

# Zoonotic Diseases in Tennessee

## East Tennessee Environmental Conference, 2008

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# What are zoonotic diseases?

- Diseases caused by infectious agents that can be transmitted between animals and people
- There are a number of zoonotic diseases in Tennessee.

# Overview

- **West Nile virus—spread, symptoms, prevention**
- **Rocky Mountain Spotted Fever—distribution, symptoms, prevention**
- **Rabies—epidemiology in the U.S. and Tennessee, emerging raccoon-variant rabies**

# West Nile Virus



# West Nile Virus

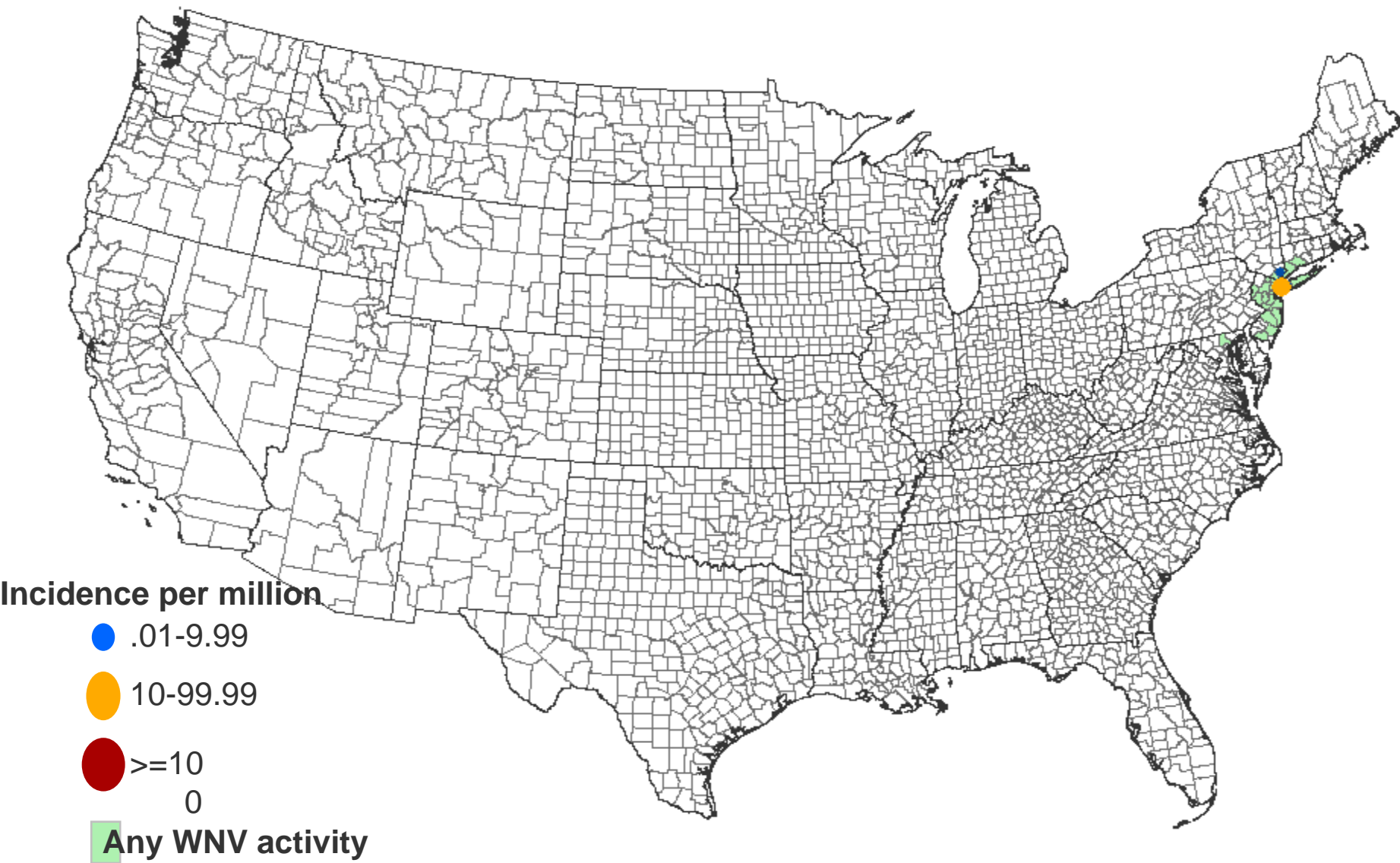
- Spread by the bite of an infected mosquito
- Symptoms vary from none to flu-like illness to meningitis, to death.
- In cooler parts of the United States, infections usually occur in summer and early fall
- In warmer parts of the U.S., the virus can be transmitted all year



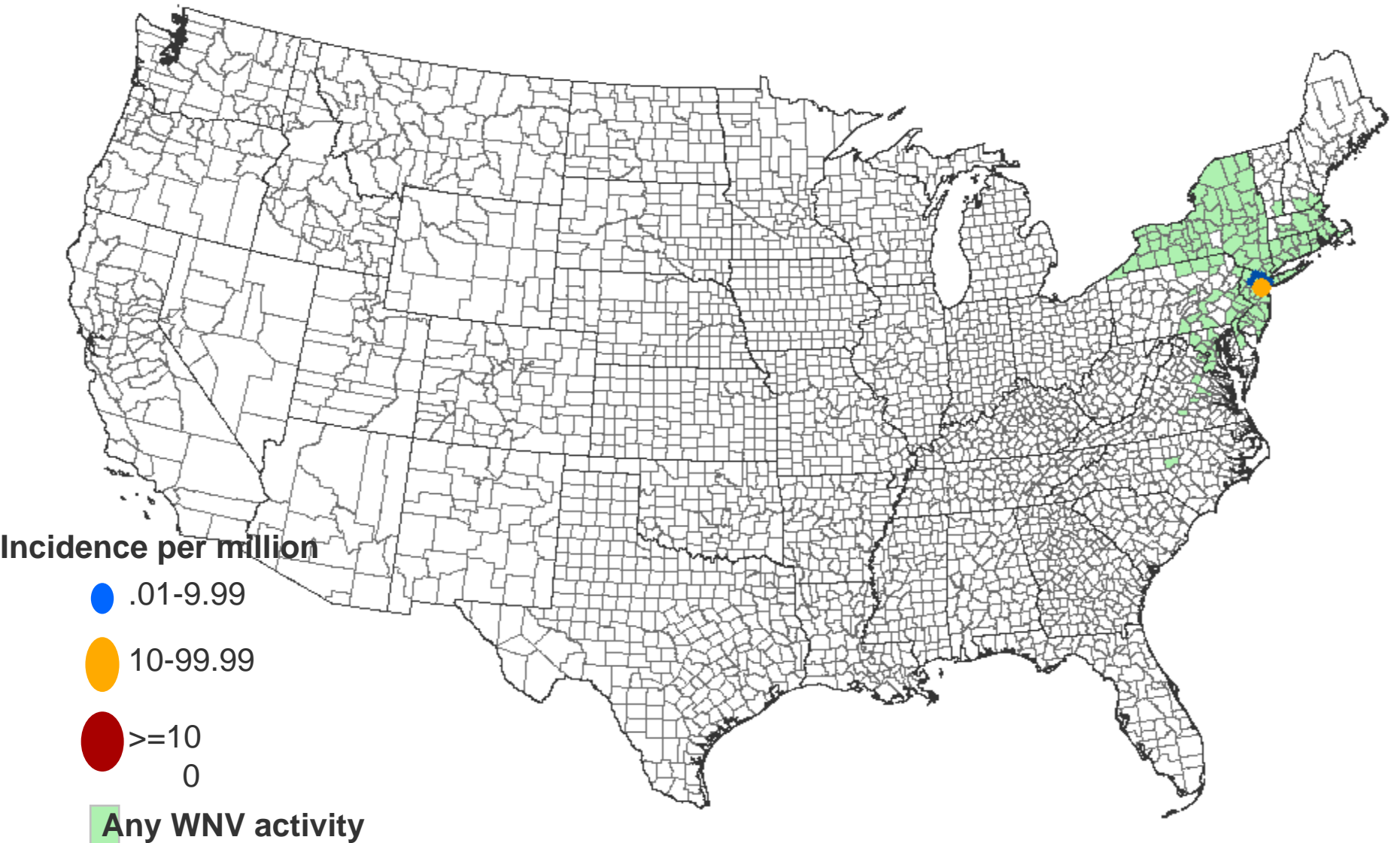
# West Nile Virus

- **Introduced into New York City in 1999**
- **Moved westward—documented in 48 states since 1999**
- **Tennessee 2007:**
  - **11 documented human cases**
    - **5 Encephalitis / meningitis**
    - **3 fever**
    - **3 other clinical unspecified**
    - **1 death**

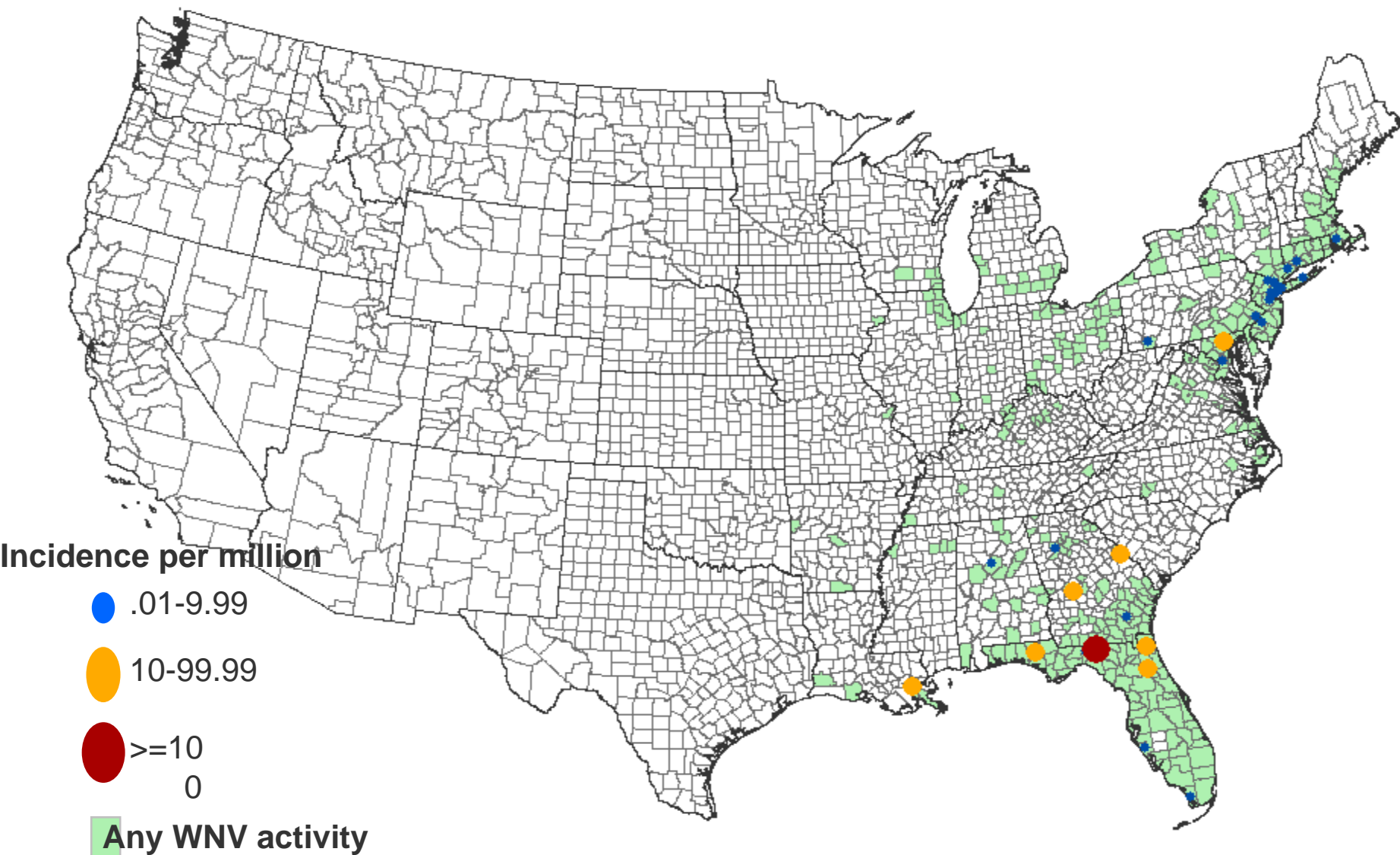
# West Nile Neuroinvasive Disease Incidence by County, 1999 (54 cases)



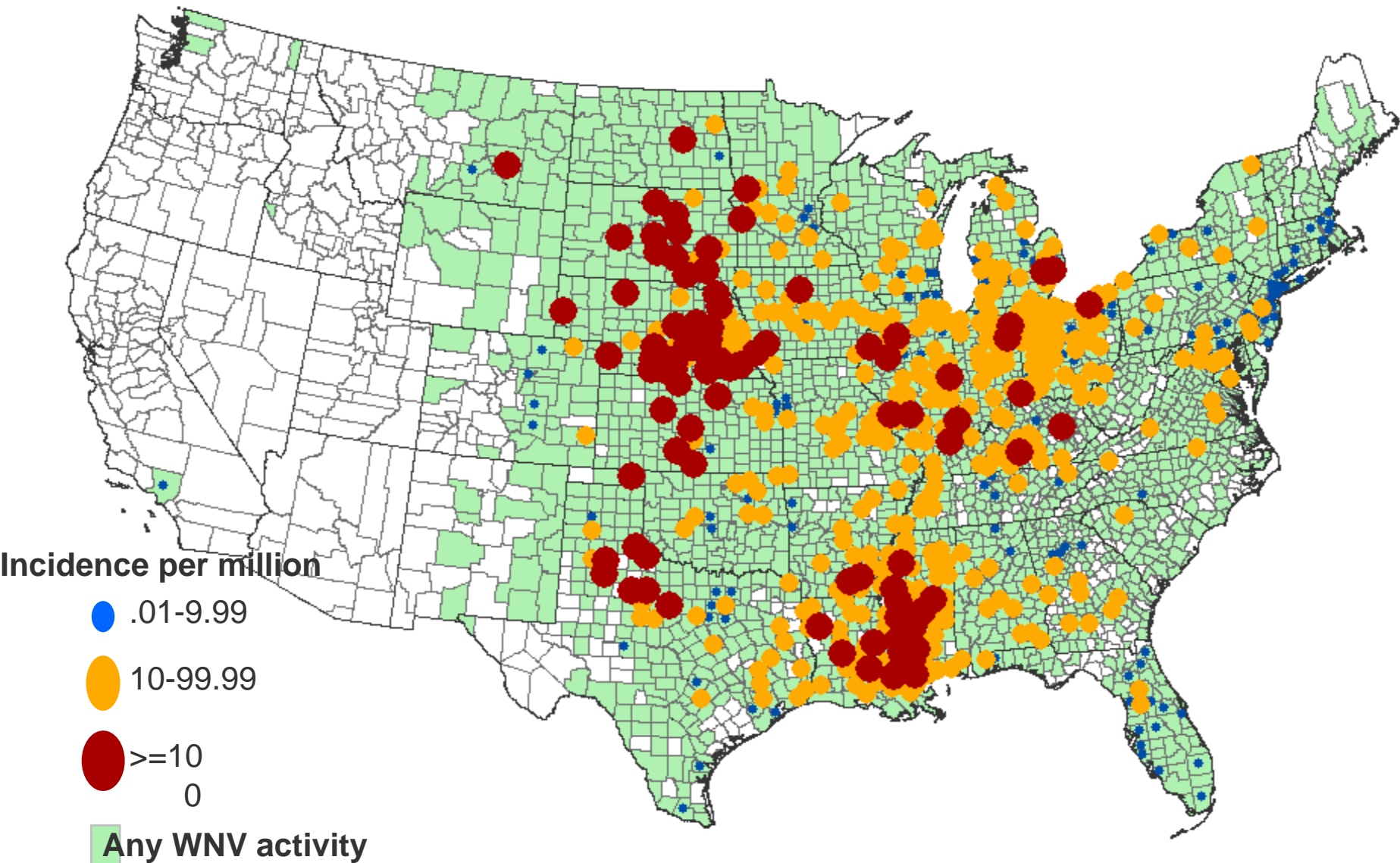
# West Nile Neuroinvasive Disease Incidence by County, 2000 (19 cases)



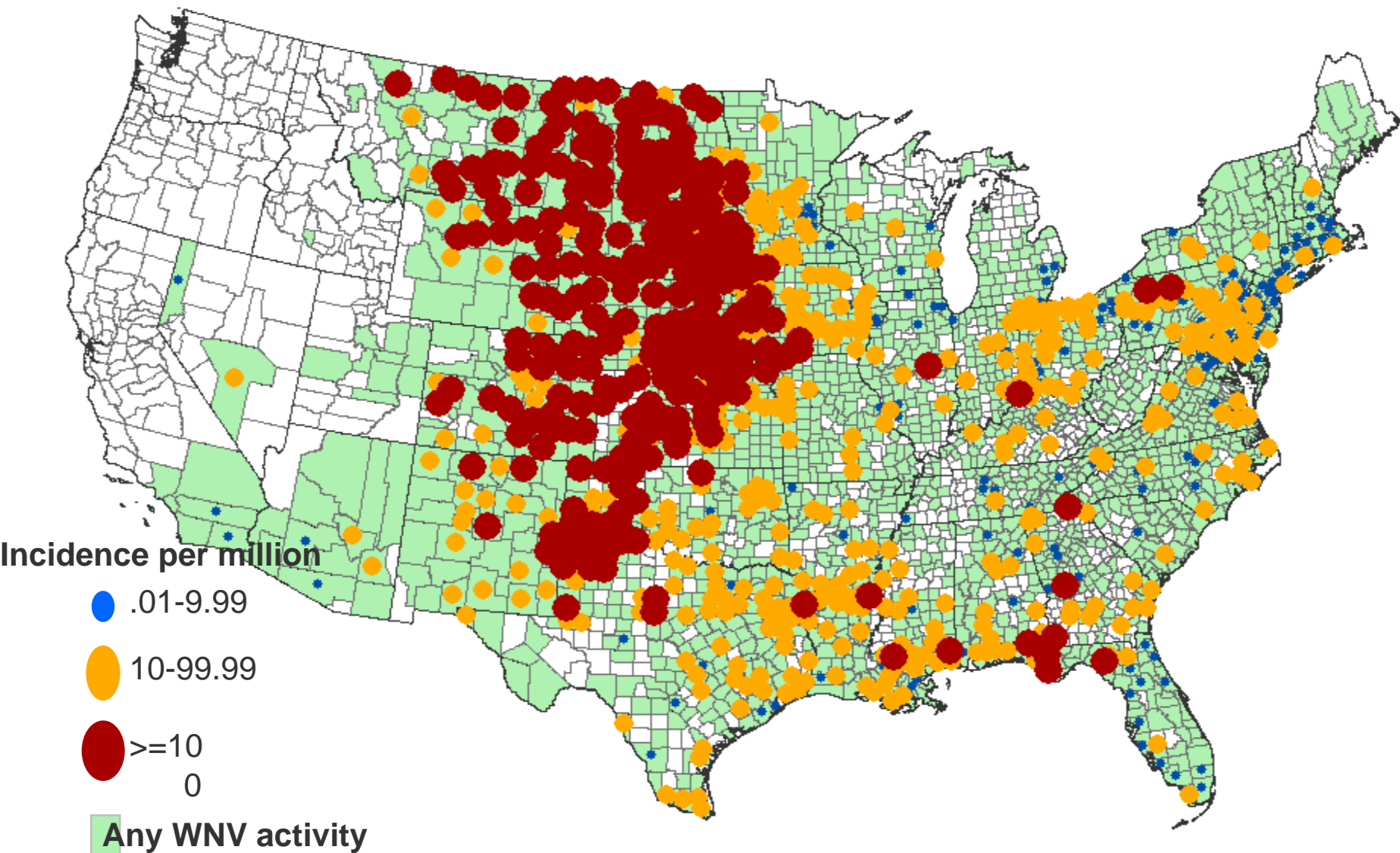
# West Nile Neuroinvasive Disease Incidence by County, 2001 (64 cases)



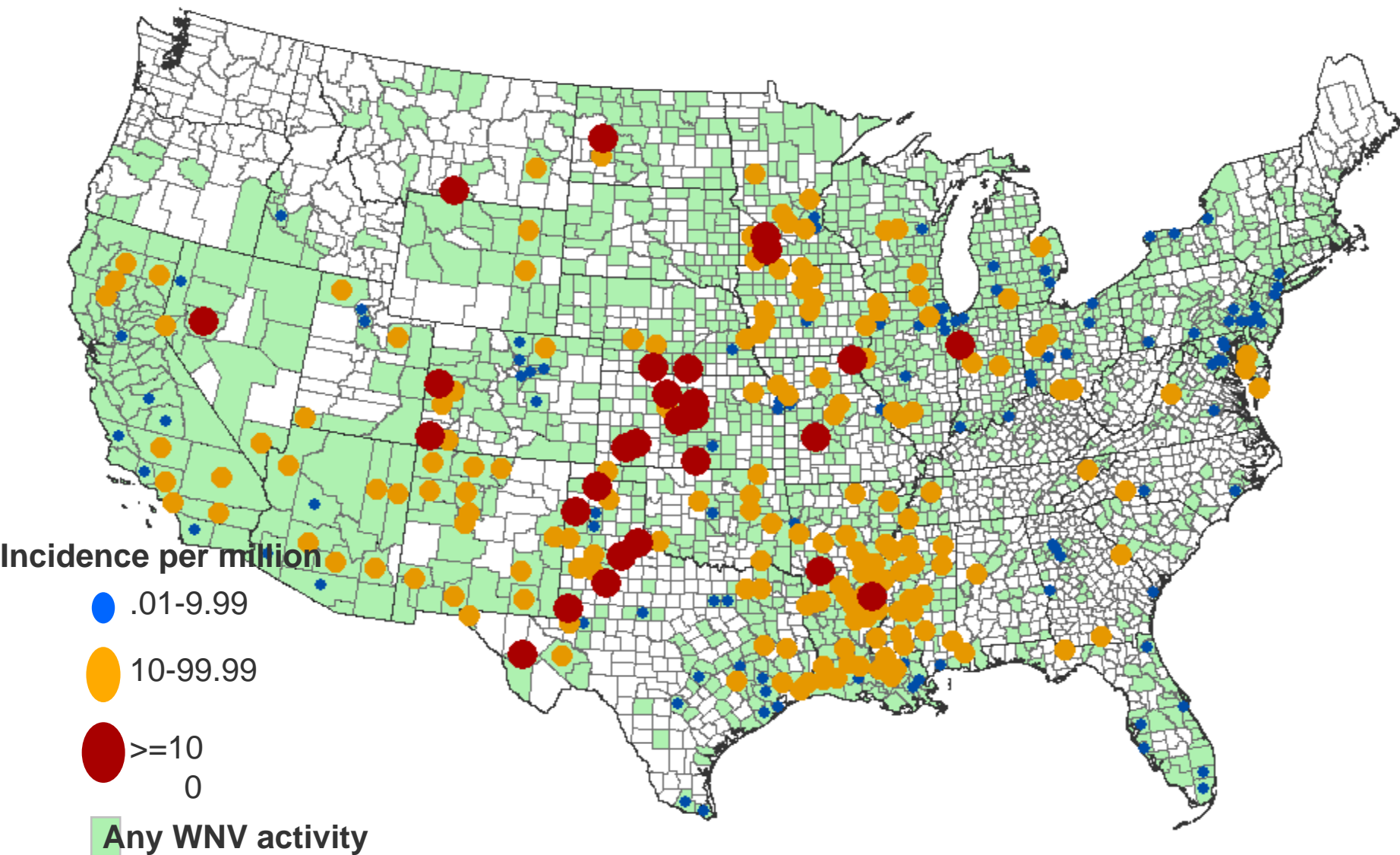
# West Nile Neuroinvasive Disease Incidence by County, 2002 (2946 cases)



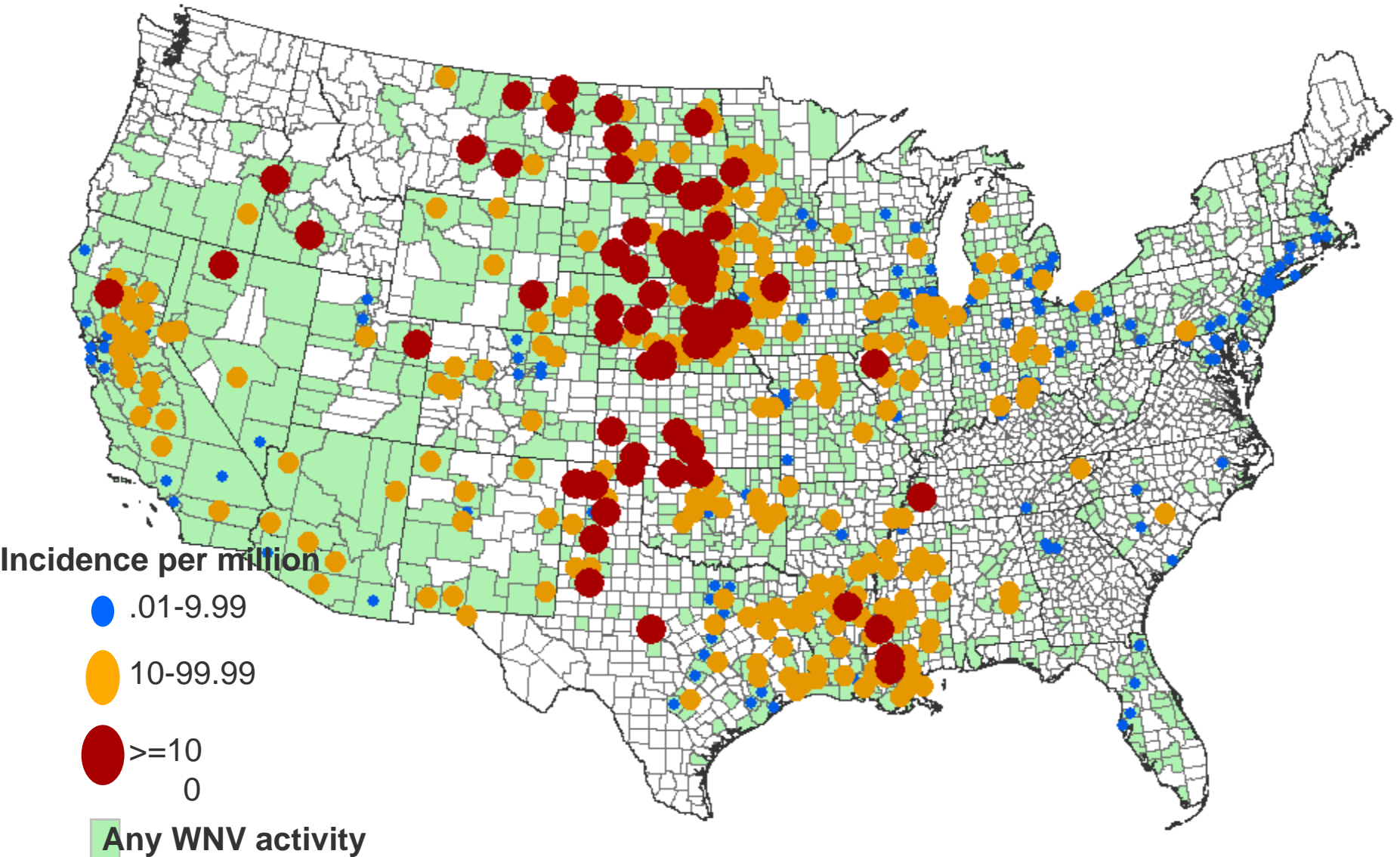
# West Nile Neuroinvasive Disease Incidence by County, 2003 (2866 cases)



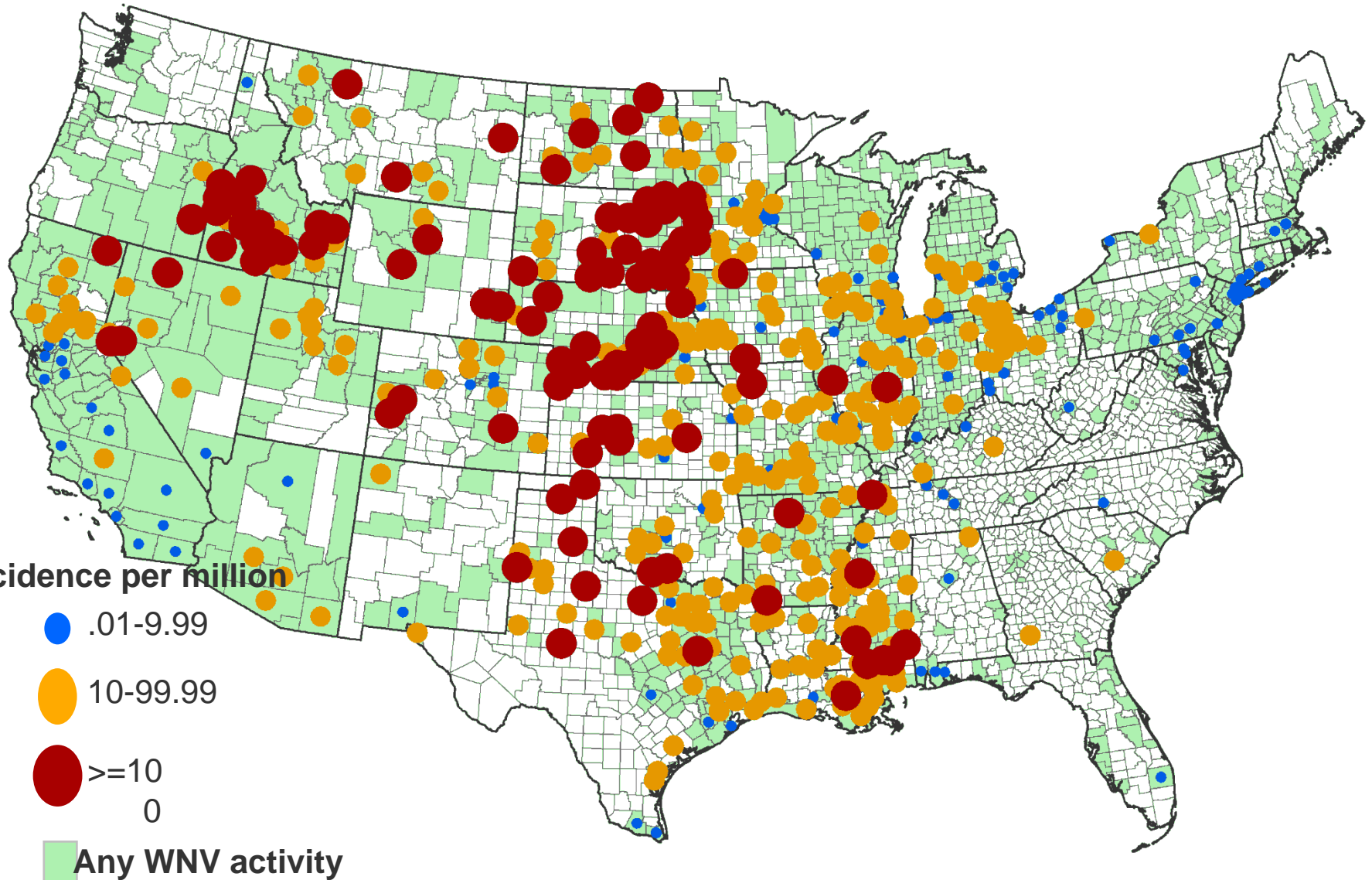
# West Nile Neuroinvasive Disease Incidence by County, 2004 (1142 cases)



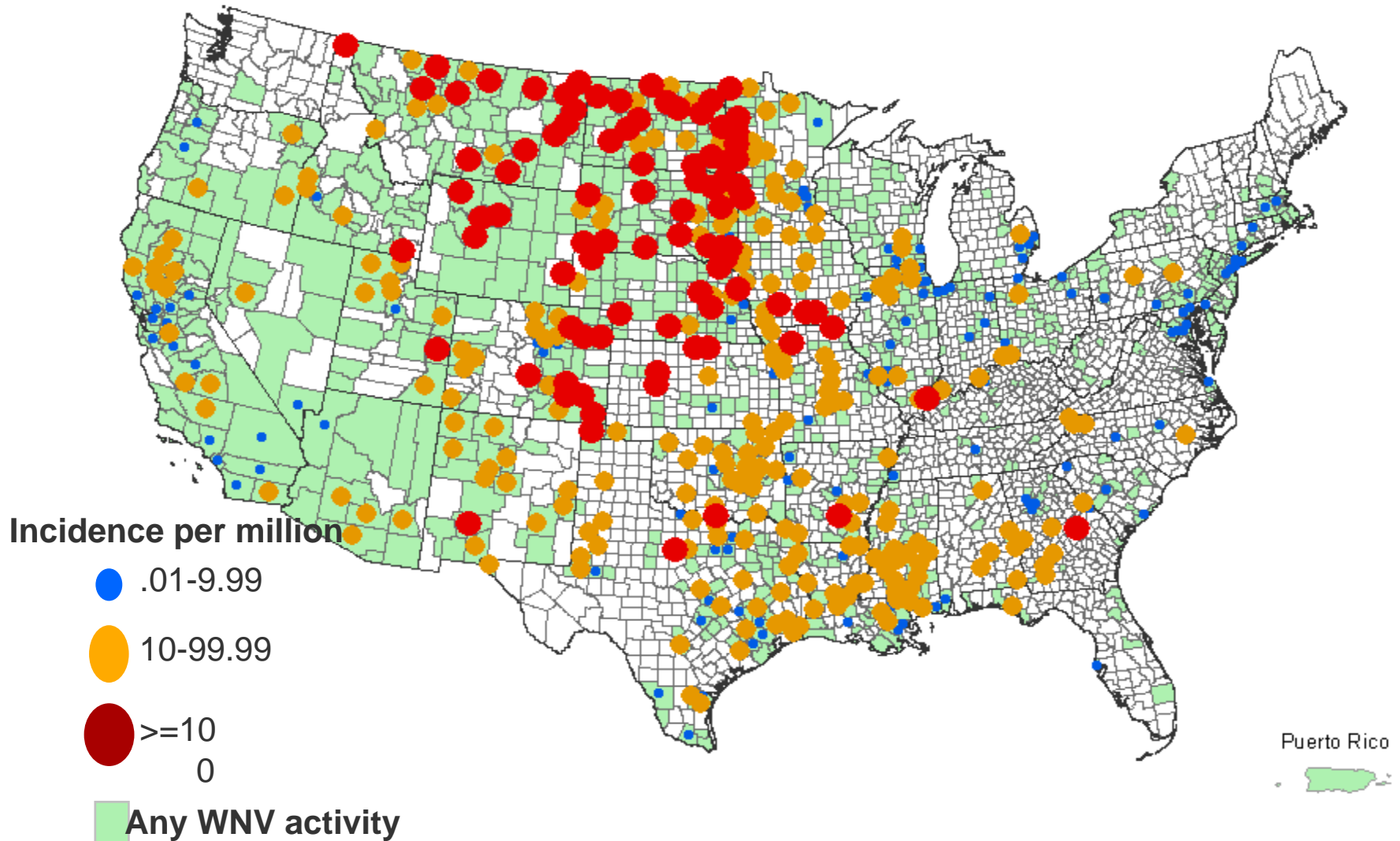
# West Nile Neuroinvasive Disease Incidence by County, 2005 (1294 cases)



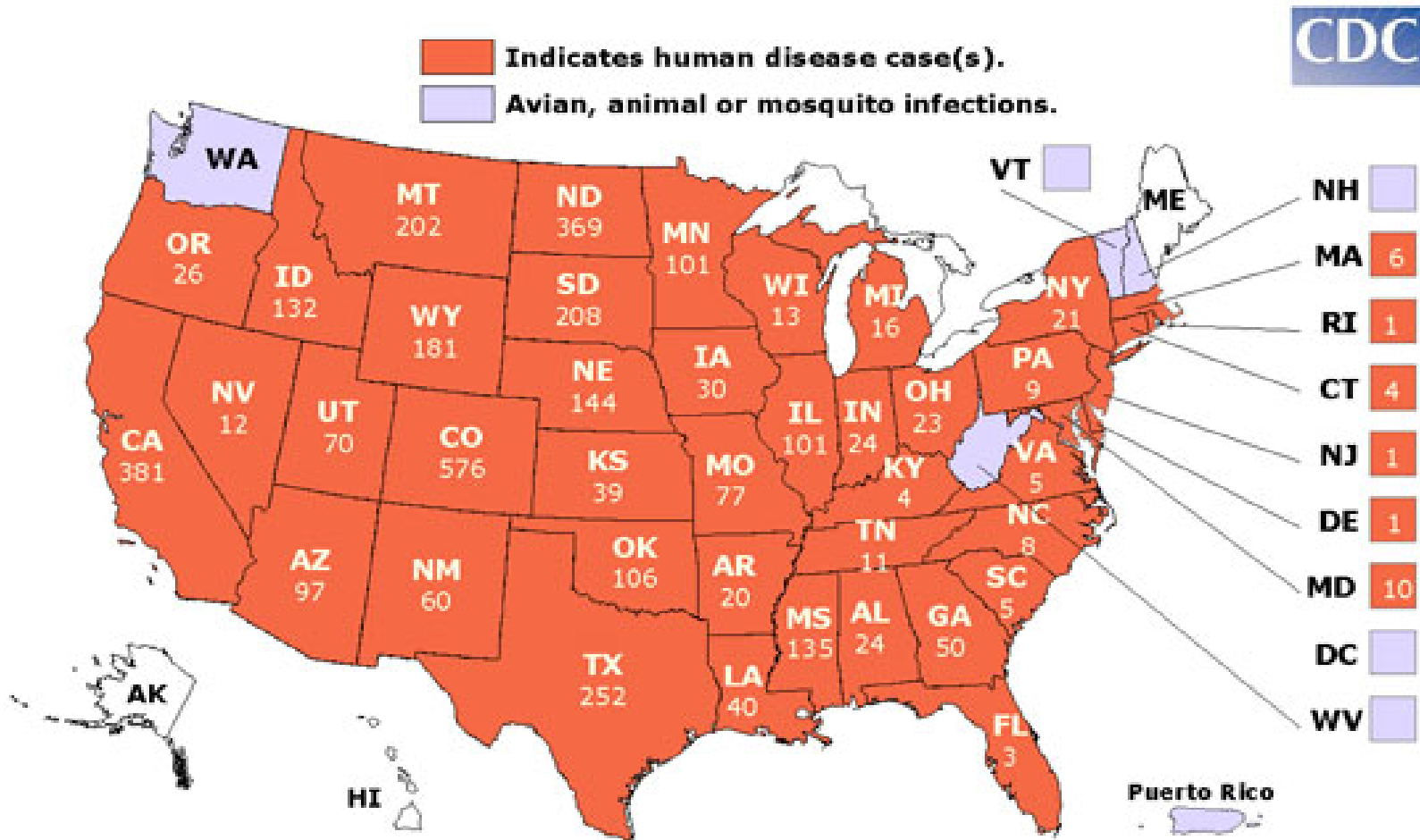
# West Nile Neuroinvasive Disease Incidence by County, 2006 (1495 cases)



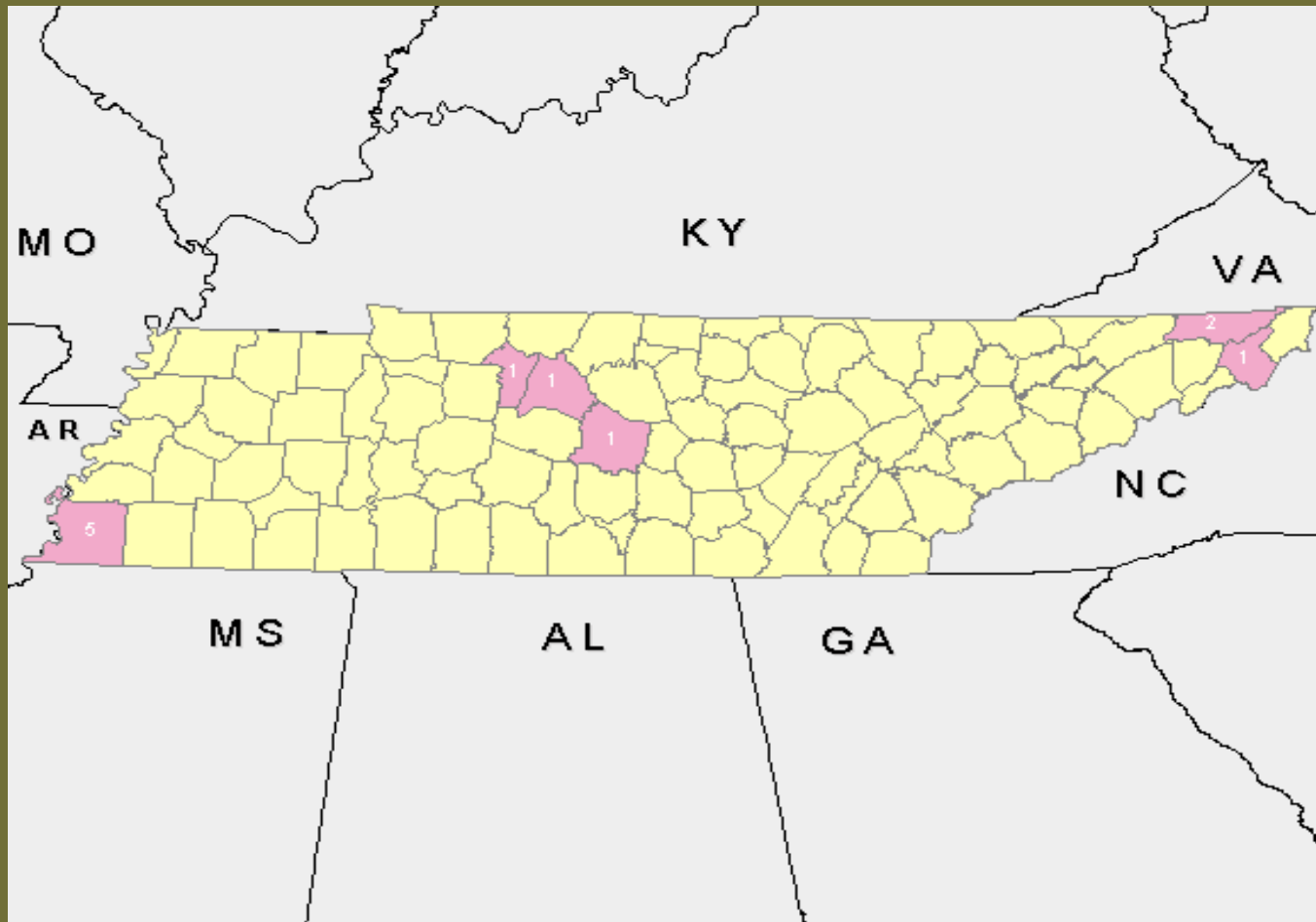
# West Nile Neuroinvasive Disease Incidence by County, 2007 (1173 cases)



# West Nile 2007



# Human West Nile in Tennessee by County

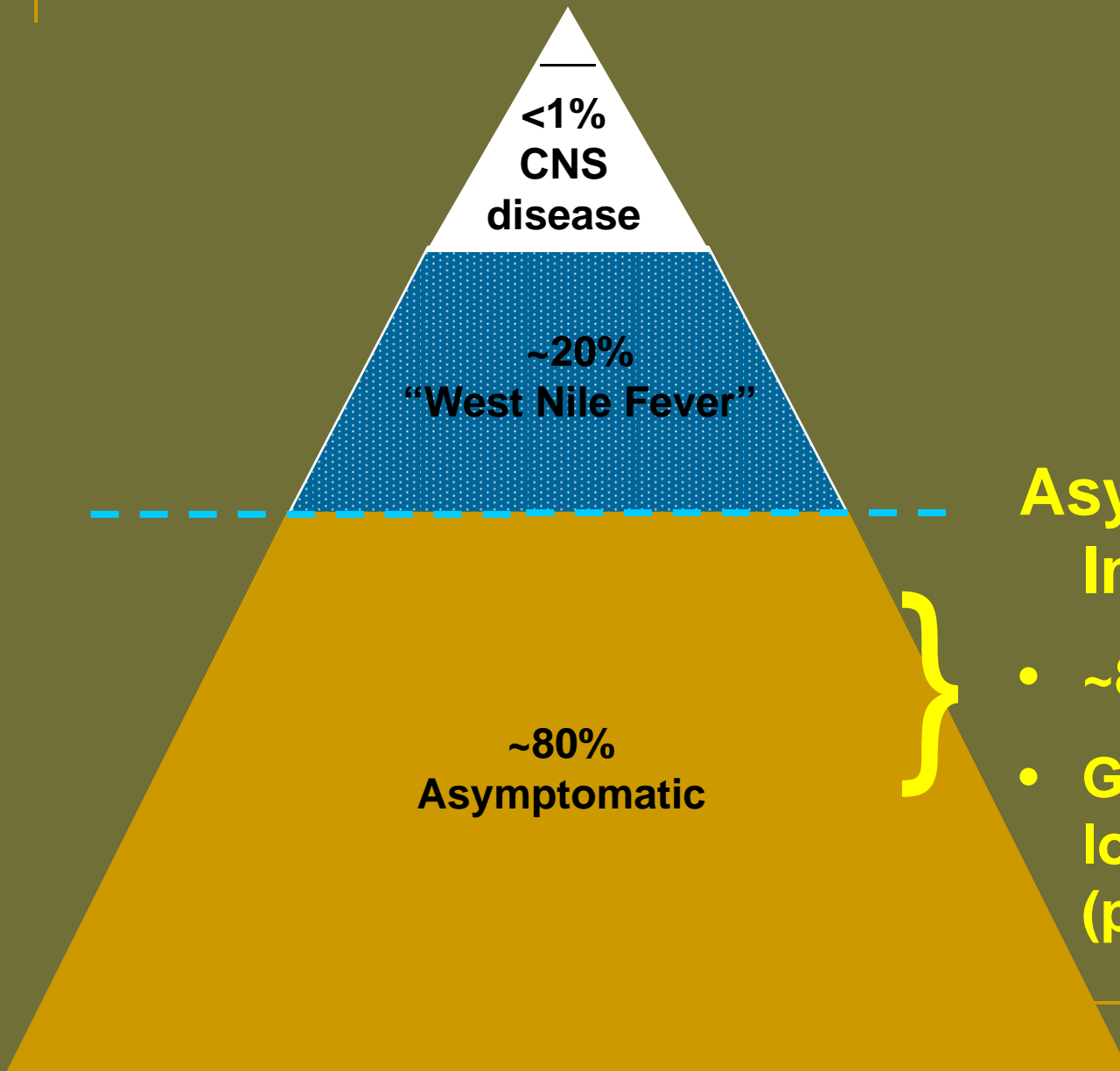


- 5-Shelby Cty
- 2-Sullivan Cty
- 1-Carter Cty
- 1-Cheatham Cty
- 1-Davidson Cty
- 1-Rutherford Cty

# West Nile Symptoms

- **80% of infected are symptom-free**
- **Up to 20%:**
  - **Fever**
  - **Headache / body aches**
  - **Nausea / vomiting**
  - **Skin rash on chest, stomach, and back**
  - **May last several days to several weeks**
- **1 in 150 will develop severe illness:**
  - **High fever, disorientation, headache**
  - **Coma, convulsions, paralysis**

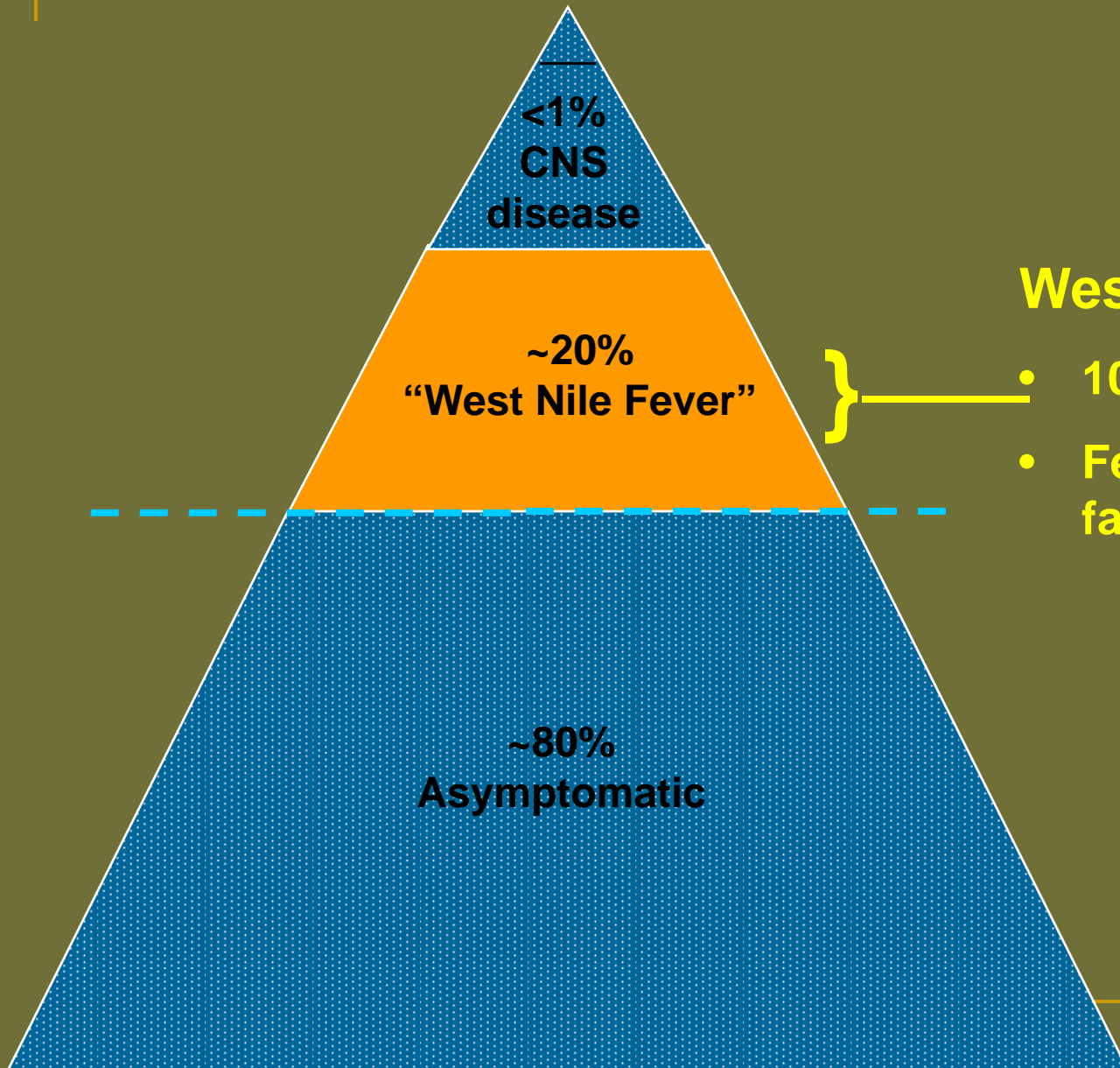
# WNV Human Infection “Iceberg”



## Asymptomatic Infection

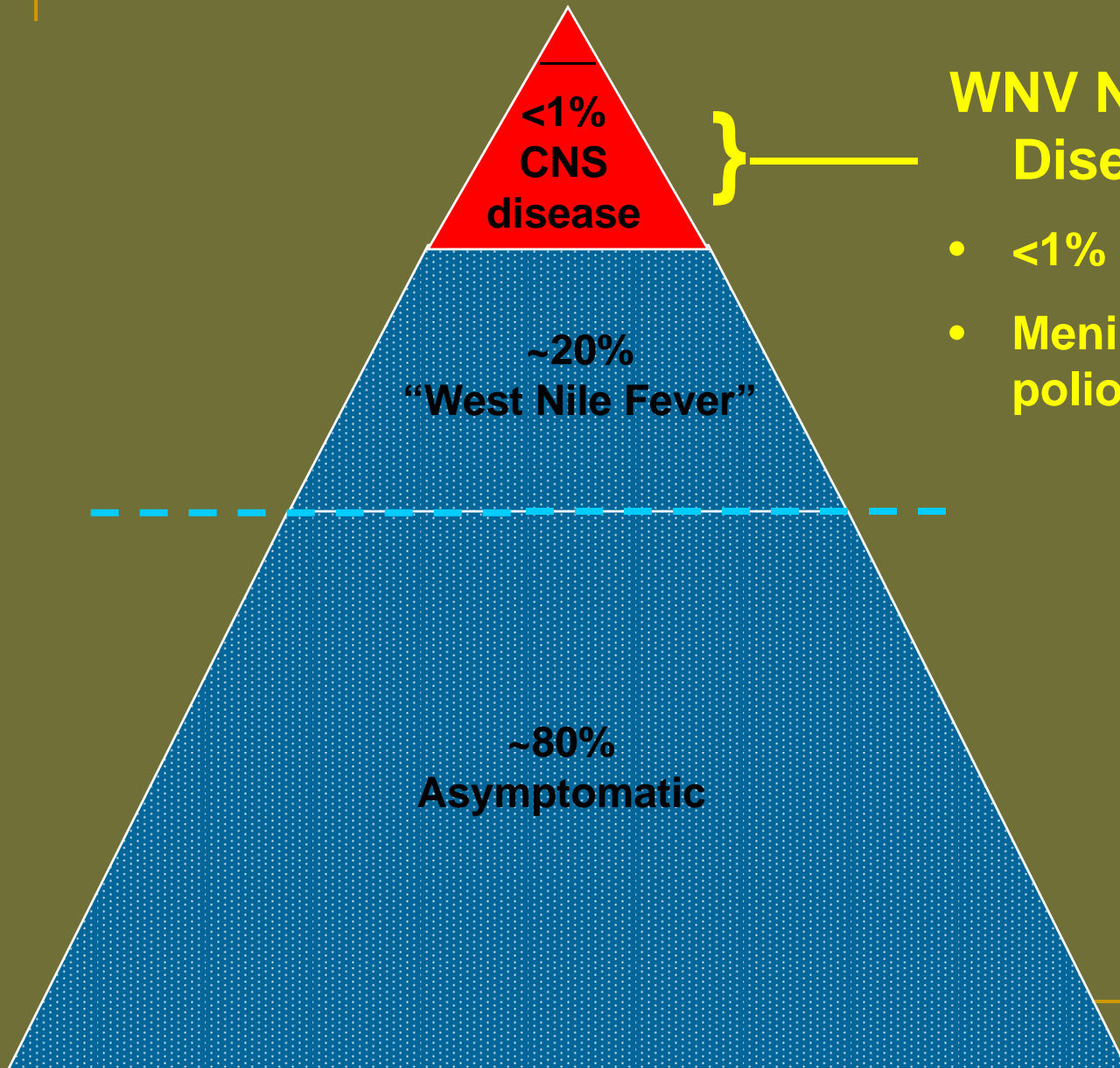
- ~80% of infections
- Generation of life-long immunity (presumed)

# WNV Human Infection “Iceberg”



## West Nile Fever

- 10-30% of infections
- Fever, headache, rash, fatigue



## WNV Neuroinvasive Disease (WNND)

- <1% of all infections
- Meningitis, encephalitis,  
poliomyelitis

# West Nile: who is most at risk?

- **For severe disease: people over 50 years of age**
- **For death: people over 70 years of age**



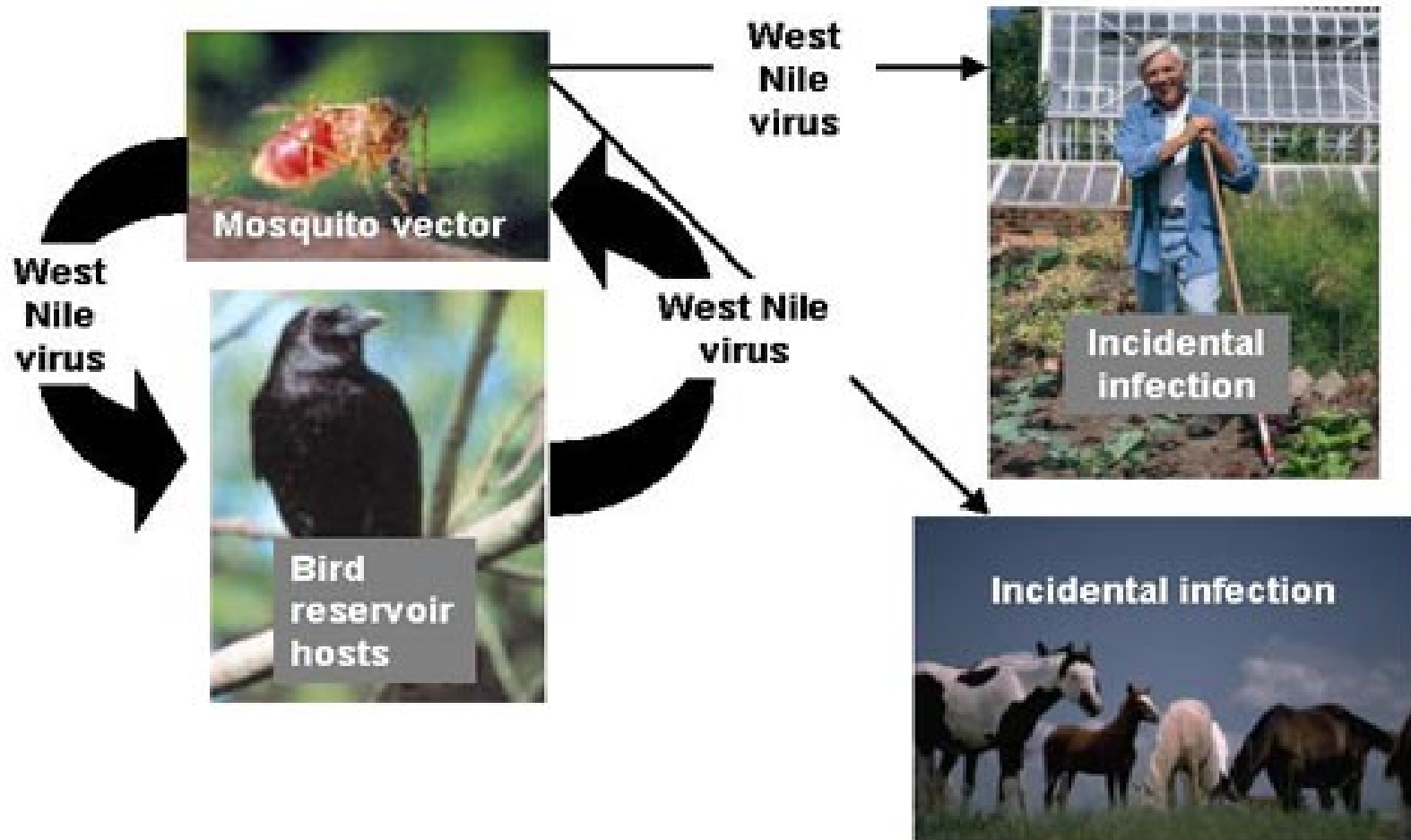
Photo Courtesy of CDC

# West Nile in Other Species

- 317 species of birds; although infected birds, particularly crows and jays, may die, most survive
- Horses (40% of cases may result in death)
- Also documented in squirrels, bats, a chipmunk, a skunk, a rabbit, and dogs and cats



# West Nile Virus Transmission Cycle



# Transmission Cycle

- **Mosquitoes transmit disease when they feed on WNV-infected, viremic birds**
- **Competent bird reservoirs sustain infectious viremia for 1 to 4 days after exposure**
- **Afterwards, life-long immunity develops**
- **Other species are not known to develop infectious-level viremias very often, therefore they are probably dead-end hosts**

# West Nile Prevention



- **Prevent mosquito bites:**
  - **Many mosquitoes most active at dusk and dawn**
  - **During these times:**
    - **Use insect repellent containing DEET, Picaridin, or oil of lemon eucalyptus**
    - **Wear long sleeves and pants**



# West Nile Prevention



- **Eliminate breeding sites:**
    - Empty standing water from flower pots, buckets, barrels, tires, kids' swimming pools, etc.
    - Replace water in bird baths weekly.
    - Change water in pet dishes frequently.
  - **Human vaccine may be available in several years.**
    - Practicality?
  - **Vaccine for horses is available and effective.**
-

# Rocky Mountain Spotted Fever



# Rocky Mountain Spotted Fever



- One of the most severe tick-borne illnesses in the United States
  - Bacterial infection transmitted by the bite of an infected tick
  - Primary vector species:
    - American dog tick
    - Rocky Mountain wood tick
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# Rocky Mountain Spotted Fever

- During 1997-2002, > 50% of reported cases were from North and South Carolina, Tennessee, Oklahoma, and Arkansas
- Not the Rocky Mountains!
- Mostly April—September





# Symptoms of Rocky Mountain Spotted Fever

- Rash (small flat pink spots on wrists, forearms, ankles)
  - 85 to 90% of patients
  - appears 3-5 days after fever
  - Often not present at time of doctor visit (makes diagnosis more challenging)
- More challenging dx. without history of tick bites





# Symptoms of Rocky Mountain Spotted Fever

- Muscle aches / headache
  - Fever
  - Nausea / vomiting / diarrhea
-

# RMSF: who is most at risk?

- **People with exposure to ticks**
  - pet owners
  - animal handlers
  - outdoor enthusiasts
- **3 to 5 % fatality rate in the U.S.**
  - **Factors associated with death:**
    - Delayed treatment
    - Patient age over 40



# RMSF in Other Species

- Dogs are susceptible too
- Checking pets for ticks regularly can reduce human exposure



# RMSF--Prevention

- **Avoid tick bites:**
  - **Wear protective clothing--hat, long sleeved shirts, pants, socks, and closed-toe shoes**
  - **Use insect repellent containing 10-35% DEET**
  - **Permethrin is available for treatment of clothing**
  - **Check frequently for ticks when hiking in wooded or grassy areas**

# RMSF--Prevention

- Disease transmission may take between 2 and 20 hours to occur--remove ticks promptly
- If an attached tick is found, grasp the body with tweezers and pull gently with constant pressure.
- Folk remedies such as gasoline or lit matches should not be used to remove ticks.
- Avoid using bare hands to remove ticks.

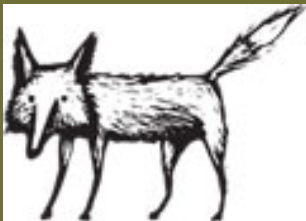


# Tennessee Tick Research

- Collaborative effort between TDH Communicable and Environmental Disease Services section (CEDS) and USDA Wildlife Services
- Collect and identify ticks from animals throughout Tennessee, test for tick-borne illnesses
- Animal species will include but not be limited to feral cats, coyotes, deer, red fox, marmot, opossum, raccoon, and skunk
- Locational (GPS) data will be collected too



# Rabies Virus



# Rabies Virus

- **Acute, progressive encephalomyelitis**
- **Human symptoms include:**
  - **Fever**
  - **Sore throat**
  - **Headache**
  - **Trouble swallowing**
  - **Disorientation, lack of coordination**
  - **Seizures**





# Rabies Virus

- **Nearly 100% fatal**
  - **Incubation of 6 weeks (range from 9 days to years)**
  - **Median 19 days from onset of symptoms to death (range from 7 to 28 days)**
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# Human Rabies in the United States

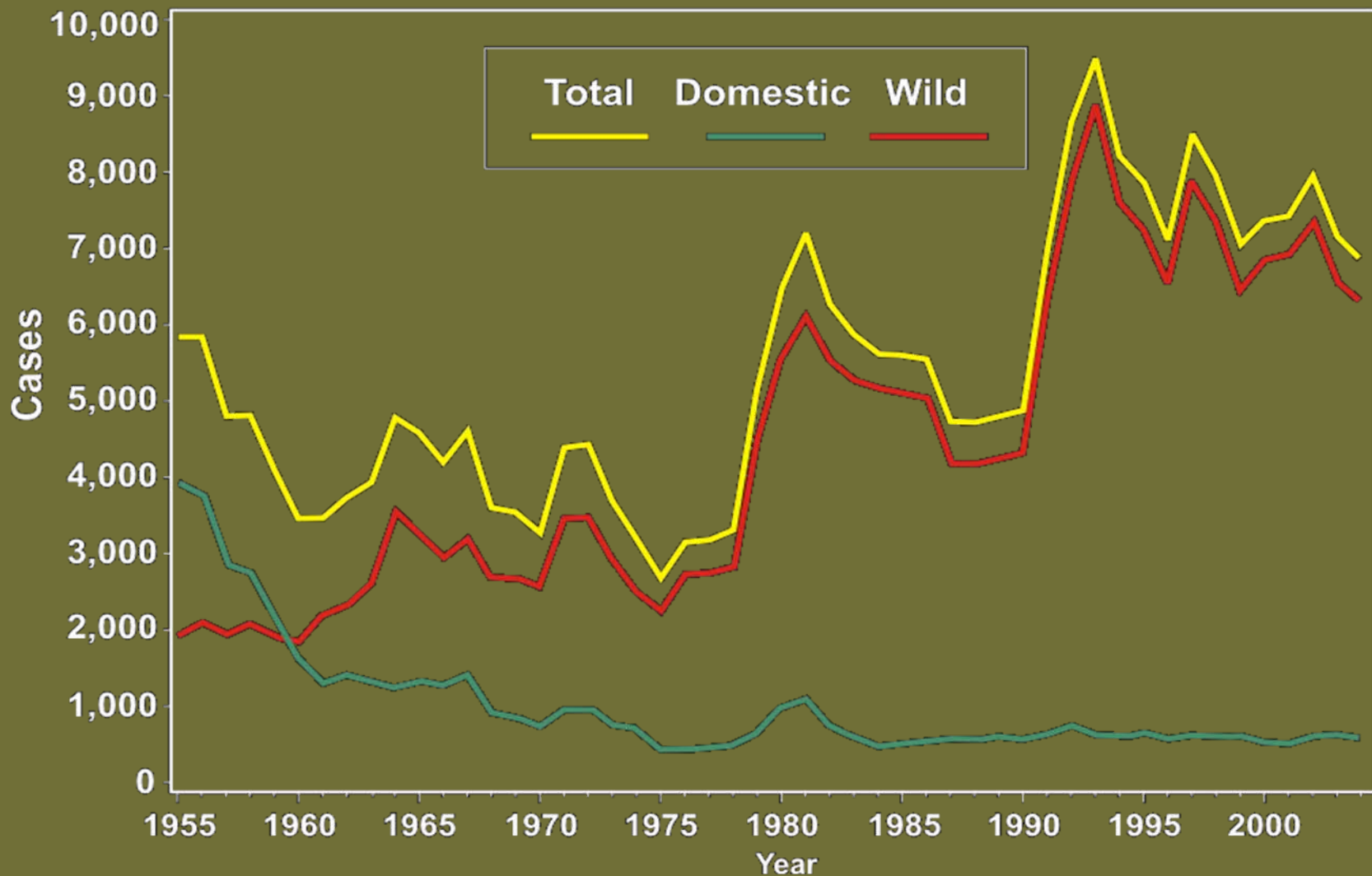
- 2 to 5 cases a year
- Last Tennessee case, 2002
  - 13 year old Franklin County boy with a history of handling a bat he had found on the ground
  - No bites noted



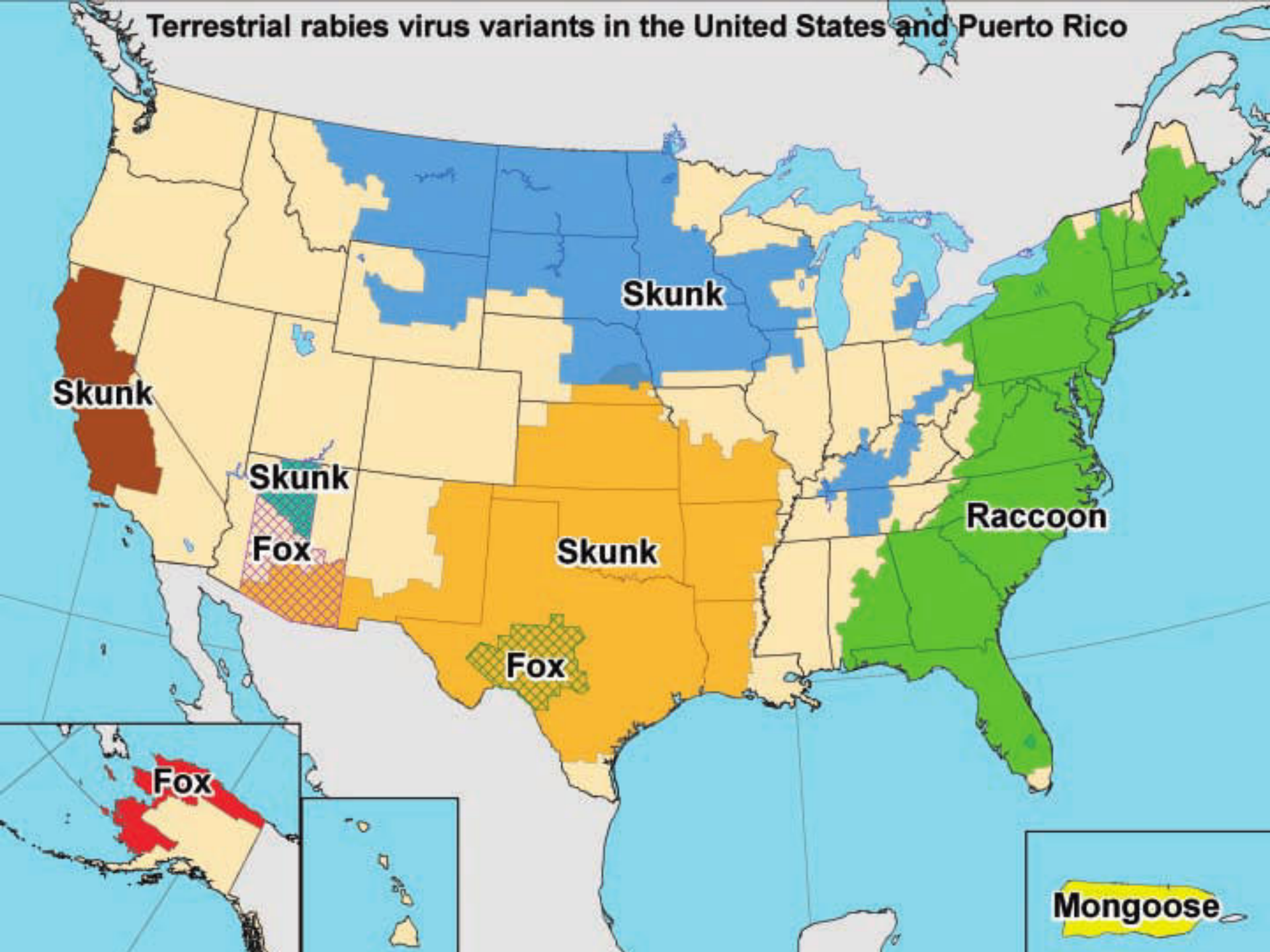
# Animal Rabies in the United States

- **More than 90% of rabies cases occur in wildlife such as raccoons, skunks, foxes, and bats.**
- **Domestic animals--less than 10% of rabies cases.**
- **Tennessee law requires that all cats and dogs be currently vaccinated against rabies.**

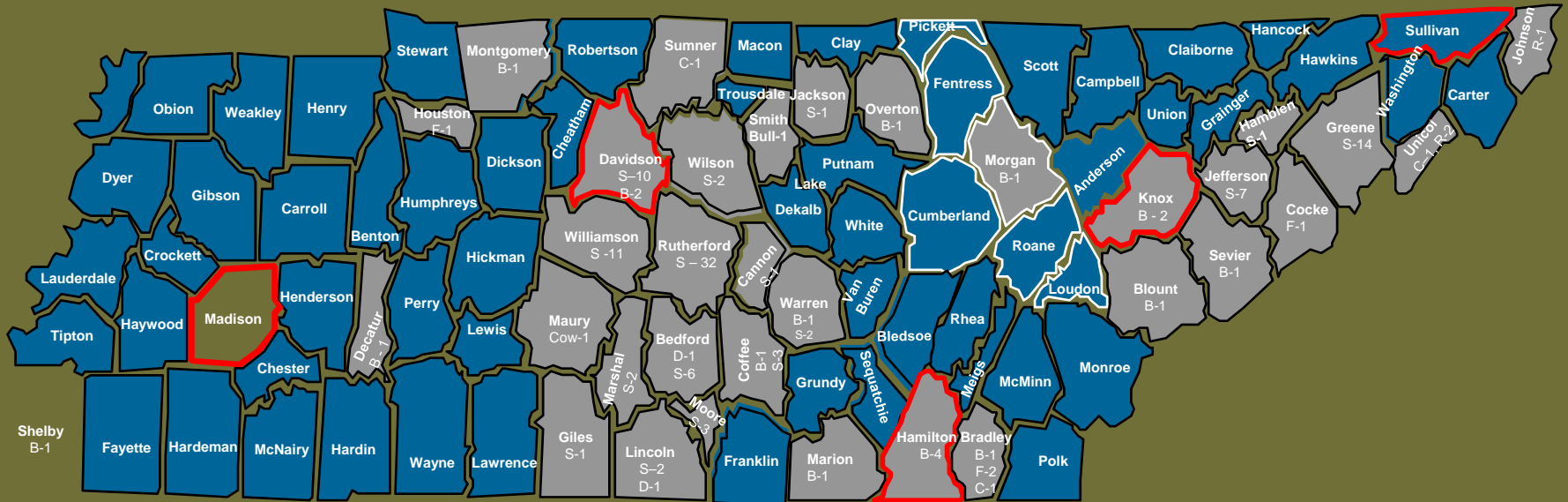
## Cases of Animal Rabies, 1955-2004



# Terrestrial rabies virus variants in the United States and Puerto Rico



# TN Rabies Positives by County 2007



|          |            |
|----------|------------|
| Bat—19   | Cat—3      |
| Cattle—2 | Dog--2     |
| Fox—4    | Raccoon--3 |
| Skunk—98 | Total--131 |

# Post-exposure treatment

- **Administration is a medical urgency, not a medical emergency**
  - **No proven effective treatment after onset of clinical signs.**
- **Rabies biologics are expensive and periodically in short supply**
  - **Important to make sure they are appropriately used**

# When is post-exposure treatment appropriate?

- **Exposure results from:**
  - **Bite of rabid animal**
  - **Contamination of scratches, cuts, or mucus membranes with saliva from a rabid animal**
- **Decision to administer post-exposure prophylaxis should be made in consultation with local health department**

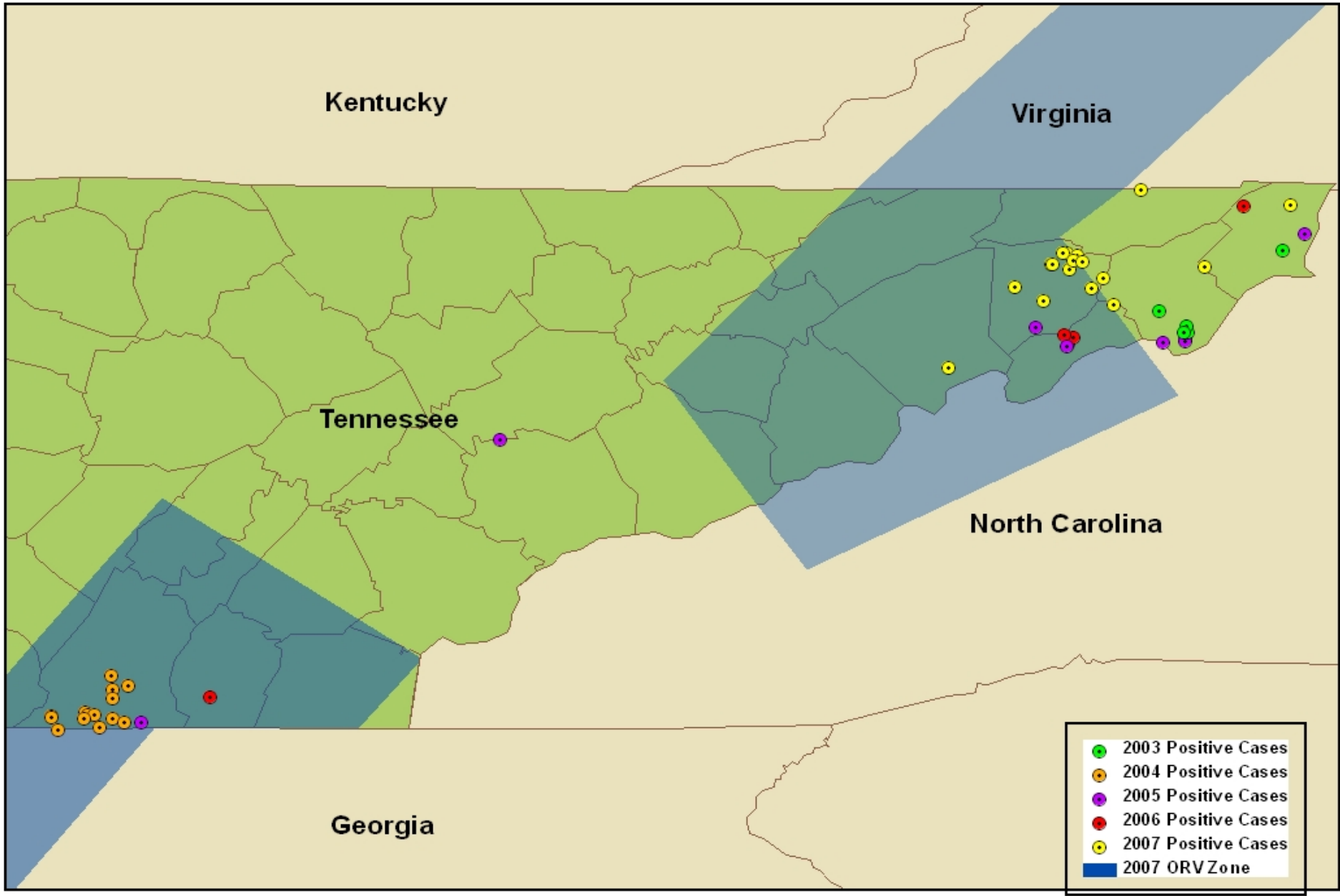


# Raccoon Variant Rabies

- **An emerging issue in eastern Tennessee**
- **Raccoons thrive in suburban settings**
- **Aggressive and swift**
  - **Increase in dog and cat rabies**
  - **Increase in other rabid species (foxes, groundhogs, livestock, etc.)**
  - **Increase in human exposures, need for PEP risk assessment, animal control calls**

# Raccoon Variant Rabies

- **Tennessee response:**
  - **Education**
  - **Increased surveillance**
  - **Help prevent spread with oral rabies vaccination (ORV)**
- **ORV is a massive collaborative effort by wildlife and public health agencies, and volunteers**



|   |                     |
|---|---------------------|
| <span style="color: green;">●</span>  | 2003 Positive Cases |
| <span style="color: orange;">●</span>   | 2004 Positive Cases |
| <span style="color: purple;">●</span>   | 2005 Positive Cases |
| <span style="color: red;">●</span>  | 2006 Positive Cases |
| <span style="color: yellow;">●</span>   | 2007 Positive Cases |
| <span style="background-color: blue; width: 15px; height: 10px; display: inline-block;"></span> | 2007 ORV Zone       |

Kentucky

Virginia

Tennessee

North Carolina

Georgia





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# Thank you!

- **John Dunn, TDH**
- **Sudeshna Mukjerjee, TDH**
- **Lyle Petersen, CDC**

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# Additional Information:

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Nashville, TN 37243  
615.741.7247

- o <http://health.state.tn.us/ceds/index.htm>
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