

2009

Zoonotic Infectious Disease: Surveillance & Control



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Introduction

The Southern Nevada Health District's 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), rabies, plague, hantavirus and rabies. Mosquito Control, a critical function of WNV, SLE, and WEE prevention, occurred concurrently with mosquito disease surveillance activities. This report details the health district's zoonotic disease surveillance, control and public education activities in Southern Nevada throughout 2009.

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 Sept. 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 (WNV) 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.

2009 Human Cases

In 2009, 8 confirmed cases, 4 probable cases and 14 presumptively viremic donors (PVDs) were reported from Clark County. Of the 8 confirmed cases, three had West Nile fever and five cases developed West Nile meningoencephalitis, a more severe neuroinvasive form of the disease. Of the probable cases one had West Nile fever, two had West Nile meningoencephalitis, and one was designated West Nile other, meaning there was no documented fever to meet the clinical case definition. None of the 14 PVDs had clinical illness associated with their positive lab results.

Of the neuroinvasive cases, three were male and four were female. The average age among neuroinvasive cases was 63.8 years with a median age of 61 years. There were no fatalities associated with West Nile virus.

Ten of the confirmed and probable cases had no travel outside Clark County during the incubation period, one confirmed case had travel history outside of Clark County, and travel history could not be obtained for another confirmed case.

Mosquito Surveillance

Mosquito trapping and testing remains the cornerstone of the health district’s arbovirus surveillance program. In comparison to migratory bird or sentinel chicken flock sampling, mosquito surveillance provides an ‘up to date’ indicator of WNV vectors 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 and Lincoln counties. This breeding season is weather dependent and will vary slightly from year to year.

The portable Encephalitis Vector Surveillance (EVS) trap, designed to attract host seeking female mosquitoes using carbon dioxide as the primary attractant, was used extensively throughout southern Nevada. Traps were 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 were frozen on dry ice and transported to the health district where they were 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 pooled, the mosquitoes were 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 2009, the health district and collaborating agencies set 586 EVS traps in Clark, Nye, Lincoln, and White Pine counties, submitting 18,255 mosquitoes to the ADL for WNV, SLE, and WEE analysis. Map 1 shows the spatial distribution of the trapping locations. Mosquito surveillance adjustments were made based on increased community generated mosquito breeding complaints. As shown in Table 1, although only 256 mosquitoes tested positive, WNV maintains a presence in the mosquito populations of Southern Nevada. Table 2 details the mosquito trapping and sample submissions by county.

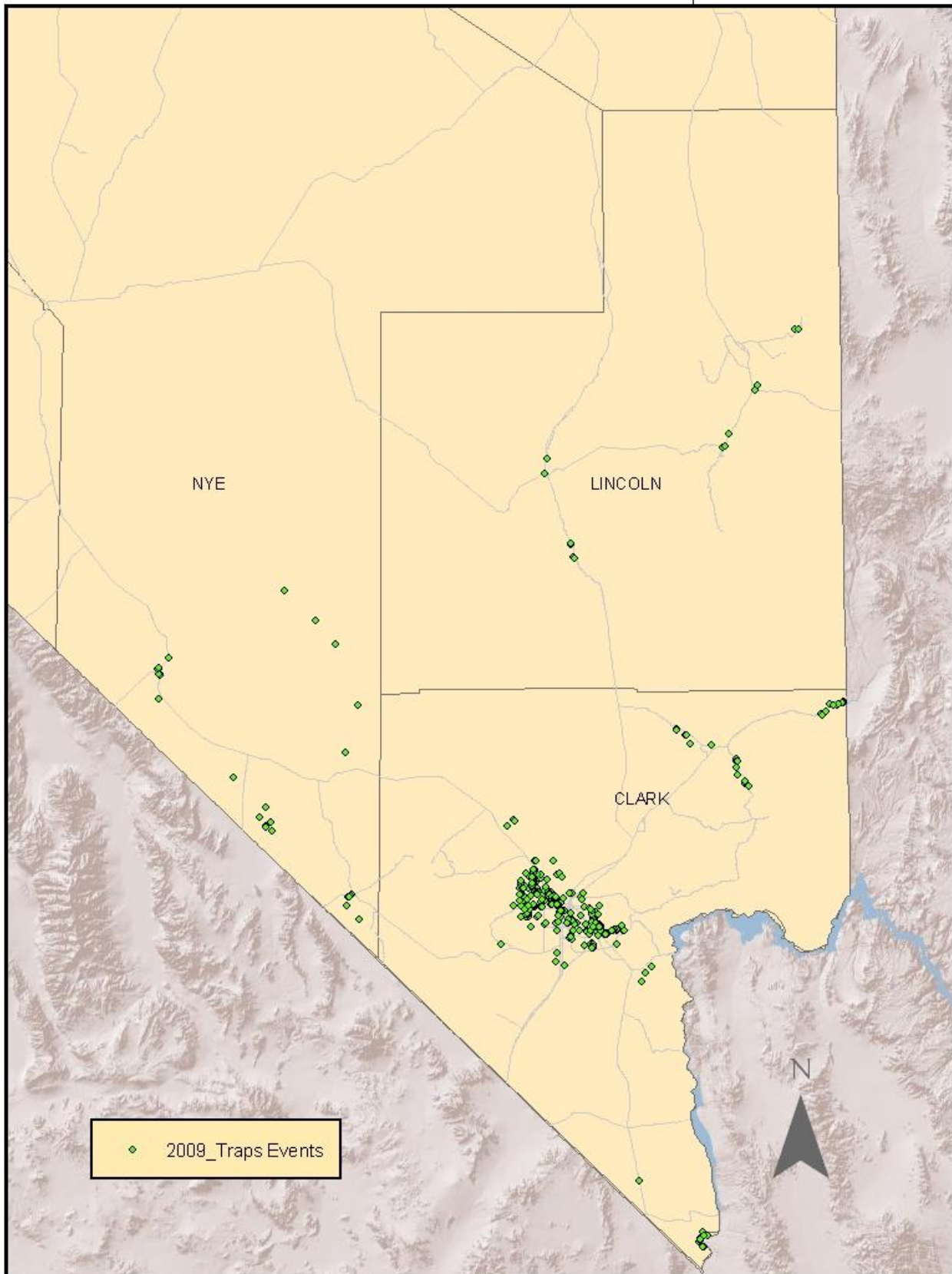
Table 1: 2004 - 2009 EVS Sample Submission Comparison

	2004	2005	2006	2007	2008	2009
EVS Traps Set	NA	561	871	468	321	586
Pools Submitted	154	1,256	1,269	1,096	709	1,137
Mosquitoes Tested	4,900	31,059	29,492	25,698	15,340	18,255
Arbovirus Positive Pools	25	59	23	10	16	14
Arbovirus Positive Mosquitoes	154	1,826	275	247	346	256

Table 2: 2009 Mosquito Submissions by County

County	# EVS Traps	# Pools	# Mosquitoes	# WNV Positive Pools	# WNV Positive Mosquitoes
Clark	505	814	11,337	14	256
Nye	47	202	5,058	0	0
Lincoln	34	121	1,860	0	0
Total	586	1,137	18,255	14	256

Map 1: Mosquito Trapping Sites in Southern Nevada



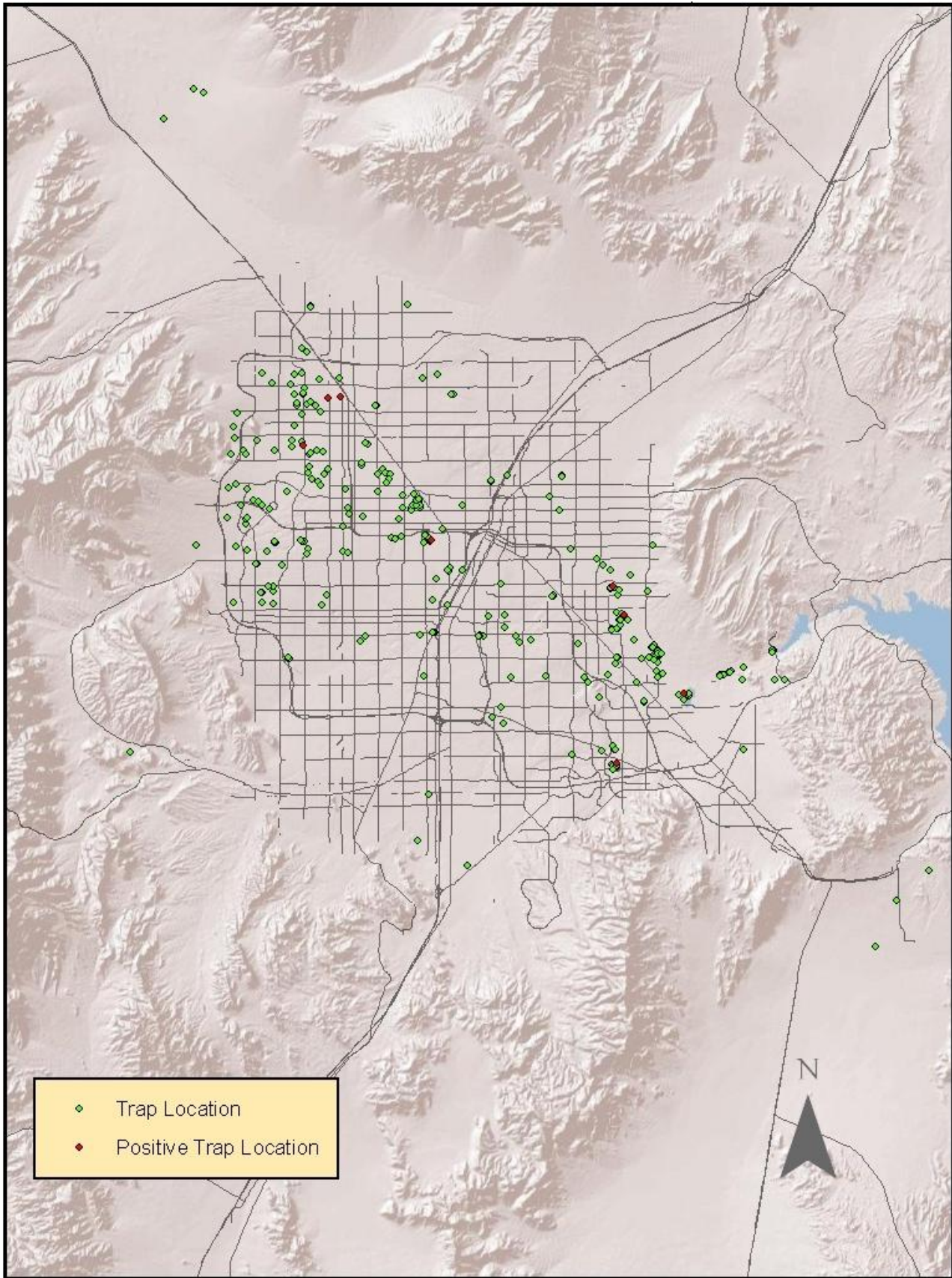
Clark County (Population 1,836,333):

In 2009, staff set 505 EVS traps in rural and urban Clark County. From these traps, 814 pools were submitted to the ADL, totaling 11,337 mosquitoes. Of the 814 pools submitted, 14 were WNV positive, totaling 256 mosquitoes. Table 3 details the type and number of mosquitoes tested from Clark County, including the WNV positive samples, and Map 2 shows the spatial distribution of the trapping locations.

Table 3: Clark County Mosquito Submissions

Mosquito Species	# of Mosquitoes	# of Pools	# Positive or Suspect Mosquitoes	# Positive or Suspect Pools
<i>Aedes vexans</i>	1,701	59	0	0
<i>Anopheles franciscanus</i>	532	52	0	0
<i>Anopheles freeborni</i>	565	74	0	0
<i>Culiseta incidens</i>	42	2	0	0
<i>Culiseta inornata</i>	809	87	0	0
<i>Culex erythrothorax</i>	1,197	62	0	0
<i>Culex quinquefasciatus</i>	2,228	223	0	0
<i>Culex stigmatosoma</i>	161	36	0	0
<i>Culex tarsalis</i>	4,025	215	256	14
<i>Psorophora signipennis</i>	77	5	0	0
TOTAL	11,337	814	256	14

Map 2: Mosquito Trapping Sites in Clark County



Nye County (Population 44,116):

In 2009, 47 EVS traps were set in Nye County, totaling 5,061 mosquitoes from 202 pools. None of the mosquitoes tested from Nye County were positive for WNV, WEE or SLE. Table 4 details the type and number of mosquitoes tested from Nye County and Map 1 shows the spatial distribution of the trapping locations.

Table 4: Nye County Mosquito Submissions

Mosquito Species	# of Mosquitoes	# of Pools	# Positive or Suspect Mosquitoes	# Positive or Suspect Pools
<i>Anopheles franciscanus</i>	95	22	0	0
<i>Anopheles freeborni</i>	146	19	0	0
<i>Culiseta incidens</i>	1	1	0	0
<i>Culiseta inornata</i>	466	24	0	0
<i>Culex erythrothorax</i>	4,103	100	0	0
<i>Culex quinquefasciatus</i>	2	1	0	0
<i>Culex tarsalis</i>	242	30	0	0
<i>Ochlerotatus dorsalis</i>	1	3	0	0
<i>Ochlerotatus melanimon</i>	3	1	0	0
TOTAL	5,061	202	0	0

Lincoln County (Population 4,759):

Health district staff set 34 EVS traps, collecting 1,860 mosquitoes from 121 pools. None of the mosquitoes tested from Lincoln County were positive for WNV, WEE or SLE. Table 6 details the type and number of mosquitoes tested from Lincoln County and Map 1 shows the spatial distribution of the EVS trap locations.

Table 6: Lincoln County Mosquito Submissions

Mosquito Species	# Mosquitoes	# of Pools	# Positive or Suspect Mosquitoes	# Positive or Suspect Pools
<i>Aedes vexans</i>	61	9	0	0
<i>Anopheles franciscanus</i>	29	6	0	0
<i>Anopheles freeborni</i>	154	17	0	0
<i>Culiseta inornata</i>	85	17	0	0
<i>Culex erythrothorax</i>	1,143	36	0	0
<i>Culex tarsalis</i>	340	29	0	0
<i>Culex quinquefasciatus</i>	1	1	0	0
<i>Ochlerotatus dorsalis</i>	47	6	0	0
TOTAL	1,860	121	0	0

Bird Surveillance

Staff continued submitting bird samples for WNV in 2009, although surveillance efforts were reduced due to increased community generated mosquito breeding complaints. In total, 16 bird samples, collected in part by USDA Wildlife Services and health district staff were submitted to the ADL; zero tested positive. Table 7 details the type and number of birds tested for WNV, SLE and WEE and Table 8 is a comparison of bird submissions from 2004 through 2009.

Table 7: 2009 Bird Sample Species Distribution

Common Name	Scientific Name	# of Samples	# Arbovirus Positive
Raven	<i>Corvus corax</i>	15	0
Sharp-shinned Hawk	<i>Accipiter striatus</i>	1	0
TOTAL		16	0

Table 8: 2004 - 2009 Bird Sample Submission Comparison

	2004	2005	2006	2007	2008	2009
Birds Tested	155	179	159	17	9	16
Arbovirus Positive Birds	8	6	1	0	0	0

Mosquito Control

The principal goal of the health district’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 appropriate breeding habitats. If neither of these options is feasible or effective, staff will treat the mosquito breeding areas with chemical or biological insecticides. The insecticides staff 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.

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

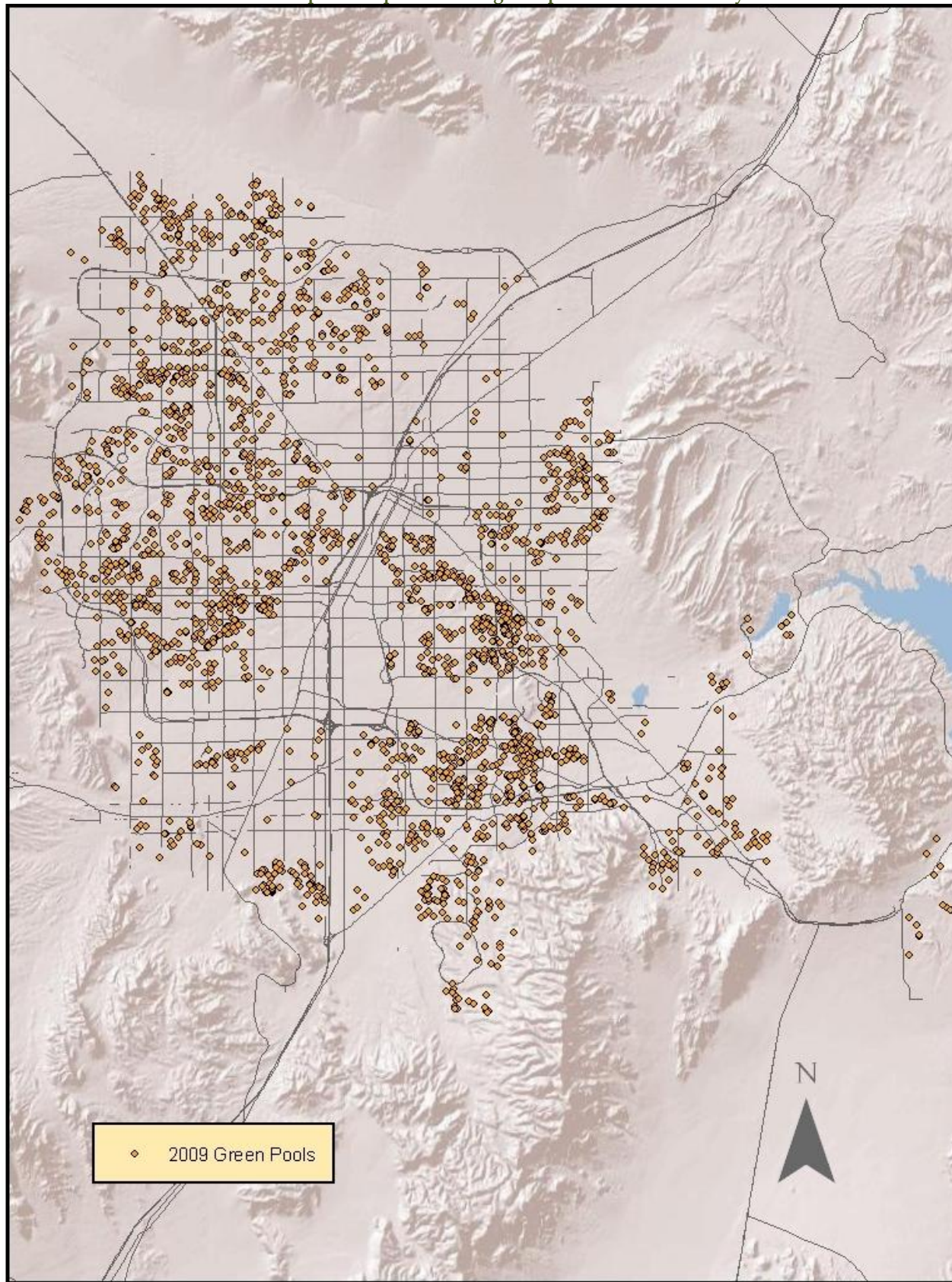
Staff routinely inspected and treated approximately 74 known mosquito breeding sources throughout the year. These areas include flood channels, roadside ditches, catch basins, pastures, irrigated fields, wastewater treatment ponds, and wetland ponds. Local public agencies and private property owners 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.

A major component of the health district’s urban mosquito control efforts are at abandoned residential swimming pools. In 2009 staff responded to 2,542 citizen complaints of stagnant swimming pools, standing water and general mosquito control concerns. Many of these responses required multiple site visits to verify the mosquito breeding source had been eliminated.

Table 9: 2005 - 2009 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
2008	43	62	185	334	542	463	400	391	205	112	79	38	2,854
2009	65	94	344	435	481	318	270	187	157	115	60	16	2,542

Map 3: Mosquito Breeding Complaints in Clark County



Rabies Surveillance

Rabies is a disease of the nervous system caused by a virus. It usually results from an exposure to an animal with rabies and is fatal 100 percent of the time to humans. In 2009, staff submitted 142 specimens from nine animal species to the ADL for rabies surveillance, with two bats testing positive. Animal samples were collected by Animal Control agencies in Clark County and submitted to the health district for recording and shipment to the ADL. Table 10 details the type of specimens submitted for rabies testing in 2009. Table 11 is a year-by-year comparison of rabies test submissions since 2001. Map 4 shows the geographical distribution of the positive rabies samples since 2002. No human cases of rabies infection have been reported to the health district.

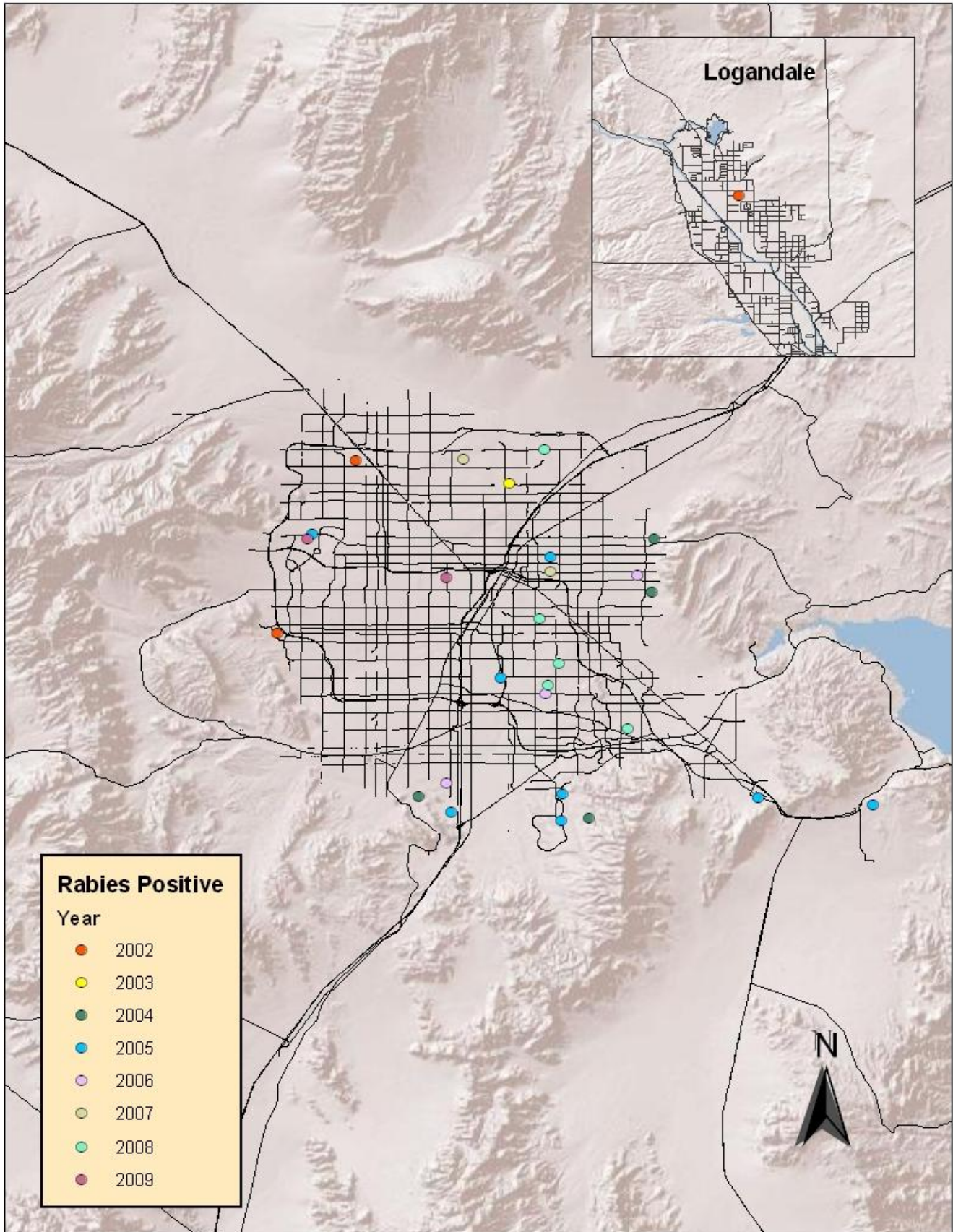
Table 10: 2009 Rabies Surveillance Submissions

Animal	# Sampled	# Positive
Bat	22	2
Badger	0	0
Bobcat	0	0
Cat	51	0
Chipmunk	1	0
Coyote	0	0
Dog	57	0
Ferret	0	0
Fox	1	0
Genet Cat	0	0
Opossum	1	0
Raccoon	4	0
Rat	1	0
Skunk	4	0
Squirrel	0	0
TOTAL	142	2

Table 11: 2001 - 2009 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
2008	145	26	6
2009	142	22	2
TOTAL	955	186	36 (19%)

Map 4: Positive Rabies Samples in Clark County



Hantavirus Surveillance

Hantavirus pulmonary syndrome (HPS) is a serious 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 2009, staff collected and submitted 29 blood samples to the University of New Mexico for hantavirus analysis. The animals tested were part of the urban rodent disease surveillance program and were not animals known to be carriers of hantavirus; all animals were negative. Table 12 details the type and numbers of animals tested and Table 13 is a year-by-year comparison of hantavirus test submissions since 2001. No human cases of hantavirus infection have been reported to the health district.

Table 12: Hantavirus Specimen Distribution

Species	Name	# Sampled for Hantavirus	# Hantavirus Positive
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel	3	0
<i>Neotoma lepida</i>	Desert Wood Rat	4	0
<i>Rattus rattus</i>	Roof rat	22	0
TOTAL		29	0

Table 13: 2001 - 2009 Hantavirus Test Submission Comparison

Year	Samples Tested	Total
2001	0	0
2002	0	0
2003	50	4
2004	0	0
2005	128	0
2006	386	12
2007	53	0
2008	98	3
2009	29	0
Total	744	16

Plague Surveillance

Plague is caused by a bacterium, *Yersinia pestis*, which is carried by fleas that feed on infected animals. In 2009, staff submitted 73 animal blood samples to the Centers for Disease Control and Prevention (CDC) for plague analysis. Samples were collected by USDA Wildlife Services personnel, Nevada Trappers Association and health district staff. No animals tested positive for plague in 2009. Table 14 details the type and numbers of animals tested for plague. Table 15 is a year-by-year comparison of plague test submissions since 2001. Additionally, 12 fleas were combed from rodents, of which zero tested positive. Table 16 details the type and numbers of fleas submitted for plague analysis. Map 5 shows the spatial distribution of plague sample collections in Clark County. No human cases of plague infection have been reported to the health district.

Table 14: Plague Specimen Distribution

Species	Name	# Sampled for Plague	Plague Positive Results
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel	3	0
<i>Canis latrans</i>	Coyote	1	0
<i>Felis rufus</i>	Bobcat	15	0
<i>Neotoma lepida</i>	Desert Wood Rat	3	0
<i>Urocyon cinereoargenteus</i>	Gray Fox	2	
<i>Vulpes macrotis</i>	Kit Fox	5	
<i>Rattus rattus</i>	Roof Rat	22	0
TOTAL		73	0

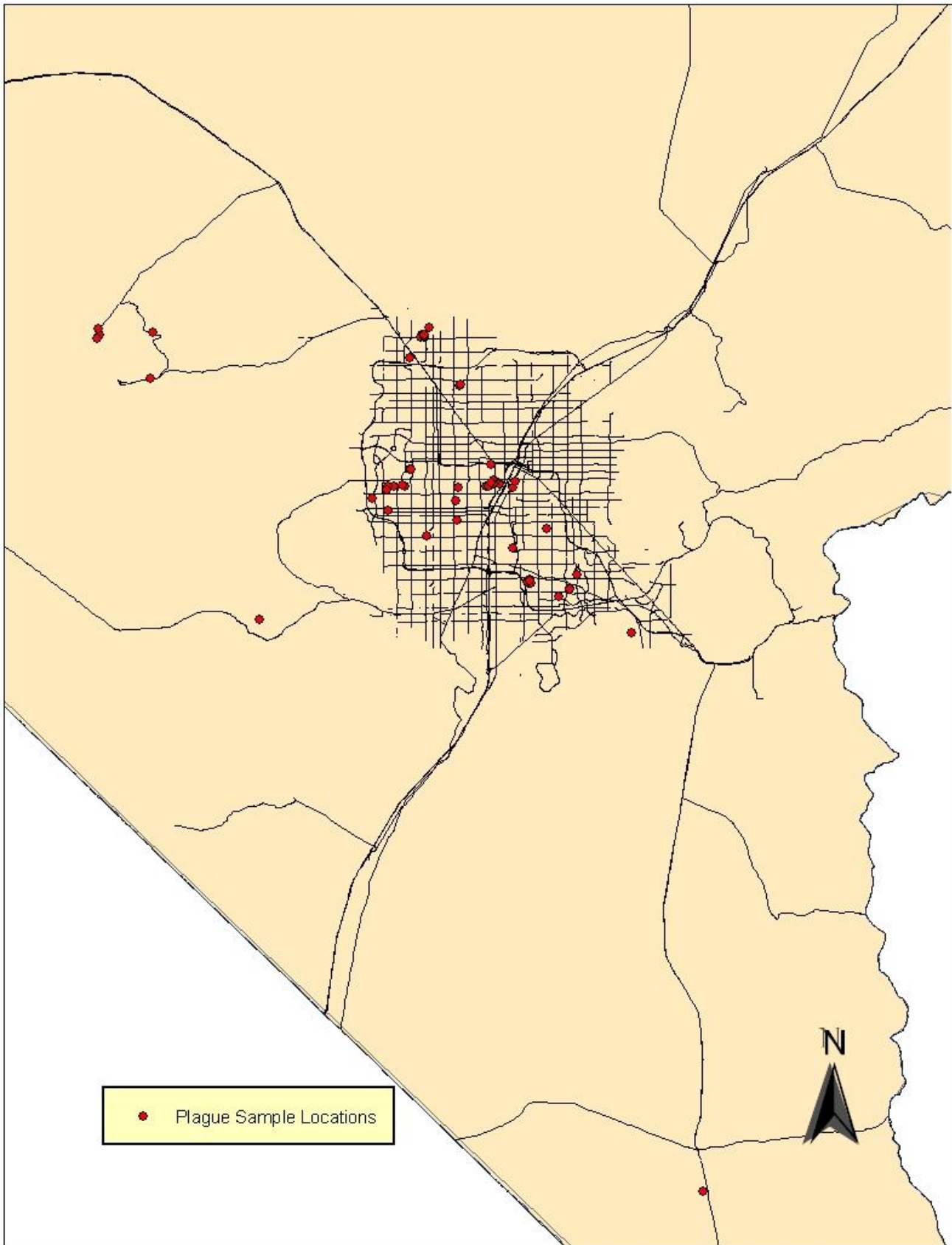
Table 15: 2001 - 2009 Plague Sample Distribution

Year	Samples	# Positive
2001	116	12
2002	25	0
2003	84	7
2004	84	3
2005	128	0
2006	459	3
2007	28	0
2008	104	1
2009	73	0
Total	1,077	26 (2.4%)

Table 16: 2009 Flea Species Distribution

Flea Species	# Sampled	# Positive
<i>Hoplopyllus anomelus</i>	1	0
<i>Thrassiss bacchi</i>	11	0
TOTAL	12	0

Map 5: Plague Sample Locations in Clark County



Conclusion

Public health education outreach is a crucial component of the zoonotic 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 the health district's public information activities are listed in Appendices A and B, respectively.

Appendix A

Time Line of Educational Outreach and Staff Training:

January

- Integrated Mosquito Management Webinar facilitated by the American Mosquito Control Association

February

- Centers for Disease Control and Prevention's West Nile Virus Conference in Savannah, GA.

March

- Mosquito Adulticide workshop presented by Clarke Mosquito Control.

April

- American Mosquito Control Association's annual conference held in New Orleans, LA.

June

- Provided a West Nile Virus prevention and bird bio-security presentation to the Southern Nevada Parrot Education, Rescue and Re-homing Society.

August

- Nevada Environmental Health Association annual conference.

September

- Provided disease prevention information at the Moapa Band of Paiutes Health Fair.

October

- Presented a Bird Bio-Security lecture, with emphasis on zoonotic disease prevention, to staff of the Gilcrease Animal Sanctuary.
- Presented a 'Mosquito and Rodent Borne Diseases' lecture at the Nevada Department of Agriculture's Restricted Use Pesticide training course.
- 62nd Annual Utah Mosquito Abatement Association meeting in Bryce Canyon, UT.

November

- Environmental Systems Research Institute's (ESRI) ArcGIS I and II courses.

Appendix B

Time Line of WNV Surveillance and Mosquito Control Media Releases

News Releases

- “Prepare for West Nile virus season,” March 17, 2009
- “Health District reports season’s first West Nile case, positive mosquito cluster/Prevention is urged,” July 1, 2009
- Public Health Update – West Nile Virus #1, July 10, 2009
- Public Health Update – West Nile Virus #2, July 2009
- Public Health Update – West Nile Virus #3, July 31, 2009
- Public Health Update – West Nile Virus #4, August 14, 2009
- Public Health Update – West Nile Virus #5, September 4, 2009

Broadcast Media Coverage

Unless indicated, broadcast outlets are Las Vegas-based network affiliates. KVBC-TV 3/NBC, KVVU-TV 5/FOX, KLAS-TV 8/CBS, KTNV-TV 13/ABC, KINC-TV 15/Univision, KBLR-TV 39/Telemundo, KAZA-TV 63/AZTECA. Following are broadcast news coverage or interviews:

- Channel 13 KTNV Monday, July 20, 2009
5pm report on one local’s struggle to get a green pool at a vacant home next door taken care of. Southern Nevada Health District has treated the pool with mosquito control chemicals & fish, comments from Southern Nevada Health District’s Vivek Raman, tagged with West Nile virus statistics; 6pm report; 11pm re-edit.
- Channel 13 KTNV Monday, July 6, 2009
Southern Nevada Health District using mosquito traps & minnows to fight West Nile virus in the Valley, 4pm report with comments from Vivek Raman; 6:30pm report.
- Channel 3 KVBC Wednesday, July 1, 2009
Southern Nevada Health District confirms season’s first probable case of West Nile virus in the valley, 4pm v/o; 5pm v/o; 6pm v/o.
- Channel 5 KVVU Wednesday, July 1, 2009
Southern Nevada Health District confirms season’s first probable case of West Nile virus in the valley, 5pm v/o; 10pm v/o; 11pm v/o.
- Channel 8 KLAS Wednesday, July 1, 2009
Southern Nevada Health District reports its first human case of West Nile virus this year, cluster of West Nile carrying mosquitoes identified in the 89119 zip code, 12pm v/o; 4pm report with comments by Vivek Raman, Southern Nevada Health District; 5pm report; 6pm re-edit.
- Channel 13 KTNV Wednesday, July 1, 2009
11am breaking news – Southern Nevada Health District reports its first human case of West Nile virus this year, announcer read; 4pm v/o - 60 yr old woman has a mild form of the virus,

mosquitoes in the 89119 zip code tested positive, tagged with symptoms; 5pm v/o; 6pm v/o; 11pm v/o.

- Channel 15 KINC Wednesday, July 1, 2009
Southern Nevada Health District confirms season's first probable case of West Nile virus in the valley, 6pm v/o.
- Channel 9 KBLR Wednesday, July 1, 2009
Southern Nevada Health District confirms season's first probable case of West Nile virus in the valley, 6pm report Jorge Viote comments.
- KDWN-AM 720 Wednesday, July 1, 2009
Southern Nevada Health District confirms season's first probable case of West Nile virus, interview with V. Raman regarding precautions.
- Channel 10 KLVX/Nevada Week in Review, June 16, 2009
Foreclosures & Swimming Pools.
- KNPR-FM/State of Nevada, Friday, May 29, 2009
Topic discussed included West Nile virus and green pools. V. Raman participated in this interview.
- Channel 13 KTNV Friday, March 20, 2009
Southern Nevada Health District's Vivek Raman comments on the start of mosquito season, abandoned pools, and the dangers of West Nile virus, & 10pm report.
- Channel 3 KVBC Wednesday, March 18, 2009
Reporter Jerry Brown requested a story on West Nile prevention, pool complaints and treatment, etc. Reporter interviewed R. Cole at an at an abandoned home.
- Channel 8 KLAS Tuesday, March 17, 2009
Southern Nevada Health District warning West Nile Virus season is fast approaching and cautions that now is the time to lessen breeding sources for mosquitoes – like unmaintained swimming pools, 6pm v/o.
- Channel 5 KVVU Tuesday, March 17, 2009
Season beginning for Southern Nevada Health District to begin monitoring for West Nile in the valley, 10pm v/o.

Print Media

- July 2009
"Summer is a good time to . . .," *Las Vegas Review-Journal/Summer Guide*
- Wednesday, July 1, 2009
"Clark County reports first West Nile fever case of the year," *Las Vegas Review-Journal*

- Sunday, May 3, 2009
“Green pools sprout from foreclosures,” *Los Angeles Times*
- Tuesday, April 21, 2009
“Precautions urged as West Nile season approaches,” *Las Vegas Review-Journal/Downtown VIEW*

Collateral Material

- April/May 2009: Designed WNV awareness ad for the April-May issue of *BLVDS Las Vegas* magazine.
- Designed mosquito/West Nile virus advertisements for publication in the following publications:
 - June 4, 18: *Henderson Home News*
 - June 7, 10, 14, 17: *Las Vegas Review-Journal*
 - June 10, 24: *Moapa Valley Progress*
 - June 11, 25: *Asian Journal*
 - June 12, 26: *El Tiempo*
 - June 12, 19: *El Mundo*
 - June 16, 19: *Desert Valley Times*
 - June 18: *Las Vegas Weekly*
 - June 24: *Laughlin Nevada Times*