



# Ecological and human health impacts of invasive species

September 8, 2023

Jocelyn Behm, Ph.D.

[jocelyn.behm@temple.edu](mailto:jocelyn.behm@temple.edu)

Assistant Professor  
Integrative Ecology Lab  
Temple University

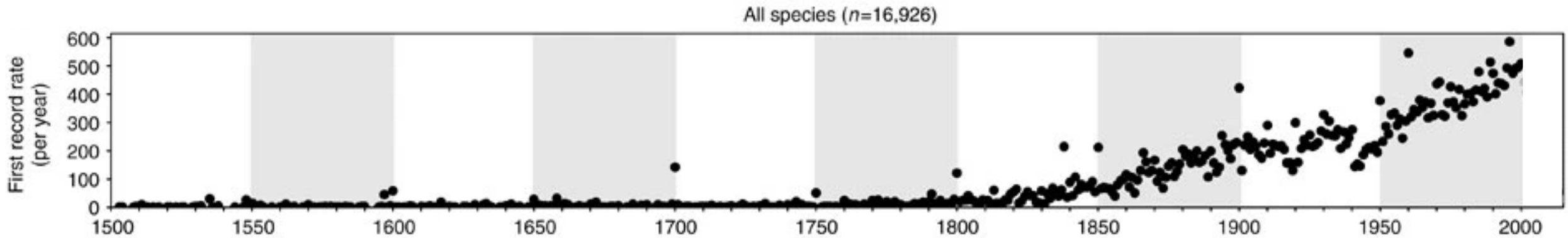


IECOLAB

# Invasive species

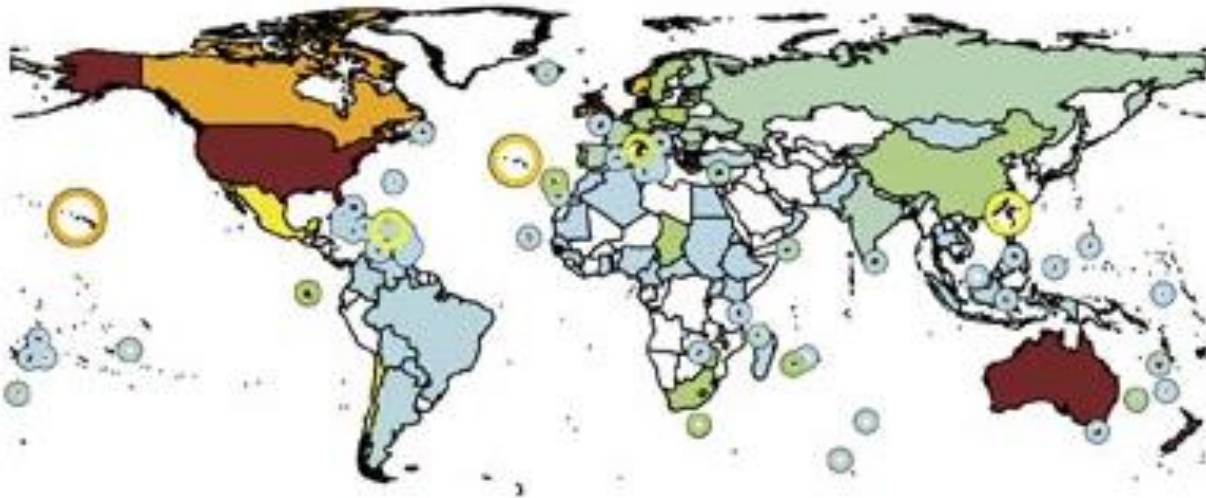
- A species that has been spread to a new area where it causes:  
environmental,  
economic, and/or  
human and animal health impacts

# Species introduction rates have been increasing over time



# The United States is a hotspot for species invasions

Number of Invasive Plant Species

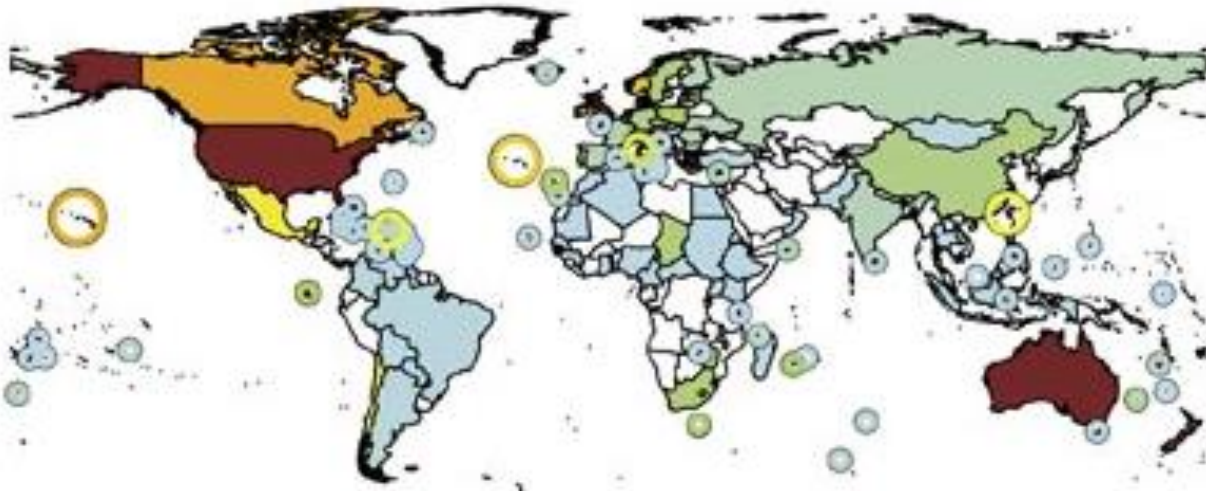


less species      more species



# The United States is a hotspot for species invasions

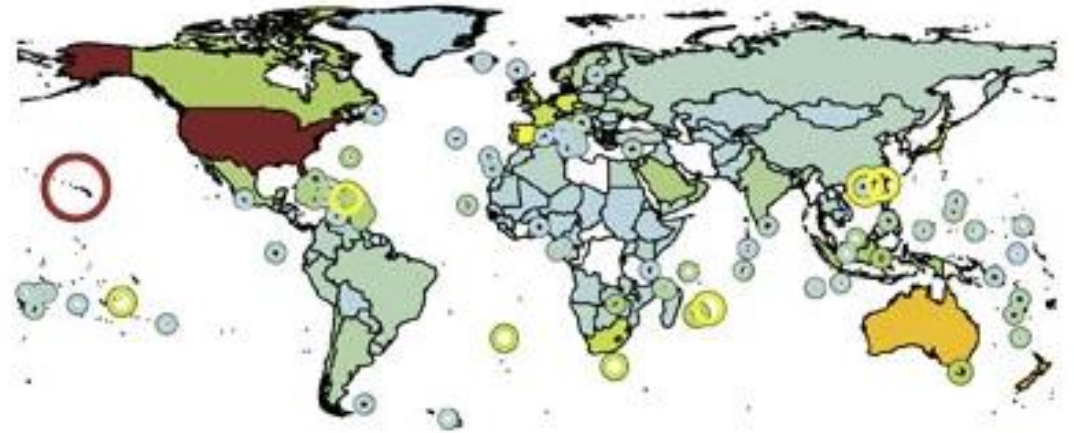
Number of Invasive Plant Species



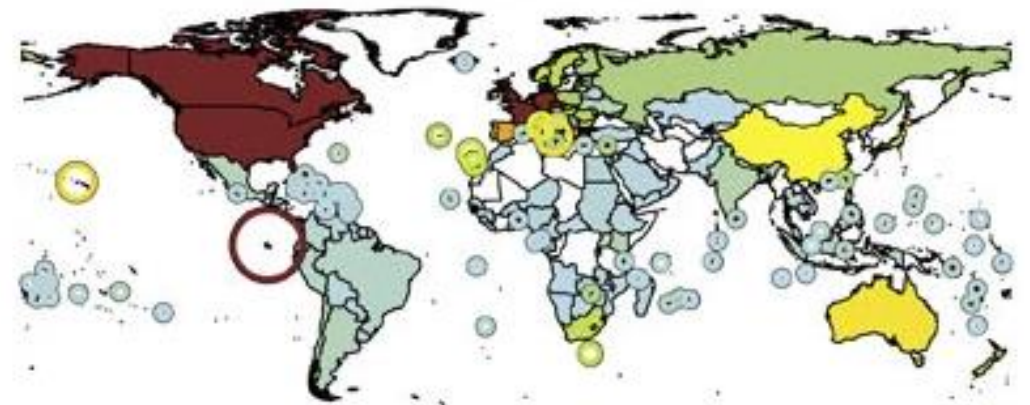
less species

more species

Birds



Insects





# Effects of invasive species can be dramatic

Kudzu Vines



Zebra Mussels



Emerald Ash Borer



# Not all invasive species cause obvious changes.

- Instead, changes can be subtle.
- But enough subtle changes to an ecosystem can trigger dramatic consequences.



# Links between invasive plants and Lyme disease






# Lyme Disease Ecology

# Lyme Disease Ecology

## Transmission of Bacteria that Cause Lyme Disease

 = Lyme disease bacteria, *Borrelia burgdorferi*




# Lyme Disease Ecology



Tick larvae  
and nymphs


## Transmission of Bacteria that Cause Lyme Disease

 = Lyme disease bacteria, *Borrelia burgdorferi*



# Lyme Disease Ecology

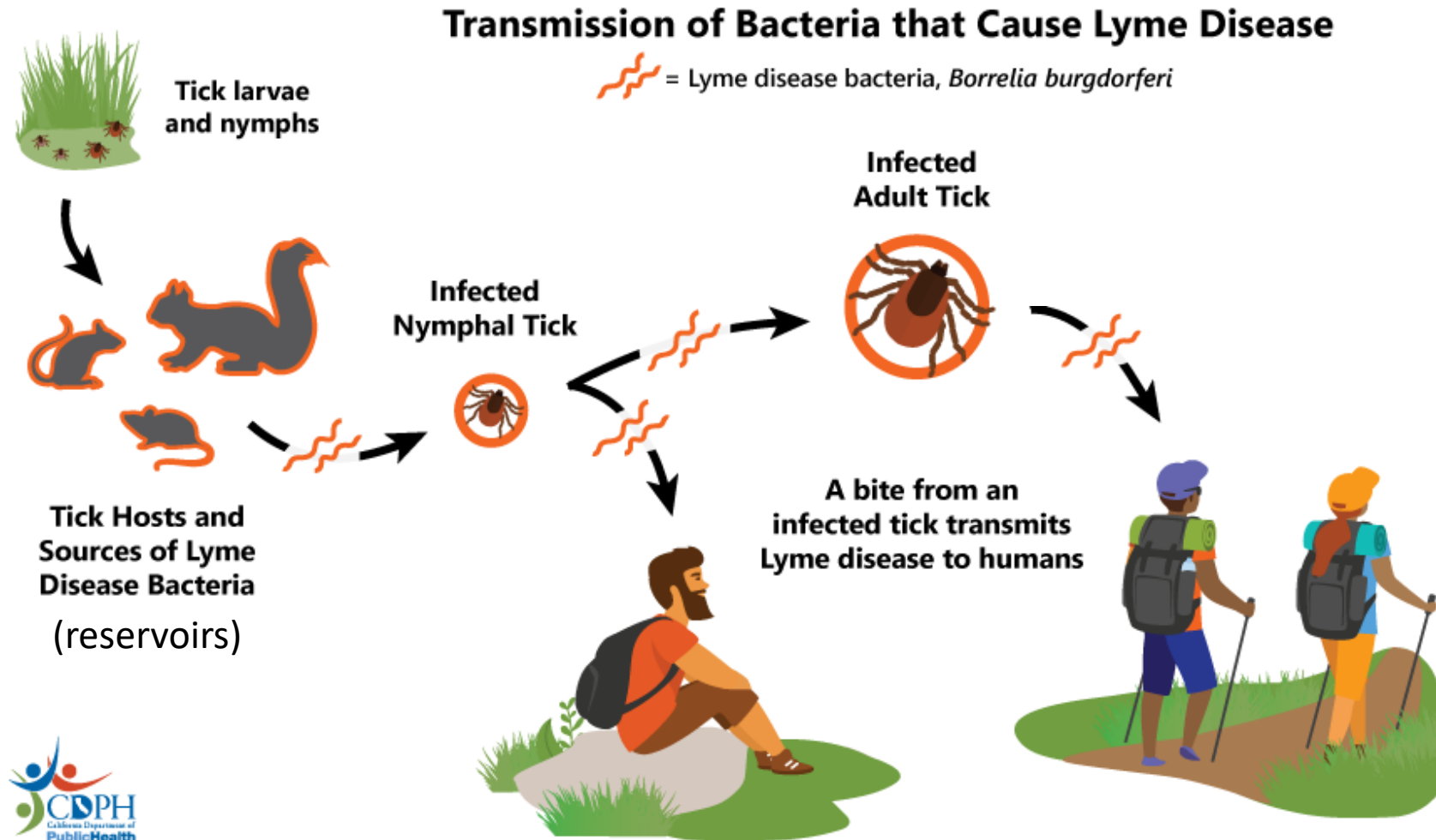
## Transmission of Bacteria that Cause Lyme Disease

 = Lyme disease bacteria, *Borrelia burgdorferi*

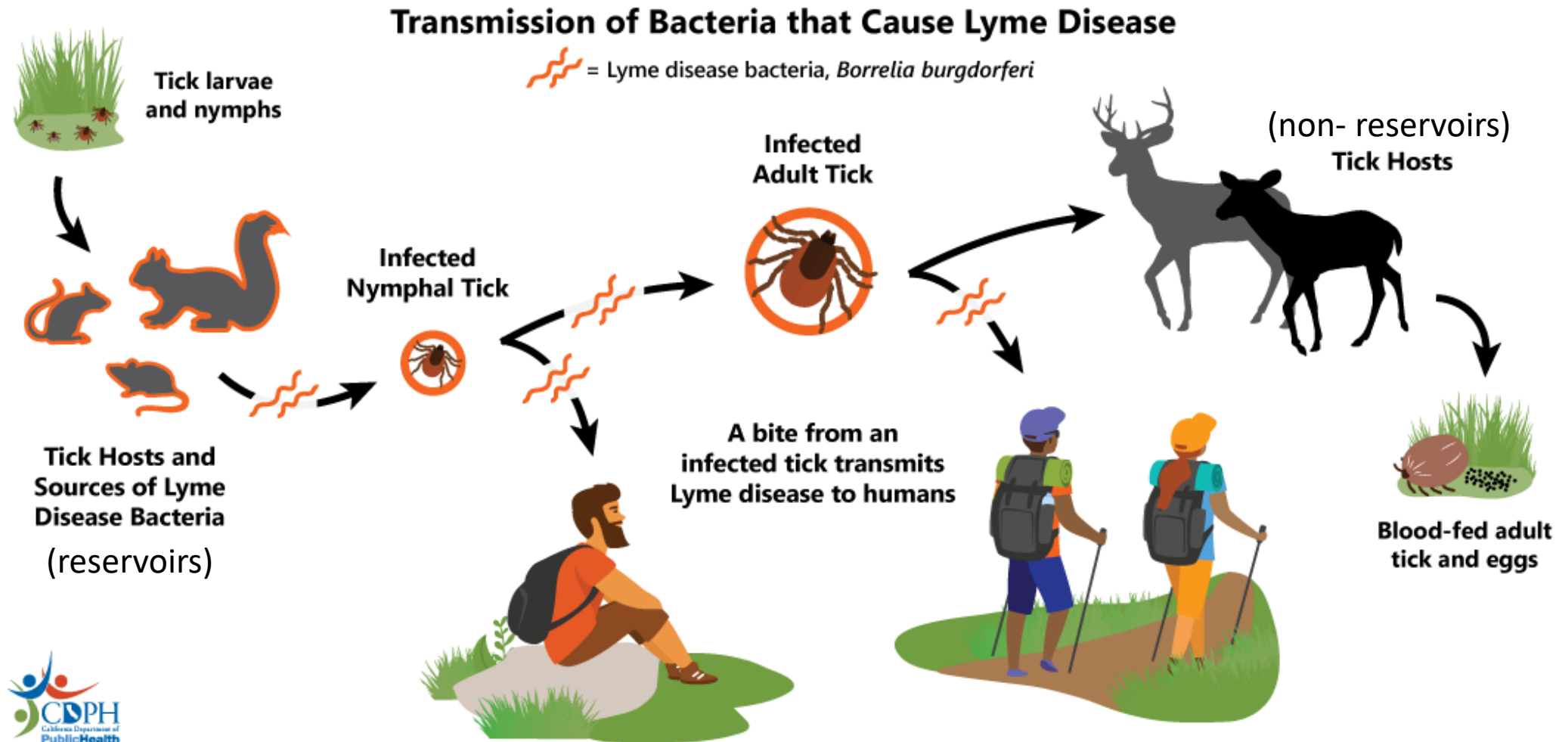




# Lyme Disease Ecology

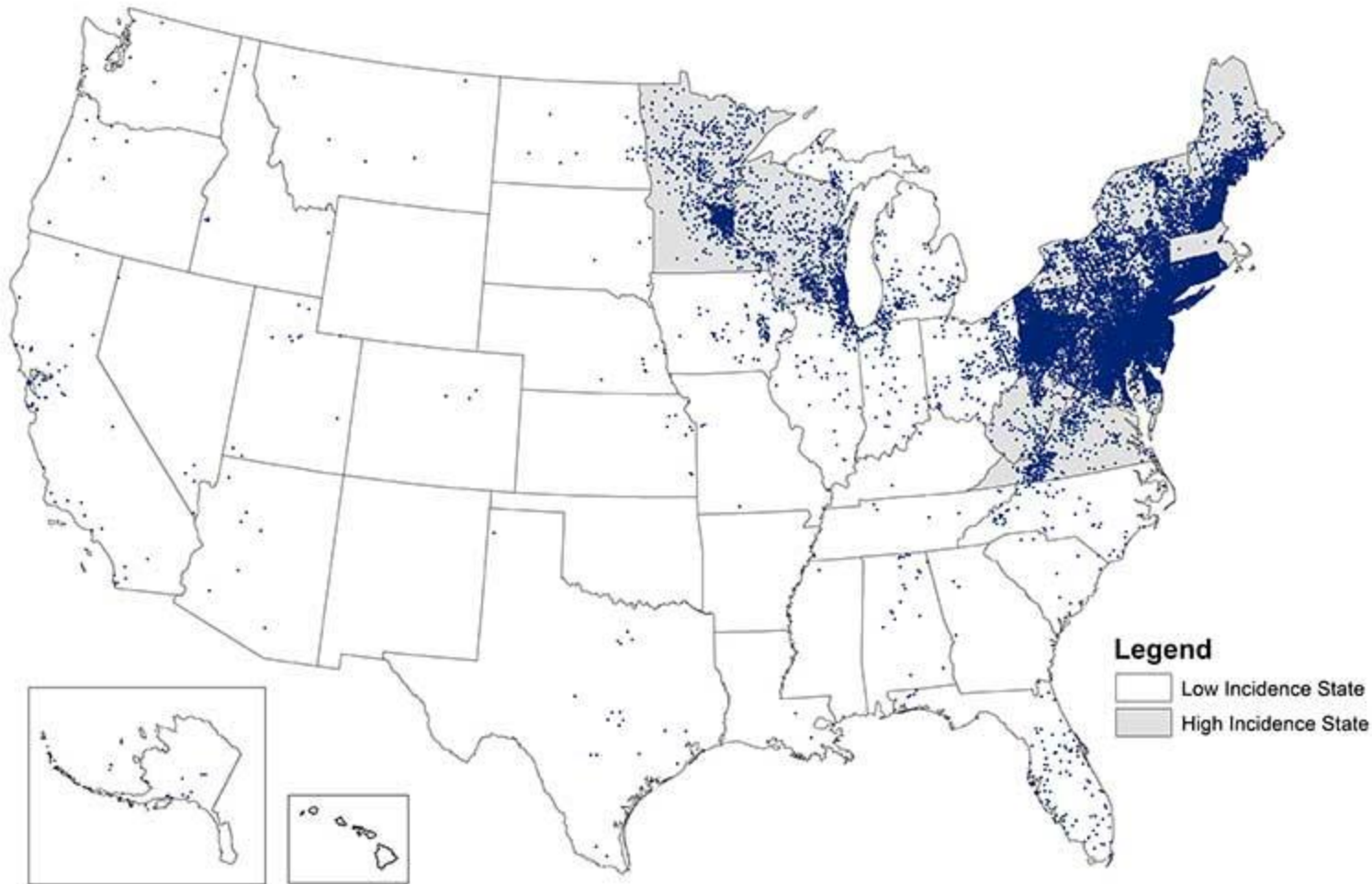


# Lyme Disease Ecology

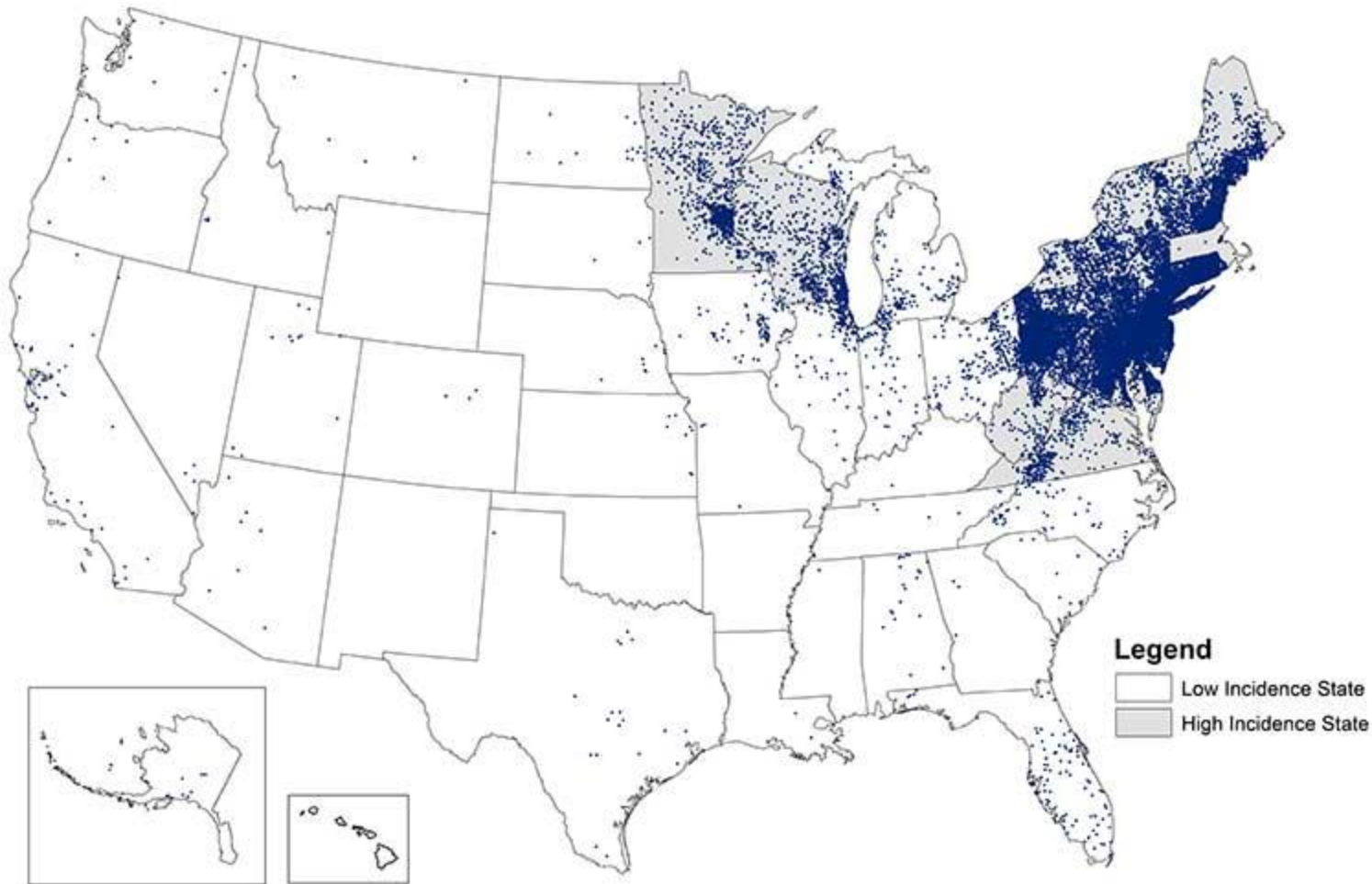


# Lyme disease in the US

Costs nearly \$1 billion annually  
for diagnosed  
Lyme disease cases



# Lyme disease in the US



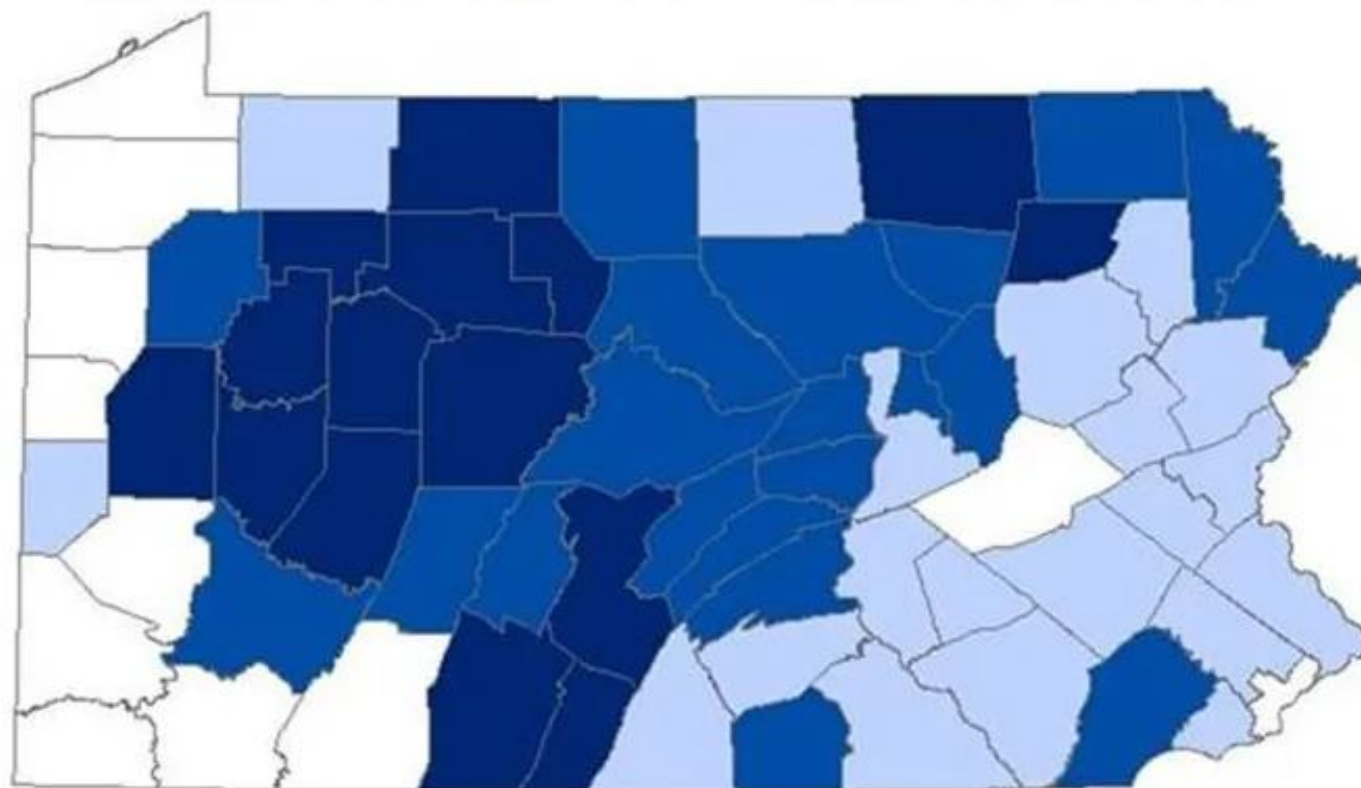
Costs nearly \$1 billion annually  
for diagnosed  
Lyme disease cases

Pennsylvania is a  
national leader for  
Lyme disease cases

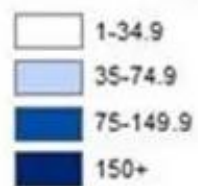


# Lyme Disease Average Annual Incidence

Average Annual Cases per 100,000 Population, 2012-2016



Average Annual Number of Cases per 100,000 Population





# Links between invasive plants and Lyme disease

Dense thickets of invasive understory shrubs

Invaded forest



Uninvaded forest



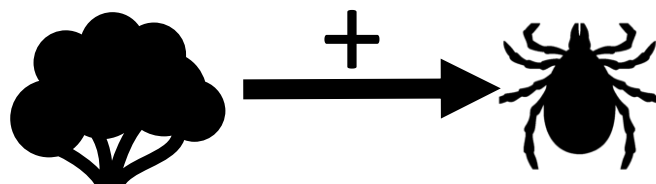


# Links between invasive plants and Lyme disease

Focal invasive shrub: Wineberry



# Links between invasive plants and Lyme disease





# Invasive plants create ideal habitat for ticks



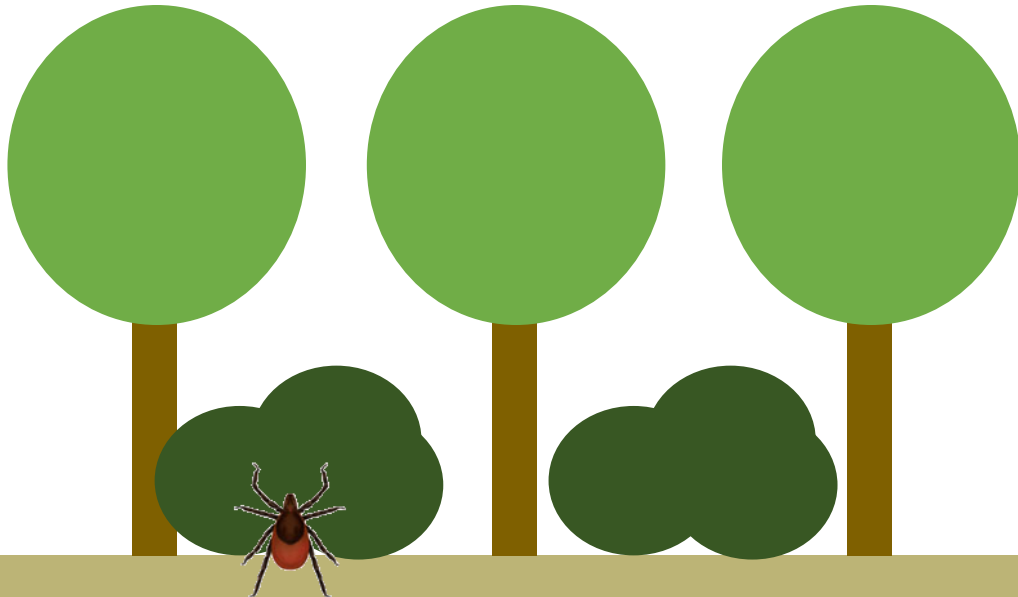
Black-legged tick: Main vector of Lyme disease

# Invasive plants create ideal habitat for ticks

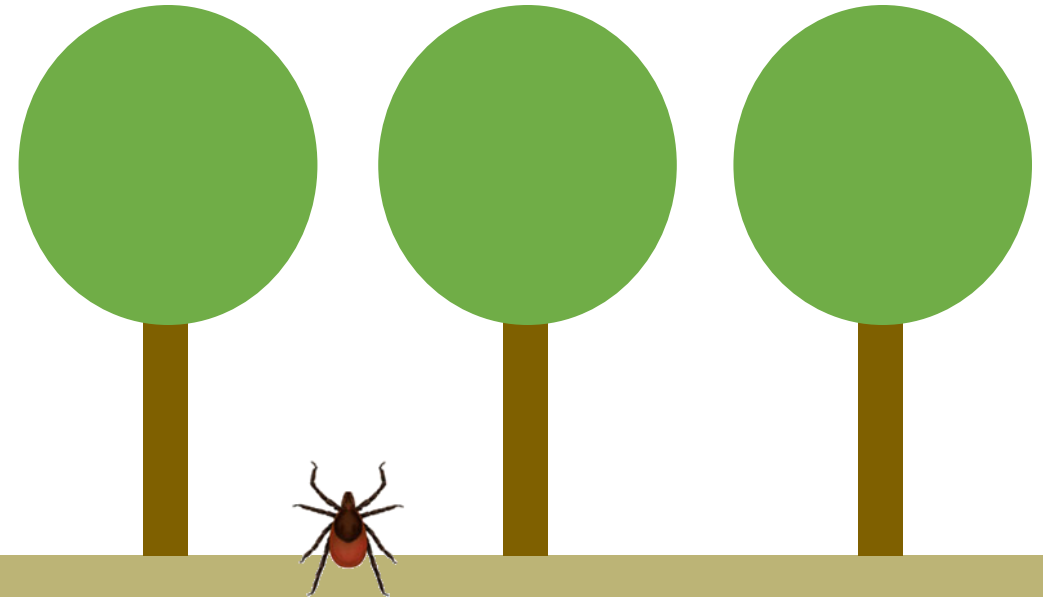


Black-legged tick: Main vector of Lyme disease

Invaded Forest  
cooler, more humid



Uninvaded Forest  
hotter, less humid

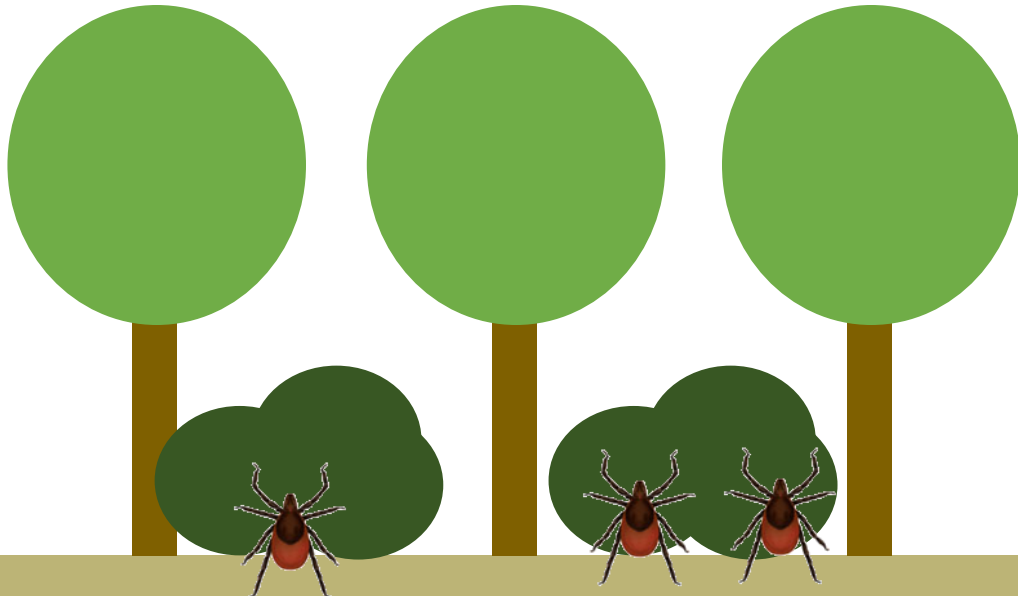


# Invasive plants create ideal habitat for ticks

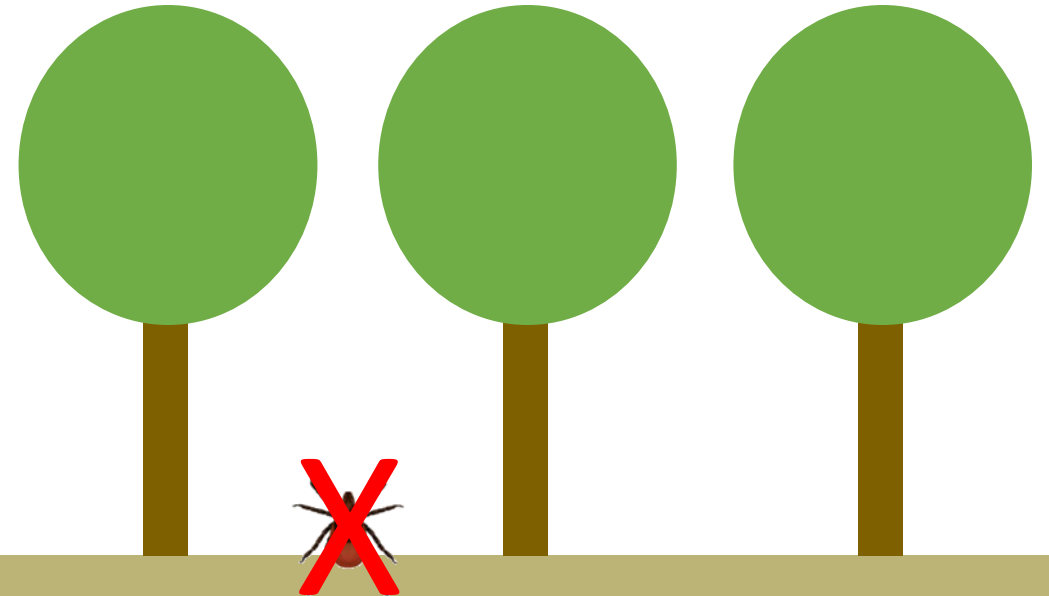


Black-legged tick: Main vector of Lyme disease

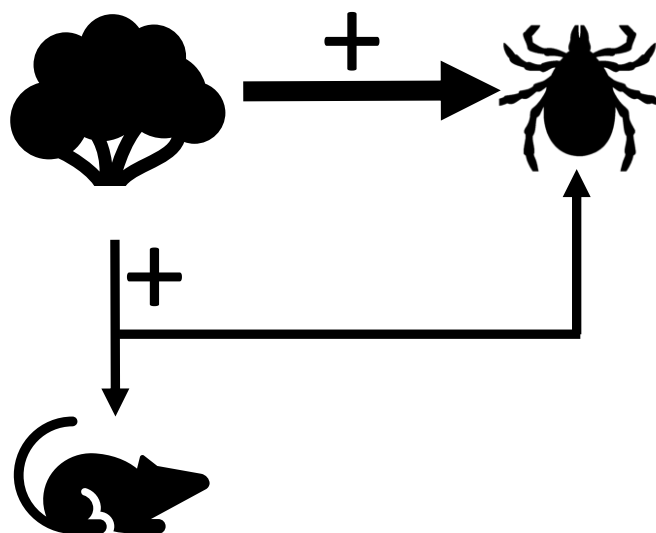
Invaded Forest  
cooler, more humid



Uninvaded Forest  
hotter, less humid



# Links between invasive plants and Lyme disease





# Invasive plants create ideal habitat for mice



White-footed mice: great reservoir for Lyme disease bacteria

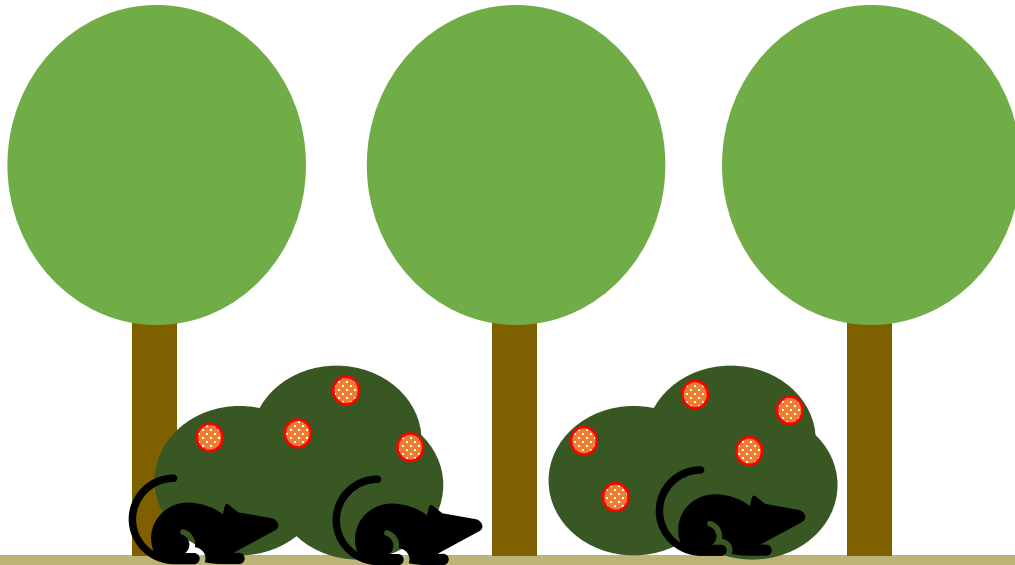
# Invasive plants create ideal habitat for mice



White-footed mice: great reservoir for Lyme disease bacteria

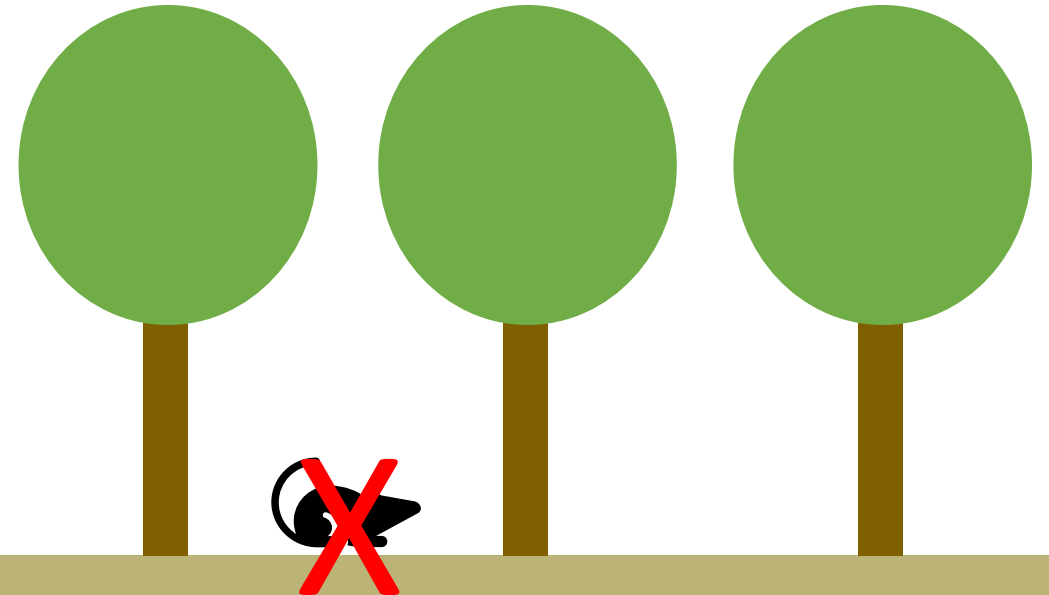
## Invaded Forest

cooler, more humid, more snacks



## Uninvaded Forest

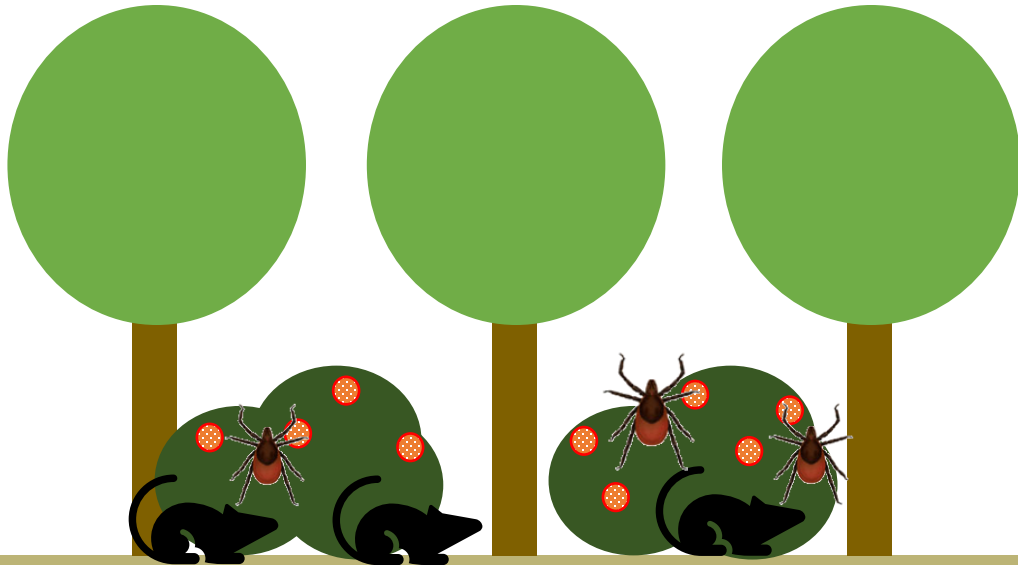
hotter, less humid, less snacks



# Ideal habitat for ticks and mice increases tick-mice encounter rates

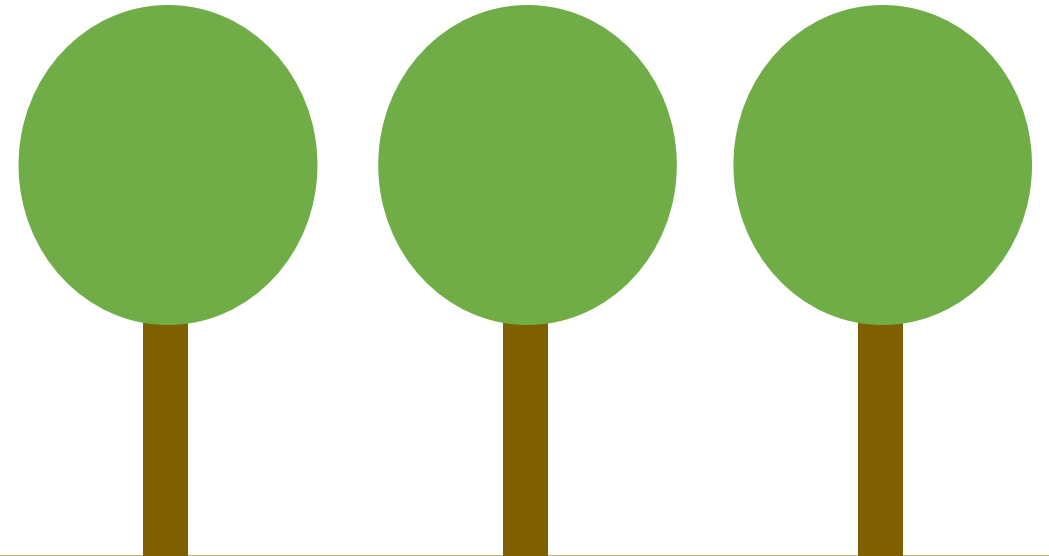
## Invaded Forest

cooler, more humid, more snacks

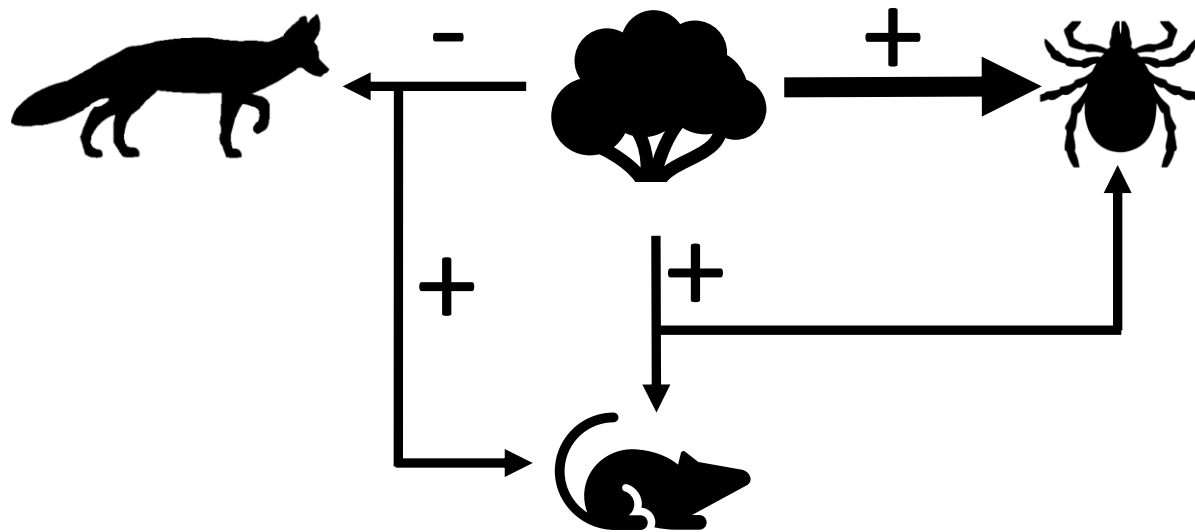


## Uninvaded Forest

hotter, less humid, less snacks



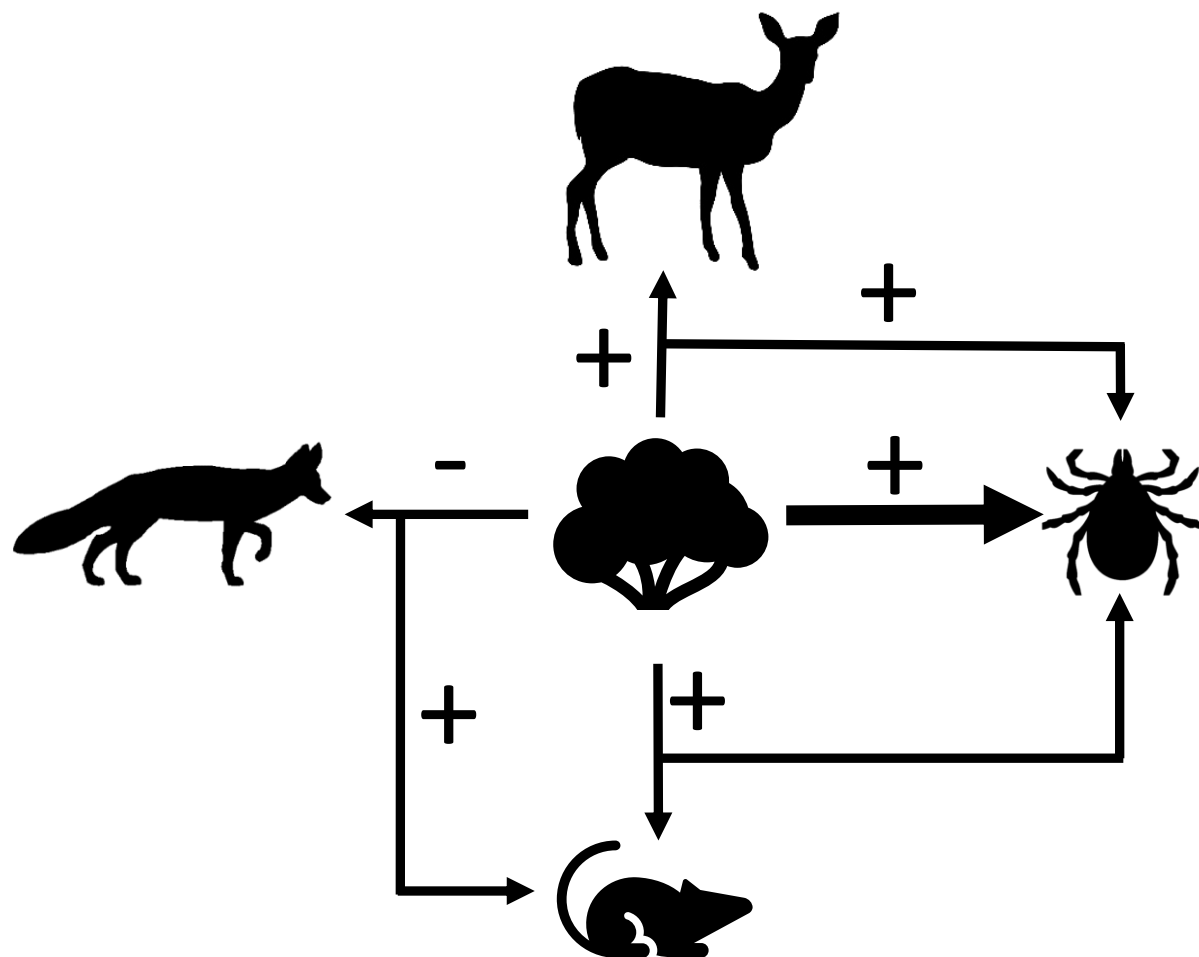
# Links between invasive plants and Lyme disease



# Invasive plants create predator-free environments and increase mouse populations



# Links between invasive plants and Lyme disease





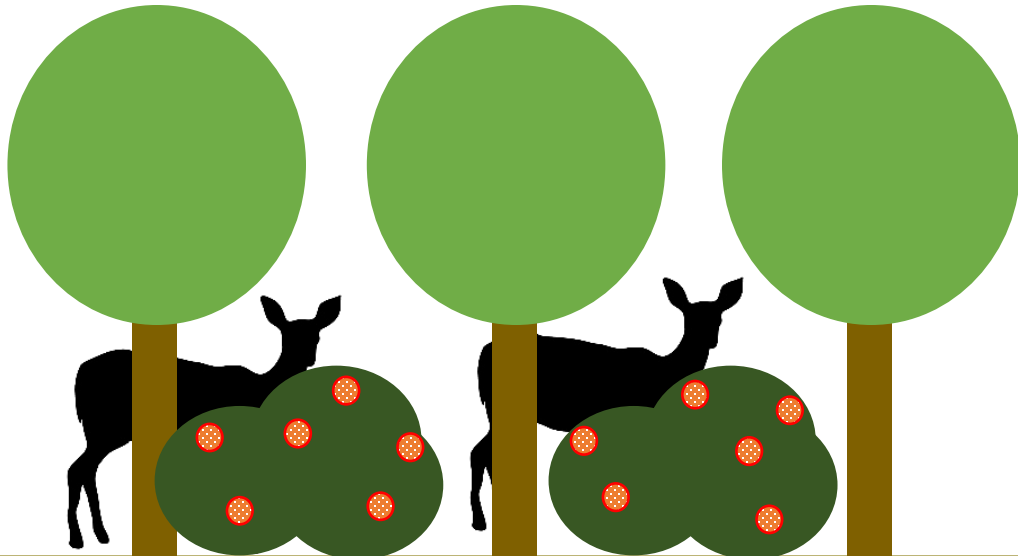
# Invasive plants attract deer



White-tailed deer: Poor reservoir for Lyme disease bacteria

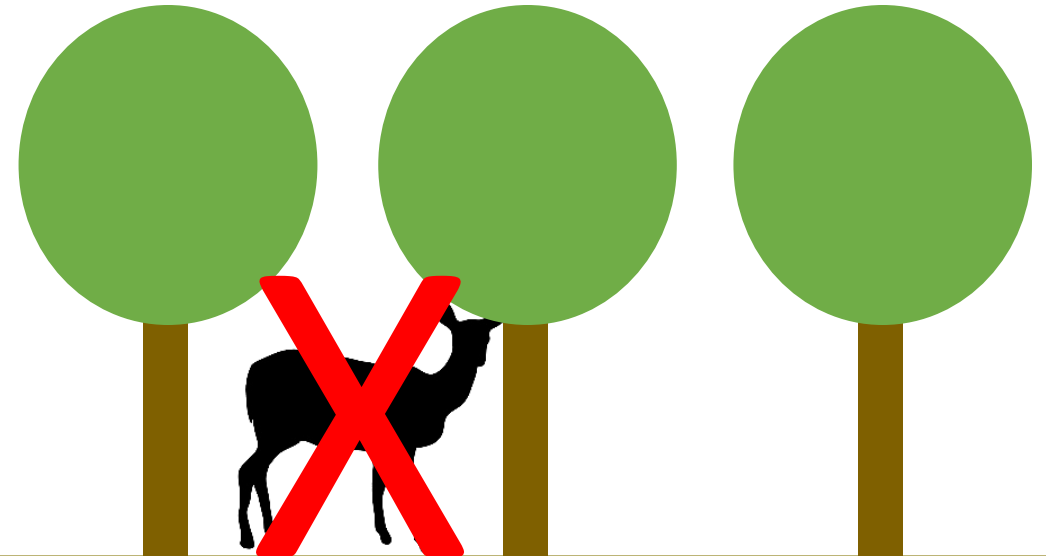
## Invaded Forest

cooler, more humid, more snacks



## Uninvaded Forest

hotter, less humid, less snacks



Deer are big and feed a lot of ticks,  
increasing tick populations

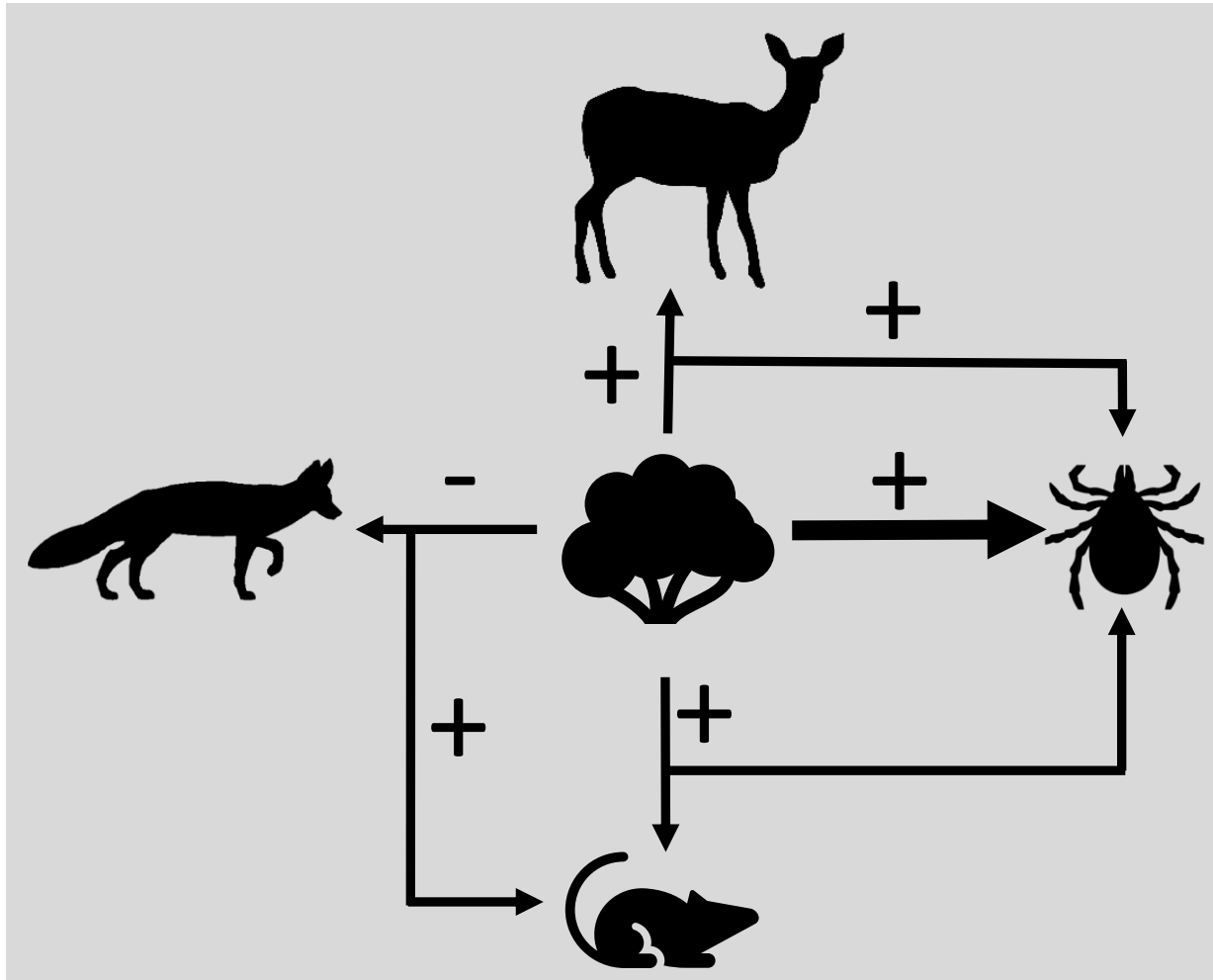


ticks on deer head

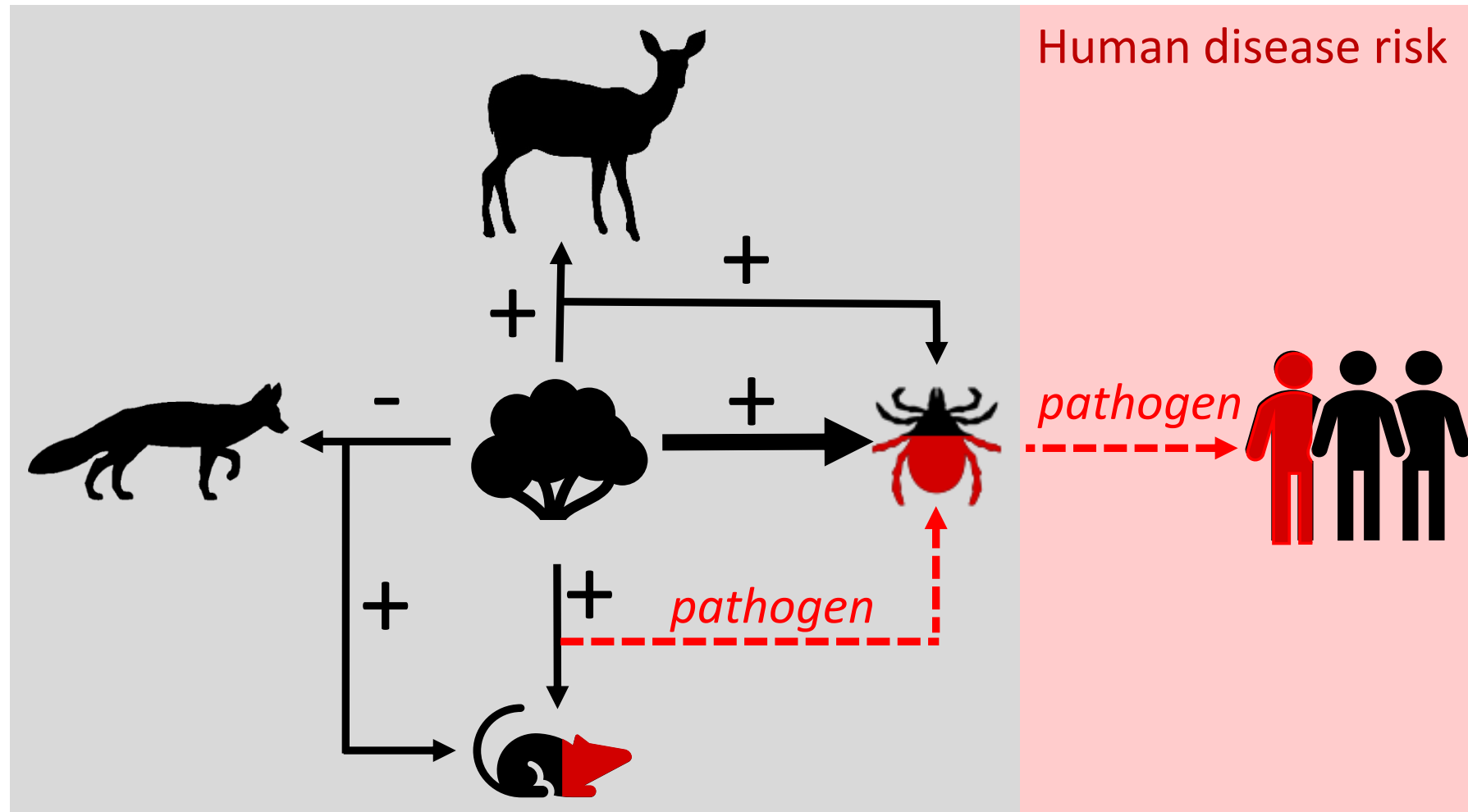


ticks on mouse ear

# Links between invasive plants and Lyme disease



# Links between invasive plants and Lyme disease





# Links between invasive plants and Lyme disease

