

# Ticks and Tickborne Disease Activity in Virginia

**Joshua Bernick**

**Tick-borne Disease and Rabies Epidemiologist**

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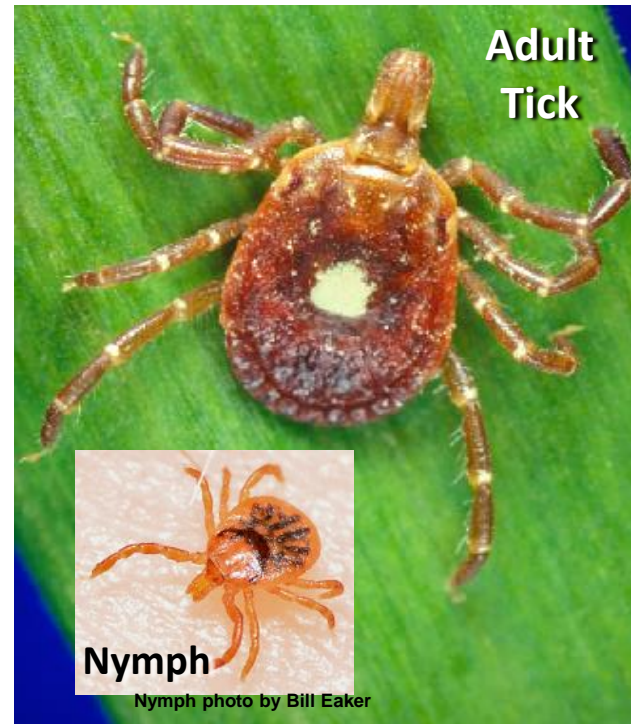
# Important Tick Vectors of Disease in Virginia

There are 16 tick species found in Virginia, only three species commonly bite people.

The lone star tick can vector Ehrlichia, RMSF, Heartland virus disease, and cause Alpha-gal syndrome as well as STARI.

The blacklegged tick can vector the agents that cause Lyme, Anaplasmosis, Babesiosis, and Powassan virus disease.

The American dog tick can transmit RMSF and cause tick paralysis.



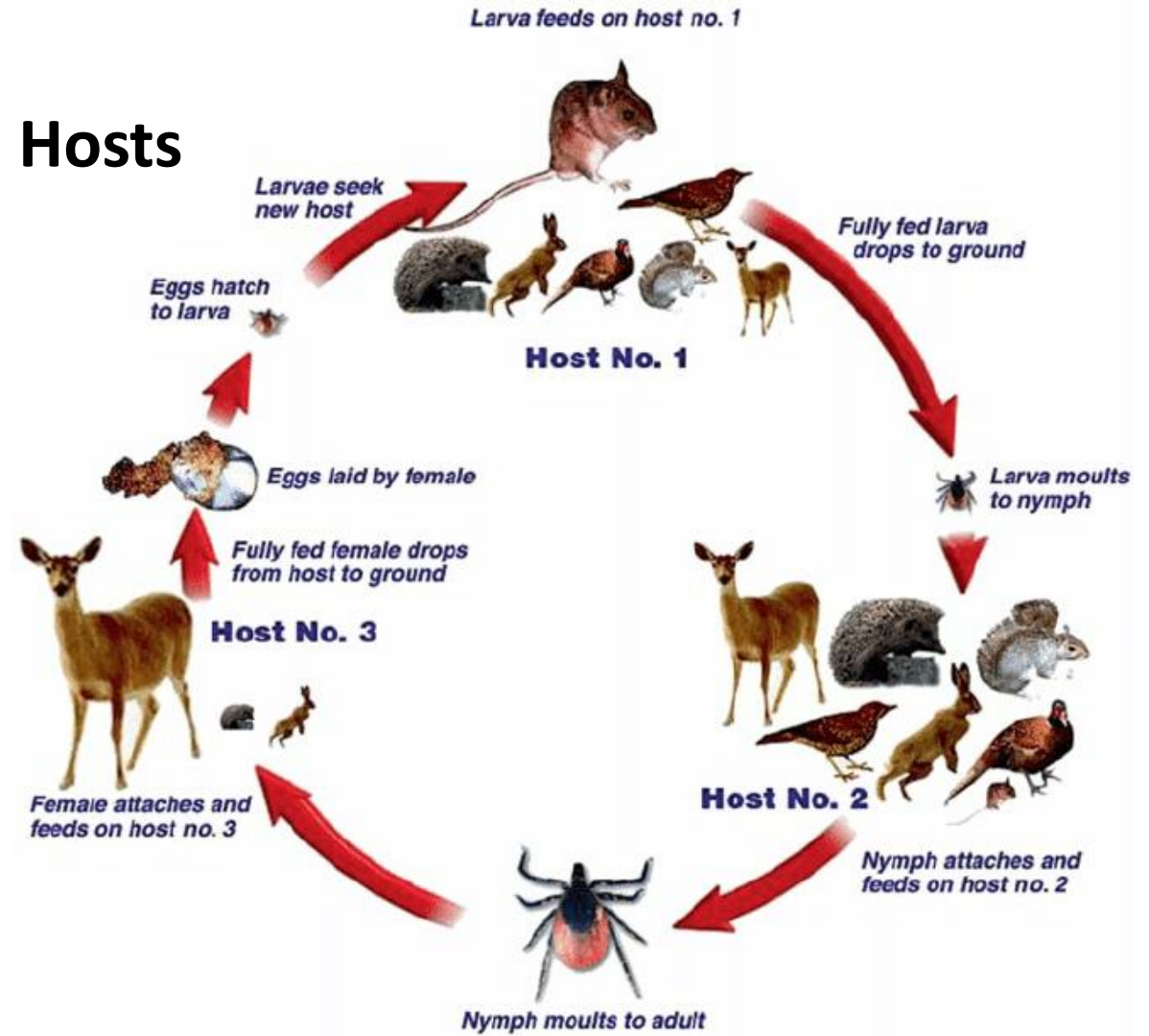
Lone Star Tick



Blacklegged Tick

# *Ix. Scapularis* Life Cycle and Associated Hosts

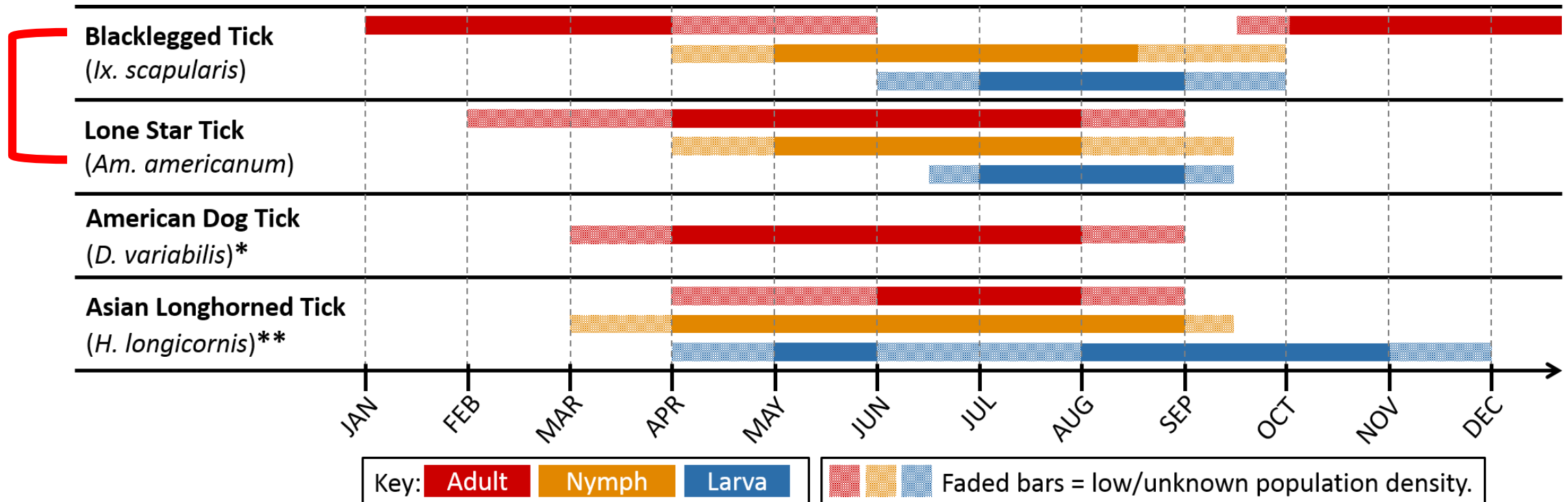
- The main host that is of concern for the Blacklegged tick (BLT) is the white-footed mouse *Peromyscus leucopus* (white-footed mouse).
  - *P. leucopus* natural reservoir of *Borrelia burgdorferi* SS, commonly known as Lyme.
- Although Deer are not implicated in the Lyme transmission, they are an important host to blacklegged adults.
- It is on the deer that the males and females blood-feed and mate, as a main contributor to the population growth of the tick.



The relative size of the animals approximates to their significance as hosts for the different tick life cycle stages in a typical woodland habitat.

Courtesy of Dr. Jeremy Gray and Bernard Kaye

# Tick Season Is Here: From May to Mid-July



\*Only the adult life stage of the American dog tick is known to bite humans.

\*\*Seasonality data for the Asian longhorned tick is incomplete across all life stages at this moment in time.

# Ten Tick-borne Diseases; their prevalence and number of cases counted in Virginia in a 10 - year period from 2011 to 2020

	Total	Confirmed ( % )	Probable
Lyme disease	12,216	8,481 (69.4 %)	3,735
Rocky Mntn. spotted fever (really RMSF ??*)	3,019	24 (0.9 %)	2,995
Ehrlichiosis ( <i>E. chaffeensis</i> )	1,060	519 (48.9 %)	541
Anaplasmosis	154	34 (22.1 %)	120
Tularemia	26	17 (65.4 %)	9
Babesiosis	19	15 (78.9 %)	4
Ehrlichiosis ( <i>E. ewingii</i> ) **	13	13 (100 %)	0
<i>Borrelia miyamotoi</i> disease	2	2 (100 %)	0
Powassan virus (tick-borne encephalitis )	2	2 (100 %)	0
Spotted Fever Rickettsiosis ( <i>R. parkeri</i> )	2	2 (100 %)	0

\* It is likely that the vast majority of patients testing seropositive for RMSF in VA had been infected with low/non-pathogenic *Rickettsia amblyommatis* sometime in the year or more before their positive test.

\*\* Ehrlichiosis cases caused by *Ehrlichia ewingii* are significantly under-reported in Virginia because most doctors use the "multiplex PCR assay" offered by Lab Corp, which does not test for *Ehrlichia ewingii* .

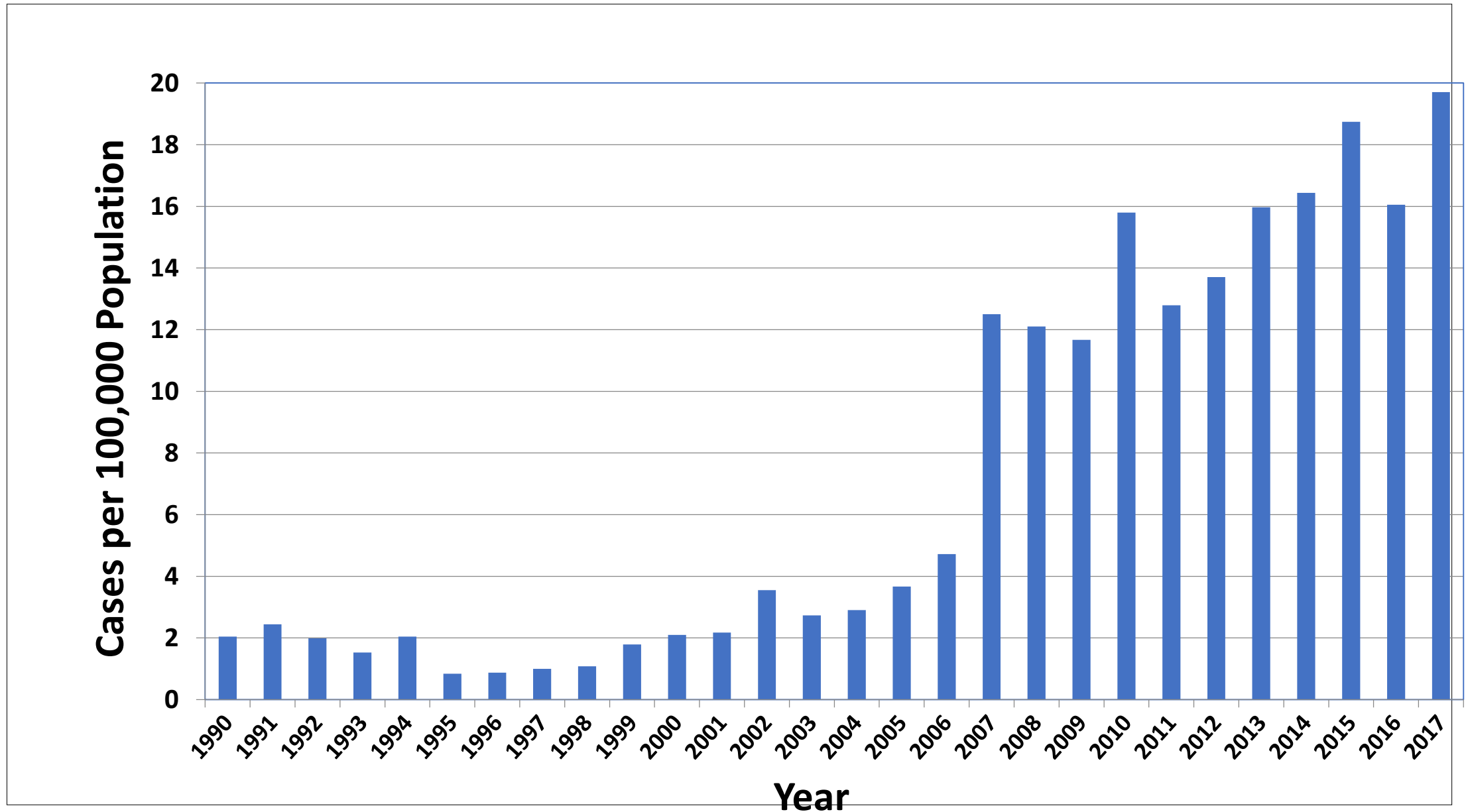
# Lyme Disease (*Borrelia burgdorferi*)

- Spread primarily by blacklegged ticks (*Ixodes scapularis*).
- Wide range of symptoms, can include: fever, rash, facial paralysis, and arthritis.
  - Early symptoms: fever, chills, headache, fatigue, muscle and joint aches, swollen lymph nodes.
    - These symptoms can occur independently of Erythema migrans (EM) rash.
  - EM rash (bull's-eye rash)
    - 70 – 80% of infected persons.
    - Takes 3-30 days to develop after tick bite (avg. 7 days).
    - Gradually expands over several days reaching up to 12 inches in diameter.
- Treatable with antibiotics like doxycycline.



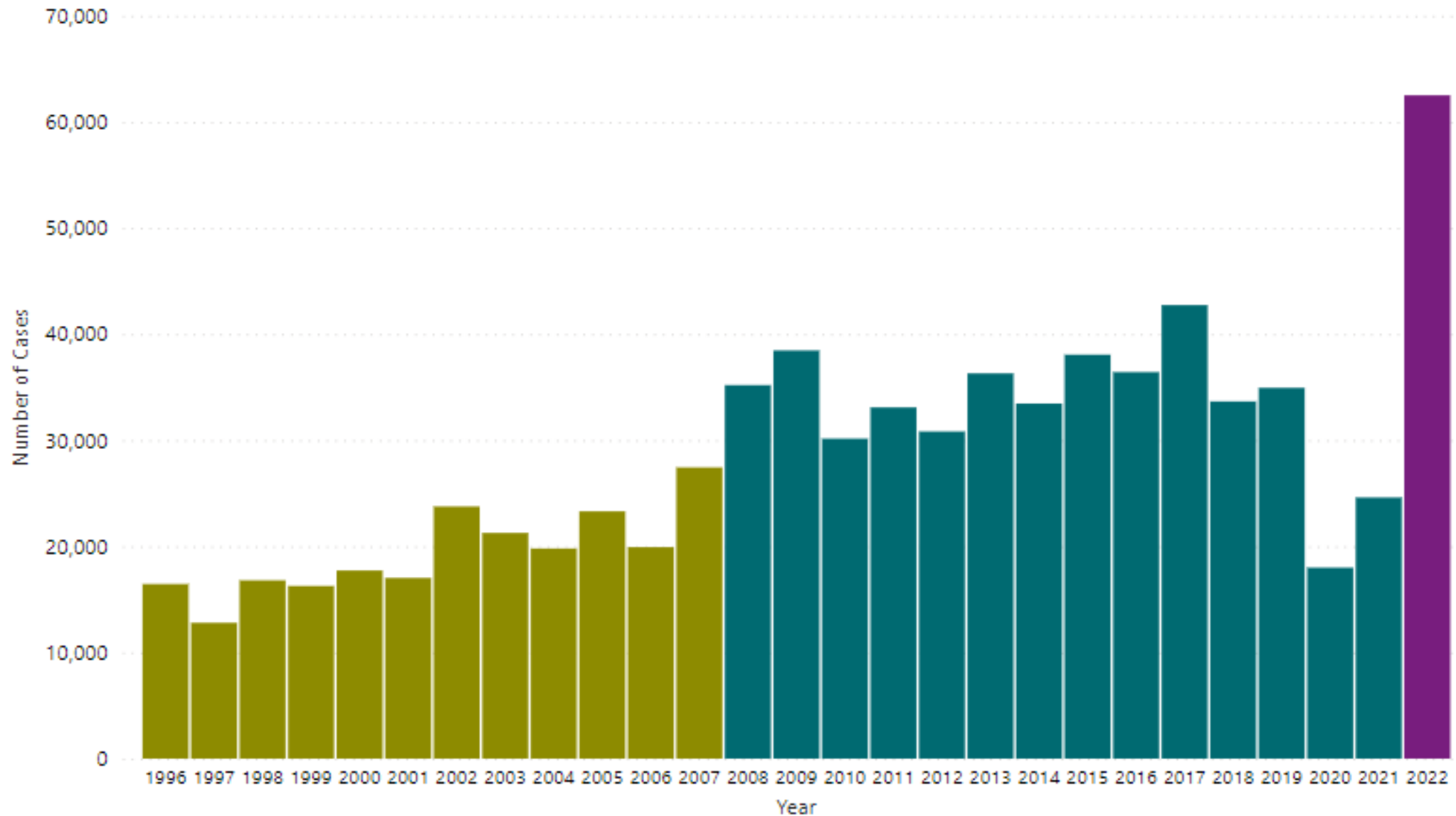
Source: CDC.gov

# Lyme Disease Incidence in Virginia, 1990 - 2017



# Lyme Disease – Total Reported Cases by Year, United States

● 1996 Case Definition ● 2008 Case Definition ● 2022 Case Definition



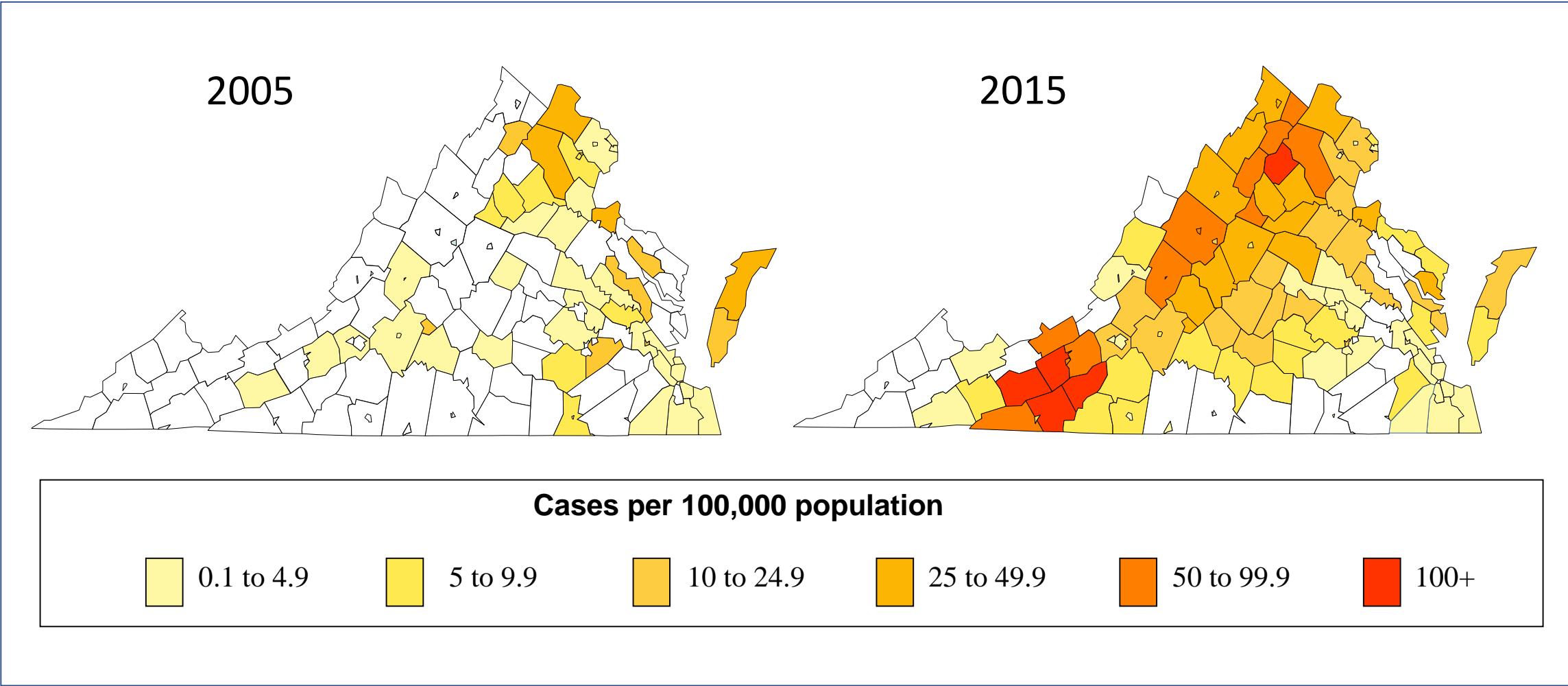
\*These data were reported according to different Lyme disease case definitions. Only major case definition changes are denoted.

Last Reviewed: February 14, 2024

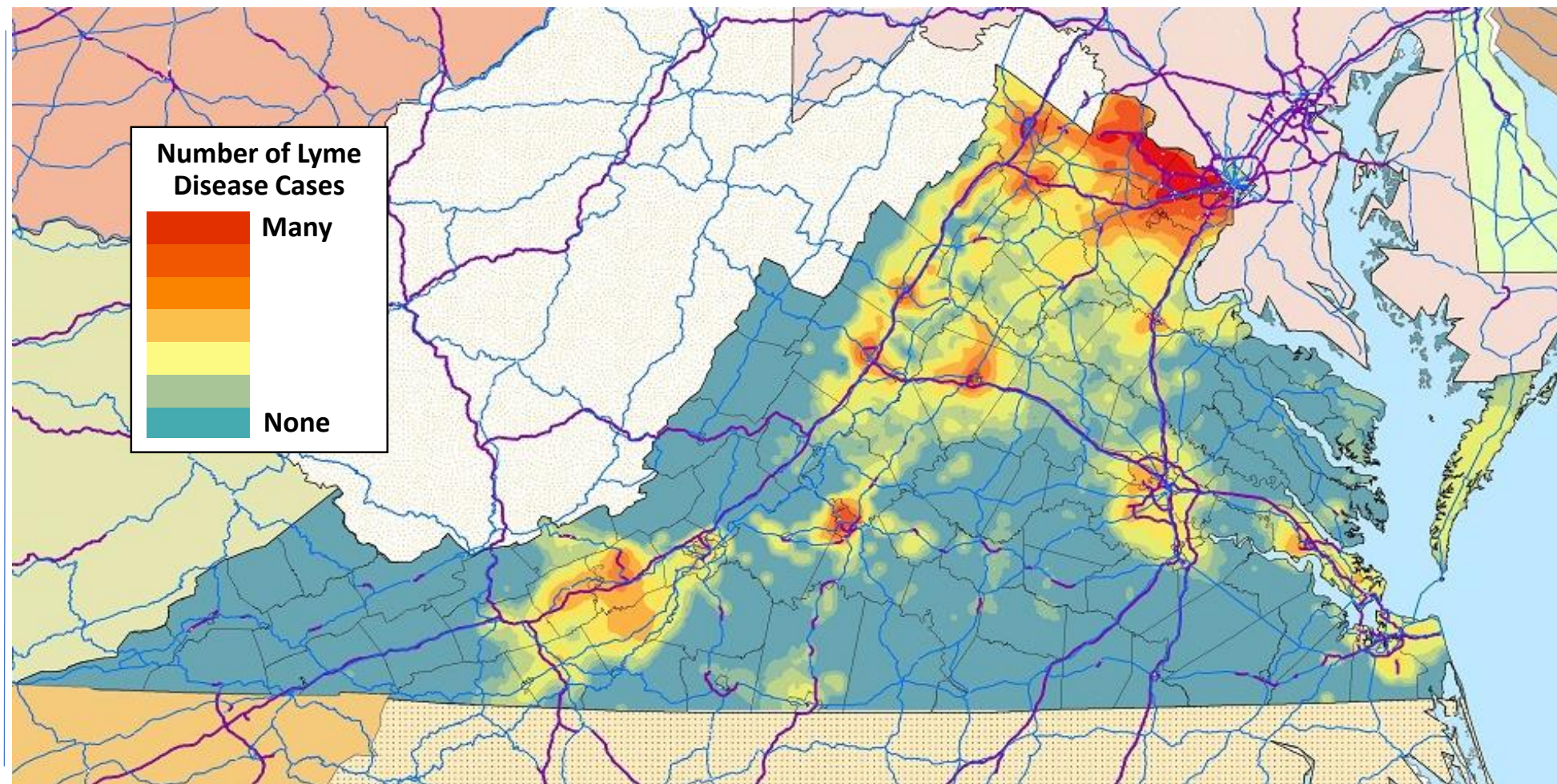
Source: [Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases \(NCEZID\), Division of Vector-Borne Diseases \(DVBD\)](#)



# Change in Lyme Disease Rate by County from 2005 to 2015



## Geographic distribution of Lyme disease cases<sup>^</sup> counted in Virginia from 2008 to 2015, (based on the number of cases per unit area\*)



<sup>^</sup> Approximately 12,000 cases, total. \* Map shows the number of cases per unit area = cases per 5.25 mile square in a grid pattern overlaid on Virginia map; Note, this map was created using empirical Bayesian Kriging .

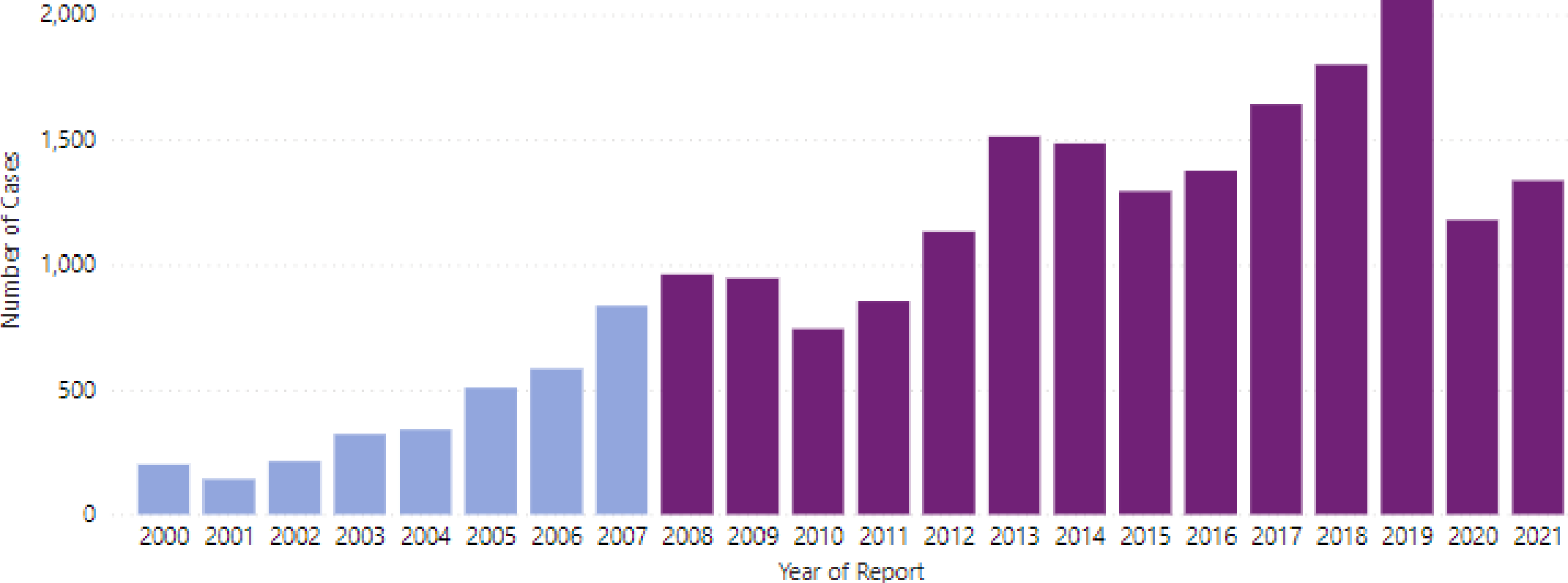
# Ehrlichiosis (*Ehrlichia chaffeensis*, *E. ewingii*)

- Spread primarily by the lone star tick (*Amblyomma americanum*).
- Early symptoms: fever, severe headache, muscle aches, nausea, emesis, diarrhea, confusion.
  - Rash: mostly in children, with splotchy or pinpoint dots (not a bull's-eye).
- Late symptoms: damage to brain/nervous system, respiratory failure, uncontrolled bleeding, organ failure, death.

Treatable with antibiotics like doxycycline.

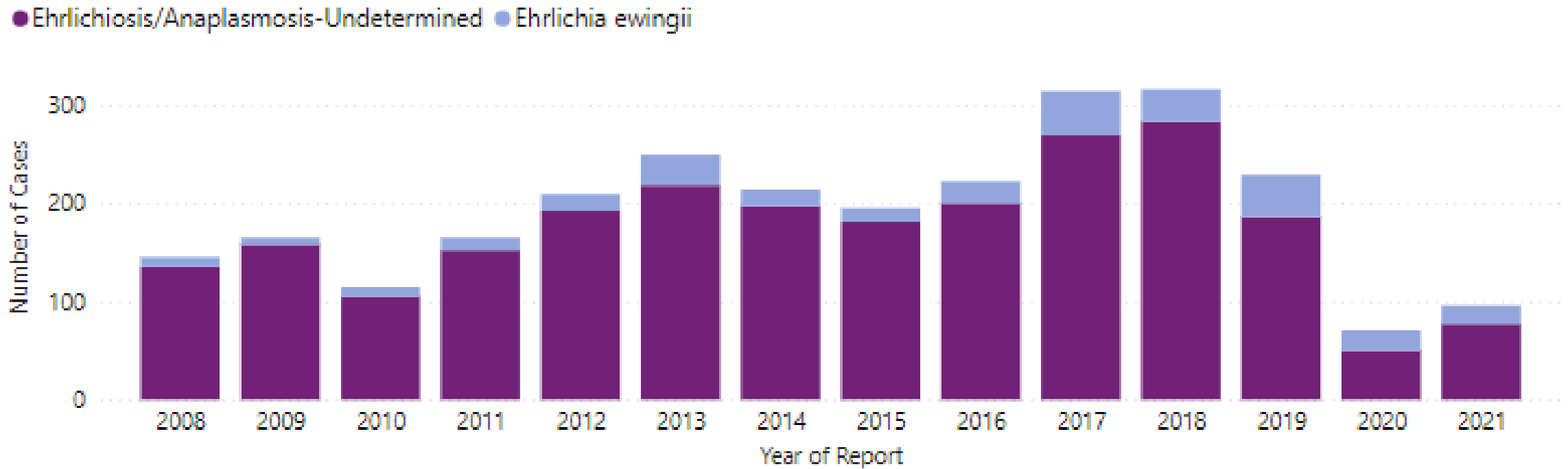
# Number of reported cases of *Ehrlichia chaffeensis* ehrlichiosis –United States, 2000–2021

● Before 2008 ● After 2008



Last Reviewed: February 14, 2024  
Source: [Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases \(NCEZID\), Division of Vector-Borne Diseases \(DVBD\)](#)

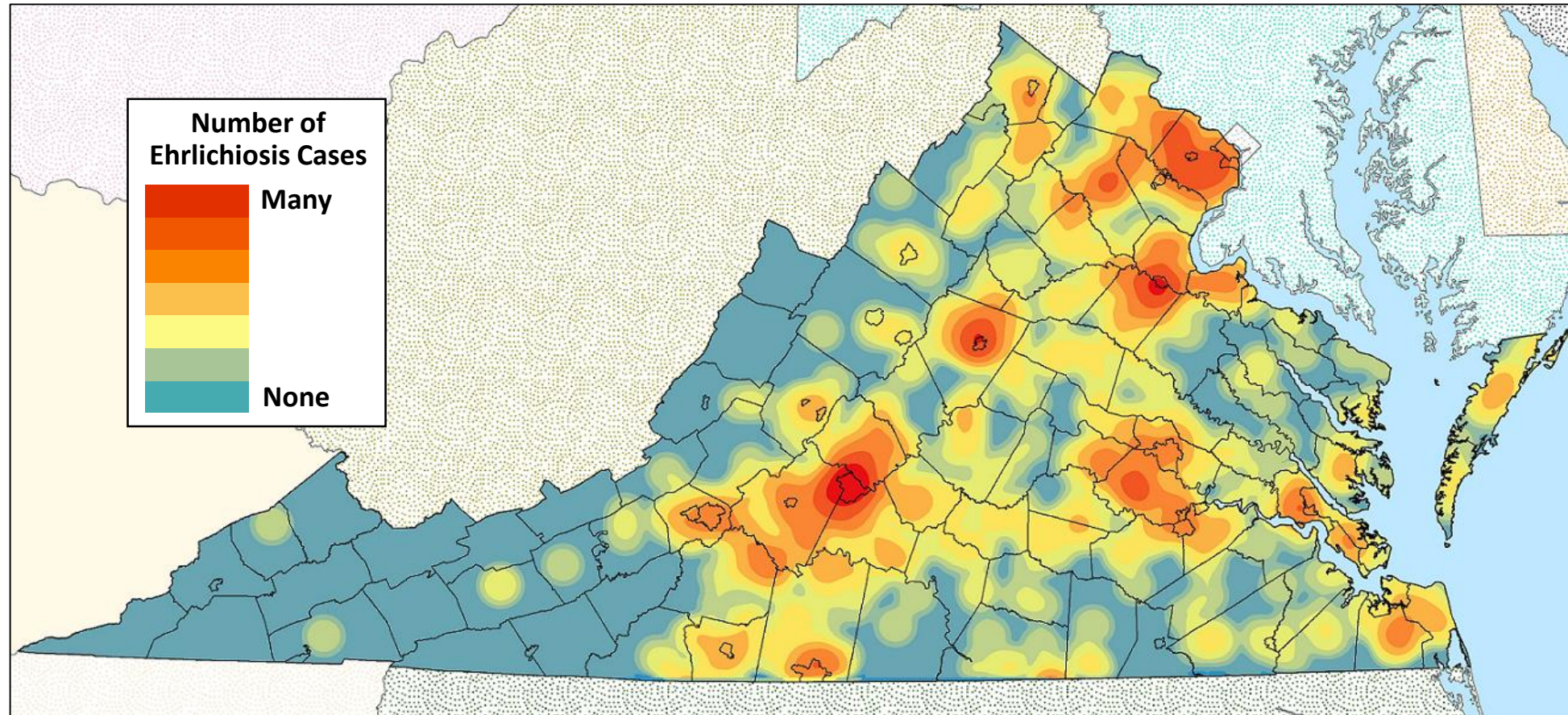
## Number of reported cases of *E. ewingii* and undetermined ehrlichiosis/anaplasmosis –United States, 2008–2021



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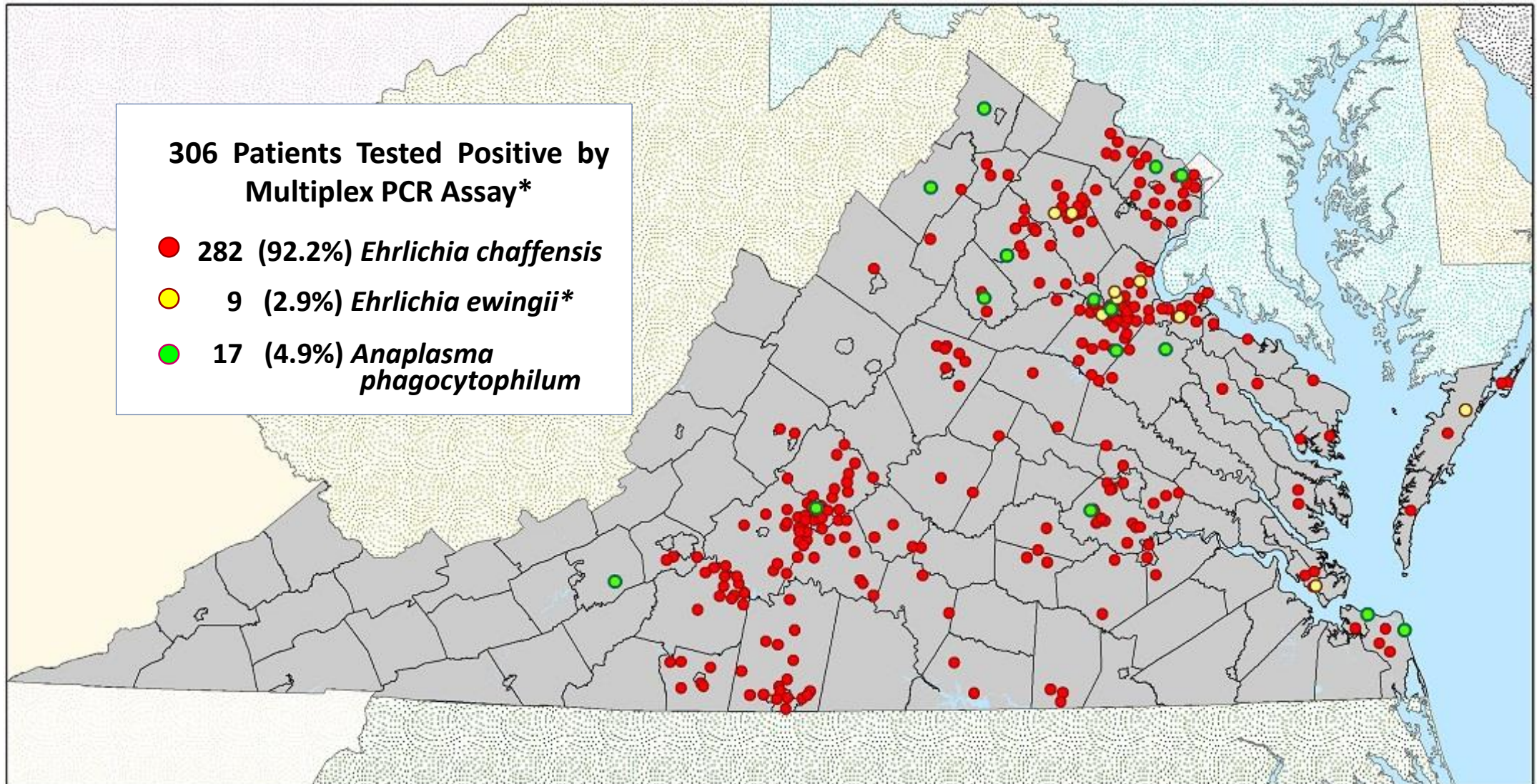
Source: [Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases \(NCEZID\), Division of Vector-Borne Diseases \(DVBD\)](#)

Geographic distribution of Ehrlichiosis cases in Virginia from 2008 to 2019  
(based on the patient residential address, and number of cases per unit area\*)



**Ehrlichiosis case data compiled from 2008 to 2019 are based on 1,111 cases.**

# Ehrlichiosis and Anaplasmosis Cases Identified by Multiplex PCR Assays from 2006 through 2015



\* *Ehrlichia ewingii* cases are only identified in patients tested by the Mayo Clinic Lab; The Lab Corp Multiplex Assay does not test for *E. ewingii*, and unfortunately, most hospitals and doctors in VA use Lab Corp as their primary diagnostic lab.

# Rocky Mountain Spotted Fever (*Rickettsia rickettsii*)

- Spread primarily by the American dog tick (*Dermacentor variabilis*) and the brown dog tick (*Rhipicephalus sanguineus*).
  - Lone star tick capable of vectoring RMSF.
- Early symptoms: non-specific but can rapidly progress to more serious illness if left untreated.
  - Fever, headache, rash, nausea, vomiting, stomach pain, muscle pain, loss of appetite.
  - Rash: develops 2-4 days after fever begins, red splotches or pinpoint dots. Almost all patients will develop rash, but it does not appear in early illness.
- Can be fatal if left untreated!
- Treatable with antibiotics like doxycycline.

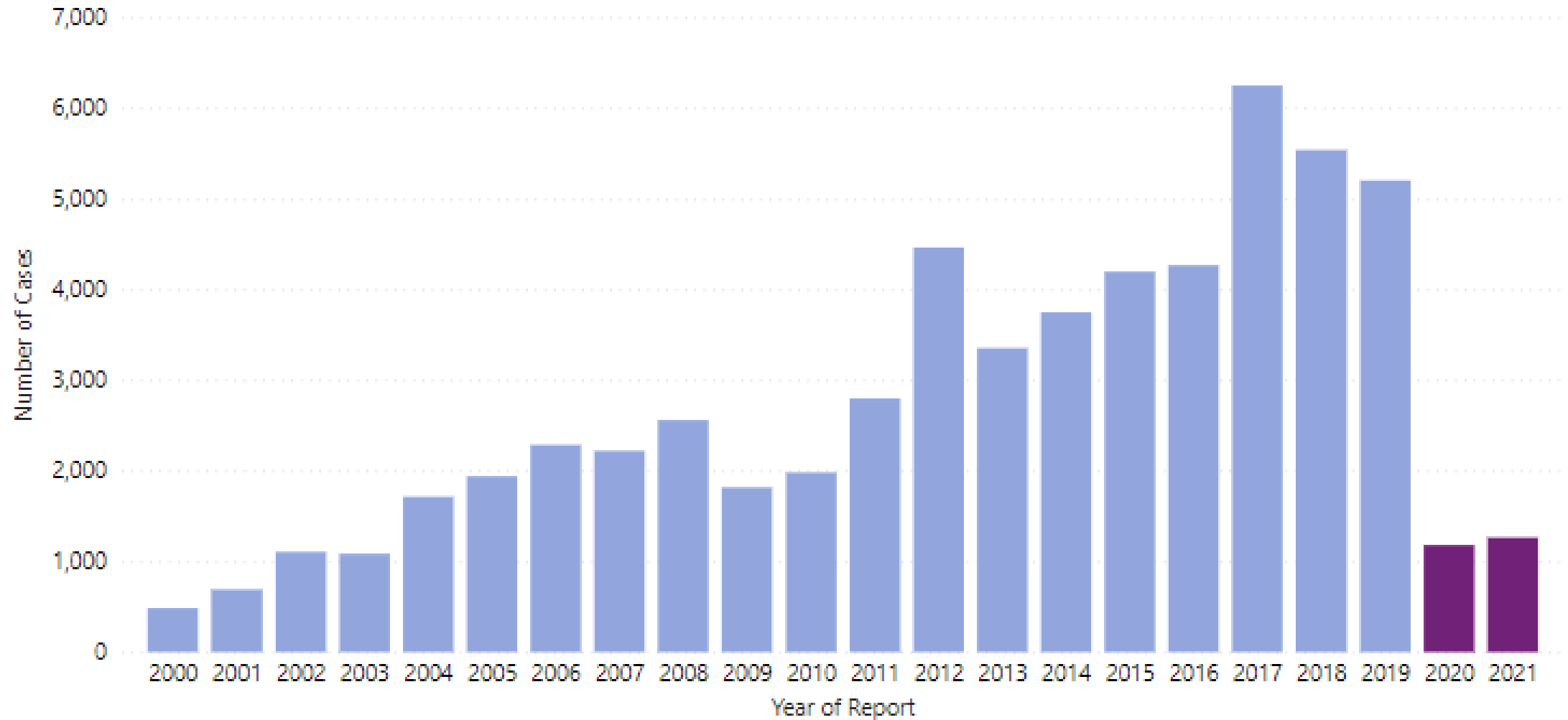


Source: CDC.gov



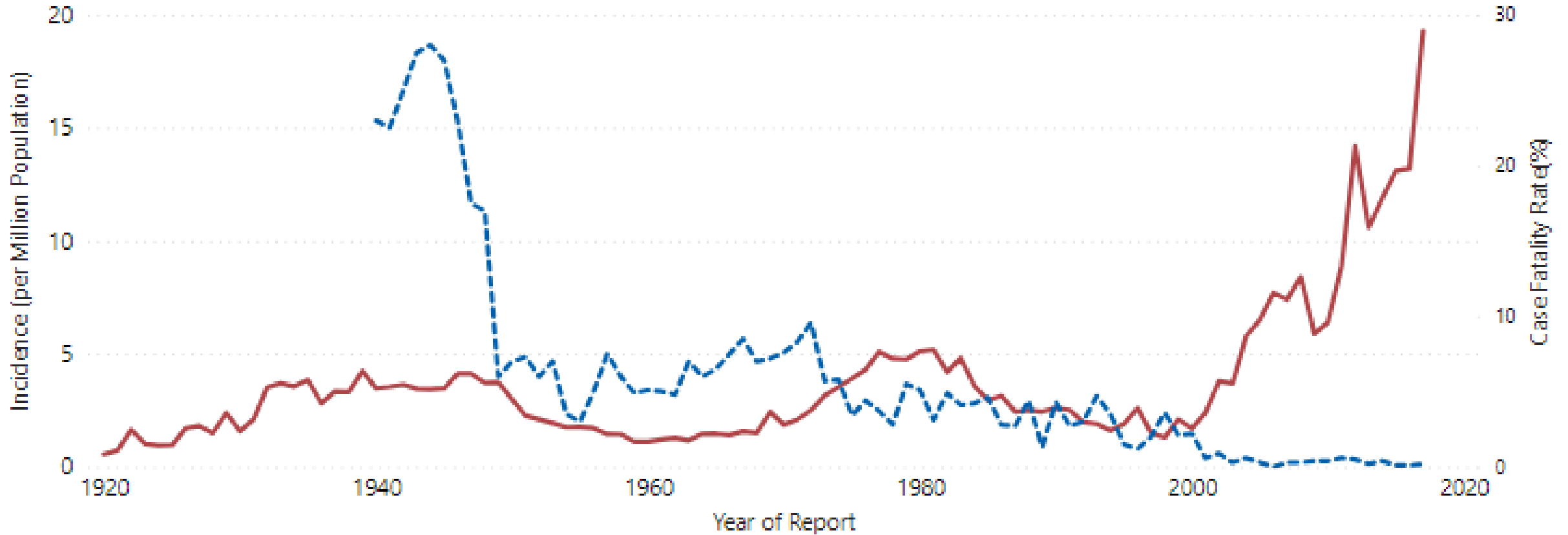
## Number of reported cases of spotted fever rickettsiosis –United States, 2000–2021

● After 2020 ● Before 2020



## Reported incidence and case fatality of SFR in the United States, 1920–2017

● Incidence (per Million Population) ● Case Fatality Rate (%)



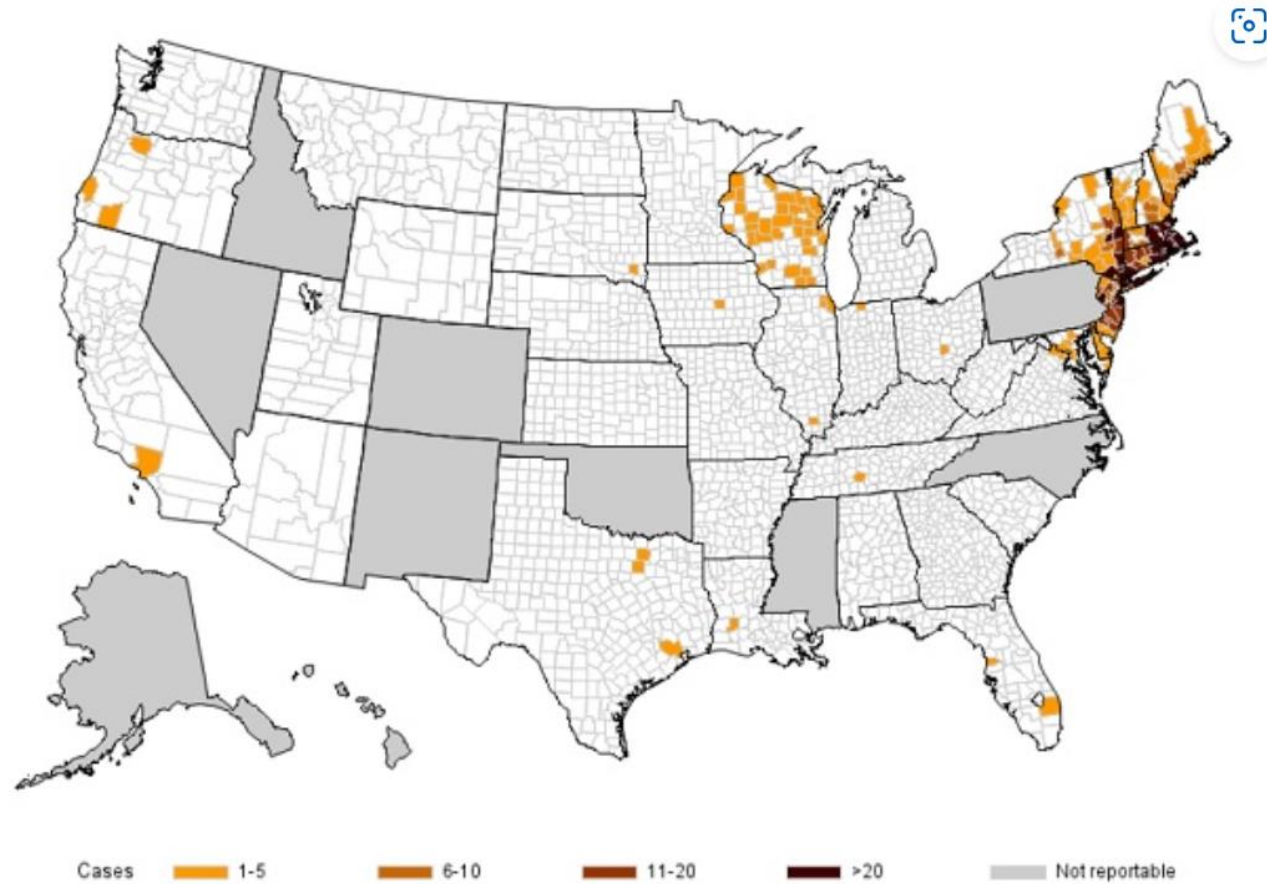
Last Reviewed: February 14, 2024

Source: [Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases \(NCEZID\), Division of Vector-Borne Diseases \(DVBD\)](#)

# Babesiosis (*Babesia microti*)

- **Spread primarily by blacklegged ticks (*Ixodes scapularis*).**
  - Parasite can be spread by contaminated blood transfusion.
  - Infects red blood cells, can cause hemolytic anemia (destruction of RBCs).
- **Symptoms: fever, chills, sweats, headache, body aches, loss of appetite, nausea, or fatigue.**
  - Can start in a week or two, can develop within few weeks or months, sometimes longer.
- **Can be severe, life-threatening particularly in people who:**
  - Do not have spleen, have weak immune system, have other serious health conditions, and/or are elderly.
- **NOT TREATABLE WITH ANTIBIOTICS ALONE!**
  - Need antibiotic + antiparasitic drug combination.

# Number\* of reported cases of babesiosis, by county of residence — 40 states, 2020<sup>†, ‡</sup>



\* N = 1,826; county of residence was known for all but 1 (<1%) of the 1,827 total case-patients. See the Appendix for the maps for surveillance years 2011–2019.

† Year as reported by the health department.

# How to Protect Yourself: Use of Repellents and Pesticides

- The best way to decrease the risk of tick-borne disease is to reduce one's exposure to ticks.
- First, limit the time you spend in brushy or wooded areas to decrease the potential for contact with ticks.
- Tick checks are highly recommended after being in the field, particularly in an area with known tick populations.
- You can also apply EPA-registered repellents containing 20 percent or more of DEET, picaridin, or IR3535 onto exposed skin. Always read the label to ensure proper use of permethrin and repellent products.



# Preventing Tick Bites

- If you must enter these environments, it is important to wear appropriate clothing such as long sleeves and pants.
- Clothing can also be treated with permethrin, which will kill any ticks that climb onto treated clothing.
- Pant legs should be tucked into socks, and shirts should be tucked into pants.
- Lastly: it is important to check yourself for any embedded ticks immediately when returning from the field. Remove any ticks promptly using tweezers, and keep a watchful eye on the area where you were bitten.



# What if a Tick Bit Someone?

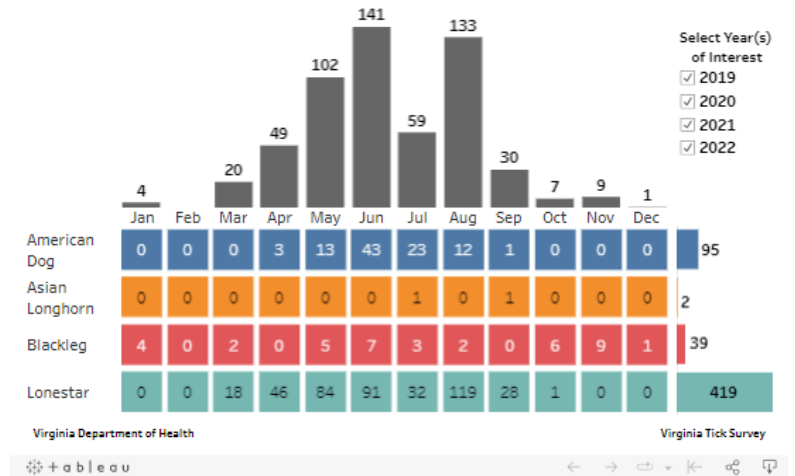
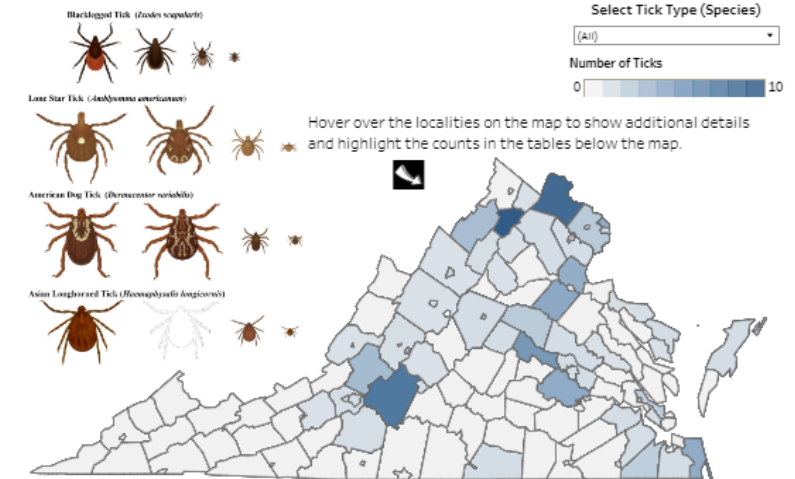
## Virginia Tick Survey:

- Does VDH test ticks for diseases? This is not something that we offer, nor does the CDC.
- Best approach is to identify the biting tick to species:
  - Each species of tick has adapted to carry specific pathogens (with a few exceptions)
  - Knowing what tick bit someone can help with treatment.
- Central office offers to ID citizen's samples and we de-identify the data and make public facing maps.



### Virginia Citizen Tick Survey

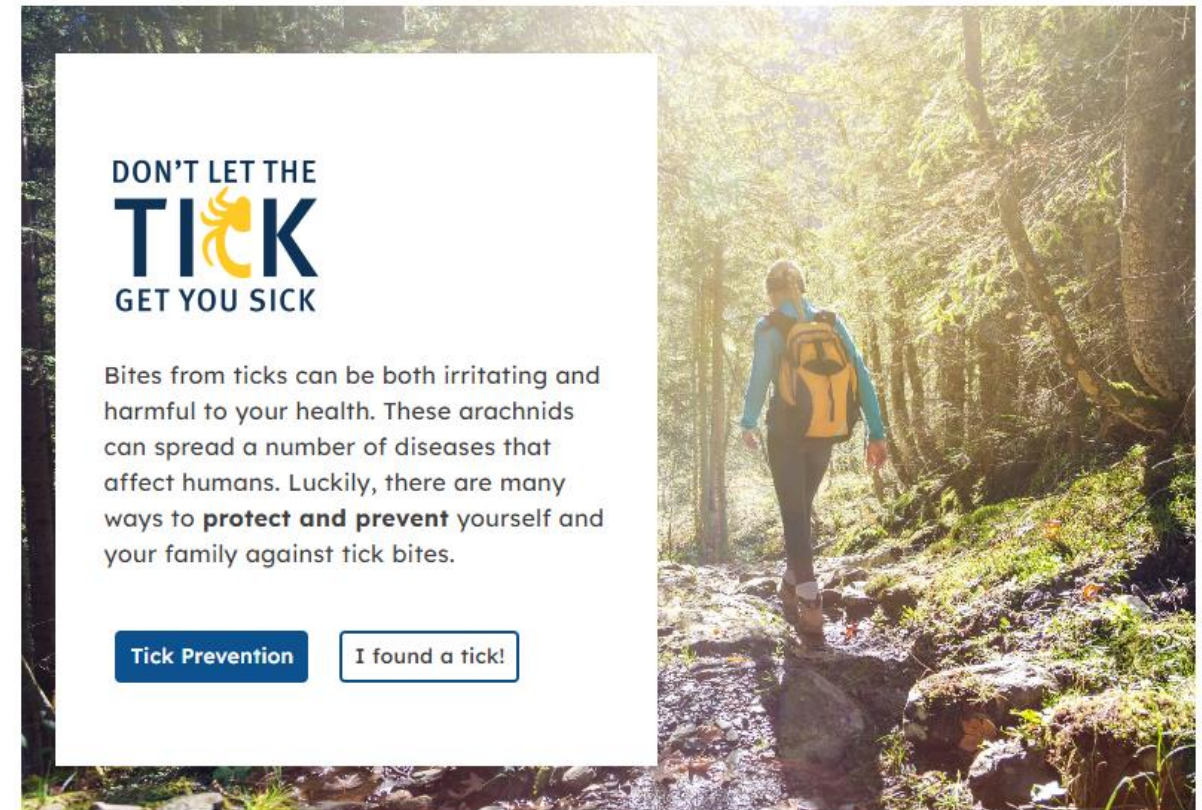
This page displays the number of ticks submitted by each county through the Virginia Citizen Tick Survey. Use the 'Select Tick Type (Species)' control to filter changes on the dashboard.



# Websites With Useful Tickborne disease Info

- CDC website: Ticks Home (searchable via google).
  - Breakdown of tick-borne diseases and conditions.
  - Houses nation-wide data.
  - Communications resources.
- VDH Tick Website: [Ticks - Ticks \(virginia.gov\)](https://www.vdh.virginia.gov/ticks)
  - Public-facing website.
  - Covers tick prevention, tick removal, tick ID, and information for tick illnesses.

## TICKS

A person with a backpack is hiking on a rocky trail in a sun-dappled forest. A white rectangular overlay is positioned on the left side of the image, containing text and buttons.

**DON'T LET THE  
TICK  
GET YOU SICK**

Bites from ticks can be both irritating and harmful to your health. These arachnids can spread a number of diseases that affect humans. Luckily, there are many ways to **protect and prevent** yourself and your family against tick bites.

[Tick Prevention](#) [I found a tick!](#)

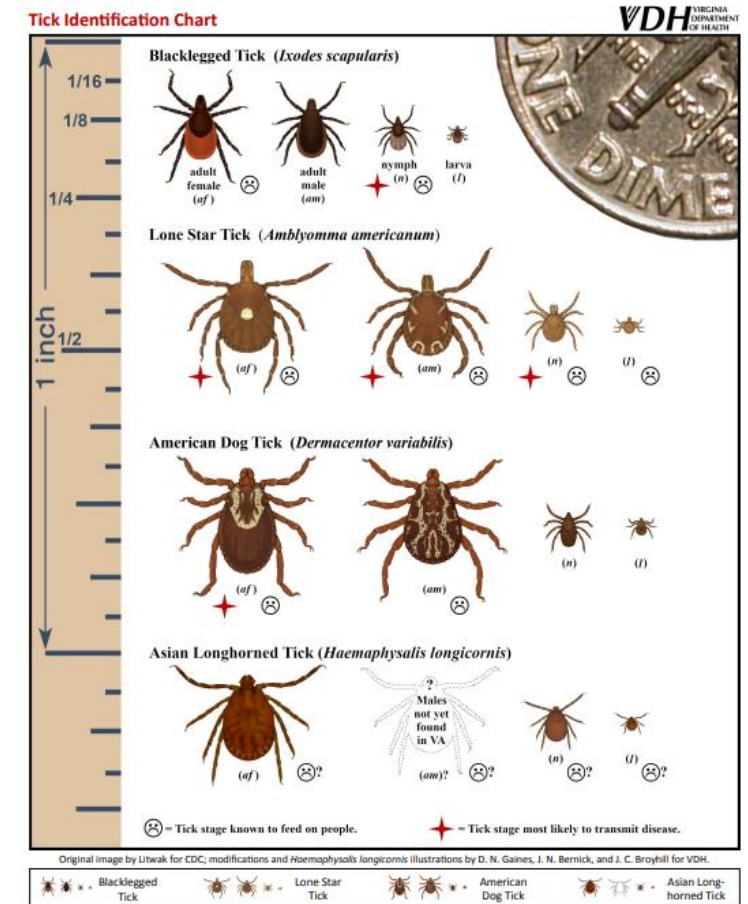


# Resources Available to You

## Tick and Tick-borne Diseases of Virginia Flyer:

- Outlines the various tick species, seasonality, minimum feeding time for disease transmission, and symptoms of the disease.
- Useful tool if public reaches out to LHD with tick questions.
- Can get digital version on our website, just look up “ticks of Virginia” flyer.

## Ticks and Tick-borne Diseases of Virginia



# Questions?

## The VBD Team:

- Jim Broyhill [james.broyhill@vdh.virginia.gov](mailto:james.broyhill@vdh.virginia.gov)
  - Vectorborne Disease Epidemiologist
- David Gaines [david.gaines@vdh.virginia.gov](mailto:david.gaines@vdh.virginia.gov)
  - State Entomologist
- Lori Flammia [lori.Flammia@vdh.virginia.gov](mailto:lori.Flammia@vdh.virginia.gov)
  - Deputy Vectorborne Epidemiologist
- Joshua Bernick [josh.bernick@vdh.virginia.gov](mailto:josh.bernick@vdh.virginia.gov)
  - Rabies and Tickborne Epidemiologist
- Elizabeth Forrey [Elizabeth.forrey@vdh.virginia.gov](mailto:Elizabeth.forrey@vdh.virginia.gov)
  - Tick Surveillance Coordinator

