

2020-2021 MOSQUITO SURVEILLANCE REPORT



SNhD
Southern Nevada Health District

MOSQUITO DISEASE SURVEILLANCE PROGRAM

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SUMMARY

West Nile Virus (WNV) reached unprecedented activity in 2019, with 43 human cases, including one death, reported and 268 mosquito submission pools across 43 ZIP codes testing positive. As a result, SNHD issued a public health advisory of an outbreak of WNV in humans. In stark contrast 2020 and 2021 had almost no WNV activity in Clark County.

In 2020, 13 mosquito submission pools were WNV positive and one human case was reported. In 2021, two mosquito submission pools were WNV positive and no human cases were reported. This dramatic decrease in activity highlights the unpredictable nature of WNV from one season to the next. In addition to routine mosquito disease surveillance, staff continued targeted *Aedes aegypti* surveillance in collaboration with the CDC.

Throughout the mosquito seasons, the Southern Nevada Health District's Office of Communications continued its efforts to educate the public about West Nile virus illnesses and prevention measures. Public health messaging was released through social media, traditional news releases, public health updates, media interviews, and static monitors placed in public areas such as bus shelters.

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). 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.

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 support SNHD's overall mission, "To protect and promote the health, the environment and the wellbeing of Southern Nevada residents and visitors."

GOALS

1. Monitor mosquito populations and associated disease prevalence within Clark County.
2. Develop effective and timely public education messages regarding mosquito-borne disease prevention.
3. Identify, report, and assist jurisdictions with small, targeted larval mosquito control measures utilizing Integrated Mosquito Management principles.
4. Conduct environmental investigations related to arbovirus cases reported by the Office of Epidemiology and Disease Surveillance.
5. Maintain communication with state and federal agencies to ensure WNV, SLEV, and WEE surveillance activities are included in nationwide monitoring systems.

METHODOLOGY

Mosquito trapping and testing is the cornerstone of SNHD's mosquito 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 May. Program staff utilize three types of mosquito traps, CDC Light traps, Gravid, and BG Sentinel traps. Each offers a different method of attracting mosquitoes while targeting specific mosquito vectors.

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.

METHODOLOGY (continued)

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, live mosquitoes were frozen on dry ice and transported to the SNHD's onsite 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 -40oC freezer until collected by the Southern Nevada Public Health Laboratory (SNPHL).

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's remediation of mosquito breeding areas is limited to small, targeted chemical treatments of areas identified when setting mosquito traps. Areas requiring abatement are referred to counterpart agencies including Public Works, Parks and Recreation, and Code Enforcement offices within the six distinct jurisdictions.

In 2021 Environmental Health transferred its mosquito control equipment and chemical supplies to Unincorporated Clark County Vector Control. The surveillance program retained minimal control chemicals to continue with small, targeted treatments.

2020 SURVEILLANCE RESULTS

During March through September, staff set 4,150 traps at 418 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, 54,908 mosquitoes, representing 3,330 mosquito testing pools, were submitted to the SNPHL for WNV, SLEV, and WEE analysis. West Nile Virus was identified in 13 submission pools, comprising of 384 mosquitoes, and one human case was reported. No SLE or WEE was identified. Table 1 details the mosquito species and arbovirus result. Table 2 details the jurisdictional distribution of traps set, mosquito samples and arbovirus results. Male *Aedes aegypti* were not tested, but their numbers remain in the overall count to document their collection.

2021 SURVEILLANCE RESULTS

During March through September, staff set 2,725 traps at 315 distinct sites throughout Clark County. Trap types comprised of 1,414 Gravid (52%), 1,173 BG Sentinel (43%), and 138 Light (5%). From these traps, 27,991 mosquitoes, representing 2,010 mosquito testing pools, were submitted to the SNPHL for WNV, SLEV, and WEE analysis. West Nile Virus was identified in two submission pools, comprising of 82 mosquitoes and no human cases were reported. No SLE or WEE was identified. Annual trends of human West Nile Virus cases are found in Table 1. Table 3 details the mosquito species and arbovirus result. Table 4 details the jurisdictional distribution of traps set, mosquito samples and arbovirus results. Male *Aedes aegypti* were not tested, but their numbers remain in the overall count to document their collection.

The reduction of mosquito traps set in 2021 is a result of staff diverting time to ensure COVID-19 prevention standards were maintained in Public Accommodation facilities. In August 2020 the Nevada State Legislature passed [Senate Bill 4 \(SB4\)](#) in an effort to reduce COVID-19 transmission in Public Accommodations. Under this legislation, staff was responsible for enforcing SB4 by inspecting resort properties every two months, hotels with over 200 rooms every three months, and all other hotels annually. This legislation will apply until the Governor of Nevada's declaration of a public health emergency due to COVID-19 is lifted or by August 31, 2022. It is anticipated mosquito trap numbers will significantly increase once SB4 is lifted.

Aedes aegypti SURVEILLANCE

In 2017, *Aedes aegypti*, an invasive urban mosquito responsible for transmitting Zika virus, Dengue, and Yellow Fever, was first identified in Clark County. In response, staff collaborated with the Centers for Disease Control and Prevention's (CDC) Division of Vector Borne Diseases to develop a two-year project proposal to establish a baseline population density of *Ae. aegypti* in a North Las Vegas community, determine what environmental factors are favorable to the mosquito survival, and evaluate Wide Area Larvicide Spray (WALS) treatments to effectively reduce or eradicate the species from the area.

The project was implemented in 2019 in the 89032 ZIP code. Homes, all within a quarter-mile radius, were canvassed by staff and selected for the project based on cooperative residents. Thirty locations were identified and had BG Sentinel traps, with CO₂ and BG Sweet Lure attractants, set for two consecutive trap nights, every other week. A data logger was attached to each trap and recorded temperature (Fo) and light intensity (lumen/ft²) every three minutes throughout the trap's deployment. The CDC was provided with all trapping data, including trap locations, mosquito species and counts, disease results, and data logger information. Additionally, the male *Ae. aegypti* were submitted to UC Davis Department of Entomology and Nematology's Mosquito Control Research Lab for genetic analysis.

In 2020, SNHD developed a collaborative project with the CDC, VALENT BioSciences, ADAPCO, Unincorporated Clark County and the City of North Las Vegas, titled "Targeted WALS Control and Surveillance of *Aedes aegypti* in Clark County, Nevada". However, with the introduction of COVID-19, the WALS intervention component of the project was placed on hold until 2021. Despite this, SNHD maintained the existing surveillance effort at homes initially surveyed in 2019 and added surveillance at 30 homes in a secondary adjacent community. One area would serve as the 'treatment' area for the WALS intervention and the other would be the 'non-treatment' area where no WALS would be applied. The surveillance methodology in both areas was the same as in 2019. Comparing the baseline populations before and after WALS intervention would help determine statistical significance of the method.

In 2021 SNHD was again unable to conduct the intervention due to ongoing COVID-19 prevention efforts, including the passing of legislation to mitigate COVID-19 in Public Accommodation facilities. The surveillance effort continued in the 'treatment' and 'non-treatment' areas, however, traps were set for two consecutive trap nights once per month and not every two weeks. Additionally, data logging information was not collected. This reduced frequency enabled staff to continue to determine mosquito populations in the two areas while continuing to respond to the ongoing pandemic. The WALS intervention and surveillance is scheduled to be completed in 2022.

Ongoing routine mosquito surveillance has identified *Ae. aegypti* in areas outside of the study area, and in a matter of years, this invasive mosquito will most likely be widespread. Table 5 details the number of *Ae. aegypti* found annually since 2017 in ZIP codes across Clark County.

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. In 2022, staff will implement programmatic updates to support the overall mission.

Figure 1: Human West Nile Virus Annual Trends 2011 – 2021

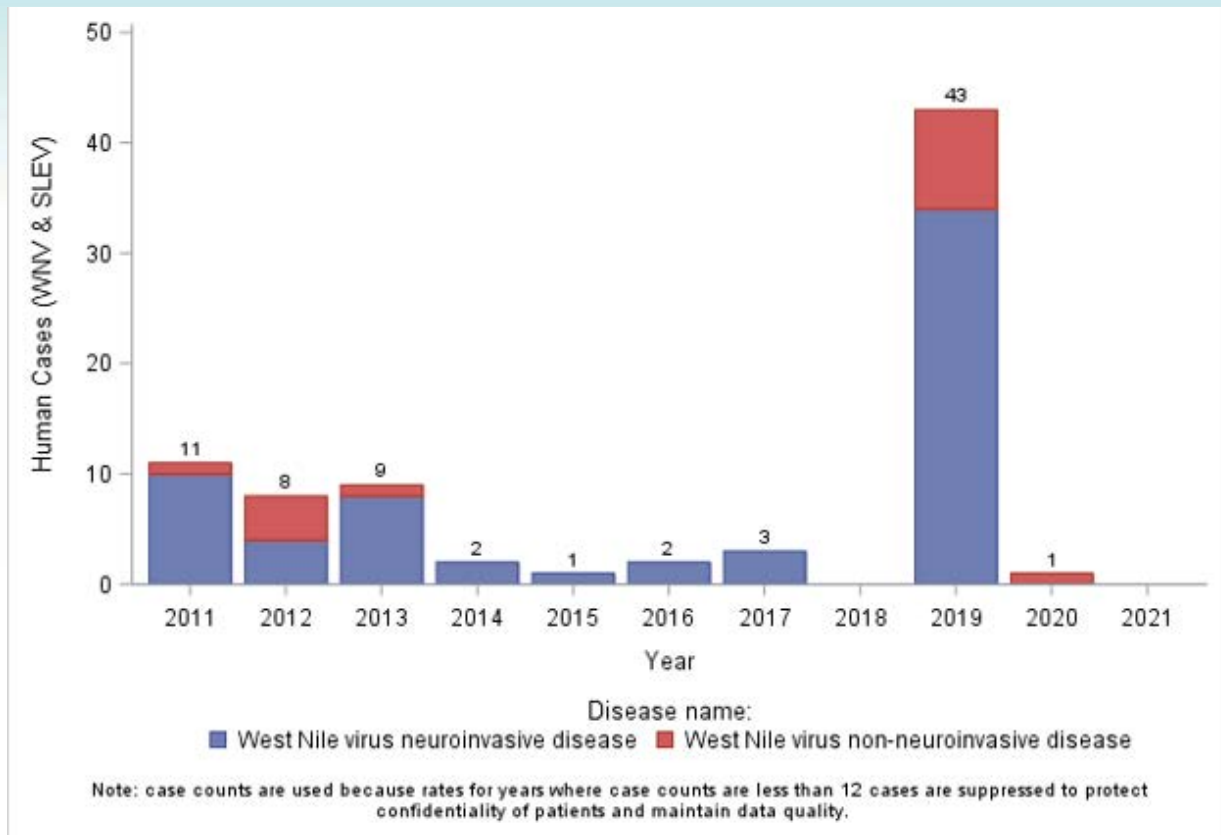


Table 1: 2020 Mosquito Species and Arbovirus Result

Mosquito Species	Mosquito Submission Pools	Mosquitoes Tested	WNV + Pools	SLEV + Pools
<i>Aedes aegypti (female)</i>	96	117	0	0
<i>Aedes aegypti (male)</i>	38	56	NA	NA
<i>Aedes vexans</i>	31	1,358	0	0
<i>Anopheles franciscanus</i>	9	39	0	0
<i>Anopheles freeborni</i>	17	113	0	0
<i>Culex erythrothorax</i>	77	2,058	0	0
<i>Culex quinquefasciatus</i>	2,344	44,553	13	0
<i>Culex stigmatasoma</i>	446	2,954	0	0
<i>Culex tarsalis</i>	240	3,557	0	0
<i>Culiseta inornata</i>	32	103	0	0
Total	3,330	54,908	13	0

Table 2: 2020 Jurisdictional Distribution of Traps Set, Mosquito Samples and Arbovirus Results

Jurisdiction	Mosquito Traps Set	Mosquitoes Tested	Mosquito Pools	WNV + Pools	Mosquitoes in WNV + Pools
City of Las Vegas	952	19,049	815	0	0
Unincorporated Clark County	769	14,836	699	8	138
City of North Las Vegas	1,796	11,641	1,363	0	0
City of Henderson	530	8,569	378	5	248
City of Mesquite	40	420	31	0	0
Boulder City	63	393	42	0	0
Total	4,150	54,908	3,330	13	384

Table 3: 2021 Mosquito Species and Arbovirus Result

Mosquito Species	Mosquito Submission Pools	Mosquitoes Tested	WNV + Pools	SLEV + Pools
<i>Aedes aegypti (female)</i>	88	138	0	0
<i>Aedes aegypti (male)*</i>	43	82	NA	NA
<i>Aedes vexans</i>	0	0	0	0
<i>Anopheles franciscanus</i>	6	14	0	0
<i>Anopheles freeborni</i>	18	56	0	0
<i>Culex erythrothorax</i>	66	1,986	0	0
<i>Culex quinquefasciatus</i>	1,435	23,002	2	0
<i>Culex stigmatasoma</i>	56	229	0	0
<i>Culex tarsalis</i>	243	2,300	0	0
<i>Culiseta incidens</i>	1	1	0	0
<i>Culiseta inornata</i>	48	82	0	0
<i>Psorophora signipennis</i>	5	95	0	0
Other	2	6	0	0
Total	2,010	27,991	2	0

Table 4: 2021 Jurisdictional Distribution of Traps Set, Mosquito Samples and WNV Results

Jurisdiction	Mosquito Traps Set	Mosquitoes Tested	Mosquito Pools	WNV + Pools	Mosquitoes in WNV + Pools
City of Las Vegas	794	11,205	624	0	0
Unincorporated Clark County	543	6,443	439	0	0
City of North Las Vegas	774	3,875	546	0	0
City of Henderson	551	6,137	354	2	82
City of Mesquite	8	27	6	0	0
Boulder City	55	304	41	0	0
Total	2,725	27,991	2,010	2	82

**Table 5: ZIP Code Distribution of Female and Male
Aedes aegypti 2017-2021**

	89031	89032	89130	89131	89128	89129	89002	89148	89145	89084	89015	Total
2017												
<i>Ae. aegypti</i> F	15	160	7	1	0	0	0	0	0	0	0	183
<i>Ae. aegypti</i> M	0	0	0	1	0	0	0	0	0	0	0	1
2018												
<i>Ae. aegypti</i> F	41	18	0	0	0	0	0	0	0	0	0	59
<i>Ae. aegypti</i> M	0	0	0	0	0	0	0	0	0	0	0	0
2019												
<i>Ae. aegypti</i> F	1	123	0	0	0	0	2	0	0	0	0	126
<i>Ae. aegypti</i> M	0	50	0	0	0	0	1	0	0	0	0	51
2020												
<i>Ae. aegypti</i> F	14	98	0	0	0	0	0	0	0	0	1	113
<i>Ae. aegypti</i> M	11	44	0	0	0	0	0	1	3	1	0	60
2021												
<i>Ae. aegypti</i> F	1	116	2	0	1	0	0	0	17	0	0	137
<i>Ae. aegypti</i> M	1	77	0	0	0	1	0	0	3	0	0	82
Total	84	686	9	2	1	1	3	1	23	1	1	812