

Southern Nevada Health District

2016 Vector Surveillance Program - Activity Summary

Mosquito Disease Surveillance

2016 was a dynamic year for the Southern Nevada Health District's (SNHD) Vector Surveillance program. The rapid spread of Zika virus in the Americas created a new urgency for invasive *Aedes* surveillance, particularly around travel associated cases of Zika virus, and enhanced jurisdictional collaborations for arboviral disease surveillance, control and prevention education. Although no invasive *Aedes* mosquito species were trapped, surveillance did identify an unprecedented amount of St. Louis encephalitis in mosquitoes, and the first human cases of illness since 2007 were reported to the Office of Epidemiology.

The Vector Surveillance program continued routine use of Gravid, BG Sentinel and Encephalitis Vector Surveillance (EVS) traps throughout Clark County. During April through October staff set a total of **1,218 traps**, comprising of 789 Gravid (65%), 268 EVS (22%), 154 BG Sentinel (13%) traps. Additionally seven emergence traps, which allow larvae to molt into adults for collection and testing, were used to search for vertical transmission of arboviral disease. From these, **1,532 mosquito pools**, totaling **37,567 mosquitoes**, were submitted to the Nevada State Department of Agriculture's Animal Disease Lab for West Nile Virus (WNV), St. Louis Encephalitis (SLEV), and Western Equine Encephalitis (WEE) analysis. The Nevada State Department of Agriculture's Animal Disease Lab provided mosquito pool testing through the Epidemiology Laboratory Capacity (ELC) grant funding.

From these samples, St. Louis encephalitis was identified in 180 mosquito pools, totaling 5,655 mosquitoes, from 32 zip codes. West Nile Virus was identified in 10 submission pools, totaling 127 mosquitoes, representing 4 zip codes. Two mosquito pools, totaling 73 mosquitoes, were positive for both WNV and SLEV. No vertical transmission was identified from the emergence traps.

St Louis encephalitis is a rare disease in Clark County. In 2015, two submission pools totaling 100 mosquitoes represent the only mosquitoes ever identified with the virus, and the most recent human case was reported in 2007. The unprecedented amount of SLEV activity captured the attention of the Centers of Disease Control and Prevention (CDC) and the University of California's Davis Arboviral Research and Training Lab (DART).

In an effort to identify the mosquito's preferred avian host, staff collected and submitted 200 engorged female mosquitoes to the CDC for blood meal analysis. This analysis can provide information on what bird species may be amplifying reservoirs for SLEV transmission. Additionally, SLEV positive isolates were sent by the Nevada Department of Agriculture to the DART lab for genetic sequencing to infer possible origin of the virus strain. Results on these samples are pending at the time of this summary's completion.

Jurisdictional counterparts were notified of arboviral activity within their boundaries and requested to environmentally manage breeding sources and provide community notifications when possible. SNHD provided mosquito breeding and bite prevention messaging through web based, television and print media.

Table 1 provides detail to the jurisdictional distribution of traps set, mosquitoes tested and arboviral positive samples. Tables 2 and 3 detail the zip codes with positive arboviral samples. Maps 1 – 10 provide spatial representation of mosquito surveillance sites and results throughout Clark County.

Human Case Reporting

In 2016, the Vector Control program saw a major shift in the viruses being isolated from mosquitoes. In previous years, the most prolific virus was WNV; however, the majority of positive mosquitoes collected in 2016 were SLEV positive. In light of what was occurring in the local vector population, the Office of Epidemiology and Disease Surveillance (OEDS) took the additional step of sending all WNV positive samples from humans (N=5) to the CDC for confirmatory testing to differentiate between WNV and SLEV infections. The two viruses are similar and can cross react during testing so additional testing by the CDC was the only way to distinguish between the viruses. Based on confirmatory testing, OEDS found 3 SLEV cases, 1 WNV case and 1 turned out to be negative for both viruses. A sixth case was investigated, but the patient was seen in California so OEDS was unable to obtain the sample for confirmation and the case was closed as a probable WNV. In total for 2016, there were 6 arbovirus investigations conducted - 3 confirmed SLEV, 1 confirmed WNV, 1 probable WNV and 1 not a case.

With the introduction of Zika, the OEDS developed a testing algorithm and began accepting referrals from healthcare providers and travelers with concerns of Zika virus exposure. Although the mosquito vector of Zika is not found in Clark County, out of an abundance of caution, when cases were identified with active viremia SNHD's Vector Control program would set mosquito traps at cases' homes to ensure there no risk of local transmission. In 2016, SNHD tested a total of 156 clients, identified 20 cases of disease, 5 of which were in active viremia during mosquito season and required an EH field visit to survey for mosquitoes.

Zika Virus Response

In response to the emerging threat of Zika virus, SNHD enhanced existing mosquito surveillance capacity by purchasing additional trapping equipment specific for the Zika mosquito vectors. Traps were deployed in areas likely for the introduction and colonization of these mosquitoes, including plant nurseries and cemeteries. In response to reports of travel associated Zika virus cases, SNHD conducted surveillance around case-patient residences for invasive *Aedes* species mosquitoes, which have the potential to start localized transmission of the disease. Additionally, teams of Environmental Health Specialists were trained on using surveillance equipment to assist as 'surge capacity' staff for pinpointing *Aedes* populations in neighborhoods.

In the event of invasive *Aedes* mosquitoes being identified, SNHD purchased mosquito control chemicals and application equipment to conduct emergency mosquito abatement. Once identified, controlling Zika mosquito vectors with aggressive and targeted abatement measures are critical to prevent colonization. Augmenting the ability to perform ground abatement, SNHD established a contingency aerial adulticide contract for use in an emergency situation. Should a situation arise, SNHD would be able to quickly mobilize a contractor who will apply insecticides approved and labeled for mosquito control use by low flying aircraft.

SNHD actively worked to provide Zika virus information to the community and jurisdictional counterparts. Mosquito breeding and bite prevention messaging through web based, television and print media was ongoing. Vector Surveillance staff met with jurisdictional counterparts, including Code Enforcement, Public Works, Streets and Drains, Parks and Recreation and Regional Flood Control, to present Zika virus information and engage them regarding environmental management of mosquito breeding areas. Jurisdictions requested SNHD assistance with mosquito surveillance and short term targeted abatement of breeding areas within their boundaries. This active collaboration between SNHD and the six distinct jurisdictions of Clark County has proven vital to managing the introduction of Zika virus vectors, and prevention of local mosquito borne diseases, in southern Nevada.

SNHD applied for, and received, Zika virus funding through the ELC and Office of Public Health Preparedness grants. This funding, to be primarily utilized in 2017, will enable staff to expand its surveillance, education and control efforts within Clark County, and assist Nye County with building local surveillance and abatement capacity against Zika vectors.

Conclusion

Currently there is not a dedicated funding source for the mosquito surveillance and targeted control program, and ensuring its sustainability remains a challenge. SNHD has the ability to immediately deploy small scale, targeted, ground based mosquito abatement. The program has five dedicated field staff and an additional eight have been trained to augment surveillance activities as necessary. SNHD is the only local governmental entity capable of monitoring the public health threat posed by mosquitoes across six distinct jurisdictions of Clark County. Despite this lack of dedicated funding, SNHD has proven to be a leader in the community regarding vector borne disease surveillance, control and education.

Table 1: Numerical Distribution of Traps Set, Mosquitoes Samples and Results

| Jurisdiction | Traps | Mosquitoes Tested | WNV + Mosquitoes | SLE + Mosquitoes |
|----------------------------------|--------------|-------------------|------------------|------------------|
| Unincorporated Clark County (CC) | 395 | 9,427 | 0 | 1,955 |
| City of Las Vegas (CLV) | 415 | 18,449 | 83 | 3,356 |
| City of Henderson (COH) | 225 | 5,425 | 0 | 309 |
| City of Mesquite | 54 | 1,156 | 34 | 0 |
| City of North Las Vegas (NLV) | 75 | 2,394 | 10 | 33 |
| Paiute Reservation | 11 | 571 | 0 | 0 |
| Boulder City (BC) | 43 | 145 | 0 | 2 |
| Total | 1,281 | 37,567 | 127 | 5,655 |

Table 2: Arbovirus Positive Mosquito Species and Number

| Mosquito Species | # WNV Mosquitoes | # of WNV + Pools | # SLE Mosquitoes | # of SLE + Pools |
|-----------------------------|------------------|------------------|------------------|------------------|
| <i>An. freeborni</i> | 0 | 0 | 2 | 1 |
| <i>Cx. erythrothorax</i> | 3 | 1 | 309 | 7 |
| <i>Cx. stigmatasoma</i> | 3 | 1 | 927 | 31 |
| <i>Cx. quinquefasciatus</i> | 117 | 6 | 3848 | 111 |
| <i>Cx. tarsalis</i> | 4 | 2 | 566 | 29 |
| <i>Cx. thriambus</i> | 0 | 0 | 3 | 1 |
| Total | 127 | 10 | 5,655 | 180 |

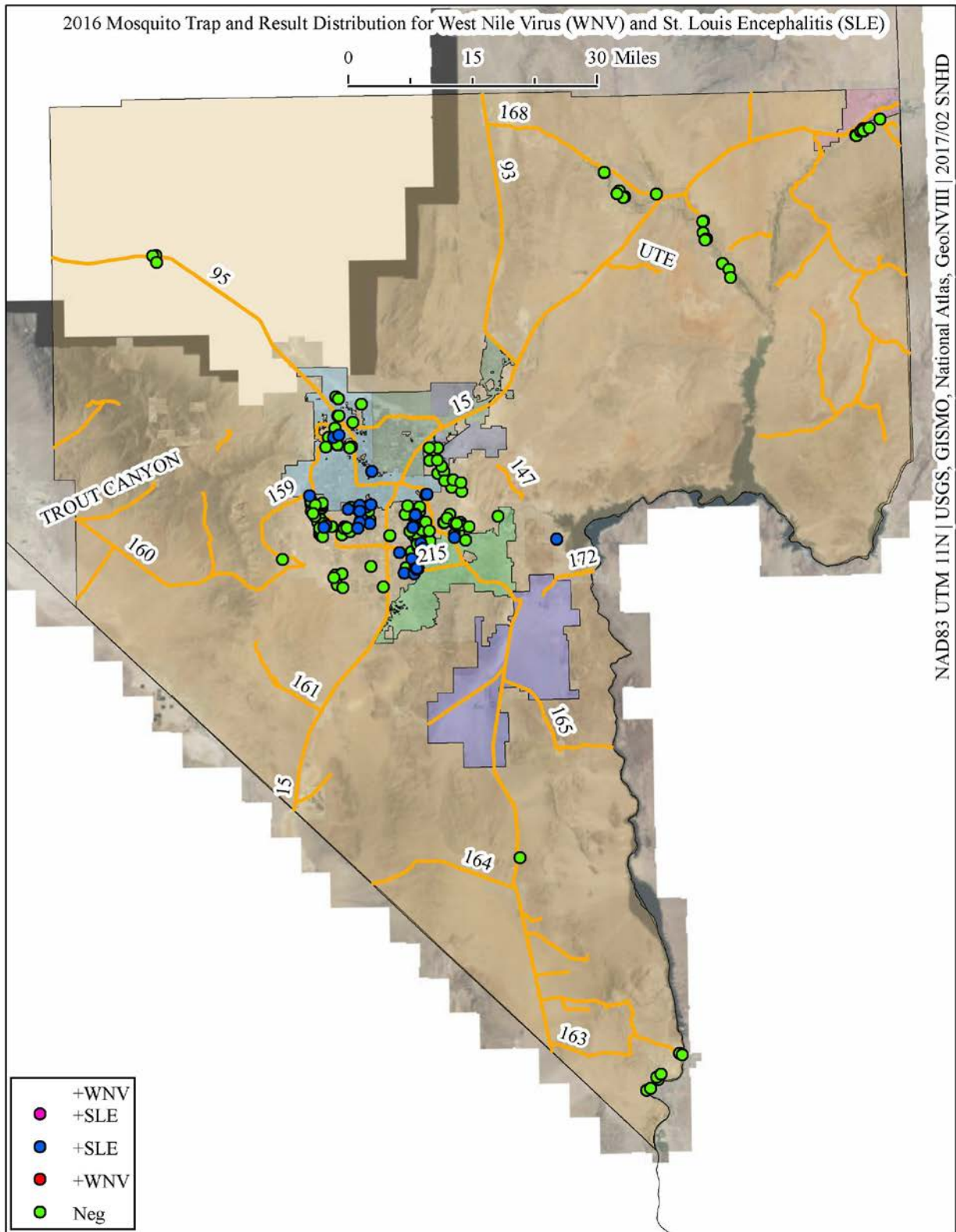
Table 2: Zip Code Distribution of WNV + Mosquitoes

| CLV | WNV + | NLV | WNV + | Mesquite | WNV + |
|----------|-----------|----------|-----------|----------|-----------|
| 89117 | 73 | 89032 | 102 | 89027 | 34 |
| 89128 | 10 | | | | |
| 2 | 83 | 1 | 10 | 1 | 34 |

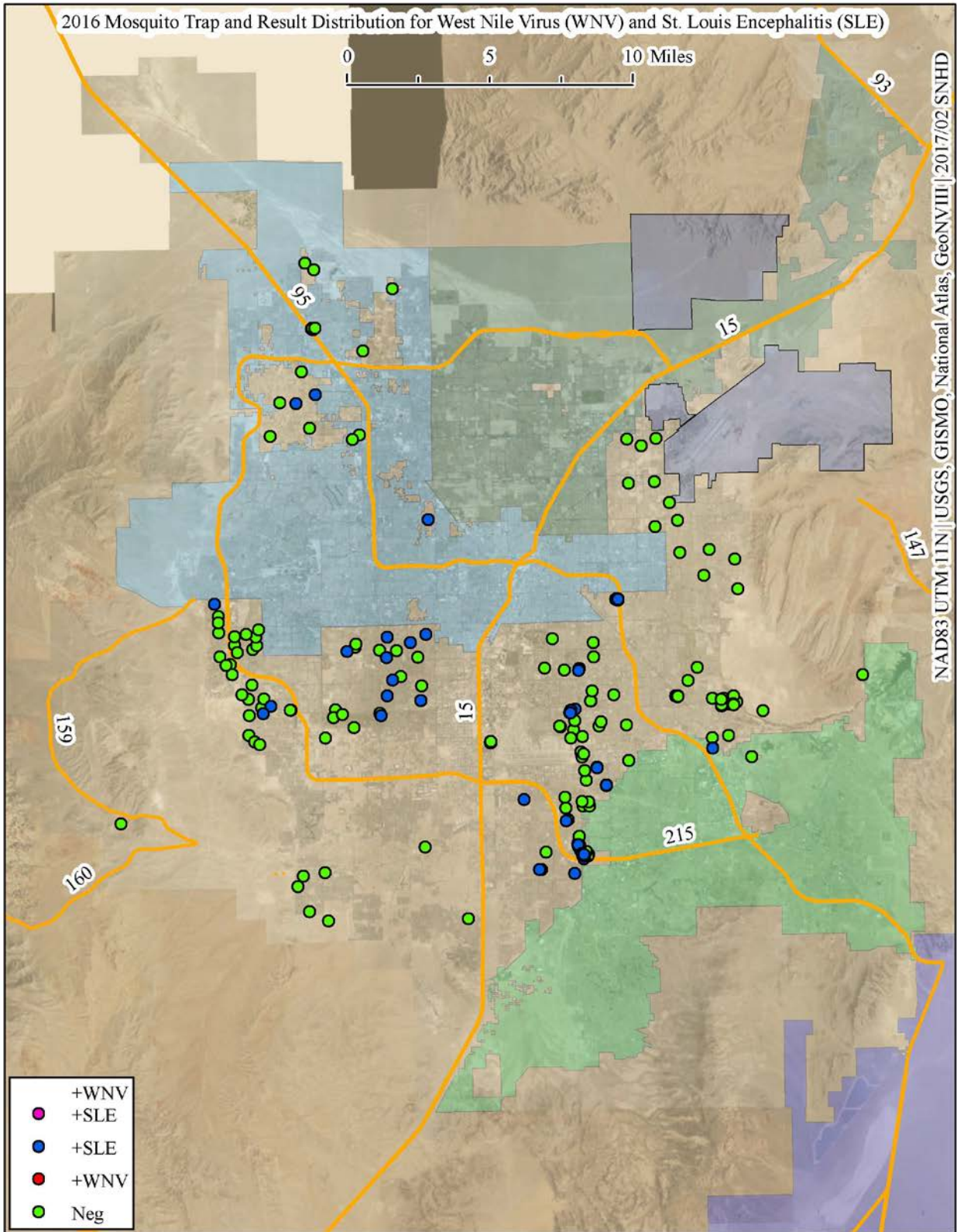
Table 3: Zip Code Distribution of SLE+ Mosquitoes

| CLV | SLE + | CC | SLE+ | COH | SLE + | NLV | SLE + | BC | SLE + |
|-----------|--------------|-----------|--------------|----------|------------|----------|-----------|----------------------------|----------|
| 89101 | 884 | 89074 | 63 | 89002 | 35 | 89081 | 20 | 89005* | 2 |
| 89107 | 1,633 | 89103 | 35 | 89011 | 6 | 89030 | 13 | | |
| 89108 | 212 | 89104 | 209 | 89012 | 13 | | | | |
| 89117 | 149 | 89118 | 27 | 89014 | 78 | | | | |
| 89128 | 66 | 89119 | 517 | 89074 | 127 | | | | |
| 89130 | 42 | 89120 | 282 | 89120 | 50 | | | | |
| 89131 | 82 | 89121 | 126 | | | | | | |
| 89134 | 34 | 89122 | 164 | | | | | | |
| 89143 | 178 | 89123 | 327 | | | | | | |
| 89144 | 34 | 89135 | 41 | | | | | | |
| 89145 | 8 | 89146 | 129 | | | | | | |
| 89146 | 19 | 89149 | 19 | | | | | | |
| 89147 | 12 | 89191 | 16 | | | | | | |
| 89149 | 3 | | | | | | | | |
| | | | | | | | | *not in urban Boulder City | |
| 14 | 3,356 | 13 | 1,955 | 6 | 309 | 2 | 33 | 1 | 2 |

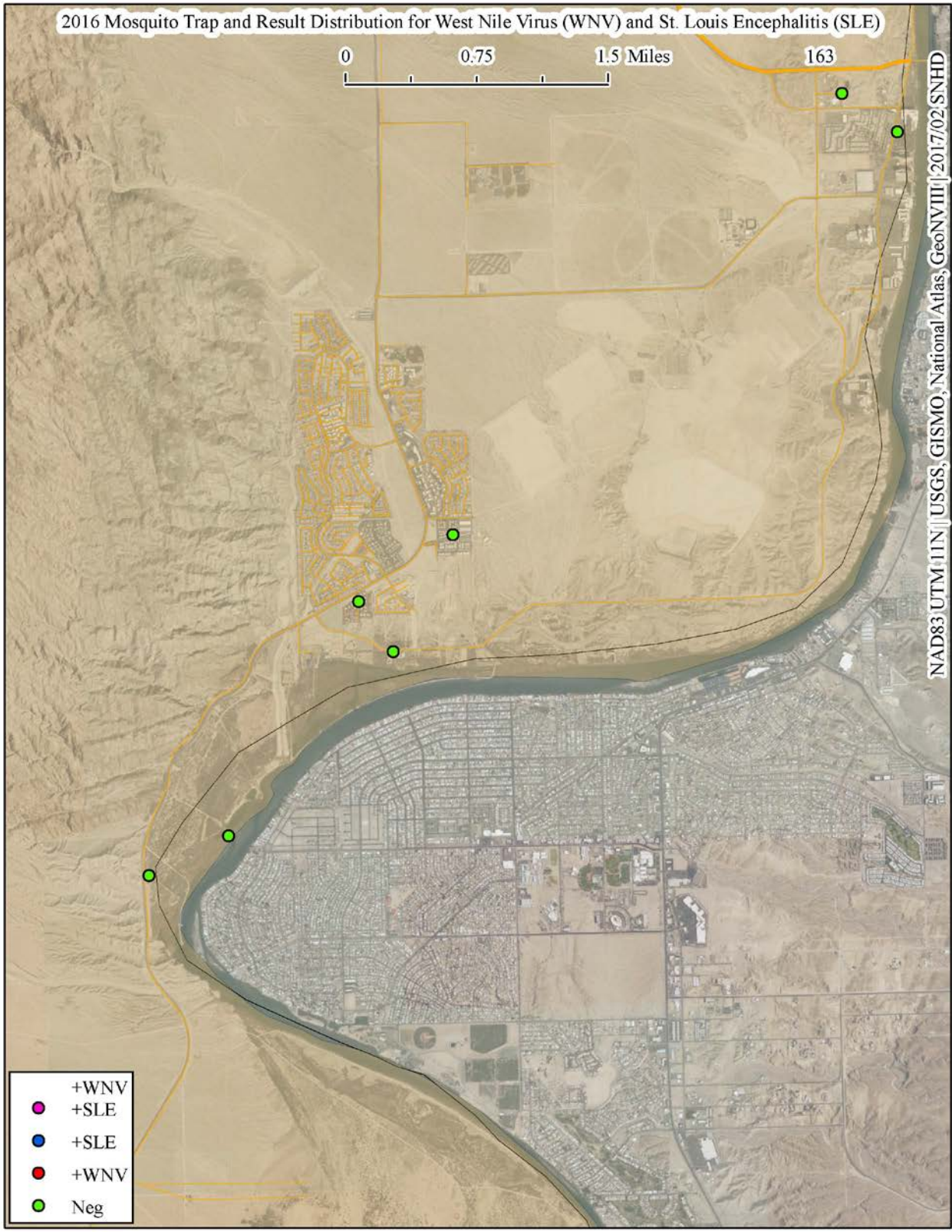
Map 2: Unincorporated Clark County - Distribution of Mosquito Surveillance Sites and Results



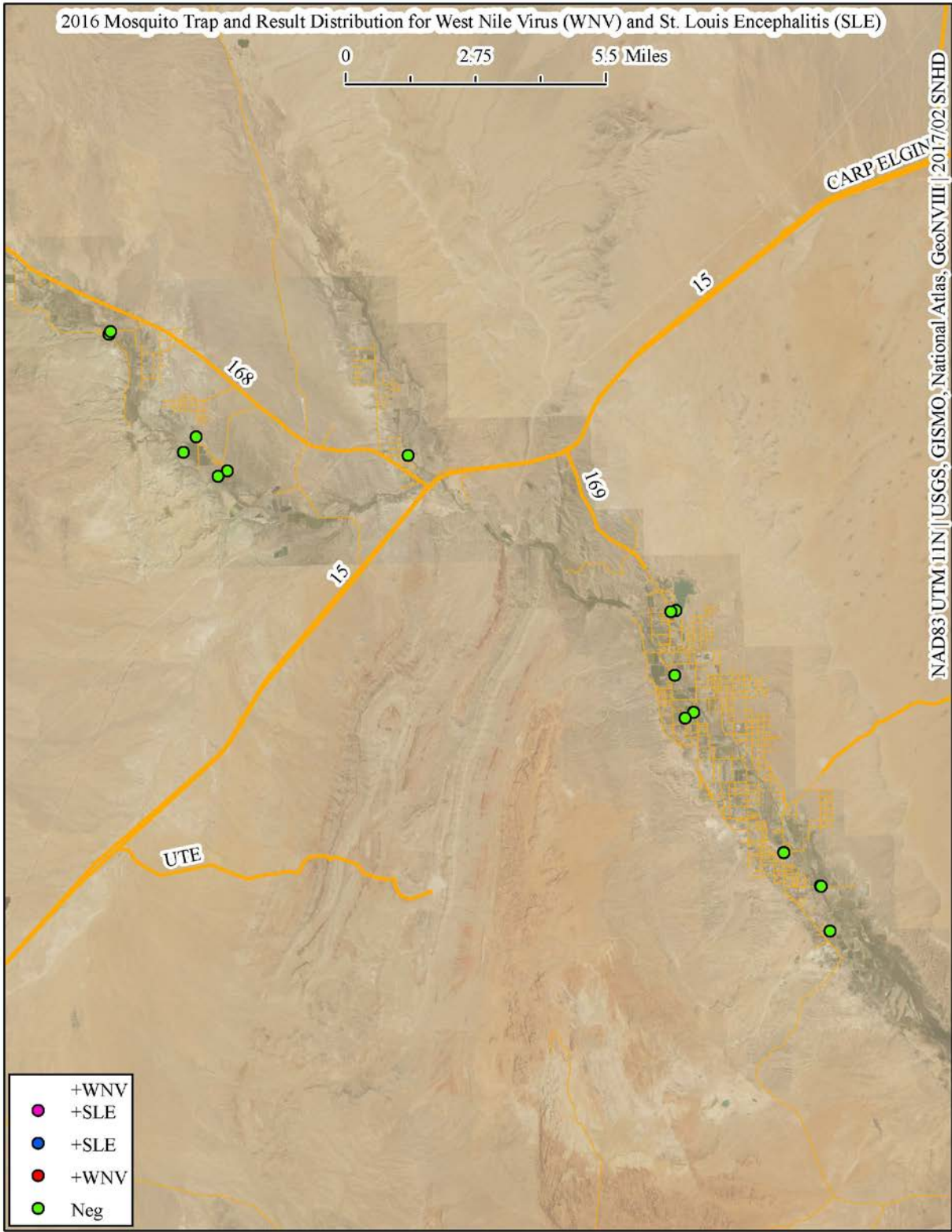
Map 3: Urban Unincorporated Clark County - Distribution of Mosquito Surveillance Sites and Results



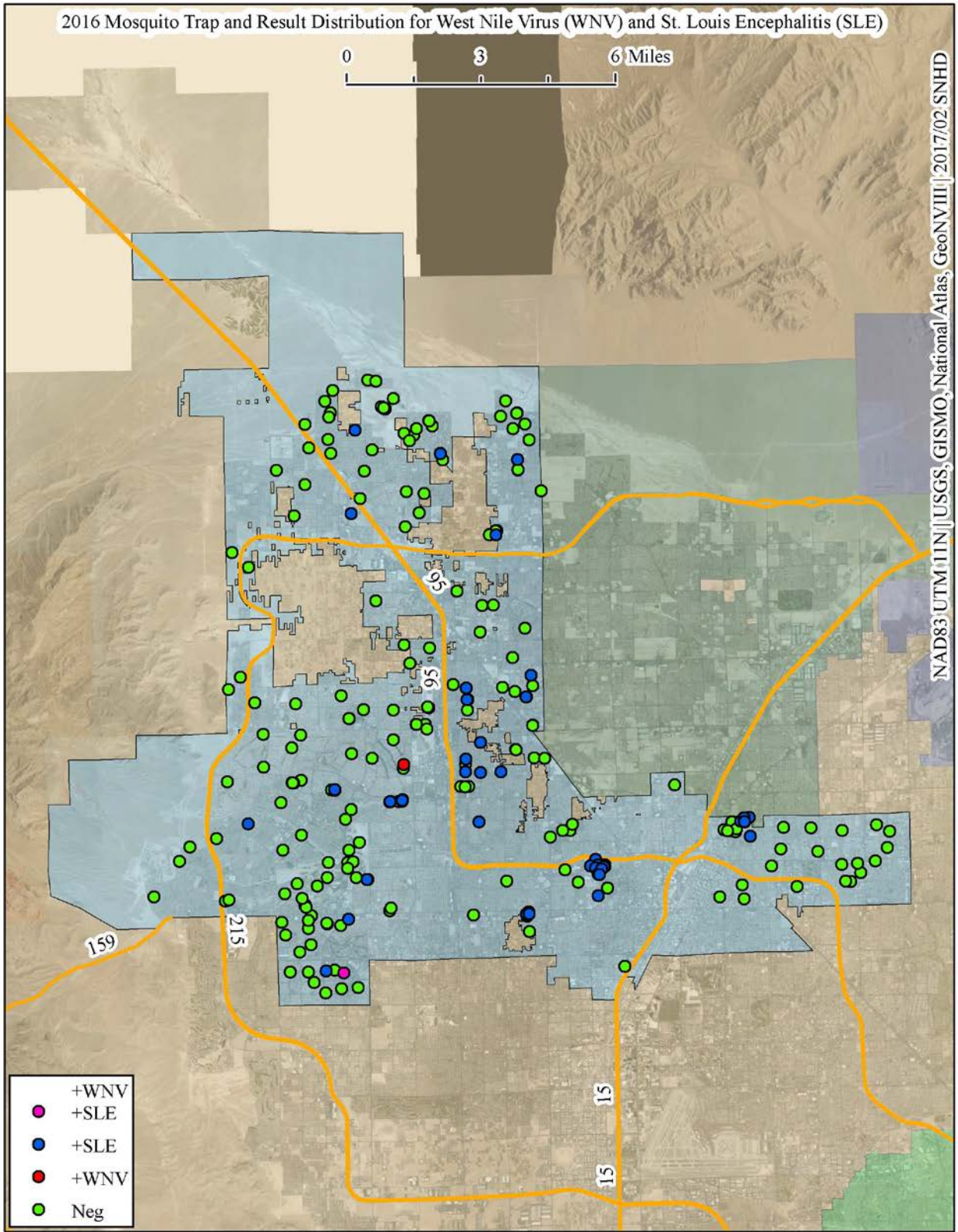
Map 3: Laughlin (Unincorporated) – Distribution of Mosquito Surveillance Sites and Results



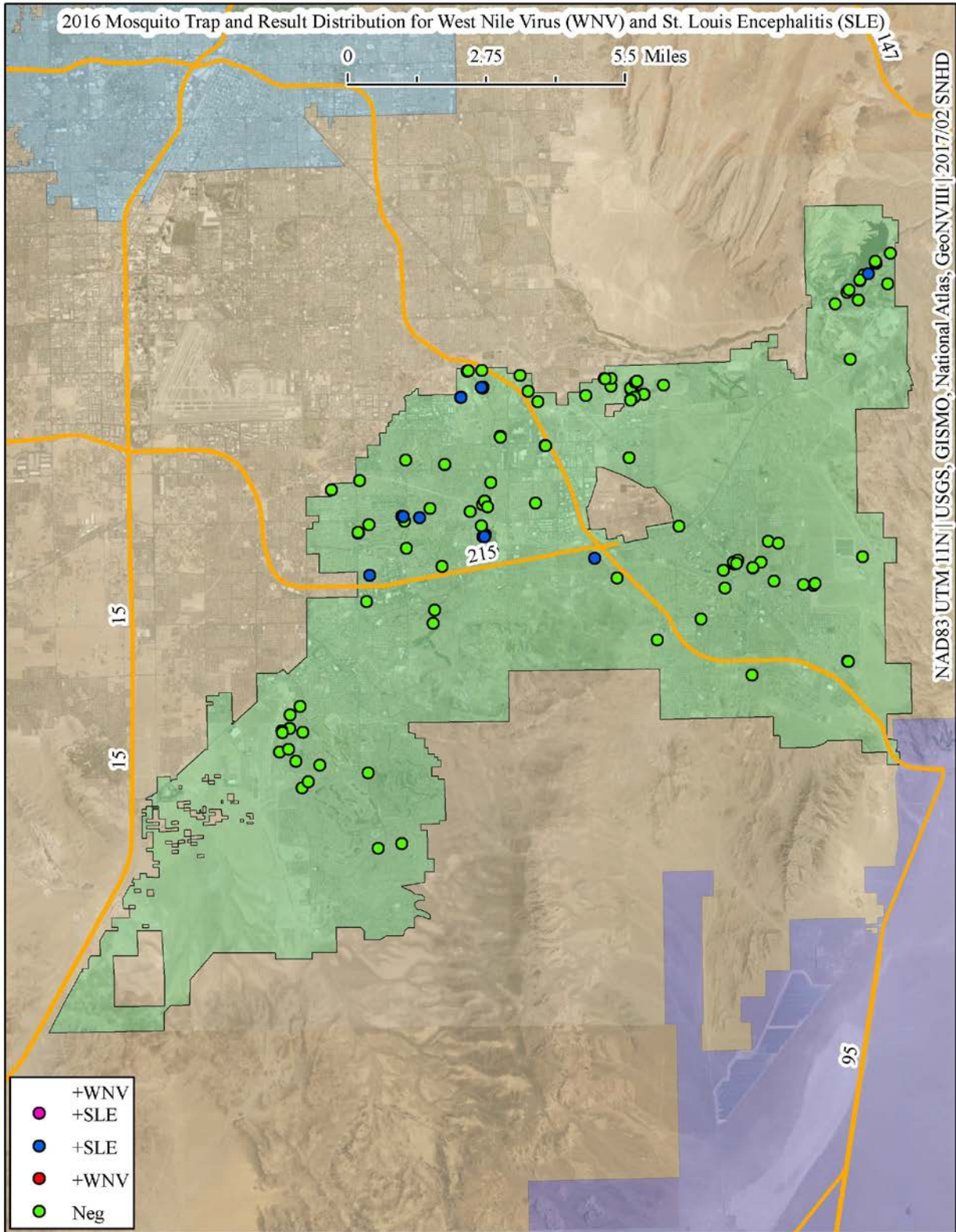
Map 4: Moapa Valley (Unincorporated) – Mosquito Surveillance Sites and Results



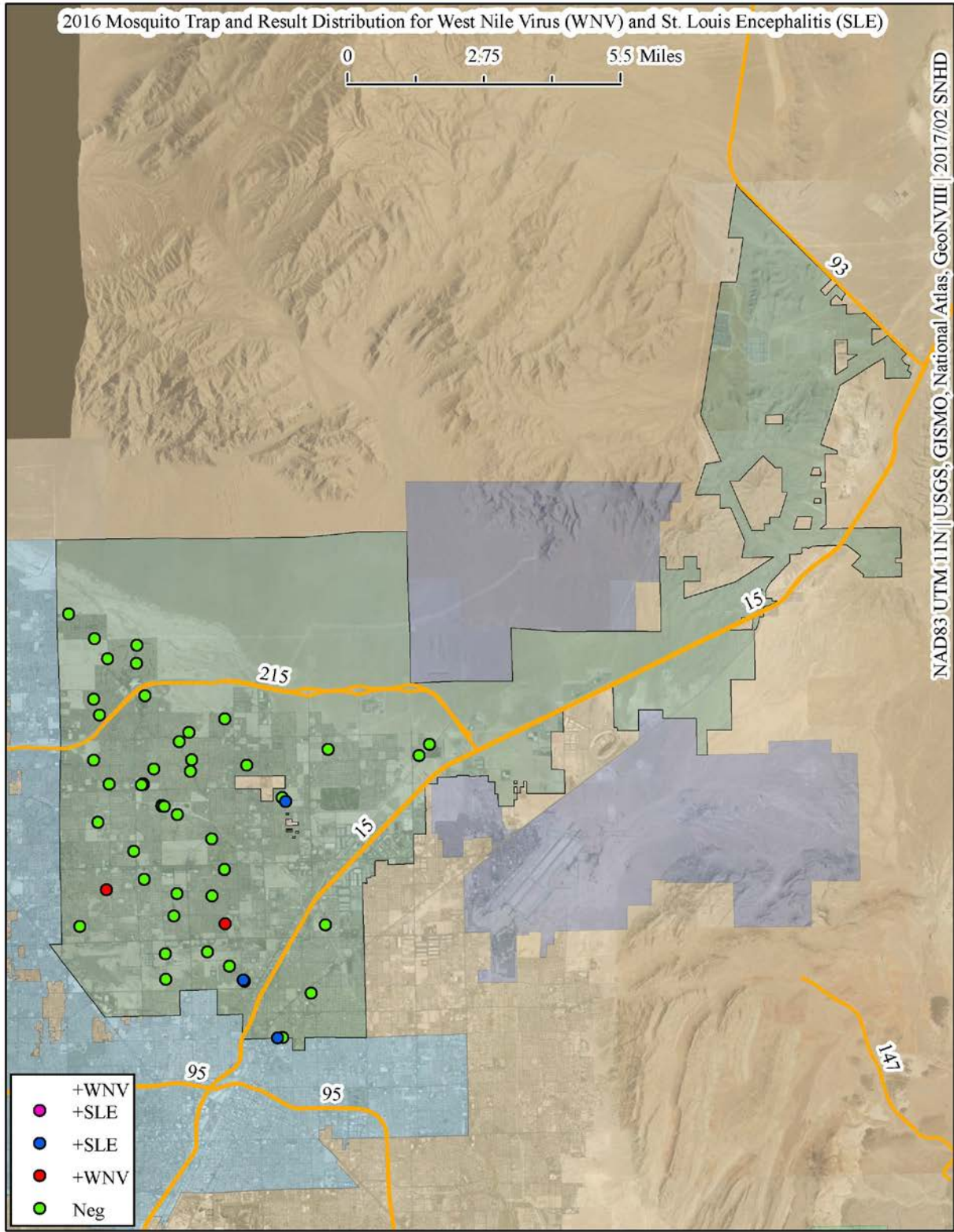
Map 5: City of Las Vegas - Mosquito Surveillance Sites and Results



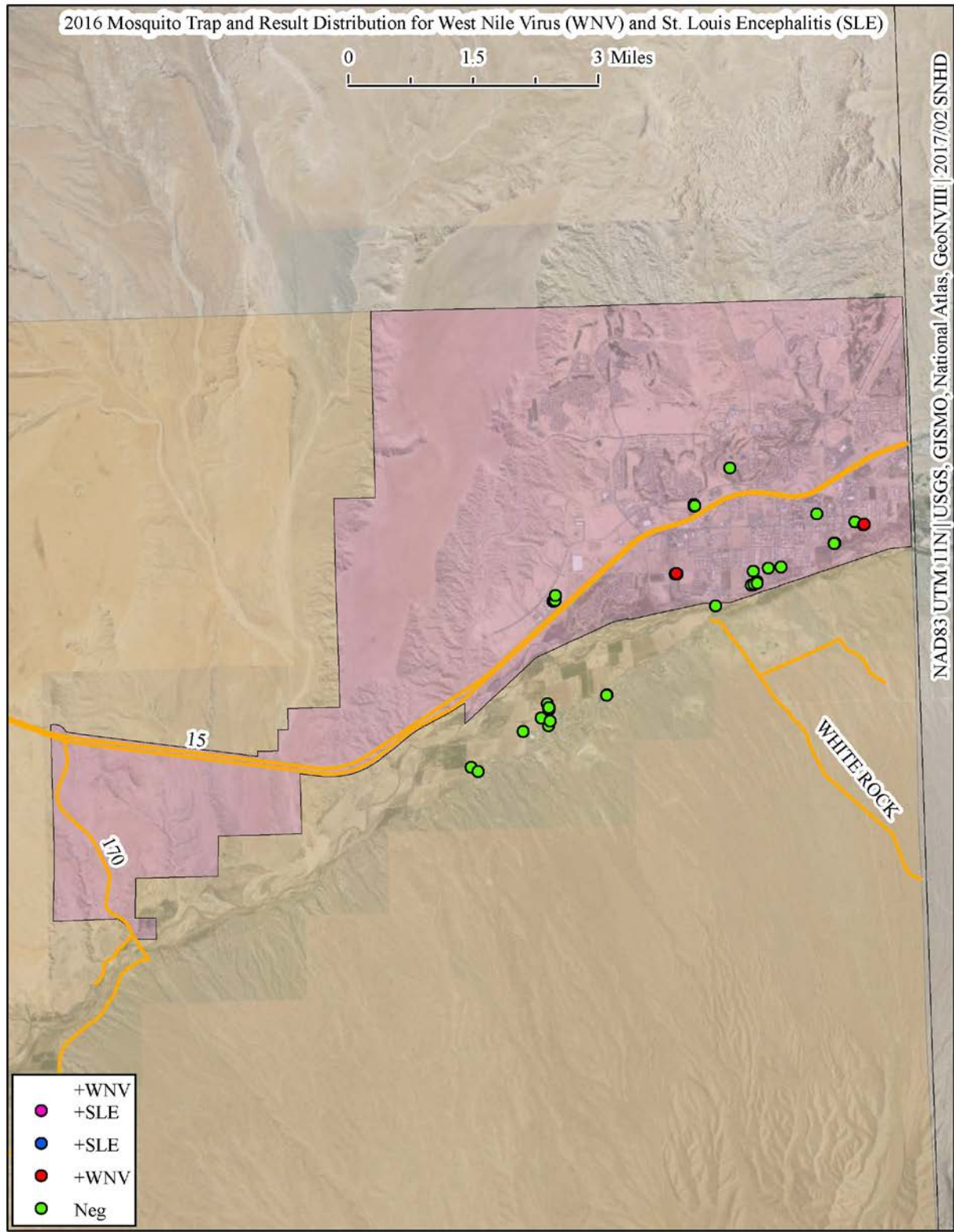
Map 6: City of Henderson - Mosquito Surveillance Sites and Results



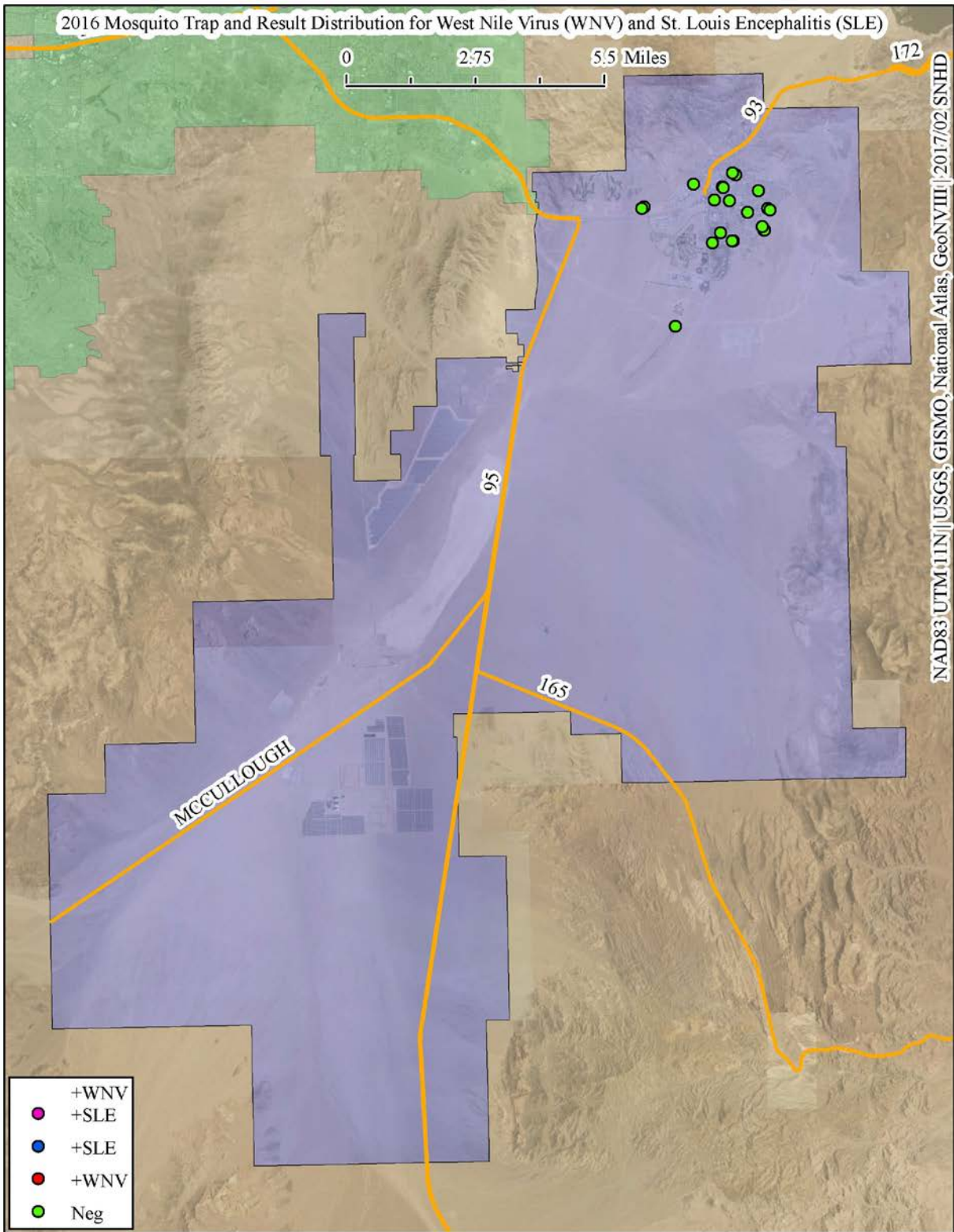
Map 7: City of North Las Vegas - Mosquito Surveillance Sites and Results



Map 8: City of Mesquite / Bunkerville (Unincorporated) - Mosquito Surveillance Sites and Results



Map 9: Boulder City - Distribution of Mosquito Surveillance Sites and Results



Map 10: Boulder City - Distribution of Mosquito Surveillance Sites and Results

