

Eco-epidemiology of tickborne disease in Wisconsin and the upper Midwest

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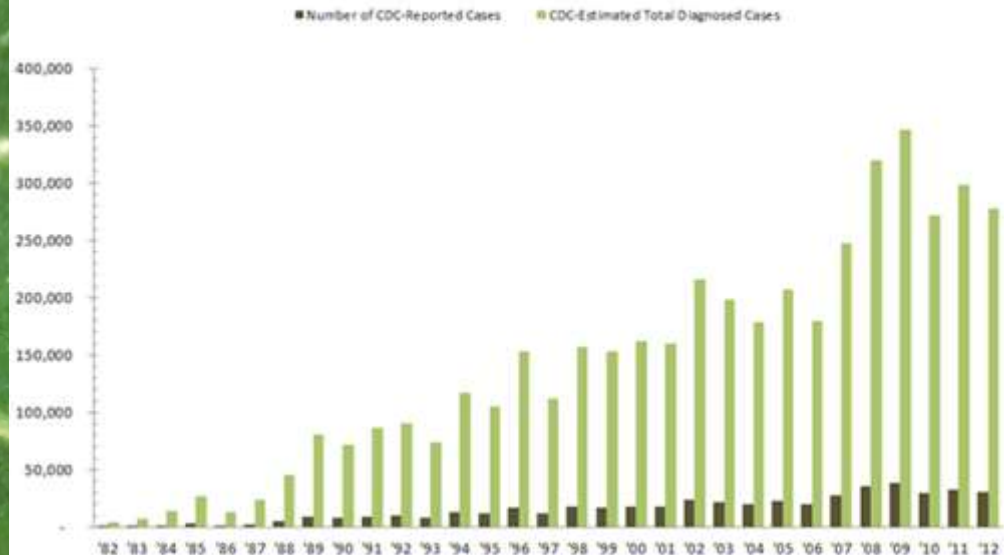
**Midwest Center
of Excellence**
VECTOR-BORNE DISEASE

Tickborne diseases such as Lyme hit record highs in the U.S., CDC says

Estimate 300-400,000 LD cases annually

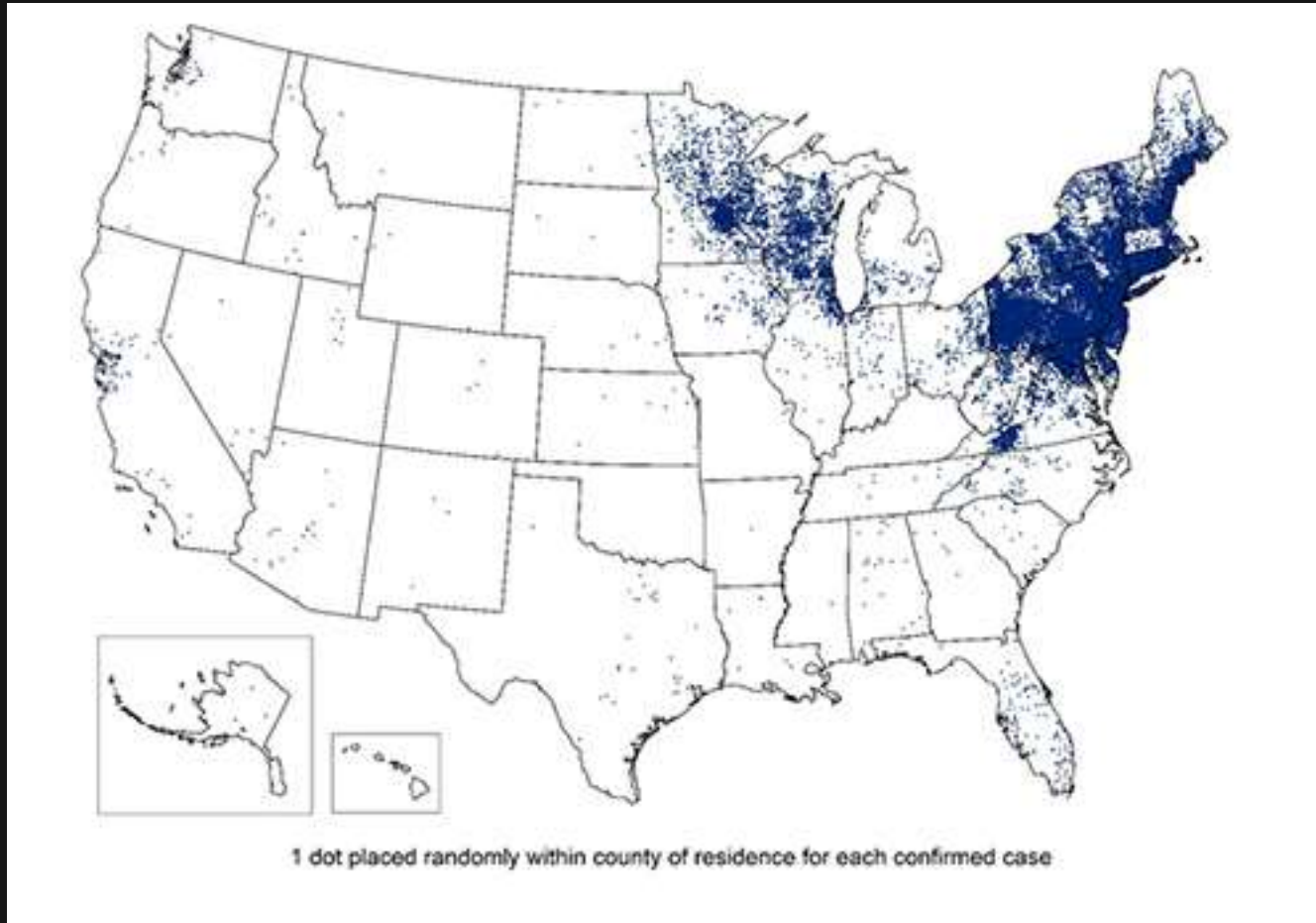


Annual Cases of Lyme Disease in the US



<https://www.bayarealy.me.org/about-lyme/lyme-disease-facts-statistics/>

Wisconsin is a high incidence state for Lyme Disease



<https://www.cdc.gov/lyme/datasurveillance/maps-recent.html>

Emergence of tickborne pathogens in the USA & Wisconsin

1969

1st Lyme Case
in USA
Wisconsin

1980

Powassan/Deer
tick virus (1970)

1990

Increasing
surveillance of Lyme

2000

**Anaplasma
phagocytophilum
(Minnesota &
Wisconsin)**

2010

**Borrelia
mayonii
2012**

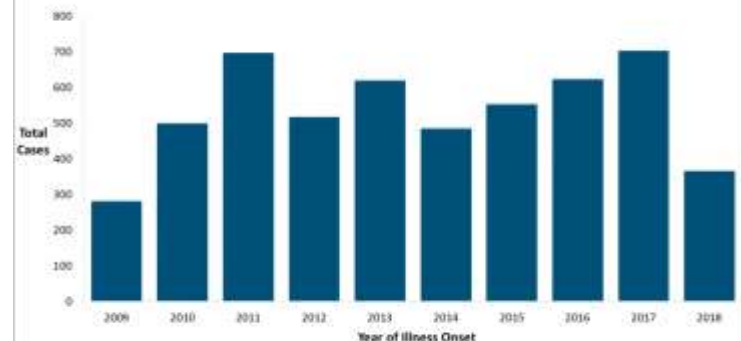
2017

**Borrelia
miyamotoi**

2018

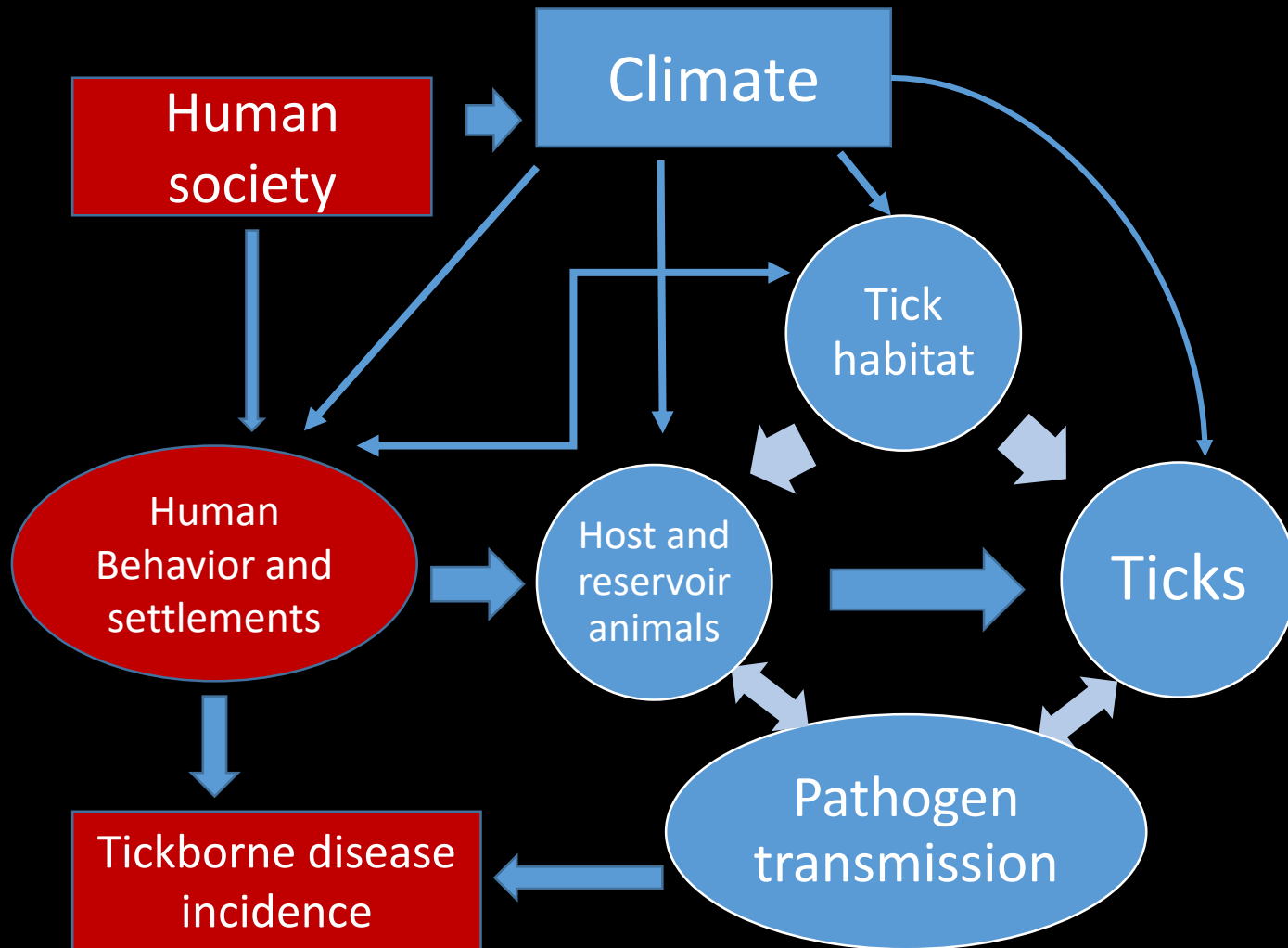
Rocky Mountain
Spotted Fever

Anaplasmosis Cases in Wisconsin



Data Source: Wisconsin Department of Health Services

What drives risk to humans?



Ticks

Commonly encountered species include:



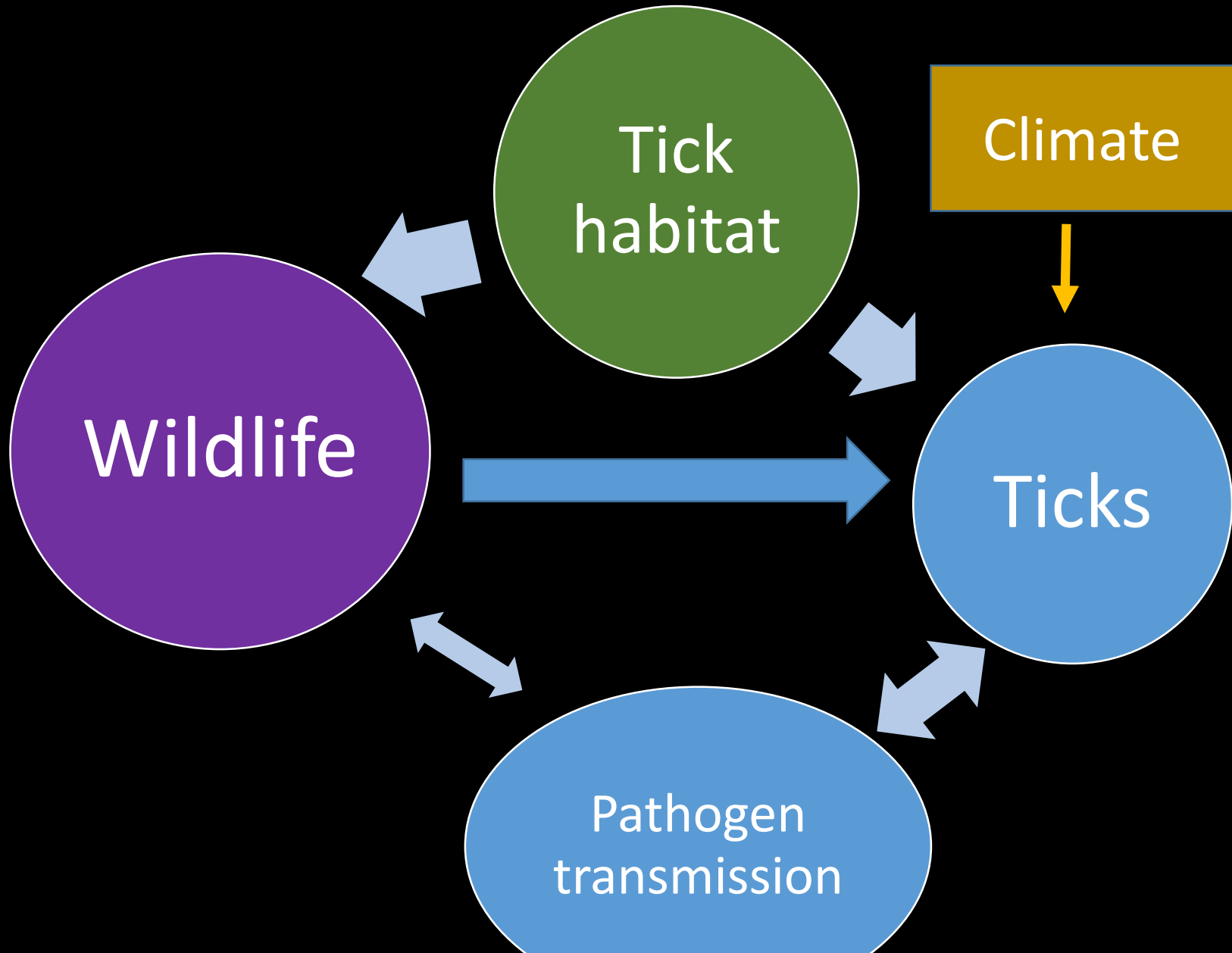
Dermacentor variabilis
“wood tick”
American dog tick



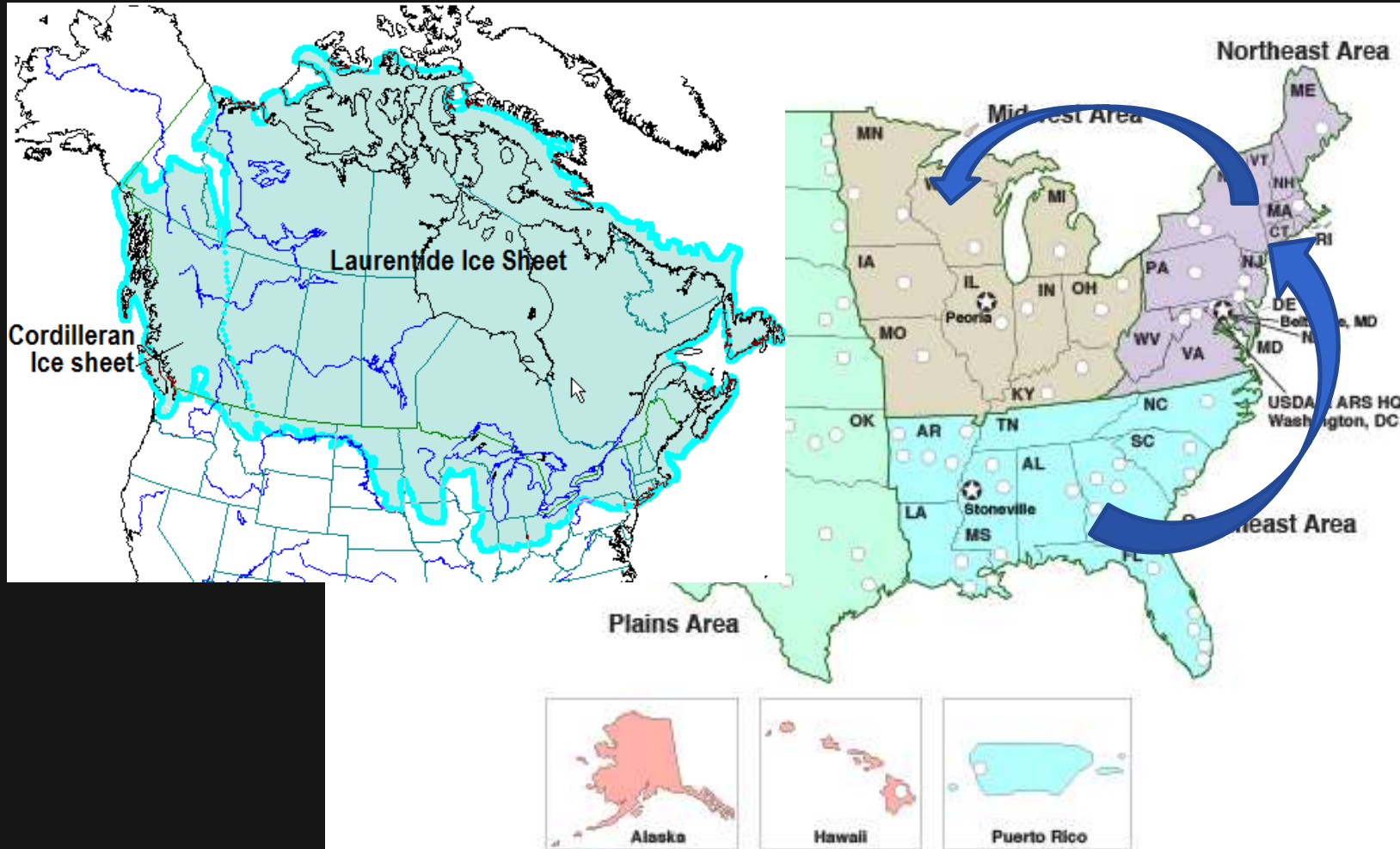
Ixodes scapularis
“deer tick”
Blacklegged tick



What drives risk to humans?

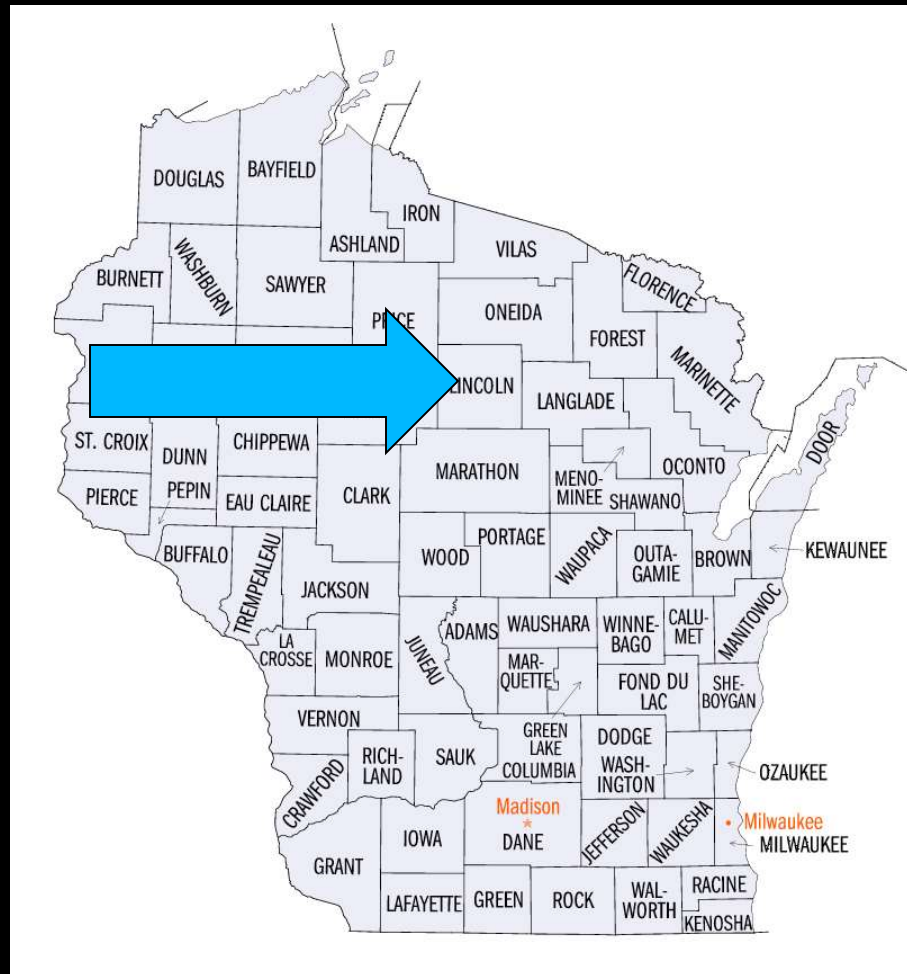


Post-glaciation invasion

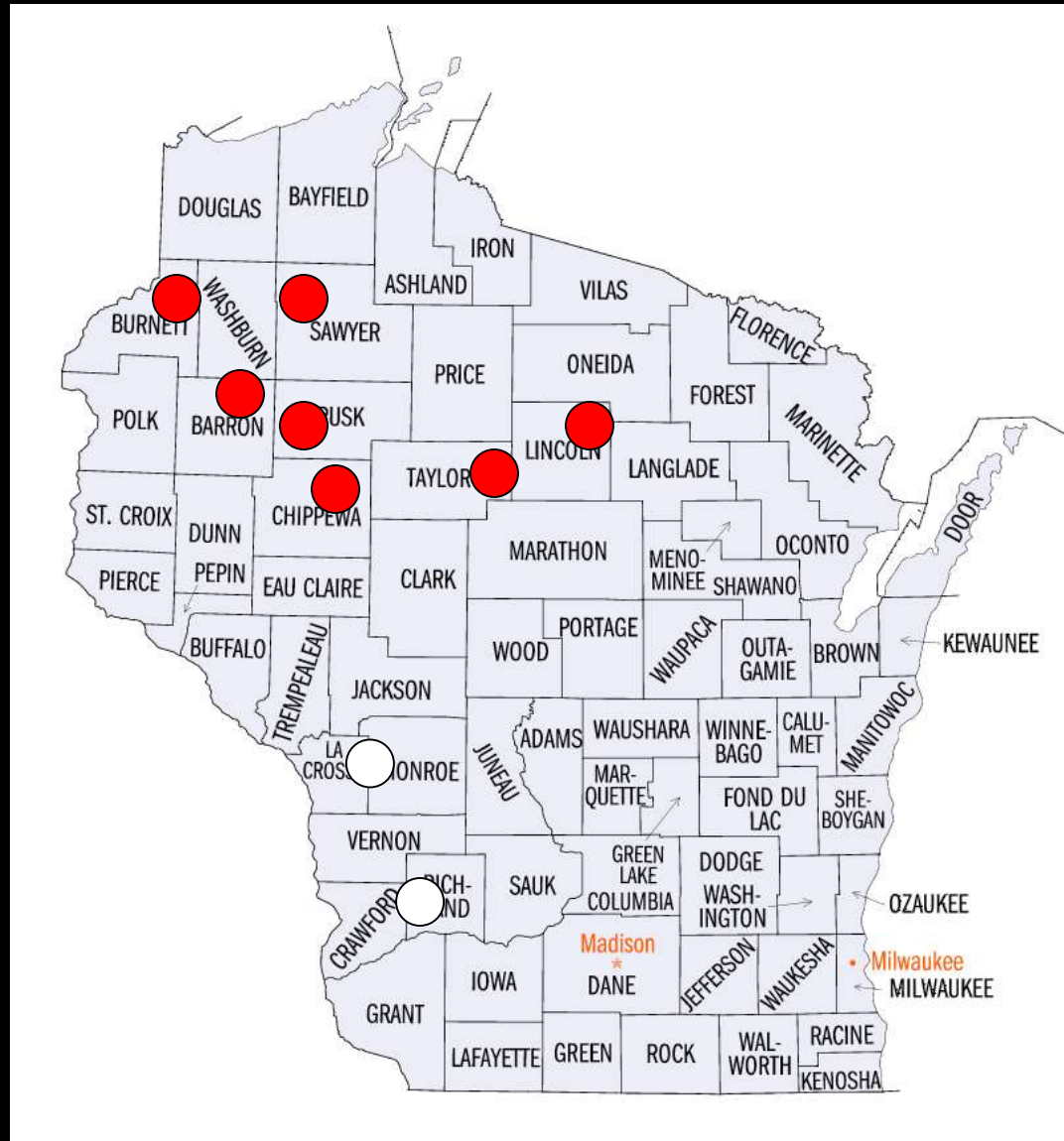


Humphrey et al. 2010. *Evolution*. 64:2653-2663

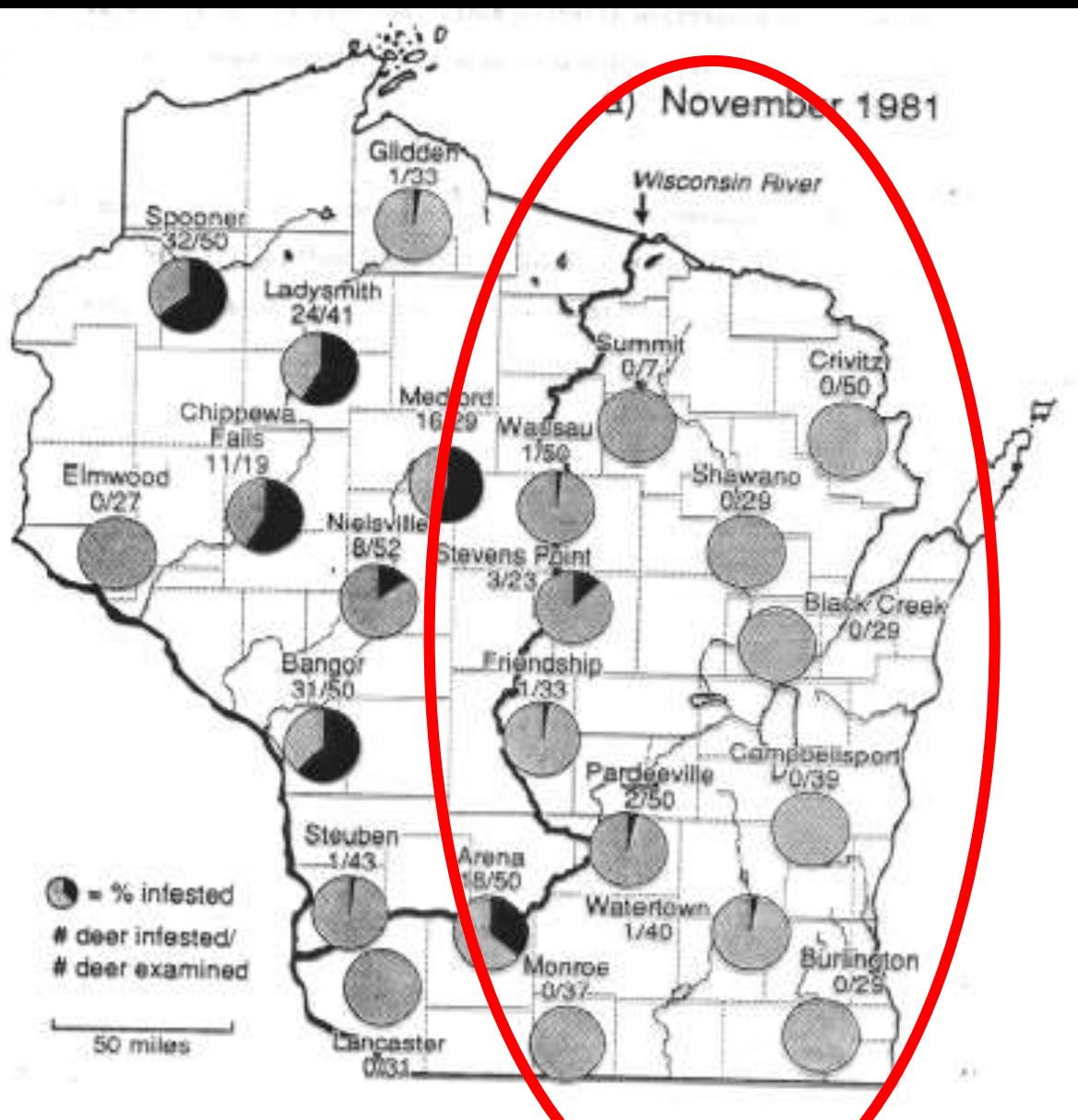
Early record of deer tick in Wi in 1952 1965: Forestry workers in Lincoln County



1965-1970 Collections by UW Entomology



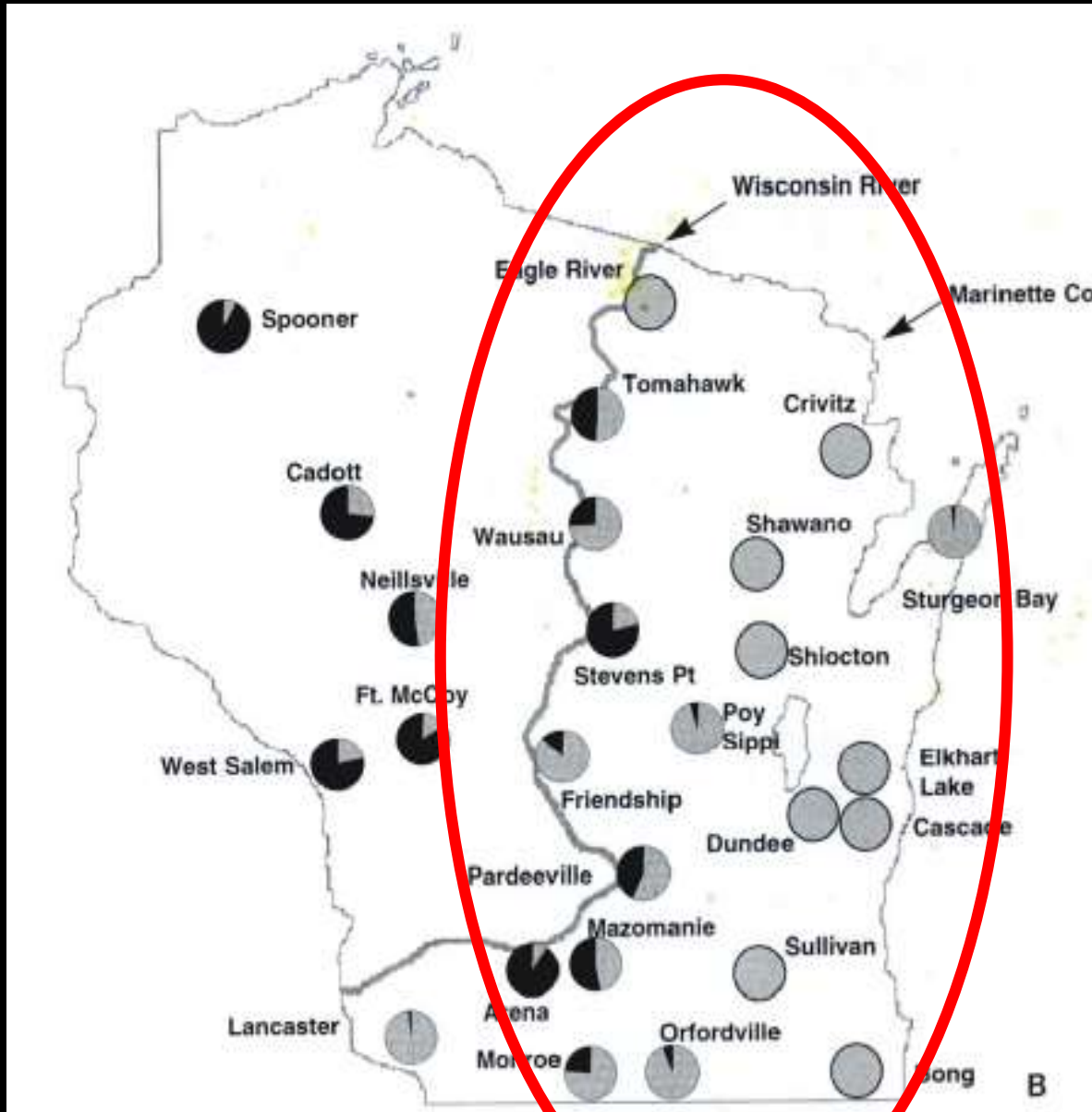
Hunter-killed deer: Adult deer tick surveys



1981

Dark color of the pie = % deer infested with deer ticks adults

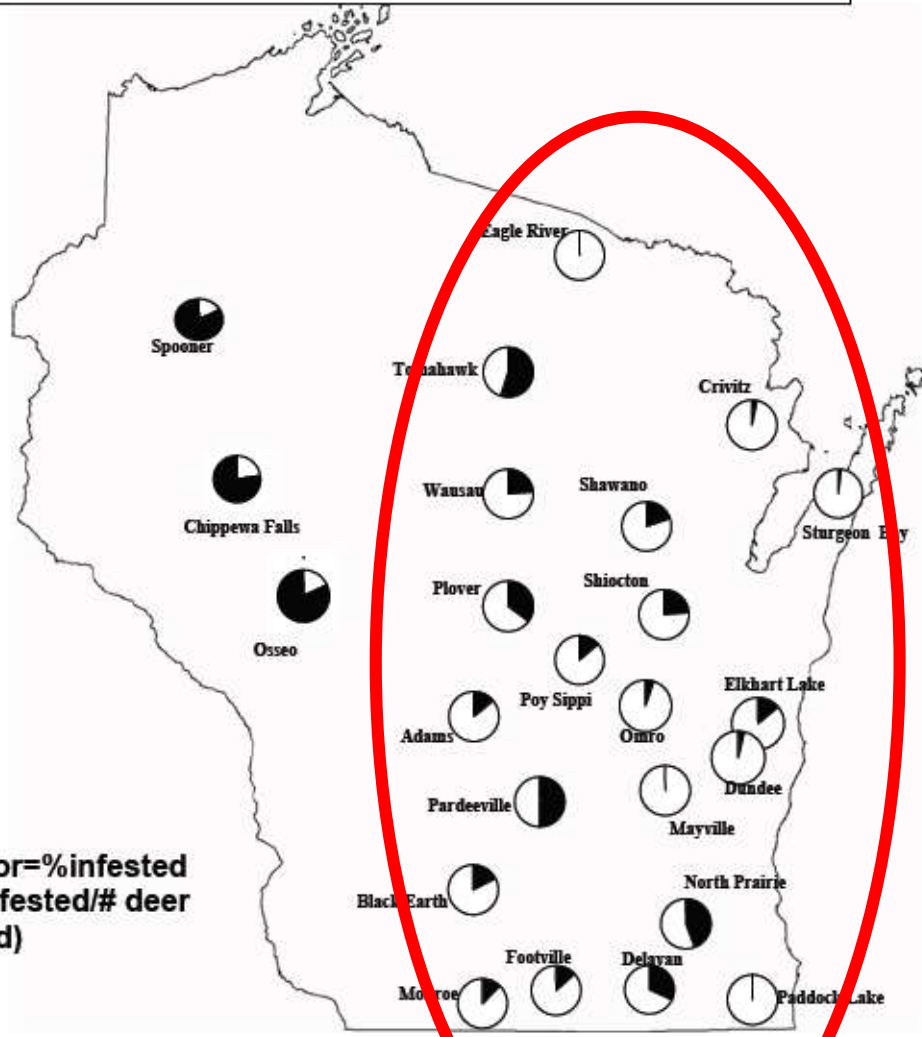
Hunter-killed deer: Adult deer tick surveys



1994

Hunter killed deer: Tick surveys

Wisconsin Surveillance of Ticks Collected from Deer During Hunting Season, 2008-2009

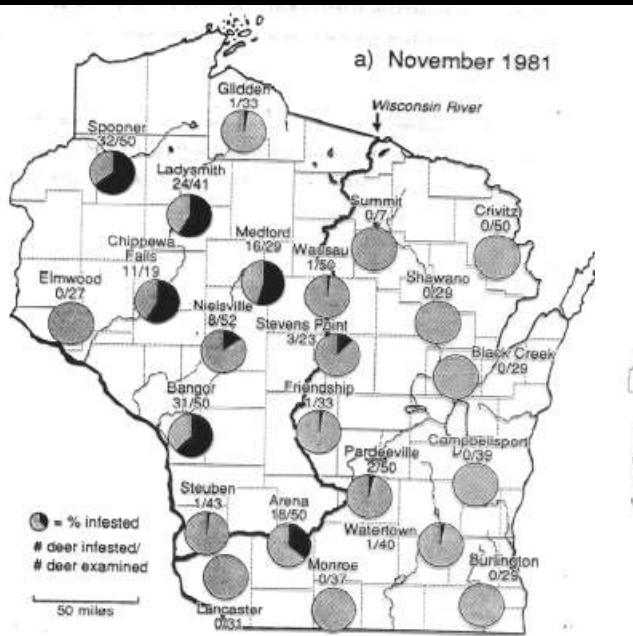


Dark color=%infested
(#deer infested/# deer
examined)

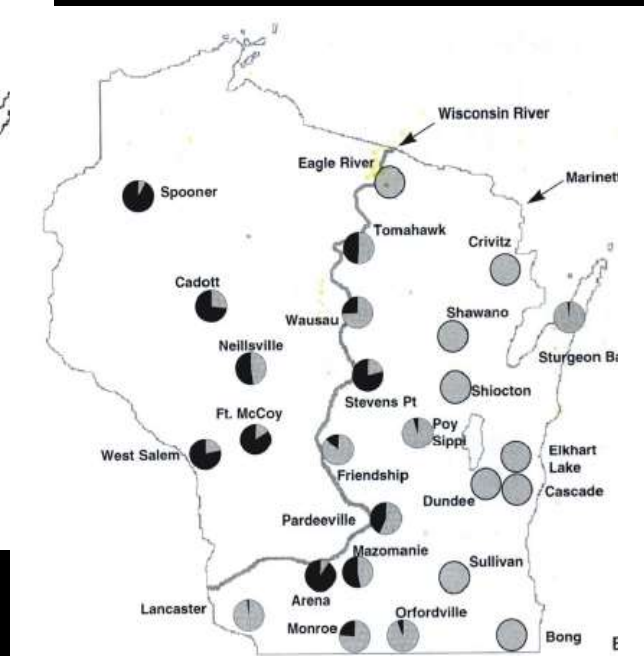
2008-2009

Hunter killed deer- Tick Surveys

1981



1994



2008-2009

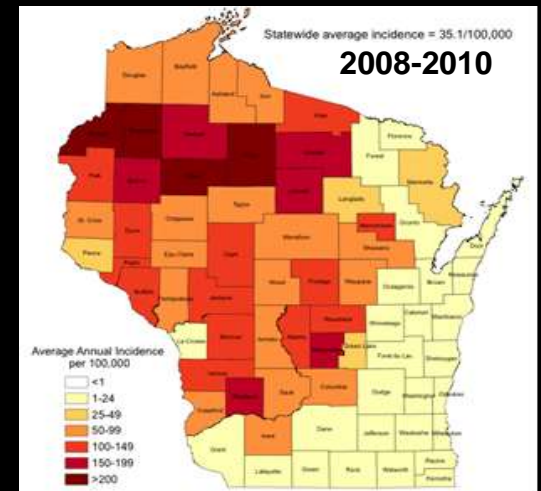
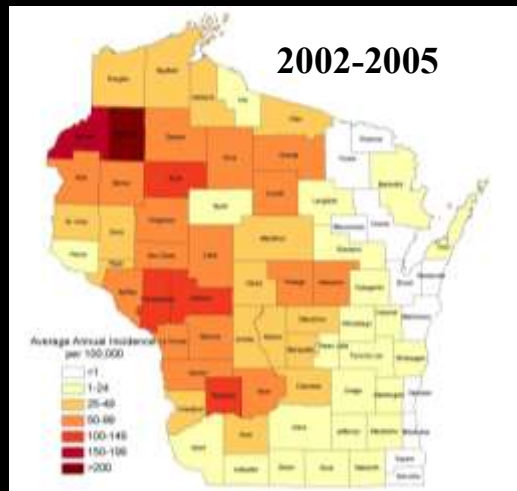
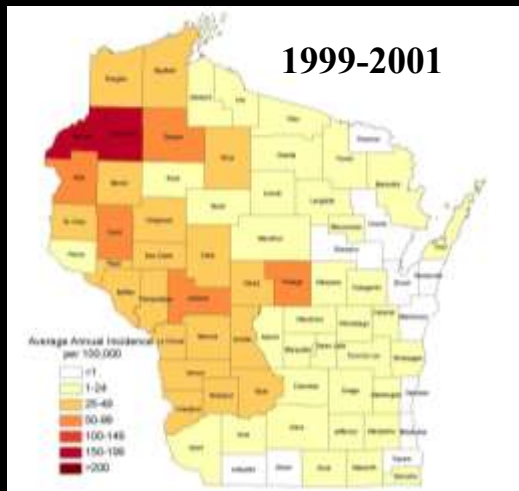
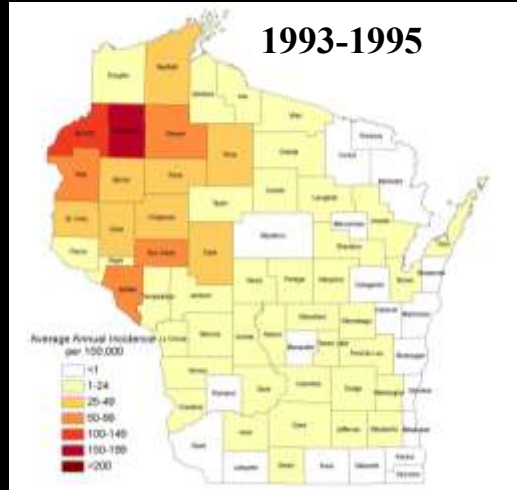
Wisconsin Surveillance of Ticks Collected from Deer During Hunting Season, 2008-2009



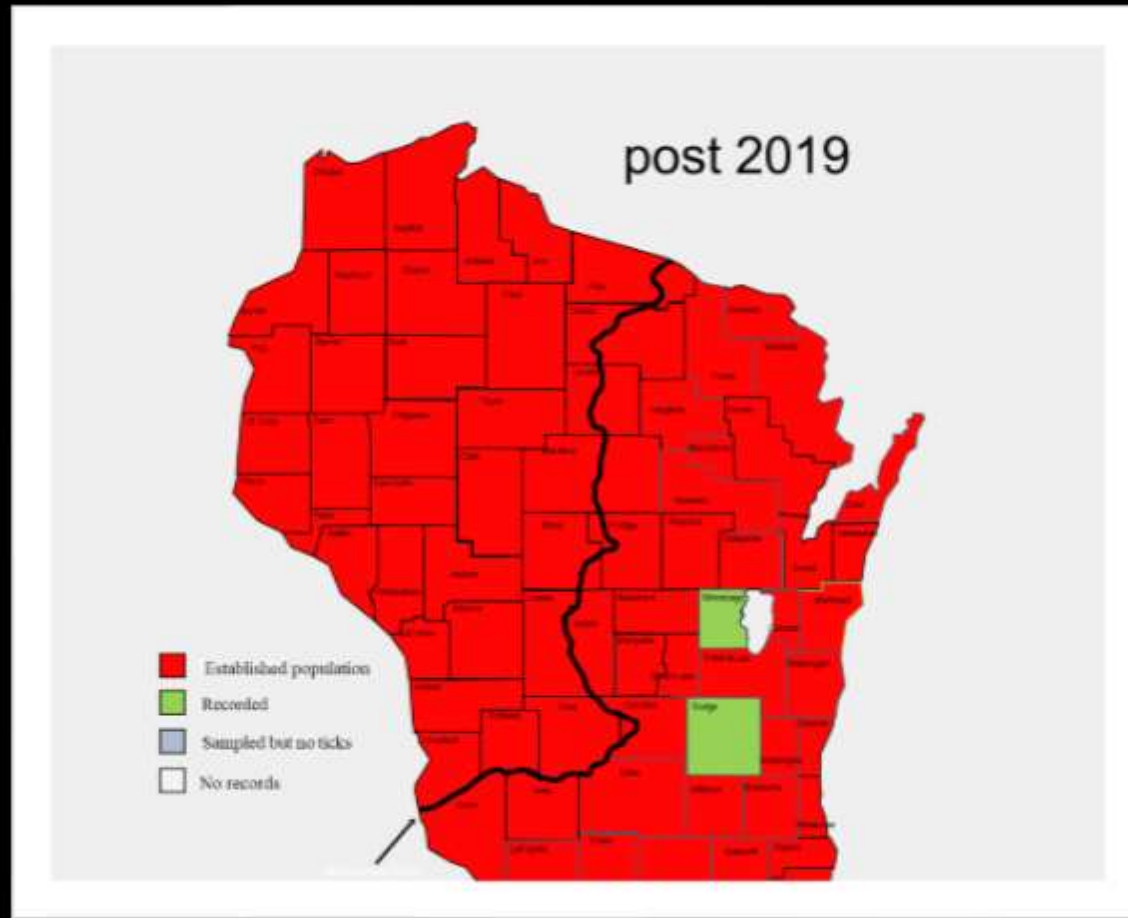
Dark color of the pie = % deer infested with *Ixodes* ticks.

Lyme disease average annual incidence

Wisconsin, 1990-2010, by county



Current distribution of deer ticks in Wisconsin



Red counties have established populations of the deer tick
in forested habitats

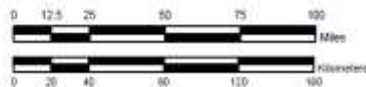
Wisconsin Landcover



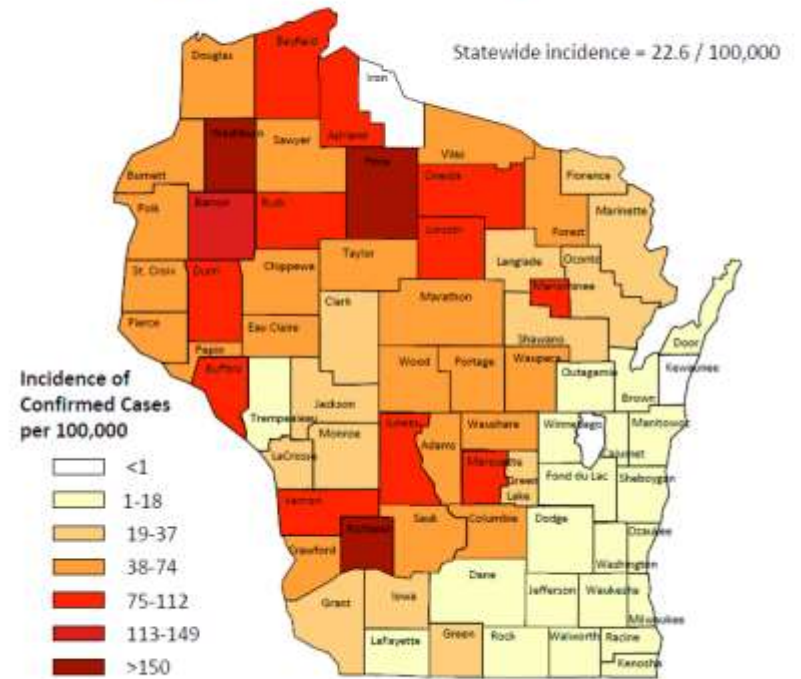
Land Cover Classes

- High Intensity Urban
- Low Intensity Urban
- Agriculture
- Grassland
- Open Water
- Shrubland
- Coniferous Forest
- Broad-leaved Deciduous Forest
- Mixed Deciduous/Coniferous Forest
- Emergent/Wet Meadow
- Lowland Shrub
- Forested Wetland
- Barren Land
- Cloud Cover
- Ecological Landscape
- County Boundaries

"WISCLAND" is the Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data. General information about WISCLAND may be found in the "Data Sources Used in this Handbook" section of the "Introduction and General Background" chapter of this Handbook. Extensive additional information about this data set, including data lineage information, is provided in the "Land Cover of Wisconsin, User's Guide Land Cover Data", 1999, WIDNR. The User's Guide is accessible at: <http://www.dnr.state.wi.us/maps/gis/data/landcover.html>. Additional information about WISCLAND is also posted on the Wisconsin State Cartographer's Office website: <http://www.sco.wisc.edu/wiscland/index.php>.



Lyme Disease Incidence



- Incidence of Confirmed Cases per 100,000
- <1
 - 1-18
 - 19-37
 - 38-74
 - 75-112
 - 113-149
 - >150

This map is based on the county of residence of confirmed cases. Some infections may have been acquired during travel to other areas.

Revised 04/12/2016

Data Source: Wisconsin Division of Public Health

Lyme Disease incidence is Correlated with forest landcover (=deer tick habitat)

Landscape change

Virgin forest in the U.S.



In 1620



In 1850



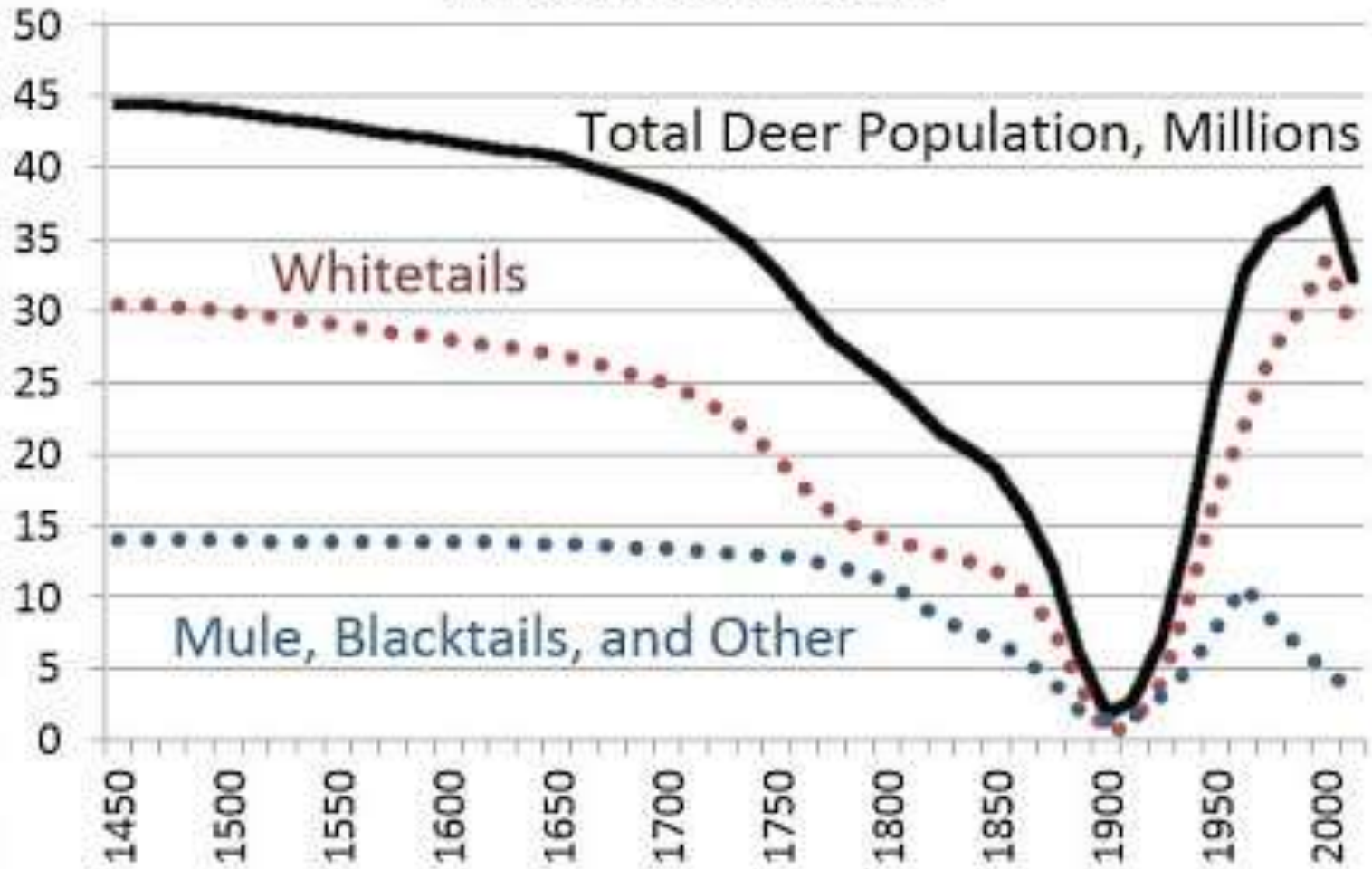
In 1926



Deer ticks require forests-moist, humid conditions

Wildlife

U.S. Deer Population 1450 to 2014



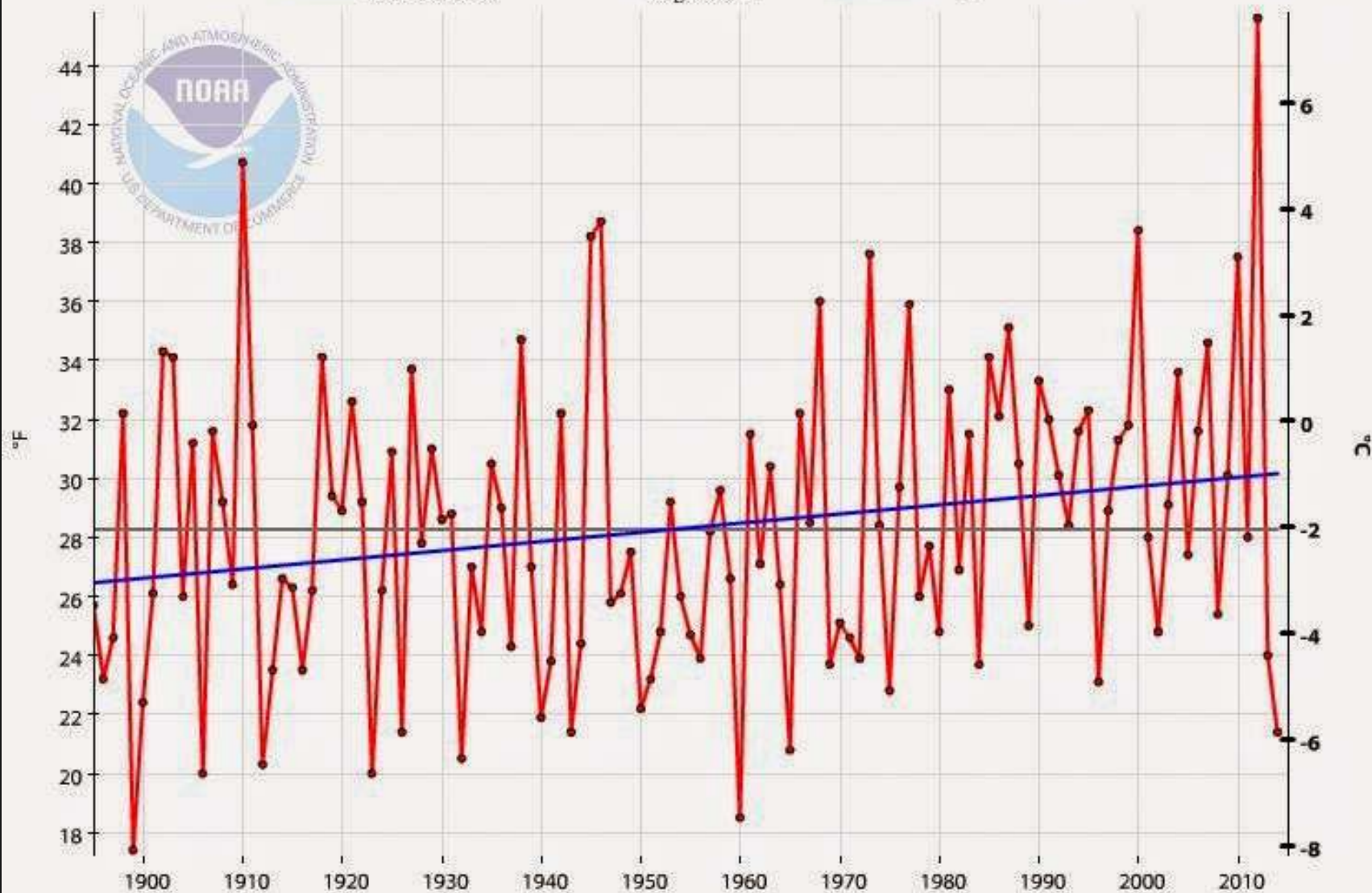
Deer are not reservoirs for Lyme disease
but do feed a lot of ticks



Climate

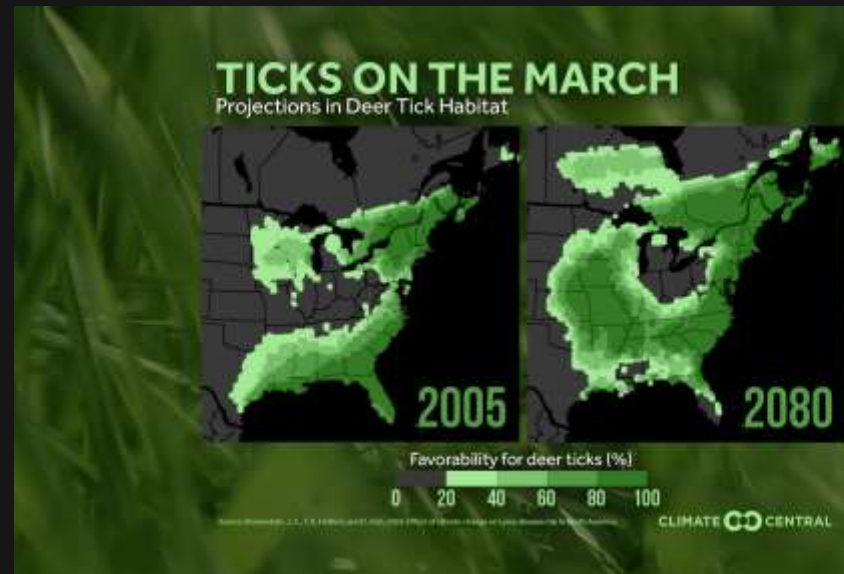
Wisconsin, Temperature, March

1895-2014 Trend +0.3°F/Decade
1901-2000 Avg: 28.3°F
Temperature



Temperature impacts on deer ticks

- An increase in population density
- A shift in risk areas: expansion into Canada (but also moving south in US)
- A longer tick season that starts earlier
- Also wildlife hosts, esp. mice that are a source of infection to the ticks



Virgin forest in the U.S.



In 1620



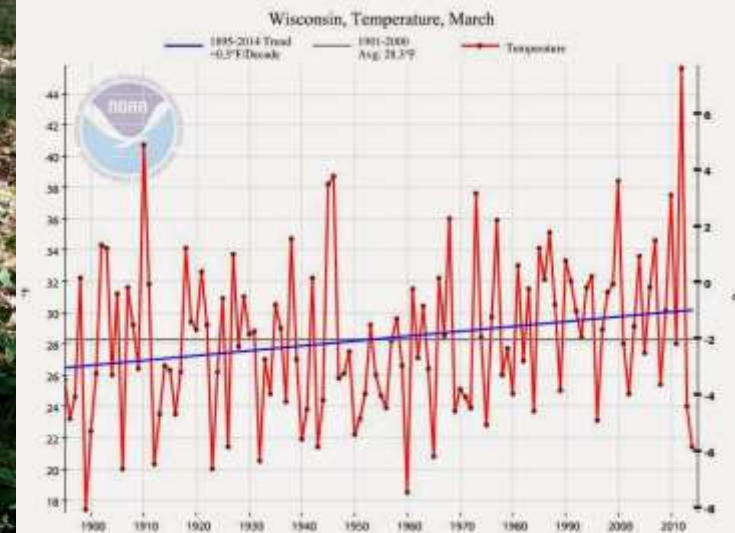
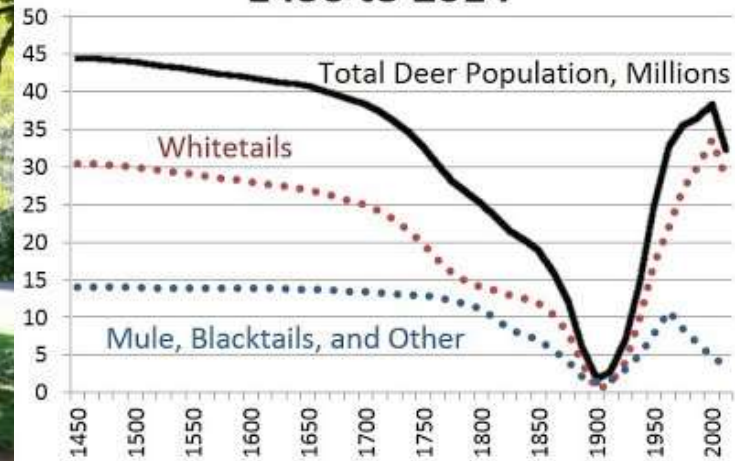
In 1850



In 1926



U.S. Deer Population 1450 to 2014





PREVENTION IS KEY!



WISCONSIN TICKS AND TICK-BORNE DISEASES

Department of Entomology, University of Wisconsin-Madison

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Page over to check out the Tick App, our new tool for providing mobile information about ticks, Lyme Disease, and other tick-borne diseases. Get your ticks identified and learn about the activity of ticks in your county. Fill out tick diaries to keep track of your exposures and participate in a citizen science tick research project!



UPDATES

November 1, 2019: We heard a report of a large number of deer ticks on a dog during a hunting trip in central Wisconsin. Always interested in learning about unusually high numbers at specific locations for this tick.

THE TICK APP

What is it about? Lyme disease! And other things related to ticks: how to identify them, how to report them and, most importantly for the research team, it asks about your whereabouts and tick encounters.

This is research? Yes, and it also reminds you to check for ticks and take precautions to not get bitten!

Download on the App Store | GET IT ON Google Play

LATEST NEWS

[Updates on ticks and Wisconsin](#)

[New invasive tick in the United States](#)

[New tools for summer camps](#)

<https://wisconsin-ticks.russell.wisc.edu/>