# LOOKING OUT FOR LYME: Identifying Areas of Disease Risk in Ohio

## Lyme Disease in the United States



These figures represent the number of reported Lyme disease cases per 100,000 people in each county of the United States in 2010 and 2015.

Lyme disease is a zoonotic tick-borne disease, commonly characterized by a bullseye-shaped skin rash. This disease was first described in the 1970s in the United States, and in the early 80s it was linked to Ixodes scapularis, the blacklegged tick or deer tick. The tick acts as a vector for the causative agent; a bacterium called Borrelia burgdorferi that is transmitted when an infected tick bites a suitable host. The CDC estimates that more than 300,000 new human cases occur each year, concentrated in the Northeast and Upper Midwest states. Currently, a vaccine against Lyme disease exists for dogs but there is no vaccine for humans.

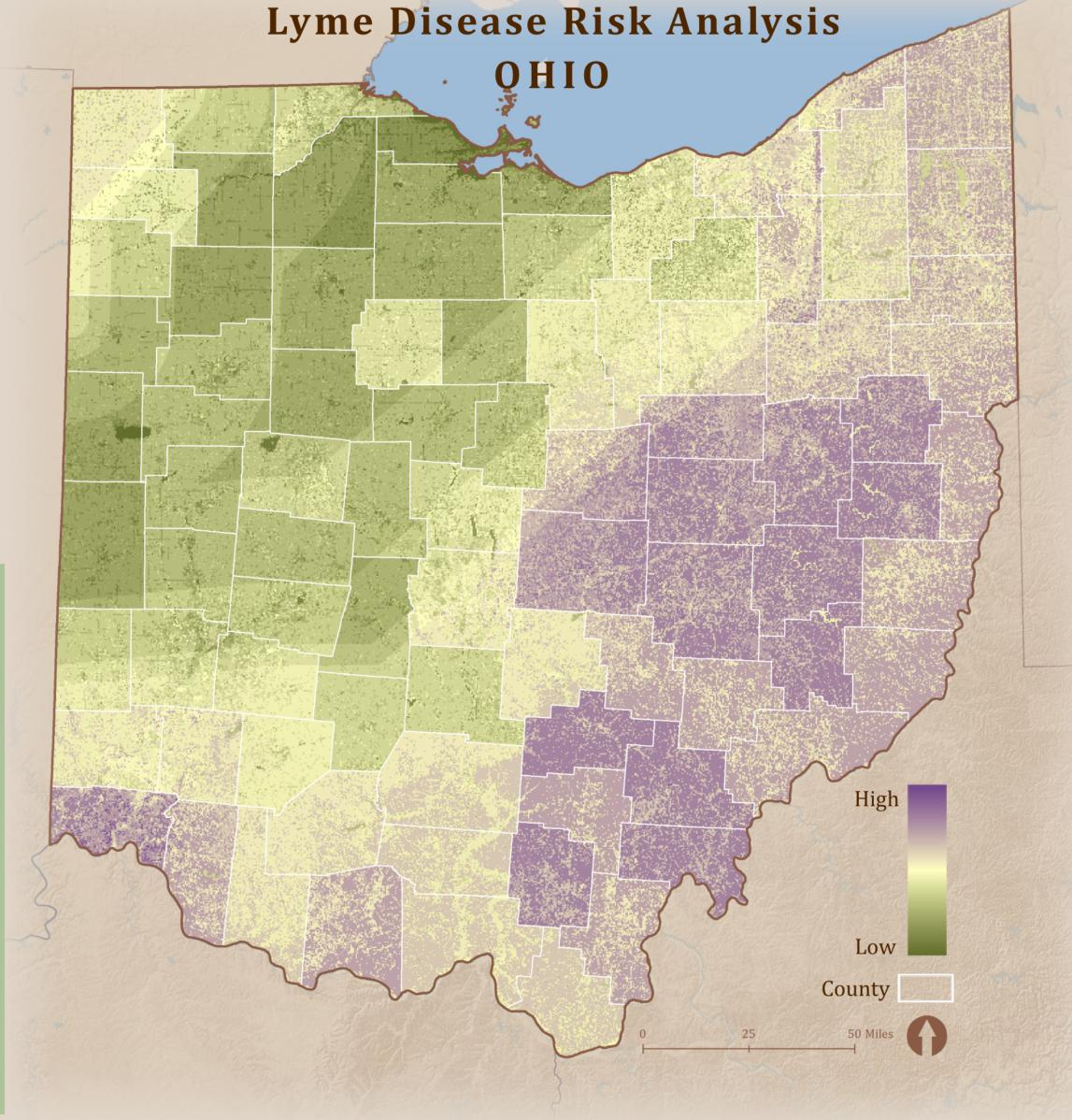
In order to understand the persistence and growing number of cases of Lyme disease each year, the life cycle of blacklegged ticks must be understood. Adult blacklegged ticks lay eggs in the spring that hatch in the summer. These larval ticks must find a meal-typically birds or small mammals such as white-footed mice (Peromyscus leocopus). White-footed mice are considered the principal reservoir for Lyme disease, meaning they can be natural carriers of the

disease-causing bacteria. Ticks become infected when they feed on an infected individual. In the spring, the now nymphal ticks search for a second blood meal. Finally in the fall, the nymphs become adults that seek larger hosts, such as white-tailed deer (Odocoileus virginianus). Occasionally, humans become the unlucky host for nymph or adult ticks. Because of their small size, nymphal ticks often go unnoticed when attached to a human.

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### Lyme Disease in Ohio

Ohio has seen very few cases of reported Lyme disease compared to neighboring Pennsylvania, though the number grows each year. In 2010, 44 cases were reported compared to 2015's 154 reported cases. Those numbers will likely continue to grow, and about half of the counties in Ohio have already seen an increase in the reported number of Lyme disease cases from 2010-2015.

The purpose of this analysis was to determine areas in Ohio that are most at risk for Lyme disease. There are many factors that contribute to

the spread of Lyme disease, including increased blacklegged tick habitat, white-tailed deer density, white-footed mouse density, and human population density. Climate change may be a factor driving the increase in suitable habitat for blacklegged ticks as temperatures rise and therefore allow the ticks to spread northward and remain active for a longer period of time. Unfortunately, due to data limitations, climate changes were unable to be incorporated into this analysis. The final risk analysis shows that the Appalachian Plateau region of eastern Ohio is at the greatest risk for Lyme disease, while the northwestern part of the state

#### What does this mean for you?

Change in number of reported Lyme

disease cases from 2010 to 2015

Lyme disease is one of many tick-borne diseases. Take necessary precautions when outdoors to avoid tick bites. Use insect repellant and thoroughly check for the presence of ticks on your clothing and body. For pets, be sure to regularly use tick prevention. Consider vaccinating your dog for Lyme disease, especially if you live in





has very little risk.





#### Methods

A risk analysis was performed by converting each factor layer into a raster and ranking the values from 1-5 (5 being the highest risk). Raster calculator was used to develop a final risk map incorporating each of the four factors.

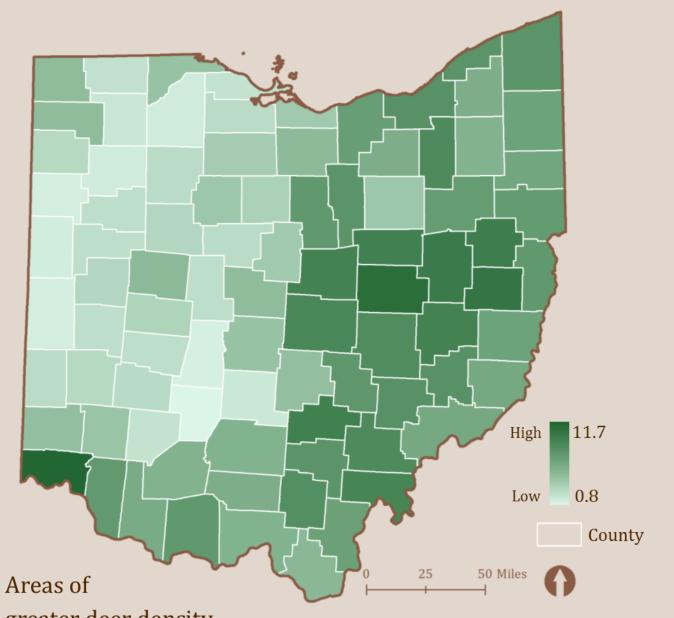
ANALYSIS FACTORS	RISK SCORE 1 (Lowest Risk)	RISK SCORE 2	RISK SCORE 3	RISK SCORE 4	RISK SCORE 5 (Highest Risk)	WEIGHT
White-tailed deer density Harvested bucks per square mile by county	0-2	2-4	4-6	6-8	8-12	30%
Blacklegged tick range Distance from range (miles)	>50	25-50	10-25	5-10	Within-5	20%
White-footed mouse habitat Based on land cover	Water, Perennial Ice/ Snow, Wetlands	Developed (Medium and High Intensity), Barren Land	Developed (Open Space and Low Intensity), Pasture, Scrub	Grassland, Herbaceous, Crops	Forest	30%
Human population density People per square mile by block group	0-1,000	1,001 - 3,000	3,001 - 10,000	10,001 - 20,000	20,001 - 40,000	20%

## White-tailed Deer Density

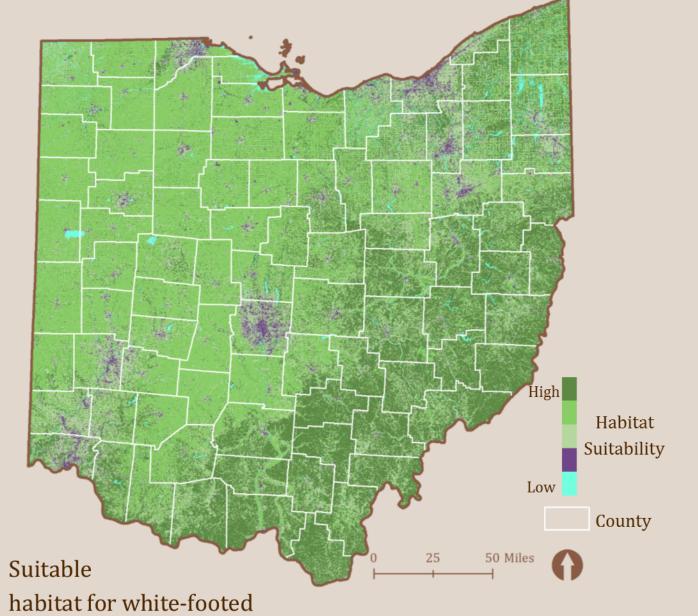
# White-footed Mouse Habitat

# Blacklegged Tick Range

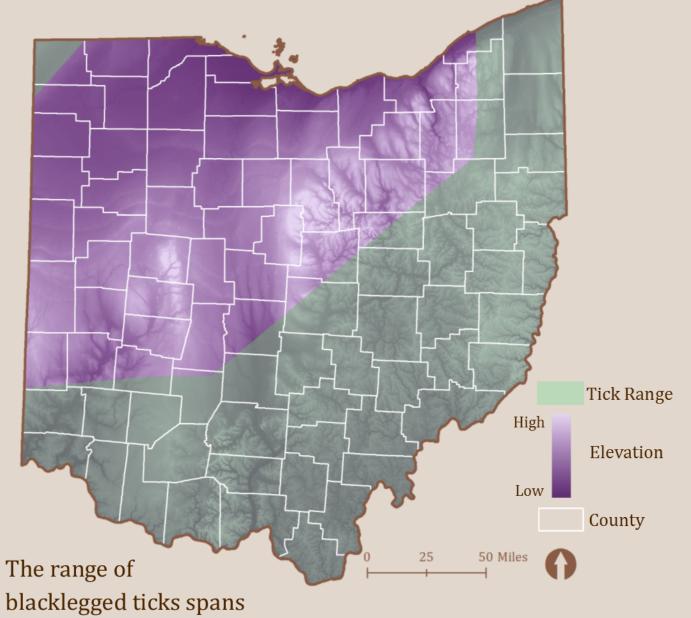
# Human Population Density



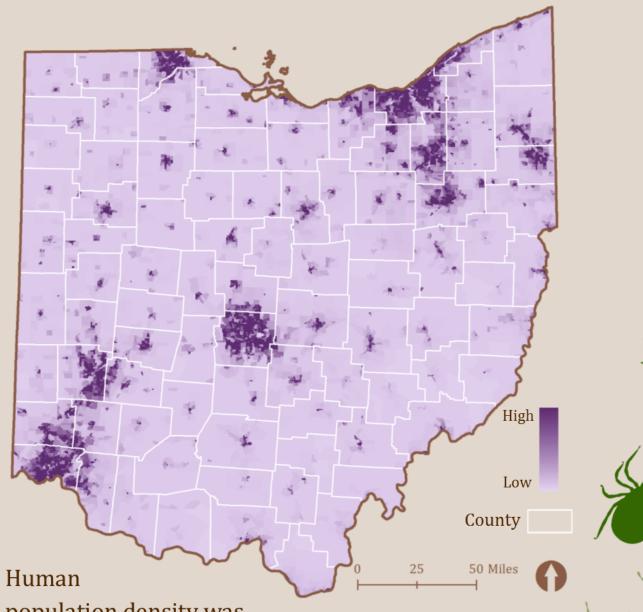
greater deer density (evaluated based on number of bucks harvested per square mile) are likely to have a greater number of blacklegged ticks as they are a suitable host for the adult ticks. The possibility for increased presence of ticks means an increased risk for Lyme disease.



mice was determined based on land cover. White-footed mice prefer dry, forested areas, but can adapt to live in various other habitats. Due to their ability to be a reservoir for Lyme disease, areas with suitable habitat are more likely at risk.



from the southwest corner of Ohio to the northeast corner. Much of this region is considered the Appalachian Plateau, as depicted by the higher elevations. Areas within the range are most at risk for Lyme disease, and the risk decreases further from the range.



population density was obtained from the 2010 US census and is based on the number of people per square mile by block group. Due to the larger number of people, areas of higher density have a greater chance of coming in contact with an infected tick and therefore are most at risk.



Data Sources: US Census, ESRI, CDC, Ohio Division of Wildlife **Projection:** NAD 1983 State Plane Ohio North FIPS 3401









