated quite a large set of data. Baseline work done in 2023 to determine the data storage and software needs estimated an average of 4.5Gb of high-resolution imagery per "operational flight". To manage this influx of data, data storage options were explored, and it was decided that a 16-terabyte network attached storage (NAS) configured in RAID 5 (Functionally 12Tb), would allow for the storage of approximately 888 flights per year over a three-year span. Options for storing processed data, either locally on one of the desktop computers, the previously discussed 16 Tb NAS, or on the existing server are being explored with the help of Amitech Computer Services. After a full year of mapping flights, the average size of the data set has increased to an average of 9.5gig per flight, this was taken from the last 12 flights of the season which totaled 115gig and is currently being stored locally on the wetlands specialist's computer.

For the 2024 season there were 83 flights, totaling 15h 44 min and 272 miles traveled. With approximately 38,500 pictures taken and 36 maps generated. All operations were conducted incident-free, reflecting our commitment to safety and precision.

For mapping software, Drone Deploy and PIX4D were evaluated with trial subscriptions in 2023. Drone Deploy requires an internet connection for cloud processing and is more user-friendly. PIX4D offers more power, and because it processes data locally, allows for the possibility of processing data in real time data in the field. This could be advantageous for future drone treatments and/or provide additional last-minute data to make informed operational decisions. When the trial periods expired, another option was explored, webODM, an open-source option. It generated good results but was difficult to install in its open source (free) format. The wetland specialist purchased a key and shared it with the commission. This greatly increased webODM's functionality and usefulness, significantly speeding up processing times and reducing failed processing attempts, though some failures still

occurred. WebODM was used for the majority of the year and is serving the Commission's needs. However, in an effort to process the imagery even faster, ClusterODM, a companion software package to WebODM, is currently being explored as a way to distribute computing resources to the local network of commission computers. It will run in the background of the other computers on the local network to process chunks of imagery, distributed by the main computer. The main computer will then assemble the chunks of data and build a complete imagery dataset

During the 2024 season the second phase of the drone program was initiated, the purchase of a treatment drone. Many factors were considered, price, modularity, country of manufacture, and after sale support. After much discussion and examination of the options, it was decided that the Hylio AG-210 was the best choice. This UAS is relatively small for a treatment drone, the price is competitive, and it is manufactured in the U.S.A. using Blue Listed flight computer and controller. The Blue Listed components negate the potential for grounding of a Chinese drone. The treatment drone was received on October 4, 2024. The after-sales support has been excellent and has continued thus far. In-person training and initial calibration were performed on October 22nd -24th and the FAA certificate of authorization, COA, was received December 17, 2024. AgroSol, the software for the Hylio AG-210, was installed on both the Wetland Specialist's computer as well as the Inspector's computer. This software allows staff to plan, organize, and execute/log treatment missions.

The integration of UAS technology into our operations is a significant step forward. We are optimistic about the potential expansion of this program, including additional treatment drones. This technological advancement aligns with our goals of improved operational efficiency and accuracy in our mosquito control program.

D. Grant Funded Tick Surveillance Project

In 2021, the New Jersey Department of Health announced that a small amount of grant funding would be available to five counties for a tick surveillance project. The Commission submitted a Letter of Interest and an application and was awarded $12,000.00 in grant funding along with four other counties. Grant funding runs on an off-center fiscal cycle from August - July and can possibly be renewed for a 5-year cycle. The first grant cycle was August 1, 2021 – July 30, 2022, grant funding was renewed for a second cycle from August 1, 2022 – July 30, 2023, and a third cycle from August 1, 2023 – July 30, 2024. The grant funding was renewed once more for August 1, 2024, through July 30, 2025.

The NJDOH Grant Funded Tick Surveillance Project started in Warren County in the fall of 2021. At that point, the primary focus was selecting long-term surveillance sites with suitable habitat for *Ixodes scapularis* ticks, the perpetrator of the majority of tickborne disease in Warren County and the focal species for the surveillance project. As the program has grown and expanded, additional sites have been identified throughout the county. All sites are sampled using a 1-meter square drag and are ideally sampled for a total of 750 square meters (for density calculation purposes). A total of twenty-five sites were sampled throughout the year at varying frequency. Collected ticks were identified to species and submitted to the Public Health and Environmental Lab (PHEL) for disease testing. *Ixodes scapularis* ticks are tested for the pathogens that cause anaplasmosis, babesiosis, Lyme disease, and hard tick relapsing fever. *Ixodes scapularis* ticks are also tested for Powassan virus. *Dermacentor variabilis* ticks are tested for the pathogens that cause rickettsia.

The focal species during the spring collection season is *Ixodes scapularis* nymphs. Thirteen sites were visited between March 13 and June 11, 2024. Some locations were only sampled once during the presumed nymphal peak while others were sampled upwards of five times throughout the spring collection season. A total of 31,410 square meters were sampled resulting in 572 total ticks collected. The most abundant species collected was *Ixodes scapularis* (55 adult females, 60 adult males, and 392

nymphs), but there were also collections of *Ixodes dentatus* nymphs (4 total) and *Dermacentor variablis*, the American dog tick (23 adult females and 18 adult males). There were 20 *Ixodes* larvae also collected; however, since larvae have not had a previous blood meal, these specimens are not a public health concern and are not considered for disease testing.

A total of 525 pools containing 548 ticks were submitted to PHEL for disease testing throughout the spring tick surveillance season. A total of 206 pools were positive, which includes 28 co-infections and 3 tri-infections. The greatest number of positive pools (131) were positive for *B. burgdorferi*, the bacterium responsible for Lyme disease, while there were 30 pools positive for *A. phagocytophilum*, 11 pools positive for *B. miyamotoi*, and 33 pools positive for *B. microti*. Of notable concern was one positive pool for Powassan virus collected from the Port Murray Preserve Morris Canal Trail in Mansfield Township. There were no positive pools for *R. rickettsii*.

Collection efforts for the fall season, where the primary species of interest is *Ixodes scapularis* adults, began on September 30 and concluded on November 19. A total of twenty-five sites were sampled during this time, totaling 25,500 square meters. In addition to the sites visited in the spring, a strong effort was made to explore other sites throughout the county to start minimizing data gaps, so sites were only visited between one to two times throughout this period. There were 524 specimens collected, including 267 adult female *Ixodes scapularis*, 250 adult male *Ixodes scapularis*, and 5 *Ixodes scapularis* nymphs. There were also 2 *Ixodes* larvae collected from one site. The greatest collection of ticks was from the Coventry Pond Trail in the Delaware Water Gap National Recreation Area (64 specimens).

A total of 522 pools consisting of 522 adult *Ixodes scapularis* ticks were submitted to PHEL for disease testing from the fall collection season. There have been 42 pools positive for *A. phagocytophilum*, 287 pools positive for *B. burgdorferi*, 12 pools positive for *B. miyamotoi*, 81 pools positive for *B. microti*, and 8 pools positive for Powassan virus. These results include 94 co-infections, 10 tri-infections, and 1 quad-infection. Since there were no collections of *Dermacentor variabilis* in the fall, no ticks were tested for *R. rickettsii*. Most concerning were the eight positive pools for Powassan virus from six sampled sites from five different municipalities.

Sites visited during the spring and fall collection seasons can be found in Figure 16 mapped alongside Lyme Disease incidence data from 2017-2021 from the Warren County Health Department. A summary of the tick species and life stages collected at all sites during both the spring and fall collection periods can be found in Figure 16a. A summary of the number of positive pools for each site during each collection season can be found in Figure 16b.

In the year 2023, a total of $12,118.14 was expended on the tick surveillance project. Payroll accounted for $6,692.02, training and supplies totaled $4,482.33, and mileage reimbursements totaled $943.79. For the spring surveillance season there were 194.75 staff hours at a cost of $4765.03 compared to the fall surveillance season when there was 80.5 staff hours spent, which totaled $1,926.99. As in the past, spring tick surveillance proved more laborious than fall tick surveillance due to the higher numbers and smaller size of the nymphal and larval ticks encountered.

As mentioned, the tick surveillance project was funded by a grant from the NJ DOH that was first awarded for the 2021/2022 grant year and was renewed for the 2022/2023 and 2023/2024 grant year. This grant is provided through the Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases (ELC) Cooperative Agreement between the NJDOH and the Centers for Disease Control (CDC). The current ELC Cooperative Agreement between the NJDOH and the CDC is from 2019 – 2023 with a possibility of renewal for another 5-year cycle.

E. Lethal Ovitraps

The gravid *Aedes* traps (GAT), a type of lethal ovitrap used in a 2023 experiment were not utilized in 2024.

IX. WATER MANAGEMENT

Water Management allows for the elimination or reduction of mosquito breeding habitat and is an integral part of an integrated mosquito management approach. Water management includes habitat modification and/or source reduction and can be an effective long-term means of mosquito control. Major water management projects must gain prior approval from various state and federal agencies. Guidelines are detailed in the Commission's blanket permit issued by the NJ Department of Environmental Protection -Division of Land Resource Protection. Each blanket permit is valid for five years. The Commission's previous permit expired on May 10, 2023. A new blanket permit was applied for and received in the spring of 2023. Just like the old permit, it includes a Flood Hazard Area General Permit 2 (Mosquito Control Water Management Activities), Freshwater Wetland General Permits 1 (Maintenance and Repair of Existing Features) and 15 (Mosquito Control Activities), and a Water Quality Certificate. The new permit is valid from May 15, 2023, until May 14, 2028.

Six water management complaints in five townships were responded to in 2024.

In January, a resident in Harmony called about a stream overflowing its banks and laying stagnant in his farm fields. This was caused by the severe rain that occurred in July 2023. Upon inspection it was noted that the stream bank had blown out, entering the farm field and then curving back into its original bed a little further downstream. The water was flowing at the time of inspection in January. The area was reinspected in April and was found to be dry. The resident stated that he was in contact with the NJDEP about getting the stream put back into its banks.

In April, a resident called about stagnant water in his farm field in Knowlton along Route 94. The water in the field is connected to a pond across the road via a concrete pipe that goes under the road. The pipe is not clogged. The pond area and the water in the field have been routinely inspected sites for many years on the north route. The pond is stocked with fish and the fish sometimes enter the site across the road along with the flood water. The resident was told that he can fill the low area in his field as a possible remedy.

Also in April, a resident from Hackettstown called about backyards flooding along Hurley Street. The railroad company diverted water from one side of the railroad tracks to the other side and now a large amount of water enters the backyards of multiple homes. The caller set up a system of dams, pipes, and diversions to keep the water running along the back of the properties. The water then enters a small, wooded area where it flows directly into the ground. This has provided a temporary solution to their issue. Exploration of the railroad bed area found a large amount of running water along stretches of the railroad and some areas of water housed copious amounts of small fish.

A third water management complaint in April came from a caller in Allamuchy reporting a pipe running under Rydell Road was clogged. The pipe was found to have a couple large branches with snagged debris partially obstructing the flow of water. These branches were removed, and full flow was restored.

In July, a representative from the Musconetcong Watershed Association called to report a tree in the river in the area of their camp. A large tree was found to have fallen halfway across the river. The area was unable to be accessed with our excavator. Our seasonal workers happened to be available as the

routes were dry at the time. We took a team of 6 employees total down to remove the tree by hand. Branches of the tree were methodically cut and carried out of the river and piled on higher ground.

Another caller in July reported a beaver dam in Trout Brook on land behind Rydell Road. Upon inspection about a week later, the dam was found to have been removed. However, there were already signs of the dam being repaired and rebuilt. The resident called again in the beginning of August and said that the dam had been rebuilt. If the dam is still active in the spring, it would be a good candidate for pipe installation to mitigate upstream flooding.

In November, a resident on Imlaydale Road in Washington Township reported logs partially blocking the Musconetcong River behind her home in two places. Inspection of the area revealed just that. There were two areas of the river where trees had fallen in, but the river was still flowing around the partial obstructions. The area is inaccessible with the excavator as it involves a steep bank. The resident said his concern lies in kayaker safety, as someone could become entangled in the logs. There is a tail race in the area where the resident stated does hold water sometimes in such a way that it could produce mosquitoes. The resident was given a business card and told to call the office in the spring if mosquito issues arise.

The statewide Water Management network established in 2001 met twice in 2023: the first meeting was held on January 27th and the second was on April 19th. The focus of both meetings was on revising the currently outdated Best Management Practices for Mosquito Control in Freshwater Wetlands manual, which is currently underway.

A. Activity Summary

1. Projects

a. FWW GP1&15/FHA GP2 Projects

One blanket permit project was performed in 2024. The ditches at the end of Freeborn Lane were cleared of silt, debris and small saplings that were beginning to emerge and interfere with the function of water conveyance. The entire project took about 3 weeks and went exactly as planned.

b. Permit-By-Rule Ditch Clearing Projects

Regulated ditches and waterways can be cleared of blockages under a Permit-By-Rule 6 (removal of major obstructions from regulated waters with machinery). No ditch clearing projects were done in 2024; however, two stream desnagging projects under this permit were completed (please refer to the Stream Desnagging section under 2. Maintenance).

2. Maintenance

a. Hand Cleaning

Hand cleaning for the maintenance of existing drainage structures was completed 61 times in 17 municipalities in 2024. Container dumps were completed 51 times in 14 municipalities. (Each recorded instance of a 'container dump' may, and often does, include the drainage of multiple sources of larval habitat in one area.)

b. Access Brushing

Hand clearing of brush for access to mosquito breeding sites was performed 142 times in 15 municipalities in 2024.

c. Trail Mowing

Trail mowing was completed at only three of seven locations that are regularly maintained by the Commission for access. The locations mowed in 2024 included the following: Young's Island Road ditch system in Independenceand Cat Swamp and Axford Avenue Wildlife Management Area in Oxford Township. Areas that were unable to be mowed included the Freeborn Lane ditch system in Allamuchy Township, the Bear Creek Road airspray access road in Allamuchy Township, the Love Pallet Company ditch system in Pohatcong Township, and the routine inspection site on Still Valley Road in Pohatcong Township.

d. Stream Desnagging

This activity is regulated by Permit-By-Rule 6. All activities that meet the requirements of the Permits-By-Rule may be conducted without prior NJDEP approval. However, machinery must be situated outside the regulated water. They may be used to reach into the waterway to remove material but cannot be driven or otherwise placed in the regulated water.
Two machinery-assisted stream desnagging projects were completed in 2024.

At the end of July, a blockage was cleared from a section of the Pequest River between Kenco and Island Dragway in Independence Township. The machinery was staged on Island Dragway property and the east and central route seasonals assisted in the project. All logs removed were stacked at least 25 feet from the top of the bank.

A larger blockage on the Pequest River was removed in early September. This one was located along Route 46 and Hudson Lane in Liberty Township. Initially, the river was approached from its southern side and most of the logs were accessible from there. Cables needed to be used to reach some of the pieces closer to the middle of the river. There were some portions that were unable to be reached from the south side of the river. The excavator has to be loaded out on the trailer and hauled to the Hudson Lane side in order to complete removal of the remaining debris.

Permit-By-Rule 5 (removal of accumulated sediment and debris from a regulated water by hand) was utilized once in 2024. This rule authorizes the removal of accumulated sediment and debris by hand provided no machinery besides handheld equipment is used in the regulated water, the bed and natural banks are not altered, fishery resource timing restrictions are followed, and disturbance is minimized. Information about the activity performed in 2024 can be found detailed above in the section describing water management complaint responses.

B. <u>Stormwater Facilities</u>

NJ stormwater rules were enacted in 2004. The collective stormwater regulations are comprised of two rules; one governs how municipalities will regulate new development with respect to stormwater and a second requires municipalities to comply with new permits that control how municipal storm systems are managed. The NJDEP has developed a guidance manual with input by various constituents including the Warren County Mosquito Control Commission and several other NJ Mosquito Control agencies. Of particular interest and concern to mosquito control agencies is the recommendation of Best Management Practices (BMP's) such as constructed wetlands and infiltration basins. These systems are known to breed mosquitoes without proper design, construction, and maintenance. Underground stormwater facilities are becoming more common in Warren County. These present nearly impossible conditions for inspecting and treating. Without surveillance capabilities, it is unknown whether these underground structures will produce mosquitoes, which is problematic.

Detention basins have one or more inlets and one outlet structure. If designed and constructed correctly, water should drain from these within 72 hours. Infiltration basins have one or more inlets and no outlet structure. Water should infiltrate these within 72 hours. Retention basins have one or

more inlets and no outlet structure. These should hold water year-round and usually have aeration or fish to prevent them from becoming larval habitat.

All basins were inspected for standing water and larval mosquitoes. There are different ways that basins can provide larval mosquito habitat. Clogged drainage holes in outlet structures cause water to back up and stagnate in low flow channels. If a basin is mowed under saturated soil conditions, ruts are created that collect water and serve as larval mosquito habitat. Lack of maintenance can cause basins to convert into mosquito-producing wetlands. Infiltration basins without the proper substrate will hold water longer than they should.

Many of the stormwater basins that the Commission is aware of are inspected and treated, if necessary, on a weekly basis. A sumped outfall structure is one in which the bottom of the structure is lower than the bottom of the pipe that is meant to convey the water out of the structure. This causes water to stagnate in the concrete structure. The length of time that the water remains depends on the depth of the water which can measure anywhere from 1" to 12" or sometimes more. Many species of mosquitoes will utilize this larval habitat. Outfall structures without sumped bottoms drain properly and quickly and do not hold water.

In 2016, the Commission was notified of a resource called the New Jersey Hydrologic Modeling Database. This electronic database is available online and is the culmination of several decades of data collection efforts by NJ Soil Conservation Districts and the NJ Department of Agriculture. It shows mapped locations of stormwater facilities throughout New Jersey. The list of stormwater facilities on this database is periodically checked against the Commission's own database.

C. Tires

Since 2008, a cooperative agreement between the Warren County Planning Department and the WCMEC has allowed for a shared 45' trailer to be placed at the County Road Department facility in Belvidere. The trailer is filled, by both road department staff and mosquito commission staff, as abandoned tires are found throughout the year. At year end, the trailer is picked up by a recycling facility and replaced with an empty trailer for the next year. In the past, payment has alternated between the Commission and the Warren County Planning Department. However, since 2017 the Planning Department has been receiving a grant that covers the cost of the tire recycling. The number of tires picked up by Commission staff is listed by municipality in Figure 12 Activity Summary.
In cooperation with the Musconetcong Watershed Association (MWA), every year since 2011 we have picked up tires from their river clean-up sites and added them to the trailer we utilize for recycling. In 2023, the MWA notified the Commission of the locations of stockpiled tires from their cleanup.

The PCFA tire recycling program, launched in 2015, was continued in 2023. The program was brought about by the Warren County District Landfill, in conjunction with the Warren County Board of Commissioners, the Warren County Mosquito Control Commission, and the Warren County Health Department. One of the stated purposes in mind was to help control West Nile virus and other diseases spread by mosquitoes. The landfill located at 500 Mt. Pisgah Avenue in Oxford began accepting tires with or without rims from residents, small businesses, and farming communities in Warren County only. The fees were: $2.50 for tires up to 22", $5.00 each for tires 22.5" to 24", and $10.00 each for tires 24.5" to 50".

If tires are seen on private property, attempts are made to contact the property owners. This is an opportunity to educate them about tires and their ability to produce mosquitoes and the diseases those mosquitoes can transmit. Residents are advised to keep tires under cover and dry, or to recycle them through PCFA. If time and space allow, employees offer to take the tires to our trailer. If a resident

isn't home at the time the tires are seen, any present mosquito breeding is abated, and a door knocker is left for the resident. The visit is documented, and a return visit is made when time allows to follow up on the situation.

D. Catch Basins

No specific measures were taken in 2024 to encourage clean out of catch basins to keep water flowing but this is to be done routinely by departments of public works under existing stormwater legislation.

E. Swimming Pools

Abandoned swimming pools can be prolific mosquito producers. A spreadsheet of unmaintained swimming pools has been kept since 2012. The spreadsheet is divided by district and contains the addresses and inspection notes for each pool. Ms. Fisher reviews all the unmaintained pool complaints for each year and updates the spreadsheet accordingly. The list is updated as pools are taken down or restored to use. By the end of 2024, 61 unmaintained pools, with at least one pool located in 21 townships, remained on the list. This number is up four pools from 2023, including one that was previously on the list for eight years. The pools that are found producing mosquitoes are stocked with mosquito-eating fish or treated with a long-lasting control product and reported to the Warren County Health Department.

F. Beaver Management

The beaver dam located along Trout Brook in the area of Johnsonburg Camp located in 2023 was active again in 2024. The impoundment was stocked with 5,000 fish in early May and then another 1,500 fish in late June.

G. Site Plan Review

Copies of Land Use Regulation Permit applications are periodically received by our Commission and are to be reviewed and comments/suggestions made when appropriate.

Warren County has been the target of a growing number of Wetland Mitigation sites in recent years. When the Commission is made aware of these sites, the plans are sought and reviewed. Comments on these plans are given to the respective Township Land Use Boards and other interested parties, when requested. Mitigation sites are often previously ditched farm fields that are being restored to natural wetlands. The Commission has been monitoring these sites by attending township meetings and conducting site inspections.

The Commission is currently aware of six wetland mitigation sites in Warren County. Roes Island mitigation site is located off Island Road in Independence and Liberty Townships. Kenco wetland restoration site is located off Alphano Road in Independence Township. The Trout Brook wetland preservation/mitigation bank is located at 203 Bear Creek Road. The Pequest River mitigation bank is located at 55 Gibbs Road in Allamuchy Township. The Oxford Western mitigation bank is located off Lower Denmark Road in Oxford. The Watergate Wetlands Restoration project is located off Old Mine Road in the Delaware Water Gap National Recreation Area. The Commission has been monitoring these sites when time allows by conducting site inspections. Growing numbers of larval and adult mosquitoes are being found at these completed mitigation sites. The burden of inspection and treatment of these sites is proving to be quite time consuming. Discussions seeking reimbursement from the state for partial or total costs for mosquito control on state owned and/or state created mitigation sites began with the State Mosquito Control Commission in 2018.

In 2024, no inspections were performed at wetland mitigation sites.

X. PUBLIC EDUCATION

Most of the restrictions in place due to the COVID-19 pandemic, lifted allowing staff to once again communicate our public health message. Most outdoor festivals and educational opportunities resumed; however, school visits for presentations did not resume until later in the 2022-2023 school year. A marked increase in interest occurred starting in 2024.

A. Literature/Poster Distribution

Files with handouts on pesticides, general mosquito control, ticks, etc. that are commonly requested are kept on hand in the office and in each of the vehicles for easy access and distribution to concerned residents.

B. Community/School Presentations/Displays

The Commission offers *Mosquito & Ticks: An Interactive Approach* to all fourth-grade classes in Warren County. Emails outlining the program are periodically sent to all fourth-grade teachers in the County. The program includes PowerPoint presentations covering ticks, mosquito biology and control and hands-on learning stations. The learning stations include live mosquitoes and fish, preserved ticks and mosquitoes, a preserved dog heart with heartworm disease, activity sheets and games. Two microscopes, insect eye viewers and molded mosquito life cycle models were added to the program. In 2024, mosquitoes and ticks preserved in resin were created by Ms. Giordano.

The Commission has a table-top tri-fold display that is used for inside venues and is generally left on display for extended periods of time. The information on the display is developed and changed periodically by Ms. Fisher. Our staffed displays are generally for one-to-two-day events, with the exception of the Warren County Farmers' Fair, which is an eight-day event. These displays familiarize the public with the Commission's activities and teach the public to recognize mosquito larvae in their own backyards.

Several posts were prepared for the Warren County Facebook and Twitter pages, which were shared with townships for their Facebook pages and websites to promote several community awareness days, promote community action *Dump & Drain* campaigns after high rainfalls, and also as a reminder during the fall to take precautions to prevent tick bites.

In 2024, the following presentations were given regarding mosquitoes and mosquito control:

Presentation/Display List:
National Mosquito Control Awareness Week
Warren County Farmer's Fair

The Warren County Farmer's Fair display theme for 2024 was *The Cutting Edge of Mosquito Control.* The display featured Unmanned Aerial Systems, the Leica Digital microscope, ULV Droplet Technology, Insecticide Resistance Studies, and GIS Mapping and FieldSeeker. Educational fliers, pens, repellent wipes and mosquito swatter handouts, as well as the photo board, Albo Annie, and the all-time favorite mosquito eating fish, were available in the display booth.

The table top tri-fold board and handouts were displayed at the Southwest Branch of the Warren County Library April 15-26, 2024 for World Malaria Day and at the Southwest Branch, June 17-21, 2024 and the Richard Gardner Branch, June 26-July 8, 2024, of the Warren County Library for National Mosquito Control Awareness Week.

School Presentation List:
Blairstown Elementary School

Great Meadows Elementary School
Oxford Township School
Allamuchy Elementary School
Pohatcong Elementary School
Harmony Township School (Twice, 2023-24 and 2024-25 School years)
Washington Memorial Elementary School
A total of 366 students were educated on mosquitoes and ticks in 2024.

In June of 2023, the Commission agreed to partner with Cornell University to learn more about community perceptions on mosquito-borne disease risk, bite prevention, and mosquito management. Cornell University implemented focus groups in the south, central, and north regions of the state as well as in other states in the northeast. The Commission staff helped Cornell staff recruit volunteers through social media, at the county and municipal levels, and word of mouth and also offered suggestions on a venue to hold the focus group meeting. Although turnout was low, Cornell reported that they were able to complete the study and felt that any more participants would have actually hindered the effort. The summary of the findings for the northeast were received in 2024 and is attached (Appendix 2 – Community Thoughts on Mosquito Control). The full study was published the Journal of Medical Entomology, Volume 62, Issue 2, March 2024, Pages 435-448, " **A qualitative analysis of perceived risks and benefits of mosquito abatement and bite prevention strategies in Northeastern U.S. communities",** by Emily M Mader, Nia Clements, Áine Lehane, Jody Gangloff-Kaufmann, Scott Crans, Chris Horton, Amelia Greiner Safi and can be found at: https://doi.org/10.1093/jme/tjae144

C. Office/Truck Files

Files with commonly requested handouts on pesticides, general mosquito control, ticks, etc. were maintained in each of the vehicles for easy access and distribution to concerned residents. This collection of handouts includes a flier on mosquito control in Spanish. These files were revamped in 2020 and continued to be available in 2024.

D. Ticks/Lyme Disease

A presentation on ticks and prevention of Lyme disease is included in the Commission's program that is offered to county schools, *Mosquitoes & Ticks: An Interactive Approach.* One of the four hands on station includes preserved ticks of various species and life stages so that the children can appreciate their small size and varying appearances. Children are also provided with tick bookmarks or identification cards, provided to the Commission by the NJ DOH, the CDC, and Rutgers and also worksheets to assist in their education. The Commission includes tick information with other educational handouts for the public during routine inspections as well as at educational events. Tick Grant funds were used to purchase an additional child's microscope and preserved tick slides for use in the school presentation in 2024.

In 2022, Prevent Tick Bites trail signs were ordered from the CDC and were placed on walking trails in the Frelinghuysen Forest Preserve and provided to staff at several other locations to alert the public to protect themselves due to the high populations of ticks in the area. In 2024, Prevent Tick Bites trail signs were also provided to mark the Oxford Mountain Trail. Also, Prevent Tickborne Disease bookmarks were also received from the CDC to hand out at public education events.

E. Presentations/Publications

Soldering Secrets: Fluxing Your Way to the Top, by John Necina presented at the 2024 NJMCA Annual Meeting Film Festival – March 22, 2024
Precise Pinning Practices: Practical Pointers for Pest Professionals by John Necina presented at the at 2024 NJMCA Annual Meeting Film Festival- March 22, 2024

West Nile virus Update, by Jennifer Gruener and Michael Ricciardi, Warren County Health Department, presented at the September 11, 2024, Warren County Board of Commissioners Meeting

F. Internet Presence

In 2005, the Commission arranged for its own website utilizing the domain name www.warrencountymosquito.org. The domain name www.warrencountymosquito.com also continues to be registered. Information for the Warren County Mosquito Extermination Commission was updated on the Rutgers hosted website within NJ Mosquitoes: Biology and Control at www.njmosquito.org. A link to this site is provided on the general web page for Warren County http://www.co.warren.nj.us/.

The Commission's original website content was finalized in February 2006. Minor modifications were made to the website following subsequent reviews and comment from the public. The website was updated in 2015 to be more compatible with current handheld devices and with current browser technology and web standards, to allow Commission staff to update more areas of the website, and to give the website an updated appearance. In 2021, the website had to be moved to a new host server since the current server could no longer support the outdated code it was written in. Since the cost of migrating to a new platform was above the quote threshold, it was temporarily moved, along with the staff email, until a more permanent solution could be found. Quotes and proposals for redesigning the website were sought and the quote from Computer Images Web was approved in December 2021. The website redesign and transfer took place and went live in 2022.

Unfortunately, in October 2022, the website was blacklisted by Google due to security issues. Although a specific cause was not determined, it was thought that the website or email addresses were hacked. Amitech Computer Services, the company that provides IT services for the commission, recommended My Corporate Hosting Solutions be contacted to handle the website and email addresses. The current website and email were reviewed, security suggestions were made, a quote received and accepted. My Corporate Hosting Solutions placed the website and email addresses on separate servers for the most security, Wordfence security was added to prevent intrusion attacks and allow MCHS to block other countries from accessing the website. Also WordPress semi-annual updates are run to keep the website's WordPress core, themes, and plugins up-to-date, and the email system was changed to Office 365.

Adult mosquito control information has been provided on the Commission website for County residents to access since 2006. A link to this information is predominantly displayed on the main page of our website. In 2018, a link to the municipal information packet was added to the main page of the website. In 2020, a link to the aerial larviciding treatment information was added to the main page of the website.

G. Media Coverage

Several radio interviews with WRNJ were conducted throughout the season.

Notices were supplied to townships where aerial larviciding and adult mosquito control took place for posting on their websites and social media platforms. The municipalities of Allamuchy, Alpha, Belvidere, Franklin, Greenwich, Hackettstown, Harmony, Hope, Liberty, Lopatcong, Oxford, Phillipsburg, Washington Township, were supplied with notices for posting on their website and Facebook pages regarding WNV activity. The County mass notification system, Rave, was used to send alerts to the entire county following a significant rainfall event to ask residents to dump any standing water on their property. Rave was also use on August 1st and 5th, 2024, to alert certain areas of Alpha, Greenwich, and Phillipsburg municipalities about adult mosquito control taking place due to West Nile virus and high populations of *Aedes albopictus* mosquitoes.

H. National Week Observance

Unfortunately, our usual displays for Heartworm Awareness Month/Malaria Day and National Mosquito Control Awareness Week were not exhibited at the Administration Building because the building was closed to the public.

In May, Tickborne Disease Awareness Month was promoted by sharing multiple blurbs and NJDOH and CDC graphics on the County Facebook and Twitter pages and also on municipal websites and social media forums. In April for World Malaria Day and in June, for National Mosquito Control Awareness Week, displays were set up in the Southwest Branch and the Richard Gardner Branch of the Warren County Library System.

ACKNOWLEDGEMENTS: The following staff members contributed to the text and/or figures included in this report: Jennifer Gruener, Christine Fisher, Stephanie Oliphant, Anastasia Giordano, Ryan Hagerty, and John Necina.

LIST OF ABBREVIATIONS

AEMCNJ	Associated Executives of Mosquito Control in New Jersey
AIMS	Army insecticide measurement system
AMCA	American Mosquito Control Association
ATM	Asian Tiger Mosquito (*Aedes albopictus*)
ATV	All-terrain vehicle
BG	BioGents
BMP	Best Management Practices
BTI	*Bacillus thuringiensis israelensis*
CDC	Center for Disease Control and Prevention
CHIKV	Chikungunya virus
CO_2	Carbon dioxide
COA	Certificate of Authorization
CoCoRaHS	Community Collaborative Rain, Hail, & Snow Network
CWA	Clean Water Act
DENV	Dengue virus
DWGNRA	Delaware Water Gap National Recreation Area
EEE	Eastern equine encephalitis
ELC	Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases
ESA	Entomological Society of America
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHAGP	Flood Hazard Act General Permit
FWWGP	Fresh Water Wetlands General Permit
GIS	Geographic Information System
GPS	Global Positioning System
GT	Gravid Trap
IPM	Integrated Pest Management
IR	Insecticide Resistance

JCV	Jamestown Canyon virus
KDR	Knockdown Resistance
LAC	La Crosse virus
LCD	Liquid Crystal Display
MSI	Municipal Software Incorporated
MWA	Musconetcong Watershed Association
NEVBD	Northeast Regional Center for Excellence for Vector-borne Diseases
NJDEP	New Jersey Department of Environmental Protection
NJDOH	New Jersey Department of Health
NJIIF	New Jersey Intergovernmental Insurance Fund
NJLT	New Jersey Light Trap
NJPDES	New Jersey Pollutant Discharge Elimination System
NMCA	Northeast Mosquito Control Association
PCP	Pesticide Control Program
PDMP	Pesticide Discharge Management Plan
PGP	Pesticide General Permit
PESP	Pesticide Environmental Stewardship Program
PCFA	Pollution Control Finance Authority
PHEL	Public Health Environmental Laboratory
PMA	Pennsylvania Manufacturers Association Insurance Group
SLE	Saint Louis encephalitis
SMCC	State Mosquito Control Commission
UAS/UAV	Unmanned Aviation System/ Unmanned Aviation Vehicle
USFWS	United States Fish & Wildlife Service
ULV	Ultra-low volume
VBDWG	Vector-borne Disease Working Group
WNV	West Nile virus
ZIKV	Zika virus

FIGURE INDEX – 2024

Expenditure Budget

GENERAL FUND

Activity to 12/31/2024

** ACTIVITY = Budget - (Balance + Encumbered) (You can include the break out by journal from the report options)*

Account Number	Description	Budget	Activity	Encumbered	Balance	% of Budget
105010	M-01 Salaries/Wages	514,596.00	476,296.95		- 38,299.05	92.60%
105020	M-02 Benefits	121,336.00	115,524.55		- 5,811.45	95.20%
105030	M-03 Insurance	26,152.00	24,984.00		- 1,168.00	95.50%
105040	M-04 Telephone/Internet	5,567.00	5,488.72		- 78.28	98.60%
105050	M-05 Legal Ads/Advertising	2,288.00	1,507.83		- 780.17	65.90%
105060	M-06 Meetings/Memberships	10,677.00	9,134.39		- 1,542.61	85.60%
105070	M-07 Professional Services	3,225.00	1,609.11		- 1,615.89	49.90%
105080	M-08 Permits/Eng/Water Mgmt	1,875.00	793.21		- 1,081.79	42.30%
105090	M-09 Contract Services	58,278.00	34,202.26		- 24,075.74	58.70%
105100	M-10 Fish/Insecticides/Licenses	56,590.00	56,331.02		- 258.98	99.50%
105110	M-11 Vehicle/Equipment Maint	40,355.00	36,090.33		- 4,264.67	89.40%
105120	M-12 Office Supplies	2,900.00	2,077.90		- 822.10	71.70%
105130	M-13 Shop Supplies	1,500.00	1,260.36		- 239.64	84.00%
105140	M-14 Lab/Field Supplies	7,845.00	6,774.50		- 1,070.50	86.40%
105150	M-15 Equipment Purchase	84,000.00	80,410.04		- 3,589.96	95.70%
TOTALS		**937,184.00**	**852,485.17**		**- 84,698.83**	

Figure 1
Budget Report

Grant Expenses

GENERAL FUND

Activity to 12/31/2024

** ACTIVITY = Budget - (Balance + Encumbered) (You can include the break out by journal from the report options)*

Account Number	Description	Budget	Activity	Encumbered	Balance
106108	GRANT - TICKS SURVEILLANCE PROJECT		- (8,309.50)		- 8,309.50
TOTALS			**- (8,309.50)**		**- 8,309.50**

Figure 1
Budget Report

100001 Pnc Bank - Regular

From 12/01/2024 to 12/31/2024

Date	Source	PO#	Contract#	Check #	Vendor #	Vendor/Description	Budget	Debit	Credit	PO Encumber	PO Payment	Balance (DR)
						ACTIVITY/BALANCE BEFORE 12/01/2024		- 880,984.29	786,309.54			**211,149.55**
12/10/2024	DJ 462	11815		761482	410	WARREN CO. MOSQUITO EXT. COMMI			18,415.20			192,734.35
12/19/2024	DJ 470	11821		6529	292	PETTY CASH			30.94			192,703.41
12/19/2024	DJ 471	11820		6528	488	Riverside Diner			145.00			192,558.41
12/19/2024	DJ 472	11818		6527	440	John Necina			174.00			192,384.41
12/19/2024	DJ 473	11814	22-FOOD-12298	6526	89	CLARKE MOSQUITO CONTROL PRODUC 1NJCP - NJ State Contract T0153: Chemicals &			3,077.45			189,306.96
12/19/2024	DJ 474	11813		6525	408	WAL-MART COMMUNITY			9.57			189,297.39
12/19/2024	DJ 475	11819		6525	408	WAL-MART COMMUNITY			115.79			189,181.60
12/19/2024	DJ 476	11811		6524	150	FRANK RYMON & SONS INC.			33.08			189,148.52
12/19/2024	DJ 477	11810		6523	92	CM AUTO PARTS			569.97			188,578.55
12/19/2024	DJ 478	11808		6522	323	ROCKY'S HARDWARE INC			4.31			188,574.24
12/19/2024	DJ 479	11812		6522	323	ROCKY'S HARDWARE INC			58.94			188,515.30
12/19/2024	DJ 480	11806		6521	252	NJ ADVANCE MEDIA			75.68			188,439.62
12/19/2024	DJ 481	11787		6520	129	EDWARD WORONOWICZ			60.00			188,379.62
12/19/2024	DJ 482	11694		6519	152	FRONTIER PRECISION Contract Awarded by sealed competitive bid			2,500.00			185,879.62
12/19/2024	DJ 483	11593		6518	435	WILSON PRODUCTS BLANKET			93.89			185,785.73
12/19/2024	DJ 484	11592		6517	23	ALL SEASONS AUTOMOTIVE LLC			1,743.63			184,042.10
12/19/2024	DJ 485	11591		6516	411	WARREN COUNTY			387.40			183,654.70
12/19/2024	DJ 486	11590		6515	373	T MOBILE			47.15			183,607.55
12/19/2024	DJ 487	11587		6514	156	GEBHARDT & KIEFER Blanket			82.50			183,525.05
12/19/2024	DJ 488	11584		6513	94	COMCAST			212.88			183,312.17
12/19/2024	DJ 489	11580		6512	118	DIGIT PAYROLL CORPORATION			57.20			183,254.97
12/19/2024	DJ 490	11816		6512	118	DIGIT PAYROLL CORPORATION			57.20			183,197.77
12/23/2024	DJ 492	11825		122324	410	WARREN CO. MOSQUITO EXT. COMMI			16,427.84			166,769.93
12/23/2024	RJ 89					Metal recycling		2.00				166,771.93
12/31/2024	DJ 496	11827		6542	408	WAL-MART COMMUNITY			9.97			166,761.96
12/31/2024	DJ 497	11826		6541	291	PETTY'S TIRE & AUTO CENTER INC			987.12			165,774.84

Figure 2
Treasurer's Report

100001 Pnc Bank - Regular

From 12/01/2024 to 12/31/2024

Date	Source	PO#	Contract#	Check #	Vendor #	Vendor/Description	Budget	Debit	Credit	PO Encumber	PO Payment	Balance (DR)
12/31/2024	DJ 498	11824		6540	456	My Corporate Hosting Solutions			2,046.00			163,728.84
12/31/2024	DJ 499	11823		6539	489	Ciocca Ford Lincoln of Fleming Resolution 2024-31 , pursuant to NJSA 40A:11-			38,053.25			125,675.59
12/31/2024	DJ 500	11822		6538	440	John Necina Reimbursement			31.80			125,643.79
12/31/2024	DJ 501	11817		6537	389	TRACTOR SUPPLY			24.98			125,618.81
12/31/2024	DJ 502	11816		6536	118	DIGIT PAYROLL CORPORATION			60.70			125,558.11
12/31/2024	DJ 503	11814	22-FOOD-12298	6535	89	CLARKE MOSQUITO CONTROL PRODUC 1NJCP - NJ State Contract T0153: Chemicals &			1,497.60			124,060.51
12/31/2024	DJ 504	11800		6534	333	RUTGERS, THE STATE UNIVERSITY			1,700.00			122,360.51
12/31/2024	DJ 505	11684		6533	252	NJ ADVANCE MEDIA BLANKET			128.26			122,232.25
12/31/2024	DJ 506	11593		6532	435	WILSON PRODUCTS BLANKET			12.00			122,220.25
12/31/2024	DJ 507	11591		6531	411	WARREN COUNTY			111.65			122,108.60
12/31/2024	DJ 508	11590		6530	373	T MOBILE			29.36			122,079.24
12/31/2024	RJ 90					Interest Reg acct		1.66				122,080.90
							-	**3.66**	**89,072.31**	-	-	**122,080.90**
							-	**880,987.95**	**875,381.85**	-	-	**122,080.90**

Figure 2
Treasurer's Report

100002 PNC Bank - Payroll

From 12/01/2024 to 12/31/2024

Date	Source	PO#	Contract#	Check #	Vendor #	Vendor/Description	Budget	Debit	Credit	PO Encumber	PO Payment	Balance (DR)
						ACTIVITY/BALANCE BEFORE 12/01/2024	-	563,105.58	563,070.14			**7,305.00**
12/ 2/2024	DJ 465			120224	446	Digit Pay- Net Payroll PR 2024-25 Taxes			4,377.04			2,927.96
12/10/2024	RJ 85					Pr 2024-26		18,415.20				21,343.16
12/12/2024	DJ 466			121224	446	Digit Pay- Net Payroll PR 2024-26 DD			11,247.48			10,095.68
12/16/2024	DJ 467			121624	446	Digit Pay- Net Payroll PR 2024-26 taxes			4,340.11			5,755.57
12/19/2024	DJ 469			1208	101	COUNTY OF WARREN Employee contributions 2024-25 & 26			2,561.16			3,194.41
12/19/2024	DJ 491			121924	285	PERS PERS & CLI Dec			3,094.43			99.98
12/23/2024	RJ 87					PR 2024-27		16,427.84				16,527.82
12/26/2024	DJ 493			122624	446	Digit Pay- Net Payroll PR 2024-27 DD			11,277.88			5,249.94
12/30/2024	DJ 494			123024	446	Digit Pay- Net Payroll PR 2024-27 Taxes			3,993.86			1,256.08
12/31/2024	DJ 495			1209	101	COUNTY OF WARREN Employee contributions PR 2024-27			1,156.08			100.00
							-	**34,843.04**	**42,048.04**	**-**	**-**	**100.00**
							-	**597,948.62**	**605,118.18**	**-**	**-**	**100.00**

Figure 2
Treasurer's Report

100003 Fulton Bank - SUI

From 12/01/2024 to 12/31/2024

Date	Source	PO#	Contract#	Check #	Vendor #	Vendor/Description	Budget	Debit	Credit	PO Encumber	PO Payment	Balance (DR)
						ACTIVITY/BALANCE BEFORE 12/01/2024	-	712.51	1,147.02			**6,873.29**
12/ 3/2024	RJ 88					3rd Qtr SUI Tf		261.54				7,134.83
12/31/2024	RJ 91					Interest SUI		0.06				7,134.89
							-	**261.60**	-	-	-	**7,134.89**
							-	**974.11**	**1,147.02**	-	-	**7,134.89**

100004 Fulton Bank Retirement Pay

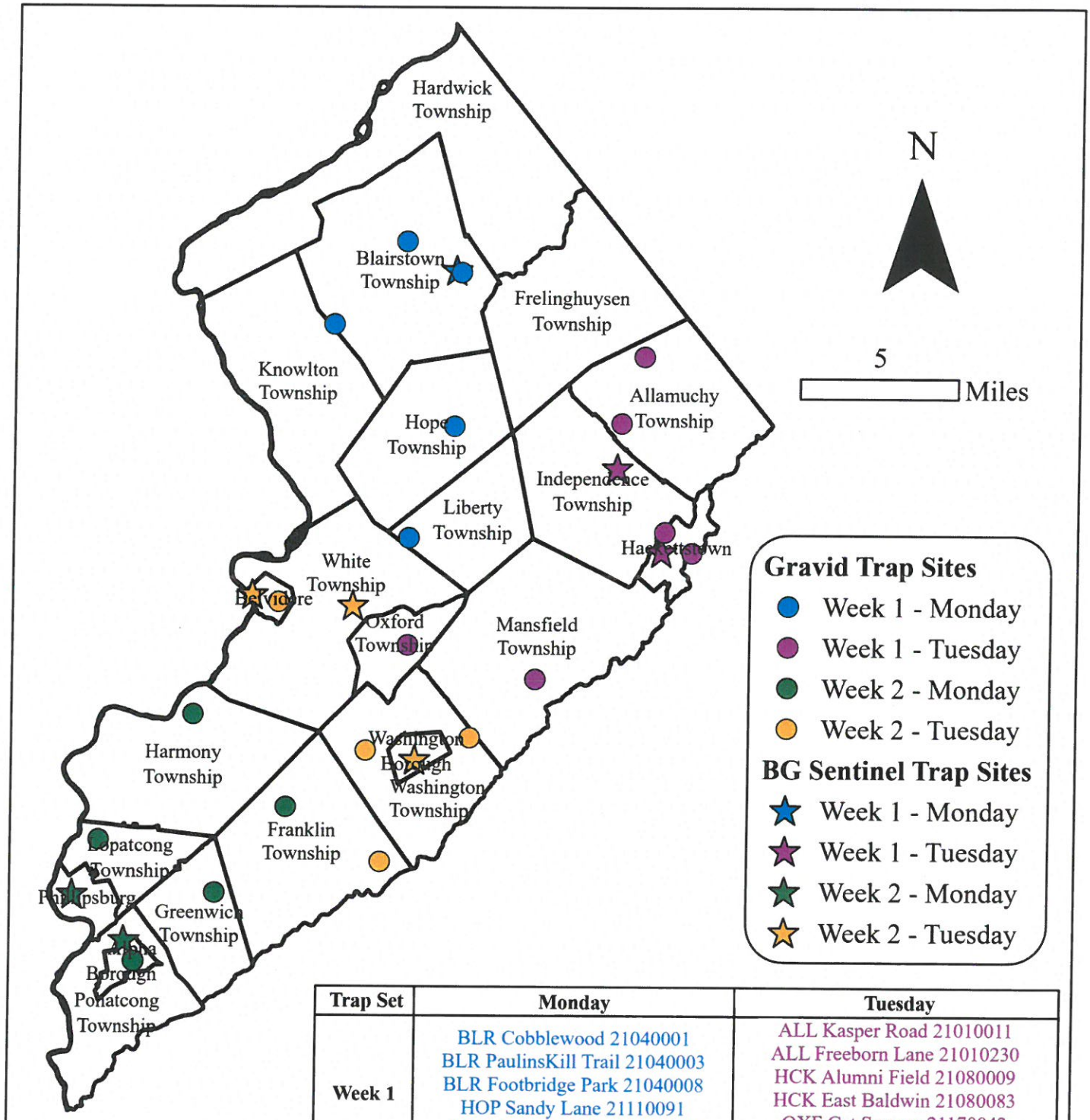
From 12/01/2024 to 12/31/2024

Date	Source	PO#	Contract#	Check #	Vendor #	Vendor/Description	Budget	Debit	Credit	PO Encumber	PO Payment	Balance (DR)
						ACTIVITY/BALANCE BEFORE 12/01/2024	-	5,001.90				**20,861.94**
12/31/2024	RJ 91					Interest Retirement		0.18				20,862.12
							-	**0.18**	-	-	-	**20,862.12**
							-	**5,002.08**	-	-	-	**20,862.12**

Figure 2
Treasurer's Report

Warren County Mosquito Control Commission
2024 Disease Surveillance/Trapping Schedule

WNV ,EEE, SLE, LAC, & JCV



Trap Set	Monday	Tuesday
Week 1	BLR Cobblewood 21040001 BLR PaulinsKill Trail 21040003 BLR Footbridge Park 21040008 HOP Sandy Lane 21110091 LIB Mountain Lake 21140135 *BLR Alpine Meats 21040377*	ALL Kasper Road 21010011 ALL Freeborn Lane 21010230 HCK Alumni Field 21080009 HCK East Baldwin 21080083 OXF Cat Swamp 21170042 *HCK Stiger Street Soil Con 21080001* *IND Kucharski Junkyard 21120082*
Week 2	ALP 7th Street Quarry 21020363 FRK Whites Road 21050279 GRN Ironwolf Road 21070045 HRM Reeder Road 21100044 LOP Jacob Lane 21150001 *PBG Filmore Cemetery 21190196* *ALP Williams Street 21020521*	BEL Cemetery 21030220 WAT Meadow Breeze 21220029 WAT Morris Canal 21220153 FRK W Asbury Anderson 21050001 *WHT Mt Pisgah Landfill 21230241* *BEL Paul Street 21030001* *WAB South Wandling 21210233*

WARREN COUNTY MOSQUITO EXTERMINATION COMMISSION
MOSQUITO-BORNE DISEASE RESPONSE GUIDELINES

PURPOSE
This is to serve as a guideline for a course of action to be taken in the event of the known presence of any mosquito-borne disease through either identification of the presence of the disease in mosquito populations or as evidenced by the illness or death of an animal/human from a mosquito borne disease within Warren County. While the focus is primarily on eastern equine encephalitis (EEE) and West Nile virus (WNV), other diseases that would be responded to include but are not limited to La Crosse encephalitis, St. Louis encephalitis, malaria, dengue fever, and concentrated cases of dog heartworm.

PROCEDURE
A. In the event of positive disease test results from mosquitoes, sentinel chickens or the resident wild bird population (taking into consideration the migratory habits and nesting behavior of the particular bird species involved) the following procedures, as appropriate, will be implemented:

1. Notify Commissioners promptly.
2. Communicate with NJAES, Center for Vector Biology Director.
3. Communicate with the Office of Mosquito Control Coordination Administrator.
4. Disseminate information to employees regarding the disease situation and necessary precautions.
5. Increase adult mosquito surveillance efforts in the area utilizing available traps and baits/lures as appropriate for the target mosquito species (such as portable traps, NJ light traps, resting boxes etc.). The object is to collect additional species for virus testing within and adjacent to known mosquito breeding sites in the area.
6. Submit subsequent collections for virus testing either through the State Surveillance Program or another source, depending on what services are available (including testing at our facility).
7. Based on surveillance data, larvicide and/or adulticide by ground and/or by air, if warranted.
8. Discuss disease situation at next monthly Commission meeting.
9. Relay disease related information at next monthly meeting of Associated Executives of Mosquito Control Work in NJ.
10. Public notification is to be implemented as appropriate for the particular situation.

Continued...

B. In the event that the illness or death of a human, horse or other domesticated animal (including pets, livestock, zoo animal etc.) is confirmed to be due to a mosquito borne disease of public health importance and suspected to have been contracted in Warren County, the following procedures, as appropriate will be implemented.

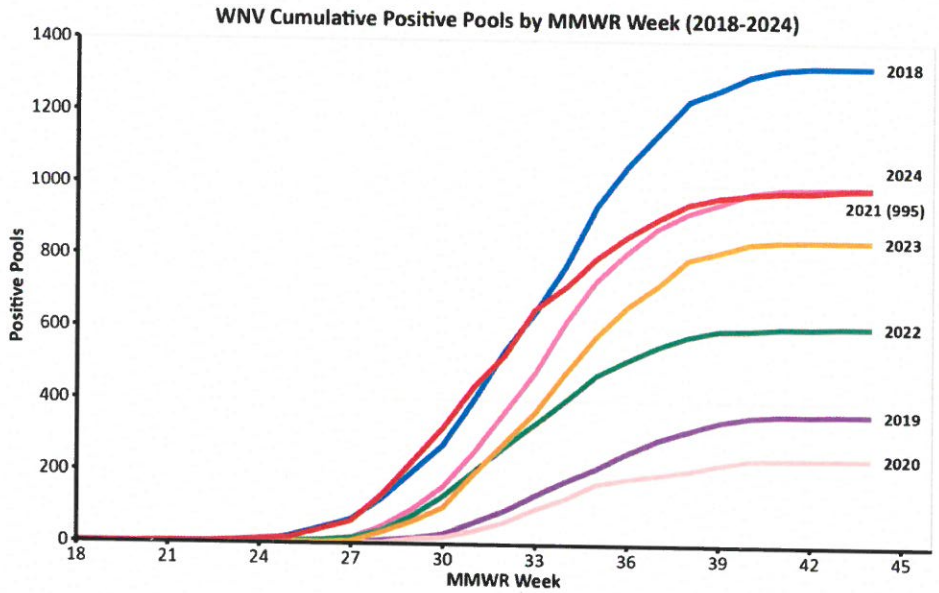
1. Notify Commissioners promptly.
2. Communicate with the NJAES, Center for Vector Biology Director.
3. Communicate with the Office of Mosquito Control Coordination Administrator.
4. Disseminate information to employees regarding the disease situation and necessary precautions.
5. Increase adult mosquito surveillance efforts in the area utilizing available traps and baits/lures as appropriate for the target mosquito species (such as portable traps, NJ light traps, resting boxes etc.). The objective is to collect additional species for virus testing from:
   a. known and potential mosquito breeding sites in the immediate and adjacent areas and,
   b. in the vicinity of the original virus isolation and/or detection of animal illness/death.
6. Increase larval mosquito surveillance and control methods in the area.
7. Coordinate activities with other counties and state departments/agencies as appropriate.
8. Communicate with the Warren County Health Department and any other Warren County agencies involved.
9. Notify the Warren County Board of Commissioners.
10. Based on surveillance data, larvicide/adulticide by ground and if warranted, by air.
11. Continue surveillance and testing to further assess the disease situation. Submit post treatment collections for virus testing either through the State Surveillance Program or another source, depending on what services are available.
12. Prepare a news release with review by the Mosquito Commission Chair, the Warren County Health Officer and the Director of the Public Information Department if available. Coordinate information details to be released with the NJ Health Department and SMCC and direct any inquiries regarding human case information to the NJ Health Department. Do not include any identifiable information in the release (address or municipality, detailed health information, etc.). Refer to the EEE Protocol approved by the Associated Executives of Mosquito Control in NJ when preparing the press release. Refrain from using language that might be alarming (i.e. no scare tactics). Suggest the use of repellent and avoidance (staying indoors, maintaining screens on doors and windows etc.) and let the public know that the Commission is fully aware and is responding accordingly.
13. Seek guidance from Rutgers regarding assessment and response in area of the disease threat.
14. If the situation becomes more than we can handle with our own adulticiding equipment and personnel, ask for assistance from the State Mosquito Control Commission and the use of the State Airspray Program.
15. Request emergency funds from the Warren County Board of Commissioners if the Mosquito Commission budget is not sufficient to continue the needed response and reserve funding has already been expended.
16. Discuss disease situation at next monthly Commission meeting.
17. Relay disease related information at next monthly meeting of Associated Executives of Mosquito Control Work in New Jersey.

NJ VECTOR SURVEILLANCE SUMMARY 2024

"Vector-borne Surveillance Report"

Excerpts from 2024 Week 46 Report published by the NJ Department of Health, Communicable Disease Service

The full report can be found at:
https://www.nj.gov/health/cd/statistics/arboviral-stats/index.shtml



*The above graph shows cumulative **WNV** positive pools for the previous 11 years, including the most active (2018) and least active (2020) years.*

Mosquito-borne Disease Summary

Eastern equine encephalitis (EEE)

- Seventeen (17) EEE positive mosquito pools; nine of which were *Culiseta melanura*, six were *Culex* species, and the remainder were one each of *Cq.perturbans, Cs.morsitans*
- Ten counties had EEE positive mosquitoes: Bergen, Camden, Cape May, Gloucester, Hunterdon, Monmouth, Morris, Salem, Somerset, and Union Counties.
- Four equine cases of EEE reported from Atlantic, Ocean (2), and Salem Counties
- Two human cases of EEE in NJ in 2024; one from Atlantic County and the other from Sussex County

West Nile virus (WNV)

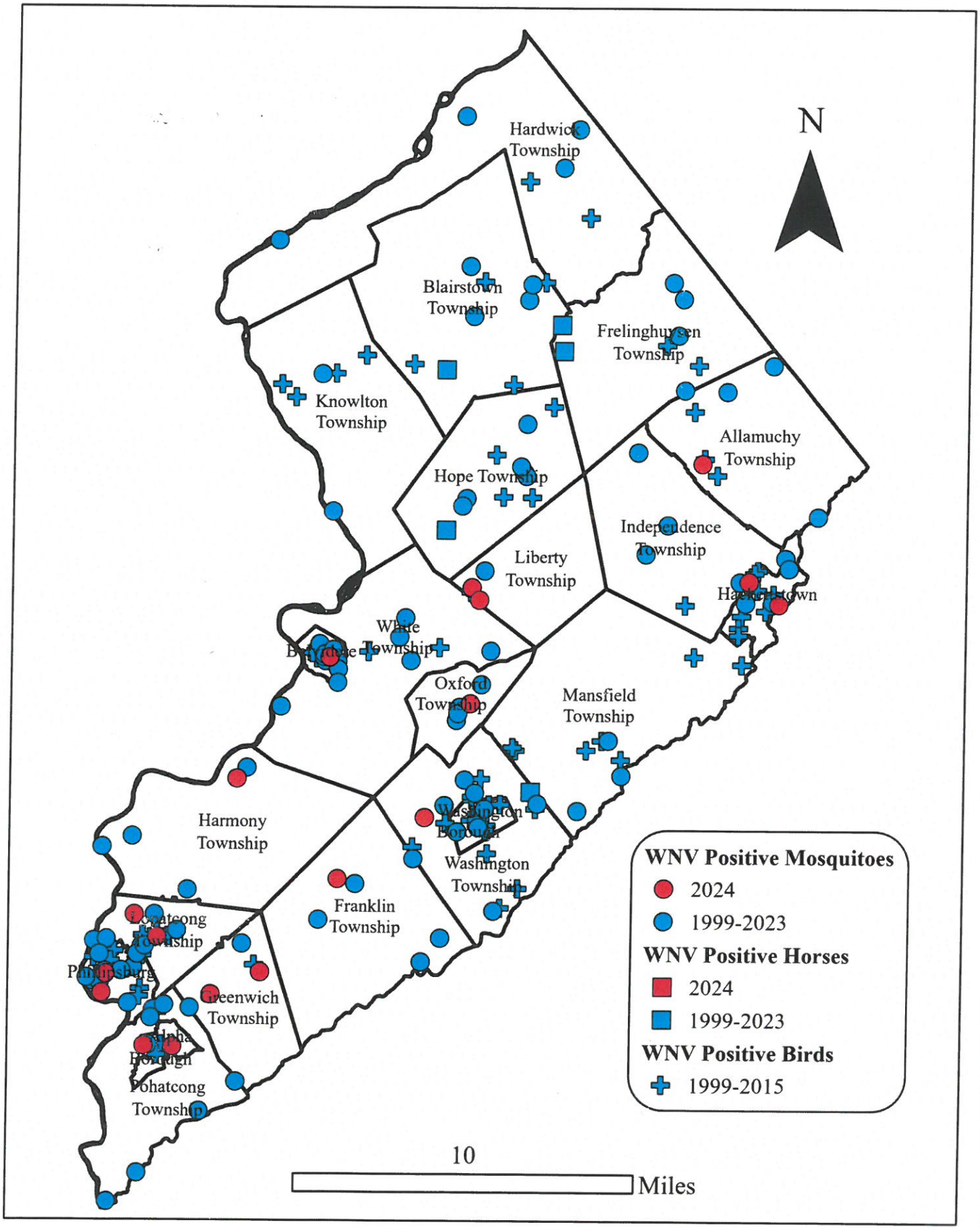
- WNV in mosquitoes was higher in 2024 than in the previous 5 years.
- 995 WNV positive pools were collected; the majority of which were Culex species (918). All counties collected positive mosquitoes.
- Positive mosquitoes were collected earlier in the season than ever before (week 18 from Gloucester County) and later in the season than ever before (week 45 from Bergen County).
- One Emu reported confirmed positive for WNV in 2024
- There were 37 WNV human cases in 2024 from: Bergen (6), Burlington (2), Camden (5), Cape May, Cumberland (2), Essex (2), Hudson, Hunterdon, Merser (2), Middlesex (3), Monmouth (4), Ocean (3), Salem, Union (2), and Warren (2)
- There were 7 fatalities and six viremic blood donors reported in 2024.

Other mosquito-borne viruses

- One (1) human case of Jamestown Virus (JCV) from Sussex County was reported in week 19 of 2024.
- Four (4) mosquito pools were reported positive for JCV in 2024 from Cumberland (2) and Monmouth (2) Counties.
- No mosquitoes tested positive for LaCrosse encephalitis, Saint Louis encephalitis, dengue virus, chikungunya virus or Zika virus in 2024.
- Travel-related human cases of dengue virus were very high again in 2024 with 112 confirmed cases reported as of week 46.

Figure 5

Warren County Mosquito Control Commission
Cumulative WNV Positives Through 2024



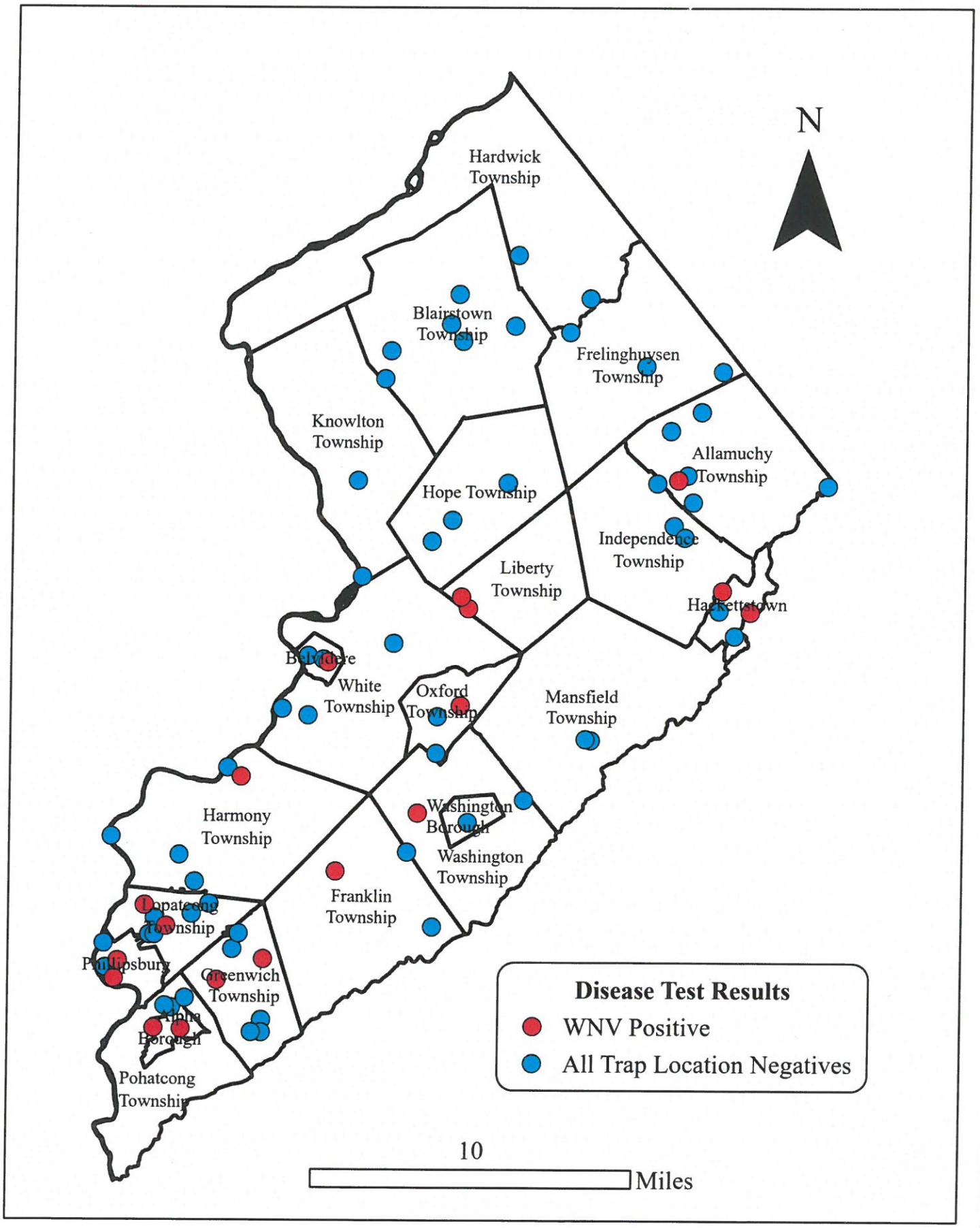
Mosquito Samples by Species
Submitted to PHEL for Mosquito-borne Disesase Testing

Species	# Pools	# Mosquitoes	WNV+	EEE+	SLE+	JCV+	LAC+	ZIKV+	DENV+	CHIKV+
Culex pipiens/restuans/ salinarius	249	10,011	**26**	0	0	0	0	0	0	0
Ae. albopictus	57	815	**1**	0	0	0	0	0	0	0
Ae. japonicus	67	519	0	0	0	0	0	0	0	0
Cx. erraticus	17	183	**1**	0	0	0	0	0	0	0
Ae. triseriatus	26	141	0	0	0	0	0	0	0	0
Cq. perturbans	5	136	0	0	0	0	0	0	0	0
An. punctipennis	22	76	0	0	0	0	0	0	0	0
Ae.sticticus	2	58	0	0	0	0	0	0	0	0
Ae. canadensis	7	56	0	0	0	0	0	0	0	0
Ae. cinereus	3	56	0	0	0	0	0	0	0	0
An. quadrimaculatus	7	37	0	0	0	0	0	0	0	0
Cx. pipiens	15	15	0	0	0	0	0	0	0	0
Cx. restuans	5	5	0	0	0	0	0	0	0	0
Ps. columbiae	1	4	0	0	0	0	0	0	0	0
An. crucians	2	2	0	0	0	0	0	0	0	0
Ae. vexans	1	1	0	0	0	0	0	0	0	0
Cx. salinarius	1	1	0	0	0	0	0	0	0	0
Cs. melanura	1	1	0	0	0	0	0	0	0	0
Total	488	12,117	**28**	0	0	0	0	0	0	0

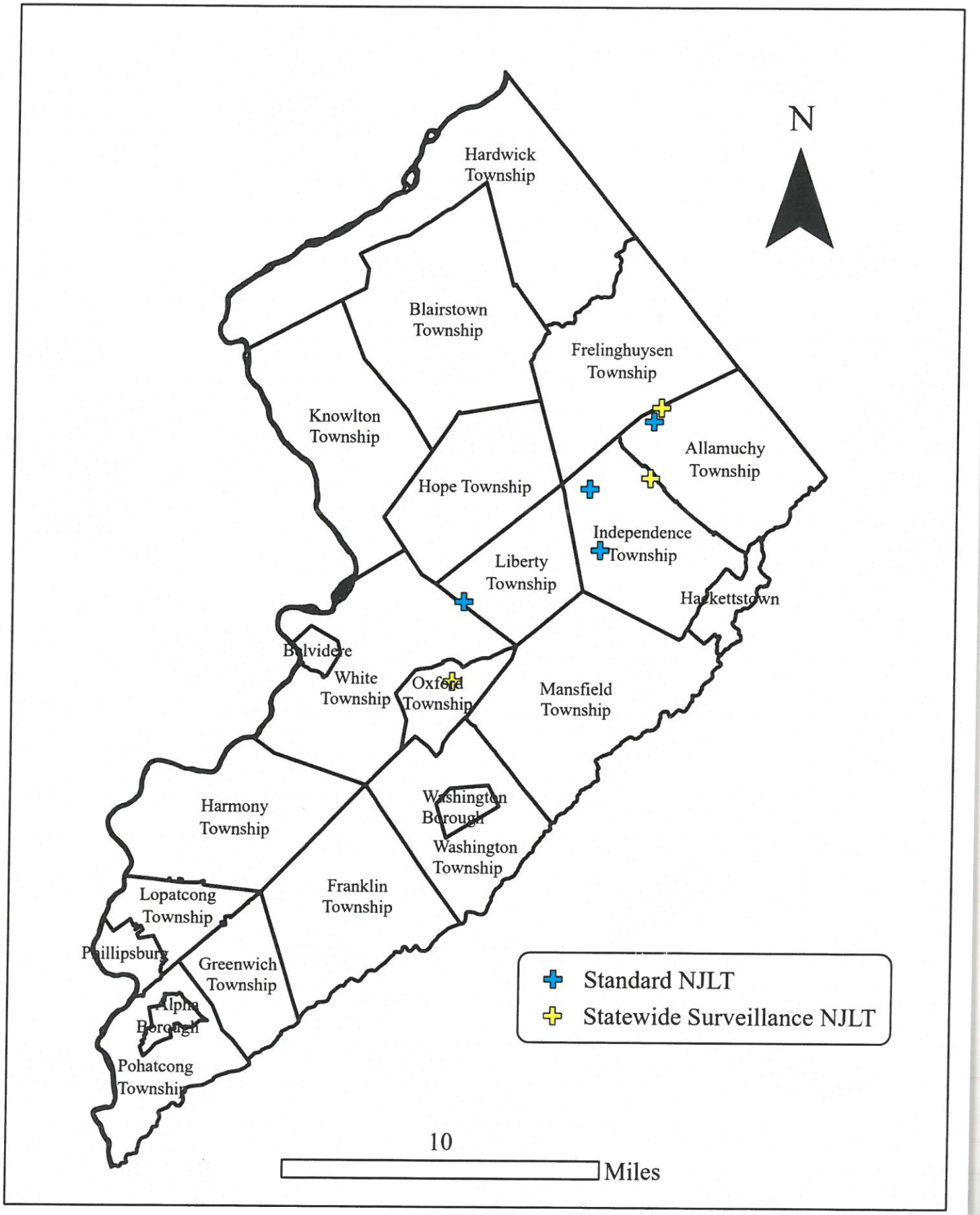
Figure 6a

Warren County Mosquito Control Commission
2024 Disease Trap Locations

WNV ,EEE, SLE, LAC, JCV, CHIKV, & DENV



Warren County Mosquito Control Commission
2024 Surveillance Stations

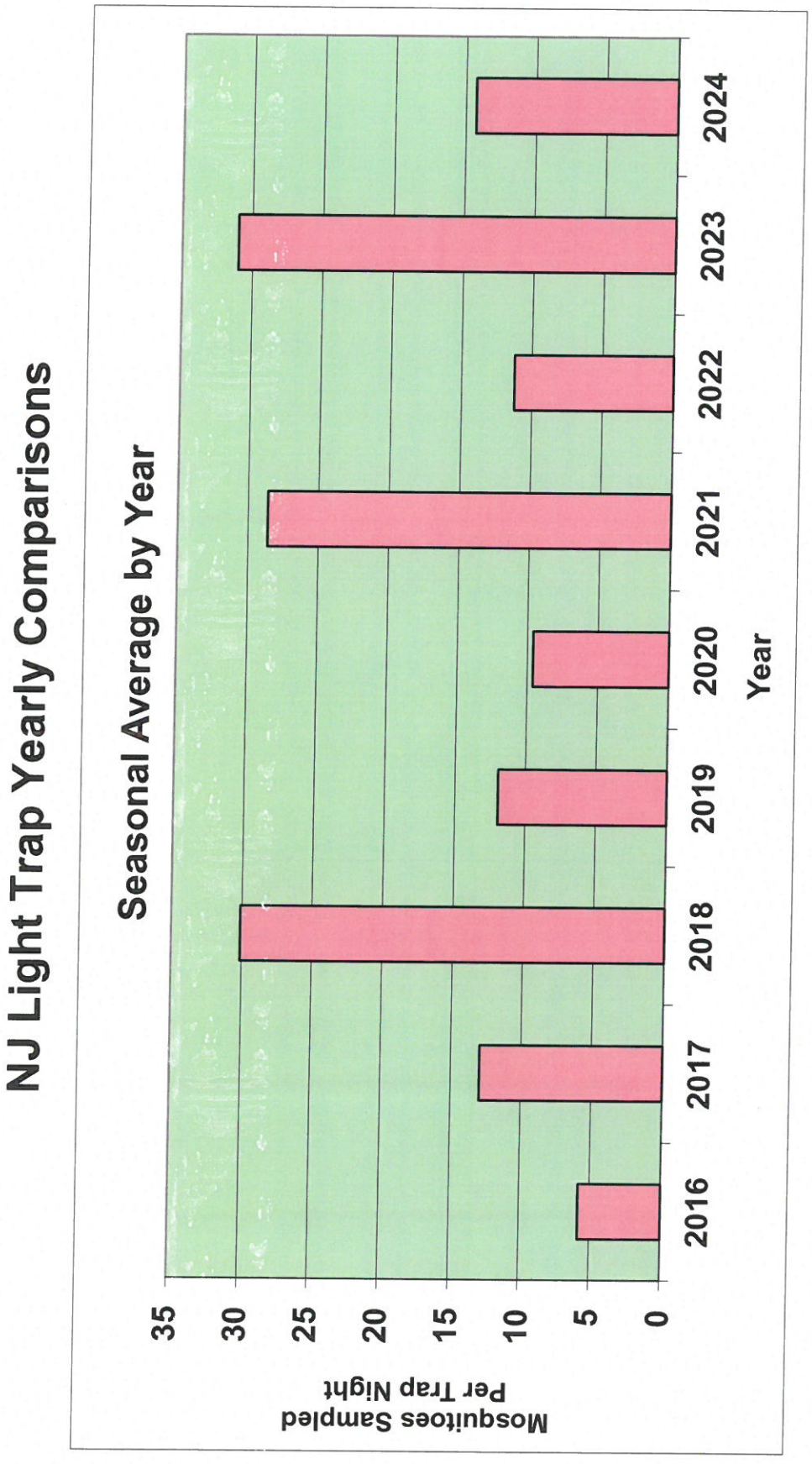


Routine Surveillance Five Year Summary

NJ Light Traps	2020		2021		2022		2023		2024	
Mosquitoes Caught	**9.60/Trap Night**	**10,817**	**28.60/Trap Night**	**32,465**	**11.24/Trap Night**	**12,666**	**31.01/Trap Night**	**34,952**	**14.28/Trap Night**	**16,200**
Species Caught	*Cx. spp.*	26.07%	*Ae. vexans*	37.67%	*Ae. vexans*	31.97%	*Culex spp.*	39.69%	*Culex spp.*	44.52%
	An. walkeri	24.35%	*Culex spp.*	22.64%	*Culex spp.*	26.11%	*Ae. vexans*	32.40%	*Ae. vexans*	15.25%
	Ae. vexans	12.88%	*An. walkeri*	10.12%	*An. punctipennis*	11.52%	*An. punctipennis*	9.30%	*An. punctipennis*	9.04%
	An. quadrimaculatus	7.65%	*An. punctipennis*	7.63%	*An. quadrimaculatus*	8.93%	*An. quadrimaculatus*	5.32%	*An. crucians*	7.72%
	Cq. perturbans	7.65%	*An. quadrimaculatus*	3.50%	*Ae. trivittatus*	5.11%	*Ps. ciliata*	2.40%	*An. quadrimaculatus*	6.55%
	An. punctipennis	5.84%	*Ae. trivittatus*	3.04%	*Cq. perturbans*	4.84%	*Ae. trivittatus*	1.91%	*Cq. perturbans*	5.70%
	Cs. melanura	5.20%	*An. brad/cru*	3.02%	*Ur. sapphirinia*	3.58%	*Ur. sapphirina*	1.50%	*Cs. melanura*	3.30%
	Ur. sapphirina	4.32%	*Ps. ciliata*	2.73%	*An. walkeri*	1.82%	*Ae. cinereus*	1.43%	*Ur. sapphirina*	2.39%
	An. brad/cru	1.98%	*Ps. howardii*	2.57%	*Cs. melanura*	1.37%	*Ps. howardii*	1.28%	*Ae. cinereus*	1.44%
	Ps. ciliata	0.80%	*Cq. perturbans*	1.97%	*Ae. japonicus*	1.35%	*Cq. perturbans*	1.24%	*Ae. japonicus*	1.43%
	Ae. japonicus	0.78%	*Cs. melanura*	1.29%	*Ae. cinereus*	0.87%	*An. brad/cru*	1.00%	*Ae. trivittatus*	0.60%
	Ps. howardii	0.42%	*Ur. sapphirina*	1.19%	*Ae. stimulans*	0.55%	*Cs. melanura*	0.93%	*Or. signifera*	0.50%
	Ae. cinereus	0.37%	*Ae. sticticus*	0.84%	*Ae. sticticus*	0.42%	*Ae. japonicus*	0.43%	*Ae. stimulans*	0.34%
	Ps. columbiae	0.36%	*Ps. ferox*	0.48%	*Ae. triseriatus*	0.39%	*Ps. ferox*	0.29%	*An. walkeri*	0.30%
	Ae. canadensis	0.36%	*Ae. japonicus*	0.46%	*Ps. ciliata*	0.35%	*Ae. sticticus*	0.17%	*Ae. triseriatus*	0.28%
	Ae. stimulans	0.34%	*Ae. stimulans*	0.31%	*Ps. howardii*	0.20%	*Ae. stimulans*	0.15%	*Ae. fitchii*	0.12%
	Ae. trivittatus	0.18%	*Ps. columbiae*	0.27%	*Or. signifera*	0.17%	*Ae. triseriatus*	0.15%	*Ps. ciliata*	0.10%
	Damaged	0.16%	*Ae. canadensis*	0.06%	*Ps. ferox*	0.12%	*Ps. columbiae*	0.11%	*Ps. howardii*	0.09%
	Ae. triseriatus	0.10%	*Ae. cinereus*	0.05%	*Ae. canadensis*	0.11%	*Or. signifera*	0.10%	*Ps. columbiae*	0.08%
	Ps. ferox	0.04%	*Ae. triseriatus*	0.05%	*Ps. columbiae*	0.08%	*An. walkeri*	0.07%	*Ae. sticticus*	0.06%
	Ae. cantator	0.04%	*Ae. aurifer*	0.02%	*Ae. aurifer*	0.05%	*Ae. canadensis*	0.06%	*Ae. albopictus*	0.04%
	Ae. sticticus	0.04%	*Ae. cantator*	0.02%	*Ae. excrucians*	0.03%	*Ae. excrucians*	0.03%	*Ae. aurifer*	0.04%
	Ae. aurifer	0.03%	*Ae. tormentor*	0.02%	*An. brad/cru*	0.03%	*Ae. aurifer*	0.01%	*Ae. canadensis*	0.04%
	Or. signifera	0.03%	*Ae. excrucians*	0.01%	Damaged	0.02%	*Ae. albopictus*	0.01%	*Ps. ferox*	0.04%
	Ae. albopictus	0.02%	Damaged	0.01%	*Ae. albopictus*	0.01%	Damaged	0.01%	*Ae. excrucians*	0.02%
	Ae. excrucians	0.01%	*Or. signifera*	0.01%	*Ae. tormentor*	0.01%			*Cs. inornata*	0.01%
			Ae. grossbecki	0.003%						
			Ae. infirmatus	0.003%						

Figure 7a

Figure 7b


NJ Light Trap Yearly Comparisons
Seasonal Average by Year
Mosquitoes Sampled Per Trap Night
0
5
10
15
20
25
30
35
2016
2017
2018
2019
2020
2021
2022
2023
2024
Year

DISEASE, COMPLAINT and FIELD STUDY SURVEILLANCE SYNOPSIS - FIVE YEAR SUMMARY

	2020		2021		2022		2023		2024	
GRAVID TRAPS										
Mosquitoes Caught	**42.181/Trap night**	**9,786**	**58.97/Trap night**	**12,148**	**38.01/Trap night**	**10,452**	**74.60/Trap night**	**17,381**	**60.48/Trap night**	**17,479**
Mosquito Species	*Cx. spp*	92.19%	*Culex spp.*	91.88%	*Culex spp.*	88.40%	*Culex spp.*	91.39%	*Culex spp.*	92.17%
	Ae. japonicus	4.41%	*Ae. japonicus*	5.64%	*Ae. japonicus*	8.01%	*Ae. japonicus*	5.19%	*Ae. japonicus*	5.68%
	Ae. triseriatus	1.15%	*Ae. triseriatus*	0.90%	*An. punctipennis*	1.23%	*Ae. triseriatus*	0.91%	*Ae. albopictus*	0.76%
	Ae. albopictus	0.87%	*An. punctipennis*	0.46%	*Ae. triseriatus*	0.92%	*An. punctipennis*	0.79%	*Ae. triseriatus*	0.65%
	An. punctipennis	0.62%	*Ae. trivittatus*	0.36%	*Ae. albopictus*	0.46%	*Ae. albopictus*	0.24%	*An. punctipennis*	0.38%
	An. quadrimaculatus	0.35%	*Ae. albopictus*	0.32%	*Ae. vexans*	0.38%	*Ae. vexans*	0.10%	*An. quadrimaculatus*	0.16%
	Ae. trivittatus	0.18%	*An. quadrimaculatus*	0.14%	*An. quadrimaculatus*	0.32%	*An. quadrimaculatus*	0.10%	*Ae. vexans*	0.07%
	Ps. ferox	0.10%	*Ps. ferox*	0.12%	*Ae. trivittatus*	0.09%	*Ae. trivittatus*	0.08%	*Ur. sapphirina*	0.05%
	Ae. vexans	0.05%	*Ae. sticticus*	0.08%	*Ae. canadensis*	0.06%	*Ps. ferox*	0.03%	*Ae. canadensis*	0.03%
	An. walkeri	0.02%	*Ae. vexans*	0.07%	*Ae. cinereus*	0.06%	*Or. signifera*	0.03%	*Or. signifera*	0.02%
	Or. signifera	0.02%	*Ur. sapphirina*	0.02%	*Ps. columbiae*	0.02%	*Ae. cinereus*	0.01%	*An. crucians*	0.01%
	Ae. canadensis	0.01%	*Ae. tormentor*	0.01%	*Ur. sapphirina*	0.02%	*Ur. saphhirina*	0.01%	*Ae. trivittatus*	0.01%
	Ps. columbiae	0.01%	*Or. signifera*	0.01%	*Or. signifera*	0.01%	*Ps. howardii*	0.01%	*Cs. melanura*	0.01%
									Ps. ferox	0.01%
BG SENTINEL TRAPS										
Mosquitoes Caught	**7.04/Trap night**	**704**	**10.43/Trap night**	**720**	**11.55/Trap night**	**1,247**	**9.09/Trap night**	**582**	**14.65/Trap night**	**1,773**
Mosquito Species	*Ae. albopictus*	71.45%	*Ae. albopictus*	81.94%	*Ae. albopictus*	58.06%	*Ae. albopictus*	33.33%	*Ae. albopictus*	69.43%
	An. quadrimaculatus	9.09%	*An. punctipennis*	4.17%	*Culex spp.*	11.07%	*Culex spp.*	20.45%	*Ae. trivittatus*	6.77%
	Cx. spp	8.52%	*Culex spp.*	3.75%	*An. punctipennis*	7.54%	*Ae. trivittatus*	11.51%	*Culex spp.*	4.74%
	An. punctipennis	2.56%	*Ae. trivittatus*	2.92%	*Ae. triseriatus*	4.81%	*An. punctipennis*	9.97%	*Ae. japonicus*	4.57%
	Ae. japonicus	2.27%	*Ae. vexans*	1.39%	*Ae. japonicus*	4.57%	*An. quadrimaculatus*	9.62%	*An. punctipennis*	4.57%
	Ae. triseriatus	2.13%	*Ae. triseriatus*	1.25%	*Ae. trivittatus*	4.25%	*Ae. triseriatus*	5.33%	*Ae. triseriatus*	3.50%
	Cq. perturbans	1.14%	*Ps. ferox*	1.11%	*Ae. vexans*	2.97%	*Ae. vexans*	3.61%	*Ae. vexans*	3.50%
	Ae. trivittatus	0.99%	*Ae. japonicus*	0.97%	*An. quadrimaculatus*	2.81%	*Ae. japonicus*	2.41%	*An. quadrimaculatus*	1.13%
	Ae. vexans	0.99%	*Ps. columbiae*	0.83%	*Ps. ferox*	1.44%	*Ps. ferox*	2.23%	*Ae. sticticus*	0.73%
	Ae. stimulans	0.28%	*An. quadrimaculatus*	0.56%	*Ae. canadensis*	0.72%	*Ae. sticticus*	1.03%	*Ps. ferox*	0.51%
	Ps. ferox	0.28%	*Ae. sticticus*	0.42%	*Ur. sapphirinia*	0.64%	*Ur. sapphirina*	0.34%	*Cq. perturbans*	0.23%
	An. walkeri	0.14%	*Ae. canadensis*	0.28%	*Cq. perturbans*	0.40%	*Ae. stimulans*	0.17%	*Ps. columbiae*	0.11%
	Damaged	0.14%	*Damaged*	0.28%	*Damaged Aedes*	0.24%			*Ps. howardii*	0.11%
			Cq. perturbans	0.14%	*additional six species*	<1.0% ea			*An. crucians*	0.01%
									Or. signifera	0.01%
CDC Traps (Inc. complaints)										
Mosquitoes Caught	**40.679/Trap night**	**5,573**	**113.72/Trap night**	**22,631**	**98.28/Trap night**	**11,007**	**87.06/Trap night**	**12,101**	**22.20/Trap night**	**3,508**
Mosquito Species	*An. walkeri*	26.45%	*Ae. vexans*	37.89%	*Ae. trivittatus*	29.37%	*Ae. vexans*	36.18%	*Ae. vexans*	31.36%
	Cq. perturbans	17.71%	*Ae. trivittatus*	28.83%	*Ae. vexans*	25.65%	*Ae. trivittatus*	22.28%	*Ae. trivittatus*	20.92%
	Ae. trivittatus	13.28%	*Ps. ferox*	8.55%	*Ae. sticticus*	22.90%	*Culex spp.*	17.55%	*Culex spp.*	14.08%
	Ae. vexans	11.02%	*Ae. sticticus*	4.56%	*An. punctipennis*	7.42%	*Ae. sticticus*	10.41%	*An. punctipennis*	5.19%
	Ps. ferox	10.66%	*Culex spp.*	4.41%	*Cq. perturbans*	6.56%	*An. punctipennis*	4.74%	*Cq. perturbans*	5.16%
	Ae. albopictus	5.69%	*An. walkeri*	4.35%	*Culex spp.*	1.62%	*An. quadrimaculatus*	2.38%	*Ae. albopictus*	5.02%
	Cx. spp	5.42%	*Cq. perturbans*	4.33%	*An. quadrimaculatus*	1.43%	*Ae. cinereus*	1.80%	*Ae. sticticus*	3.71%
	An. punctipennis	2.71%	*An. punctipennis*	1.90%	*An. walkeri*	1.03%	*Cq. perturbans*	0.77%	*An. quadrimaculatus*	3.14%
	An. quadrimaculatus	2.23%	*Ps. ciliata*	1.04%	*Ps. ferox*	0.90%	*Ps. ciliata*	0.74%	*Ae. cinereus*	2.60%
	Ps. columbiae	0.79%	*Ae. albopictus*	0.98%	*Ae. canadensis*	0.74%	*Ps. ferox*	0.74%	*Ae. triseriatus*	2.02%
	Ae. japonicus	0.75%	*An. quadrimaculatus*	0.58%	*Ae. cinereus*	0.64%	*Ae. albopictus*	0.59%	*Ae. canadensis*	1.54%
	Ae.canadensis	0.57%	*Ae. cinereus*	0.40%	*Ae. albopictus*	0.62%	*Ae. triseriatus*	0.45%	*Ps. columbiae*	1.34%
	Ae.cinereus	0.56%	*Ps. howardii*	0.38%	*Ae. stimulans*	0.36%	*Ae. japonicus*	0.35%	*Ps. ferox*	1.34%
	Ae. triseriatus	0.48%	*Ps. columbiae*	0.38%	*Ae. japonicus*	0.24%	*Ps. howardii*	0.25%	*Ae. japonicus*	0.97%
	Ps. ciliata	0.48%	*Ae. japonicus*	0.27%	*Ae. triseriatus*	0.17%	*Ur. sapphirina*	0.24%	*Ae. stimulans*	0.43%
	Ae. stimulans	0.39%	*Ae. canadensis*	0.20%	*Ae. aurifer*	0.12%	*Ps. columbiae*	0.18%	*Ur. sapphirina*	0.37%
	Ur. sapphirina	0.34%	*Ae. triseriatus*	0.17%	*Ur. sapphirina*	0.07%	*An. walkeri*	0.15%	*Ps. ciliata*	0.31%
	Ps. howardii	0.25%	*Cs. melanura*	0.16%	*Ps. ciliata*	0.05%	*Ae. stimulans*	0.06%	*An. walkeri*	0.20%
	Ae. aurifer	0.07%	*Ur. sapphirina*	0.15%	*Ps. howardii*	0.04%	*An. brad/cru*	0.05%	*An. crucians*	0.17%
	An. bradleyi/crucians	0.05%	*Ae. aurifer*	0.11%	*Ae. tormentor*	0.03%	*Ae. canadensis*	0.04%	*Cs. melanura*	0.09%
	Cs. melanura	0.05%	*Ae. cantator*	0.09%	*Ps. columbiae*	0.03%	*Or. signifera*	0.30%	*Ps. howardii*	0.06%
	Ae. cantator	0.04%	*Ae. stimulans*	0.06%	*Damaged Aedes*	0.01%	*additional 3 species*	<0.01% ea.		

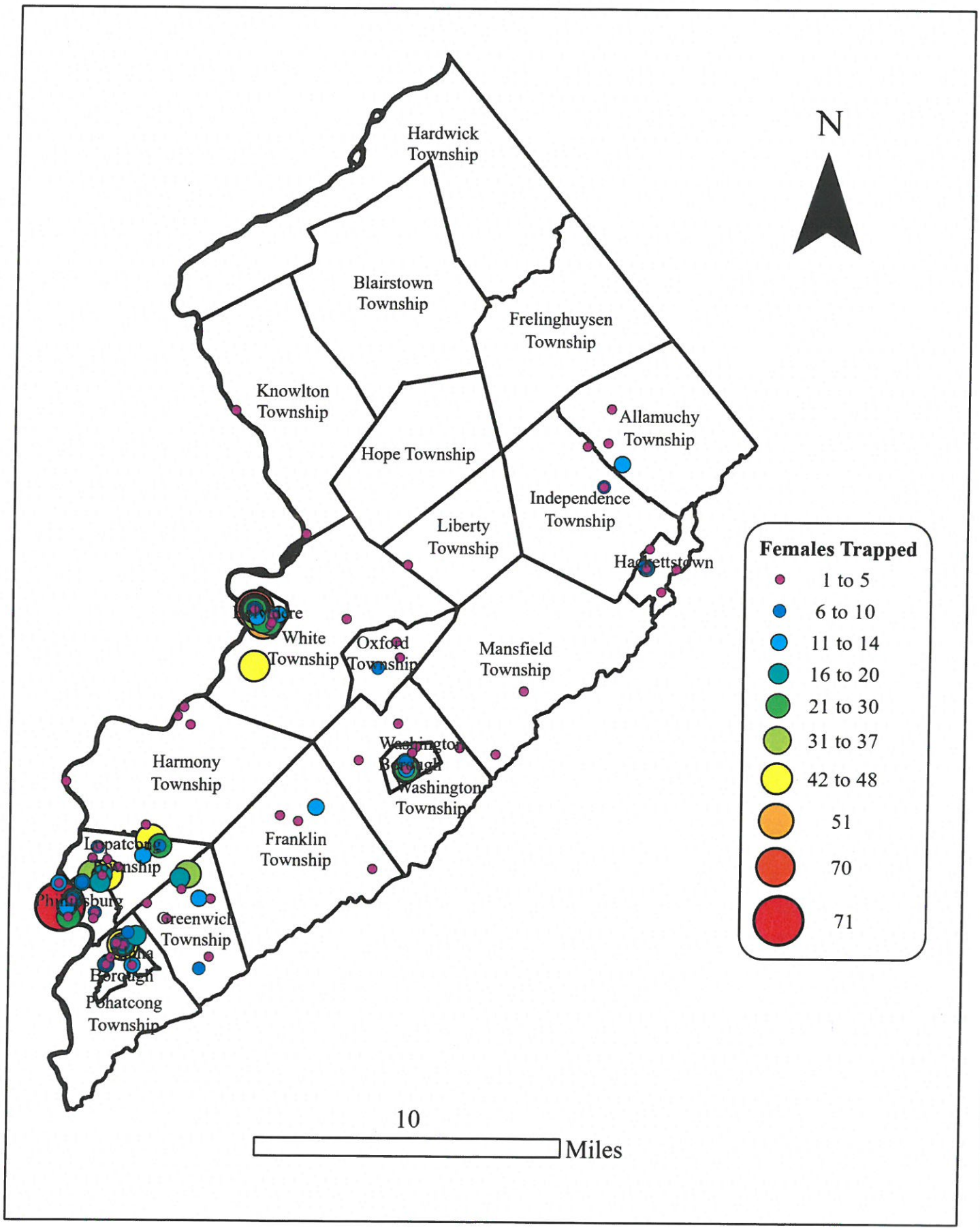
Figure 8

Warren County Light Trap Collections
2024

	AEDES																ANOPHELES				CQ.	CX.	CULISETA			OR.	PSOROPHORA					UR.		
LOCATION (site no.)	*Ae. albopictus*	*Ae. aurifer*	*Ae. canadensis*	*Ae. cantator*	*Ae.cinereus*	*Ae. excrucians*	*Ae. fitchii*	*Ae. grossbecki*	*Ae. infirmatus*	*Ae. japonicus*	*Ae. sticticus*	*Ae. stimulans*	*Ae. tormentor*	*Ae. triseriatus*	*Ae. trivittatus*	*Ae. vexans*	*An. punctipennis*	*An. quadrimaculatus*	*An. walkeri*	*An. bradleyi/cucians*	*Cq. perturbans*	*Cx. spp*	*Cs. inornata*	*Cs. melanura*	*Cs. morsitans*	*Or. signifera*	*Ps. ciliata*	*Ps. columbiae*	*Ps. ferox*	*Ps. howardii*	*Ur. sapphirina*	Damaged	TOTAL
Woronowicz; Pequest Road, Oxford (2A)	3									47				6		46	42	48		3	19	80		1						68		363
Independence Road Department (3A)					2					25	1			1	1	123	67	169		2	117	116		1			2			2		629
Sehulster; Bear Creek Road, Allamuchy (4A)					3					13	1			2	14	233	20	14	9	1	21	398		12			1		1	15		758
Zellars; Bear Creek Road, Allamuchy (4B)		1	3		28					38	2			11	67	674	283	105	19	7	70	4279	1	49			3	1	5	3	98		5747
Ivaseczko; Post Lane, Independence (5)	3				24	3	13			90	2	42		16	12	1048	173	254	1		17	835		14		17	6	4		2	9		2585
Mountain Lake Fire Company, Liberty (7)	1	6	3		98					9	1			2	2	177	799	105	12	1237	85	819		448		62		1		10	73		3950
Kelsey; Shades of Death Road, Indpendence (20)					79		7			9	2	13		7	2	170	80	366	7	1	594	686		10		2	4	7			122		2168
TOTAL	7	7	6	0	234	3	20	0	0	231	9	55	0	45	98	2471	1464	1061	48	1251	923	7213	1	535	0	81	16	13	6	15	387	0	16200
% OF TOTAL CATCH	0.04%	0.04%	0.04%	0.00%	1.44%	0.02%	0.12%	0.00%	0.00%	1.43%	0.06%	0.34%	0.00%	0.28%	0.60%	15.25%	9.04%	6.55%	0.30%	7.72%	5.70%	44.52%	0.01%	3.30%	0.00%	0.50%	0.10%	0.08%	0.04%	0.09%	2.39%	0.00%	100%

Figure 9

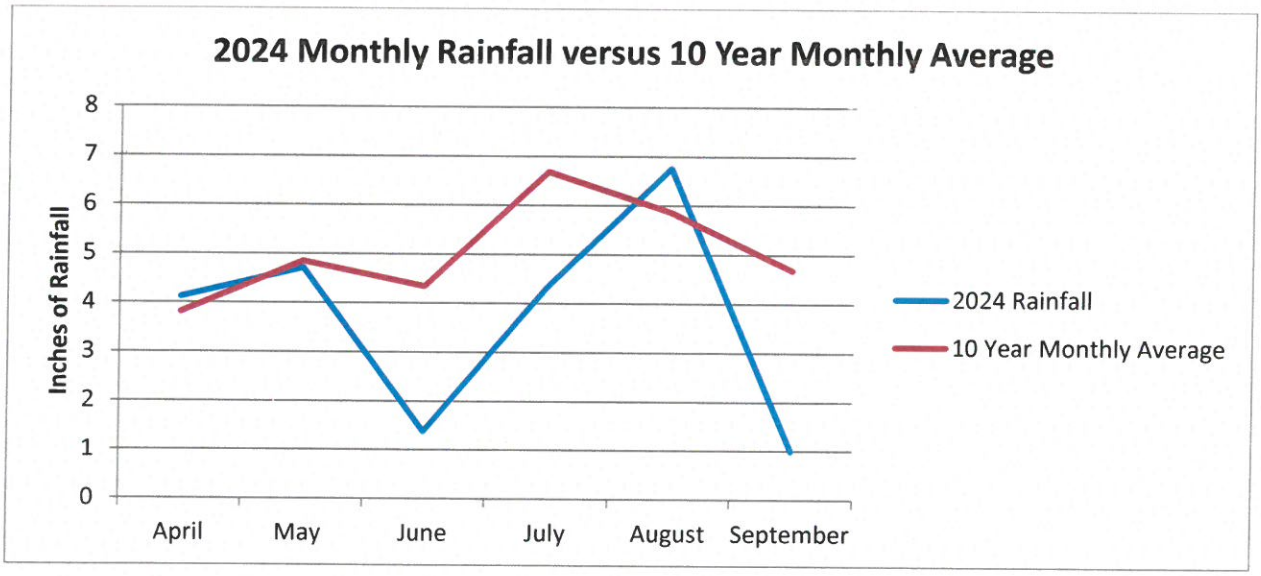
Warren County Mosquito Control Commission
2024 *Aedes albopictus* Distribution



Oxford Rainfall Comparison over Ten Years (April – September)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
April	2.58	2.61	3.87	4.49	4.28	3.74	1.91	8.42	2.06	4.12
May	1.60	3.29	4.98	4.81	10.46	4.57	4.70	5.98	3.39	4.71
June	8.66	3.21	4.13	3.57	4.92	3.07	3.11	3.94	7.41	1.37
July	3.96	2.87	8.34	6.54	9.55	6.00	6.83	1.97	16.42	4.34
August	4.76	4.20	4.89	8.23	5.33	8.34	7.45	1.66	7.01	6.76
September	5.14	2.50	3.40	6.77	1.56	3.91	11.35	4.4	6.78	0.99
TOTAL	26.70	18.68	29.61	34.41	36.10	29.63	35.35	26.37	43.07	22.29

2024 Seasonal Rainfall vs. Ten Year Average



2024 Activity Summary

Figure 12

MUNICIPALITY	Catch Basin Treatments	Routine Larval Inspections	Larval Samples	Service Requests Received	Service Request Adult Samples	Service Requests Landing Rates	Larvicide/Pupicide Applications	Number of Fish Site Stockings	Water Management	Tires Collected	Brush Cutting	Adulticide Applications	Total
ALL	119	583	18	9	7	0	87	0	1	0	6	5	835
ALP	33	45	1	10	5	0	17	0	3	0	0	5	119
BEL	122	75	6	13	10	0	18	0	5	0	0	5	254
BLR	87	858	12	13	9	0	75	5	1	0	0	3	1,063
FRK	69	281	2	14	10	0	44	0	1	3	1	1	426
FRL	7	914	42	12	10	0	96	3	9	21	19	7	1,140
GRN	325	185	5	9	6	0	19	0	11	0	0	5	565
HCK	562	491	12	8	1	0	56	2	3	0	4	2	1,141
HDW	21	569	17	4	4	0	69	7	3	0	0	5	699
HRM	8	301	3	14	6	0	60	0	1	0	0	5	398
HOP	12	756	26	3	3	0	77	4	7	0	23	1	912
IND	180	837	34	4	6	0	131	14	6	14	13	3	1,242
KNL	28	1,084	12	12	11	1	90	8	2	0	2	5	1,255
LIB	62	657	22	5	1	0	72	11	2	0	13	3	848
LOP	503	305	4	12	10	0	92	0	5	0	1	11	943
MNS	260	598	5	2	3	0	101	3	0	0	10	1	983
OXF	60	600	20	2	1	0	82	1	12	15	17	3	813
PBG	191	31	5	22	10	0	16	0	7	28	0	8	318
PHT	264	373	8	10	7	0	62	0	15	0	1	1	741
WAB	188	130	2	5	7	0	17	0	3	0	1	2	355
WAT	377	620	1	9	6	0	69	1	10	34	2	2	1,131
WHT	78	937	43	10	7	0	113	6	8	0	29	2	1,233
TOTAL	3,556	11,230	300	202	140	1	1,463	65	115	115	142	85	17,414

* indicates at least one area-wide application for *Aedes albopictus* control

New Jersey Mosquito Species – 2024

Bolded Species - Sampled in Warren County

Genus *Aedes* (Meigen)

1. ***Aedes abserratus* (Felt and Young)**
2. *Aedes atlanticus* (Dyar and Knab)
3. ***Aedes albopictus* (Skuse)**
4. ***Aedes atropalpus* (Coquillett)**
5. ***Aedes aurifer* (Coquillett)**
6. ***Aedes canadensis canadensis* (Theobald)**
7. ***Aedes cantator* (Coquillet)**
8. ***Aedes cinereus* (*Meigen*)**
9. ***Aedes communis* (De Geer)**
10. *Aedes dorsalis* (Meigen)
11. *Aedes dupreei* (Coquillet)
12. ***Aedes excrucians* (Walker)**
13. ***Aedes fitchii* (Felt and Young)**
14. *Aedes flavescens* (Miller)
15. ***Aedes** grossbecki* **(Dyar and Knab)**
16. *Aedes hendersoni* (Cockerell)
17. *Aedes implicates* (Vockeroth)
18. *Aedes infirmatus* (Dyar and Knab)
19. ***Aedes intruden* (Dyar)**
20. ***Aedes japonicus* (*Theobald*)**
21. *Aedes mitchellae* (Dyar)
22. *Aedes provocans* (Walker)
23. *Aedes punctor* (Kirby)
24. ***Aedes sollicitans* (Walker)**
25. *Aedes spencerii spencerii* (Theobald)
26. ***Aedes sticticus* (Meigen)**
27. ***Aedes stimulans* (Walker)**
28. *Aedes taeniorhynchus* (Say)
29. *Aedes thibaulti* (Dyar and Knab)
30. ***Aedes tormentor* (Dyar and Knab)***
31. ***Aedes triseriatus* (Say)**
32. ***Aedes trivittatus* (Coquillet)**
33. ***Aedes vexans* (*Meigen*)**

Genus *Anopheles* (Meigen)

34. *Anopheles atropos* (Dyar and Knab)
35. ***Anopheles barberi* (Coquillett)**
36. ***Anopheles bradleyi* (King)**
37. ***Anopheles crucians* (*Weidemann*)**
38. ***Anopheles earlei* (*Vargas*)**
39. ***Anopheles punctipennis* (Say)**
40. ***Anopheles quadrimaculatus* (Say)**
41. ***Anopheles walkeri* (Theobald)**

Genus *Coquillettidia* (Dyar)

42. ***Coquillettidia perturbans* (*Walker*)**

Genus *Culex* (Linnaeus)

43. ***Culex erraticus* (Dyar and Knab)**
44. ***Culex pipiens* (Linnaeus)**
45. ***Culex restuans* (Theobald)**
46. ***Culex salinarius* (Coquillett)**
47. ***Culex tarsalis* (Coquillett)**
48. ***Culex territans* (*Walker*)**

Genus *Culiseta* (Felt)

49. ***Culiseta inornata* (Williston)**
50. ***Culiseta melanura* (Coquillett)**
51. ***Culiseta minnesotae* (Barr)**
52. ***Culiseta morsitans* (Theobald)**

Genus *Orthopodomyia* (Theobald)

53. *Orthopodomyia alba* (Baker)
54. ***Orthopodomyia signifera* (Coquillett)**

Genus *Psorophora* (Robineau-Desvoidy)

55. ***Psorophora ciliata* (Fabricius)**
56. ***Psorophora columbiae* (Dyar and Knab)**
57. *Psorophora cyanescens* (Coquillett)
58. *Psorophora discolor* (Coquillett)
59. ***Psorophora ferox* (von Humboldt)**
60. ***Psorophora howardii* (Coquillet)**
61. *Psorophora mathesoni* (Belkin & Heinemann)

Genus *Toxorhynchites* (Theobald)

62. ***Toxorhynchites rutilus septentrionalis* (Dyar and Knab)**

Genus *Uranotaenia* (Lynch- Arribalzaga)

63. ***Uranotaenia sapphirina* (Osten Sacken)**

Genus *Wyeomyia* (Theobald)

64. ***Wyeomyia smithii* (Coquillett)**

46 species in Warren County

***Most recent addition 7/7/21**

Figure 14

2024 GROUND INSPECTION/LARVICIDING DISTRICTS

Known Mosquito Production Sites by Control Approach

DISTRICT 1 (North)

Township	*Regular Sites*	*Ext Release Briquets*	*Fish Sites*	*2 Person Sites*	*Aerial Sites*	*Untreated Sites*	*Ext Release Granual*	TOTAL
Blairstown	66	6	11	0	0	0	0	83
Hardwick	46	7	18	0	3	5	0	79
Knowlton	76	3	15	0	0	0	0	94
Total	**188**	**16**	**44**	**0**	**3**	**5**	**0**	**256**

DISTRICT 2 (East)

Township	*Regular Sites*	*Ext Release Briquets*	*Fish Sites*	*2 Person Sites*	*Aerial Sites*	*Untreated Sites*	*Ext Release Granual*	TOTAL
Allamuchy	62	1	4	6	18	2	0	93
Hackettstown	23	3	4	0	0	16	0	46
Independence	74	13	20	5	1	0	0	113
Mansfield	39	1	8	1	0	0	0	49
Total	**198**	**18**	**36**	**12**	**19**	**18**	**0**	**301**

DISTRICT 3 (Central)

Township	*Regular Sites*	*Ext Release Briquets*	*Fish Sites*	*2 Person Sites*	*Aerial Sites*	*Untreated Sites*	*Ext Release Granual*	TOTAL
White	47	4	8	1	6	0	0	66
Hope	49	9	13	6	2	0	5	84
Liberty	44	2	8	0	4	0	1	59
Frelinghuysen	60	8	7	1	6	0	2	84
Total	**200**	**23**	**36**	**8**	**18**	**0**	**8**	**293**

DISTRICT 4 (South)

Township	*Regular Sites*	*Ext Release Briquets*	*Fish Sites*	*2 Person Sites*	*Aerial Sites*	*Untreated Sites*	*Ext Release Granual*	TOTAL
Alpha	4	0	0	0	0	0	0	4
Belvidere	6	0	0	2	0	0	0	8
Franklin	19	2	1	0	0	0	0	22
Greenwich	13	0	1	0	0	0	0	14
Harmony	34	0	5	0	0	6	0	45
Lopatcong	18	0	0	0	0	0	0	18
Oxford	35	4	6	3	14	2	0	64
Phillipsburg	1	0	0	0	0	0	0	1
Pohatcong	26	16	3	0	0	0	0	45
Washington Boro.	8	1	0	0	0	0	0	9
Washington Twsp.	44	7	6	0	0	0	0	57
Total	**208**	**30**	**22**	**5**	**14**	**8**	**0**	**287**
GRAND TOTAL	**794**	**87**	**138**	**25**	**54**	**31**	**8**	**1,137**

DISTRICTS 1, 2, 3 & 4 Catch Basins

Catch basins throughout the county, inspected and treated bimonthly	**1500+**
Swimming pools (abandoned/unused) constantly changing status	**60+**

KEY:

Regular Sites	Inspected regularly by one or more inspectors
Ext Release	Use of an extended release product for season long control- -primarily for safety concerns & visited only periodically
Fish	Sites where fish are regularly used for larval/pupal control -sites visited periodically to check on status of fish
2 Person	Sites where inspection in pairs (2 people) is advisable -primarily due to either size of the flooded area or a safety issue
Aerial	Parcels of land inspected seperated and larvicided using aircraft
Untreated	While periodically monitored for breeding theses sites are left untreated -primarily due to lack of human population or large size.

Figure 15

Warren County Mosquito Control Commission
2024 Airspray Site Treatments

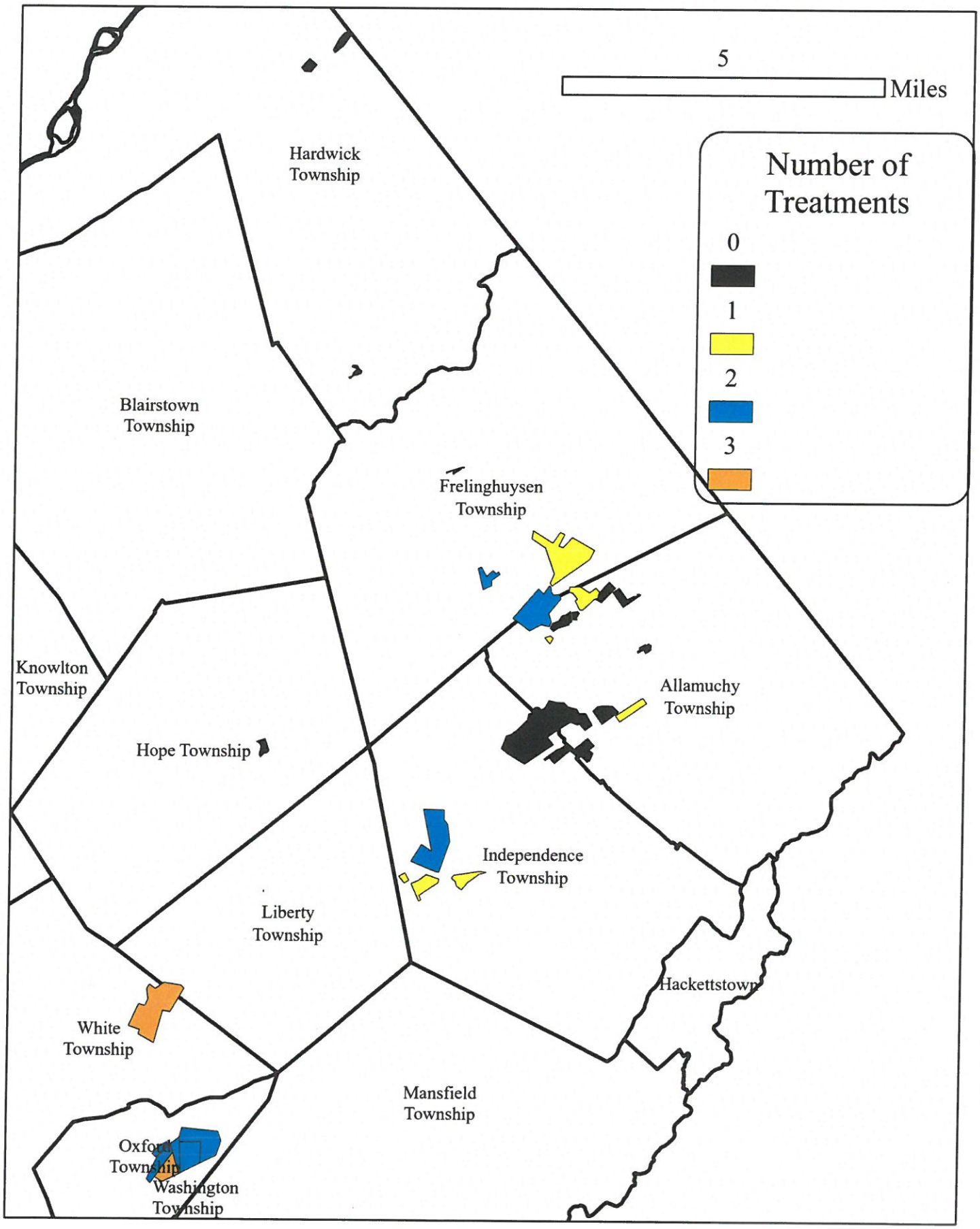
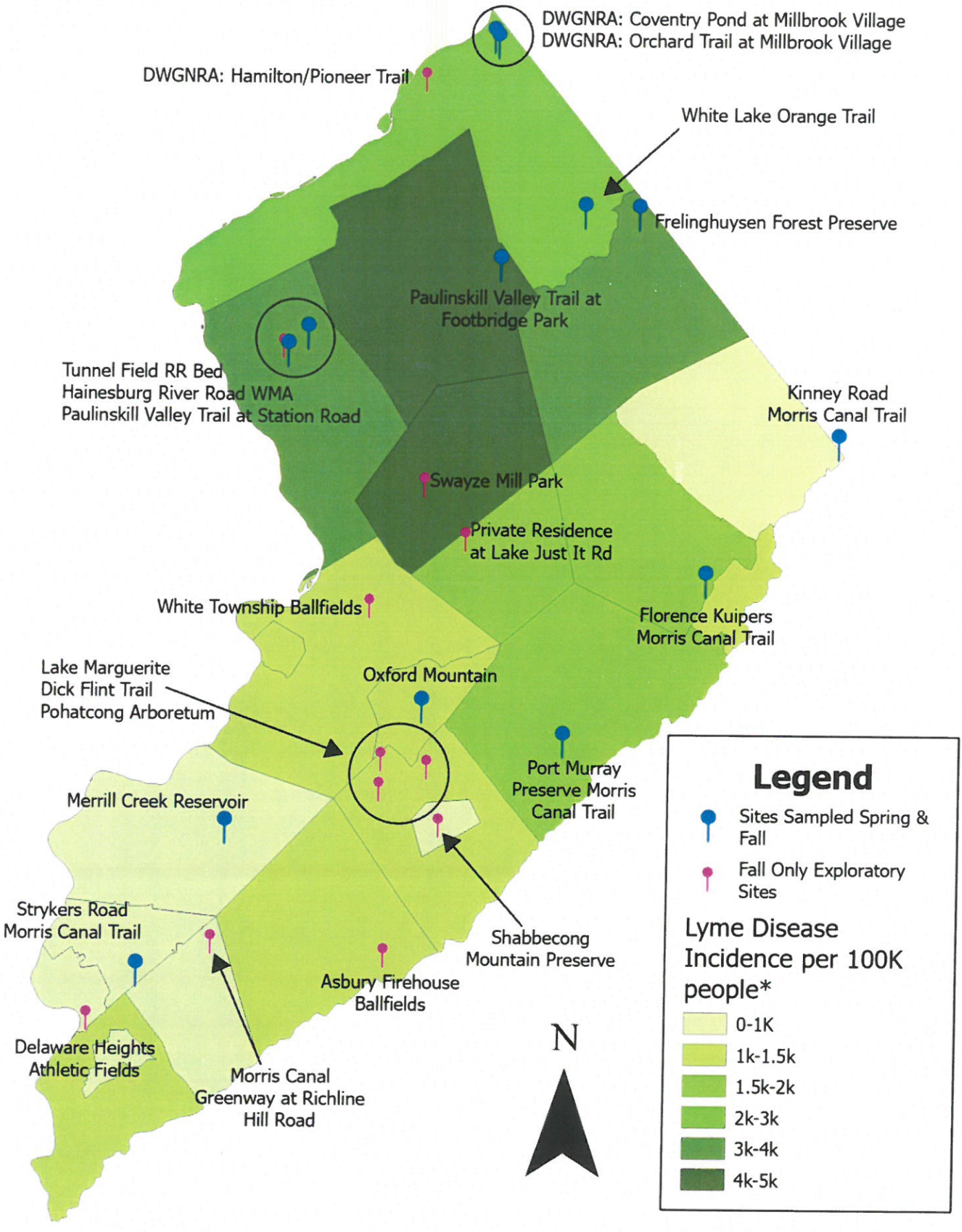


Figure 16

2024 Warren County Tick Surveillance Sites



*Lyme disease incidence based on 2017-2021 data from the Warren County Health Department

2024 Warren County Tick Surveillance Summary

2024 Spring Collection Season

			Ixodes scapularis			*Ixodes dentatus*	*Ixodes*	*Dermacentor variabilis*			*Amblyomma americanum*			*Haemaphysalis longicornis*			TOTAL
Site Name	**Township**	**Cumulative Area Sampled (meters^2)**	Adult Female	Adult Male	Nymph	Nymph	Larvae	Adult Female	Adult Male	Nymph	Adult Female	Adult Male	Nymph	Adult Female	Adult Male	Nymph	
Kinney Road Morris Canal Trail	Allamuchy	2,535	15	22	11	–	–	–	–	–	–	–	–	–	–	–	48
Paulinskill Valley Trail at Footbridge Park	Blairstown	3,000	2	–	4	–	–	1	–	–	–	–	–	–	–	–	7
Frelinghuysen Forest Preserve	Frelinhuysen	3,000	–	–	56	–	–	–	–	–	–	–	–	–	–	–	56
Strykers Road Morris Canal Trail	Greenwich	3,000	4	4	6	–	–	14	6	–	–	–	–	–	–	–	34
Florence Kuipers Morris Canal Trail	Hackettstown	2,250	9	10	75	–	–	–	–	–	–	–	–	–	–	–	94
White Lake Orange Trail	Hardwick	3,000	2	3	37	–	–	–	–	–	–	–	–	–	–	–	42
National Water Gap: Coventry Pond Trail	Hardwick	750	–	1	6	–	–	2	4	–	–	–	–	–	–	–	13
National Water Gap: Orchard Trail at Millbrook Village	Hardwick	750	–	1	35	–	–	2	3	–	–	–	–	–	–	–	41
Merrill Creek Reservoir	Harmony	3,000	–	1	46	–	1	–	–	–	–	–	–	–	–	–	48
Paulinskill Valley Trail at Station Road	Knowlton	3,750	14	10	28	2	–	1	4	–	–	–	–	–	–	–	59
Tunnel Field RR Bed	Knowlton	375	–	–	8	–	–	–	1	–	–	–	–	–	–	–	9
Port Murray Preserve Morris Canal Trail	Mansfield	3,000	6	5	45	2	1	2	–	–	–	–	–	–	–	–	61
Oxford Mountain	Oxford	3,000	3	3	35	–	18	1	–	–	–	–	–	–	–	–	60
	TOTALS	**31,410**	**55**	**60**	**392**	**4**	**20**	**23**	**18**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**572**

2024 Fall Collection Season

			Ixodes scapularis			*Ixodes dentatus*	*Ixodes*	*Dermacentor variabilis*			*Amblyomma americanum*			*Haemaphysalis longicornis*			TOTAL
Site Name	**Township**	**Cumulative Area Sampled (meters^2)**	Adult Female	Adult Male	Nymph	Nymph	Larvae	Adult Female	Adult Male	Nymph	Adult Female	Adult Male	Nymph	Adult Female	Adult Male	Nymph	
Kinney Road Morris Canal Trail	Allamuchy	1,500	31	22	–	–	–	–	–	–	–	–	–	–	–	–	53
Paulinskill Valley Trail at Footbridge Park	Blairstown	1,500	13	8	–	–	–	–	–	–	–	–	–	–	–	–	21

Figure 16a

2024 Warren County Tick Surveillance Summary

Asbury Firehouse Ballfields	Franklin	750	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1
Frelinghuysen Forest Preserve	Frelinhuysen	1,500	8	5	–	–	–	–	–	–	–	–	–	–	–	–	13
Strykers Road Morris Canal Trail	Greenwich	1,500	7	4	–	–	–	–	–	–	–	–	–	–	–	–	11
Morris Canal Greenway Richline Hill Road	Greenwich	750	5	4	–	–	–	–	–	–	–	–	–	–	–	–	9
Florence Kuipers Morris Canal Trail	Hackettstown	1,500	9	7	–	–	–	–	–	–	–	–	–	–	–	–	16
National Water Gap: Coventry Pond Trail	Hardwick	750	35	29	–	–	–	–	–	–	–	–	–	–	–	–	64
National Water Gap: Orchard Trail at Millbrook Village	Hardwick	750	17	15	–	–	–	–	–	–	–	–	–	–	–	–	32
National Water Gap: Hamilton/Pioneer Trail	Hardwick	750	25	34	–	–	–	–	–	–	–	–	–	–	–	–	59
White Lake Orange Trail	Hardwick	750	3	6	–	–	–	–	–	–	–	–	–	–	–	–	9
Merrill Creek Reservoir	Harmony	1,500	3	3	–	–	–	–	–	–	–	–	–	–	–	–	6
Swayze Mill Park	Hope	750	12	15	–	–	–	–	–	–	–	–	–	–	–	–	27
Hainesburg River Road Wildlife Management Area	Knowlton	750	6	7	–	–	–	–	–	–	–	–	–	–	–	–	13
Paulinskill Valley Trail at Station Road	Knowlton	1,500	26	27	–	–	–	–	–	–	–	–	–	–	–	–	53
Tunnel Field RR Bed	Knowlton	750	4	2	–	–	–	–	–	–	–	–	–	–	–	–	6
Private Residence on Lake Just It Road	Liberty	750	2	4	–	–	–	–	–	–	–	–	–	–	–	–	6
Port Murray Preserve Morris Canal Trail	Mansfield	1,500	26	19	4	–	2	–	–	–	–	–	–	–	–	–	51
Oxford Mountain	Oxford	750	2	3	1	–	–	–	–	–	–	–	–	–	–	–	6
Delware Heights Athletic Fields	Phillipsburg	750	3	12	–	–	–	–	–	–	–	–	–	–	–	–	15
Shabbecong Mountain Preserve	Washington Borough	750	2	3	–	–	–	–	–	–	–	–	–	–	–	–	5
Dick Flint Trail	Washington Township	750	5	2	–	–	–	–	–	–	–	–	–	–	–	–	7
Lake Marguerite	Washington Township	1,500	4	3	–	–	–	–	–	–	–	–	–	–	–	–	7
Pohatcong Arboretum	Washington Township	750	6	6	–	–	–	–	–	–	–	–	–	–	–	–	12

Figure 16a

2024 Warren County Tick Surveillance Summary

White Township Ballfields	White Township	750	13	9	–	–	–	–	–	–	–	–	–	–	–	–	22
	TOTALS	**25,500**	**267**	**250**	**5**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**524**

Figure 16a

2024 Tick Pool Summary

Site Name	Township	2024 SPRING									
		# pools	# ticks tested	# pools positive						Number of total positives
				A. phagocytophilum	B. burgdorferi	B. miyamotoi	B. microti	R. rickettsii	POW	
Kinney Road Morris Canal Trail	Allamuchy	48	48	5	30	–	–	–	–	35
Paulinskill Valley Trail at Footbridge Park	Blairstown	7	7	–	1	1	1	–	–	3
Frelinghuysen Forest Preserve	Frelinhuysen	56	56	2	13	3	2	–	–	20
Strykers Road Morris Canal Trail	Greenwich	21	34	–	5	–	–	–	–	5
Florence Kuipers Morris Canal Trail	Hackettstown	94	94	7	10	–	2	–	–	19
White Lake Orange Trail	Hardwick	42	42	4	13	3	7	–	–	27
National Water Gap: Coventry Pond Trail	Hardwick	9	13	–	1	–	–	–	–	1
National Water Gap: Orchard Trail at Millbrook Village	Hardwick	38	41	3	11	–	4	–	–	18
Merrill Creek Reservoir	Harmony	47	47	1	10	2	5	–	–	18
Paulinskill Valley Trail at Station Road	Knowlton	55	57	2	21	1	4	–	–	28
Tunnel Field RR Bed	Knowlton	9	9	1	2	–	2	–	–	5
Port Murray Preserve Morris Canal Trail	Mansfield	57	58	5	8	1	6	–	1	21
Oxford Mountain	Oxford	42	42	–	6	–	–	–	–	6
	TOTAL	525	548	30	131	11	33	0	1	206

*28 co-infections
*3 tri-infections

Figure 16b

Site Name	Township	2024 FALL								
		# pools	# ticks tested	# pools positive						Number of total positives
				A. phagocytophilum	B. burgdorferi	B. miyamotoi	B. microti	R. rickettsii	POW	
Kinney Road Morris Canal Trail	Allamuchy	53	53	4	31	1	7	–	1	44
Paulinskill Valley Trail at Footbridge Park	Blairstown	21	21	2	10	0	3	–	2	17
Asbury Firehouse Ballfields	Franklin	1	1	–	–	–	–	–	–	0
Frelinghuysen Forest Preserve	Frelinhuysen	13	13	1	7	1	1	–	–	10
Strykers Road Morris Canal Trail	Greenwich	11	11	–	3	1	–	–	–	4
Morris Canal Greenway Richline Hill Road	Greenwich	9	9	–	3	–	–	–	–	3
Florence Kuipers Morris Canal Trail	Hackettstown	16	16	–	7	–	2	–	1	10
National Water Gap: Coventry Pond Trail	Hardwick	64	64	2	44	1	15	–	1	63
National Water Gap: Orchard Trail at Millbrook Village	Hardwick	32	32	2	15	2	7	–	2	28
National Water Gap: Hamilton/Pioneer Trail	Hardwick	59	59	11	37	2	13	–	–	63
White Lake Orange Trail	Hardwick	9	9	3	7	1	4	–	–	15
Merrill Creek Reservoir	Harmony	6	6	1	4	–	2	–	–	7
Swayze Mill Park	Hope	27	27	1	11	–	1	–	–	13
Hainesburg River Road Wildlife Management Area	Knowlton	13	13	–	8	–	3	–	1	12
Paulinskill Valley Trail at Station Road	Knowlton	53	53	4	28	–	6	–	–	38
Tunnel Field RR Bed	Knowlton	6	6	–	5	–	1	–	–	6
Private Residence on Lake Just It Road	Liberty	6	6	–	3	–	–	–	–	3
Port Murray Preserve Morris Canal Trail	Mansfield	49	49	5	28	1	13	–	–	47
Oxford Mountain	Oxford	6	6	–	2	1	–	–	–	3
Delware Heights Athletic Fields	Phillipsburg	15	15	–	4	–	–	–	–	4

Shabbecong Mountain Preserve	Washington Borough	**5**	**5**	1	1	–	–	–	–	**2**
Dick Flint Trail	Washington Township	**7**	**7**	1	5	1	–	–	–	**7**
Lake Marguerite	Washington Township	**7**	**7**	1	3	–	–	–	–	**4**
Pohatcong Arboretum	Washington Township	**12**	**12**	1	8	–	1	–	–	**10**
White Township Ballfields	White Township	**22**	**22**	2	13	–	2	–	–	**17**
	TOTAL	522	522	42	287	12	81	0	8	**430**

*94 co-infections
*10 tri-infections
*1 quad-infection

Figure 16b

Pesticide Resistance Monitoring Report 2024

NEVBD Pesticide Resistance Monitoring Project

Contents

1 Submitter Information

Submitting Agency : Warren County Mosquito Control Commission

Location: Warren,NJ

Project: 2024 Pesticide Resistance Monitoring Project

2 CDC Bottle Bioassay

The CDC bottle bioassay directly tests mosquitoes for resistance against specific active ingredients. Resistance is determined by measuring mosquito mortality at set times, also called diagnostic times. These diagnostic times are specific to each active ingredient tested. The level of resistance is determined by measuring the amount of mosquitoes that have died (mortality) at these diagnostic time points. When less than 90% of the mosquitoes die at the first diagnostic time point, this indicates low level resistance. Medium level resistance is indicated when less than 90% mortality is achieved when we double the diagnostic time, and high level resistance is indicated when less than 90% mortality is achieved when we triple the diagnostic time.. The CDC bottle bioassay is important in evaluating resistance against specific adulticides and assessing the level of resistance we can expect resistance to occur for those insecticides.

Table 1: Adulticide Assay Resistance Results

Town / City	Site Name	Species	Pesticide	Resistance Level
Belvidere	Belvidere Cemetery	*Culex pipiens*	Etofenprox	High resistance
Belvidere	Belvidere Cemetery	*Culex pipiens*	Malathion	Susceptible
Belvidere	Belvidere Cemetery	*Culex restuans*	Etofenprox	High resistance
Belvidere	Belvidere Cemetery	*Culex restuans*	Malathion	Susceptible

CDC Bottle Bioassay Results

The following clustered bar chart represents the percent mortality of different pesticides at their corresponding diagnostic time points. A red dashed line on the plot shows the threshold for 90% mortality. When we see mortality below this 90% threshold, resistance is indicated.

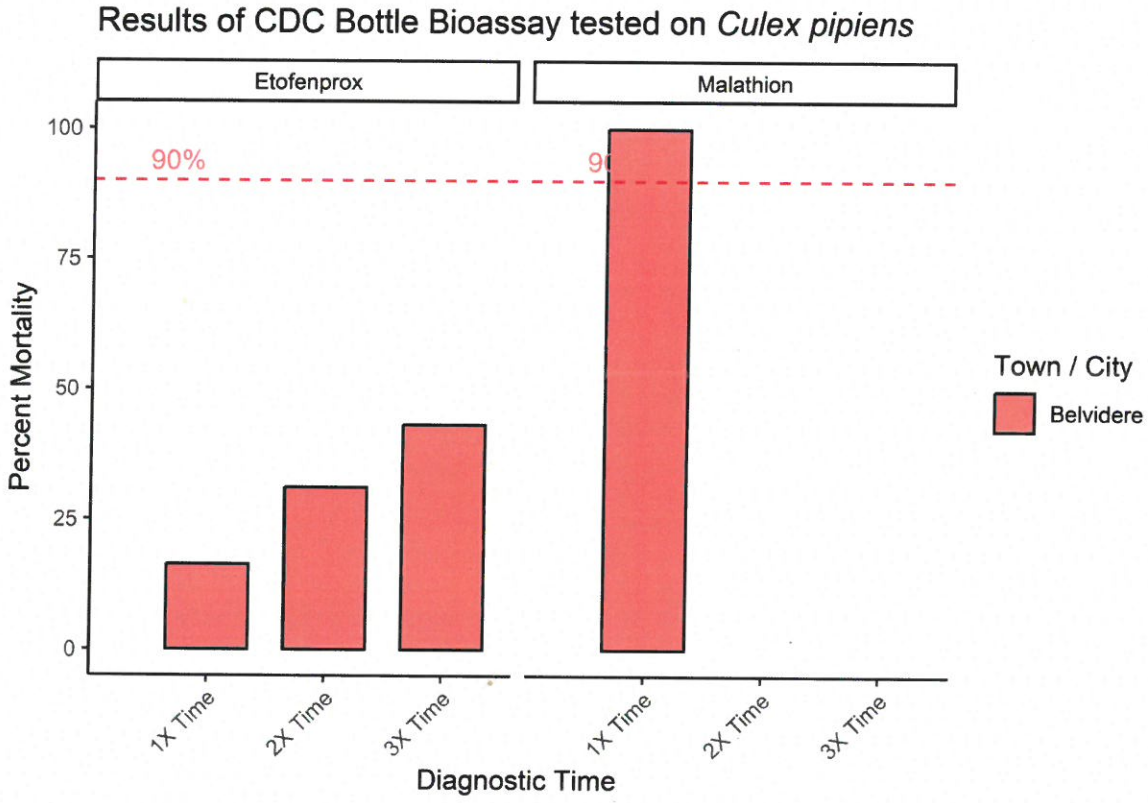


Figure 1: Results of CDC Bottle Bioassays

2.0.1 *Culex restuans* Bottle Bioassay Results

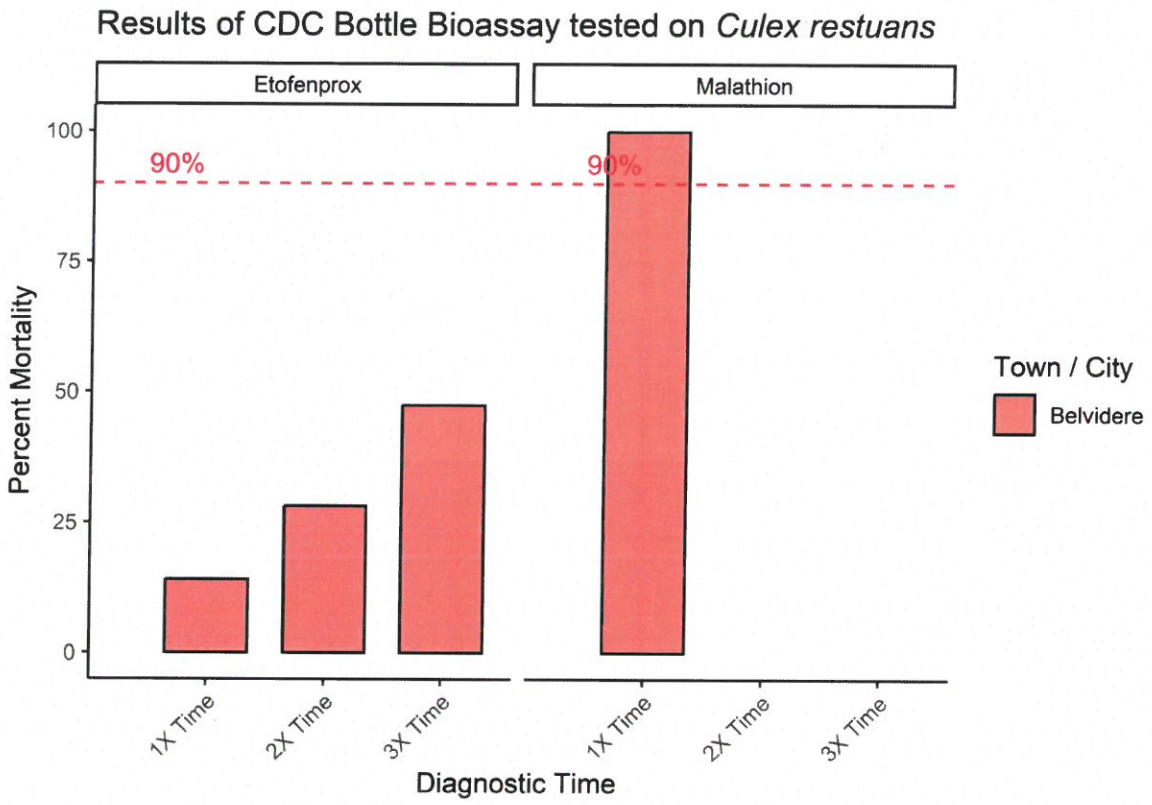


Figure 2: Results of the Culex restuans CDC Bottle Bioassay

Results of the CDC bottle bioassay. Each diagnostic time represents a timepoint in which less than 90% mortality indicates resistance. Intensity of resistance is directly corresponds with the diagnostic time, with 1X, 2X, and 3X referring to low, moderate and high resistance respectively.

3 Larval Resistance Assays

3.1 Larval Resistance Assay Results

Low-level resistance to larvicides in mosquito larvae can be determined using larval resistance assays. These include biological control, such as *BTI* and *L. sphaericus*, or the insect growth regulator Methoprene.The mechanisms of action for the biological controls *BTI* and *L. sphaericus* are directly toxic and destructive to the larvae, acting in their midgut. Resistance to biological controls is determined using percent mortality. The larvicide Methoprene works differently than the biological controls. It is an insect growth regulator, acting on the eclosion of mosquitoes, which is the process of adults emerging from their pupal casing. Resistance to Methoprene is determined by the number of mosquitoes that fail to eclose or die in pupation.

4 Characterizing Metabolic Enzyme Activity

Insecticide resistance in mosquitoes is a complex and consistently changing problem. Having multiple tools to investigate resistance is essential for adapting control practices. Testing of individual adulticides provides critical information on what active ingredients mosquitoes are resistant to. Enzymes within mosquitoes are key to breaking down pesticide chemicals. Mosquitoes often protect themselves from similar chemicals using the same groups of enzymes. Therefore, enzyme testing offers additional insight into resistance beyond individual adulticide testing. The enzyme assay helps reveal how mosquitoes break down pesticides by identifying if the activity of protective molecular mechanisms are higher than expected when compared to a susceptible mosquito colony.The following box plots represent the data of these enzyme assays. These plots compare the relative enzyme activity of the mosquito samples submitted to our program to a known susceptible mosquito colony. We conducted statistical analyses to compare the submitted samples to the susceptible mosquito colony. We looked at the proportion of submitted mosquitoes that exceeded the 99th percentile of the susceptible mosquito colony, categorizing the enzyme activity into three levels:

- **Unelevated**: This means that less than 15% of the submitted samples have enzyme activity that exceeds the 99th percentile threshold. It suggests that the enzyme levels in these mosquitoes are not significantly different from those in the susceptible mosquito colony.
- **Emerging elevation**: More than 15% of the submitted samples tested above the 99th percentile threshold. This indicates that the submitted samples are likely developing elevated enzyme levels.
- **Elevated**: This category indicates that more than 50% of the submitted samples fall above the 99th percentile threshold. It suggests that the enzyme pathway in these mosquitoes is elevated compared to the susceptible mosquito colony.

Elevated enzyme levels are associated with increased potential adulticide resistance within mosquitoes. If adulticide resistance is present, but the enzyme levels are not elevated, this indicates another pathway might be responsible for this resistance.

4.1 Oxidase Enzyme Assay Results

The oxidase enzyme assay measures the activity of the p450 oxidases within the mosquito samples. Elevated oxidase enzymes are associated with pyrethroid resistance as well as cross-resistance to organophosphates to a lesser extent.

Table 2: Oxidase Assay Results of Submission Compared to 99th Percentile of Susceptible Colony

Site	Proportion Above	Enzyme Status
Belvidere Cemetery	4.1667	Unelevated

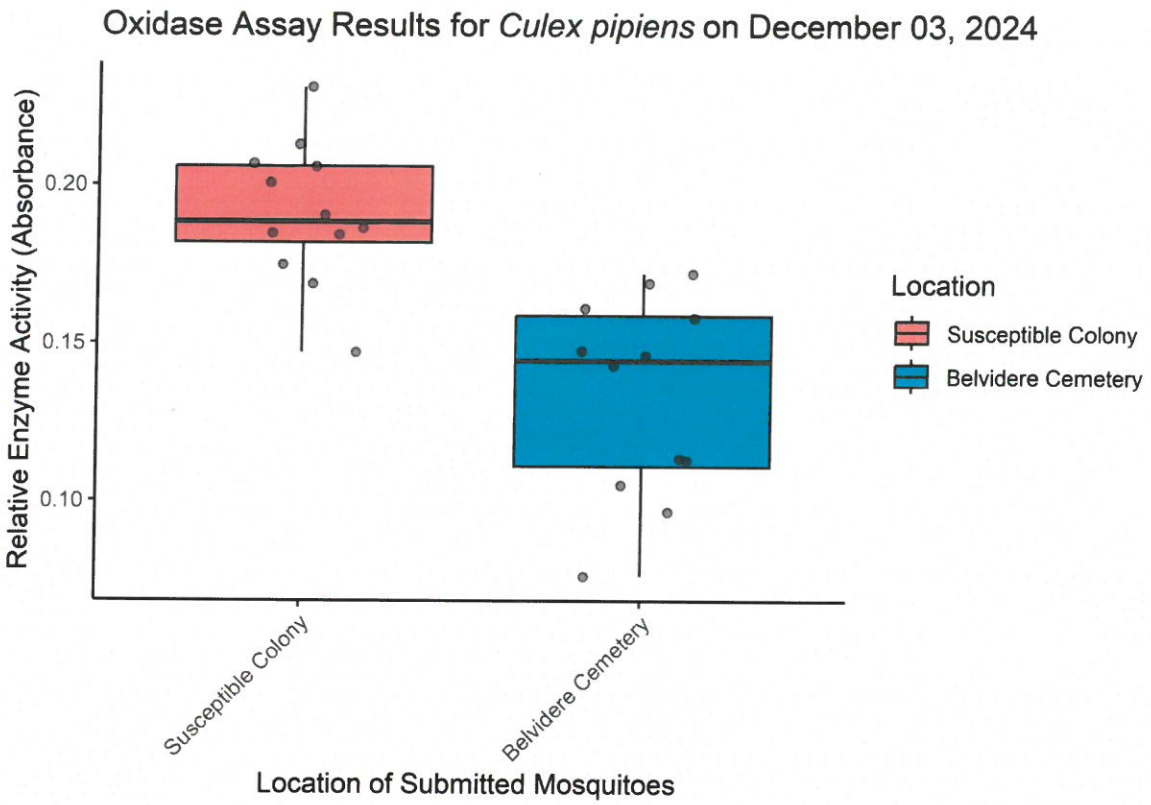


Figure 3: Oxidase Enzyme Assay

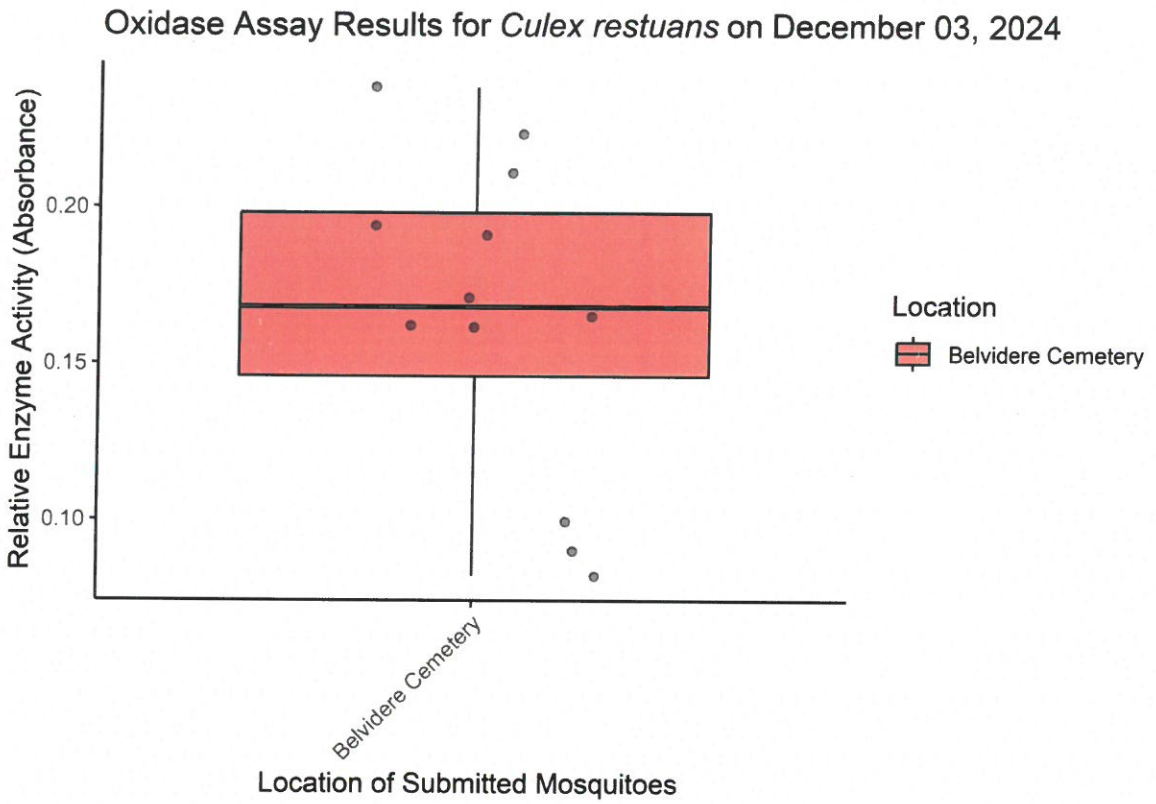


Figure 4: Oxidase Enzyme Assay

Results of the oxidase enzyme assay performed on field collected mosquitoes.

4.2 Esterase Enzyme Assay Results

The esterase enzyme assays measure the activity of two classes of enzymes, the alpha and beta esterases. These enzymes are primarily responsible in resistance against organophosphates, along with cross-resistance to pyrethroids to a lesser extent.

The following box plots represent the data of these enzyme assays. These plots compare the relative enzyme activity of the mosquito samples submitted to our program to a known susceptible mosquito colony. We conducted statistical analyses to compare the submitted samples to the susceptible mosquito colony. We looked at the proportion of submitted mosquitoes that exceeded the 99th percentile of the susceptible mosquito colony, categorizing the enzyme activity into the three levels listed above

Table 3: Esterase Enzyme Assay Results of Submission Compared to 99th Percentile of Susceptible Colony

Site	Proportion Above	Enzyme Status	Assay
Belvidere Cemetery	0	Unelevated	Beta-esterase

4.2.1 Beta-Esterase

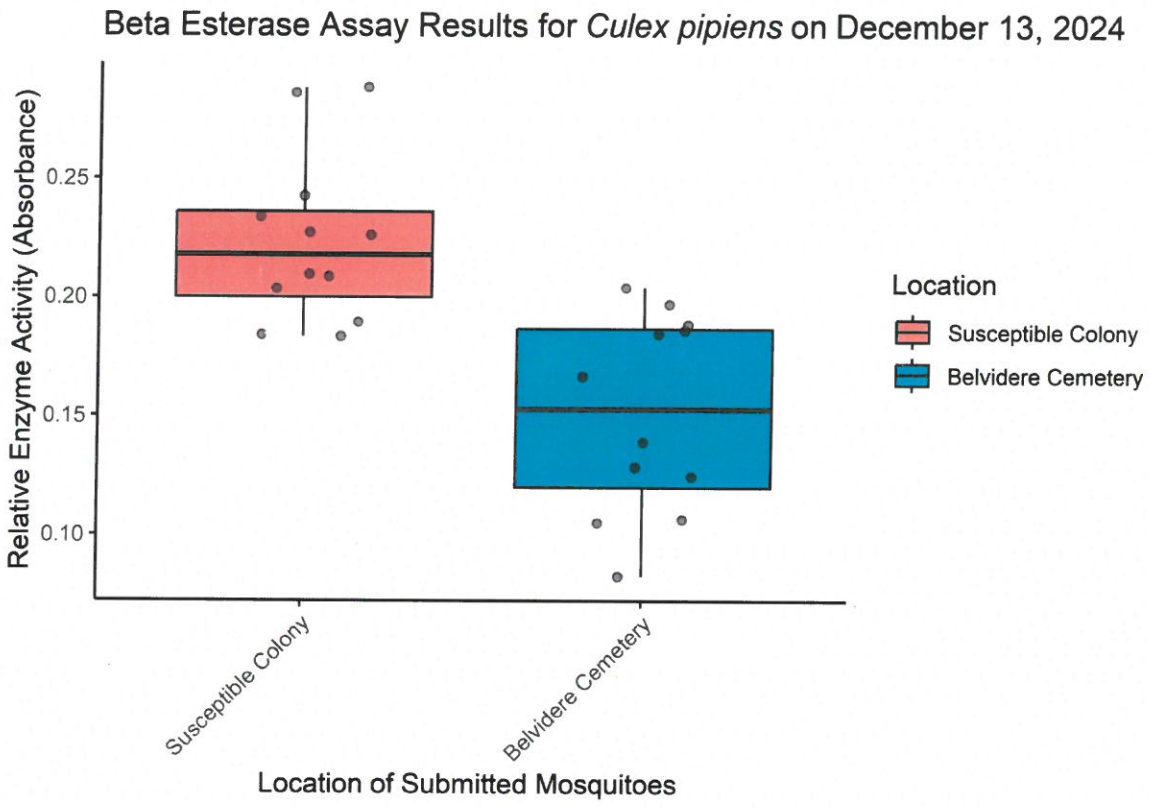


Figure 5: Beta Esterase Assay

(#fig:Esterase Boxplot-1)

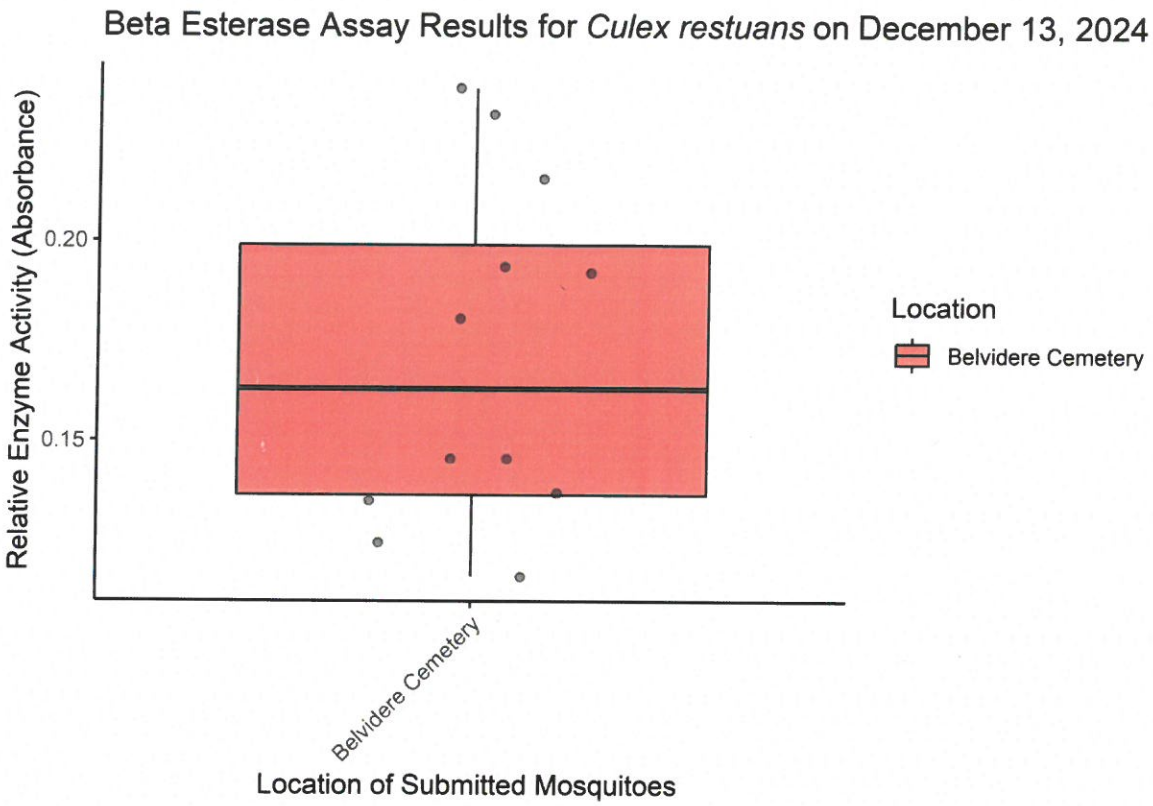
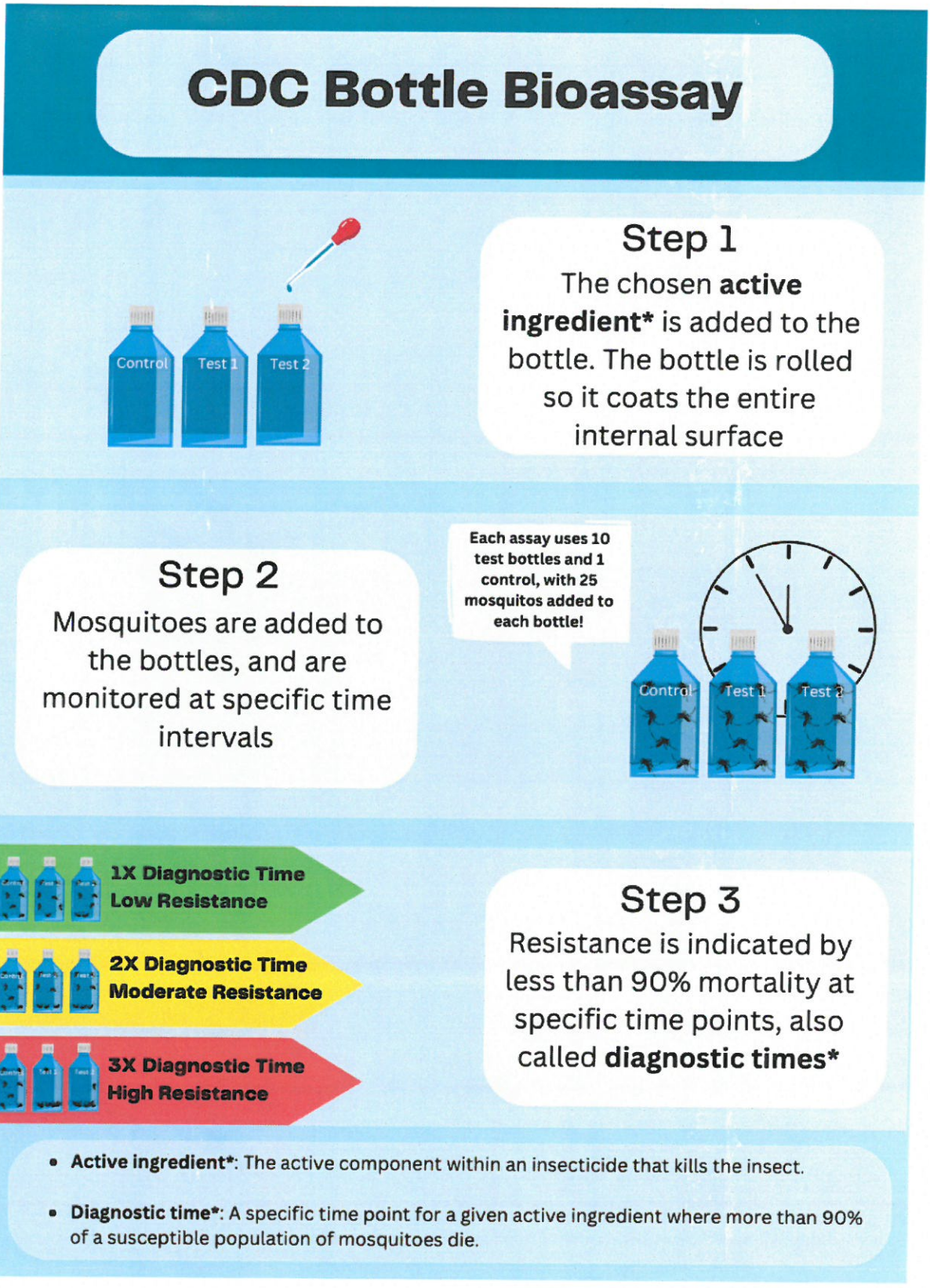


Figure 6: Beta Esterase Assay

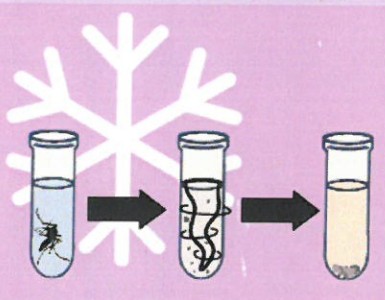
(#fig:Esterase Boxplot-2)

Results of the beta-esterase enzyme assay performed on field collected mosquitoes.

5 Assay Infographics



Microplate Assays

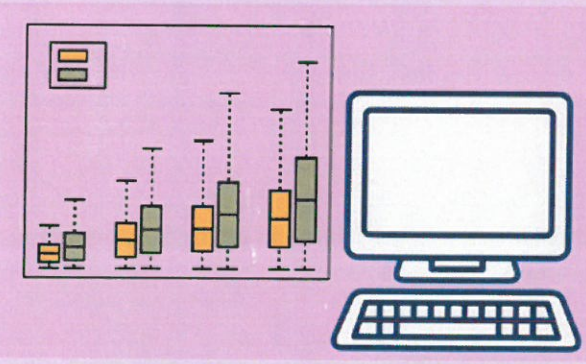


Step 1

Adult mosquitoes are frozen and later **homogenized*** to extract the **enzymes***. It's important to keep everything cold at this step!

Step 2

The **mosquito homogenate*** is added to the microplate with other chemicals, where the enzymes create a color reaction. The **absorbance*** of each well is measured to indicate activity



Step 3

The sample means are compared to a susceptible mosquito colony. Statistically significantly higher enzyme levels can indicate a group of enzymes is contributing to resistance

- **Enzyme*:** a protein that breaks down toxins and other compounds
- **Homogenize*:** prepare a suspension of compounds from (tissue) by physical treatment in a liquid.
- **Absorbance*:** the amount of light absorbed by a substance. This can be used to measure chemical reactions that change color as they progress, like these assays!

NEVBD
NORTHEAST REGIONAL CENTER FOR EXCELLENCE IN VECTOR-BORNE DISEASES

COMMUNITY THOUGHTS ON MOSQUITO CONTROL

We asked participants in MA, NJ, and NY about mosquitoes and mosquito-borne disease (MBD), their perceptions of local mosquito control, and what motivates their bite prevention behavior

Northeastern US

Respondents perceive MBD risk as low

Participants felt they were not at all likely (40%) or only somewhat likely (37%) to become sick with a MBD

Largely supportive of mosquito control services, but have concerns about pesticide usage impact on environment, animals, and humans

> "I'd want to know the risk of... cancer causing agents in [pesticides]"
> MA focus group

When perceived risk of MBD increases, sentiment swings to supporting mosquito control action through pesticide use

> "I wouldn't push...city government to do something unless...people are getting hospitalized for it [MBD]" - NY focus group

Belvidere, NJ

- Six participants attended a focus group session in Belvidere, NJ in the summer of 2023.
- Overall participants viewed investment in mosquito control as important for the community's health
- Largely supportive of the local health authorities knowing if mosquitoes are infected with viruses
- There was a desire for transparency and easily accessible information on the timeline and duration of spray events

If you have questions please contact Emily Mader (emm367@cornell.edu) or Aine Lehane (al2432@cornell.edu)

WHAT CAN MOSQUITO CONTROL AGENCIES DO?



Mosquito control agencies should actively communicate with the community to foster trust and allay fears by:

- Communicating information that is responsive to community concerns
- Partnering with trusted community organizations (e.g., library, schools, etc.)
- Tailoring messages and engagement approaches to the local constituency appropriately

Mosquito control agencies can increase feelings of trust among the community by increasing transparency, including:

- Providing instructions for public during spray events, including how long to keep windows closed and pets indoors
- Conducting outreach and education on how to reduce mosquito bite risk
- Making all technical information on pesticide products, application processes, and potential risks publicly available
- Having decision-making process for mosquito control actions publicly available
- Recognizing opt-in listservs are not effective and providing diverse outreach approaches