

**PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
ANNUAL PROJECT REPORT**

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TITLE: Chronic Wasting Disease Surveillance

PROJECT JOB NO.: 40001

TITLE: Chronic Wasting Disease (CWD) Surveillance in Free-ranging Deer and Elk in Pennsylvania

PERIOD COVERED: 1 July 2014 to 30 June 2015

COOPERATING ENTITIES: Bureau of Wildlife Protection, Pennsylvania Game Commission Region Offices, Pennsylvania Department of Agriculture, Pennsylvania State University Animal Diagnostics Lab, U.S. Department of Agriculture.

WORK LOCATION(S): Statewide

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ABSTRACT Since the first reported detection during 2012, chronic wasting disease (CWD) has been identified in 3 distinct areas in Pennsylvania: a captive cervid facility in Adams County (2012); multiple free-ranging deer in Blair and Bedford counties (2012 - present); and two captive cervid facilities in Jefferson County (2014). Following these detections, Executive Orders were issued by the Pennsylvania Game Commission to establish CWD Disease Management Areas (DMAs), where regulations were put in place to control the spread of CWD and surveillance activities were intensified. The boundaries of DMA 2 have been expanded twice based on identification of new positives. Surveillance for CWD in Pennsylvania's free-ranging and escaped captive cervids occurs statewide and throughout the year, but sampling efforts are focused within the DMAs. The broad aims of this surveillance are to: 1) monitor the occurrence and distribution of the disease in free-ranging cervids in the DMAs, and 2) identify introductions of CWD into areas outside the DMAs. During the 2014 calendar year, active and targeted surveillance resulted in a total of 4,268 deer samples that were collected and tested for CWD, including 2,953 (69%) from hunter-harvested white-tailed deer, 1,235 (29%) road-killed white-tailed deer, 51 (1%) clinical suspect white-tailed deer (i.e. exhibiting clinical signs consistent with CWD), 19 (<1%) escaped captive deer, 5 (<1%) crop-killed white-tailed deer, and 5 (<1%) deer that were sampled for other reasons not listed above. Of the 4,268 deer samples tested, 520 (12%) were from DMA 1, 938 (22%) were from DMA 2, and 243 (6%) were from DMA 3. CWD was detected in five free-ranging cervids sampled during 2014; all of which were road-kill white-tailed deer from DMA 2. There were no other positive detections of CWD in the remaining free-ranging or escaped

captive cervid samples that were tested. Also during 2014, 90 elk samples were collected and tested for CWD, including 80 from hunter-harvested elk and 10 from clinical suspects or escaped captives. There were no positive detections of CWD in these elk samples collected during 2014. For the first half of 2015 (January to June) there have been 503 deer sampled for CWD, including 151 (30%) from DMA 1, 251 (50%) from DMA 2, and 72 (14%) from DMA 3. Of these samples, CWD was not detected in 323, 179 are pending, and 1 was positive. The single positive sample was from a road-killed deer from within DMA 2. Since 2012, CWD has been identified in 10 captive deer from three different facilities and 11 free-ranging white-tailed deer, all from within DMA 2.

OBJECTIVES

1. To monitor for the presence of Chronic Wasting Disease (CWD) in free-ranging and escaped captive deer and elk statewide.

2. To define the occurrence and geographic distribution of CWD within the Disease Management Areas (DMAs).

3. To continue to improve surveillance efficiency through modifications in infrastructure, sampling strategies, and data management.

4. To continue to train personnel in recognition of CWD suspects, collecting carcasses, and extracting and preserving diagnostic tissue samples.

5. To continue to work with other state and federal agencies through the Interagency CWD Task Force to develop a strategic program for the prevention, early detection, and management of CWD in free-ranging and captive cervids throughout all regions of the state.

INTRODUCTION

During the fall of 2012, CWD was first identified in Pennsylvania in a captive cervid facility in Adams County. The herd was depopulated and all remaining deer over 1 year were tested for CWD. One of the 8 (13%) remaining deer tested positive for CWD. After this initial detection, the Pennsylvania Game Commission (PGC) implemented an Executive Order which established DMA 1 and put in place several regulations within the DMA to mitigate risks for transmission and spread of CWD in free-ranging cervids, including bans on the transportation of high-risk cervid carcass parts out of the DMA, deer feeding, use and possession of cervid urine-based lures in an outdoor setting, and deer rehabilitation. Subsequent to the detection of CWD in captive cervids, the PGC intensified CWD surveillance in DMA 1 with the overall objective of determining whether the disease had spilled over into free-ranging deer. During the remainder of 2012, over 2,000 deer samples were collected from DMA 1 and no positives were identified. However, as part of the annual statewide CWD surveillance efforts, approximately 3,000 samples were collected from hunter-harvested free-ranging white-tailed deer throughout the remainder of the state and 3 of these samples tested positive for CWD; two in Blair County and one in Bedford County. As with DMA 1, the PGC responded by implementing another Executive Order, which established DMA 2 and outlined the associated prohibitions described above. Since 2012, CWD

has been identified in 11 free-ranging white-tailed deer within DMA 2 and in each of the subsequent years. The boundary of DMA 2 has been expanded twice based on the locations of these new positives, and now encompasses 2,408 square miles. During the spring of 2014, CWD was identified in 2 other captive cervid facilities in Jefferson County. Another Executive Order established DMA 3 with all of the prohibitions described for DMA 1 and 2. Both facilities were quarantined by the PDA and depopulated, and all remaining deer over 1 year of age were tested for CWD. Five of the remaining 13 deer on 1 of the farms tested positive for CWD; in total 7/19 (37%) deer in the captive herd at the time of the first CWD positive deer mortality were positive for CWD. None of the remaining 10 deer over 1 year on the second facility were positive for CWD. From 2012 to present, 10 captive white-tailed deer have tested positive for CWD on 3 separate facilities. This report summarizes the surveillance efforts of the PGC during the calendar year 2014 and first half of 2015, and provides a summary of recent detections that have changed the current understanding of CWD epidemiology within Pennsylvania.

METHODS

General Surveillance Approaches

During 2014 to present, the PGC employed a two-tiered surveillance approach, which included targeted and active sampling to detect CWD in free-ranging and escaped captive cervids. This two-tiered strategy has been recommended as the most effective approach for detecting the presence of CWD in free-ranging cervids (Miller et al. 2000, Samuel et al. 2003, Walsh and Miller 2010). Targeted surveillance efforts were focused on identifying and testing clinical suspect animals (i.e., free-ranging deer and elk exhibiting overt signs of disease consistent with CWD) and escaped captive cervids. Samples collected from target animals were the highest priority for testing and these were collected statewide whenever clinically-ill or escaped captive animals were identified by the general public or PGC staff. Active surveillance for CWD included any samples collected from free-ranging cervids that were not exhibiting outward signs of disease, including cervids harvested by hunters during normal hunting seasons or landowners under crop damage permits (referred to herein as crop-killed) or cervids killed by vehicular collisions (referred to herein as road-killed). Surveillance of hunter-harvested and crop-killed cervids occurred statewide, while sampling and testing of road-killed deer primarily occurred within DMA 1, 2, and 3.

Diagnostic Tissue Samples

The obex and medial retropharyngeal lymph nodes were collected from all cervid sample categories by trained extractors and placed in 10% neutral buffered formalin for fixation.

Sample Collection

Diagnostic tissue samples from clinical suspects and escaped captive cervids were collected when carcasses were submitted to the Pennsylvania Animal Diagnostic Laboratory System (PADLS) for complete necropsies or in the field when these animals were found dead or euthanized. These samples were collected year-round from throughout the state and our objective was to test all of these samples that could be retrieved.

All successful elk hunters were required to present their elk at a designated check station. At the check station, trained PGC staff extracted the diagnostic tissue samples from those elk that were not going to be mounted. If the hunter intended to have the elk mounted, instructions and

materials, including postage-paid shipping containers to transport the caped head to the lab, were provided to the hunter. Our objective for hunter-killed elk samples was 100% of harvested elk over 1 year of age.

Pennsylvania deer hunters were not required to register deer at check stations during the 2014 hunting seasons. To sample hunter-harvested deer, 33 deer aging teams made up of biologists, foresters, food and cover employees, and other trained personnel visited deer processors across the state. Proposed sample sizes were created for each Wildlife Management Unit (WMU) based on proportion of state's deer population occurring in that WMU. Deer aging teams were instructed to obtain a specific number of deer heads that met the following criteria: attached valid tag showing tag number and WMU, deer at least 1.5 years of age, and no evidence of damage to the brainstem. Each aging team collected the harvested deer's head with ear tag attached, and recorded the following information electronically on Pendragon Forms 5.1 software using a Windows Mobile hand-held computer (Trimble Nomad): ear-tag number, Customer Identification (CID) number, WMU, county, township, sex, and age. Teams then delivered deer heads to the nearest PGC sample extraction center where diagnostic tissue samples were collected by trained personnel of the Pennsylvania Department of Agriculture (PDA), U.S. Department of Agriculture (USDA), or PGC. Tissues were collected and confirmed in the system only if the CID number, the ear tag number, WMU, and the CWD sample number were present and legible. Any samples with missing or illegible information were discarded.

In addition to the clinical suspects, escaped captives, crop-killed, and hunter-harvested deer, diagnostic samples were collected from road-killed deer within DMA 1, 2, and 3. Road-killed deer were collected from state and local roads by contractors who delivered the carcasses to a designated deer processing locations within the same DMA where the animal was collected. Heads were removed and placed in a cooler at the processing site; carcasses were discarded into a dumpster at these locations and disposed of into approved landfills. Road-killed deer were sampled throughout the 2014 calendar year in DMA 1 and 2, but sampling began during September 2014 in DMA 3. Samples were collected from all road-killed deer that were older than 1 year and that had no significant damage to the brain or head or decomposition of target tissues.

Sample Testing

Extracted samples were placed in 10% neutral buffered formalin for fixation and a uniquely numbered CWD label was attached to each sample cup. Samples were delivered to the Pennsylvania Veterinary Laboratory in Harrisburg for CWD testing by immunohistochemistry. All suspect positives were confirmed at the National Veterinary Services Laboratories, USDA by immunohistochemistry.

RESULTS

Surveillance

Elk.--A total of 90 elk samples were collected and tested for CWD during 2014, including 80 (90%) hunter-harvested elk and 10 (10%) clinical suspects or escaped captives. Thirty-four (38%) of these samples were males and 56 (62%) were female. Since 2007, there has been a general increase in the total number of elk samples tested annually by the PGC (Fig. 1). This trend continued this year and the 90 elk samples was the highest number tested during this 8 year period.

The 80 hunter-harvested samples represented 99% of the elk harvested during the 2014 season over 1 year of age. Samples from 1 hunter-harvested elk over 1 year of age were collected and submitted from a taxidermist, but did not contain the correct tissue for testing. CWD was not detected in any of the elk samples collected during 2014. Thus far during 2015, samples have been collected and tested from 6 elk, including 5 clinical suspects and 1 escaped captive. CWD was not detected in any of these 2015 elk samples.

Deer.--A total of 4,268 deer samples were collected and tested for CWD during 2014, including 2,953 (69%) from hunter-harvested white-tailed deer, 1,235 (29%) road-killed white-tailed deer, 51 (1%) clinical suspect white-tailed deer (i.e. exhibiting clinical signs consistent with CWD), 19 (<1%) escaped captive deer, 5 (<1%) crop-killed white-tailed deer, and 5 (<1%) deer that were sampled for other reasons not listed above. Of the 4,268 deer samples tested, 520 (12%) were from DMA 1, 938 (22%) were from DMA 2, and 243 (6%) were from DMA 3. A summary of deer samples collected in each WMU is shown in Figure 2. The age, sex, and DMA status samples collected during 2014 is summarized in Table 1.

A total of 520 samples were collected from the 591 square mile area of DMA 1, including 421 (81%) road-killed white-tailed deer, 97 (19%) hunter-harvested white-tailed deer, and 2 (<1%) clinical suspect white-tailed deer. The geographic distribution of hunter-harvested and road-killed deer samples from DMA 1 by township is shown in Figure 3. Both sample types were collected from throughout DMA 1 and from most townships. The age and sex compositions of hunter-harvested and road-killed deer samples collected within and outside the DMAs are summarized in Table 2. Of the 97 hunter-harvested deer samples collected from DMA 1, 46 (47%) were female, 50 (52%) were male, and 1 (1%) was undetermined. Of the 421 road-killed deer samples collected from DMA 1, 247 (59%) were female and 174 (41%) were male. There were no positive detections of CWD in any of the deer samples collected in DMA 1 during 2014.

A total of 938 deer samples were collected from the 1,664 square mile area of DMA 2, including 268 (29%) hunter-harvested white-tailed deer, 655 (70%) road-killed white-tailed deer, 10 (1%) clinical suspect white-tailed deer, 4 (<1%) crop-killed white-tailed deer, and 1 (<1%) escaped captive cervid. As with DMA 1, road-killed and hunter-harvested deer samples were collected from most townships in DMA 2 and the spatial distribution of these sample types is shown in Figure 4. The age and sex compositions of hunter-harvested and road-killed deer samples collected within and outside the DMAs are summarized in Table 2. Of the 268 hunter-harvested deer samples collected from DMA 2, 189 (71%) were male, 67 (25%) were female, and 12 (4%) were undetermined. Of the 655 road-killed deer samples collected from DMA 2, 316 (48%) were male and 339 (52%) were female. Of the 938 deer tested during 2014, 5 free-ranging white-tailed deer samples collected in DMA 2 tested positive for CWD. The age and sex composition of the positive samples from 2012 – present are summarized in Table 3. The locations of all positive samples to date are depicted in Figure 5. Based on the location of these new positives, DMA 2 was again expanded to 2,408 square miles (Fig. 6). All the prohibitions described previously were extended to this new area.

Intensive sampling of wild white-tailed deer, including road-killed deer, in DMA 3 began in September of 2014. From September to 31 December, a total of 243 deer samples were collected from DMA 3, including 102 (42%) hunter-harvested white-tailed deer, 140 (58%) road-killed

white-tailed deer, and 1 (<1%) clinical suspect white-tailed deer. Road-killed and hunter-harvested deer samples were collected from most townships in DMA 3 and the spatial distribution of these sample types is shown in Figure 7. The age and sex compositions of hunter-harvested and road-killed deer samples collected within and outside the DMAs are summarized in Table 2. Of the 102 hunter-harvested deer samples collected from DMA 2, 94 (92%) were male, 5 (5%) were female, and 3 (3%) were undetermined. Of the 140 road-killed deer samples collected from DMA 3, 91 (65%) were male and 49 (35%) were female. There were no positive detections of CWD in any of the deer samples collected in DMA 1 during 2014.

A total of 2,511 deer samples were collected outside of DMA 1, 2, and 3, including 2,436 (97%) hunter-harvested white-tailed deer, 18 (1%) road-killed white-tailed deer, 36 (1%) clinical suspect white-tailed deer, 16 (1%) escaped captive deer, 1 (<1%) crop-killed white-tailed deer, and 4 (<1%) deer that were sampled for reasons other than those listed above. An additional 56 free-ranging deer samples did not have adequate spatial data to determine DMA status. The age and sex compositions of hunter-harvested and road-killed deer samples collected within and outside the DMAs are summarized in Table 2. There were no positive detections of CWD in any of the free-ranging or escaped captive deer samples collected outside DMA 1, 2, or 3 during 2014.

From January through June, 2015, 503 deer samples have been collected, including 477 road-killed white-tailed deer (95%), 20 clinical suspects (4%), 1 crop-killed white-tailed deer (<1%), 2 escaped captives (<1%), and 3 were sampled for reasons other than those listed above. Of these 503 samples, 151 were from DMA 1 (30%), 252 were from DMA 2 (50%), and 72 were from DMA 3 (14%). Of the 503 samples, CWD was not detected in 323 samples; 179 are pending, and 1 was positive.

Response Update

A new Executive Order was issued to create DMA 3 and account for the expanded DMA 2. The Pennsylvania Interagency CWD Response Plan was revised and will be available in the coming weeks online. All informational documents on the PGC website were updated and revised where needed.

RECOMMENDATIONS

1. As we continue to collect surveillance data on CWD in Pennsylvania, future analyses should evaluate the effectiveness of each sample type relative to the associated cost (both financial and effort). Effectiveness should be measured both in number of positive detections as well as ability to obtain samples from age and sex categories associated with increased risks for CWD.

2. Due to the large-scale, multi-tiered approach, and rapidly evolving nature of the PGC CWD surveillance program, data collection and management has become increasingly complex. A standardized system for data collection and management should be developed to accurately record data from the various sample categories (i.e. hunter-harvest vs. road-kill, DMA vs. non-DMA, etc.) and quickly generate summary updates as needed throughout the year.

3. Continue to educate both elk hunters and their taxidermists about the importance of receiving samples from these animals.

LITERATURE CITED

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- Samuel, M. D., D. O. Joly, M. A. Wild, S. D. Wright, D. L. Otis, R. W. Werge, and M. W. Miller. 2003. Surveillance strategies for detecting chronic wasting disease in free-ranging deer and elk. United States Geological Survey, National Wildlife Health Center, Madison, Wisconsin, USA.
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Table 1. Deer samples collected for CWD testing during 2014 by DMA category, age, and sex. An additional 56 samples did not have adequate spatial data to determine DMA status.

	DMA 1	DMA 2	DMA 3	Non-DMA
Female	294	412	54	724
<18-months	1	1	-	3
18- to 30-months	106	124	17	203
≥30-months	187	287	32	517
Undetermined age	-	-	5	1
Male	225	513	186	1,770
<18-months	-	2	2	3
18- to 30-months	160	318	102	766
≥30-months	65	190	81	1,001
Undetermined age	-	3	1	-
Undetermined sex	1	13	3	17
<18-months	-	-	-	-
18- to 30-months	-	-	-	-
≥30-months	-	-	-	1
Undetermined age	1	13	3	16

Table 2. Composition of road-killed and hunter-harvested white-tailed deer samples collected from within and outside the DMAs for CWD testing during 2014 by age and sex. An additional 50 samples did not have adequate spatial data to determine DMA status.

	DMA 1	DMA 2	DMA 3	Non-DMA
Hunter-harvested deer	97	268	102	2,436
Female	46	67	5	689
<18-months	-	-	-	-
18- to 30-months	16	17	1	197
≥30-months	30	50	4	492
Undetermined age	-	-	-	-
Male	50	189	94	1,731
<18-months	-	-	-	-
18- to 30-months	23	75	33	751
≥30-months	27	114	61	980
Undetermined age	-	-	-	-
Undetermined sex	1	12	3	16
<18-months	-	-	-	-
18- to 30-months	-	-	-	-
≥30-months	-	-	-	-
Undetermined age	1	12	3	16
Road-Killed deer	421	655	140	18
Female	247	339	49	10
<18-months	-	-	-	-
18- to 30-months	91	107	16	4
≥30-months	156	232	28	6
Undetermined age	-	-	5	-
Male	174	316	91	8
<18-months	-	-	-	-
18- to 30-months	137	243	70	8
≥30-months	37	72	20	-
Undetermined age	-	1	1	-
Undetermined sex	-	-	-	-
<18-months	-	-	-	-
18- to 30-months	-	-	-	-
≥30-months	-	-	-	-
Undetermined age	-	-	-	-

Table 3. Summary of all CWD positive free-ranging white-tailed deer from Pennsylvania by year, sample-type, age, and sex. All positive free-ranging deer have been from DMA 2.

	2012	2013	2014	2015
Hunter-harvested deer	3	-	-	NT
Female	1	-	-	
<18-months	-	-	-	
18- to 30-months	-	-	-	
≥30-months	1	-	-	
Male	2	-	-	
<18-months	-	-	-	
18- to 30-months	1	-	-	
≥30-months	1	-	-	
Road-Killed deer	-	2	5	1
Female	-	-	3	1
<18-months	-	-	-	-
18- to 30-months	-	-	1	-
≥30-months	-	-	2	1
Male	-	2	2	-
<18-months	-	-	-	-
18- to 30-months	-	2	2	-
≥30-months	-	-	-	-

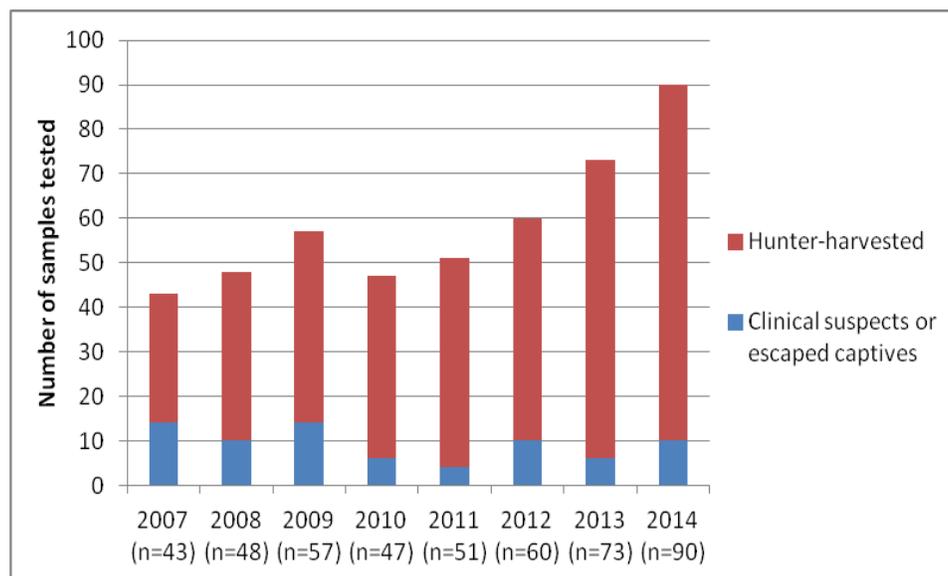


Figure 1. Annual number of Pennsylvania elk samples tested by the PGC during 2007 to 2014.

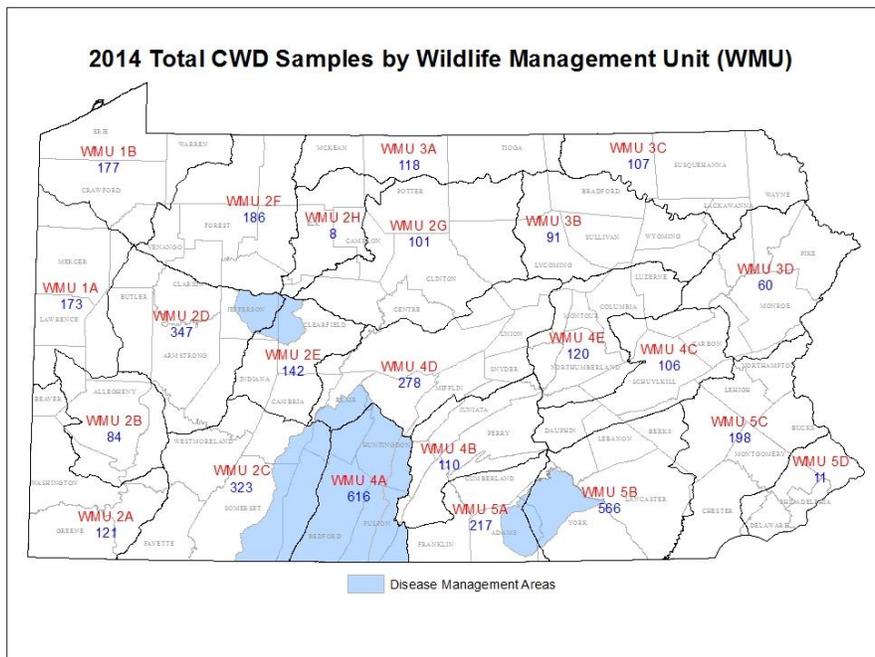


Figure 2. Distribution of 4,268 deer samples tested for CWD by WMU in Pennsylvania during 2014. Eight additional deer samples were tested but did not have adequate location data to include in this map.

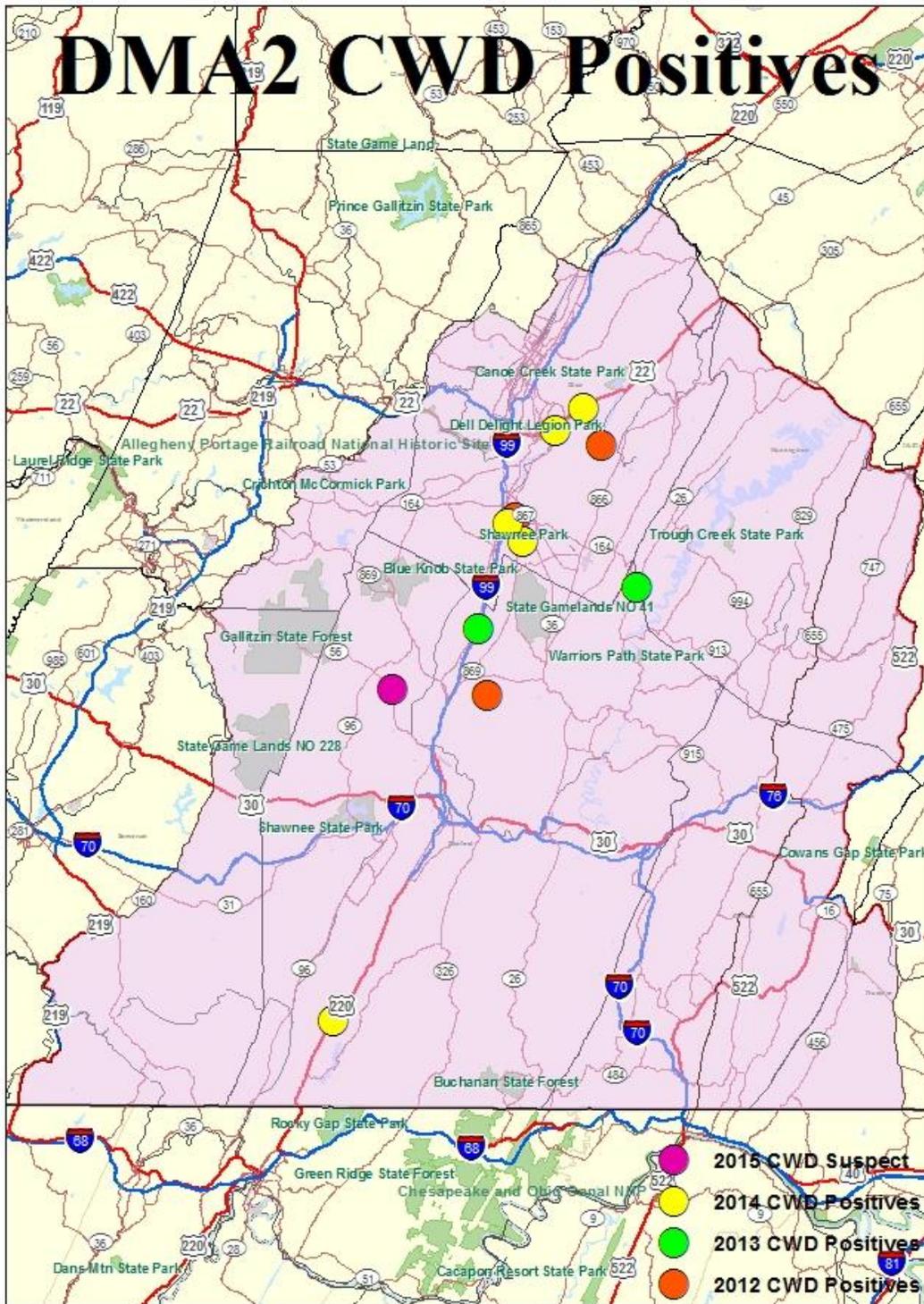


Figure 5. Location of the 11 free-ranging white-tailed deer in DMA 2 that tested positive for CWD during 2012 to present.

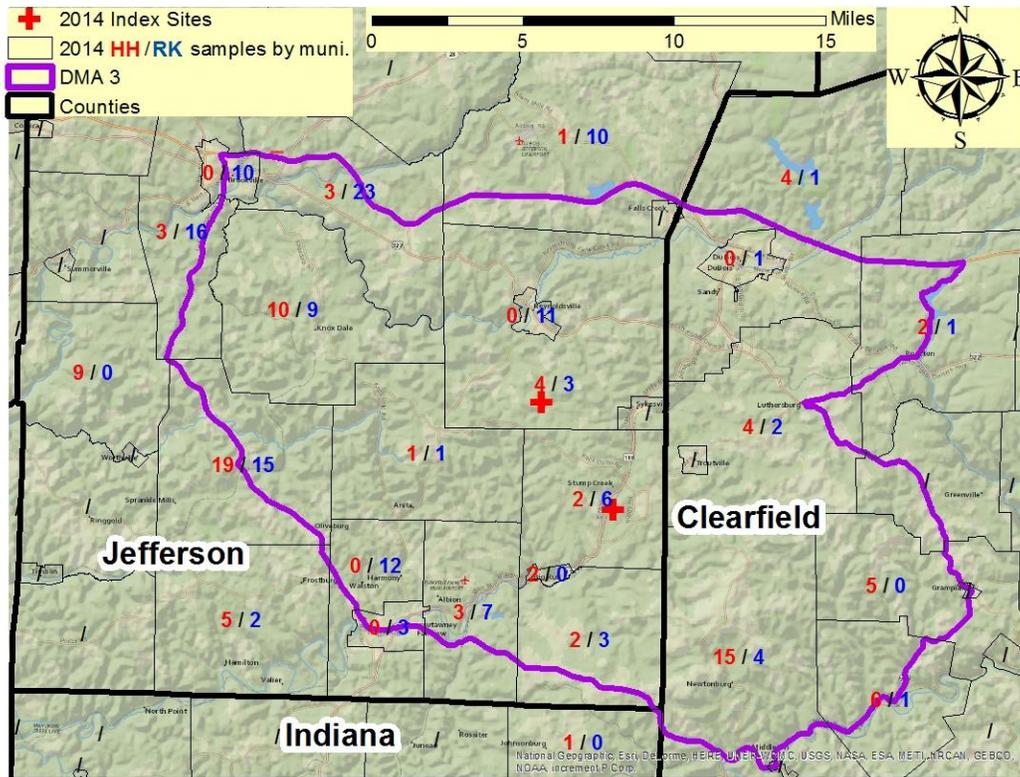


Figure 7. Distribution of hunter-harvested and road-killed white-tailed deer samples tested for CWD within DMA 3 by township.