2024 Year End Report

Gem County Mosquito Abatement District
6846 West Highway 52
Emmett, Idaho 83617

2024 Mosquito Surveillance and Control Summary Report

Mission Statement

The principal mission of the Gem County Mosquito Abatement District and the basic reason for its operation is to provide comprehensive and sustainable mosquito control as a means of protecting public and veterinary health by reducing the number of mosquitoes that transmit diseases. Secondary missions accomplished by the district's program include the improvement of human and animal welfare by reducing the number of nuisance mosquitoes, increasing yields and productivity in livestock, continual enjoyment of public and private outdoor recreation areas, and minimization of impacts mosquito populations may have on tourism and visitor-generated revenues for local area businesses.

District History

The Gem County Mosquito Abatement District (GCMAD) was created by election in 1960 using the "Idaho Abatement Act," Idaho Code Title 39, Chapter 28 for the purpose of alleviating the pressure mosquitoes were having on cattle production. Originally, the district was established to protect all of Gem County, but over time, several areas opted out of coverage. Currently, the district is approximately 145 square miles.

Today, mosquito control utilizes an Integrated Pest Management program that realizes mosquito populations will not always be eliminated but can be suppressed to tolerable levels for protection of public health and welfare. The program is reviewed annually to adjust for regulatory and ecological changes and requirements. Only scientifically sound methods are used for mosquito control in the GCMAD, and decisions are based on consideration of what is ecologically and economically in the best interests of the district constituency over a sustainable period of time.

G.C.M.A.D Management and Staff

Board of Trustees:
Michele Chadwick, Co-Chairperson
Tom Carlsen, Co-Chairperson
Anita Taylor, Member
Scott Uhrig, Member
Kilikuna Jung, Member

Full-time Staff:
Cody Johns, Manager
Crystal Anderson, Administrative Assistant
Jerry Forrey, Mechanic/Larval Technician
Conrad Patereau, Surveillance Coord
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Seasonal Positions:

10 Mosquito Control Technicians

Ex-Officio Members:
Southwest District Health Dept.
Idaho Dept. of Agriculture
University of Idaho Extension Office

Manager's Letter

The 2024 mosquito control season presented many different challenges and provided several opportunities to further develop GCMAD program sustainability.

Gem County has continued to grow, this created and will create more impact on our control efforts. GCMAD will continue to increase public outreach as it will become essential for the public to help manage standing water in their yards, pastures, and any other sites that they might be creating. GCMAD will be successful with everyone helping to fight the bite.

The GCMAD's robust integrated mosquito management program focused primarily on the identification and treatment of larval mosquito development sites. The district ensured long-lasting control in historically high-output larval mosquito production sites by applying residual products to the sites on a regular, appropriate schedule. As part of the district's pesticide selection plan, it utilized a larval mosquito control product, Altosid P-35™, in greater quantities to meet the district's needs in 2024 after district staff effectively applied and controlled larva. The district plans to increase the volume of these types of products in 2025, which will help reduce the impact we have on properties and reduce mosquito numbers.

GCMAD uses a sUAV (small unmanned aerial vehicle), typically this drone is vital and sees tons of workload. We had a small fire on a flight which then caused our drone to be out of commission for most of the season. This in turn made treatments more difficult and put more workload on our staff.

West Nile virus (WNv) was initially found in mosquitoes during routine surveillance on August 7th. This is later than we typically find it. The district collected 10 positive samples of mosquitoes for WNv), One confirmed equine case of WNV occurred in Gem County in 2024, and one human case was confirmed in Gem County.

The district continued to build on the significant improvements to its surveillance capabilities in 2024. We also used a greater amount of CO-2 baited traps to increase our Culex samples. In addition to the increase CO-2 traps we added light traps back into the rotation as well.

The district also had one aerial adulticide spray conducted this season. This aerial was flown to suppress and help with our Culex numbers. It was focused on high Culex mosquito production areas of the district and high nuisance mosquitoes. This aerial spray was extremely productive in reducing our mosquito numbers in the district.

Memberships, Affiliations, and Leadership Roles

- American Mosquito Control Association (AMCA), sustaining member, Cody Johns
- Northwest Mosquito and Vector Control Association, sustaining member.
- Idaho Mosquito and Vector Control Association, sustaining member.

Public Education

The GCMAD understands that public education is a critical component of a modern mosquito control program. The following are examples of the district's public education efforts in 2024:

- The substantial use of the district's website: www.gcmad.org.
- Facebook and the flow of information from us to the constituents.
- Gem County Local Emergency Planning Committee participation.
- News releases from the district in the Emmett Messenger Index discussing pertinent and timely mosquito control information.
- Coordination with other mosquito control programs to ensure a coordinated message is relayed to media.
- Participation in the town's Youth Appreciation Day

Integrated Mosquito Management Policy

The GCMAD supports management of mosquito populations when and where necessary by means of an integrated program designed to benefit or to have minimal adverse effects on people, domestic animals, wildlife, and the environment. This Integrated Mosquito Management Policy recognizes that mosquito populations cannot always be eliminated but must be suppressed to tolerable levels for the well-being of humans, domestic animals, and wildlife, and that selection of scientifically sound suppression methods must be based upon consideration of what is ecologically and economically in the long-term best interests of constituents of the GCMAD.

The following principles are to be followed:

- Mosquito control measures should only be undertaken when there is adequate justification based on surveillance data.
- The combination of methods for mosquito control should be chosen after careful consideration of the efficacy, health effects, ecological effects, and the cost versus benefits of the various options, including public education, legal action, natural and biological control, elimination of development sources, and pesticide applications.
- Mosquito development sources, whether natural or created by human activity, should be altered in such a manner as to cause the least undesirable impact on the environment.
- Pesticide application methods should be used in the most efficient and least hazardous manner in accordance with all applicable laws, regulations, and available scientific data. The registered label requirements for the pesticide used will be followed. When choices are available among different effective pesticides, those offering the least hazard to non-target organisms should be used. Pesticides will be chosen and used in a manner that will minimize the development of resistance in mosquito populations.
- Personnel involved in mosquito control programs should be properly trained and supervised, certified in accordance with relevant laws and regulations, and kept current with improvements in management techniques through continuing education and/or training programs.
- All necessary personal protective equipment should be provided to technicians making pesticide applications and proper handling, mixing, loading, and application training should be provided by supervisory staff, in accordance with all relevant pesticide label language.

Mosquito Surveillance and Control Objectives

The GCMAD is an independent taxing district, formed, organized, and governed by Idaho Code and is mandated by law to protect public health by controlling mosquitoes and the transmission of mosquito-borne disease. Mosquito control in Gem County can start as early as April 1st. In 2024, the GCMAD started regular larval mosquito inspections and treatments by April 1st. Fogging for adult mosquitoes began in May 2024 and continued until the end of September. Mosquito control applications and operations were determined by mosquito surveillance conducted throughout the district. Only when control thresholds were reached or surpassed were applications made. Thresholds were determined using CO_2-baited BG-pro EVS-style traps deployed at variable sites throughout the district. This allowed for real-time response to mosquito infestations. This report summarizes the results of surveillance conducted to monitor adult mosquito population dynamics, virus activity in adult mosquitoes, and the control products used in 2024.

The 2024 mosquito surveillance initiative began in the first week of June and continued through the third week of September. The initiative involved trapping adult mosquitoes with carbon dioxide (CO_2)-baited BG-pro EVS-style traps that were deployed on a weekly basis at different sites to monitor mosquito populations for the presence of West Nile virus (WNv).

Commonly Found Mosquito Species in Gem County:

Anopheles

Anopheles freeborni, the Western Malaria Mosquito, overwinter in sheltered locations and emerge in early spring. The species is one of the first biters of the season, attacking when the air is still cold. They bite freely from dusk to dawn. Females lay eggs in permanent water sources associated with poor irrigation practices.

Aedes

Aedes nigromaculis, the Irrigated Pasture Mosquito, is a common pest mosquito of the agricultural communities and surrounding areas of southern Idaho. It is a ferocious biter, inflicting a painful bite. It is a strong flyer and may migrate several miles from its development site. The primary habitat of this species has been largely created by agriculture; irrigated pastures are the most common development sites. The winter is passed in the egg stage with hatching occurring within hours of flooding. This mosquito species can transmit WEE, SLE, and California encephalitis virus.

Aedes vexans, the Inland Floodwater Mosquito, overwinter in the egg stage and there are generally one or more broods per season. Irrigation practices with poor drainage suits this species well. The females feed in shady places during the day and can be particularly annoying at dusk and after dark. They are troublesome biters and have a flight range of 1 to 5 miles.

Culiseta

Culiseta inornata, the Winter Marsh Mosquito, prefer to feed on larger mammals, and at times, are very troublesome to livestock. Active biting by this mosquito can occur during the fall. Dusk is the most common time for biting activity. They are active flyers and can disperse 5 to 10 miles from their emergence sites.

Culex

Culex pipiens, the Northern House Mosquito, is named so because of its close association with human habitation. The species is considered a domesticated mosquito species because of this close association. It is a multi-brood mosquito and eggs are laid in rafts in temporary and permanent sites, such as catch basins, retention ponds, roadside ditches, and any open container where water may hold for ten days or longer. Birds are the preferred hosts for this mosquito. *Culex pipiens* is a vector of Western Equine Encephalitis (WEE), SLE, and WNv.

Culex tarsalis, the Western Encephalitis Mosquito, overwinter in protected places such as cellars, outbuildings, culverts, animal burrows and other sheltered locations. Upon emerging, the female seeks a blood meal to mature her eggs. Preferred breeding sites include temporary to permanent water sites such as marshes, waste irrigation water, ditches, retention ponds, catch basins, and open containers. Females are persistent biters and prefer birds in the spring, then later turn to mammals and humans as a source for a blood meal. *Culex tarsalis* is a vector of WEE, SLE, and WNv.

Mosquito Population Dynamics

The ongoing mosquito surveillance project allows the GCMAD to assess the current mosquito populations on a week-to-week basis throughout the mosquito season. Each weekly trapping result determines whether or not necessary mosquito control procedures are warranted and should be implemented. Each week seven traps were set for a total of four days each week.

Procedures

Insects were collected using CO_2-baited BG-pro EVS-style traps for sorting and identification of mosquitoes. The number of vector mosquitoes (*Culex pipiens* complex and *Culex tarsalis*) and the number of nuisance mosquitoes (*Aedes* and *Anopheles* species) were determined for each week and reported. Included in weekly reports were updated line graphs to show population trends throughout the season (Figure 1). Also, three-year histories were collaborated and compared to determine where lack of control was occurring (Figure 2).

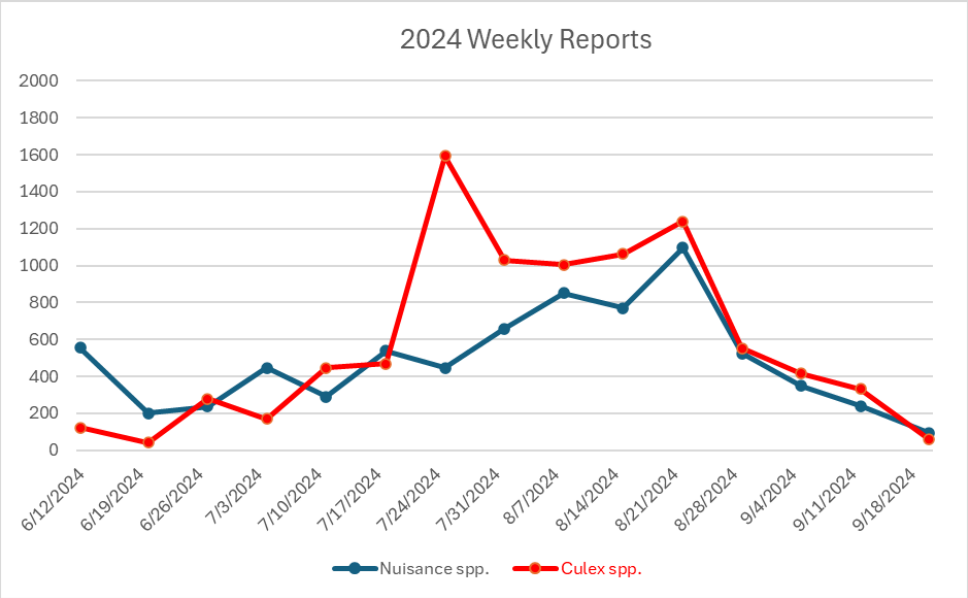


Figure 1. *Aedes* and *Culex* mosquito population levels during the 2024 mosquito season in the GCMAD. Fluctuations of nuisance and vector mosquitoes were seen throughout the season with largest populations occurring in Early-August for nuisance species and in mid-July for vector species.

Results

In 2024, 16,121 adult mosquitoes were collected and identified from CO_2-baited BG-pro EVS-style traps. *Aedes* (nuisance mosquitoes) populations were highest in the middle of August.

Table 1. Total numbers of mosquitoes collected by CO_2-baited BG-pro EVS-style traps site in 2024.

Week of	Nuisance spp.	Culex spp.
6/12/2024	556	124
6/20/2024	201	43
6/27/2024	237	278
7/4/2024	447	171
7/11/2024	290	447
7/18/2024	539	469
7/25/2024	446	1,593
8/1/2024	659	1,029
8/8/2024	852	1,005
8/15/2024	771	1,064
8/22/2024	1,095	1,239
8/29/2024	524	552
9/5/2024	348	415
9/12/2024	239	332
9/20/2024	95	61
Total	**7299**	**8822**

Virus Monitoring in Mosquitoes

Disease prevalence and risk can be determined by monitoring mosquitoes for the presence or absence of viruses in the mosquito population. Virus monitoring allows for the identification of dominant mosquito species, minimum field infection rate determination, and indicates areas with virus activity/transmission occur. By monitoring vector species and virus activity, an important assessment of virus activity at each location can be determined throughout the mosquito season and appropriate response protocols can be employed.

Procedures

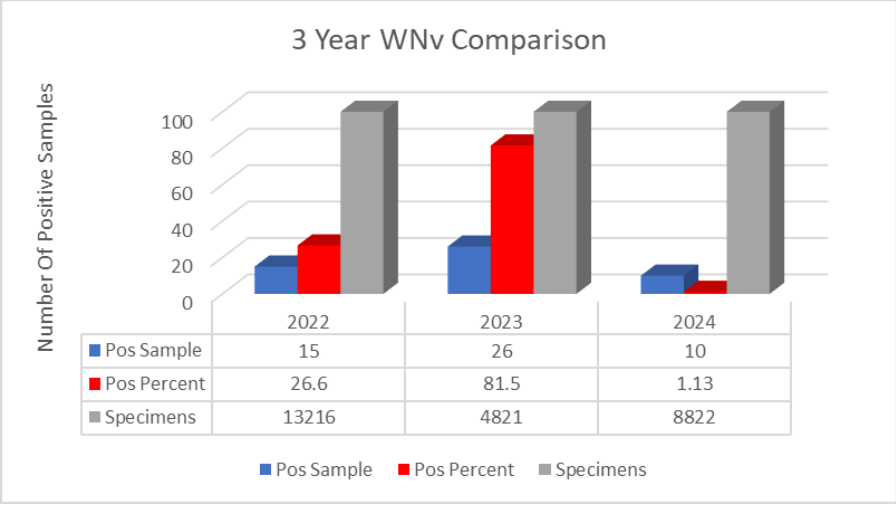
Generally, mosquitoes were collected in different areas throughout the district with CO_2-baited BG-pro EVS-style traps from June 1st until the last week in September. Traps operate on 22000 mAH power bank batteries and can be set up in any area of the district. After collection, mosquitoes were taken back to the GCMAD lab, sorted, identified, and pooled according to species, date, and location. *Culex* species were then sent to Idaho Bureau of Laboratories to be tested using reverse-transcriptase polymerase chain reaction analysis for the presence of WNv. Other species (*Aedes*) were identified, counted, and discarded, unless the specimens were identified as exotic species (*Aedes aegypti* or *Aedes albopictus*).

Results

A total of 8,822 vector species mosquitoes were processed from CO_2-baited BG-pro EVS-style traps in 2024. The GCMAD sent all vector species pools to the Idaho Bureau of Laboratories to be tested using reverse-transcriptase polymerase chain reaction analysis. The minimum number of mosquitoes tested per sample was 1 and the maximum was 50. Of the 344 samples tested by the Idaho Bureau of Laboratories in 2024, 10 pools (1.13% of all samples) tested positive for WNv. *Table* 2 indicates the number of pools of each species tested by the Idaho Bureau of Laboratories and the number of positive pools determined by testing. Figure 2 is a bar graph that shows the number of mosquitoes collected at different trapping events during the 2024 mosquito season as compared to previous seasons.

Table 2. Assay results of mosquito species tested by GCMAD in 2024.

Mosquitoes Tested by GCMAD in 2024				
Species	**# of Samples**	**# Mosquitoes**	**# Positive WNV Pools**	**# Positive SLEV Pools**
Cx. pipiens	**261**	**7827**	**10**	**0**
Cx. tarsalis	**83**	**995**	**0**	**0**
Season Totals	**344**	**8822**	**10**	**0**



2024 Citizen Service Requests and Complaints

The district used input from citizens, either by telephone or website, to correlate the mosquito population information generated from the population trap surveillance.

Procedures

Telephone and website service requests were recorded manually into a computer database. The information taken by the GCMAD administrative assistant included name, address, contact information and reason for request. The requests were separated into three different categories: standing water/larval mosquito control applications, barrier applications, or fogging applications.

Results

The GCMAD satisfied 74 service requests in 2024. Of those requests, there were 27 fogging requests, and 47 requests to check standing water. (Figure 4). GCMAD also received 346 calls and 76 emails all of which consisted of no spray requests, custom fogging, and general inquiries.

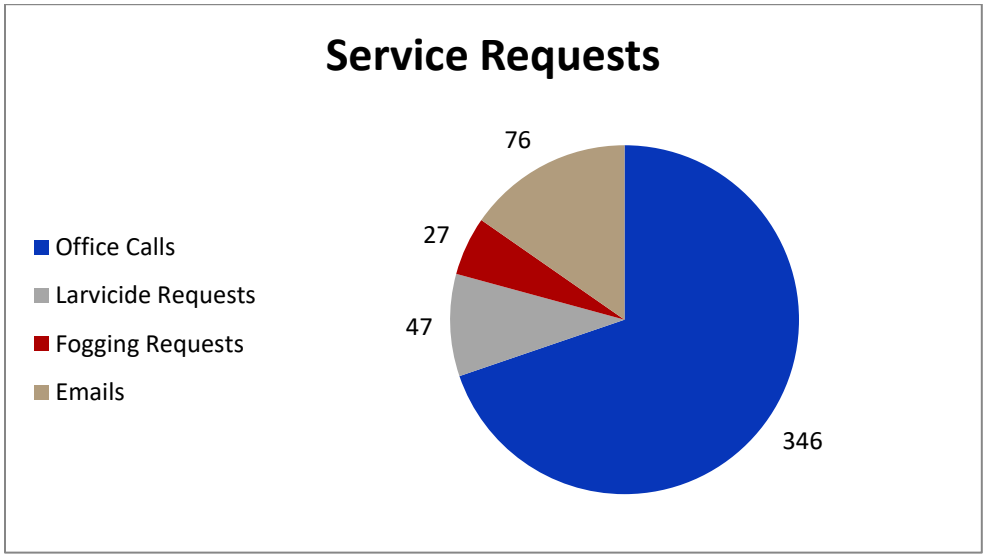


Figure 4. District-wide service requests received in 2023.

Surveillance Summary

A total of 16,121 mosquitoes were collected, identified, and processed by the GCMAD in 2024. When compared to the 2023 mosquito season, there was an increase of 5,506 mosquitoes collected in CO_2-baited BG-pro EVS-style traps. 10 mosquito samples tested positive for WNv in 2024 which was a decrease, with 16 WNv positive mosquito samples collected as compared to 2023.

Mosquito Control Report

The goal of the GCMAD is to use a fully integrated approach to control mosquitoes and the spread of mosquito-borne disease. The district also strives to maintain a level of control that responsibly abates mosquitoes while limiting the effects of applications to the environment.

Since environmental safety and preservation is a critical part of any responsible IMM program, the GCMAD tracks and records how much larval mosquito and adult mosquito control products were used in the mosquito season.

Larval Mosquito Control Operations – 2024

In Gem County, an aggressive larval mosquito control program, commonly called larviciding, is an important key to a successful IMM program. The GCMAD's larviciding program is designed to control mosquitoes in standing water before they can emerge as adults. Larviciding is one of the most effective ways to control mosquitoes because focus is on a specific source. The GCMAD is divided into 5 operational sections. Trained larval mosquito control technicians work in groups of two, equipped with a pickup truck and trailer, all-terrain vehicles (ATVs), larval mosquito control products, backpack dusters, backpack sprayers, hand spreaders, global positioning system (GPS) handheld units for application data entry, and other equipment necessary to complete larval mosquito control objectives.

Larval treatments began in April to permanent sites, such as storm water retention ponds, catch basins, and some marshes. In the district, there are hundreds of development sites that are inspected throughout the summer. The GCMAD relies heavily on *Bacillus thuringiensis israelensis* (Bti) to control mosquitoes. The bacterium is applied to standing water in a granule or liquid formulation. The district applied 42.5 gallons of Bti liquid, 27,559 pounds of Bti/Methoprene granule, 5,922 pounds of Methoprene granule to standing water in 2024. Additionally, the GCMAD applied 317 pounds of Methoprene (insect growth regulator) to control mosquito larvae in stock tanks, horse troughs, and other similar sites. The district applied 22.25 gallons of larviciding oil to standing water in 2024 for the control of pupae (the final stage before becoming an adult. Crews made a total of 30,655 inspections, with district staff treating 8,910 of the inspections, resulting in 9,427 acres of mosquito production habitat treated in 2024 (Figure 6). Table 3 shows larval mosquito control products and amounts used in 2024.

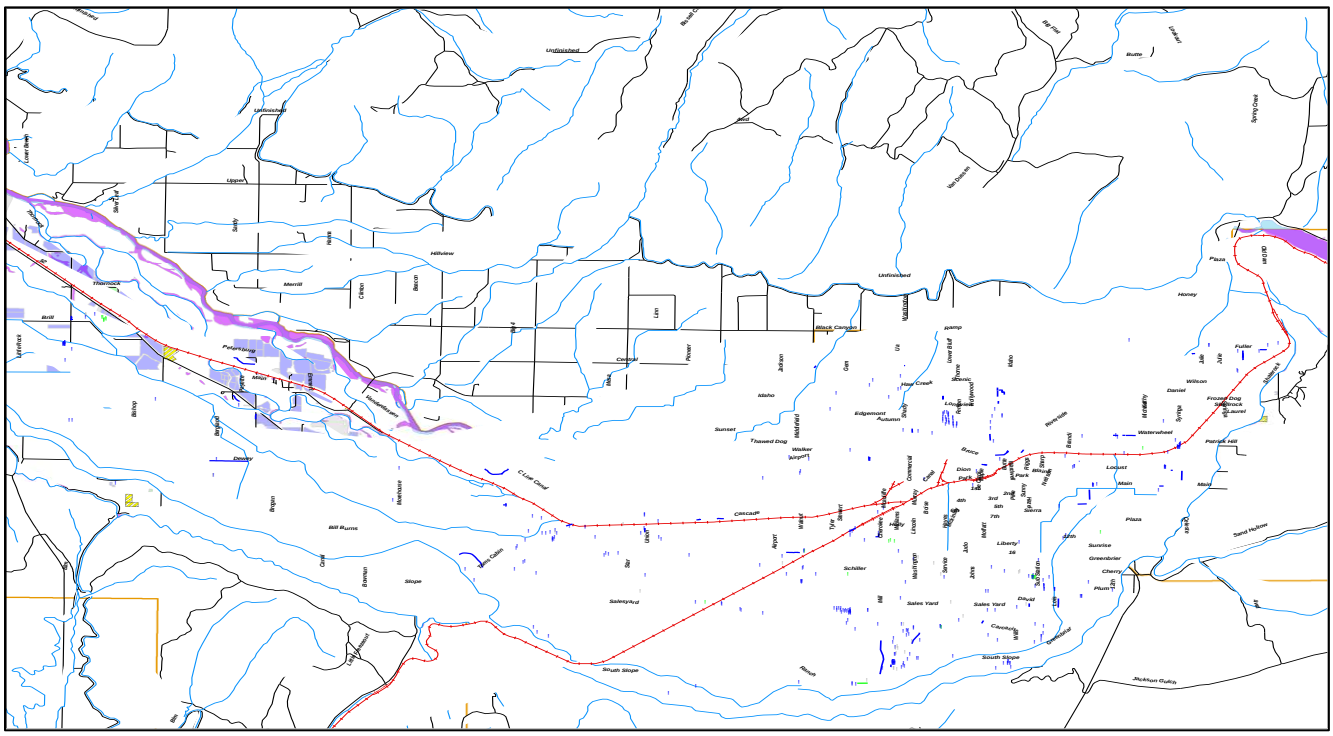


Figure 6. Sites shaded represent sites identified as larval mosquito development sites.

Larvicide Usage in 2022, 2023, and 2024

Product	2022	2023	2024
Bti granule	0lbs	0 lbs	0lbs
Bti liquid	47.5 gals	50.5 gals	42.5gals
Bs granule	340lbs	0 lbs	0lbs
Bti/methoprene granule	24,360lbs	24,670lbs	27,559lbs
Methoprene:			
120 day WSP	0	30	200
Granule	4,779lbs	5,251lbs	5,847lbs
Larviciding Oil	55 gals	22gals	20gals

Table 3: Larviciding products and amounts used in the past three years.

sUAV (drone)

The district is licensed, insured and met all qualifications with the Certificate of Authorization (COA) to operate in Gem County. GCMAD would have ran 3,500lbs of product through the drone this season had we not had an electrical short that caused a small fire and had to replace a bunch of parts that left our drone grounded for most of the season. In 2025 our drone will be back in full force with an estimated 5,000lbs to be applied.

Figure 2.1 GCMAD Drone

The drone has a twenty-five pound payload for granular products. With this payload capacity we see a huge reduction in man hours to complete the same amount of work normally done by ATV. This will allow us to cover more area and with greater accuracy.

Adult Mosquito Control Operations – 2024

The mosquito population naturally increases as the season progresses. When these numbers reach a certain threshold, the district begins an adult mosquito control program, referred to as adulticiding or "fogging." Adult mosquito populations can be reduced with adulticide applications. The best time to make applications for adult mosquitoes is at dawn or dusk, when mosquitoes are most active and looking for a host. When fogging for adult mosquitoes, only appropriate products that are effective are used. In addition, all fogging applications were recorded by a GPS field computer mounted in the cab of the fogging vehicles. The GPS unit recorded data such as time, temperature, location, wind direction and speed, data regarding the applicator, the product amount applied, and when and where the control product was applied. This information was then uploaded to the district's geographic information system (GIS) and reports about fogging applications were quickly queried and referenced. The GCMAD used daily recorded telephone messages available by calling the district office to notify residents when adulticiding operations began and what areas were targeted for a specific evening. The GCMAD website was also updated every day with the areas targeted for adult mosquito control applications.

The GCMAD primarily relied on permethrin-based adulticide agents. Permethrin is a synthetic pyrethroid, a synthetically derived compound similar in composition to natural pyrethrins that are isolated from chrysanthemum flowers. In 2024, the GCMAD used 322 gallons of permethrin-based agents (Figure 8). District personnel applied the adulticide products using truck-mounted ultra-low volume (ULV) foggers. Figure 9 shows a seven-year comparison of the quantities of adult mosquito control products used in the GCMAD.

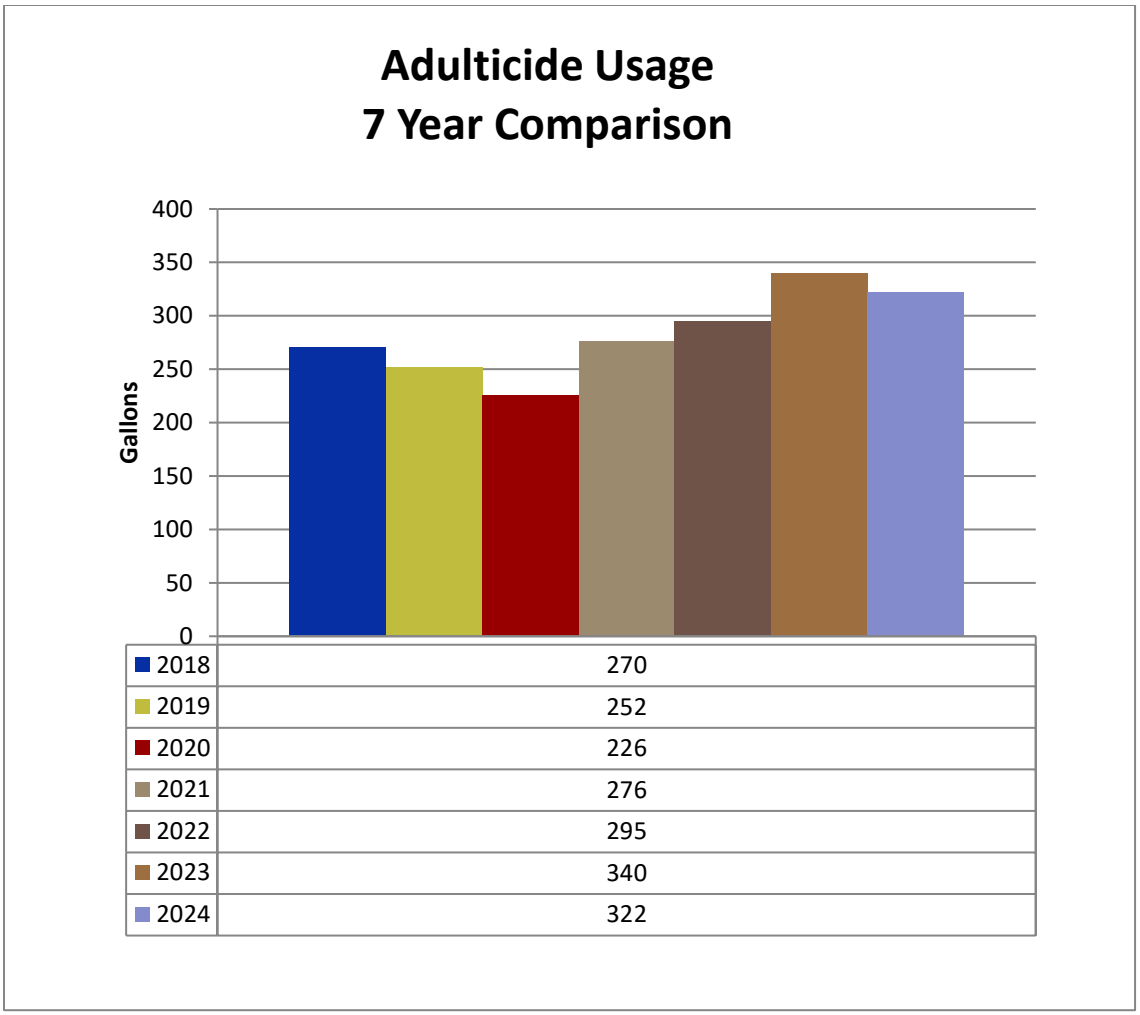


Figure 9. 7-year comparison of adult mosquito control products used in the GCMAD.

Cost Comparisons

GCMAD spent $299,518.00 on mosquito control products in 2024. GCMAD spent $232,157.00 on larval control products and $67,361.00 on adulticide products. Figure 8 shows the amount of money spent on larvicide and adulticide products and the percentage of product budget spent on the respective product category. Figure 10 shows a 3-year comparison of product costs for the district.

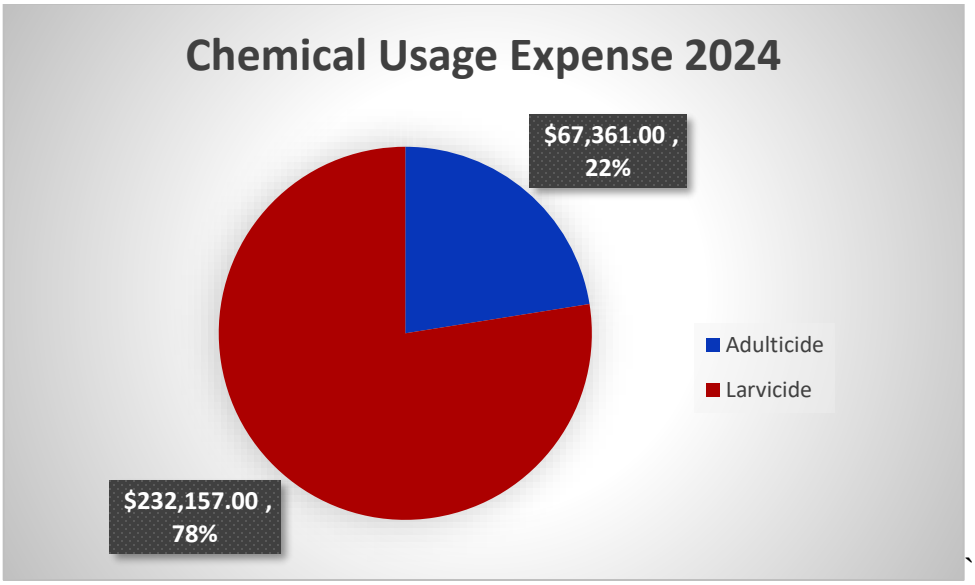


Figure 8. The amount of money spent on larvicide and adulticide products and the proportion of product budget spent on each category.

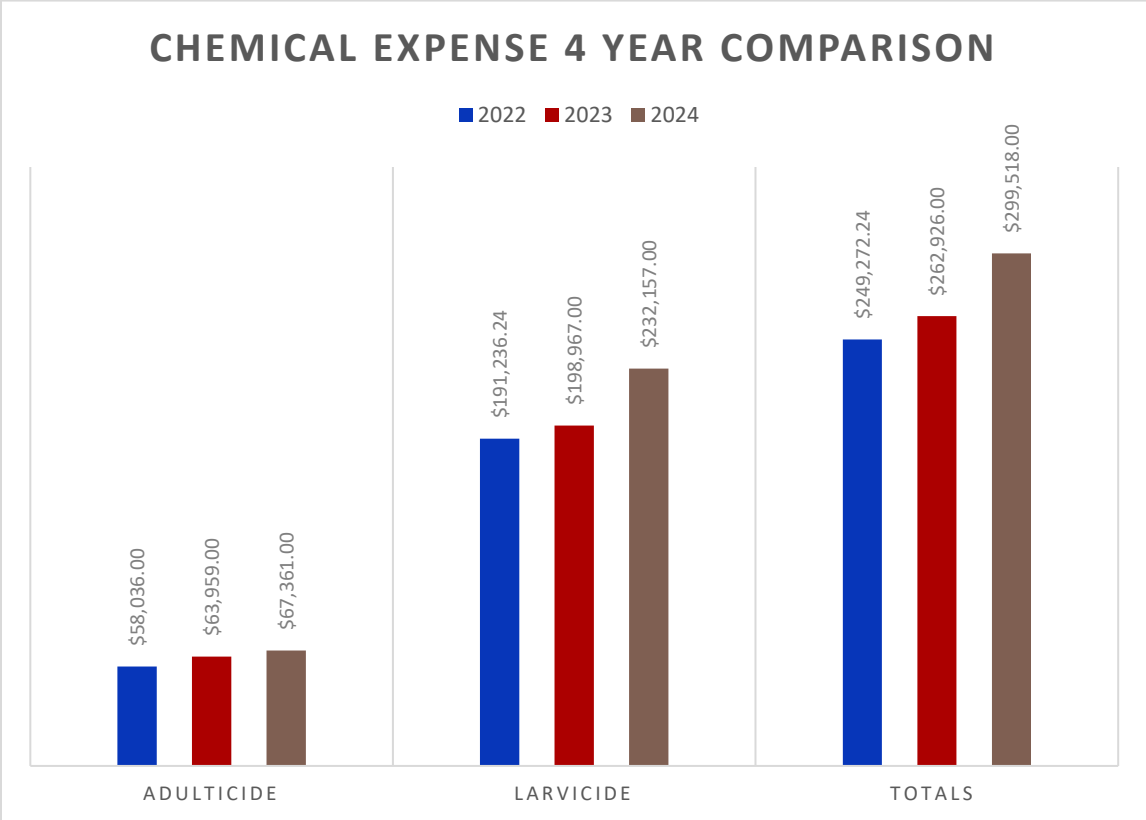


Figure 10. Four year comparison of product costs for the GCMAD.

Other Control Initiatives

Contractual Services:

Shadow Butte Elementary School, located outside of the current district boundaries, was provided service at the beginning of the 2024 school year. This was made possible by a contract between the GCMAD and the Emmett School District. Shadow Butte Elementary was treated with an ULV fogger on a regular basis when school was back in session in late August 2024. GCMAD also provided the barrier applications for Shadow Butte and the other schools in the District this year.

Closing Remarks

This report summarizes data from the 2024 mosquito control season. GCMAD focused heavily on controlling mosquitoes with what resources it had this summer. GCMAD had one aerial flight for adulticiding and the continued use of the drone for aerial larviciding. Similar to past seasons, the district spent substantially more on larval mosquito control products as compared to adult mosquito control products in 2024. District operations focused on controlling mosquitoes during the larval stage of development, knowing that larval control is much more efficient and sustainable than adult mosquito control.

The GCMAD will continue to leverage more residual mosquito control product for long term control of mosquitoes in known, persistent areas of infestation in the 2024 mosquito season. The district wants to continue working closely with local governments, service and civic groups, and constituents to raise awareness and help reduce mosquito development habitat in the GCMAD. The GCMAD is confident that these goals are achievable. The district had a productive season due to the diligent work of many people. This success would not be possible without the commitment, support, and efforts of all the citizens of the GCMAD, the GCMAD staff, and the GCMAD Board of Trustees.

Gem County Mosquito Abatement District
Budgetary (GAAP Basis) Comparison Schedule - General Fund
For the Year Ended September 30, 2024

	Budgeted Amounts			
	Original	Final	Actual	Variance
Revenues				
Property Taxes	$ 772,197	$ 772,197	$ 783,397	$ 11,200
Sales Taxes	56,000	56,000	76,080	20,080
Miscellaneous	5,200	5,200	20,174	14,974
Total Revenues	833,397	833,397	879,651	46,254
Expenditures				
Current:				
Chemicals	265,000	265,000	264,982	18
Insurance	11,361	11,361	11,362	(1)
Legal and Professional	10,000	10,000	6,340	3,660
Maintenance and Repair	48,000	48,000	42,667	5,333
Meals, Travel, and Training	4,500	4,500	7,243	(2,743)
Salaries and Benefits	413,326	413,326	382,488	30,838
Utilities	35,000	35,000	44,748	(9,748)
Application Expenses	53,653	53,653	15,718	37,935
Miscellaneous Expenses	7,500	7,500	17,907	(10,407)
Capital Outlay	30,000	30,000	27,042	2,958
Contingency Fund	90,511	90,511	-	90,511
Total Expenditures	968,851	968,851	820,497	148,354
Net Change in Fund Balances	(135,454)	(135,454)	59,154	194,608
Fund Balances - Beginning	135,454	135,454	419,076	283,622
Fund Balances - Ending	$ -	$ -	$ 478,230	$ 478,230

Appendix 1. Fiscal Year 2024 Accounting Review and Audit Report

Declaration

I, the undersigned, have read and approve the attached Gem County Mosquito Abatement District's "2024 Year-End Report" for the 2024 mosquito control season.

Gem County Mosquito Abatement District Board Members:

_____
Michele Chadwick, Co-Chairperson

_____
Tom Carlsen, Co-Chairperson

_____
Anita Taylor

_____
Scott Uhrig

_____
Kilikina Jung

Gem County Commissioners:

_____
Bill Butticci

_____
Mark Rekow

_____
Kirk Wille

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