

Know Thy Enemy

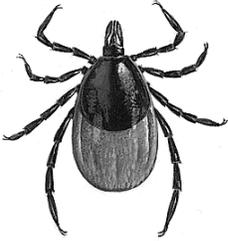
Understanding Ticks and their Management



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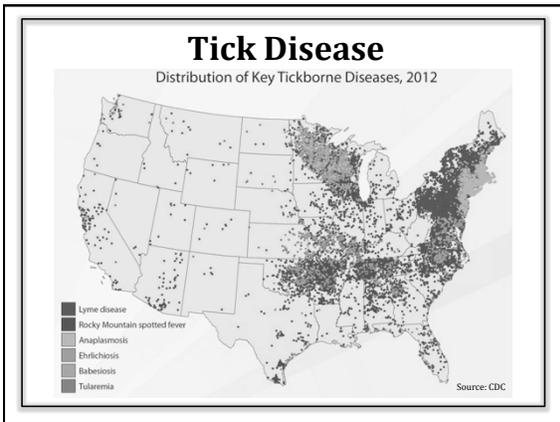


Enemy #1



300,000 cases of Lyme Disease
#1 vector-borne disease in US

<http://www.cdc.gov/nczod/disease-prevention/dpd/html/DPID1016.htm>



Tick Disease

Lone Star Ticks Spread New Disease and Food Allergies

July 23, 2013 by Entomology Today [Leave a Comment](#)

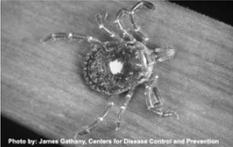


Photo by: James Gathany, Centers for Disease Control and Prevention

As if Lyme disease, ehrlichiosis, and Rocky Mountain spotted fever weren't enough, scientists have recently found that ticks can spread other diseases and can even cause people to have allergic reactions to meat.

**Tick paralysis
Meat allergies
Lyme and sex**



NEWS: Recent study suggests that Lyme disease can be sexually transmitted

NEWS one researcher: "There is always some risk of getting Lyme disease from a tick bite in the woods. But there may be a bigger risk of getting Lyme disease in the bedroom."

Press release, January 25, 2014

Cornell, CA - A new study suggests that Lyme disease may be sexually transmitted. The study was published in the journal PLoS ONE.

Integrated Pest Management

"Integrated Pest Management (IPM) is an **effective** and **environmentally sensitive** approach to pest management that relies on a combination of common-sense practices. IPM programs use **current, comprehensive information on the life cycles of pests** and their **interaction** with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the **least possible hazard** to people, property, and the environment."

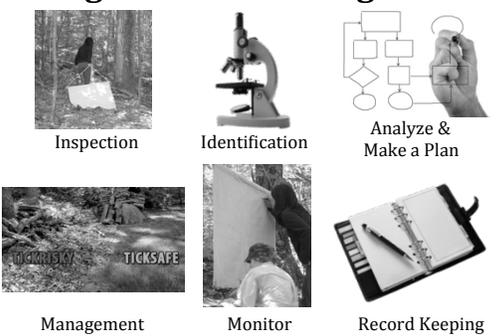
-US EPA-

PROactive rather than a REactive approach

Integrated Pest Management

1. Inspection
2. Identification
3. Analysis / Program Development
4. Population Reduction
 - a. Short-term (physical, mechanical & chemical control)
 - b. Long-term (cultural & biological control)
5. Monitor (survey/sample)
6. Record Keeping

Integrated Pest Management



Inspection Identification Analyze & Make a Plan

Management Monitor Record Keeping

<http://www.epa.gov/osceola/biocontrol/multimedia/whiteflag1.htm> http://www.dorcascenter.org/prevention/identify_and_eliminate_tick_habitat

Remember these points..

Blood feeding ectoparasites

- most ambush hunters with *questing* behavior
- do not jump, fly, or drop from trees
- quest 0 to 1.5 feet from forest floor

90% or more time off the host
Require ≥80% relative humidity



<http://www.cornellinsect.com/news/questing-tick-control/>

Tick Surveillance

Square yard (or meter) of white flannel
Attached to wooden pole

Tick Drag Tick Flag



<http://webparks.com/edu/appd/htm/tick-survey> http://ftp-stanford.edu/du/projects/project_48/zip/zip?project_id=115

Tick Surveillance



Survey potential tick habitats

- drag specified distance (10 m)
- or drag specified time (30 s)
- drag in multiple areas (15+)

<http://blogs.cornellinsect.com/observations/2012/02/01/new-stap-ticks-that-most-lyme-diseased-ticks-are-no-doubt-east-northwest-ticks/>

Tick Surveillance

Good GREAT! Not So Good



<http://www.healthnet.com/tick-surveillance> <http://herdmanagement.blogspot.com/2010/07/01/serbia.html?m=0>
<http://webparks.com/edu/appd/htm/tick-survey> http://www.dorcascenter.org/prevention/identify_and_eliminate_tick_habitat

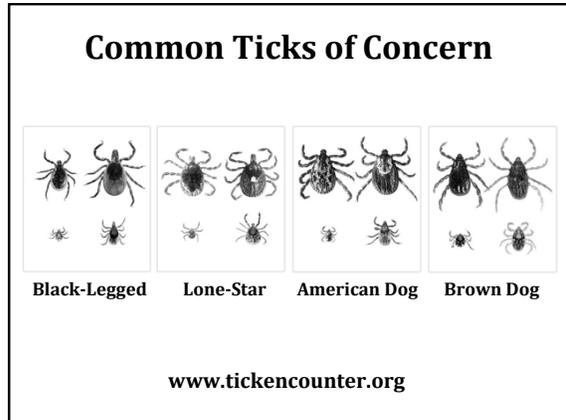
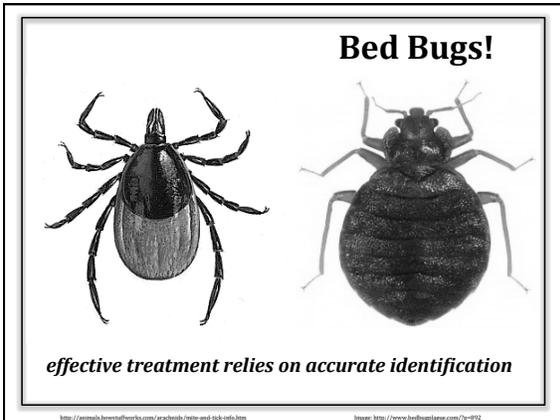
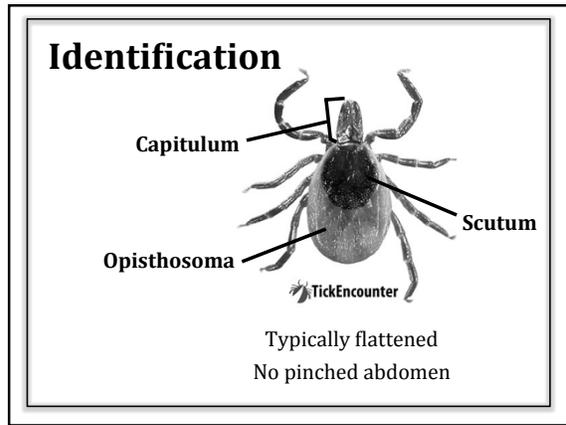
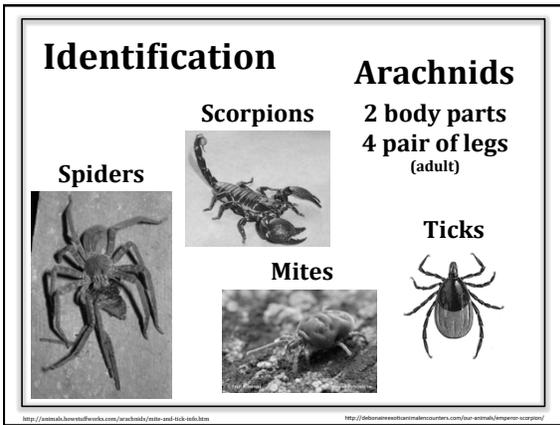
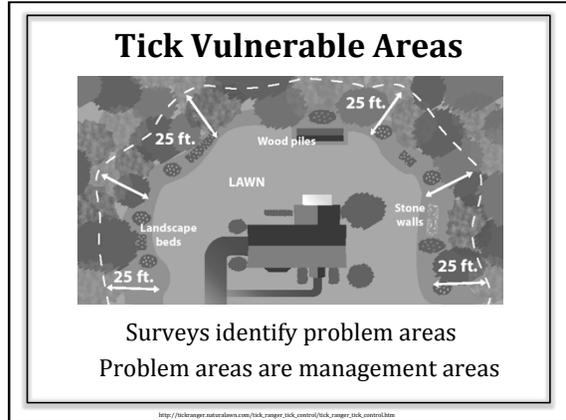
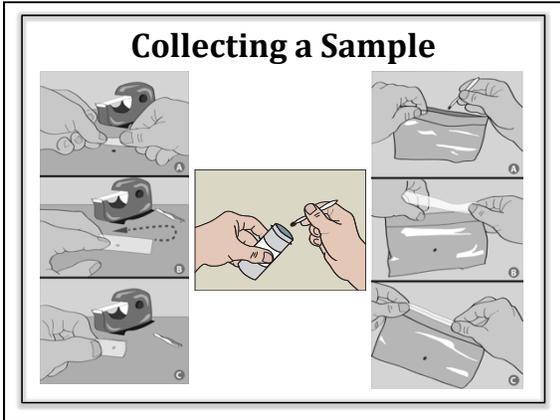
Tick Surveillance

What did you get?

- remove & preserve ticks
- record where, when, #
- check yourself too!



<http://www.nad.gov/newsroom/images.asp?cat=1&id=12436&org=NSF> http://public.health.yale.edu/news/06/diseases/ticks_collection.aspx



Identification Resource

Species	Larva	Nymph	Male	Female	Partially Fed Female	Fully Fed Female
Deer Tick <i>Ixodes scapularis</i>						
Dog Tick <i>Dermacentor variabilis</i>						
Lone Star Tick <i>Amblyomma americanum</i>						
Brown Dog Tick <i>Rhipicephalus sanguineus</i>						

www.tickencounter.org

Look Closer!

Female *Ixodes scapularis*
(Blacklegged tick or Deer tick)

Female *Amblyomma americanum*
(Lone Star tick)

Scutum pattern & mouthpart length for engorged ticks

Female *Dermacentor variabilis*
(American Dog tick)

Female *Rhipicephalus sanguineus*
(Brown Dog tick)

www.tickencounter.org

Identification = Information

Ixodes scapularis
Deer tick male

Seasonal Activity in New England

Known Diseases Transmitted

**Biology
Habits
Lifecycle**

Amblyomma americanum
Deer tick female

Seasonal Activity in New England

Known Diseases Transmitted

www.tickencounter.org

Deer Tick Life Cycle

Images: Tick Encounter

Lifecycle and Infection

Source: Tick Management Handbook

Hosts of the Black-Legged Tick

Host	Proportion
mouse	~0.48
veery	~0.28
catbird	~0.27
chipmunk	~0.25
squirrel	~0.18
opossum	~0.05

Keesing et al. 2009. Hosts as ecological traps for the vector of Lyme disease. *Proc. R. Soc. B* 276: 3911-3919

Risk of Lyme Disease...

Nymphs are most important stage in transmission

<http://diseasesmagazine.com/2013/06/14-embedder-graphic/>

Human-Tick Interaction

Attracted to CO₂ + heat + ammonia
 Use tactile stimuli to verify host
 Attachment reinforced with cementing substance
 Saliva prevents pain, clotting and immune reaction

http://lymevixen.blogspot.com/2014/05/01_embedder.html

Human-Tick Interaction

10-30 min, up to 2 hours to insert mouthparts

Source: Tick Management Handbook

Ticks, Lyme and Humans

24 Hours	48 Hours	72 Hours
No transmission	About 1/2 of infected ticks transmit	All of infected nymphs transmit

Penman et al. 1987. J Clin Microbiol 25:557-8 and Penman et al. 1991. J Infect Dis 163:895-7

It takes more than 24 hours of attachment for nymphal stage ticks to transmit Lyme disease-causing bacteria into your skin. It takes more than 48 hours for adult stage ticks to transmit Lyme disease-causing bacteria into your skin.

www.tickencounter.org

Tick Management

- Personal and Pet Protection
- Habitat Management
- Reservoir/Host Management

Pet Protection

- Avoid tick habitat
- Daily tick checks
- Protective treatments & vaccine

http://www.reddit.com/r/WNY/comments/3msh3i/figure_this_belongs_here_as_a_reminder_dot/17mst-500

Personal Protection

When in tick-infested areas...



Light-colored clothes
Pants in socks

www.tickcounter.org http://tick.org/sumo/04/tick/04tickprotection.php

Personal Protection



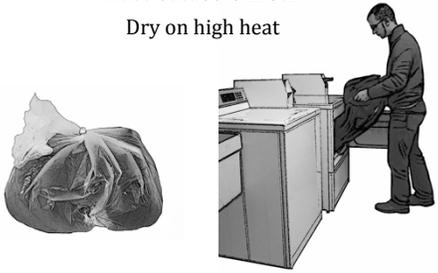
DEET
Picaridin
(repellants)

Permethrin-
treated clothing
(kills ticks)

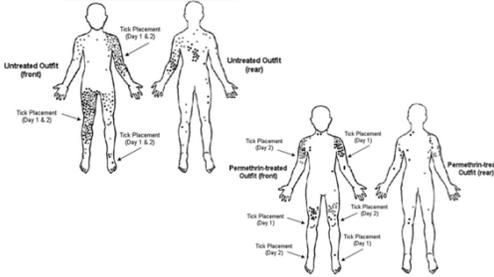
http://tickcounter.org/04/tick/04tickprotection.php http://tickcounter.org/04/tick/04tickprotection.php

Personal Protection

Seal clothes and gear in plastic bag
Place outdoors in sun
Dry on high heat



Tick Checks!



Miller et al. 2011. Tick bite protection with permethrin-treated summer-weight clothing. *Journal of Medical Entomology* 48(2): 327-333.

Toilet Stall Cards



www.tickcounter.org

Shower Cards



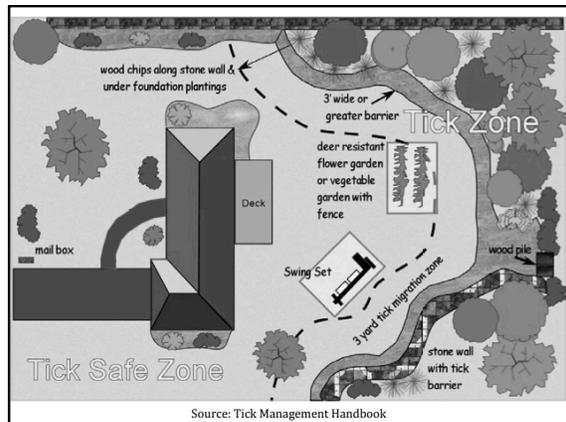
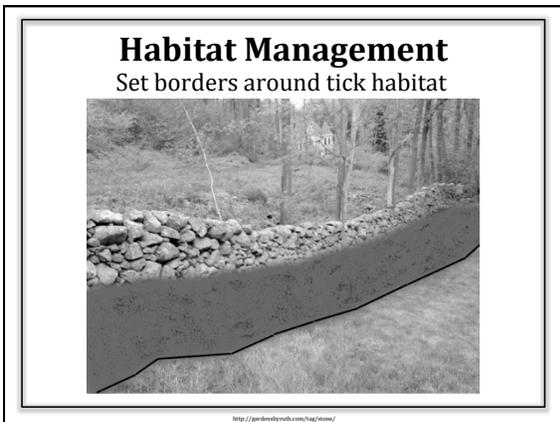
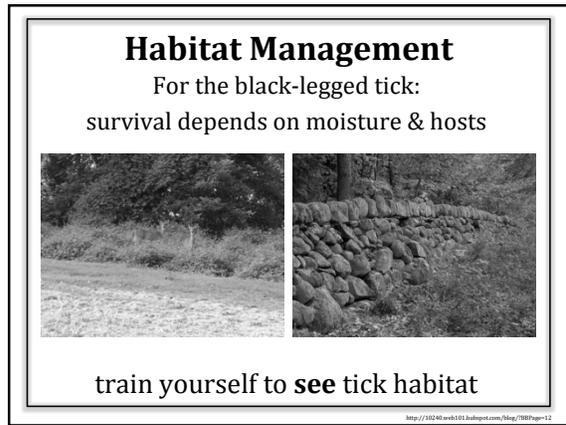
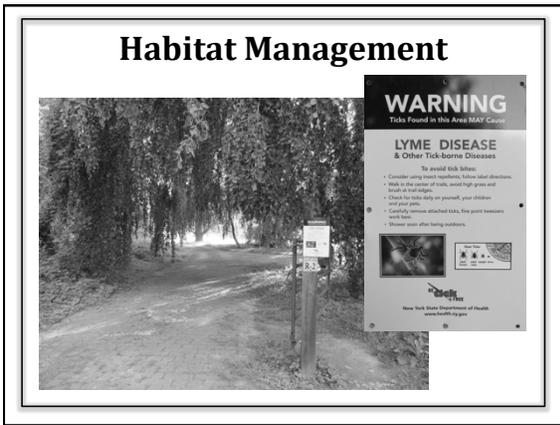
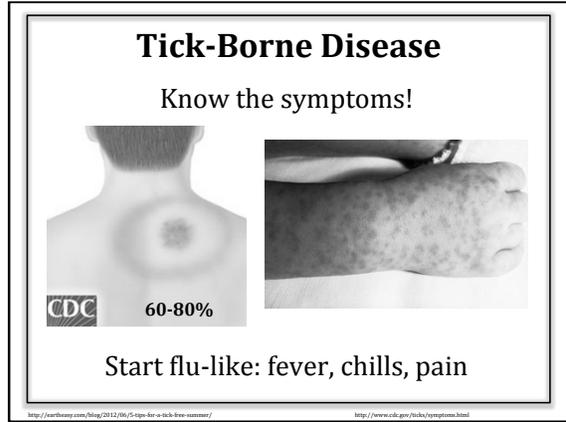
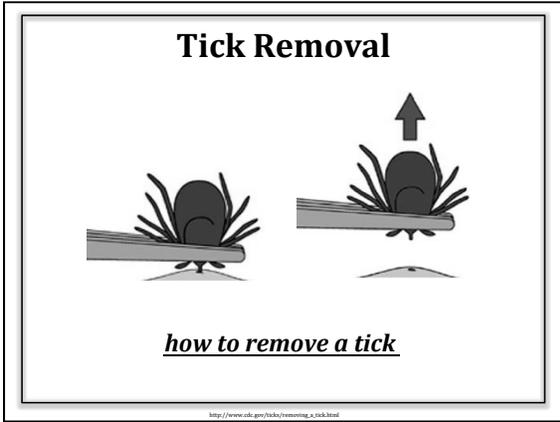
Be TickSmart! Stay TickSafe!
Check for Ticks Every Day.

Only blacklegged ticks transmit Lyme disease.

Other ticks you might find biting

Daily TickCheck Shower Card

Tickcounter



Host Targeted

White-Tailed Deer



Host for about 90% of adult ticks
Long distance dispersal of ticks

<http://galleries.com/tick-identifiers-before-and-after.html>

Host Targeted



Overpopulation
6-8 deer per sq mile ideal
Commonly 40+ per sq mile or **more**

http://www.enr.com/resources/story/2012/02/02/Natural_Business_Sustainability/Living_with_wildlife/Deer/Overpopulation.html

Host Targeted



<u>Ticks/hectare</u>
Barberry Stand
251
Controlled
121
No Barberry
30

barberry might concentrate tick populations
and permit questing throughout season

<http://www.jessiegardens.com/news-to-the-time-to-identify-and-control-japanese-barberry/>

Host Targeted



Deer cull:
emotionally charged scientific debate

<http://www.wildlife.com/blog/2011/05/16/wildtick-bait-4-0-contains-an-appeal-to-nature/> http://commons.wikimedia.org/wiki/File:Be_aware_deer_cull_in_progress_-_geograph.org.uk_-_37474.jpg

Host Targeted



4-poster device: cost effective?

<http://wildlifenews.time.com/2011/06/15/15/15/study-4-poster-devices-can-control-tick-population/>

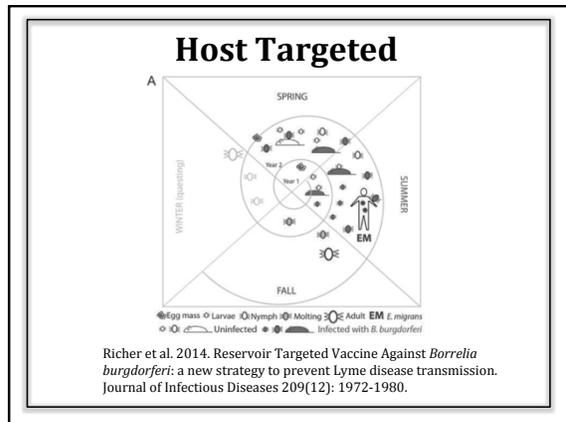
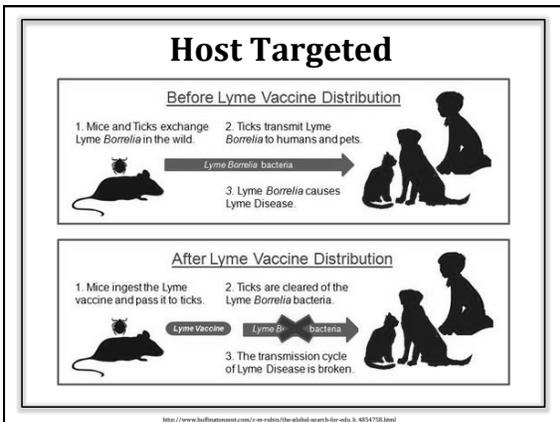
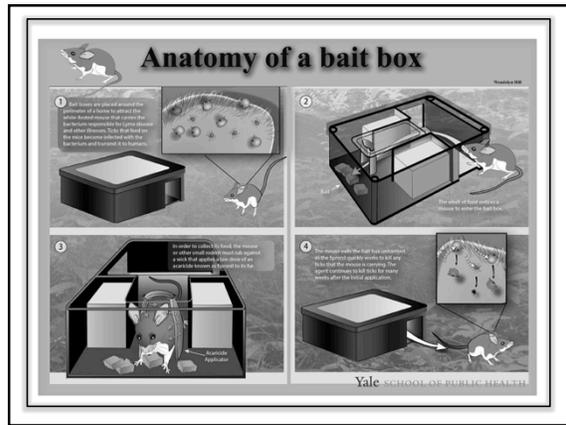
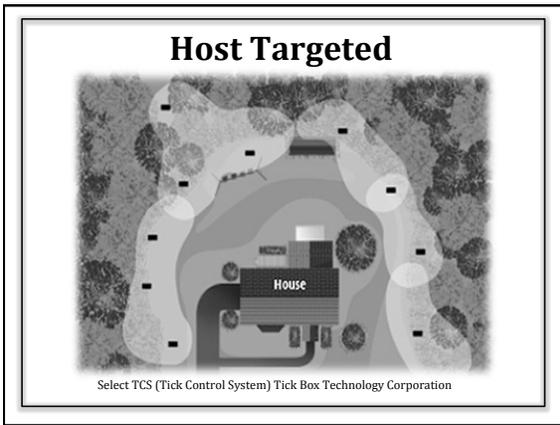
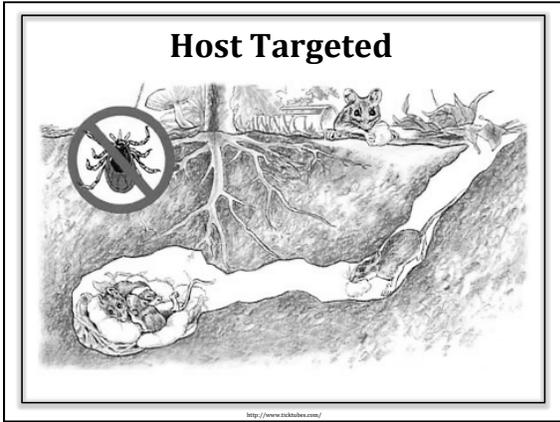
Host Targeted

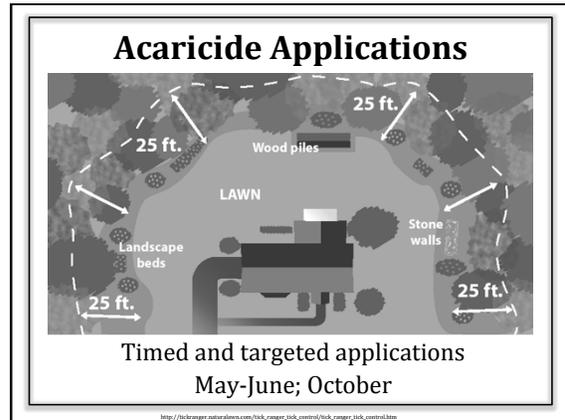
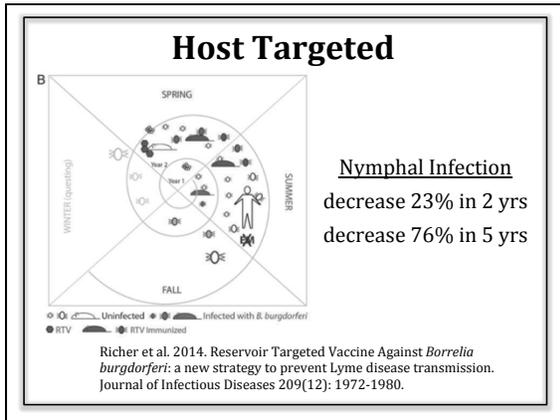
White-Footed Mouse



Amplifying host of Lyme Disease
Present in forest fragments of any size
>90% can be infected; ~50% w/ 3 pathogens

<http://www.merckvetguide.com/lyme-disease-transmission-blocked-by-new-oral-bait-vaccine-in-white-footed-mice>





Summary

Individual

- Understand tick biology and survival needs
- Manage tick habitat to reduce human exposure
- Treat only those areas where ticks are found
- Check daily for ticks**; isolate exposed items

Community

- Consider community-wide host targeted methods
- Educate residents through signs about tick exposure

www.nysipm.cornell.edu/buildings/

NYS IPM

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