

Update on Vector & Vector-borne Disease Activity in West Virginia 2017

Eric J. Dotseth

State Public Health Entomologist

2018 Mid-Atlantic Mosquito Control Association Meeting

February 14, 2018

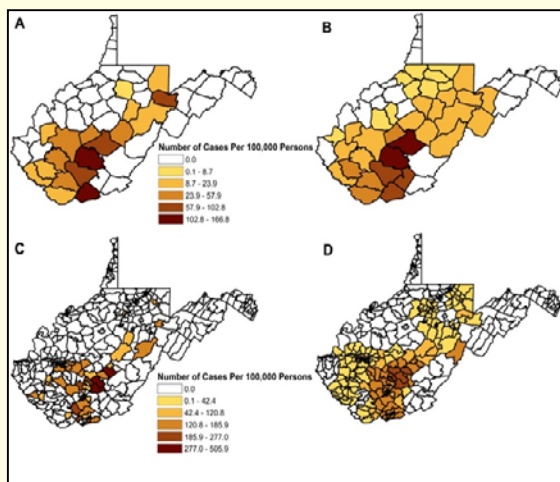


Objectives

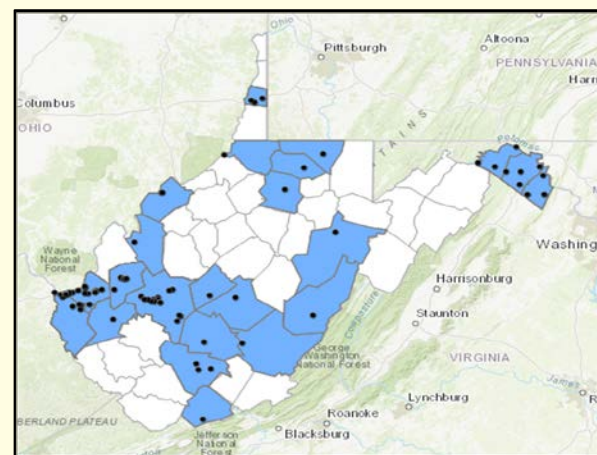
- Present an update on mosquito and mosquito-borne disease activity in West Virginia
- Provide an update on tick and tick-borne disease activity in West Virginia

Mosquito Surveillance 2017

- Mosquito surveillance conducted May 17 through October 26 in 97 localities in 23 counties
- Regular weekly sampling at counties with high La Crosse encephalitis (LAC) incidence (Raleigh, Fayette, and Nicholas) and low LAC incidence (Kanawha and Wood)
- Outlying areas were surveyed on semi-regular basis by state or local West Virginia Department of Health and Human Resources' (DHHR) agents



Unsmoothed and smoothed cumulative incidence of La Crosse virus (LACV) infections at the county and census tract levels in children 15 years and younger, West Virginia 2003-2007



Locations under mosquito surveillance in West Virginia. (Counties are shown in blue and sites are represented as black dots)

Haddow, A. D., D. Bixler & A. Odoi. 2011. The spatial epidemiology and clinical features of reported cases of LACV infection in West Virginia from 2003 to 2007. *BioMed Central Infectious Diseases* **11**: 29.

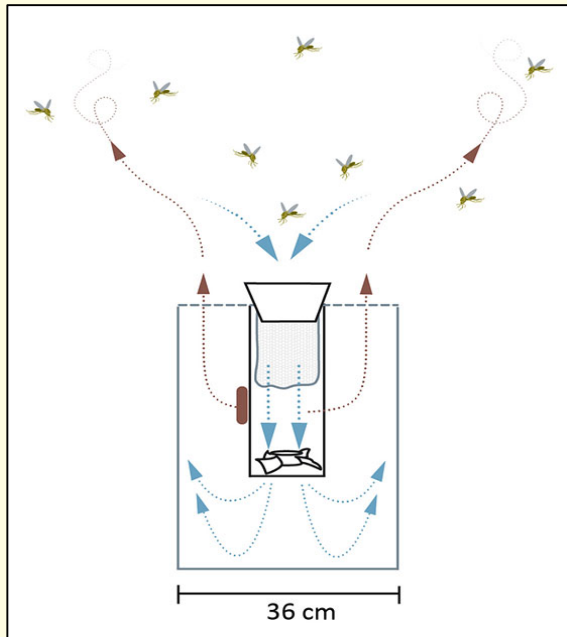
Mosquito Surveillance 2017 (cont'd)

- Standardized gravid trap and CDC light trap (CO₂ trap)
- Mosquitoes tested for pathogens by West Virginia Office of Laboratory Services
 - West Nile virus (WNV)
 - LACV
 - St. Louis encephalitis virus (SLEV)
 - Zika Virus (ZIKV)



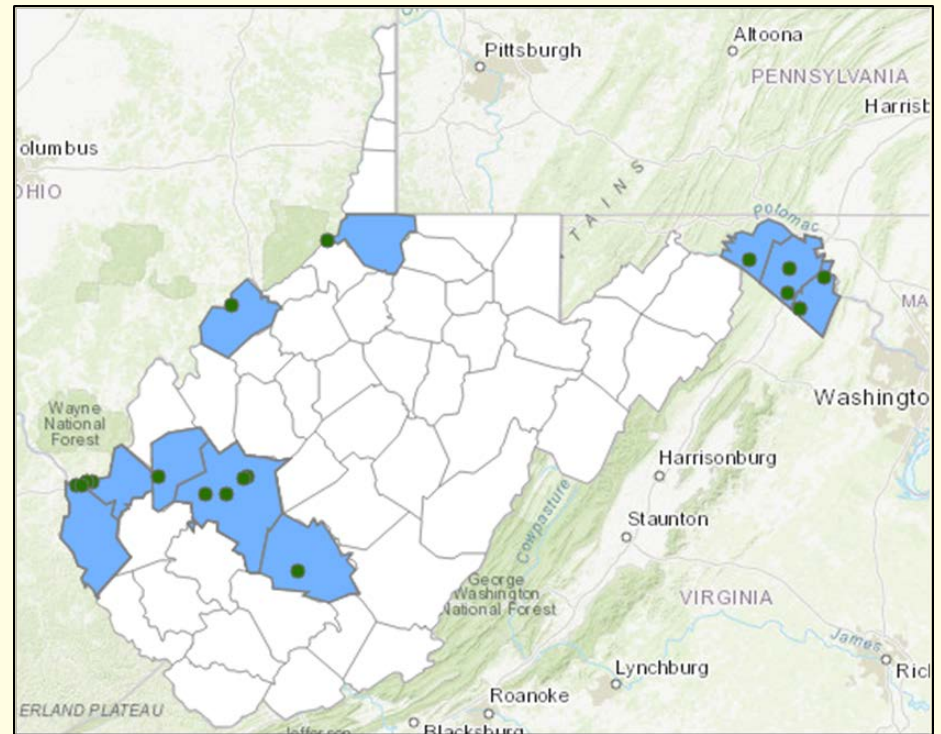
Mosquito Surveillance 2017 (cont'd)

- Utilized BG Sentinel Trap to capture *Aedes albopictus* and *Aedes aegypti*



Mosquito Surveillance 2017 (cont'd)

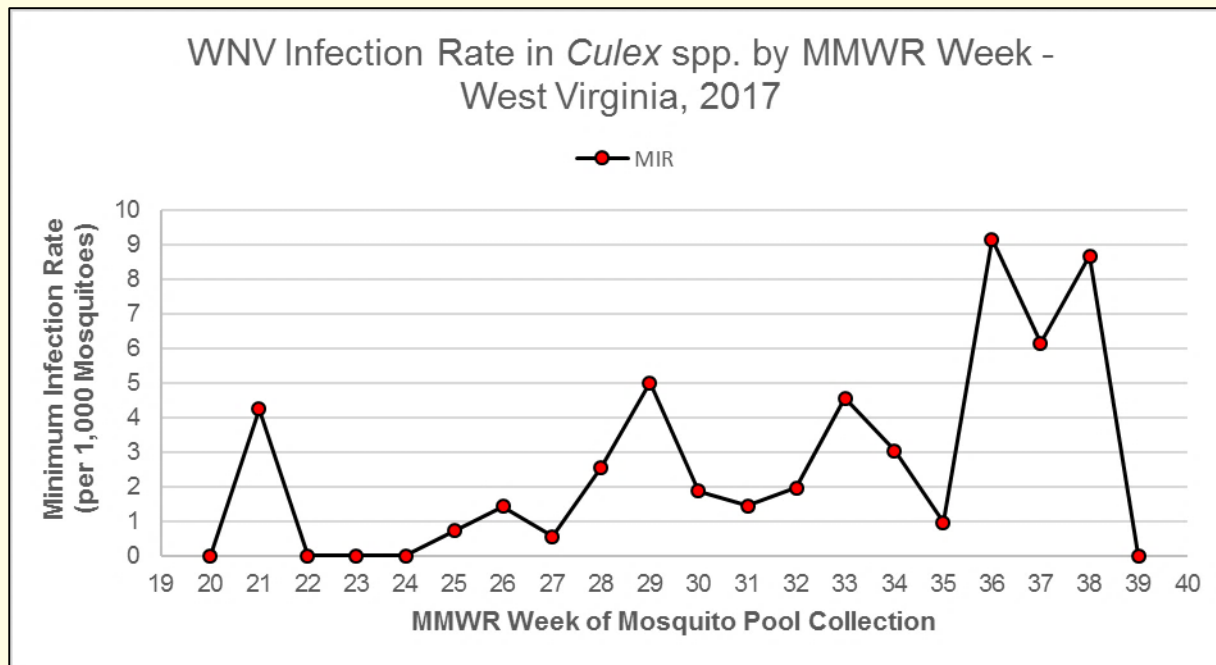
- Sixty-five (65) mosquito pools were infected with WNV
 - 49 *Culex* spp.
 - 12 *Aedes albopictus*
 - 3 *Aedes* spp.
 - 1 *Psorophora* spp.
- WNV positive mosquito pools by county: Cabell (27), Kanawha (17), Berkeley (6), Jefferson (4), Wayne (3), Wetzel (3), Wood (2), Fayette (1), Putnam (1), and Morgan (1)



Location of WNV positive mosquitoes in West Virginia (counties shown in blue)

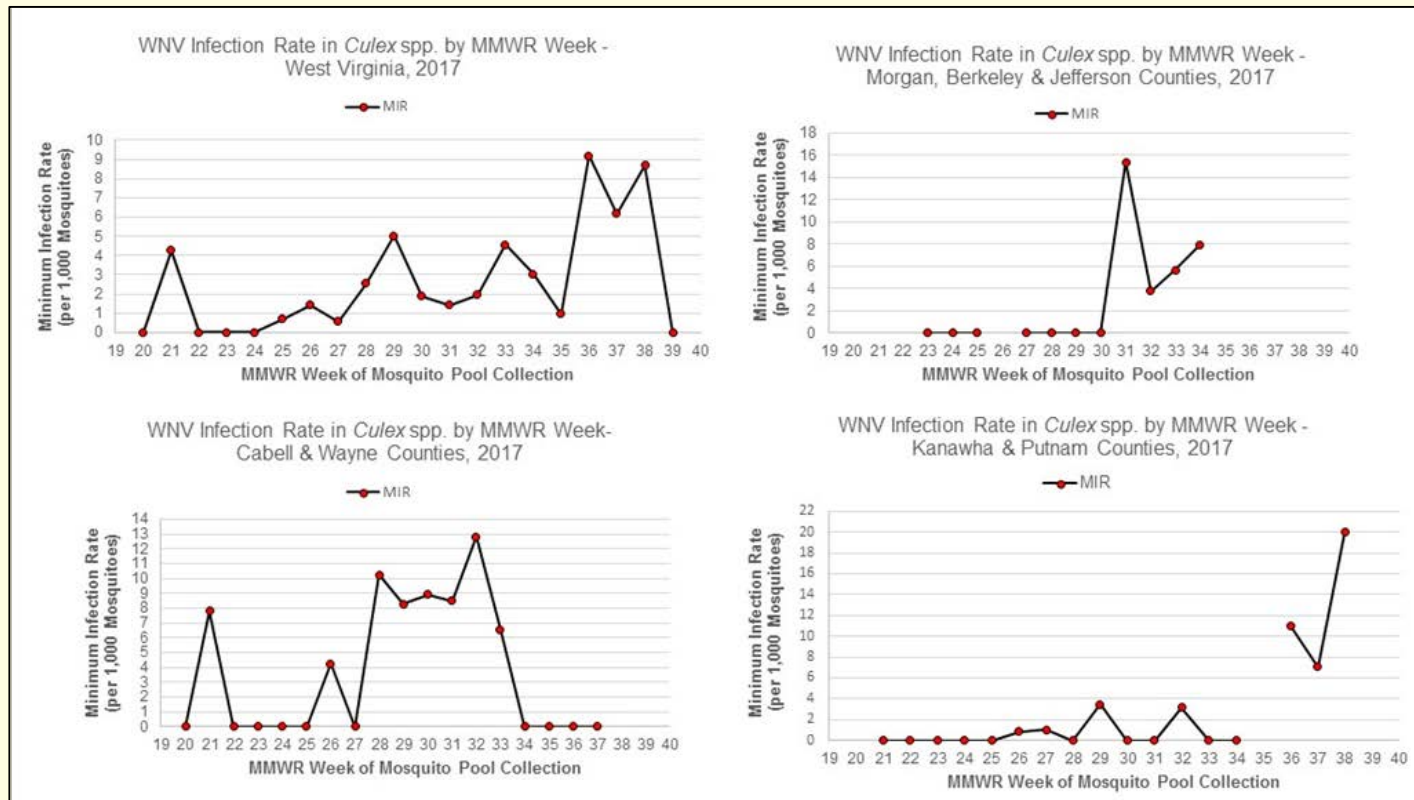
Mosquito Surveillance 2017 (cont'd)

- The first WNV-positive mosquito pool contained *Culex restuans* active in Cabell County on May 25, 2017
- In the adult mosquitoes, WNV activity began to increase during the middle of July (MMWR Week 28) with WNV MIR value 5.0 during the third week of July (MMWR Week 29)
- Across the State, WNV activity in *Culex* mosquitoes reached its peak in September (MMWR Weeks 34-39)



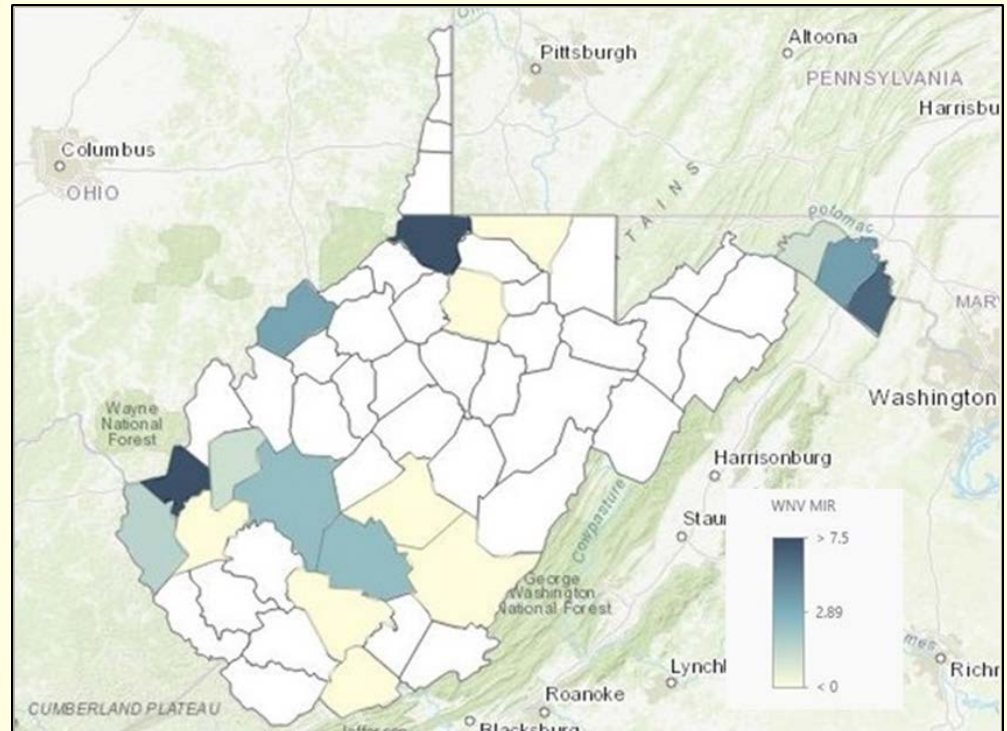
Mosquito Surveillance 2017 (cont'd)

- Although statewide the WNV MIR in the *Culex* mosquito population remained low and human risk of WNV infection was moderate from middle of July through August, western and northeastern West Virginia experienced high WNV activity in *Culex* mosquitoes



Mosquito Surveillance 2017 (cont'd)

- Western and northeastern West Virginia experienced high WNV activity in the *Culex* mosquito populations



WNV minimum infection rate in *Culex* mosquitoes in each county under surveillance

Mosquito Surveillance 2017 (cont'd)

- Increased WNV activity in mosquitoes prompted the release of a health advisory to health care professionals

THIS IS AN OFFICIAL WEST VIRGINIA HEALTH ALERT NUMBER WV140-09-05-2017
Distributed via the WV Health Alert Network – 09-05-2017



TO: West Virginia Healthcare Providers, Hospitals and other Healthcare Facilities
FROM: Rahul Gupta, MD, MPH, MBA, FACP
Commissioner and State Health Officer
West Virginia Department of Health and Human Resources, Bureau for Public Health
DATE: September 5, 2017

LOCAL HEALTH DEPARTMENTS: PLEASE DISTRIBUTE TO COMMUNITY HEALTH PROVIDERS, HOSPITAL-BASED PHYSICIANS, INFECTION CONTROL PREVENTIONISTS, LABORATORY DIRECTORS, AND OTHER APPLICABLE PARTNERS.

OTHER RECIPIENTS: PLEASE DISTRIBUTE TO ASSOCIATION MEMBERS, STAFF, ETC.

Based on data collected from May 24, 2017 to July 26, 2017, the West Virginia Department of Health and Human Resources, Bureau for Public Health Mosquito Surveillance Program is reporting several West Nile virus (WNV) positive mosquito pools across West Virginia with the greatest number of infected mosquitoes from Cabell County. WNV positive mosquito pools have also been detected in Berkeley, Fayette, Kanawha, Putnam, Wayne, Wetzel, and Wood counties this season.

As of August 22, 2017, human and/or non-human (i.e. mosquito, horse, and dead horse) WNV activity has been reported in 45 states, including those that share a border with West Virginia. Though no human WNV cases have been reported in West Virginia to date, increased activity in mosquitoes may indicate an increased risk to humans. Healthcare providers can assist public health in preventing WNV and other mosquito-borne diseases by encouraging patients to remove potential mosquito breeding sites around their homes and practice mosquito bite prevention techniques. For more information on mosquito bite prevention, visit the Centers for Disease Control and Prevention website at <https://www.cdc.gov/westnile/prevention/index.html>.

The Bureau for Public Health uses exposure, clinical, and laboratory information to assess the risk of WNV to West Virginia residents. Symptoms of WNV infection vary in severity with about 8 of 10 people showing no symptoms of infection. Severe neuro-invasive disease may result in death in some cases. Healthcare providers should consider WNV infection as a differential diagnosis among patients with encephalitis or meningitis through the rest of the mosquito-borne disease season (May-October). The preferred diagnostic test for WNV and other arboviral encephalitis is virus-specific IgM antibodies in cerebrospinal fluid (CSF) or serum. WNV-specific IgM antibodies are usually detectable 3 to 8 days after onset of illness and may persist for 30 to 90 days. The West Virginia Office of Laboratory Services (OLS) offers a complete arboviral disease panel that includes the WNV and is free-of-charge. For more information, contact the OLS at (304) 558-3530.

The WNV and other arboviral diseases are reportable to the local health department in the patient's county of residence within one week. For more information, contact your local health department or the Division of Infectious Disease Epidemiology at 1 (800) 423-1271, extension 1; (304) 558-5358, extension 1; or the answering service at (304) 925-9946.

This message was directly distributed by the West Virginia Bureau for Public Health to local health departments and professional associations. Receiving entities are responsible for further disseminating the information as appropriate to the target audience.

Categories of Health Alert messages:

Health Alert: Conveys the highest level of importance. Warrants immediate action or attention.

Health Advisory: Provides important information for a specific incident or situation. May not require immediate action.

Health Update: Provides updated information regarding an incident or situation. Unlikely to require immediate action.

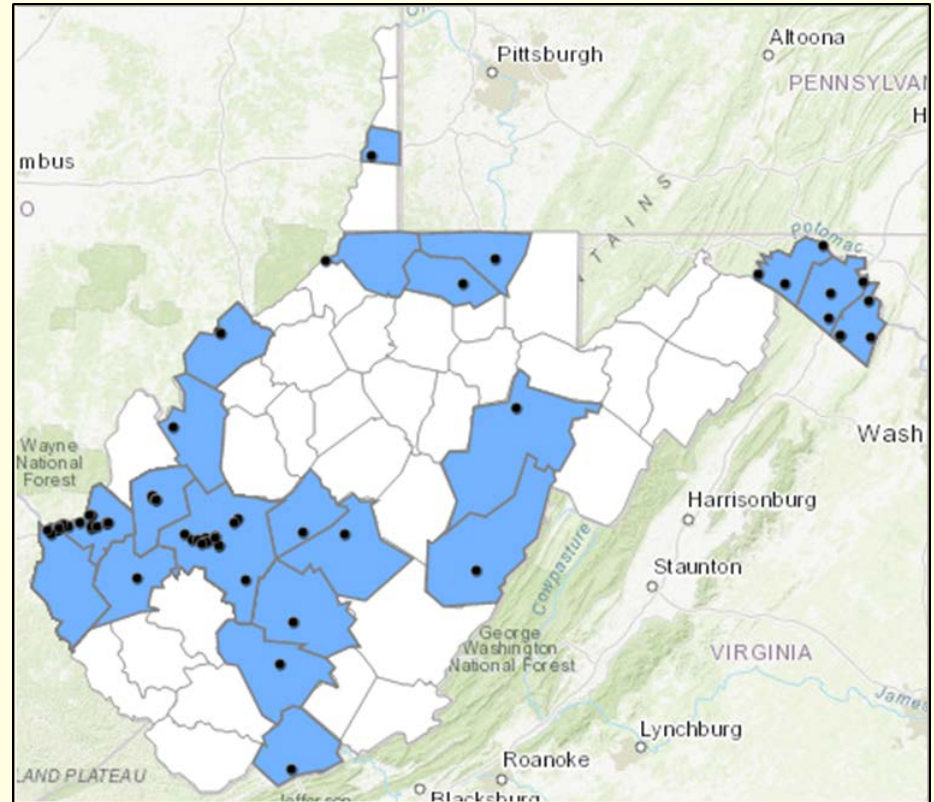
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West Virginia Health Advisory Number WV140-09-05-2017

- Two (2) *Aedes japonicus* mosquito pools and one *Culex* mosquito pool tested positive for LACV
- LACV was first detected in *Aedes japonicus* in South Charleston, Kanawha County on June 26
- LACV was also detected in *Aedes japonicus* in different site in South Charleston, Kanawha County on September 22
- *Culex erraticus* and *Culex restuans* collected from Berkeley Springs, Morgan County on August 11 were also infected with LACV

Mosquito Surveillance 2017 (cont'd)

- *Aedes albopictus* was detected in 69 localities in 21 counties surveyed
- *Aedes albopictus* was active throughout the mosquito surveillance season
- *Aedes aegypti* was not detected



Location of *Aedes albopictus* pools in West Virginia (counties shown in blue)

- **Confirmed and probable human cases of mosquito-borne disease in West Virginia**
 - One (1) ZIKV cases (travel associated)
 - Two (2) malaria cases (travel associated)
 - Four (4) LAC cases from Kanawha, Raleigh, and Summers counties
 - One (1) WNV case from Cabell County

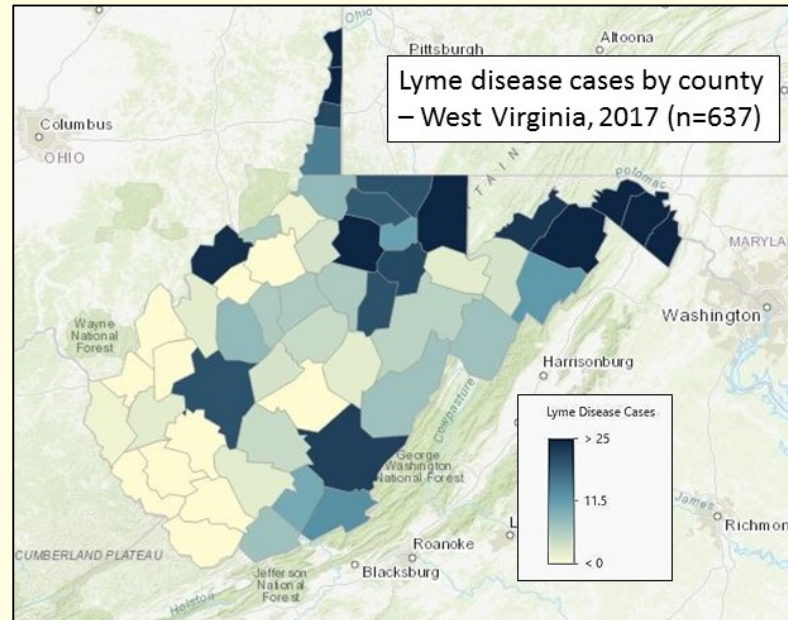
Tick-borne Disease

Tick-borne Diseases by Causative Organism(s) and Presence of Tick Vectors in West Virginia

Tick-borne Disease	Pathogen(s)	Tick Vector(s) Present in WV
Tularemia	<i>Franciscella tularensis</i>	American dog tick (<i>Dermacentor variabilis</i>)
		Lone star tick (<i>Amblyomma americanum</i>)
Anaplasmosis	<i>Anaplasma phagocytophilum</i>	Blacklegged tick (<i>Ixodes scapularis</i>)
Ehrlichiosis	<i>Ehrlichia chaffeensis</i>	Lone star tick (<i>Amblyomma americanum</i>)
	<i>Ehrlichia ewingii</i>	Gulf Coast tick (<i>Amblyomma maculatum</i>)
	Panola Mountain <i>Ehrlichia</i> sp. <i>Ehrlichia muris</i> -like agent	Blacklegged tick (<i>Ixodes scapularis</i>)
Lyme disease	<i>Borrelia burgdorferi</i>	Blacklegged tick (<i>Ixodes scapularis</i>)
	<i>Borrelia mayonii</i>	
Relapsing fever*	<i>Borrelia miyamotoi</i>	Blacklegged tick (<i>Ixodes scapularis</i>)
Powassan encephalitis*	Powassan virus	Groundhog tick (<i>Ixodes cookei</i>)
		Blacklegged tick (<i>Ixodes scapularis</i>)
Babesiosis	<i>Babesia microti</i>	Blacklegged tick (<i>Ixodes scapularis</i>)

*This tick-borne disease has not been detected in West Virginia

Tick-borne Disease Surveillance

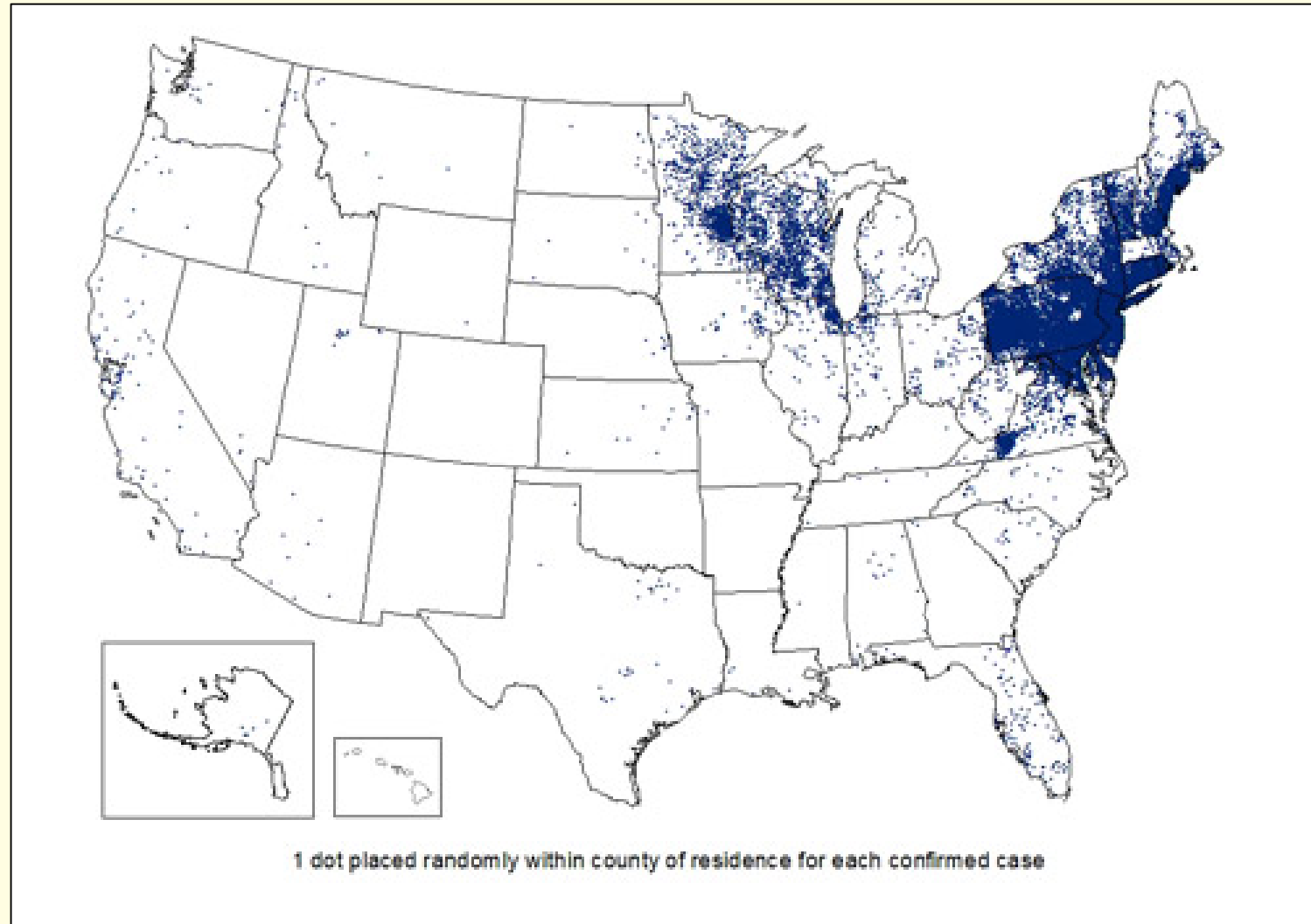


Tick-borne Disease ^a	Confirmed or Probable Cases (2017) (as of January 12, 2018)
Lyme disease	637
Spotted fever group rickettsioses ^b	15
Ehrlichiosis	6
Ehrlichiosis/Anaplasmosis Undetermined	1
Anaplasmosis	1
Q Fever	3
Babesiosis	1
TOTAL	664

^aTable includes only confirmed or probable cases that have been reviewed and closed by the Zoonotic Disease Epidemiologist

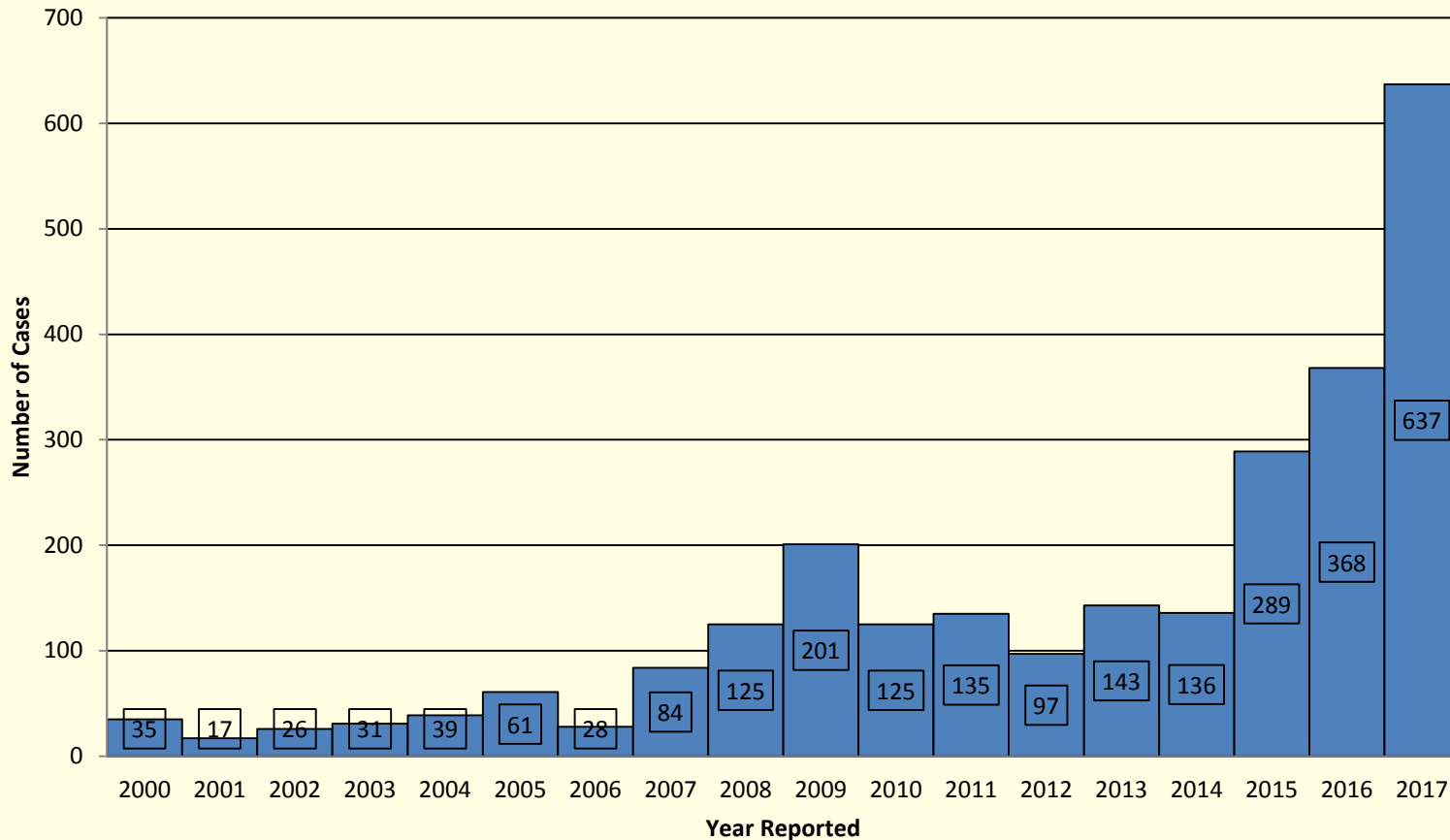
^bIncludes Rocky Mountain spotted fever

Lyme Disease Surveillance



Lyme Disease Surveillance (cont'd)

Reported Cases of Lyme Disease by Year - West Virginia 2000-2017



*Updated as of January 12, 2018

Council of State and Territorial Epidemiologists Lyme disease case definition

- Epidemiologic criteria distinguishes exposure in a high incidence vs. low incidence state
- High incidence state: a state having an average of at least ten confirmed cases/100,000 for the previous three reporting years


Year	# of Confirmed Cases	Incidence per 100,000
2014	112	6.1
2015	243	13.2
2016	297	16.1
Average three-year incidence rate		11.8

As of 2017, West Virginia is a high incidence Lyme disease state

Lyme Disease Surveillance (cont'd)

- In response to the increase in Lyme disease cases, West Virginia DHHR released health advisories, press releases, and trainings for local health departments

THIS IS AN OFFICIAL WEST VIRGINIA HEALTH ADVISORY NUMBER WV134-05-01-2017
Distributed via the WV Health Alert Network – May 1, 2017



HEALTH ADVISORY #134
Tickborne Disease Season

TO: West Virginia Healthcare Providers, Hospitals and Other Healthcare Facilities

FROM: Rahul Gupta, MD, MPH, FACP, Commissioner and State Health Officer
WVDHHR, Bureau for Public Health

DATE: May 1, 2017

LOCAL HEALTH DEPARTMENTS: PLEASE DISTRIBUTE TO COMMUNITY HEALTH PROVIDERS, HOSPITAL-BASED PHYSICIANS, INFECTION CONTROL PREVENTIONISTS, LABORATORY DIRECTORS, AND OTHER APPLICABLE PARTNERS

OTHER RECIPIENTS: PLEASE DISTRIBUTE TO ASSOCIATION MEMBERS, STAFF, ETC.

Tickborne diseases occur annually in West Virginia with most cases developing symptoms between April and September. Lyme disease is the most commonly reported tickborne disease in West Virginia. In 2016, West Virginia recorded 368 Lyme disease cases, the most ever in a single year. Counties in the northwestern and southwestern parts of the state have had increasing case counts in recent years. In 2016, 43 counties reported at least one confirmed or probable Lyme disease case. Based on new national reporting standards, West Virginia is considered a high incidence Lyme disease state.

Tickborne rickettsial diseases (TRBDs), such as anaplasmosis, ehrlichiosis, and Rocky Mountain spotted fever, have also been reported in the state. In 2016, 20 TRBD cases were reported in West Virginia. These diseases are characterized by acute onset of fever, headache, and myalgia. Symptoms can also include anemia, leukopenia, thrombocytopenia, and elevated hepatic transaminases. TRBDs can be confused with other illnesses, and serologic results are often negative during the first week of illness.

Laboratory testing is important for diagnosing tickborne diseases. For Lyme disease, a two-tiered testing approach is recommended by the Centers for Disease Control and Prevention (CDC): an IFA/EIA screen followed by IgG and IgM Western blots. For TRBDs, the gold standard test is IFA using pathogen-specific antigen performed on paired serum specimens (one taken during the first week of illness and another taken two to four weeks later). Patients treated early and appropriately with antibiotics (e.g. doxycycline) usually recover quickly from infections with Lyme disease and TRBDs.

Ticks are mostly active during warm months but were reported during winter months this past season. It is important to remind patients to conduct tick checks on themselves (and their pets) when visiting wooded areas. The use of repellent (e.g. DEET, picaridin, oil of eucalyptus) can deter ticks from biting. Please work with your local health department (LHD) to obtain patient information necessary for surveillance. Lyme disease and TRBDs are reportable to the LHD in the patient's home county within one week.

For more information about tickborne diseases in West Virginia, visit the Division of Infectious Disease Epidemiology (DIDE) website at www.dide.wv.gov. You may also contact your LHD or call the DIDE at (304) 558-5358, extension 1 or the answering service at (304) 525-9946.

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West Virginia Health Alert messages: Immediate action is required.

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West Virginia Health Advisory Number WV134-05-01-2017



April 20, 2017

Welcome to the 2017 Lyme Disease Surveillance Training. Please take a few minutes to complete the pre-training questions.


CEUs are being offered. Please remember to sign in!

Presenters
Miguella Mark-Carew, Zoonotic Disease Program Manager
Eric Dotseith, Public Health Entomologist
Jessica Shiltz, Vectorborne Disease Epidemiologist
Karen Sittler, Vectorborne Disease Epidemiologist Intern
Dave Stiltner, Zoonotic Disease Data Analyst

TIME	TOPIC
9:00a – 9:05a	Introduction to Lyme disease
9:05a – 9:40a	Ticks and One Health Tickborne Disease Initiatives in West Virginia
9:40a – 10:20a	Human Lyme Disease Surveillance in West Virginia
10:20a – 10:30a	Break
10:30a – 11:00a	Entering Lyme Disease Laboratory Reports in WVEDSS
11:00a – 11:15a	Review of the Lyme Disease Toolkit
11:15a – 12:00p	Interpreting Laboratory Reports and Mock Case Investigations

CEUs pending approval from the Office of Maternal, Child and Family Health for Nursing through the WV Board of Examiners for Registered Nurses, License # WV1999-0297RN. Social Work through the WV Board of Social Work Examiners, License # 490005

THIS IS AN OFFICIAL WEST VIRGINIA HEALTH ALERT NUMBER WV141-11-20-2017
Distributed via the WV Health Alert Network – November 20, 2017



HEALTH ADVISORY #141
Dramatic Increase in Lyme Disease Cases

TO: West Virginia Healthcare Providers, Hospitals and Other Healthcare Facilities

FROM: Rahul Gupta, MD, MPH, MEd, FACP, Commissioner and State Health Officer
WVDHHR, Bureau for Public Health

DATE: November 20, 2017

LOCAL HEALTH DEPARTMENTS: PLEASE DISTRIBUTE TO COMMUNITY HEALTH PROVIDERS, HOSPITAL-BASED PHYSICIANS, INFECTION CONTROL PREVENTIONISTS, LABORATORY DIRECTORS, AND OTHER APPLICABLE PARTNERS

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West Virginia will report the highest number of Lyme disease cases on record in 2017. As of November 8, 2017, 571 confirmed and probable Lyme disease cases have been reported compared to the previous record of 368 cases in 2016. The geographic distribution of cases has also increased. As of November 8, 2017, 45 counties have reported at least one confirmed or probable Lyme disease case, up from 11 counties in 2012. This increase could be the result of increased reporting, increase in the number of *Ixodes scapularis* ticks infested with *Borrelia burgdorferi* in West Virginia, or a recent change in the national surveillance case definition for Lyme disease. Based on the change, West Virginia is considered a high incidence Lyme disease state, and the presence of an erythema migrans (EM) with known exposure in the state is sufficient for a patient to be classified as a confirmed surveillance case.

Laboratory testing is important for diagnosing Lyme disease. The following tests are recommended:

- A positive two-tier test (positive or equivocal IFA/EIA screen followed by a positive immunoglobulin M (IgM) or immunoglobulin G (IgG) western immunoblot (WB) for Lyme disease
- A positive culture for *B. burgdorferi*
- A single IgG WB

Symptoms of Lyme disease include: erythema migrans (EM rash), arthritis, lymphocytic meningitis, cranial neuritis, facial palsy, radiculoneuropathy, encephalomyelitis, and atrioventricular block. Patients treated early and appropriately with antibiotics (e.g. doxycycline) usually recover quickly from infections.

Lyme disease occurs annually in West Virginia with most cases developing symptoms between April and September. The emergence of adult *Ixodes scapularis* in the fall contributes to additional cases being reported through the end of the year. Ticks are mostly active during warm months but were active during winter months this past season. It is important to remind patients to conduct tick checks on themselves (and their pets) when visiting wooded areas. The use of a repellent (e.g. DEET, picaridin, oil of eucalyptus) can deter ticks from biting.

Lyme disease is reportable to the local health department (LHD) in the patient's home county within one week. Please work with your LHD to obtain patient information necessary for surveillance. For more information about tickborne diseases in West Virginia, please contact your LHD or the Office of Epidemiology and Prevention Services, Division of Infectious Disease Epidemiology (DIDE) at 1 (800) 423-1271 ext. 1, (304) 558-5356 ext. 1, or the 24/7 answering service at (304) 525-9946. Information is also available on DIDE's website at www.dide.wv.gov.

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West Virginia Health Advisory Number WV141-11-20-2017

West Virginia Veterinary Tick Submission Project

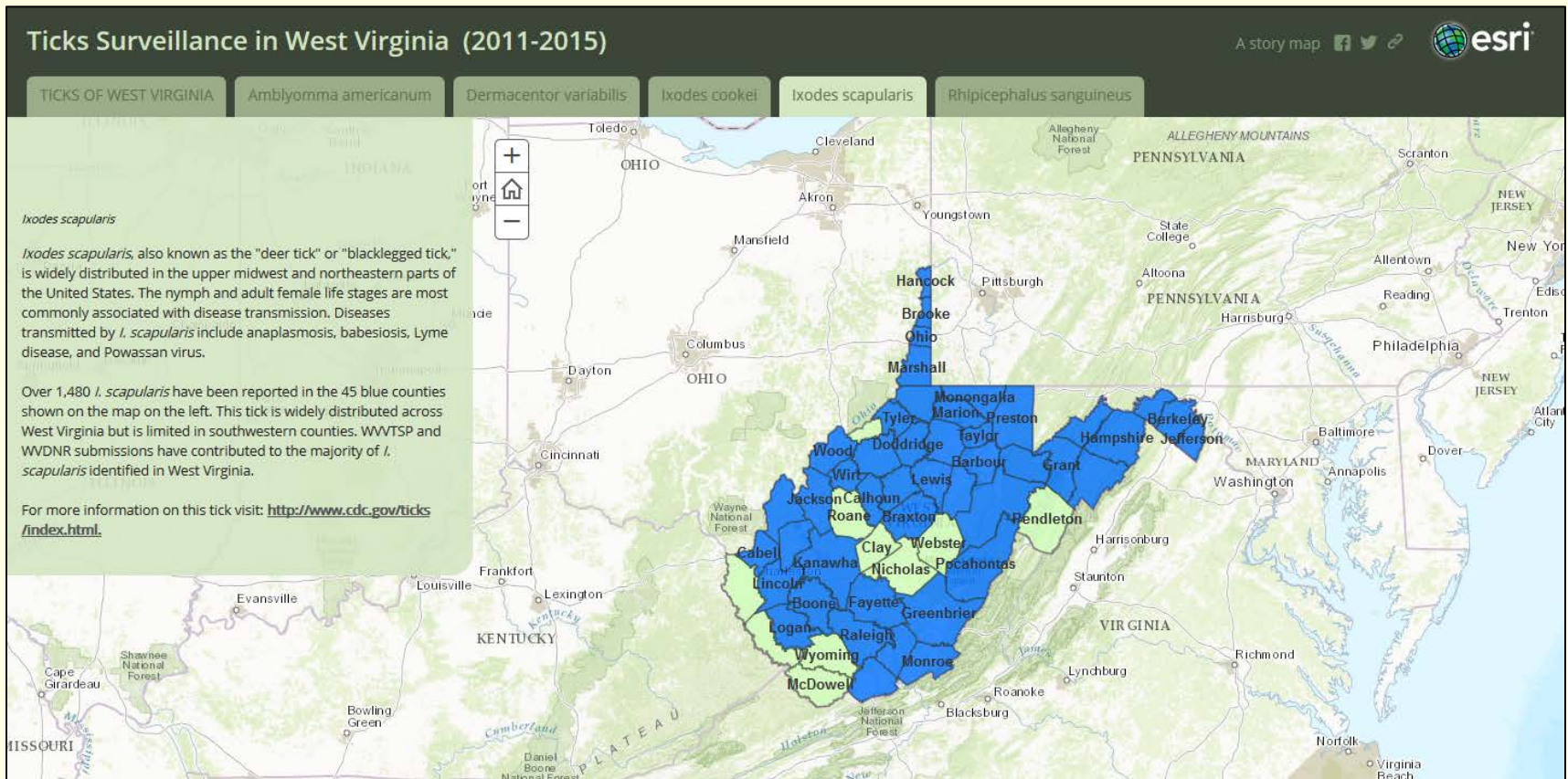
- Created in 2013 as a sentinel surveillance system for detection of vectors of human tick-borne disease
- Veterinarians are invited early in the year to submit tick specimens for identification
- *Ixodes scapularis* ticks are tested for *Borrelia burgdorferi*
 - Cornell University College of Veterinary Medicine (2013)
 - West Virginia University (2014-2016)



WEST VIRGINIA
VETERINARY TICK SUBMISSION PROJECT
(WVVTSP)

Tick Species in West Virginia

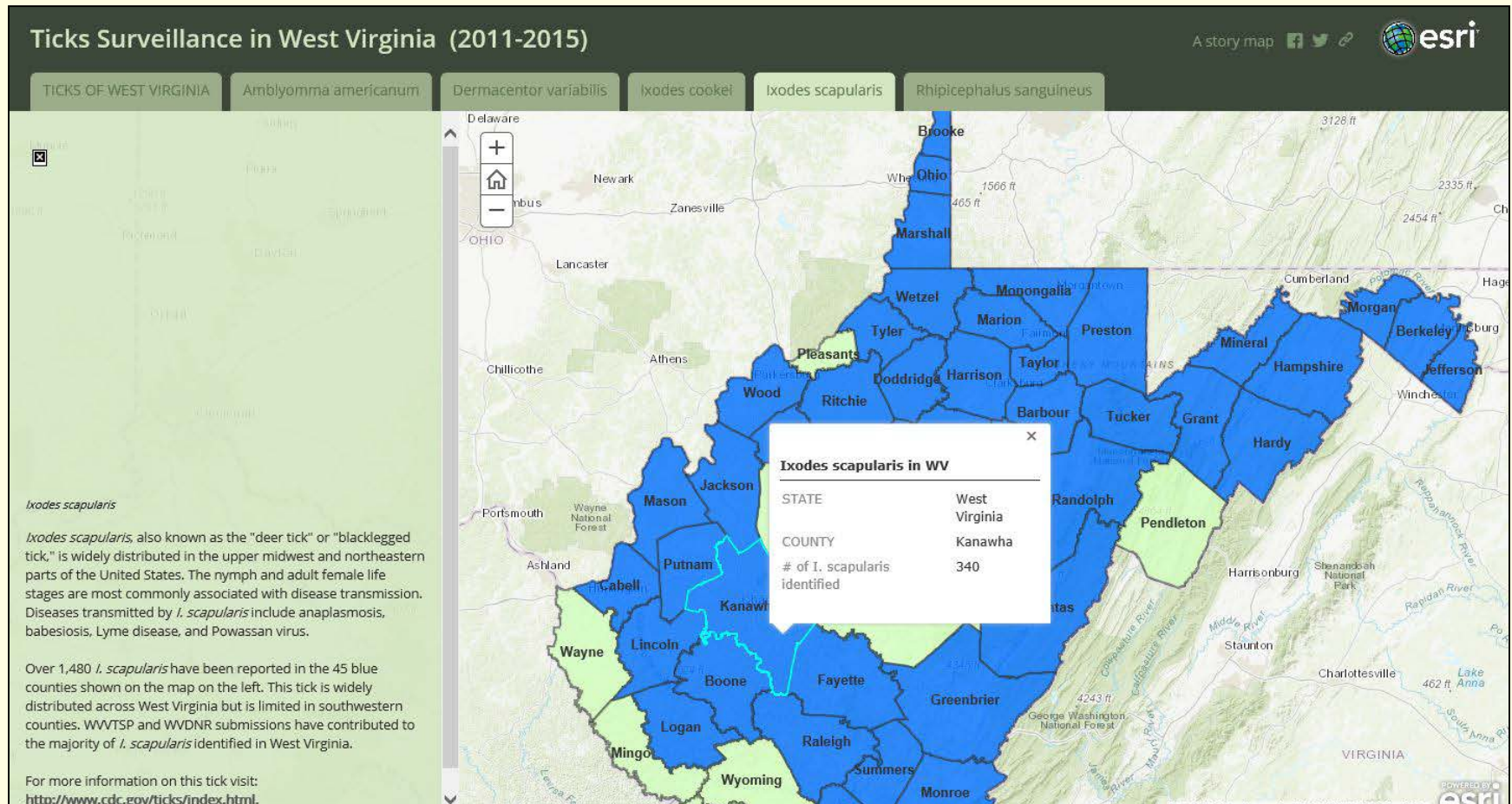
- Interactive “Story Map” combines active, passive, and sentinel tick surveillance data from 2011–2015



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Tick Species in West Virginia (cont'd)

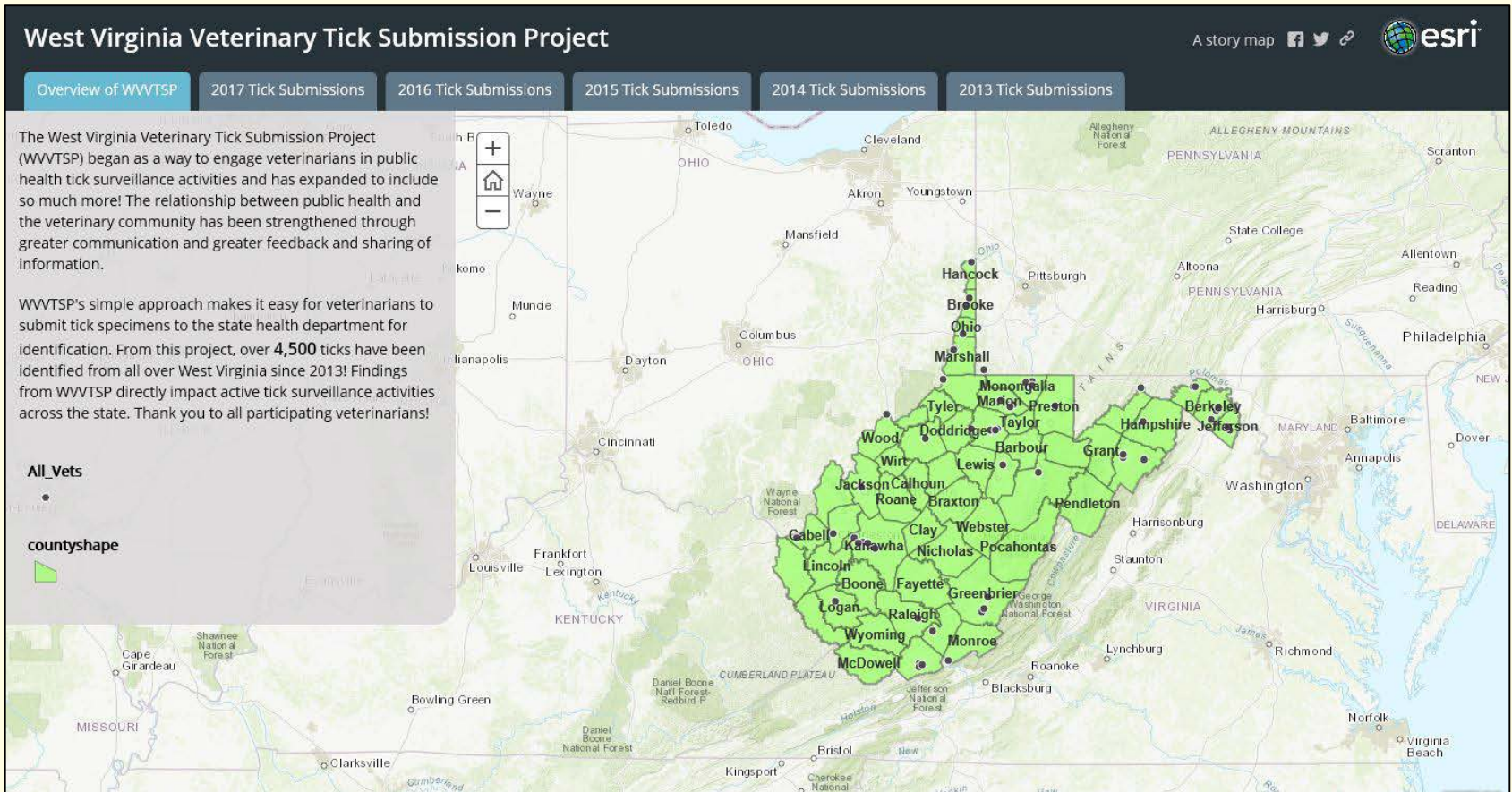
- County-level data is available for individual tick species



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WVVTSP (cont'd)

- An interactive map function shows distribution of tick species across the State



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WVVTSP (cont'd)

Tick Species	# of ticks submitted and identified (2013) (%)	# of ticks submitted and identified (2014) (%)	# of ticks submitted and identified (2015) (%)	# of ticks submitted and identified (2016) (%)	# of ticks submitted and identified (2017) (%)
<i>Dermacentor variabilis</i> ¹	472 (77.4)	994 (85.5)	699 (54.0)	723 (51.0)	803 (35.1)
<i>Amblyomma americanum</i> ²	5 (0.8)	16 (1.3)	84 (6.5)	109 (7.7)	144 (6.3)
<i>Ixodes scapularis</i> ³	121 (19.8)	134 (11.5)	436 (33.7)	434 (30.6)	953 (41.7)
<i>Ixodes cookei</i> ⁴	7 (1.1)	10 (0.9)	71 (5.5)	28 (2.0)	20 (0.9)
<i>Haemaphysalis leporispalustris</i> ⁵	5 (0.8)	8 (0.7)	0	3 (0.2)	27 (1.2)
<i>Amblyomma maculatum</i> ⁶	0	1 (0.0)	0	1 (0.0)	1 (0.0)
<i>Rhipicephalus sanguineus</i> ⁶	0	0	4 (0.3)	119 (8.4)	315 (13.8)

Summary of veterinary tick submissions for the current reporting period in West Virginia

¹Vector of tularemia and Rocky Mountain spotted fever

³Vector of Lyme disease, anaplasmosis, babesiosis, and Powassan encephalitis

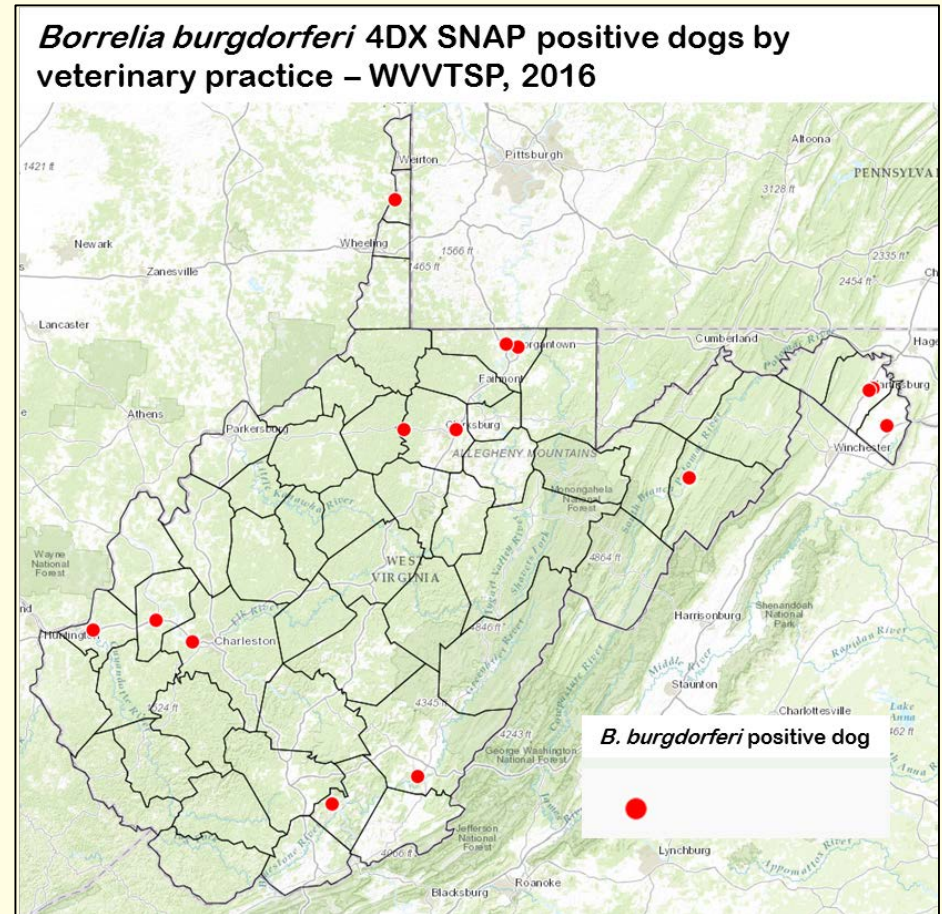
⁵Vector of tularemia in rabbits

²Vector of ehrlichiosis, tularemia, STARI, and spotted fever rickettsioses

⁴Vector of Powassan encephalitis

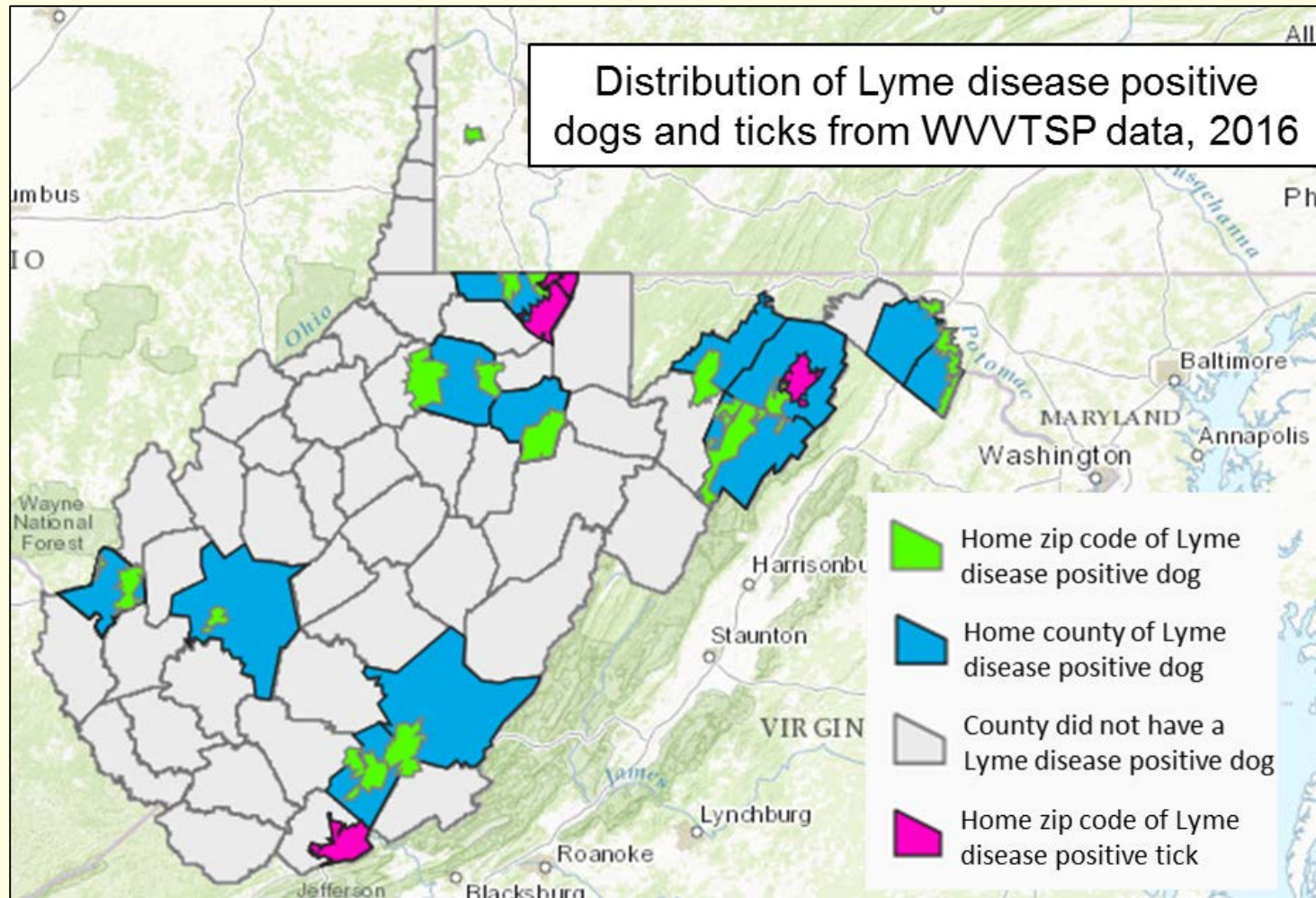
⁶Vector of spotted fever rickettsioses

- In 2016, data was collected on tick-borne diseases present in veterinary patients through WVVTSP
- Patients with submitted samples:
 - 22.2% had 4DX SNAP testing done
 - 15.6% were positive for a tick-borne disease
 - 90.9% of those cases were Lyme positive



*Lyme cases marked by clinic geographic coordinates

WVVTSP (cont'd)



Positive ticks were removed from three cats

Summary

- WNV activity in the *Culex* mosquito population was low in West Virginia except for counties in western and northeastern West Virginia
- LAC is the major mosquito-borne disease in West Virginia
- The Asian tiger mosquito (*Aedes albopictus*), another competent mosquito vector for ZIKV, is established in most West Virginia counties
- Although the yellow fever mosquito (*Aedes aegypti*) is established in neighboring states, this Zika competent vector has not been recorded in West Virginia
- Human cases of Lyme disease are increasing in West Virginia
- Lyme disease infection in humans and ticks is predominantly in the eastern half of West Virginia

Contact

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