

Keeping Ticks Away Integrated Pest Management

Joellen Lampman, NYS IPM Program

Adapted from presentations developed by Matt Frye, PhD
and J.L. Gangloff-Kaufmann, PhD

www.nysipm.cornell.edu



Integrated Pest Management

- IPM is a sustainable method to manage pests that minimizes environmental, health, and economic risks
- IPM relies on knowledge of pest biology and is achieved using multiple control tactics
- **PROactive** rather than a **REactive** approach

Basic Biology

- Ticks are blood feeding ectoparasites
 - most ambush with questing behavior
 - do not jump, fly, or drop from trees
 - quest from 0 to 1.5 feet on foliage
- Spend 90% or more time off the host
- Black-legged ticks require $\geq 80\%$ relative humidity
- Other ticks can stand drier conditions



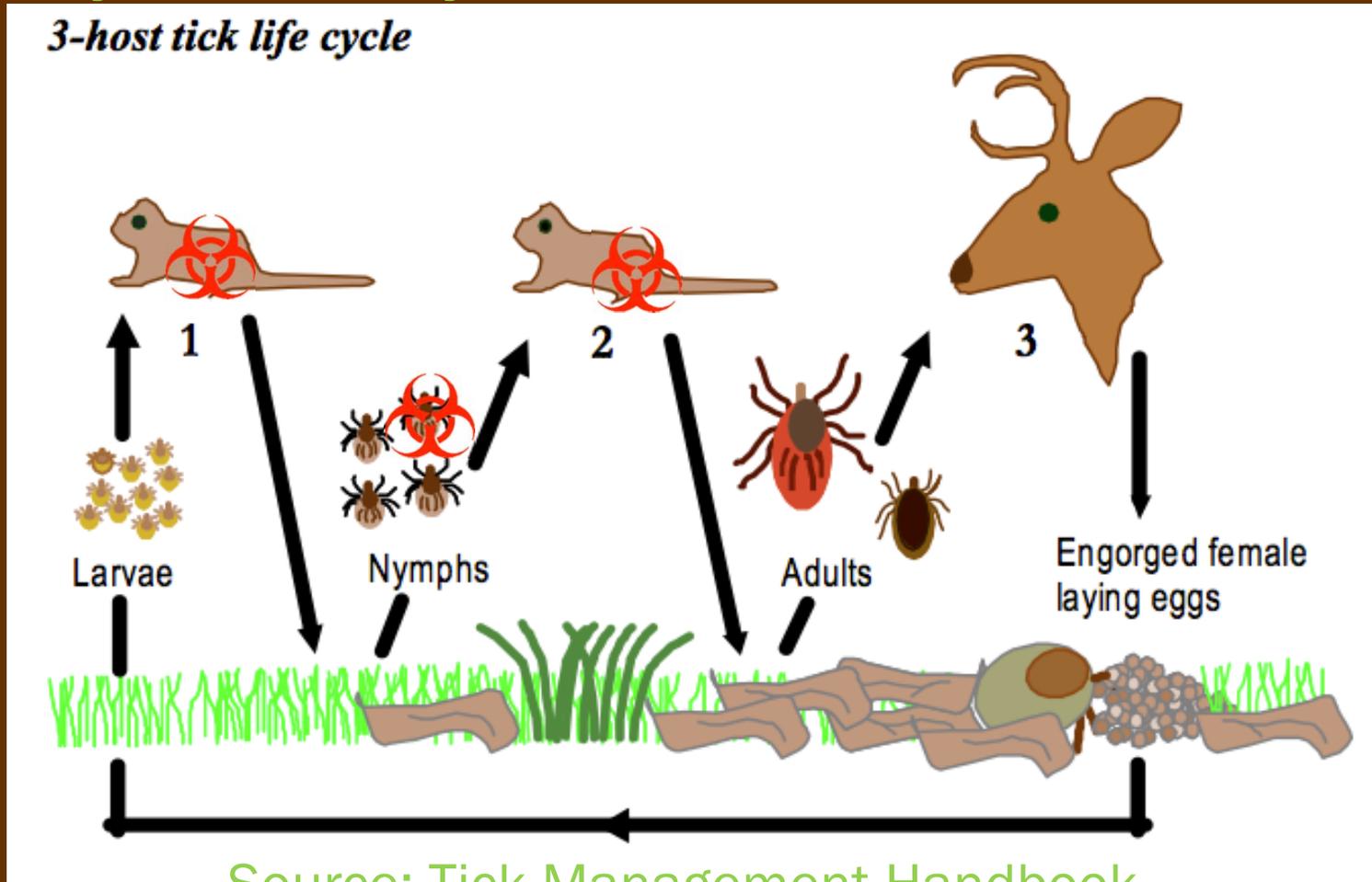
www.envturfmgmt.com/services/flea-and-tick-control

Basic Biology

- Black-legged (deer) tick - *Ixodes scapularis*
 - Found on deer and mice, but...
 - Found on over 120 hosts nationwide, 27 in NY
 - Prefers dense forest
 - Vector of Lyme, anaplasmosis, babesiosis, and human granulocytic ehrlichiosis

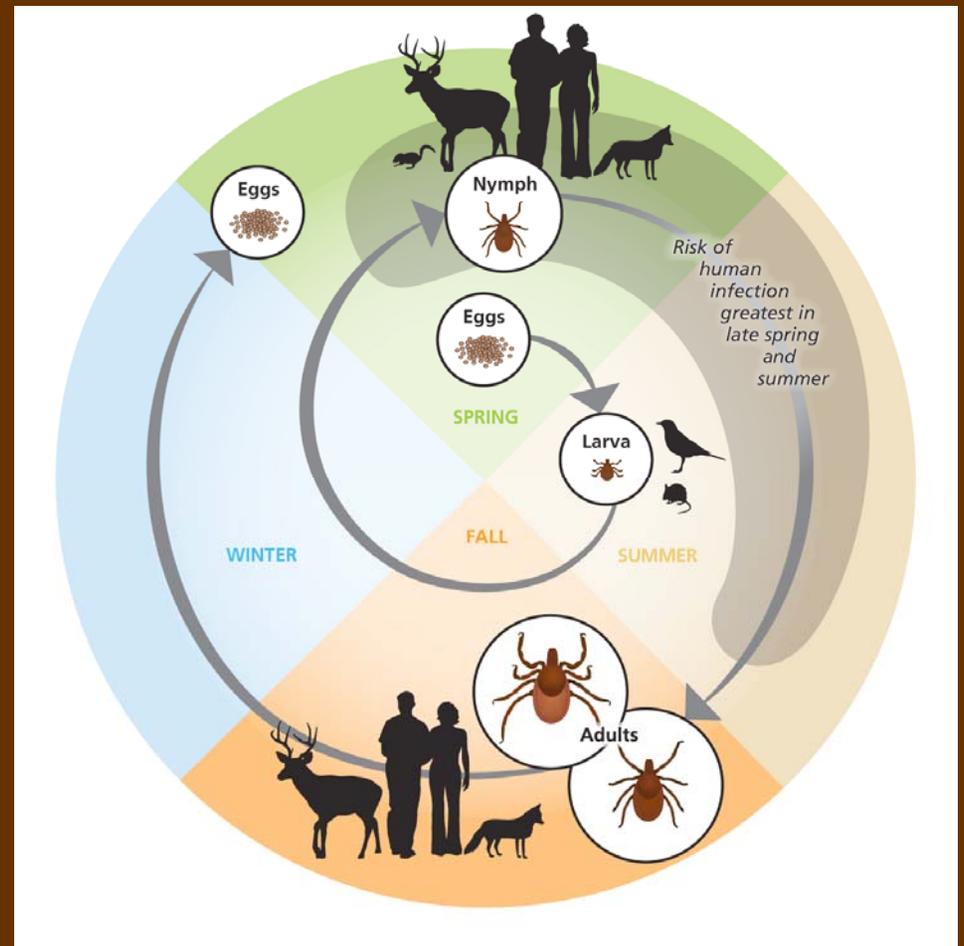


Lifecycle and Lyme Infection



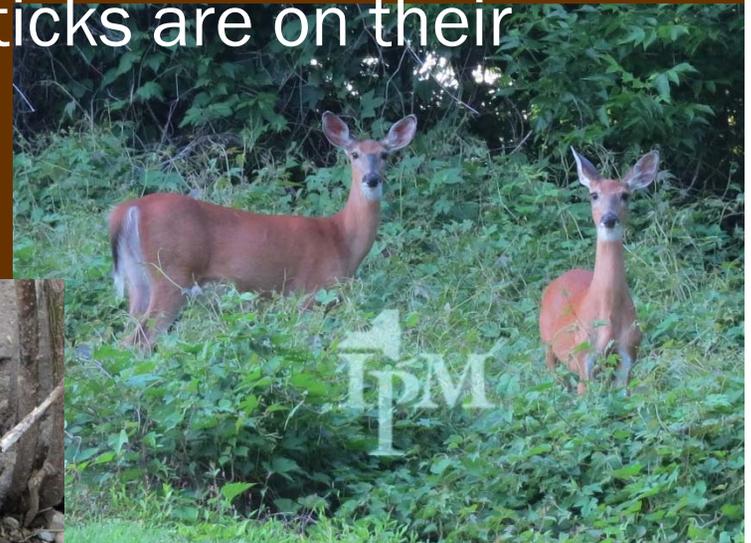
Risk of Lyme Disease

- Black-Legged Tick Nymphs are the most important stage in transmission

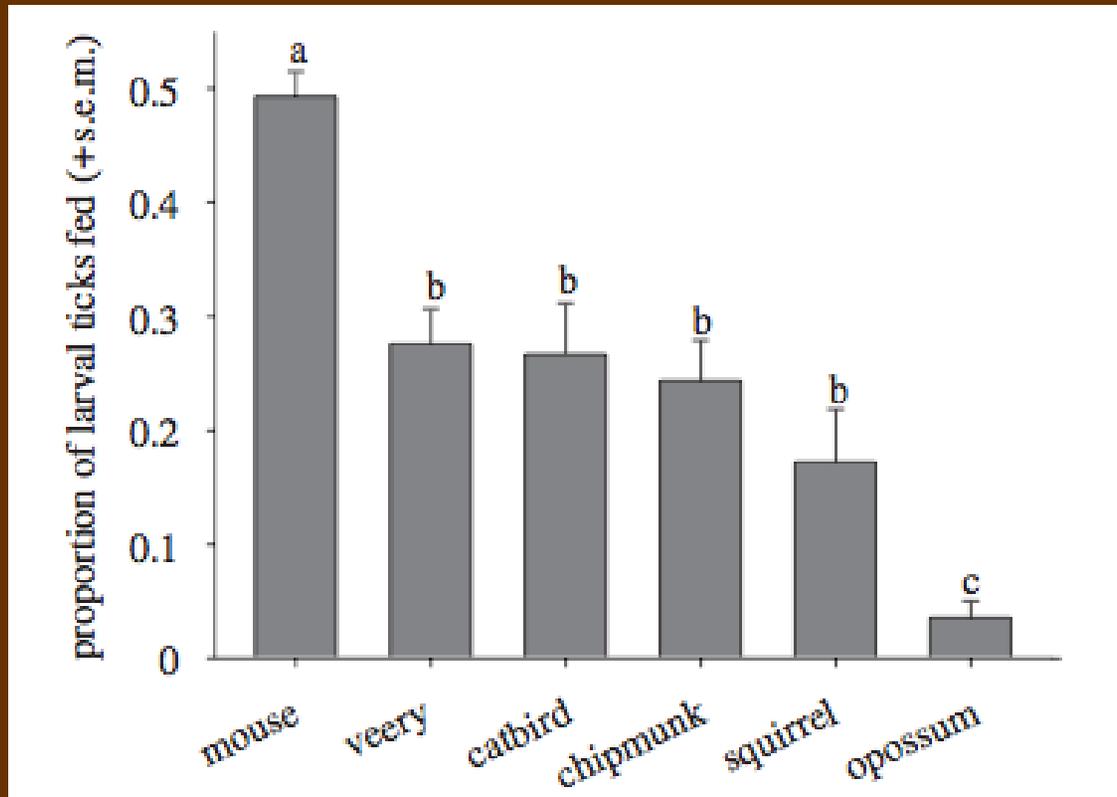


Hosts of Black-legged Ticks

- The majority of the reproducing ticks are on their natural wildlife hosts:
 - Mice
 - Chipmunks
 - Deer
 - Coyotes
 - Rabbits
 - Opossums
 - Raccoons
 - Woodchucks
 - Squirrels
 - Songbirds



Not all hosts are created equal



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

White-footed Mouse

- Amplifying host of Lyme Disease
- >90% can be infected; ~50% w/ 3 pathogens



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

Integrated Pest Management

- Inspection - Tick Surveillance
- Identification
- Analysis/Planning
- Population Reduction
 - Short-term (physical, mechanical & chemical control)
 - Long-term (cultural & biological control)
- Monitor (survey/sample)
- Record Keeping

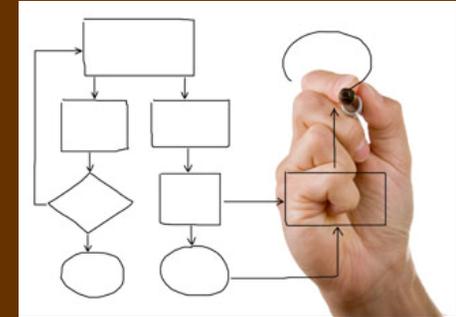
Integrated Pest Management



Inspection



Identification



Analyze & Plan



Management



Monitor



Record Keeping

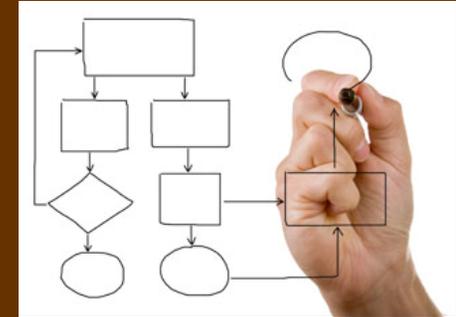
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Inspection

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

Tick Drag



<http://utahpests.usu.edu/uppd/htm/tick-survey>

Tick Flag



http://jrpb.stanford.edu/db/projects/project_display.php?project_id=115

Tick Surveillance



Graham Hickling/University of Tennessee



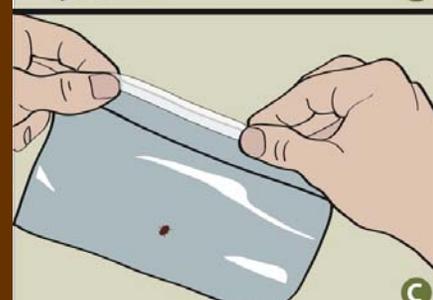
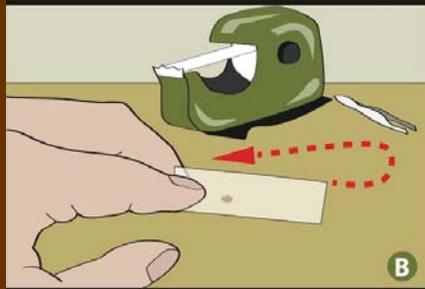
www.healthunit.com/tick-surveillance

Survey potential tick habitats

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



Collecting a Sample



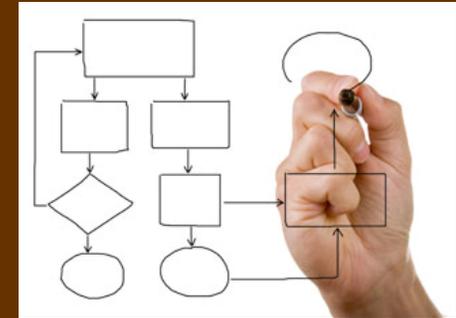
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Identification



Effective treatment relies on accurate identification

animals.howstuffworks.com/arachnids/mite-and-tick-info.htm

www.bedbugplague.com/?p=892

Identification

- Arachnids
 - 2 body parts
 - 4 pairs of legs (adult)
- Ticks
 - Typically flattened
 - Become very large when engorged

Scutum



Common Ticks of Concern



Black-Legged
Tick



Lone-Star
Tick



American
Dog Tick



Brown Dog
Tick

www.tickencounter.org

Identification Resources

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.tickcounter.org

Identification Resources

WILLIAM F. RICE JR.
EXTENSION CENTER
CORNELL COOPERATIVE EXTENSION OF ALBANY COUNTY
SOIL AND WATER CONSERVATION DISTRICT (S.W.C.D.)
USDA FARM SERVICE AGENCY
NATURAL RESOURCES CONSERVATION SERVICE



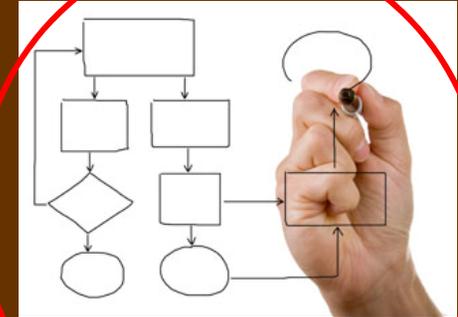
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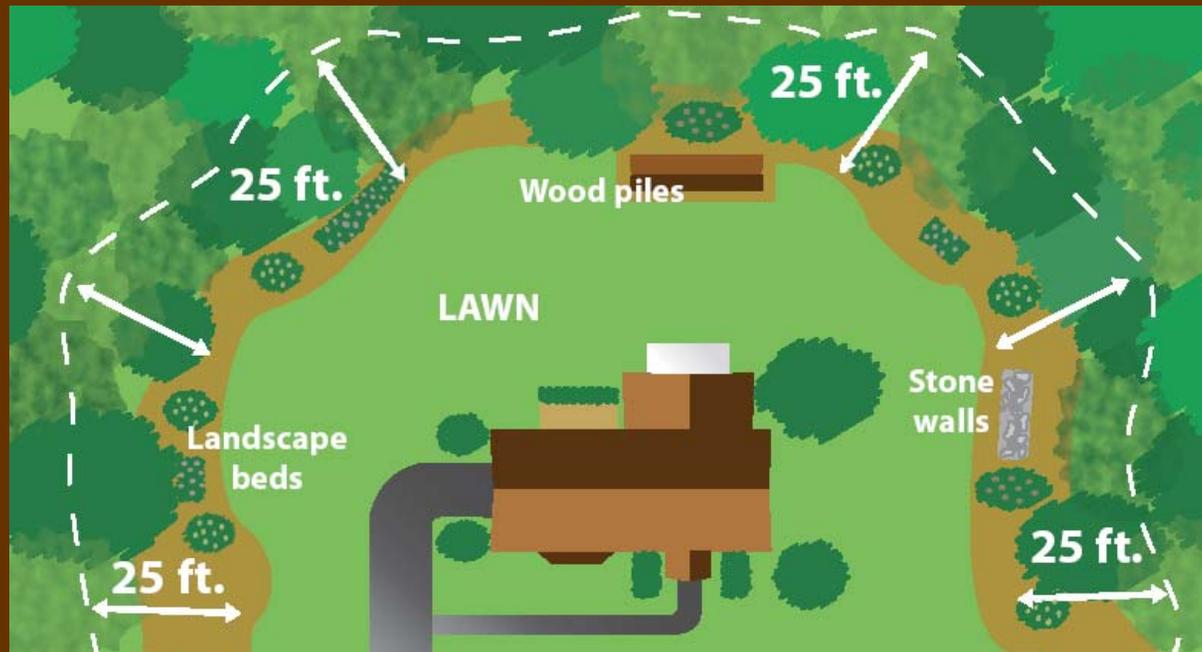
Monitor



Record Keeping

Record Tick Vulnerable Areas

- Surveillance identifies problem areas
- Problem areas are management areas



tickranger.naturalawn.com/tick_ranger_tick_control/tick_ranger_tick_control.htm

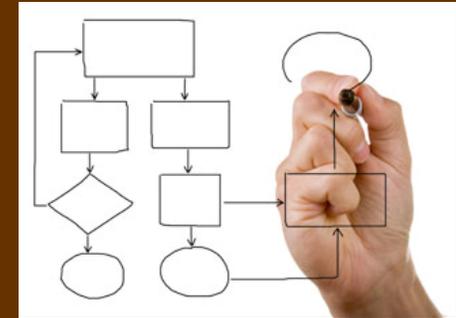
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Record Keeping

Tick Management

- Manage tick bites to manage tick-borne diseases
 - Personal and pet protection
 - Habitat management
 - Reservoir/Host management



Lyme Disease Management

- Manage tick bites to manage tick disease
 - Personal and pet protection
 - Habitat management
 - Reservoir/Host management



Personal Protection

- When entering tick-infested areas...
 - Light-colored clothes
 - Pants in socks
 - Seal pant legs



<http://tickapp.tamu.edu/tickbiteprevention.php>

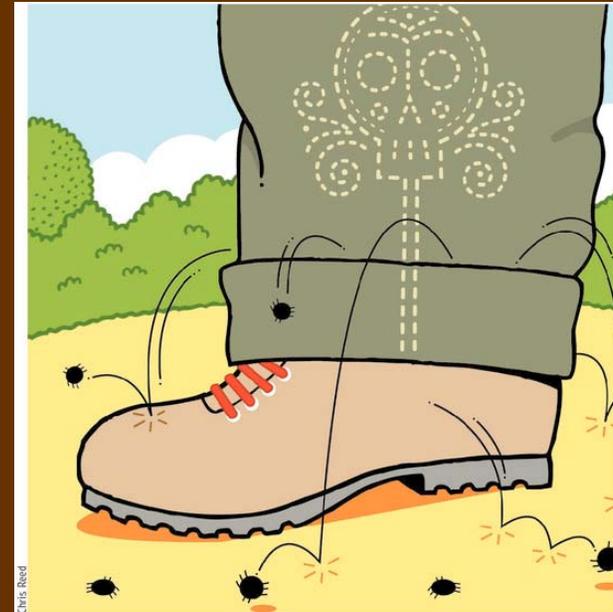


www.tickencounter.org

Personal Protection



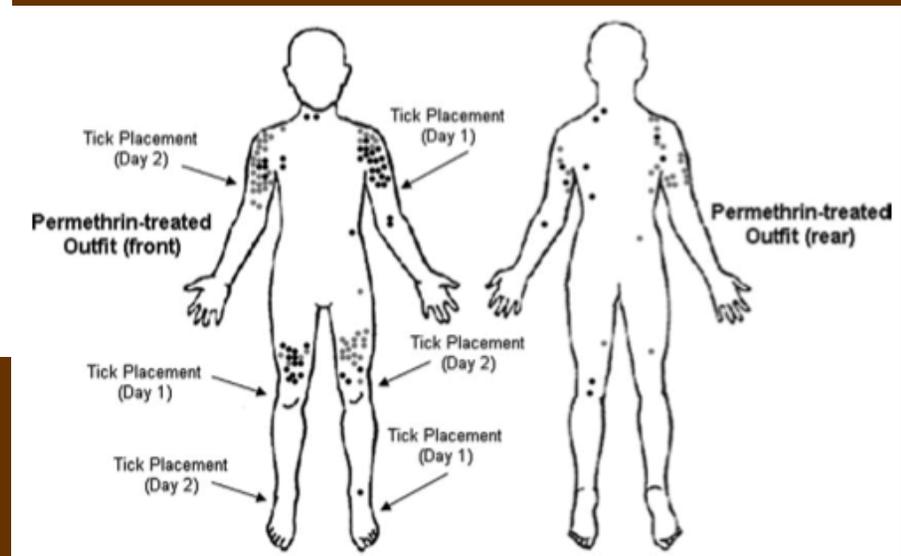
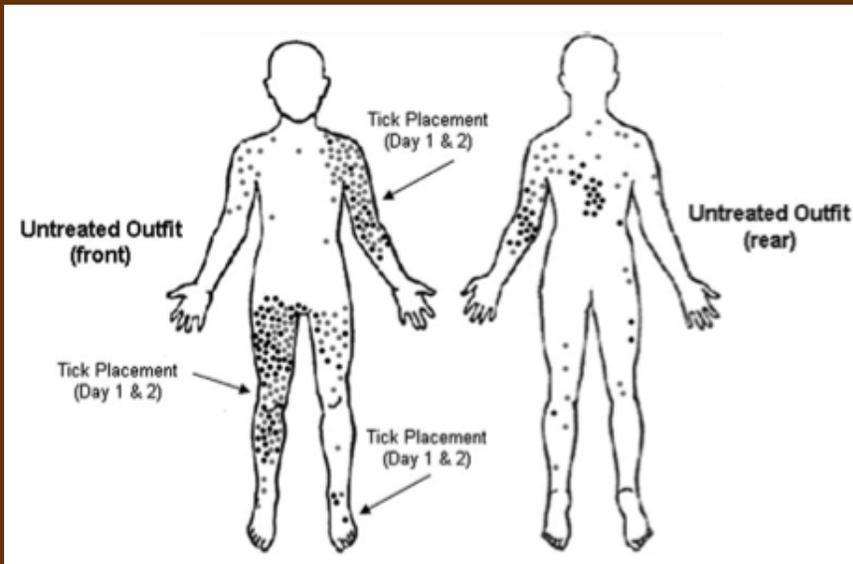
DEET
Picaridin
(repellants)



Permethrin-
treated clothing
(kills ticks)

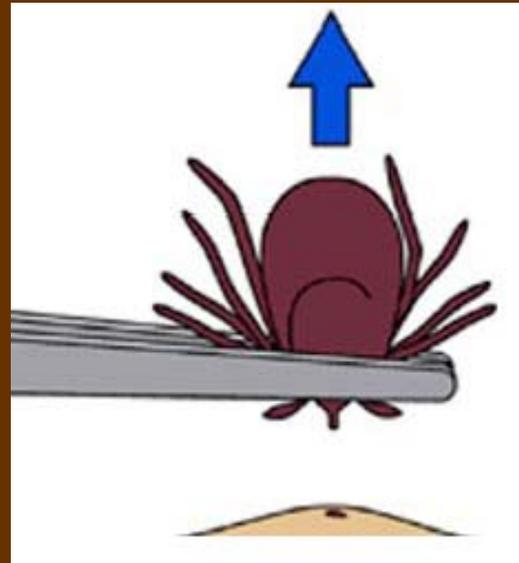
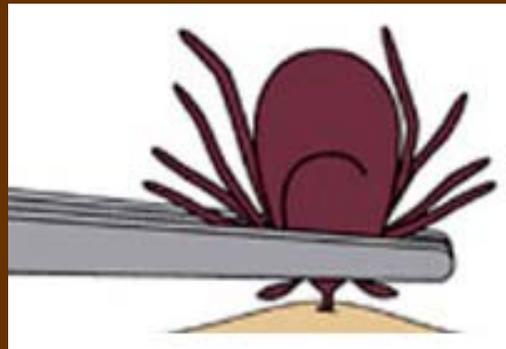
<http://labs.russell.wisc.edu/mosquitosite/repellents-for-application-to-skin/>
<http://online.wsi.com/news/articles/SB10001424052702303380004579523931040864274>

Personal Protection – Tick Checks



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

Tick Removal



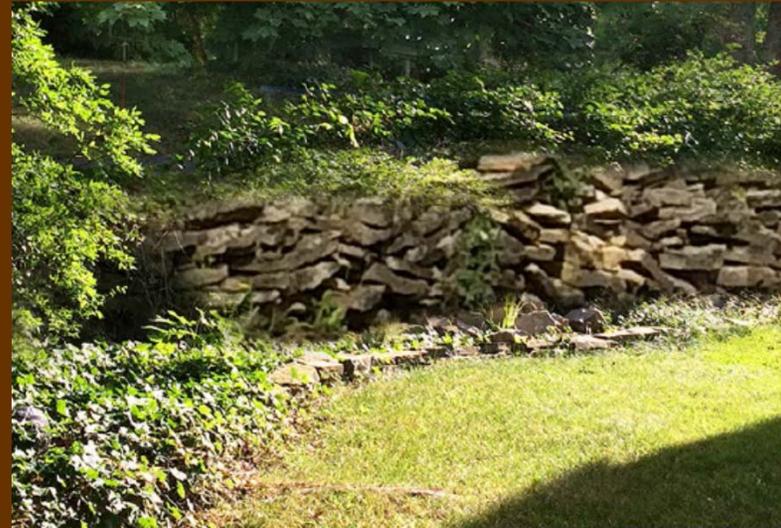
How to remove a tick

Mouthparts or head rarely get “stuck” in the skin. If it does, just use tweezers to remove those bits.

http://www.cdc.gov/ticks/removing_a_tick.html

Habitat Management

- For the black-legged tick survival depends on moisture & hosts



Think like a tick.

Habitat Management



Train yourself to see tick habitat

Habitat Management - Border

- Set borders around tick habitat



Habitat Management - Border

- Set borders around tick habitat



www.louispage.com/fences/deer-wildlife



Source: Tick Management Handbook

Play Areas



Habitat Management – Invasives Management

- Japanese barberry might concentrate tick populations and permit questing throughout season



Ticks/hectare

Barberry Stand	251
Controlled	121
No Barberry	30

Habitat Management – Manage for Biodiversity

Low diversity communities contain best hosts

Resilience to disturbance/
diversity loss

High reservoir/high
competence

“Fast” life history

Low immune
investment

Lyme Disease: The Ecology of a Complex System, Richard S. Ostfeld, 2011

Reservoir/Host Management

- White-tailed deer can host about 90% of adult ticks
- Every year, each deer = 1.5 million ticks
- Likely most responsible for long distance dispersal of ticks



<http://galleryhip.com/tick-infestation-before-and-after.html>

Reservoir/Host Management

- To reduce tick populations, deer populations need to approach 6-8 deer per square mile



[www.montgomeryparks.org/PPSD/Natural Resources Stewardship/Living with wildlife/deer/DeerManagement.shtm](http://www.montgomeryparks.org/PPSD/Natural%20Resources%20Stewardship/Living%20with%20wildlife/deer/DeerManagement.shtm)

Damminix Tick Tubes



<http://www.ticktubes.com/>

Damminix Tick Tubes

- Application site matters! Think like the host.



<http://landcareassociates.com/lawn-garden-nh/item/damminix-tick-tubes>

<http://mosquitosquadnorthshore.wordpress.com/>

Damminix Tick Tubes

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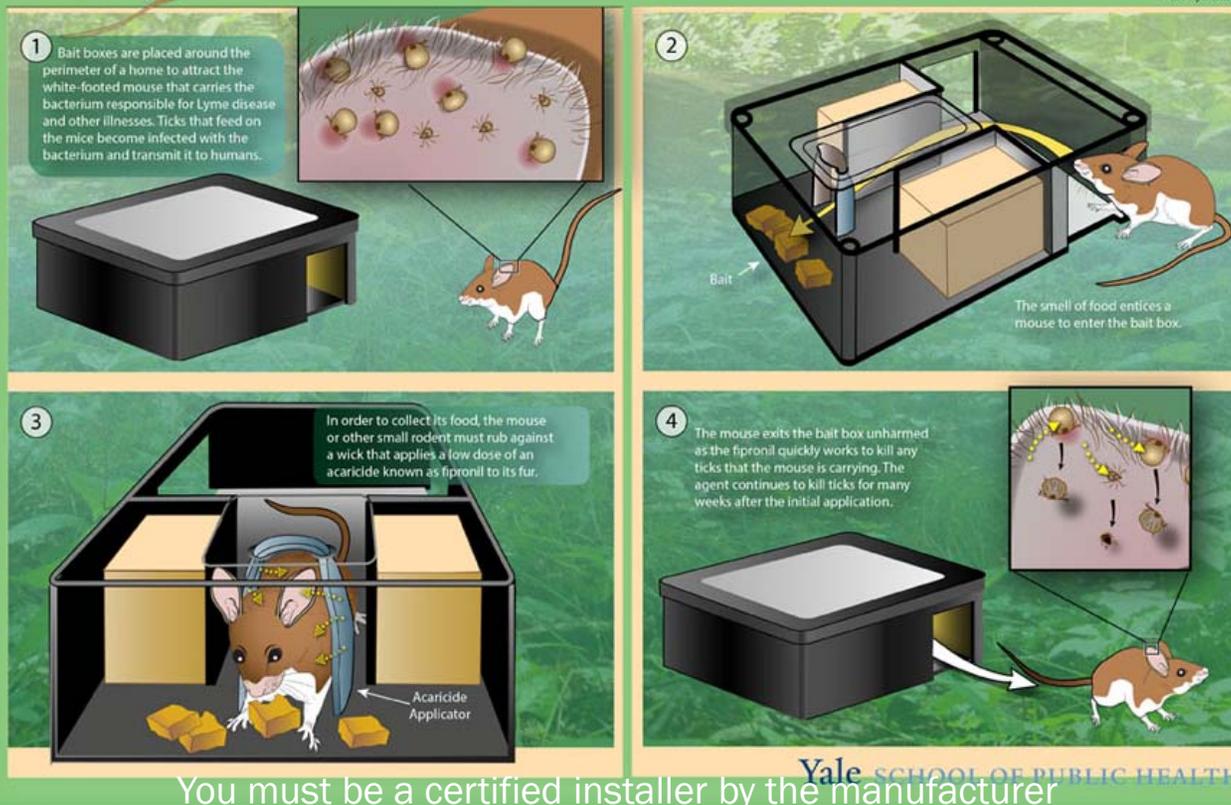
Damminix Tick Tubes



Tick Control System (TCS)



Anatomy of a bait box



Acaricide Applications



Timed and targeted applications
May-June; October

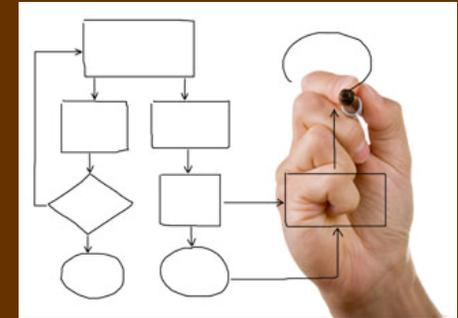
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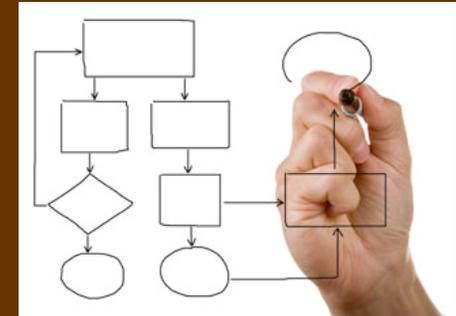
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Summary

- Understand tick biology, habitat, and survival needs
- Manage tick habitat to reduce human exposure
- Treat only those areas where ticks are found
- Personal protection is vital
- Check yourself daily for ticks
- Properly remove any ticks



www.nysipm.cornell.edu/buildings/



Tick Handbook: CT Ag Experiment Station

Tick-Borne Diseases of the US: CDC

TickEncounter Resource: University of Rhode Island

The Community IPM Team
New York State IPM Program
Cornell University

**Cornell Cooperative Extension provides equal program and employment opportunity*

It's Complicated

- The majority of the reproducing ticks are on their natural wildlife hosts such as coyotes, deer, rabbits, opossums, raccoons, woodchucks and squirrels or some other wild mammal or bird.
- We have few options to manage ticks on wildlife
 - 4-Poster systems are illegal in NY
 - Damminix Tubes are not proven to be effective
- Reinfestations are common requiring year-round use of pet tick products as preventives.
- From Veterinarypracticenews.com