

2010



Zoonotic Infectious Diseases: **SURVEILLANCE & CONTROL**

SOUTHERN NEVADA HEALTH DISTRICT
ENVIRONMENTAL HEALTH DIVISION | VECTOR CONTROL PROGRAM

Table of Contents

Introduction	
Mosquito Borne Diseases.....	4
Mosquito Surveillance.....	4
Clark County	7
Nye County.....	9
Lincoln County.....	9
Bird Surveillance	10
Mosquito Control.....	10
Rabies Surveillance	13
Hantavirus Surveillance.....	15
Plague Surveillance.....	16
Conclusion	18

Introduction

The Southern Nevada Health District's Vector Control office conducts routine surveillance and control of diseases in animals communicable to humans. 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 2010.

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 handheld Global Positioning Systems (GPS), entered real time data in the field, which was then transferred onto a desktop GIS system. This data has been plotted onto maps and supplements the numeric tables throughout this report.



A staff member hangs a Encephalitis Vector Surveillance (EVS) trap near a known mosquito breeding source in Mesquite, Nev.

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 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 infection is reported into two surveillance systems: NETSS (National Electronic Telecommunications System for Surveillance) and ArboNET. NETSS captures information on human cases of all nationally notifiable diseases. 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.

2010 Human Cases

In 2010, there were no confirmed human cases of WNV in Clark County.

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 at known 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 2010, the health district and collaborating agencies set 708 EVS traps in Clark, Nye and Lincoln Counties, submitting 18,520 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, no mosquitoes tested positive in 2010; however, it is believed that WNV still maintains a presence in Southern Nevada's mosquito population, due to the presence of WNV in neighboring counties. Table 2 details the mosquito trapping and sample submissions by county.

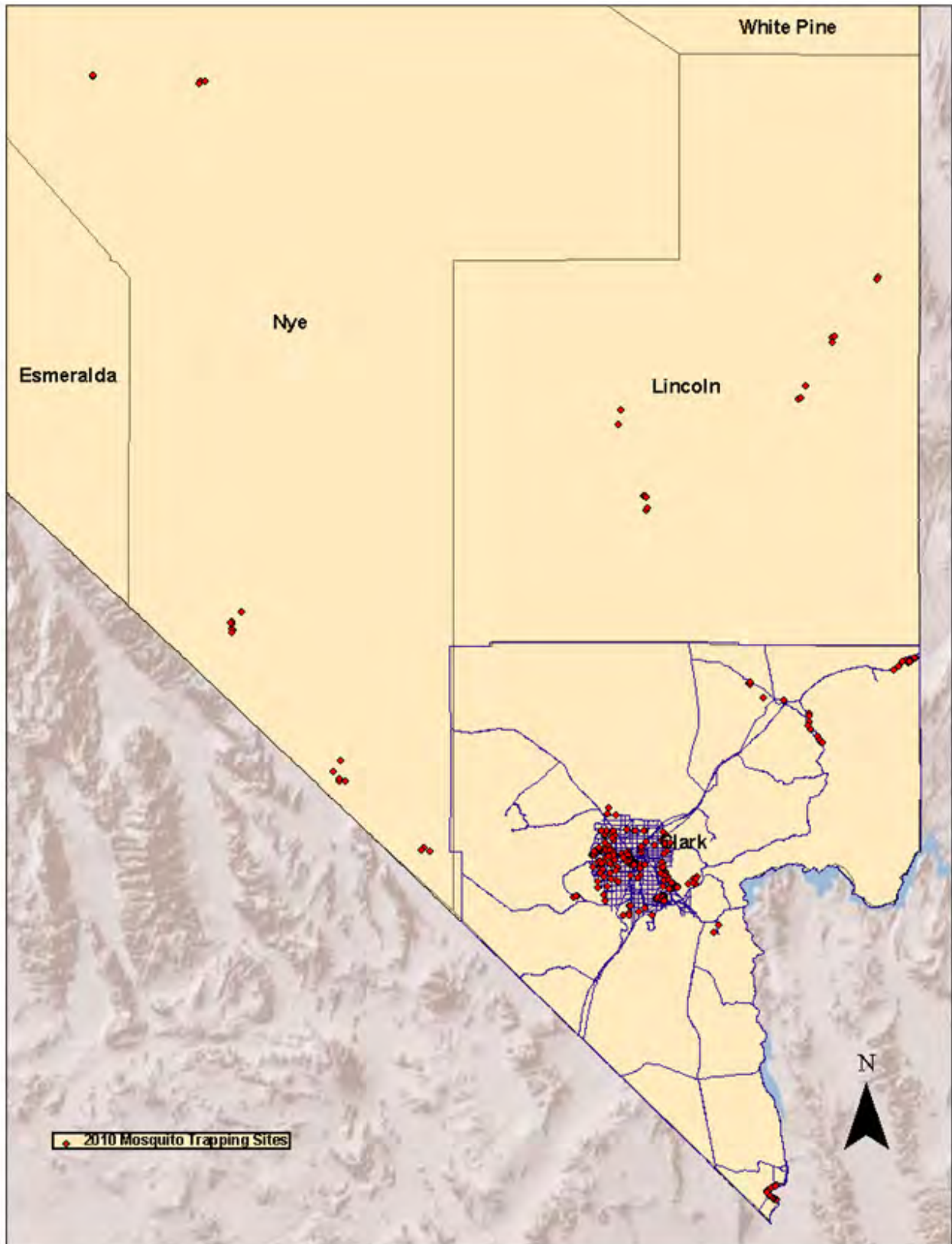
Table 1: 2004 – 2010 EVS Sample Submission Comparison

	2004	2005	2006	2007	2008	2009	2010
EVS Traps Set	NA	561	871	468	321	586	708
Pools Submitted	154	1,256	1,269	1,096	709	1,137	1,153
Mosquitoes Tested	4,900	31,059	29,492	25,698	15,340	18,255	18,520
Arbovirus Positive Pools	25	59	23	10	16	14	0
Arbovirus Positive Mosquitoes	154	1,826	275	247	346	256	0

Table 2: 2010 Mosquito Submissions by County

County	# EVS Traps	# Pools	# Mosquitoes	# WNV Positive Pools	# WNV Positive Mosquitoes
Clark	616	881	12,889	0	0
Nye	45	134	3,990	0	0
Lincoln	47	138	1,641	0	0
Total	708	1,153	18,520	0	0

Map 1: 2010 Mosquito Trapping Sites in Southern Nevada



Clark County (Population 1,836,333):

In 2010, staff set 616 EVS traps in rural and urban Clark County. From these traps, 881 pools were submitted to the ADL, totaling 12,889 mosquitoes. Of the 881 pools submitted, 0 were WNV positive. Table 3 details the type and number of mosquitoes tested from Clark County, and Map 2 shows the spatial distribution of the trapping locations.

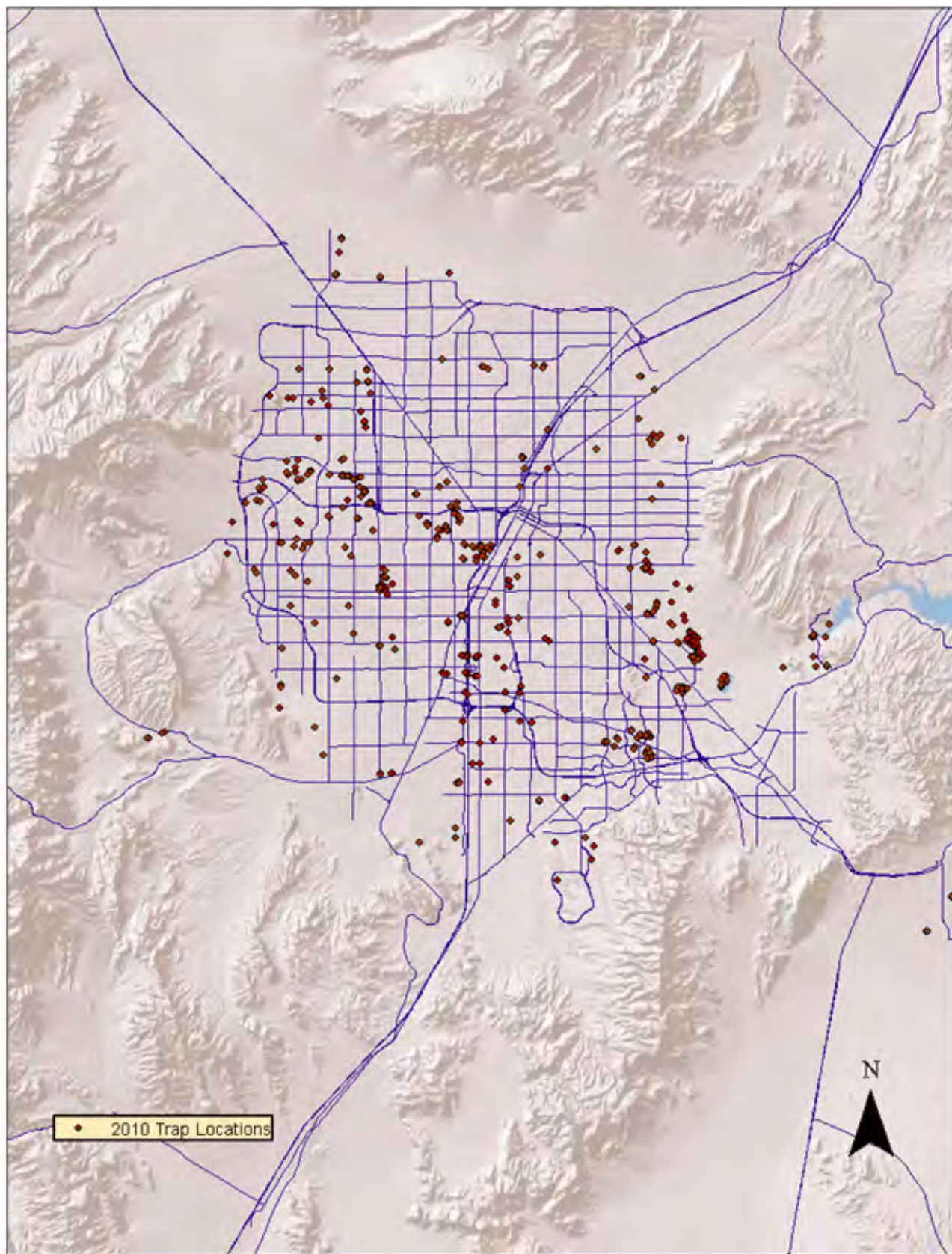
Table 3: Clark County Mosquito Submissions

Mosquito Species	# of Mosquitoes	# of Pools	# Positive or Suspect Mosquitoes	# Positive or Suspect Pools
<i>Aedes dorsalis</i>	5	1	0	0
<i>Aedes increpitus</i>	0	0	0	0
<i>Aedes vexans</i>	714	31	0	0
<i>Anopheles franciscanus</i>	674	79	0	0
<i>Anopheles freeborni</i>	832	78	0	0
<i>Culiseta incidens</i>	6	5	0	0
<i>Culiseta inornata</i>	211	67	0	0
<i>Culex erythrothorax</i>	3,384	120	0	0
<i>Culex quinquefasciatus</i>	687	166	0	0
<i>Culex stigmatosoma</i>	80	36	0	0
<i>Culex tarsalis</i>	6,235	300	0	0
<i>Psorophora signipennis</i>	77	5	0	0
Total	12,889	881	0	0



Staff members conduct larval surveillance at one of the many mosquito breeding sites in Clark County. Larval surveillance identifies what mosquito species are present and helps determine which chemicals will be used to treat the area.

Map 2: 2010 Mosquito Trapping Sites in Clark County, Nevada



Nye County (Population 44,116):

In 2010, 45 EVS traps set in Nye County collected 3,990 mosquitoes from 134 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>Aedes dorsalis</i>	0	0	0	0
<i>Aedes increpitus</i>	0	0	0	0
<i>Aedes vexans</i>	194	5	0	0
<i>Anopheles franciscanus</i>	30	9	0	0
<i>Anopheles freeborni</i>	32	11	0	0
<i>Culiseta incidens</i>	1	1	0	0
<i>Culiseta inornata</i>	23	8	0	0
<i>Culex erythrothorax</i>	3,495	79	0	0
<i>Culex quinquefasciatus</i>	0	0	0	0
<i>Culex stigmatosoma</i>	0	0	0	0
<i>Culex tarsalis</i>	224	22	0	0
<i>Psorophora signipennis</i>	0	0	0	0
Total	3,990	134	0	0

Lincoln County (Population 4,759):

Health district staff set 47 EVS traps, collecting 1,641 mosquitoes from 138 pools. None of the mosquitoes tested from Lincoln County were positive for WNV, WEE or SLE. Table 5 details the type and number of mosquitoes tested from Lincoln County, and Map 1 shows the spatial distribution of the EVS trap locations.

Table 5: Lincoln County Mosquito Submissions

Mosquito Species	# Mosquitoes	# of Pools	# Positive or Suspect Mosquitoes	# Positive or Suspect Pools
<i>Aedes dorsalis</i>	55	9	0	0
<i>Aedes increpitus</i>	1	1	0	0
<i>Aedes vexans</i>	22	7	0	0
<i>Anopheles franciscanus</i>	36	6	0	0
<i>Anopheles freeborni</i>	73	13	0	0
<i>Culiseta incidens</i>	1	1	0	0
<i>Culiseta inornata</i>	250	29	0	0
<i>Culex erythrothorax</i>	344	19	0	0
<i>Culex quinquefasciatus</i>	9	1	0	0
<i>Culex stigmatosoma</i>	0	0	0	0
<i>Culex tarsalis</i>	847	46	0	0
<i>Psorophora signipennis</i>	0	0	0	0
Total	1,641	138	0	0

Bird Surveillance

Staff continued submitting bird samples for WNV in 2010, although surveillance efforts were reduced due to increased community generated mosquito breeding complaints. In total, 3 bird samples, collected by health district staff were submitted to the ADL; zero tested positive. Table 6 details the type and number of birds tested for WNV, SLE and WEE, and Table 7 is a comparison of bird submissions from 2004 through 2010.

Table 6: 2010 Bird Sample Species Distribution

Common Name	Scientific Name	# of Samples	# Arbovirus Positive
Mallard	<i>Anas platyrhynchos</i>	1	0
Grackle	<i>Quiscalus quiscula</i>	1	0
House Finch	<i>Carpodacus mexicanus</i>	1	0
Total		3	0

Table 7: 2004-2010 Bird Sample Submission Comparison

	2004	2005	2006	2007	2008	2009	2010
Birds Tested	155	179	159	17	9	16	3
Arbovirus Positive Birds	8	6	1	0	0	0	0

Mosquito Control

The Vector Control office at The Southern Nevada Health District uses an Integrated Pest Management (IPM) approach to controlling mosquito populations. The program is based on larval surveillance and control. It is well documented that larval control is more effective than routine spraying for adult mosquitoes. The first step taken by Vector Control Staff is to pursue the possibility of environmental engineering to permanently eliminate the breeding source. If environmental management is not an option, other natural means are pursued. Staff routinely place mosquito fish in appropriate breeding habitats. This is an effective and low-cost means of mosquito control in the Las Vegas valley. When the environment is not suitable for fish, or is ineffective, 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, 10 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 85 to 100 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 staff member works to remove mosquito fish from a green pool that is being drained. When possible, fish were recovered prior to the draining of a pool and relocated to other green pools.

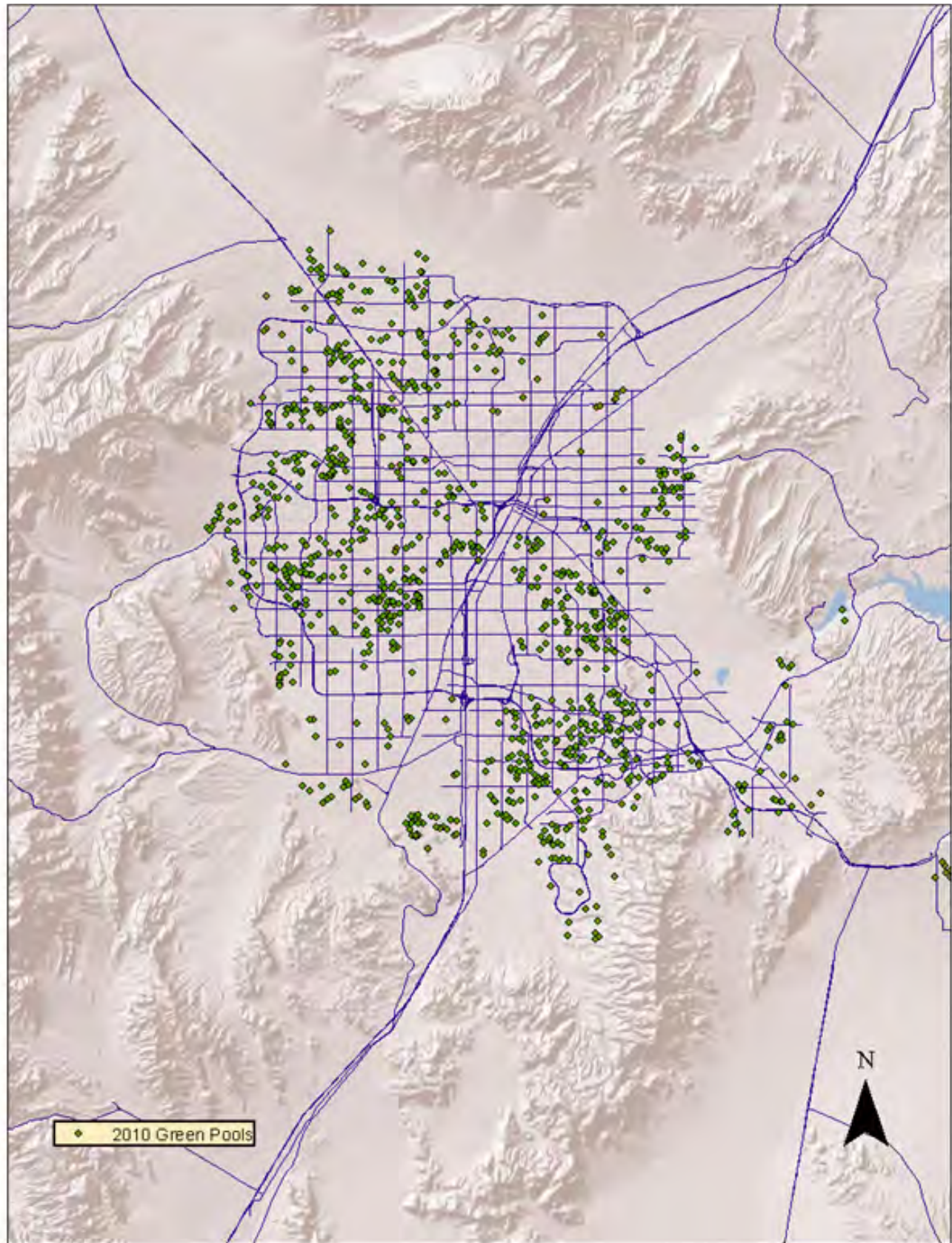
A large part of the health district's mosquito control efforts consisted of abandoned residential swimming pools. In 2010 staff responded to 1,109 citizen complaints of stagnant swimming pools, standing water and general mosquito control concerns. Many of these responses required multiple site visits to verify the mosquito breeding source had been eliminated.

Table 8: 2005 - 2010 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
2010	10	36	113	264	307	385	0*	0*	0*	0*	0*	0*	1,109

*The interlocal contract between Clark County and the Southern Nevada Health District, which funded mosquito abatement in Clark County, expired on July 1, 2010. After many months of discussions, it was determined the abatement of green pools would be handled by the Code Enforcement agency for each of the jurisdictions in Clark County. As of July 1, 2010, health district staff no longer received or responded to green pool complaints in Clark County. However, the health district continues to treat common areas and conducts mosquito surveillance throughout the county.

Map 3: 2010 Mosquito Breeding Complaints in Clark County, Nevada



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 2010, staff submitted 68 specimens from nine animal species to the ADL for rabies surveillance. 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 9 details the type of specimens submitted for rabies testing in 2010. Table 10 compares annual rabies test results of all animals sampled with the number of bats sampled 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. As of July 1, 2010, the health district was no longer the clearing house for Rabies shipments. Each Animal Control agency became responsible for its own specimen submission and now reports results to the health district via fax.

Table 9: 2010 Rabies Surveillance Submissions

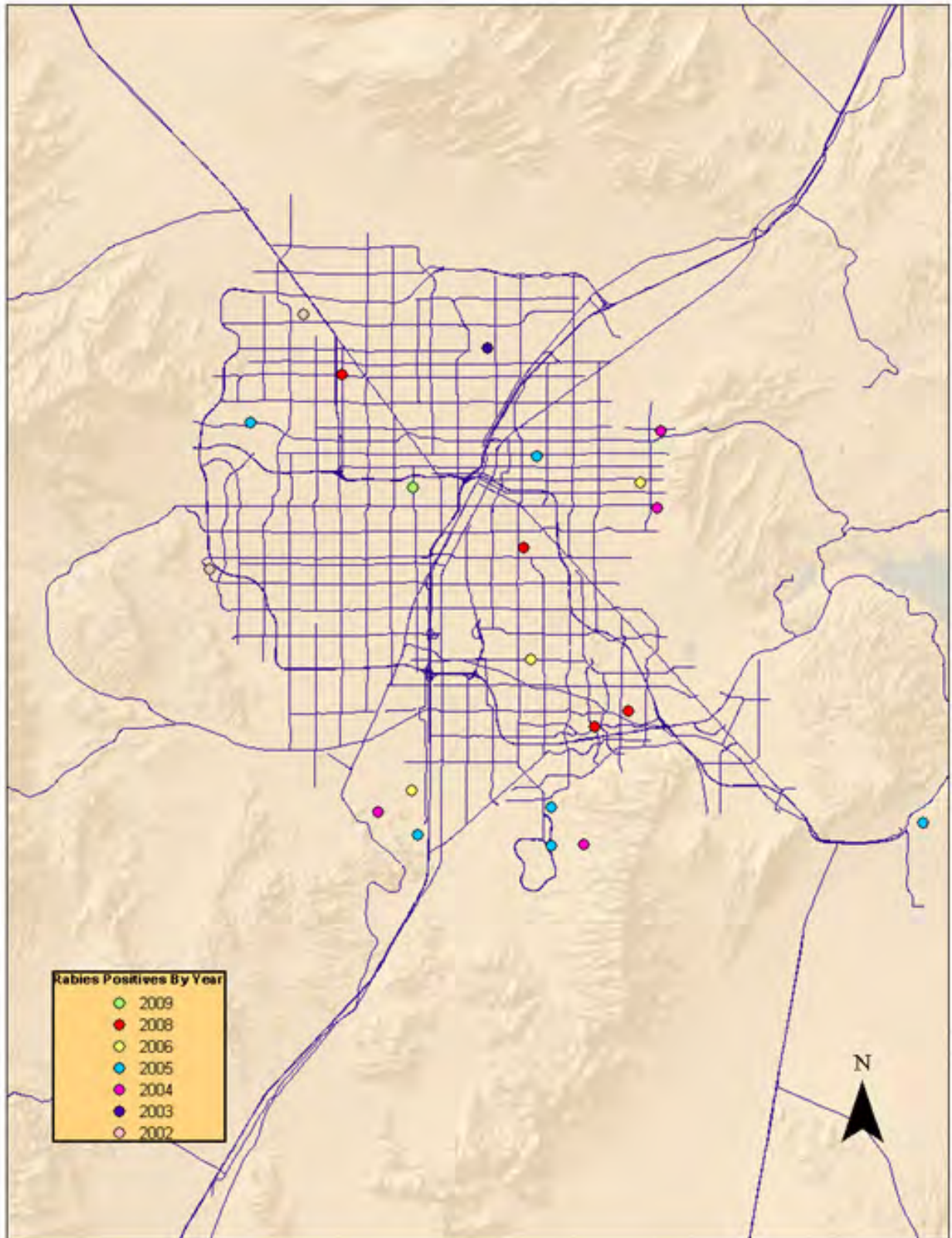
Animal	# Sampled	# Positive
Bat	6	1
Badger	0	0
Bobcat	0	0
Cat	17	0
Chipmunk	0	0
Coyote	0	0
Dog	37	0
Ferret	0	0
Fox	1	0
Genet Cat	0	0
Opossum	1	0
Raccoon	3	0
Rat	0	0
Skunk	0	0
Squirrel	1	0
Total	68	1

Table 10: 2001-2010 Rabies Test Submission Comparison of All Animals Sampled with the Number of Bats Sampled

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
2010	68	6	1
Total	1,023	192	37

*Total animals sampled include: bats, badgers, bobcats, cats, chipmunks, coyotes, dogs, ferrets, foxes, genet cats, opossums, raccoons, rats, skunks and squirrels, as referenced in Table 9.

Map 4: 2010 Positive Rabies Samples in Clark County, Nevada



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 2010, as part of the Urban and Rural Rodent Surveillance Program, staff collected and submitted 80 blood samples to the University of New Mexico for Hantavirus analysis. All animals tested negative.



Table 11 details the type and numbers of animals tested and Table 12 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 11: 2010 Hantavirus Specimen Distribution

Species	Name	# Sampled for Hantavirus	# Hantavirus Positive
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel	1	0
<i>Neotoma lepida</i>	Desert Wood Rat	11	0
<i>Rattus rattus</i>	Roof Rat	11	0
<i>Peromyscus eremicus</i>	Cactus Mouse	28	0
<i>Peromyscus boylei</i>	Brush Mouse	17	0
<i>Peromyscus maniculatus</i>	Deer Mouse	8	0
<i>Eutamias panamintinus</i>	Panamit Chipmunk	3	0
<i>Mus musculus</i>	House Mouse	1	0
Total		80	0

Table 12: 2001-2010 Hantavirus Test Submission Comparison

Year	Samples Tested	Total Positive
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
2010	80	0
Total	824	19

Plague Surveillance

Plague is caused by a bacterium, *Yersinia pestis*, which is carried by fleas that feed on infected animals. In 2010, 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 2010.



Table 13 details the type and numbers of animals tested for plague. Table 14 is a year-by-year comparison of plague test submissions since 2001. Additionally, 118 fleas were taken from rodents, of which zero tested positive. Table 15 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 13: 2010 Plague Specimen Distribution

Species	Name	# Sampled for Plague	Plague Positive Results
<i>Peromyscus eremicus</i>	Cactus Mouse	28	0
<i>Peromyscus boylei</i>	Brush Mouse	17	0
<i>Felis rufus</i>	Bobcat	2	0
<i>Neotoma lepida</i>	Desert Wood Rat	11	0
<i>Ammospermophilus leucurus</i>	White-tailed Antelope Squirrel	1	0
<i>Peromyscus maniculatus</i>	Deer Mouse	8	0
<i>Rattus rattus</i>	Roof Rat	11	0
<i>Eutamias panamintinus</i>	Panamint Chipmunk	3	0
<i>Mus musculus</i>	House Mouse	1	0
Total		82*	0

Table 14: 2001-2010 Plague Sample Distribution

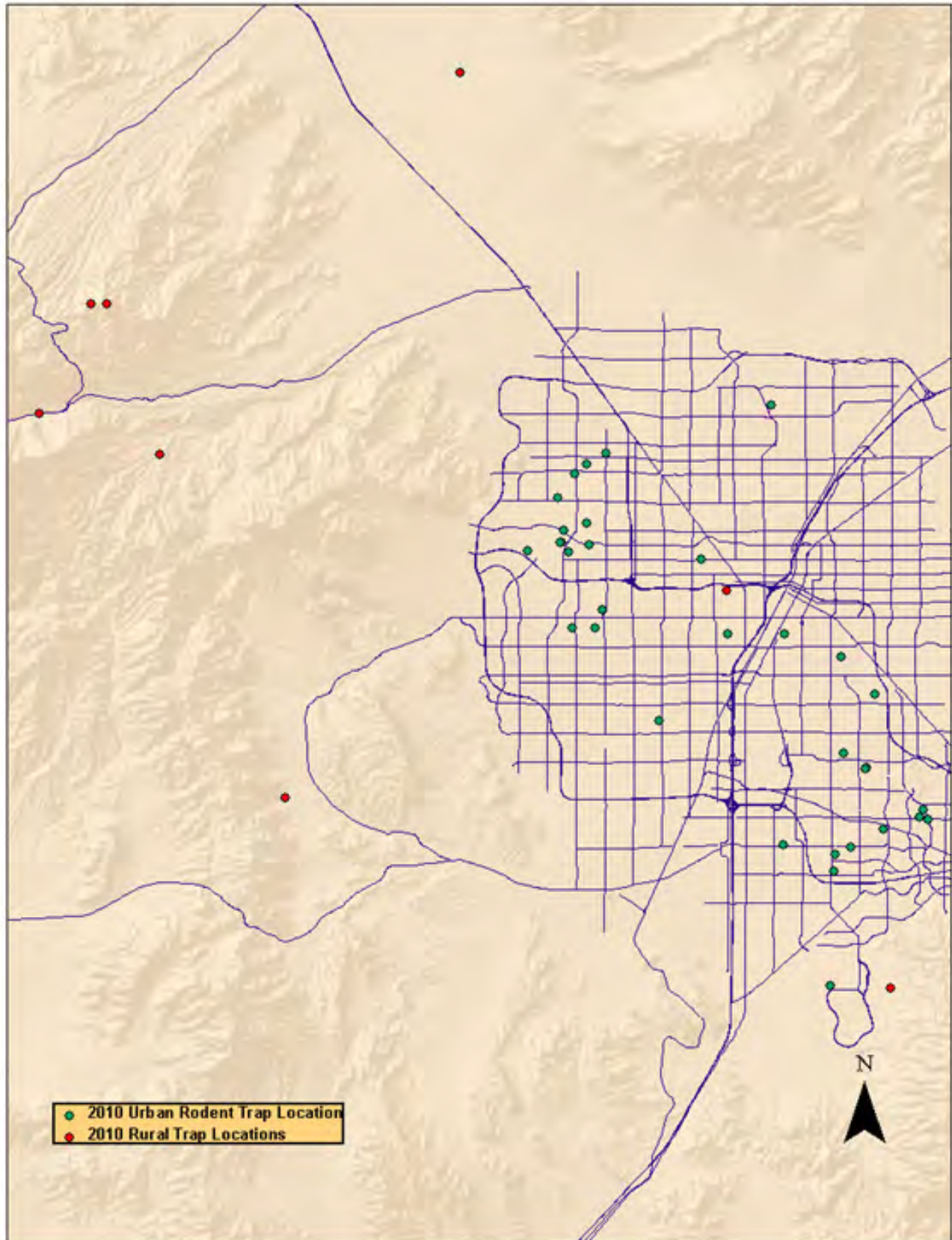
Year	Samples	# Positive
2001	116	12
2002	25	0
2003	84	7
2004	84	3
2005	128	0
2006	459	3
2007	28	0
2008	104	1
2009	73	0
2010	82	0
Total	1,159	26

Table 15: 2010 Flea Species Distribution

Flea Species	# Sampled	# Positive
<i>Orchopeas leucopus</i>	106	0
<i>Meringis dipodomys</i>	3	0
<i>Thrassis aridis</i>	1	0
<i>Orchopeas sexdentatus</i>	17	0
<i>Anomiopsyllus nudatus</i>	1	0
<i>Peromyscopsylla hesperomys</i>	4	0
<i>Aetheca wagneri</i>	1	0
<i>Malareus euphorbia</i>	1	0
<i>Eumolpianus eumolpi</i>	1	0
Total	118	0

*Not all animals are sampled for blood due to Federal protection rights.

Map 5: 2010 Plague Sample Locations in Clark County, Nevada



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.



Former supervisor of the Vector Control Program Vivek Raman conducts area surveillance at the Wetlands Park. Vivek played an integral role in establishing the health district's Vector Control Program. After a brief hiatus in Papua New Guinea earlier this year, Vivek has returned to the district to continue work with Vector Control.

This publication was supported by the Nevada State Health Division through Grant Number 3U50CI000489-03S3 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official view of the Nevada State Health Division or the CDC.