



MOSQUITO SURVEILLANCE REPORT

2022–2023

Southern Nevada Health District
Environmental Health Division

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SUMMARY

West Nile Virus (WNV) continued to maintain minimal presence in Clark County with 27 submission pools, comprising 1,145 mosquitoes, and two human cases reported in 2023; WNV was not detected in 2022. This continued the downward trend of arboviral activity since the WNV outbreak of 2019, when 43 human cases were reported and 268 mosquito submission pools across 43 ZIP codes tested positive.

***Aedes aegypti*, the aggressive urban mosquito first identified in 2017, continued its expansion across Clark County at an alarming rate.** Without any coordinated control intervention, the mosquito spread from 12 ZIP codes in 2022 to 43 ZIP codes in 2023. Along with the spread came the dramatic increase of mosquito activity complaints, with 99 in 2022 and 735 in 2023. This upward trend is likely to continue in the coming years and will require the program to enhance its surveillance and educational outreach efforts to meet the challenge.

Throughout the mosquito seasons, the Southern Nevada Health District's Office of Communications continued its efforts to educate the public about WNV illness and mosquito breeding prevention measures. Public health messaging was released through social media, traditional news releases, public health updates, media interviews, and a public outreach campaign that included placing messages in public areas such as bus shelters.



2023
Aedes aegypti
present in **43**
ZIP CODES

2022
Aedes aegypti
present in **12**
ZIP CODES

BACKGROUND

West Nile Virus, a mosquito-borne disease, was first identified in mosquito and human populations of Clark County in 2004. In response to this public health threat, **the Southern Nevada Health District (SNHD) developed a Mosquito Disease Surveillance Program to survey mosquito populations for arboviral diseases** including West Nile Virus (WNV), Western Equine Encephalitis (WEE), and Saint Louis Encephalitis Virus (SLEV). Annual trends of human West Nile Virus cases are found in **Figure 1**.

SNHD is the only entity in Clark County capable of monitoring mosquito populations across the six distinct jurisdictions within the county, including City of Las Vegas, unincorporated Clark County, City of Henderson, City of North Las Vegas, City of Mesquite and the City of Boulder City.

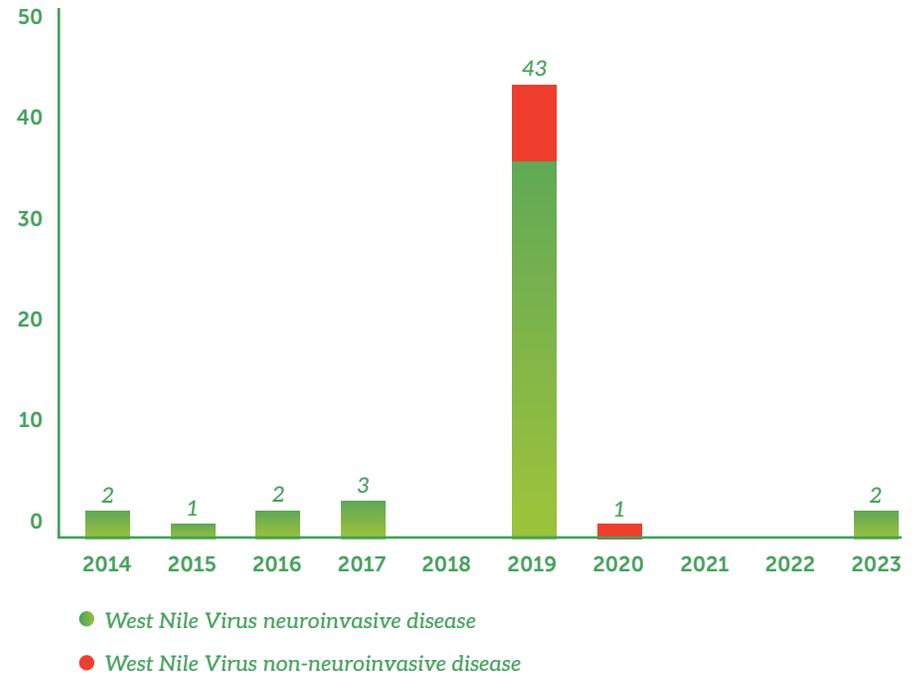


Figure 1: West Nile Virus Activity (Neuroinvasive and Non-neuroinvasive) Annual Trends, 2014–2023

MISSION

The principal mission of the Mosquito Disease Surveillance Program is to identify diseases in mosquitoes and provide public health messages prior to and after reports of human cases.

Mosquito disease surveillance and prevention education are important components of the Environmental Health Division and supports SNHD's overall mission, "To assess, protect and promote the health, the environment and the well-being of Southern Nevada communities and visitors."

GOALS

1. **Monitor mosquito populations** and associated disease prevalence within Clark County.
2. **Develop effective and timely public education messages** regarding mosquito breeding and disease prevention.
3. **Identify and report breeding sources** to jurisdictions so they can manage their infrastructure utilizing Integrated Mosquito Management principles.
4. **Conduct environmental investigations** related to arbovirus cases reported by the Office of Acute Communicable Disease Control (ACDC).
5. **Maintain communication with state and federal agencies** to ensure WNV, SLEV, and WEE surveillance activities are included on nationwide monitoring systems.

METHODOLOGY

Mosquito trapping and testing is the cornerstone of the disease surveillance program. This type of surveillance provides an up-to-date indicator of arbovirus vectors in an area and can be used as a trigger for control measures. In Southern Nevada, the primary mosquito breeding months are April through October, with submission for disease analysis beginning typically in April. Program staff primarily utilize three types of mosquito traps, CDC Light traps baited with CO₂, Gravid traps, and BG Sentinel traps. Each offers a different method of attracting mosquitoes while targeting specific mosquito vectors.

All traps were set overnight in potential mosquito breeding areas such as washes, drainage ditches, pools of standing water, cemeteries, plant nurseries and private residences. From the collection sites, mosquitoes were frozen on dry ice and transported to the SNHD's on site lab, where they were sorted by species and gender, and then pooled for testing. A submission pool is defined as a collection of 50 or fewer female mosquitoes, from the same species and location, placed into a vial for testing. Once pooled, the mosquitoes were stored in a -40°C freezer until collected by the Southern Nevada Public Health Laboratory for testing.

The Mosquito Disease Surveillance Program subscribes to the concept of Integrated Mosquito Management (IMM), which is fundamentally Integrated Pest Management (IPM) tailored for mosquito control. Surveillance is the backbone of all IMM programs as it identifies problem species and population trends which are used to direct and evaluate control measures. **SNHD is not an abatement agency, and areas requiring control are referred to counterpart agencies including Public Works, Parks and Recreation, and Code Enforcement offices within the six distinct jurisdictions.**

TRAP

- *CDC Light traps*
- *Gravid traps*
- *BG Sentinel traps*



COLLECT

- *Washes and parks*
- *Plant nurseries*
- *Private residences*



POOL

- *>50 same-species female mosquitoes*
- *Submit to SNPHL for Arbovirus testing*





CDC LIGHT TRAP

CDC light traps are designed to attract host seeking female mosquitoes using **carbon dioxide (dry ice) as the primary attractant**, captures mosquitoes of several species, including *Culex*, *Anopheles*, and *Aedes*.



GRAVID TRAP

Gravid traps are designed to capture egg laden (gravid) female mosquitoes using a **baited water solution intended to simulate stagnant water** found in the environment. This trap is designed to primarily capture *Culex* mosquitoes.



BG SENTINEL TRAP

BG Sentinel traps utilize color cues, **artificially generated air plumes**, and a **scent lure** to attract mosquitoes. This trap was designed specifically for attracting *Aedes albopictus* and *Aedes aegypti*. These mosquitoes are capable of vectoring emerging diseases including Chikungunya and Dengue Fever.

2022 SURVEILLANCE RESULTS

During March through September, staff set 3,246 traps at 441 distinct sites throughout Clark County. Trap types comprised of 2,274 BG Sentinel (55%), 1,644 Gravid (40%), and 232 Light (5%). From these traps, 43,516 mosquitoes, representing 3,280 mosquito testing pools, were submitted to the SNPHL for WNV, SLEV, and WEE analysis. No arboviral diseases were identified in any of the submission pools and no human cases were reported.

Table 1 details the mosquito counts by species and arbovirus results. **Table 2** details the jurisdictional distribution of traps set, mosquito samples and WNV results. Male *Aedes aegypti* were not tested, but their numbers remain in the overall count to document their collection and location.

Table 1: 2022 Mosquito Counts by Species and Arbovirus Results

Mosquito Species	Mosquito Submission Pools	Mosquitoes Tested	WNV + Pools	WNV + Mosquitoes
<i>Aedes aegypti</i> (female)	514	1,853	0	0
<i>Aedes aegypti</i> (male)	371	1,041	NA	NA
<i>Aedes vexans</i>	36	1,090	0	0
<i>Anopheles franciscanus</i>	3	4	0	0
<i>Anopheles freeborni</i>	16	83	0	0
<i>Culex erythrothorax</i>	69	2,535	0	0
<i>Culex quinquefasciatus</i>	1,877	33,993	0	0
<i>Culex stigmatasoma</i>	81	254	0	0
<i>Culex tarsalis</i>	274	2,077	0	0
<i>Culiseta incidens</i>	4	4	0	0
<i>Culiseta inornata</i>	12	43	0	0
<i>Psorophora columbiae</i>	3	78	0	0
<i>Psorophora signipennis</i>	20	455	0	0
Total	3,280	43,510	0	0

Table 2: 2022 Jurisdictional Distribution of Traps Set, Mosquito Tested and Arbovirus Results

Jurisdiction	Mosquito Traps Set	Mosquitoes Tested	Mosquito Pools	WNV + Pools	Mosquitoes in WNV + Pools
City of Las Vegas	633	10,789	545	0	0
Unincorporated Clark Co.	544	12,496	562	0	0
City of North Las Vegas	1,601	12,127	1,776	0	0
City of Henderson	422	7,405	351	0	0
City of Mesquite	14	374	22	0	0
Boulder City	32	325	24	0	0
Total	3,246	43,516	3,280	0	0

2023 SURVEILLANCE RESULTS

During March through September, staff set 3,149 traps at 741 distinct sites throughout Clark County. Trap types comprised of 1,642 Gravid (52%), 1,354 BG Sentinel (43%), 141 Light (5% and 12 ‘other’. From these traps, 68,634 mosquitoes, representing 3,701 mosquito testing pools, were submitted to the SNPHL for WNV, SLEV, and WEE analysis. West Nile Virus was identified in 27 submission pools, comprising 1,145 mosquitoes and two human cases were reported. No SLE or WEE was identified.

Table 3 details the mosquito counts by species and arbovirus results. **Table 4** details the jurisdictional distribution of traps set, mosquito samples and WNV results. Again, male *Aedes aegypti* were not tested, but their numbers remain in the overall count to document their collection.

Table 3: 2023 Mosquito Counts by Species and Arbovirus Results

Mosquito Species	Mosquito Submission Pools	Mosquitoes Tested	WNV + Pools	WNV + Mosquitoes
<i>Aedes aegypti</i> (female)	554	7,411	1	22
<i>Aedes aegypti</i> (male)	405	4,889	NA	NA
<i>Aedes vexans</i>	37	789	0	0
<i>Anopheles franciscanus</i>	3	5	0	0
<i>Anopheles freeborni</i>	19	94	0	0
<i>Culex erythrothorax</i>	80	2,563	1	50
<i>Culex quinquefasciatus</i>	1,880	48,341	21	894
<i>Culex stigmatasoma</i>	303	1,266	0	0
<i>Culex tarsalis</i>	287	2,946	4	179
<i>Culiseta incidens</i>	2	3	0	0
<i>Culiseta inornata</i>	119	248	0	0
<i>Psorophora signipennis</i>	12	79	0	0
Total	3,701	68,634	27	1,145

Table 4: 2024 Jurisdictional Distribution of Traps Set, Mosquito Tested and Arbovirus Results

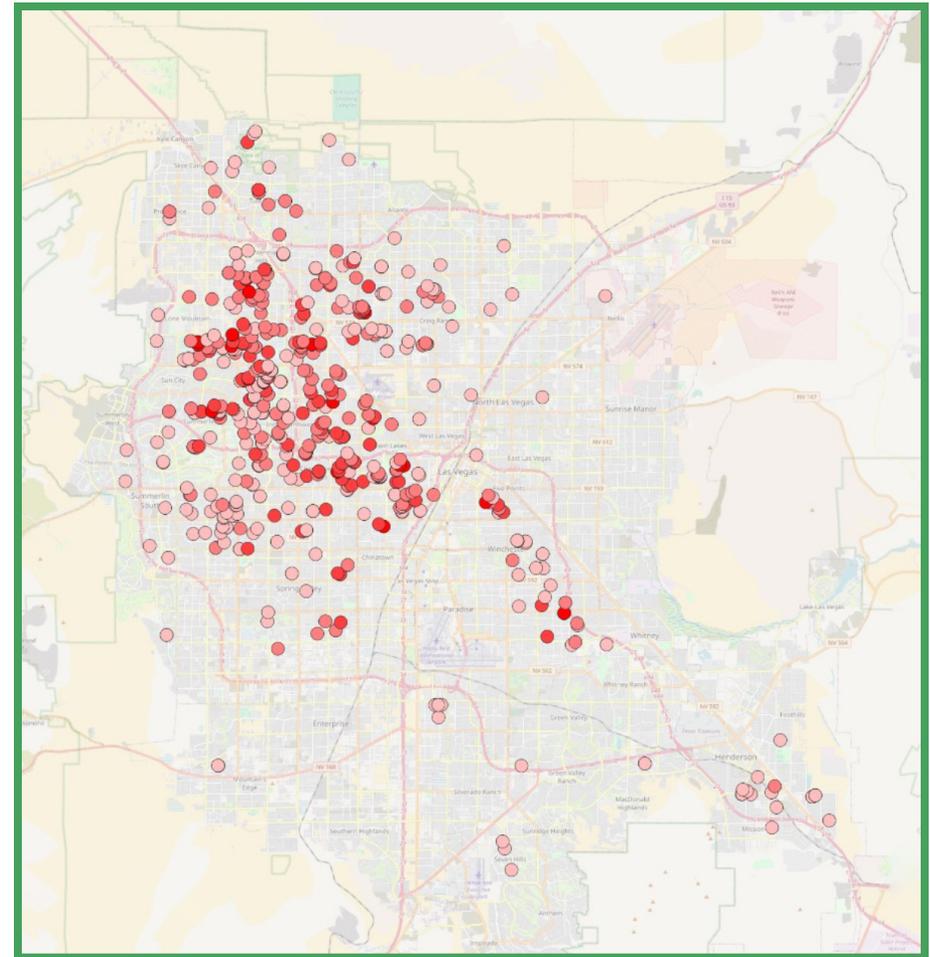
Jurisdiction	Mosquito Traps Set	Mosquitoes Tested	Mosquito Pools	WNV + Pools	Mosquitoes in WNV + Pools
City of Las Vegas	1,352	39,069	1,923	15	615
Unincorporated Clark Co.	906	17,162	935	8	361
City of North Las Vegas	352	7,659	464	1	31
City of Henderson	447	3,837	294	2	88
City of Mesquite	48	810	68	1	50
Boulder City	44	97	17	0	0
Total	3,149	68,634	3,701	27	1,145

AEDES AEGYPTI SURVEILLANCE

***Aedes aegypti* is the most important emerging vector borne disease threat in Southern Nevada.** This highly aggressive and invasive urban mosquito is responsible for transmitting Zika virus, Dengue, Yellow Fever and other exotic arboviruses that have a significant global health impact. The mosquito was first identified in 2017 and has rapidly spread to 43 ZIP codes across Clark County. Many of the newly identified locations were a result of citizens reporting mosquito activity to SNHD, with complaints increasing from 99 in 2022 to 735 in 2023. This trend of increased calls for service will continue as *Ae. aegypti* entrench themselves in communities. **Map 1** details the locations and density of *Ae. aegypti* found in 2023.

The program attempted to conduct a Wide Area Larvicide Spray (WALS) control project in two specific North Las Vegas communities, as described in previous reports, to determine the efficacy of the WALS in Southern Nevada. Despite four years of surveillance to establish the baseline, *Ae. aegypti* populations, SNHD did not receive adequate local jurisdictional support to implement the WALS control measures and the project ended in 2022.

The initial *Ae. aegypti* samples in 2017 were submitted to Yale University for genetic analysis, which determined they were most likely introduced from southern California. Recent, longitudinal samples have been submitted to the University of Nevada, Las Vegas for whole genome sequencing, to establish whether the contemporary expansion of *Ae. aegypti* across Clark County reflects endemic dispersal or multiple reintroduction events from neighboring states.



Map 1: 2023 Distribution and Density per Trap of *Ae. aegypti*

- 0–5
- 5–20
- 20–50
- 50–142

LOOKING AHEAD

The Mosquito Disease Surveillance program will continue monitoring mosquito populations and disease prevalence within the six jurisdictions of Clark County. Maintaining a single surveillance system across the county is the most efficient way to ensure the community has consistent information on vector disease prevalence and its prevention.



Mosquitoes trapped and tested

43,516
MOSQUITOES
in 2022

68,634
MOSQUITOES
in 2023