

# The Ecology of Ticks at Turnbull National Wildlife Refuge

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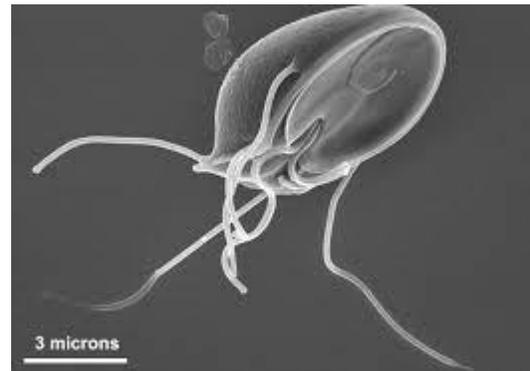
# Overview

- Background
- Observational Study
- Tick collection
- Vegetation Study
- Small Mammal collection
- Preliminary Results
- Future of Study



# How do we contract diseases?

- Usually by some form of contact with the pathogen
  - by touching infected vector
- Vectors carry the pathogens
  - vectors can be animals and or invertebrates
- Vectors give/get pathogens to/from their hosts
- These pathogens can be in the form of
  - bacteria
  - viruses
  - Protozoans
  - Fungi



# Ticks can cause life threatening diseases

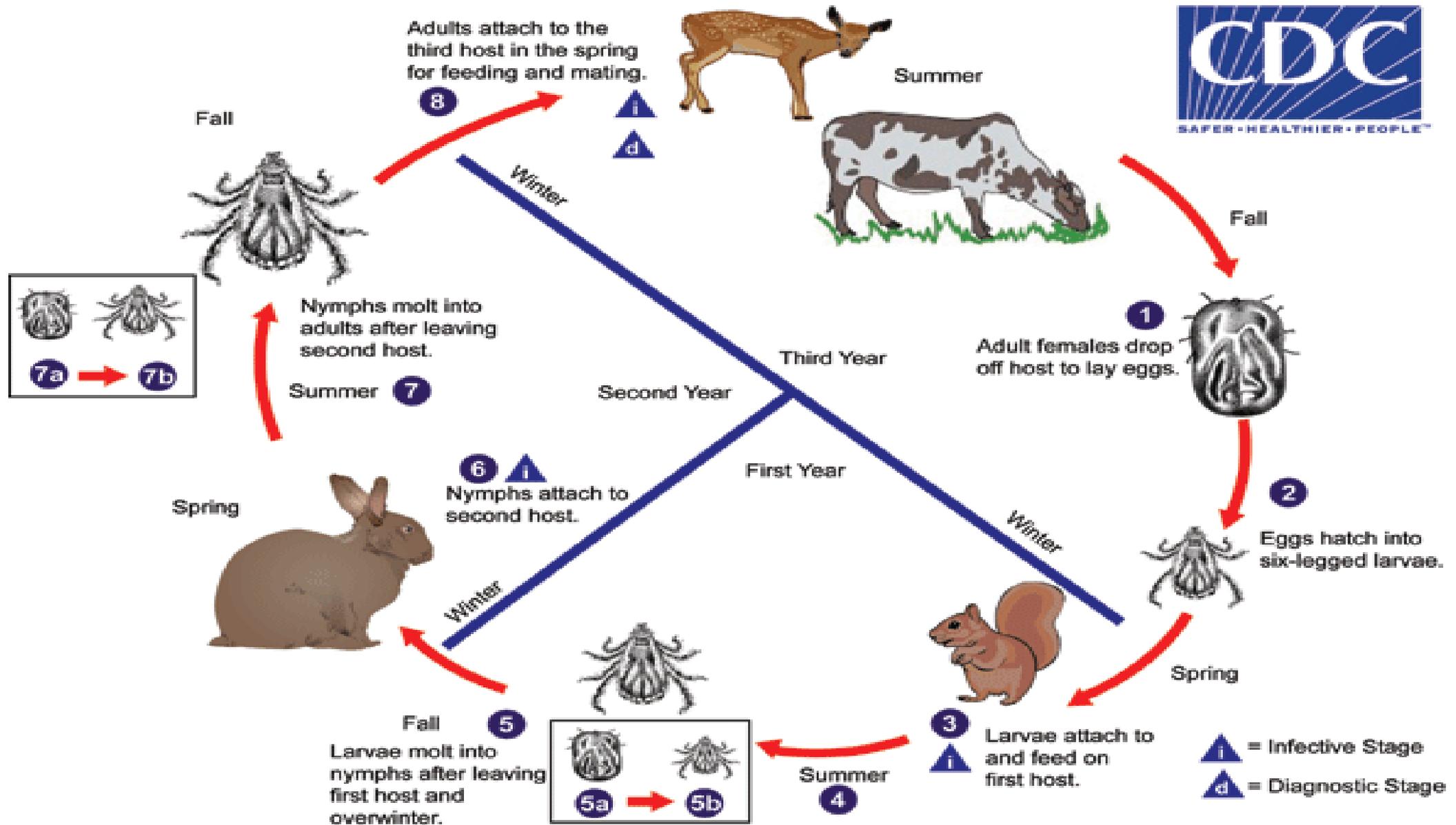
- *Borrelia burgdorferi* or Lyme Disease
  - Not life threatening
  - Typically found in eastern states
- *Rickettsia rickettsii* or Rocky Mountain Spotted fever (RMSF)
  - Life threatening
  - Untreated death rate nearly 75% per CDC
  - Found in Washington state



RMSF



# 3 Stage life cycle



Taken from CDC.gov website

# Prior studies in the area

- In 2014, Dr. Magori's student collected ticks at multiple locations
- The 30 Acre Lake Trail had the most tick collected
- 24 ticks were collected on Northern part of trail
- 3 were infected with *R. rickettsii*



# Observational Survey of 30 Acre Lake Trail

- TNWR is approximately 20 miles South West of Spokane WA
- 5 miles South of Cheney WA



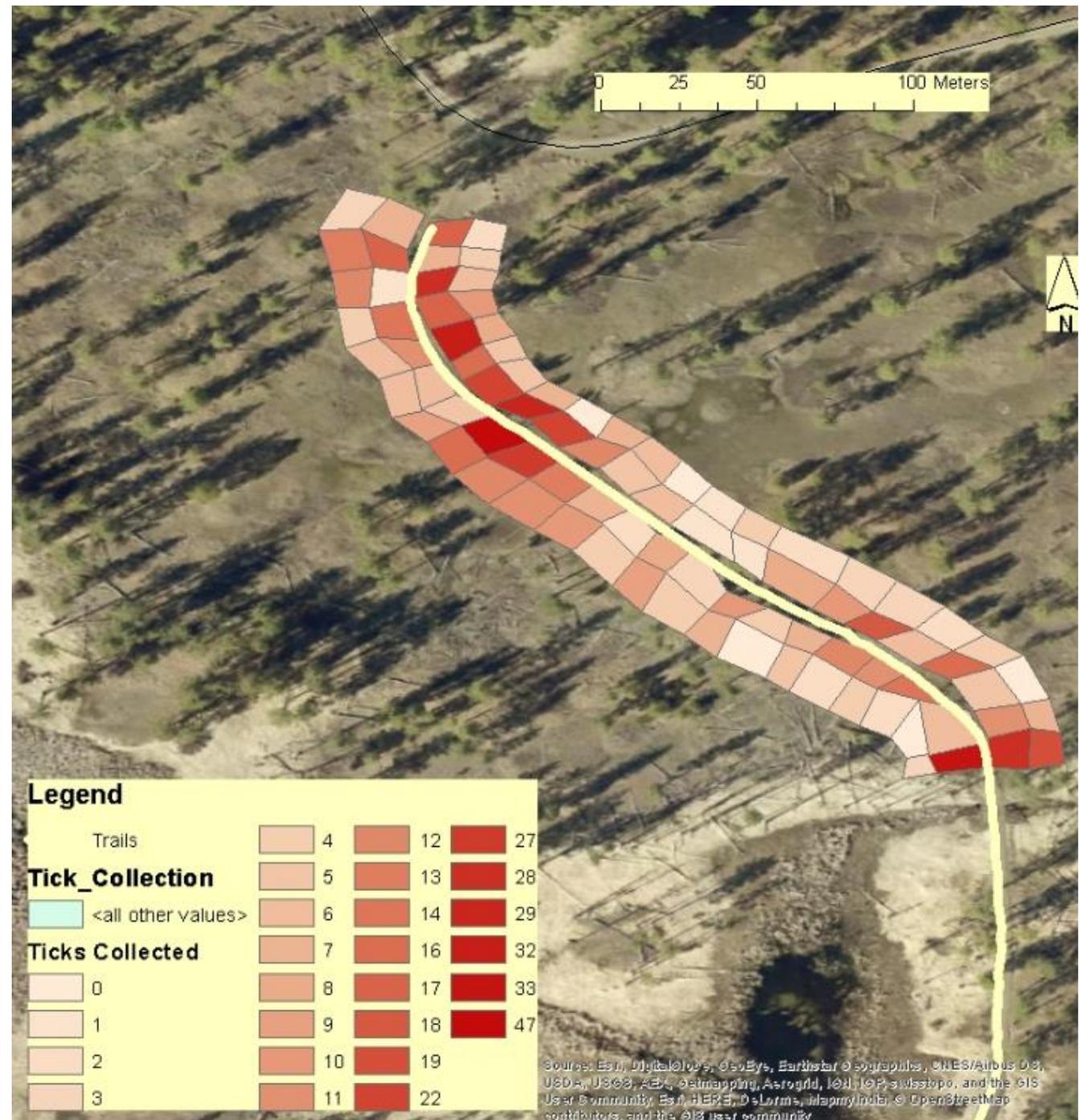
# The 30 Acre Lake Trail

- Within the public use area
- High use area by public for bird watching and recreation
- Off the auto trail
- Runs parallel to intermittent creek



# Study Site

- 44 zones each side of trail for total of 88 zones
- 10 X 10 meter
  - Standard sized for collection
- Total of 220 meters



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# Collecting ticks

- Drag method of collection (Estrada-Pena et al. 2013)
- 1 meter square corduroy cloth, light in color
- Dragged behind collector for 10 meters
- Pick ticks off cloth/person
- Place in 70% ethanol
- BIOL490 Disease Ecology students



Taken from vetbook.org website-google

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# Vegetation Study

- Performed by Graduate Student Jarrett Cellini
- Percentages given to amount of vegetation coverage
  - Shrubs
  - Grasses and Forbs
  - Bare ground
  - Biocrust
  - Wood
  - Rock



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# Trapping small mammals- catch and recapture (Mills et al. 1995)



- 88 Sherman traps
- Mammals identified
  - Yellow Pine Chipmunks (*Tamias amoenus*)
  - Deer mice (*Peromyscus maniculatus*)
- Ticks removed
- Mammals tagged with ear tag and released

# Blood Taken

- Mammal must be over 20 grams
- retro-ocular orbit with capillary tubes (Kirkland 1998)
- 0.5 mls taken (Diehl et al. 2001)
- One full capillary tube
- Serological antibody testing (presence/absence ) (Simser et al. 2001)



# Capture of Large mammals



Taken from nps.gov website

- Trail cameras
  - pointed on the 30 Acre Lake Trail
  - pointed at large game trails



Taken from huntingtop10.com website

- Pictures taken off SD cards for evaluation



Taken from wideopenspaces.com website

- Possible host of Adult ticks



Taken from calamusoutfitters.com website



Taken from dnr.state.il.us website

# Preliminary Results



## Ticks collected

- 6 separate collections
- Once an week for three weeks
- Three week break
- Once a week for three more weeks
- Collected 824 ticks
- Two species collected were *D. andersonii* and *D. variabilis*
- *No Ixodes spp. were collected*

# Preliminary Results



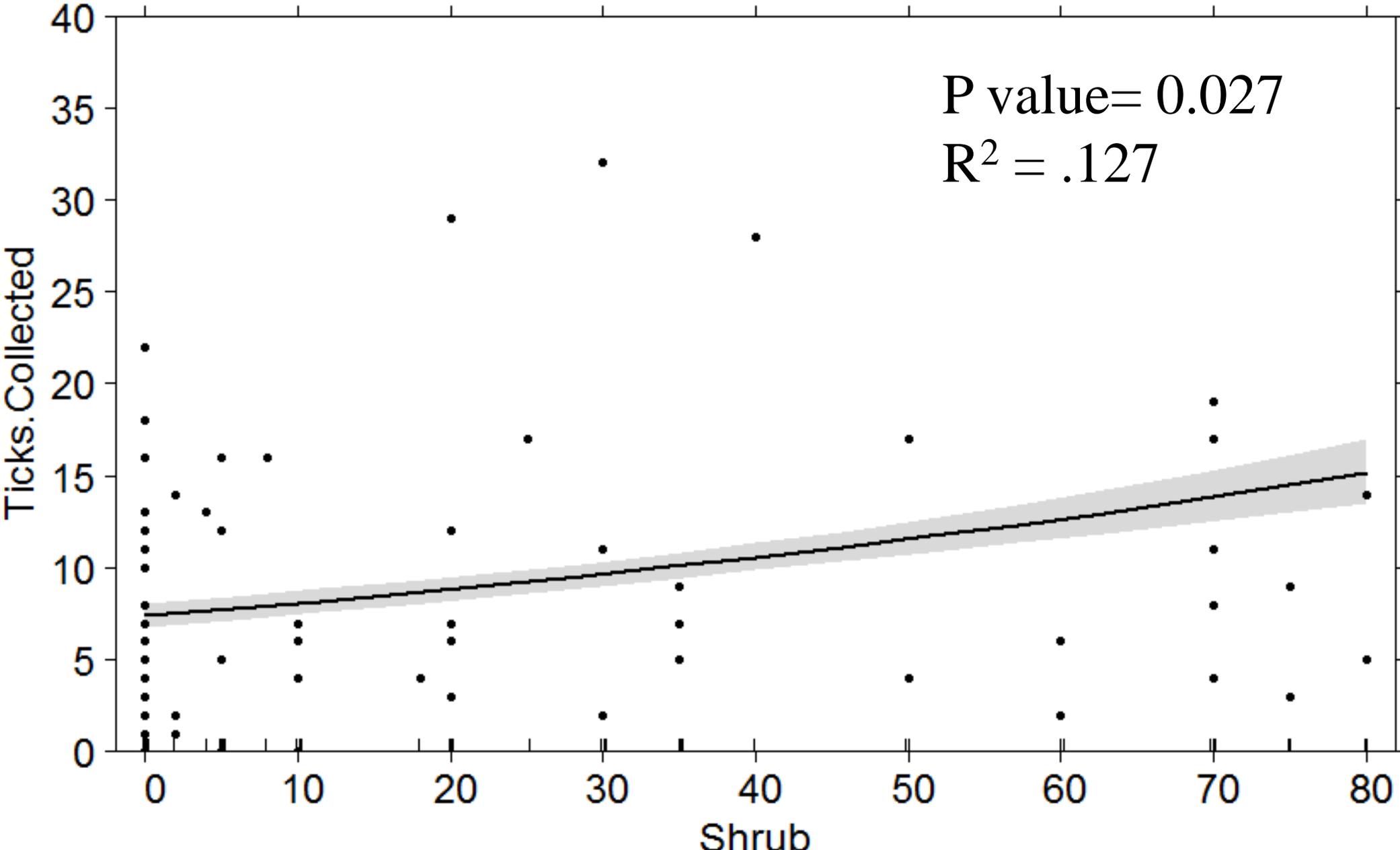
## Mammals Collected

- Twice a day for first three weeks
- Three weeks off
- Once a week for three more weeks
- Total first captures
  - 46 Chipmunks
  - 36 Deer mice
- First weeks were mostly first capture
- Later weeks mostly recaptures

# Tick Distribution along 30 Acre Lake Trail



# Preliminary Results from Statistical Analysis



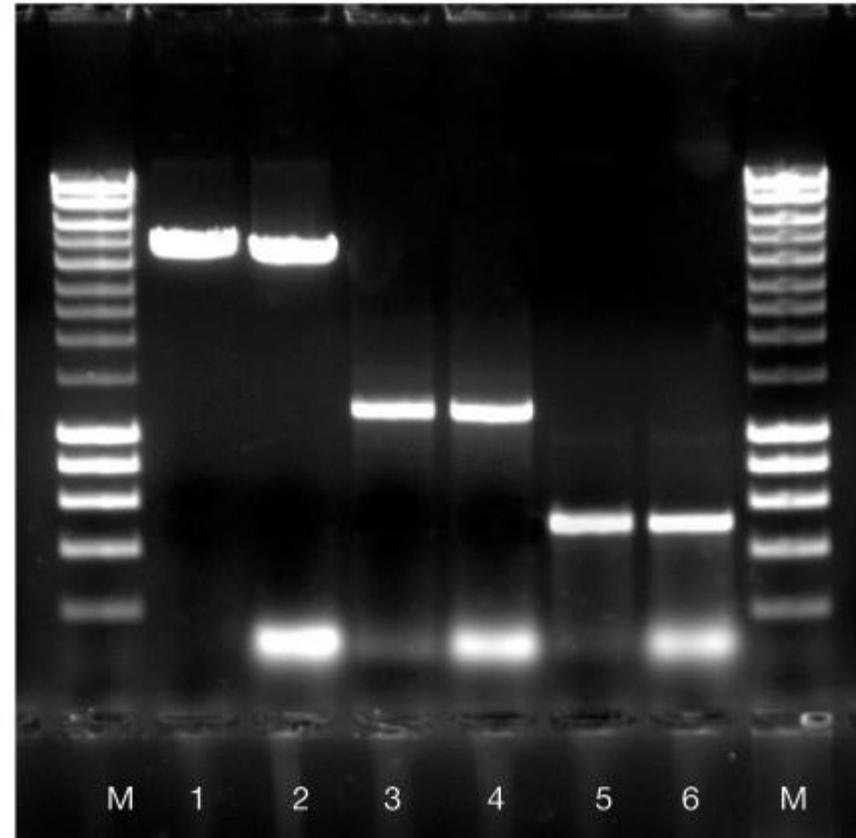
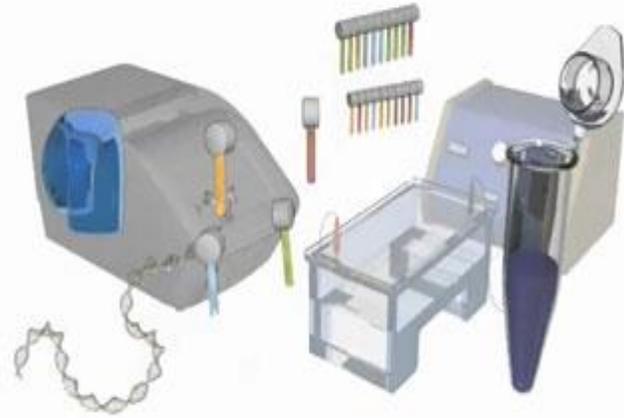
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# TICKS DNA Tested

- DNA extracted
  - Test for *Rickettsia* species
- PCR performed on DNA (Simser et al. 2001)
  - different species of *Rickettsia*
  - sent for sequencing
  - compare to amplicons on file at GenBank (Dergousoff et al. 2009)



# Serology

- Serological antibody testing for infection history of small mammals (presence/absence) (Simser et al. 2001)
- SFG-96k ELISA kit (Fuller Laboratories, CA) for the presence of IgG immunoglobulins
- Seropositive animals will be further tested for IgG antibodies using a RRD-120 micro-IFA test kit (Fuller Laboratories, CA).



# Conclusion

- Risk Management
- Inform TNWR management and State Department of Health
- Inform Public



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- Turnbull National Wildlife Refuge for Study Site
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- Dr Magori's 490 class for collecting ticks
- Shelby Hunter, Tim Silva, and Justin Donahue for helping with mammal collection

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**Questions ?**

# Next Up!

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