2007

# Zoonotic Infectious Diseases: Surveillance and Control

Southern Nevada Health District

Vector Control Program
ENVIRONMENTAL HEALTH DIVISION

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## INTRODUCTION

The Southern Nevada Health District's (SNHD) Vector Control office conducts routine surveillance and control of diseases in animals communicable to man. These animal diseases, or zoonoses, include West Nile virus (WNv), Western Equine Encephalitis (WEE), St. Louis Encephalitis (SLE), plague, hantavirus, rabies, and raccoon roundworm. Mosquito Control, a critical function of WNv, SLE, and WEE prevention, occurred concurrently with mosquito disease surveillance activities. This report details SNHD's zoonotic disease surveillance, control and public education activities in Clark County conducted in 2007.

Vector Control uses a geographical information system (GIS) for capturing, storing, analyzing and managing zoonotic disease surveillance and control activity data. Field staff, equipped with Global Positioning Systems (GPS), entered field data into a desktop GIS system. This data has been plotted onto maps and supplements the numeric tables throughout this report.

## MOSQUITO-BORNE DISEASES

### Human Surveillance Methodology

West Nile encephalitis is a reportable condition per Nevada Administrative Code (NAC) Chapter 441A.520. West Nile fever was made temporarily reportable by a technical bulletin issued by the Nevada State Health Division on Sept. 23, 2003. The temporary West Nile requirement expired on September 23, 2006, and was not renewed by the State Health Officer. In order to ensure the prompt and complete reporting of West Nile cases in the future, West Nile infection was made reportable in Clark County on Jan. 4, 2007 by order of the Chief Health Officer.

In the United States, a case is reported based on the person's home jurisdiction, despite being diagnosed or potentially acquiring disease elsewhere. Each case of West Nile virus infection is reported into two surveillance systems - NETSS (National Electronic Telecommunications System for Surveillance) and ArboNET. ArboNET captures information on diseases spread by arthropods, such as mosquitoes and ticks and includes information on human cases, as well as infections in horses, birds and mosquitoes. NETSS captures information on human cases of all nationally notifiable diseases.

### 2007 Human Cases

In 2007, four West Nile Virus cases were reported from Clark County. One of these cases was reported in ArboNET in December 2007, but was not entered into NETSS until January 2008; therefore disease statistics may vary depending on which source is referenced. Two of the cases in 2007 were under the age of 50 and experienced the milder form of West Nile infection, while two were over the age of 50 and experienced severe illness. One of these cases died from encephalitis and was diagnosed with West Nile virus at a medical facility in Colorado. Two of the cases had no travel outside Clark County during the incubation period. The other two cases spent time and experienced mosquito bites in Colorado; however, both of those individuals were also in Clark County during part of the incubation period and a local exposure cannot be excluded.

Mosquito Surveillance

Mosquito trapping and testing is the cornerstone of SNHD's arbovirus surveillance program. In comparison to migratory bird or sentinel chicken flock sampling, mosquito surveillance provides an up-to-date indicator of WNv presence in an area. Mosquito sampling also provides information on the type of mosquitoes present, their estimated infection rate, and can be used as a trigger for control measures. In Clark County the major mosquito breeding months are generally April through October, with the breeding season shorter in the higher elevations of Nye, Lincoln and White Pine counties. This breeding season is weather dependent and will vary slightly from year to year.

EVS Trap

The portable Encephalitis Vector Surveillance (EVS) trap, designed to collect host seeking female mosquitoes using carbon dioxide as the primary attractant, was used extensively throughout southern Nevada. The traps are set overnight in potential mosquito breeding areas such as washes, drainage ditches, rivers and pools of standing water, as well as in human and equine population centers. From the collection site, live mosquitoes are frozen on dry ice and transported to SNHD where they are sorted by species, gender, and pooled for submission (one pool consists of no more than 50 adult females of a single species from the same trap). Once identified, sorted and pooled, the mosquitoes are placed into vials, packed in ice and shipped overnight to the Nevada Department of Agriculture's Animal Disease Lab (ADL) in Reno for analysis.

In 2007 SNHD set 468 EVS traps in Clark, Nye, Lincoln, and White Pine counties, submitting 25,698 mosquitoes to the ADL for WNv, SLE and WEE analysis. As shown in Figure 1, although only 247 mosquitoes tested positive, WNv maintains a presence in the mosquito populations of Southern Nevada.

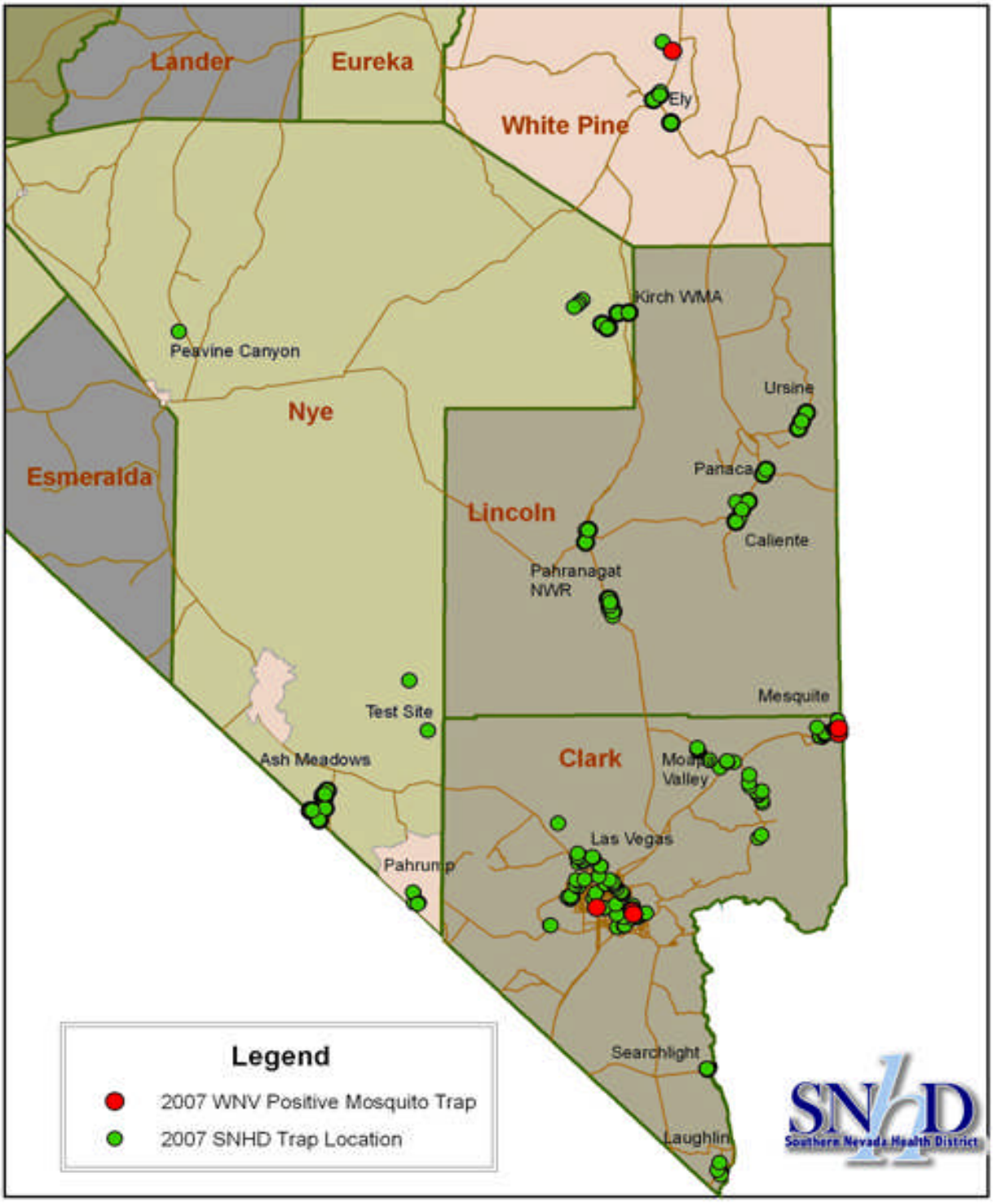
**Figure 1:** 2004-2007 EVS Sample Submission Comparison

| | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|
| **EVS Traps Set** | NA | 561 | 871 | 468 |
| **Pools Submitted** | 154 | 1,256 | 1,269 | 1,112 |
| **Mosquitoes Tested** | 4,900 | 31,059 | 29,492 | 25,698 |
| **Arbovirus Positive Pools** | 25 | 59 | 23 | 10 |
| **Arbovirus Positive Mosquitoes** | 154 | 1,826 | 275 | 247 |

**Figure 2:** Mosquito Submissions by County

| County | # EVS Traps | # Pools | # Mosquitoes | # WNv Positive Pools | # WNv Positive Mosquitoes |
|---|---|---|---|---|---|
| Clark | 315 | 723 | 17,644 | 9 | 200 |
| Nye | 54 | 84 | 1,647 | 0 | 0 |
| White Pine | 18 | 14 | 245 | 1 | 47 |
| Lincoln | 81 | 257 | 6,162 | 0 | 0 |
| **TOTAL** | **468** | **1,112** | **25,698** | **10** | **247** |

**Map 1:** Mosquito Trap Locations in Southern Nevada



Clark County (Population 1,800,000)

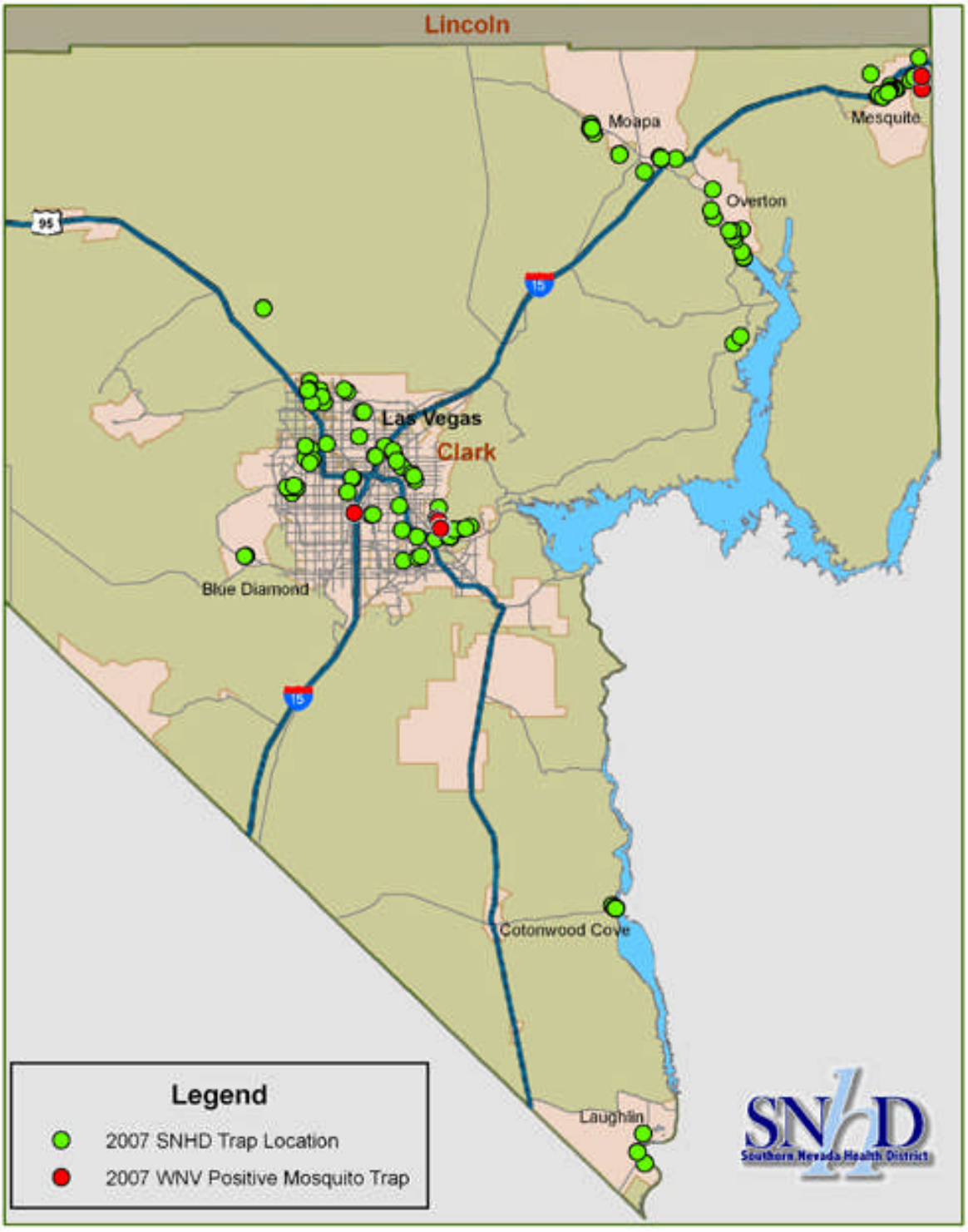
In 2007, SNHD set 315 EVS traps in rural and urban Clark County. From these traps, 723 pools were submitted to the ADL, totaling 17,644 mosquitoes. Of the 723 pools submitted, nine were WNv positive, totaling 200 mosquitoes.

Figure 3 details the type and number of mosquitoes tested from Clark County, including the WNv positive samples, and Maps 2 and 3 show the spatial distribution of the trapping locations.

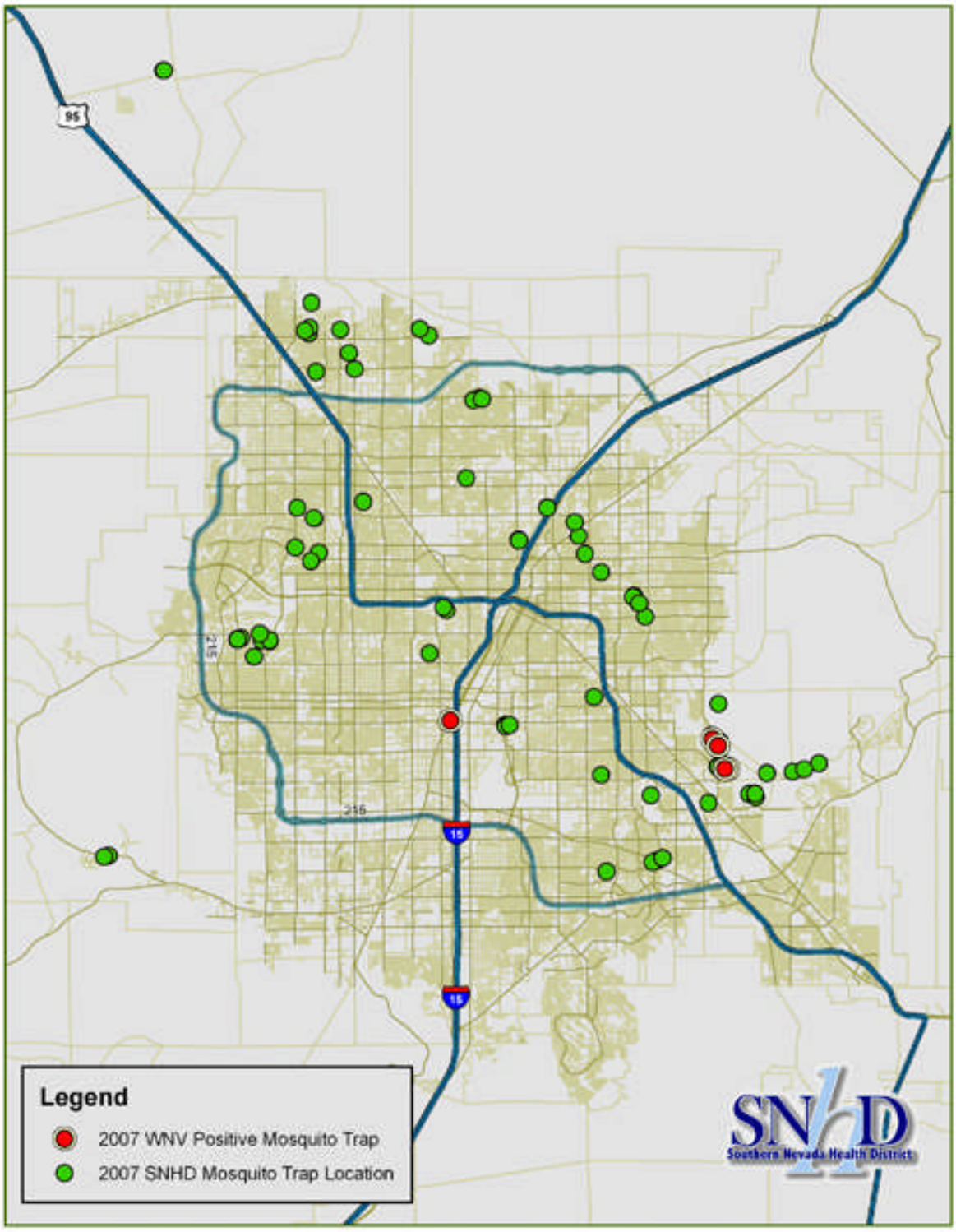
**Figure 3:** Clark County Mosquito Submissions

| Mosquito Species | # of Mosquitoes | # of Pools | # Pos or Suspect Mosquitoes | # Pos or Suspect Pools |
|---|---|---|---|---|
| Aedes vexans | 4,963 | 125 | 0 | 0 |
| Anopheles franciscanus | 109 | 35 | 0 | 0 |
| Anopheles freeborni | 631 | 55 | 0 | 0 |
| Culiseta inornata | 50 | 15 | 1 | 1 |
| Culex erythrothorax | 1,611 | 87 | 0 | 0 |
| Culex quinquefasciatus | 1,473 | 98 | 5 | 1 |
| Culex stigmatosoma | 20 | 8 | 0 | 0 |
| Culex tarsalis | 8,783 | 299 | 194 | 7 |
| Ochlerotatus dorsalis | 3 | 1 | 0 | 0 |
| **TOTAL** | **17,644** | **723** | **200** | **9** |

**Map 2:** Mosquito Trap Locations in Clark County



**Map 3:** Mosquito Traps Locations – Las Vegas Valley



Nye County (Population 40,777)

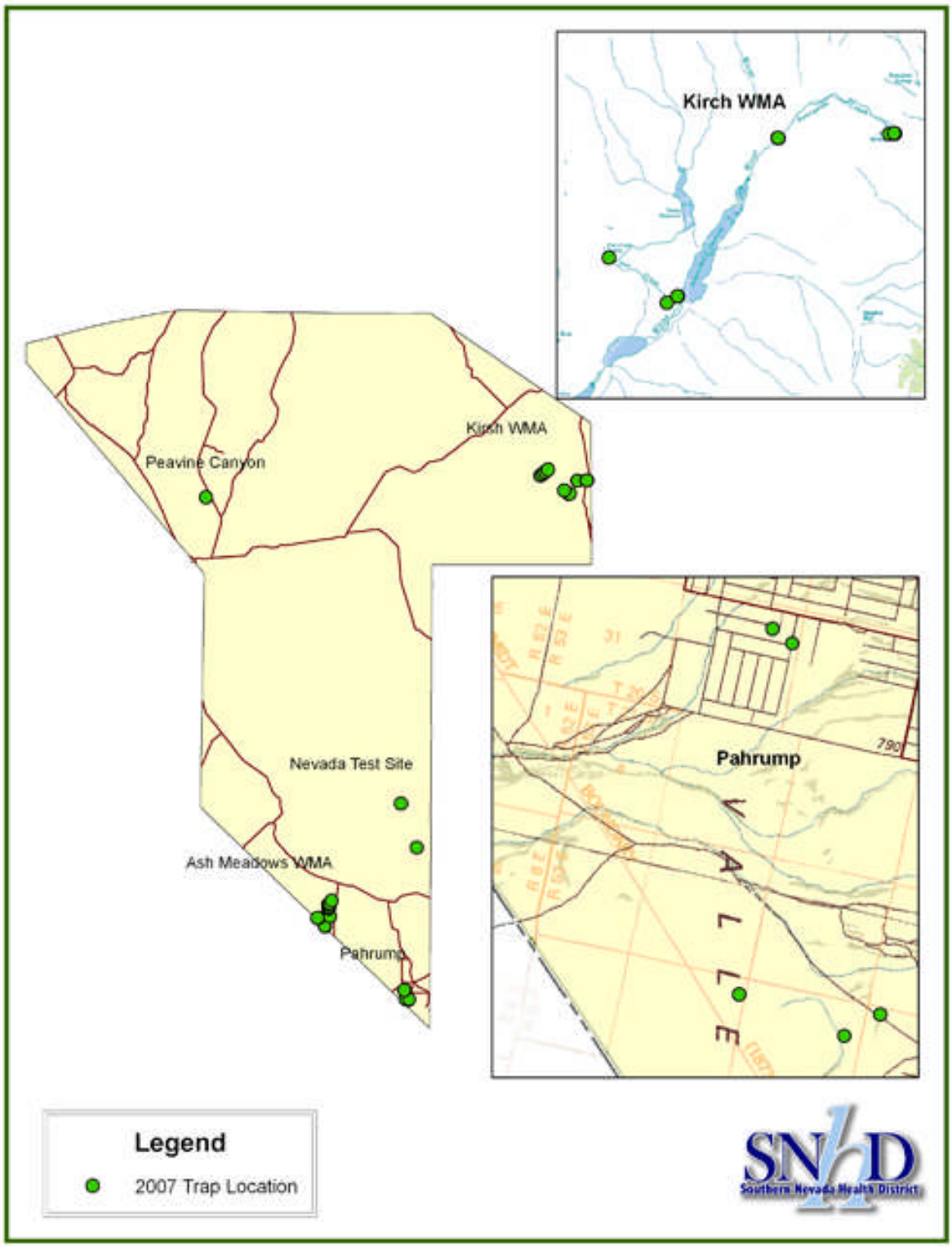
In 2006 Nye County Emergency Management developed and implemented a mosquito surveillance and control program. SNHD provided technical information on using EVS traps and guidance on applying mosquito control larvicides and adulticides. In 2007, Nye County staff trapped mosquitoes in Beatty, Tonopah and Pahrump, while biologists with National Security Technologies, LLC (NST) trapped mosquitoes on the Nevada Test Site. The mosquitoes collected by Nye County Emergency Management and NST were submitted to SNHD for identification, pooling, and shipment to the ADL.

In 2007, 54 EVS traps were set in Nye County, totaling 1,647 mosquitoes from 84 pools. Of the 84 pools submitted to the ADL, no mosquitoes were positive for WNv. Figure 4 details the type and number of mosquitoes tested from Nye County and Map 4 shows the spatial distribution of the trapping locations.

**Figure 4:** Nye County Mosquito Submissions

| Mosquito Species | # of Mosquitoes | # of Pools | # Pos or Suspect Mosquitoes | # Pos or Suspect Pools |
|---|---|---|---|---|
| Anopheles franciscanus | 40 | 8 | 0 | 0 |
| Anopheles freeborni | 73 | 10 | 0 | 0 |
| Culiseta inornata | 12 | 4 | 0 | 0 |
| Culex erythrothorax | 931 | 25 | 0 | 0 |
| Culex quinquefasciatus | 1 | 1 | 0 | 0 |
| Culex tarsalis | 111 | 23 | 0 | 0 |
| Psorophora signipennis | 479 | 13 | 0 | 0 |
| **TOTAL** | **1,647** | **84** | **0** | **0** |

**Map 4:** Mosquito Traps Locations in Nye County



White Pine County (Population 9,100)

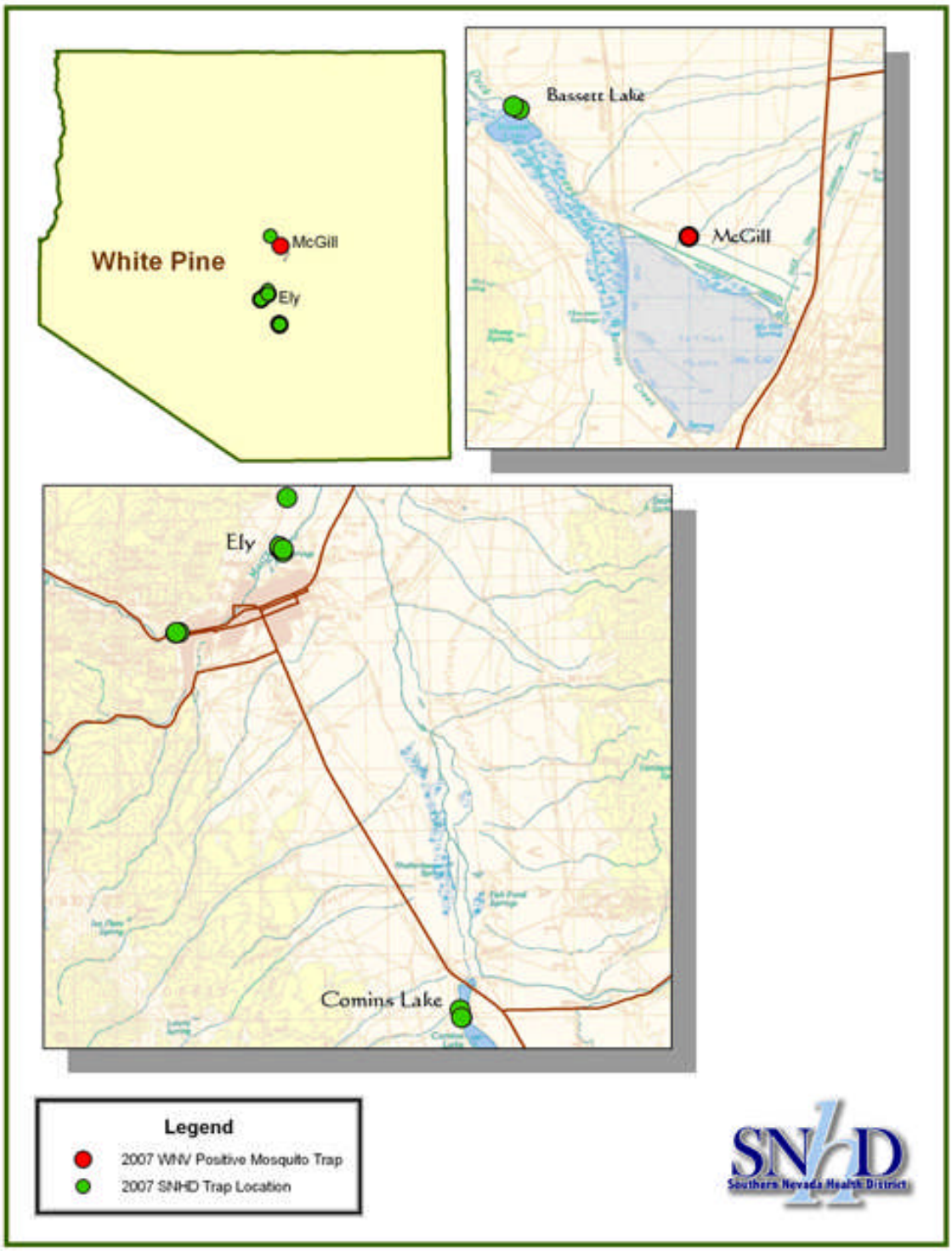
In 2007, SNHD set 18 EVS traps in White Pine County, totaling 245 mosquitoes from 31 pools. Of the 31 pools submitted to the ADL, one was positive for WNv, totaling 47 mosquitoes. EVS traps were set in and immediately around Ely, with the remainder of the county being surveyed by the Nevada Department of Agriculture

Figure 5 details the type and number of mosquitoes tested from White Pine County, including the WNv positive sample, and Map 5 shows the geographical distribution of the trapping locations.

**Figure 5:** White Pine County Mosquito Submissions

| Mosquito Species | # Mosquitoes | # of Pools | # Pos or Suspect Mosquitoes | # Pos or Suspect Pools |
|---|---|---|---|---|
| Anopheles freeborni | 10 | 2 | 0 | 0 |
| Culiseta inornata | 62 | 12 | 0 | 0 |
| Culex erythrothorax | 18 | 2 | 0 | 0 |
| Culex tarsalis | 144 | 12 | 47 | 1 |
| Ochlerotatus dorsalis | 1 | 1 | 0 | 0 |
| Ochlerotatus increpitus | 10 | 2 | 0 | 0 |
| **TOTAL** | **245** | **31** | **47** | **1** |

**Map 5:** Mosquito Traps Locations in Nye County



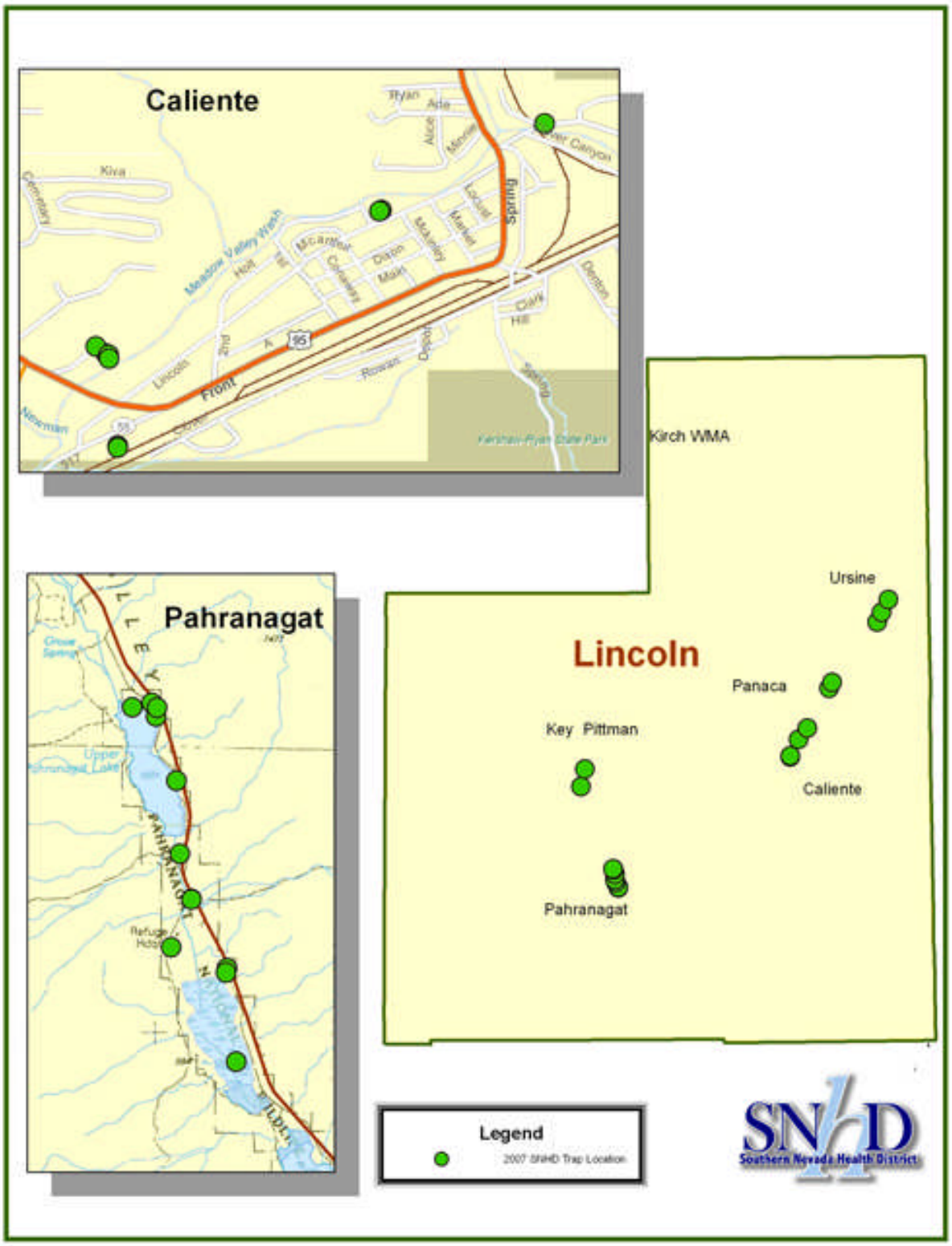
Lincoln County (Population 4,200)

In 2007, SNHD set 81 EVS traps, collecting 6,162 mosquitoes from 257 pools. None of the mosquitoes tested from Lincoln County were positive for WNv, WEE or SLE. Figure 6 details the type and number of mosquitoes tested from Lincoln County, and Map 6 shows the spatial distribution of the EVS trap locations.

**Figure 6:** Lincoln County Mosquito Submissions

| Mosquito Species | # Mosquitoes | # of Pools | # Pos or Suspect Mosquitoes | # Pos or Suspect Pools |
|---|---|---|---|---|
| Aedes vexans | 11 | 5 | 0 | 0 |
| Anopheles franciscanus | 75 | 12 | 0 | 0 |
| Anopheles freeborni | 386 | 40 | 0 | 0 |
| Culiseta inornata | 221 | 30 | 0 | 0 |
| Culex erythrothorax | 2,949 | 72 | 0 | 0 |
| Culex tarsalis | 2,499 | 89 | 0 | 0 |
| Ochlerotatus dorsalis | 9 | 6 | 0 | 0 |
| Ochlerotatus flavescens | 2 | 1 | 0 | 0 |
| Ochlerotatus increptius | 10 | 2 | 0 | 0 |
| **TOTAL** | **6,282** | **257** | 0 | 0 |

**Map 6:** Mosquito Traps Locations in Lincoln County



Bird Surveillance

SNHD continued sampling and testing birds for WNv in 2007. Oral swab specimens were collected from birds by USDA Wildlife Services, Animal Hospitals, Bird Rehabilitation centers and SNHD staff. Seventeen birds were submitted to the ADL, with zero testing positive. Fifteen of the bird samples were from Clark County, with two from Lincoln and one from Nye County. Figure 7 details the type and number of birds tested for WNv, SLE and WEE, and Figure 8 is a comparison of bird submissions from 2004 through 2007. The total sample size of birds tested for West Nile virus declined in 2007 due to fewer samples being collected and submitted by partnering agencies.

**Figure 7:** Bird Sample Species Distribution

| Common Name | Scientific Name | # of Samples | # Arbovirus Positive |
|---|---|---|---|
| American Coot | Fulica americana | 5 | 0 |
| Finch | Carpodacus mexicanus | 3 | 0 |
| Great-Tailed Grackle | Quiscalus mexicanus | 1 | 0 |
| Mallard | Anas platyrhynchos | 1 | 0 |
| Raven | Corvus corax | 3 | 0 |
| Kildeer | Charadrius vociferus | 1 | 0 |
| Long-eared Owl | Asio outs | 1 | 0 |
| Mandarin Duck | Aix galericulata | 1 | 0 |
| Western Grebe | Aechmophorus occidentalis | 1 | 0 |
| **TOTAL** | | **17** | **0** |

**Figure 8:** 2004-2007 Bird Sample Submission Comparison

| | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|
| **Birds Tested** | 155 | 179 | 159 | 17 |
| **Arbovirus Positive Birds** | 8 | 6 | 1 | 0 |

## MOSQUITO CONTROL ACTIVITIES

The principal goal of SNHD's mosquito control program is to use an Integrated Pest Management approach to eliminating or reducing mosquito breeding habitats. Environmental engineering, to eliminate the breeding source, is the first course of action, followed by placing mosquito fish in the breeding habitat. If neither of these options is feasible or effective, SNHD will treat the mosquito breeding areas with chemical or biological insecticides. The insecticides SNHD uses to control mosquitoes are registered by the EPA and are carefully chosen for larviciding and adulticiding applications. Mosquito adulticiding is not a routine activity and is conducted to control biting mosquitoes in areas where larviciding is impractical to control the population.

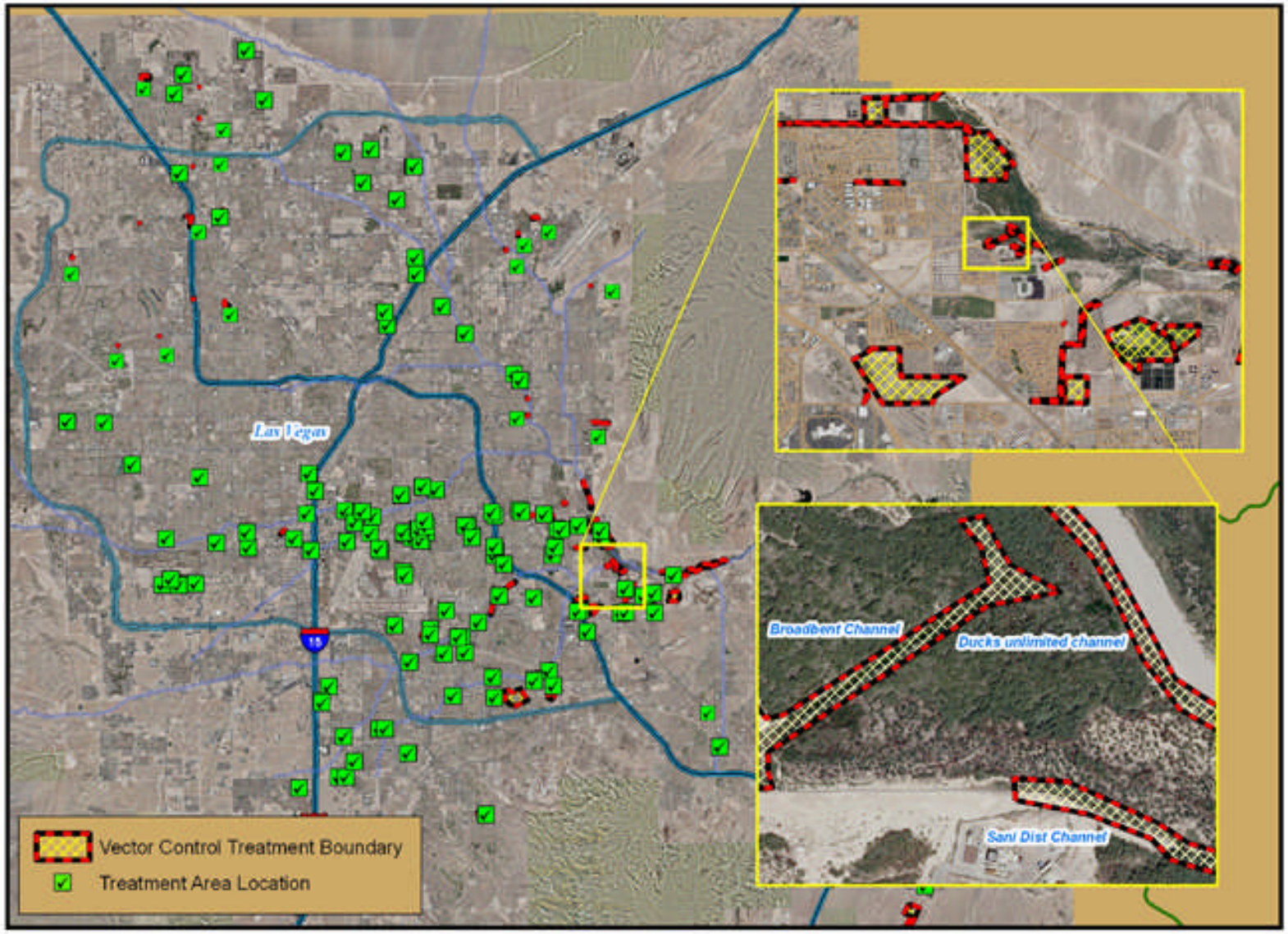
Routinely monitored and treated mosquito breeding sites

Seventeen species of mosquitoes live in Clark County, of which 10 are known vectors of disease. In Clark County the peak mosquito breeding season is April through October, but with moderate winter temperatures, several of these mosquito species can breed year round.

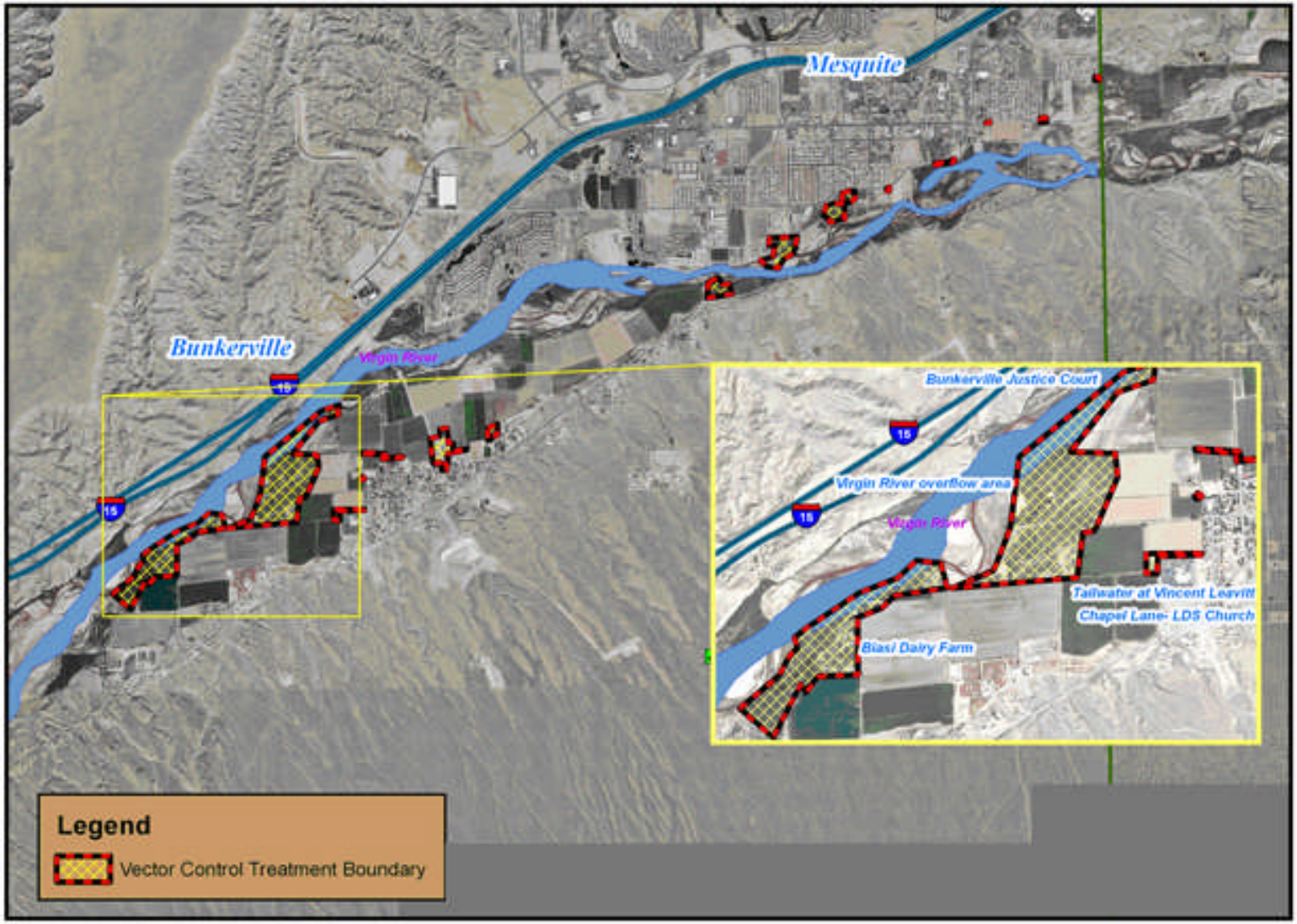
SNHD routinely inspected and treated 170 known mosquito breeding sources throughout the year. These areas include flood channels, road side ditches, catch basins, pastures, irrigated fields, wastewater treatment ponds, and wetland ponds. Local public agencies and private property owners were contacted to maintain drainage in channels and ditches, remove or thin vegetation in wetland and wastewater ponds, remove debris from street gutters and drains, and improve field irrigation methods for agriculture use.

Maps 7 and 8 show the spatial distribution of the mosquito breeding sources routinely checked and treated throughout the year.

**Map 7:** Routine Mosquito Treatment Areas – Las Vegas Valley



**Map 8:** Routine Mosquito Treatment Areas – Mesquite and Bunkerville



In 2005, a mosquito control hotline (759-1633) and on-line complaint form were set up to address citizen complaints regarding mosquito breeding and WNv concerns. In 2007 SNHD responded to 1,624 citizen complaints requiring field response, an increase of 578 complaints over 2006. Of the 1,624 complaints, 1,547 responses were to stagnant swimming pools, with the remaining responses to vacant lots, storm drains, washes and other areas of standing water. Many of these responses required multiple site visits to verify the mosquito breeding source had been eliminated.

*Mosquito larvae in abandoned swimming pool*

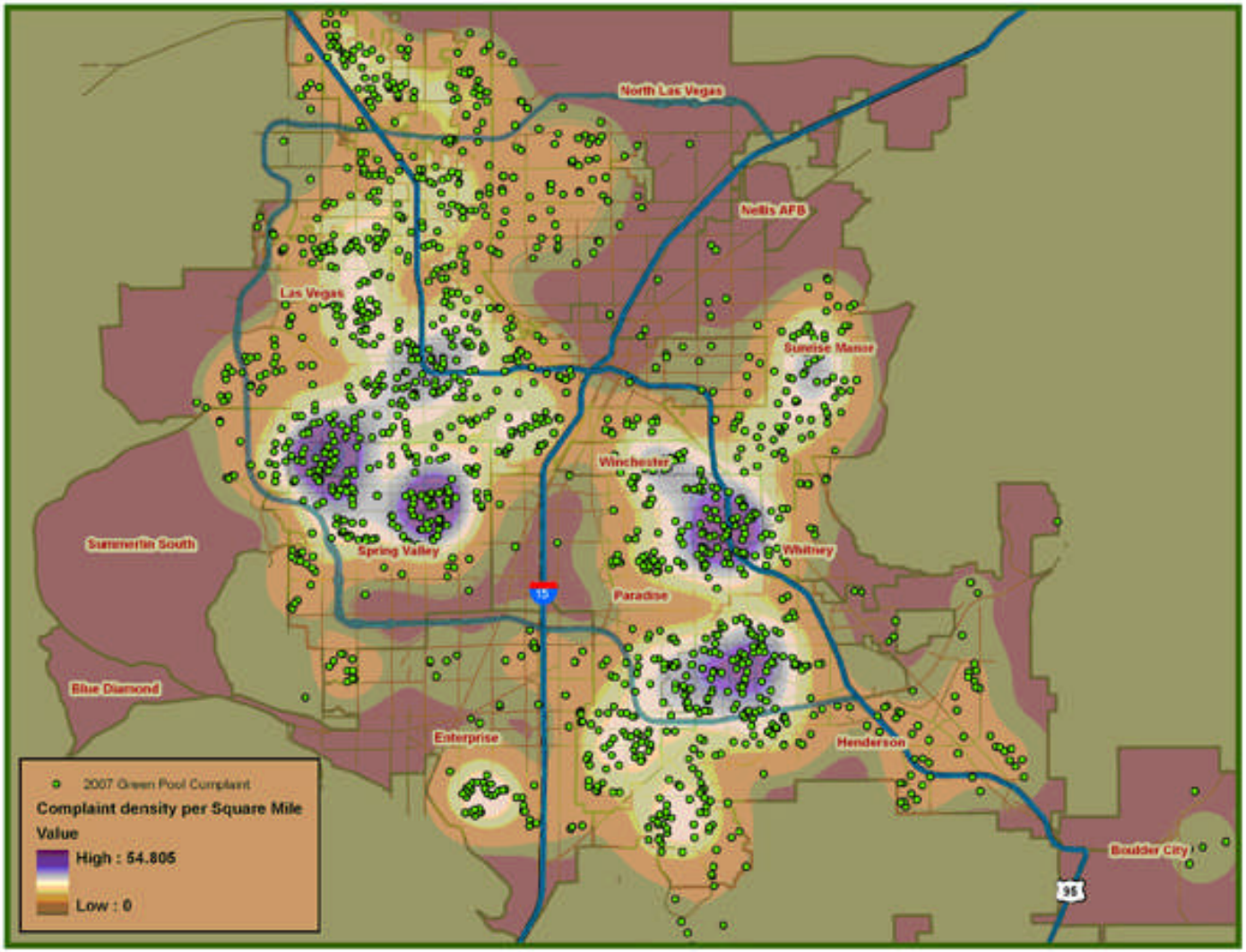
In December 2007, SNHD implemented a stagnant swimming pool billing process in an attempt to recuperate costs associated with residential mosquito control. The initial swimming pool assessment and short term treatment (three weeks of mosquito control) are conducted free of charge, with remediation notices left at the property and mailed to the homeowner. If the swimming pool remains stagnant after three weeks, SNHD applies a long term treatment (60 days of control) and issues the property owner an invoice of $117 for the treatment or $83 for a survey if access to the site is restricted. Invoices 90 days past due are forwarded to SNHD's collection agency.

Figure 8 details the number of citizen generated complaints and Map 9 shows the spatial and density distribution of the field responses.

**Figure 9:** 2005-2007 Mosquito Control Complaint Response Totals

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2005** | 0 | 0 | 0 | 3 | 6 | 363 | 205 | 349 | 115 | 45 | 37 | 14 | **1,131** |
| **2006** | 12 | 18 | 50 | 75 | 318 | 138 | 130 | 128 | 86 | 61 | 24 | 6 | **1,046** |
| **2007** | 14 | 42 | 96 | 115 | 257 | 276 | 233 | 255 | 153 | 98 | 78 | 7 | **1,624** |

**Map 9:** Spatial and Density Distribution of Citizen Generated Complaints



## RABIES

Rabies is a communicable disease of the nervous system caused by a virus. It usually results from an exposure to an animal with rabies and is 100 percent fatal to humans. In 2007, SNHD submitted 123 specimens from 13 animal species to the ADL for rabies surveillance, with four bats testing positive. Animal samples were collected by Animal Control agencies in Clark County and submitted to SNHD for recording and shipment to the ADL. Figure 10 details the type of specimens submitted for rabies testing in 2007. Figure 11 is a year-by-year comparison of rabies test submissions since 2001. Map 10 shows the geographical distribution of the positive rabies samples since 2002. No human cases of rabies infection have been reported to SNHD.

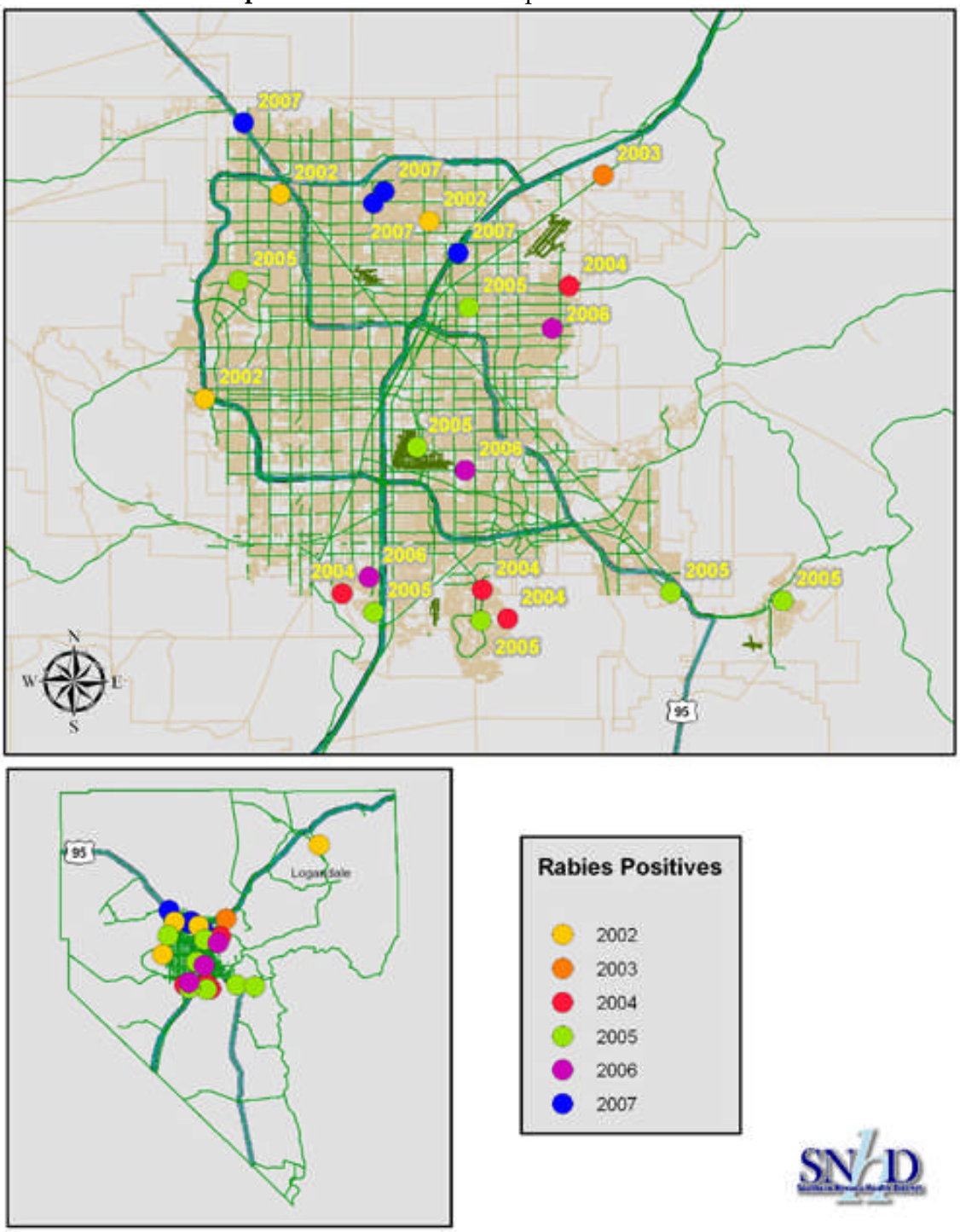
**Figure 10:** 2007 Rabies Surveillance Submissions

| Animal | # Sampled | # Positive |
|---|---|---|
| Bat | 23 | 4 |
| Bob Cat | 2 | 0 |
| Cat | 33 | 0 |
| Coyote | 2 | 0 |
| Dog | 48 | 0 |
| Ferret | 1 | 0 |
| Fox | 1 | 0 |
| Mouse | 3 | 0 |
| Opossum | 1 | 0 |
| Raccoon | 4 | 0 |
| Rat | 2 | 0 |
| Skunk | 2 | 0 |
| Squirrel | 1 | 0 |
| **TOTAL** | **123** | **4** |

**Figure 11:** 2001-2007 Rabies Test Submission Comparison

| Year | Total Sampled | # of Bats | # Positive Bats |
|---|---|---|---|
| 2001 | 156 | 17 | 4 |
| 2002 | 138 | 22 | 4 |
| 2003 | 128 | 13 | 1 |
| 2004 | 155 | 20 | 4 |
| 2005 | 140 | 19 | 7 |
| 2006 | 93 | 24 | 4 |
| 2007 | 123 | 23 | 4 |
| **TOTAL** | **933** | **115** | **28 (20%)** |

**Map 10:** Rabies Positive Sample Locations 2001-2007



## HANTAVIRUS

Hantavirus pulmonary syndrome (HPS) is a respiratory disease transmitted by infected rodents through urine, droppings, or saliva. Humans can contract the disease when they breathe in aerosolized fecal matter or urine containing the virus. In 2007, SNHD collected and submitted 53 blood samples to the University of New Mexico for hantavirus analysis. Zero animals tested positive for hantavirus. The total sample size of rodents tested for hantavirus declined in 2007 due to SNHD focusing sample collection efforts on species of hantavirus concern versus sampling all rodents trapped, as done in prior years. Figure 12 details the type and numbers of animals tested for hantavirus. Figure 13 is a year-by-year comparison of hantavirus test submissions and positive results, since 2001. Map 11 shows the spatial distribution of hantavirus sample collections in Clark County. No human cases of hantavirus infection have been reported to SNHD.

**Figure 12:** Hantavirus Specimen Distribution

| Species | Name | # Sampled for Hantavirus | # Hantavirus Positive |
|---|---|---|---|
| Dipodomys merriami | Merriam's Kangaroo Rat | 2 | 0 |
| Eutamias panamintinus | Panamint Chipmunk | 3 | 0 |
| Neotoma albigula | White-throated Wood Rat | 1 | 0 |
| Neotoma lepida | Desert Wood Rat | 7 | 0 |
| Peromyscus boyli | Brush Mouse | 17 | 0 |
| Peromyscus eremicus | Cactus Mouse | 3 | 0 |
| Peromyscus crinitis | Canyon Mouse | 8 | 0 |
| Perognathus formosus | Long Tail Pocket Mouse | 1 | 0 |
| Rattus rattus | Roof rat | 11 | 0 |
| **TOTAL** | | **53** | **0** |

**Figure 13:** 2001-2007 Hantavirus Test Submissions

| Year | Samples Tested | # Positive |
|---|---|---|
| 2001 | 0 | 0 |
| 2002 | 0 | 0 |
| 2003 | 50 | 4 |
| 2004 | 0 | 0 |
| 2005 | 128 | 0 |
| 2006 | 386 | 12 |
| 2007 | 53 | 0 |
| **TOTAL** | **617** | **16** |

## PLAGUE

In 2007, SNHD submitted 31 animal blood samples to the Centers for Disease Control and Prevention (CDC) for plague analysis, with zero testing positive. The total sample size of mammals tested for plague declined in 2007 due to fewer samples being collected and submitted by partnering agencies. Additionally, SNHD modified its plague sample collection methods in response to the CDC's request for submitting only Nobuto filter paper strips for plague analysis. This modification excluded certain small rodents that could not produce enough blood to saturate the Nobuto filter paper and provide a hantavirus sample without killing it. Figure 14 details the type and numbers of animals tested for plague. Figure 15 is a year-by-year comparison of plague test submissions since 2001. Additionally, 31 fleas were combed from rodents, of which zero tested positive for plague (Figure 16). Map 11 shows the spatial distribution of plague sample collections in Clark County. No human cases of plague infection have been reported to SNHD.

**Figure 14:** Plague Specimen Distribution

| Species | Name | # Sampled for Plague | Plague Positive Results | # Animals With Fleas | Fleas Positive Results |
|---|---|---|---|---|---|
| Peromyscus boylii | Brush Mouse | 2 | 0 | 4 | 0 |
| Neotoma albigula | White-throated Wood Rat | 1 | 0 | 1 | 0 |
| Rattus rattus | Roof Rat | 12 | 0 | 0 | 0 |
| Dipodomys merriami | Merriam's Kangaroo Rat | 2 | 0 | 0 | 0 |
| Procyon lotor | Raccoon | 1 | 0 | 0 | 0 |
| Neotoma lepida | Desert Wood Rat | 7 | 0 | 8 | 0 |
| Felis felis | Domestic Cat | 3 | 0 | 0 | 0 |
| Vulpes vulpes | Red Fox | 1 | 0 | 0 | 0 |
| Eutamias panamintinus | Panamint Chipmunk | 2 | 0 | 2 | 0 |
| **TOTAL** | | **31** | **0** | **15** | **0** |

**Figure 15:** 2001-2007 Plague Sample Distribution

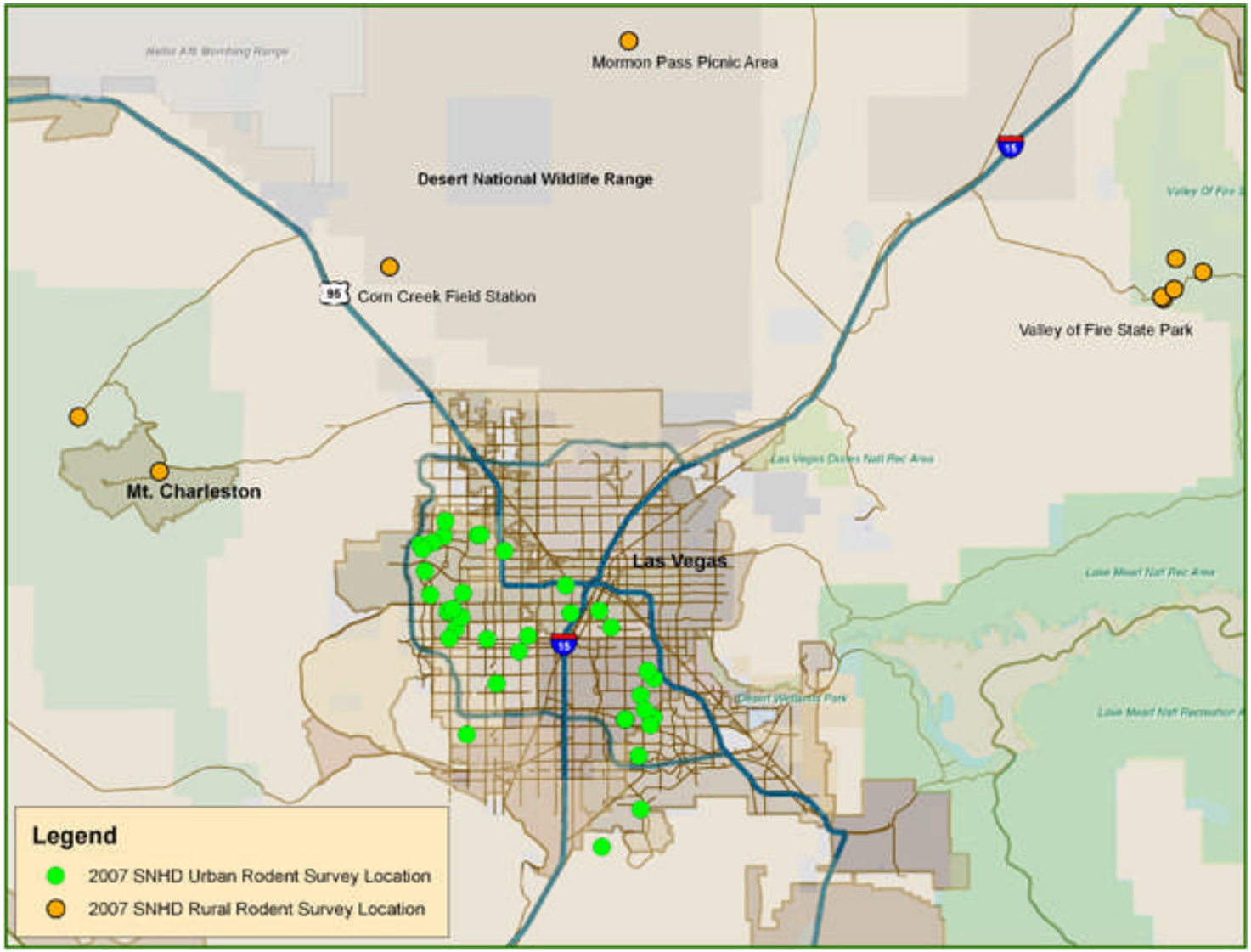
| Year | Samples | # Positive |
|---|---|---|
| 2001 | 116 | 12 |
| 2002 | 25 | 0 |
| 2003 | 84 | 7 |
| 2004 | 84 | 3 |
| 2005 | 128 | 0 |
| 2006 | 459 | 3 |
| 2007 | 31 | 0 |
| **TOTAL** | **927** | **25(2.7%)** |

| Gray Fox | Raccoon | Feral Cat | Palmers Chipmunk |
|---|---|---|---|
| 5 | 4 | 2 | 1 |
| 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 |
| 2 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| **17** | **5** | **2** | **1** |

**Figure 16:** Flea Specimen Distribution

| Flea Species | # Sampled | # Positive |
|---|---|---|
| Orchopeas sexdentatus | 21 | 0 |
| Aetheca wagneri | 5 | 0 |
| Orchopeas leucopus | 2 | 0 |
| Peromyscopsylla hesperomys | 1 | 0 |
| Eumolpianus eumolpi | 1 | 0 |
| Oropsylla montana | 1 | 0 |
| **TOTAL** | **31** | **0** |

**Map 11:** Plague and Hantavirus Sample Locations – Urban and Rural Clark County



## RACCOON ROUNDWORM

Baylisascaris procyonis is a roundworm that lives in the intestines of raccoons. The worm does not harm the raccoon, but can cause serious illness in humans. The adult worms shed millions of microscopic eggs that are passed in the raccoon's feces. These eggs are resistant to most environmental conditions, and with adequate water, can survive from months to years. People become infected with Baylisascaris when they ingest eggs which are in soil, water, or on objects that have been contaminated with raccoon feces. When humans ingest these eggs, they can hatch into larvae in the person's intestine and migrate throughout the body, affecting the organs and muscles.

In 2004, SNHD and USDA Wildlife Services collaborated to collect and submit raccoon fecal samples to the ADL for Baylicascaris analysis. Since 2004, Baylisascaris as well as other roundworm species including Capillaria sp., Trichursis sp., and Toxocara sp. have been identified in raccoon fecal matter collected in Clark County. The total sample size of raccoons tested for roundworm declined in 2007 due to fewer samples being collected and submitted by partnering agencies.

In 2007, SNHD submitted two raccoon fecal samples to the ADL for Baylisascaris testing, of which one sample was positive for Trichursis. Figure 17 is a year-by-year comparison of raccoon roundworm submissions since 2004. No human cases of Baylisascaris infection have been reported to SNHD.

**Figure 17:** 2004-2007 Raccoon Parasite Distribution

| Year | # Raccoon Fecals Sampled | # Roundworm Present | # Baylisiscaris **Present** | # Capillaria **Present** | # Trichursis **Present** | # Toxocara canis **Present** |
|---|---|---|---|---|---|---|
| **2004** | 16 | 3 | 2 | 1 | 0 | 0 |
| **2005** | 17 | 5 | 2 | 0 | 2 | 1 |
| **2006** | 23 | 4 | 2 | 2 | 0 | 0 |
| **2007** | 2 | 1 | 0 | 0 | 1 | 0 |
| **Total** | **58** | **13(22%)** | **6** | **3** | **3** | **1** |

## EDUCATIONAL OUTREACH

Public health education outreach is a crucial component of the zoonotic infectious disease surveillance and control program. Outreach was accomplished throughout the year, using formal and informal methods including media interviews, community group presentations, health fair booths, school presentations and citizen contact through routine field activities. A timeline of Vector Control's educational outreach and SNHD Public Information activities are listed in Appendices A and B respectively.

## CONCLUSION

Zoonotic diseases such as rabies, plague, hantavirus, West Nile virus, Bartonella and raccoon roundworm are present in many of Southern Nevada's wild animal populations. The Environmental Health Division's Vector Control office continues to develop and expand the methods and scope of its Zoonotic Infectious Disease program, identifying areas of endemic zoonoses and providing up-to-date public health information to the visitors and residents of Southern Nevada.

## APPENDIX A:
## Timeline of Educational Outreach and Staff Training

**January**
- "Public Health Pests" presentation for the University of Nevada Pesticide Applicator Certification School

**April**
- "West Nile virus Surveillance and Control" presentation for the Southern Nevada Health District board of Health
- Career Day Mosquito Control Presentations, various Clark County elementary schools

**May**
- Annual Nevada GIS Conference; Lake Tahoe, NV
- ArcGIS training; Las Vegas, NV

**August**
- "Mosquito and Rodent Borne Disease Surveillance and Prevention" presentation for the University of Nevada.

**September**
- "West Nile virus surveillance and Mosquito Control" presentation at the Bunkerville Town Board meeting.
- 2007 Society of Vector Ecology conference; Springfield, Illinois

**October**
- 60th Annual Utah Mosquito Abatement Association conference; Park City, Utah

**November**
- "Prevention and Control of Mosquito and Rodent Borne Diseases in Clark County" presentation for the University of Nevada Master Gardeners

## APPENDIX B:
## Timeline of Public Information Activities

The Southern Nevada Health District implemented a variety of risk communication and informational strategies in order to educate the public about illnesses related to West Nile virus and prevention measures. These strategies were implemented using a multi-media approach consisting of print and broadcast news stories, paid advertisements, a special section of the health district website and in an episode of the health district's television show, HD-tv.

**New Releases**

Southern Nevada Health District:

- "Plan ahead for West Nile virus season," March 14, 2007
- "Plan ahead for West Nile virus season," Sandstone-May 2007
- "Mosquitoes in Southern Nevada?" Las Vegas Review-Journal Summer Guide 2007
- "Southern Nevada Health District reports season's first West Nile virus case," July 13, 2007
- "Southern Nevada Health District surveillance detects West Nile virus in mosquitoes, prevention is urged," August 8, 2007
- "Public Health Update – West Nile Virus," August 28, 2007
- "Public Health Update – West Nile Virus," August 29, 2007

Nevada State Health Division:

- "Mosquitoes and West Nile virus: prevention reminders," May 16, 2007
- "First positive West Nile virus sample of 2007 season," June 1, 2007
- "Nevada State Health Division announces five additional human cases of West Nile virus in Nevada," September 18, 2007

**Broadcast Media Coverage**

KVBC-TV 3, NBC affiliate; KVVU-TV 5 FOX affiliate; KLAS-TV 8 CBS affiliate; KTNV-TV 13 ABC affiliate; KINC-TV 15 UNIVISION affiliate; KBLR-TV 39 Telemundo affiliate; KHDF-TV 63 Azteca affiliate

- Channel 15 KINC-TV Wednesday, March 14, 2007:
  Jorge Viote, Southern Nevada Health District, comments on West Nile virus, 6pm report.

- Channel 8 KLAS-TV Thursday, March 15, 2007:
  West Nile virus season approaching – prevention tips offered by the Southern Nevada Health District, 9pm v/o.

- 720 KDWN-AM Monday, April 9. 2007
  Preparing for West Nile virus season. Interview with Vivek Raman.

- Channel 13 KTNV-TV Tuesday, April 10, 2007:
  West Nile virus season beginning in Nevada, 4:30pm v/o; 5pm v/o.

- Channel 8 KLAS-TV Wednesday, May 9, 2007:
  Southern Nevada Health District officials have begun their annual surveillance for West Nile virus – Mark Berghtoldt explains, 4pm report – housing slump and resulting unattended swimming pools creating a risk this season.

- Channel 13 KTNV-TV Wednesday, May 16, 2007:
  5-7pm live reports from a vacant house where the pool is a breeding ground for mosquitoes – Southern Nevada Health District comments on West Nile virus threat; 11pm v/o.

- Channel 15 KINC-TV Thursday, May 17, 2007:
  Mention of West Nile virus, 6pm v/o.

- Channel 8 KLAS-TV Friday, June 1, 2007:
  4:30pm report on efforts by the Southern Nevada Health District to eliminate mosquito-breeding areas in the valley, to lessen the dangers of West Nile virus – Mark Berghtoldt comments; 11pm report.

- Channel 5 KVVU-TV Friday, June 8, 2007:
  1st case of West Nile virus reported in NV… found in Churchill County last month, 7:30 am v/o.

- Channel 8 KLAS-TV Friday, June 8, 2007:
  First case of West Nile virus for the season in a sick bird confirmed in Churchill County, 6pm v/o.

- Channel 3 KVBC-TV Friday, June 8, 2007:
  1st case of West Nile virus reported in NV this season, found in sick bird in Churchill County last month, 6am v/o.

- Channel 63 KHDF-TV Monday, June 18, 2007:
  6pm report on West Nile virus – Southern Nevada Health District's Mark Bergtholdt comments.

- Channel 8 KLAS-TV Wednesday, June 20, 2007:
  Southern Nevada Health District is reporting a large increase in complaints about un-maintained swimming pools – 6pm live report from Durango & 95 – Mark Bergtholdt, Southern Nevada Health District, explains.

- Channel 63 KHDF-TV Thursday, June 21, 2007
  Southern Nevada Health District monitors green pools, report on West Nile virus prevention. Interview with Mark Bergtholdt.

- Channel 2/KLBC-TV Laughlin, June 29, 2007
  West Nile virus prevention tips. Interview with the health district's Patricia Hayde.

- 720 KDWN-AM Friday, July 13, 2007
  Southern Nevada Health District confirmed first human case of West Nile virus in Clark County. Interview with Brian Labus.

- Channel 3 KVBC-TV Friday, July 13, 2007:
  Southern Nevada Health District has confirmed the first human case of West Nile virus in Clark County, 12pm v/o; 4pm v/o; 5pm report; 6pm v/o; 11pm report.

- Channel 8 KLAS-TV Friday, July 13, 2007:
  Southern Nevada Health District has confirmed the first human case of West Nile virus in Clark County, 4pm v/o; 4:30 live report; 5pm v/o; 6pm report; 11pm report.

- Channel 13 KTNV-TV Friday, July 13, 2007:
  Southern Nevada Health District has confirmed the first human case of West Nile virus in Clark County, 11am v/o; 4pm v/o; 5pm v/o; 6pm v/o; 11pm v/o.

- Channel 5 KVVU-TV Friday, July 13, 2007:
  Southern Nevada Health District reporting the first case of West Nile virus in Clark County this season, 10pm report.

- Channel 15 KINC-TV Friday, July 13, 2007:
  West Nile virus confirmed in Clark County, 6pm v/o.

- Channel 63 KHDF-TV Friday, July 13, 2007:
  West Nile virus confirmed in Clark County, 6pm v/o.

- Channel 3 KVBC-TV Saturday, July 14, 2007:
  6pm report looks at ways to protect you from West Nile virus.

- Channel 3 KVBC-TV Sunday, July 15, 2007:
  5pm report on the dangers of un-maintained pools, when it comes to West Nile virus; 6pm report.

- Channel 3 KVBC-TV Friday, July 27, 2007:
  Federal health officials report the US could be on pace to have the worst West Nile virus season in years; 4pm v/o.

- Channel 39 KBLR-TV Tuesday, July 31, 2007
  Protection tips against West Nile virus.

- Channel 8 KLAS-TV Wednesday, August 8, 2007:
  Southern Nevada Health District reports mosquitoes with West Nile virus were found recently in the southeast part of the valley – Mark Bergtholdt, Southern Nevada Health District comments – 4:30pm report.

- Channel 13 KTNV-TV Wednesday, August 8, 2007:
  Southern Nevada Health District reports mosquitoes with West Nile virus were found recently in the southeast part of the valley, urge people to use bug spray & get rid of standing water, 11am v/o; 4pm v/o; Southern Nevada Health District environmental health supervisor Mark Bergtholdt speaks out about ways to help protect against mosquitoes 6pm report.

- Channel 3 KVBC-TV Wednesday, August 8, 2007:
  Southern Nevada Health District reports mosquitoes with West Nile virus were found recently in the southeast part of the valley, urging people to use bug spray & get rid of standing water, 12pm v/o; 6pm v/o.

- 720 KDWN-AM Wednesday, August 8, 2007:
  Southern Nevada Health District reports mosquitoes with West Nile virus were found. Interview with Mark Bergtholdt.

- Channel 3 KVBC-TV Thursday, August 9, 2007:
  West Nile infected mosquitoes found in the 89122 zip code, 4pm v/o; 6pm v/o.

- Channel 63 KHDF-TV Tuesday, August 14, 2007:
  Mosquitoes carrying West Nile virus found in Clark County, 6pm v/o.

- Channel 3 KVBC-TV Saturday, August 25, 2007:
  2nd case of West Nile virus confirmed here in CC, Southern Nevada Health District says a woman under the age of 50 was diagnosed with the more serious form of that virus, 11pm v/o.

- Channel 8 KLAS-TV Saturday, August 25, 2007:
  A woman in CC has been diagnosed with the West Nile virus, 11pm v/o.

- Channel 13 KTNV-TV Saturday, August 25, 2007: (6pm news pre-empted)
  The 2nd case of West Nile in CC has been confirmed, 8am v/o; 11pm v/o.

- Channel 5 KVVU-TV Thursday, September 20, 2007:
  Five more cases of West Nile virus have been confirmed in Nevada, bringing the total for the year so far to 8, 5pm v/o.

- Channel 15 KINC-TV Friday, September 21, 2007:
  West Nile cases rising in Nevada, 6pm v/o.

- Channel 63 KHDF-TV Friday, September 21, 2007:
  More West Nile virus cases reported in LV, 6pm v/o.

- Channel 13 KTNV-TV Thursday, September 20, 2007:
  Five more cases of West Nile virus have been confirmed in Nevada, bringing the total for the year so far to 8, 4pm v/o.

**Print Media Coverage**

- Thursday, April 5-11, 2007:
  "Officials warn of virus," Henderson Home News

- Saturday, July 14, 2007:
  "Clark County man first case of West Nile in Nevada this year," Las Vegas Review-Journal

- Sunday, July 15, 2007:
  "County has first West Nile case," The Week in Review, Las Vegas Review-Journal

- Monday, July 16, 2007:
  "Vacant pools leave neighbors swimming in mosquitoes, USA Today

- Thursday, July 19, 2007:
  "Mosquitoes in Southern Nevada?" Guide to Las Vegas, Las Vegas Review-Journal

- Thursday, July 26-August 1, 2007:
  "Health officials on mosquito watch," The News

- Friday, July 27, 2007:
  "Cases of West Nile worry health officials," Las Vegas Review-Journal

- Thursday, August 9, 2007:
  "West Nile virus found in mosquitoes southeast of Las Vegas," Associated Press/State Online Nevada

- Thursday, August 9, 2007:
  "Mosquito positive for West Nile virus," Las Vegas Review-Journal

- Thursday, August 16-22, 2007:
  "West Nile-infected mosquitoes reported," Henderson Home News

- Friday, August 17-23, 2007:
  "Mosquitoes with West Nile virus found," Summerlin SW News
  "Mosquitoes with West Nile virus found," Summerlin NE News

- Wednesday, November 21, 2007:
  "Foreclosed homes pools a health hazard," Associated Press

**Collateral Materials**
The public information office updated the mosquito control information brochure. In addition, informational brochures about West Nile virus are available in both English and Spanish.

**Website**
The West Nile virus page of the health district website was updated to include several additional informational and educational links. In addition, a surveillance map of green pool complaints from 2006 was added to the mosquito control page.

**HD-TV**
The ninth episode of Health District Television (HD-tv), which aired for approximately six weeks in May and into June 2007, included a segment called "Fight the Bite." The story detailed the health district's surveillance and trapping activities and basic information for the general public about West Nile virus. Clips of the episode are currently available on the health district website.

**Paid Advertisements**
A print advertising campaign included a series of eight advertisements about mosquito control/protection. The ads were published in Asian Journal, Desert Valley Times (Pahrump, Nev.), El Tiempo Libre, El Mundo, Las Vegas Sentinel Voice, Las Vegas Review Journal, Laughlin Nevada Times and Moapa Valley Progress. The ads ran between May 31 and June 29.