Preventing Tick-borne Diseases

(“On A Shoestring”)

April 2005

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Public Health Significance of Ticks

- Nuisance / Recreational Impact / Agricultural
- [2] Pathogen Transmission

Tick-borne Diseases: USA & Illinois

	DISEASE	ORGANISM	Tick Vector
IL	Lyme	Bacterium	Blacklegged
	STARI*	Bacterium	Lone Star
	RMSF**	Bacterium	American Dog
IL	Tularemia	Bacterium	LS, AD
	Ehrlichiosis	Bacterium	LS, AD, BL
	CO Tick Fever	*Virus*	*Rocky Mt. Wood*
	Powassan En.	*Virus*	*GH*
	Babesiosis	*Protozoan*	*Blacklegged*
IL ?	Tick Paralysis	Toxin	LS, AD

* Southern Tick-Associated Rash Illness ** Rocky Mountain Spotted Fever

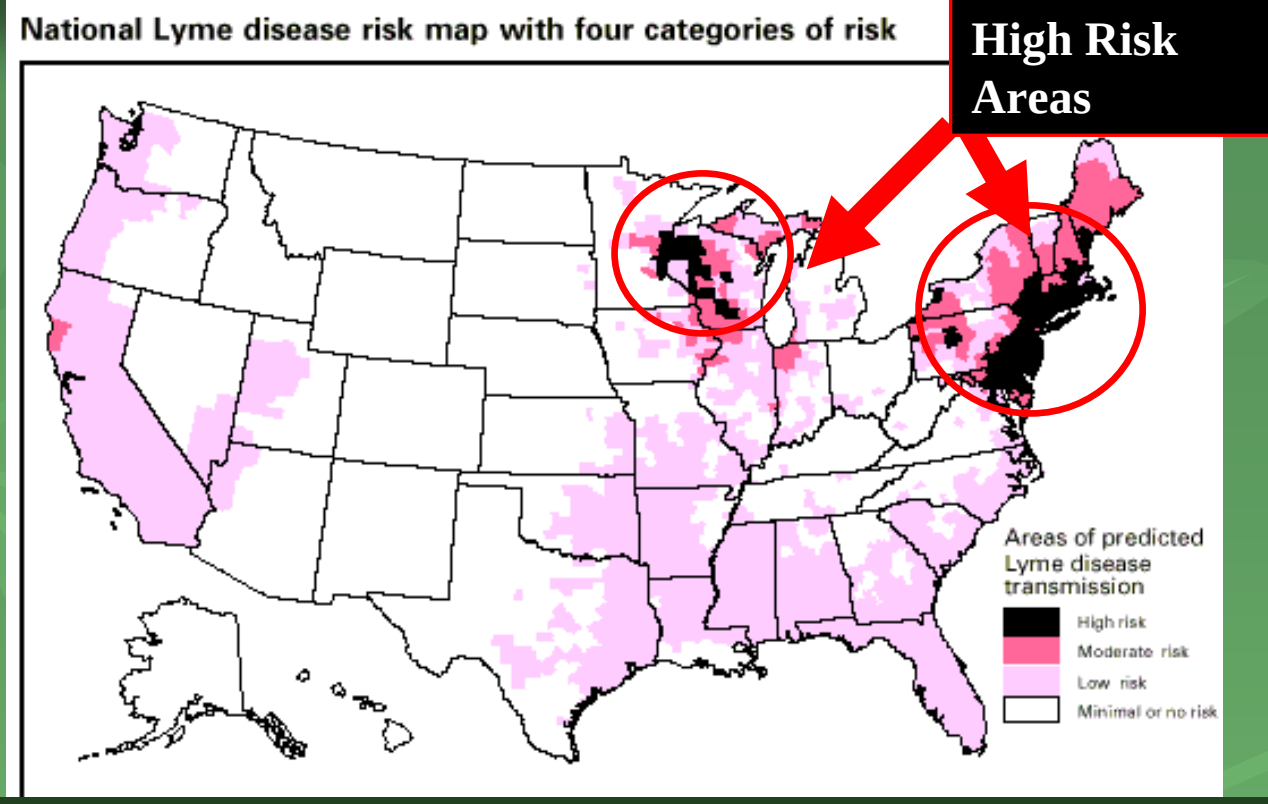
Lyme Disease

- Bacterial - spirochete
- Vector: blacklegged “deer” tick
- Most common arthropod-borne disease in U.S.
- Illinois: about 50 cases/year; the risk of Lyme Disease appears to be increasing in some areas of NW and central IL.

Ixodes scapularis

Borrelia burgdorferi

Lyme Disease

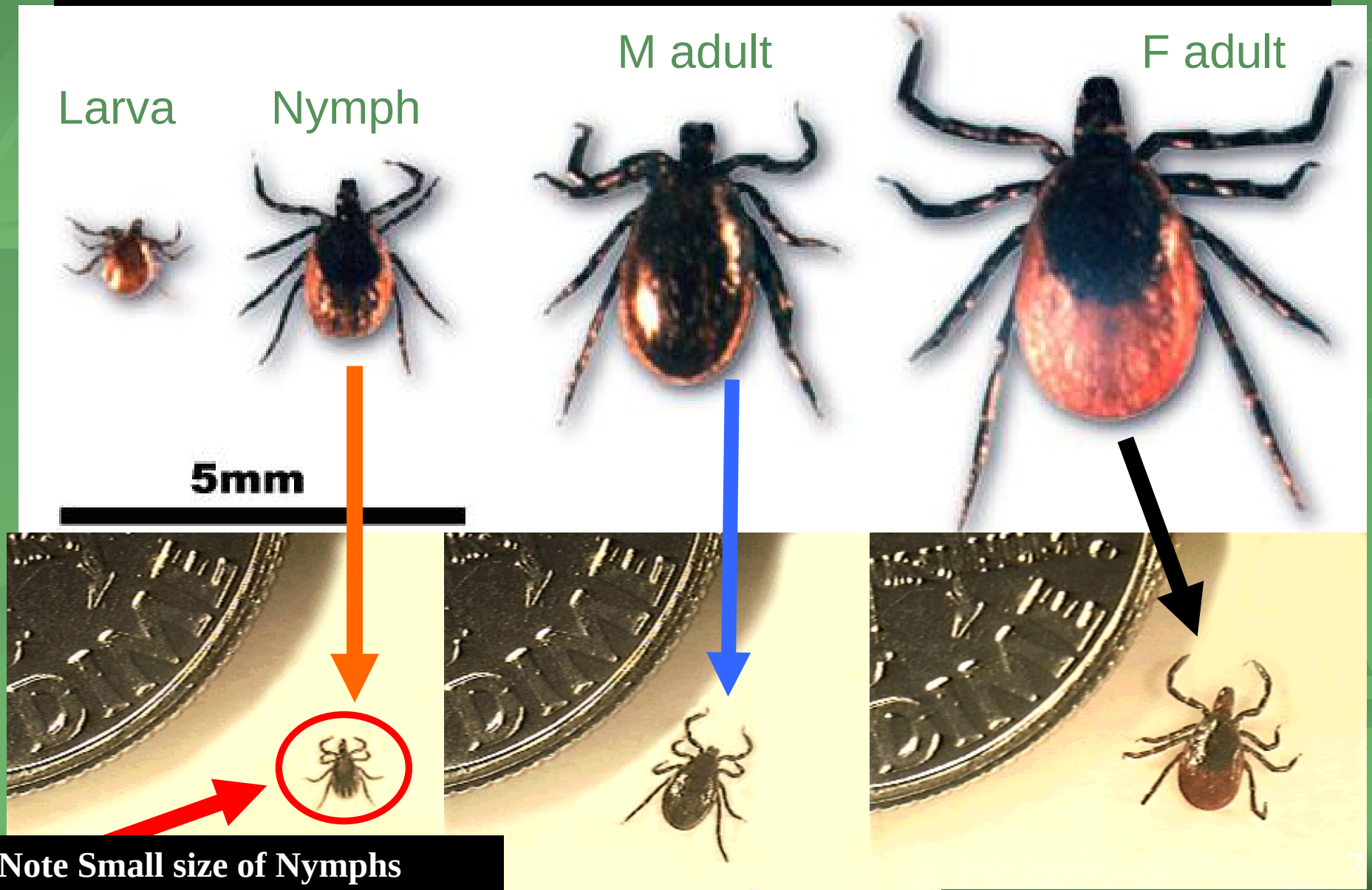


- Affects humans and dogs (not deer or rodents)
- Incubation: 3 - 32 days
- Non-specific and variable symptoms
- Most cases improve, some deteriorate
- If diagnosed early, treatment with antibiotics is generally successful

Old Lyme, CT

- **1975 - Several children were afflicted by illness with neurologic and arthritic symptoms, diagnosed as juvenile rheumatoid arthritis**
- **1981: Pathogen identified: Spirochete bacterium *Borrelia burgdorferi***
- **1988-90: Blacklegged tick and Lyme disease become established along Rock River in nort**

Blacklegged "Deer" Tick, the primary vector of Lyme Disease



Note Small size of Nymphs

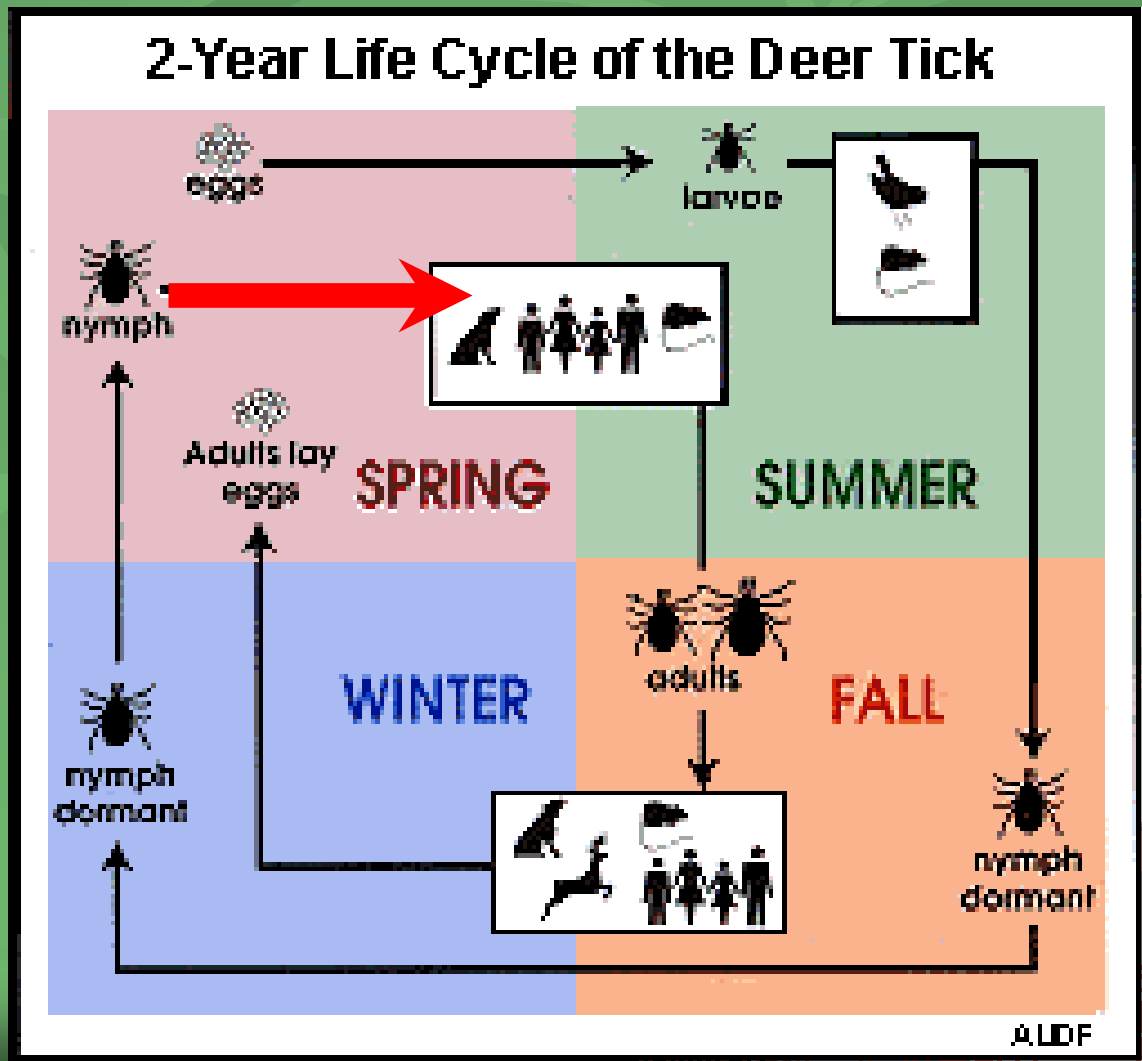
Blacklegged Tick: Life Cycle

Highest Risk of LD Transmission --

LARVAE hatch in the summer.

NYMPHS* emerge the following spring.

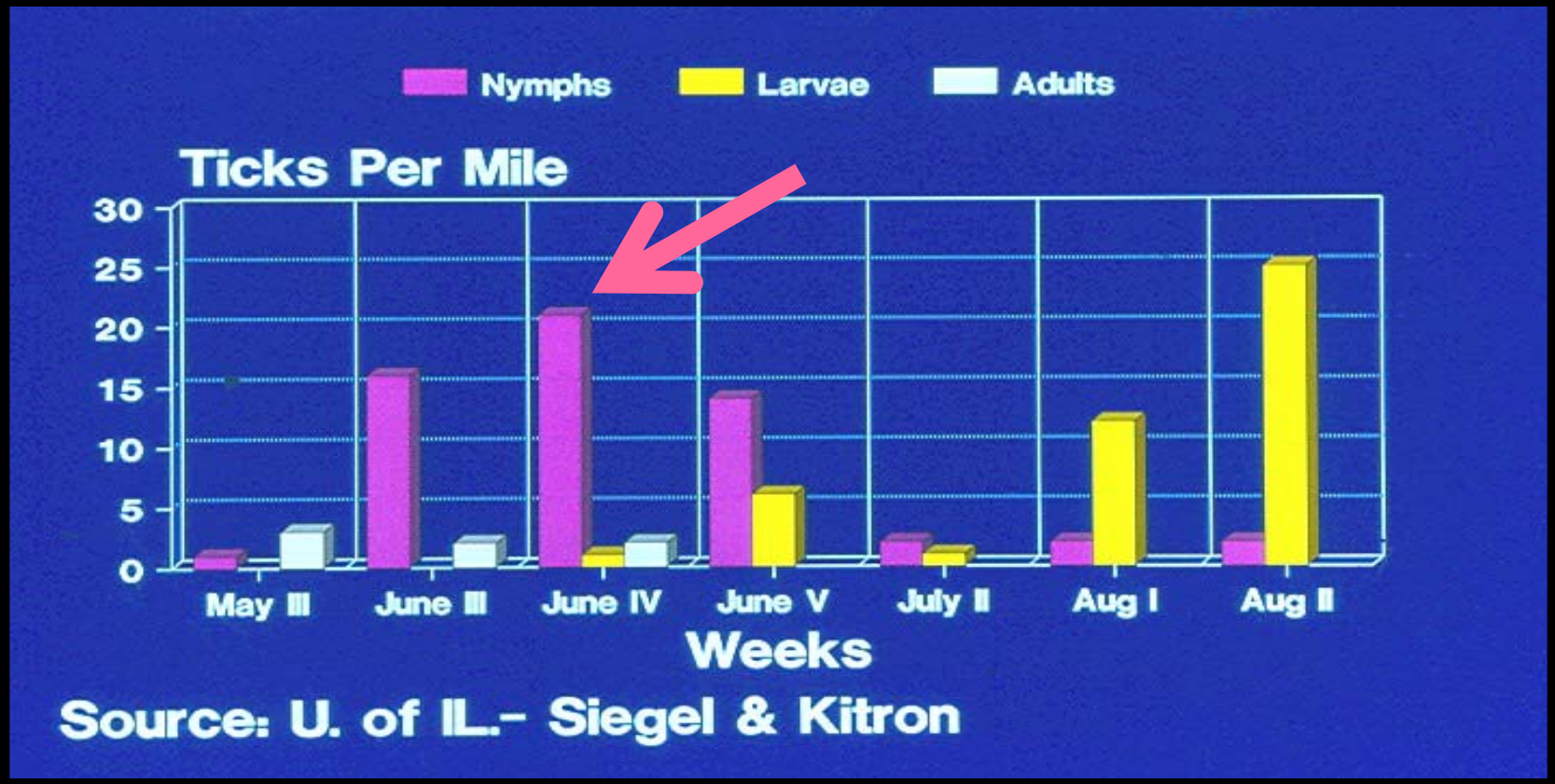
ADULTS emerge in fall, oviposit in spring.



* Nymphs transmit most disease to humans

Most Lyme Disease transmission to humans occurs from nymphs infected the previous season from the white-footed mouse

Note appearance of nymphs in spring and early summer (data from northern Illinois: May through August)



Blacklegged Tick: HOSTS

LARVA: Small rodents (white-footed mouse and deer mouse, chipmunks)

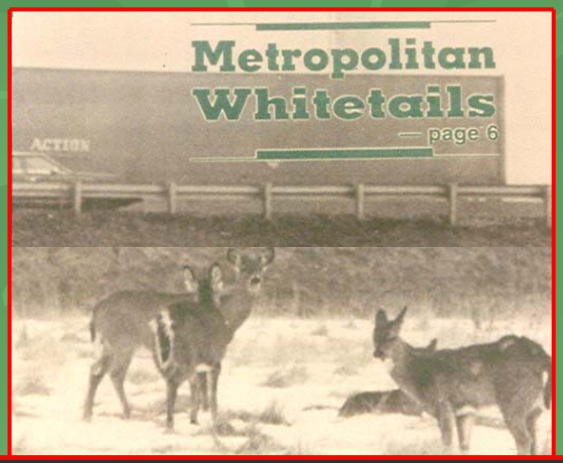
NYMPH: Small rodents → dogs, humans

ADULT: Deer, occasionally horses and humans

Sometimes found on birds, too

Some Suspected Causes for the "Emergence" of Lyme Disease

Suburbanization brings people, wildlife and ticks together



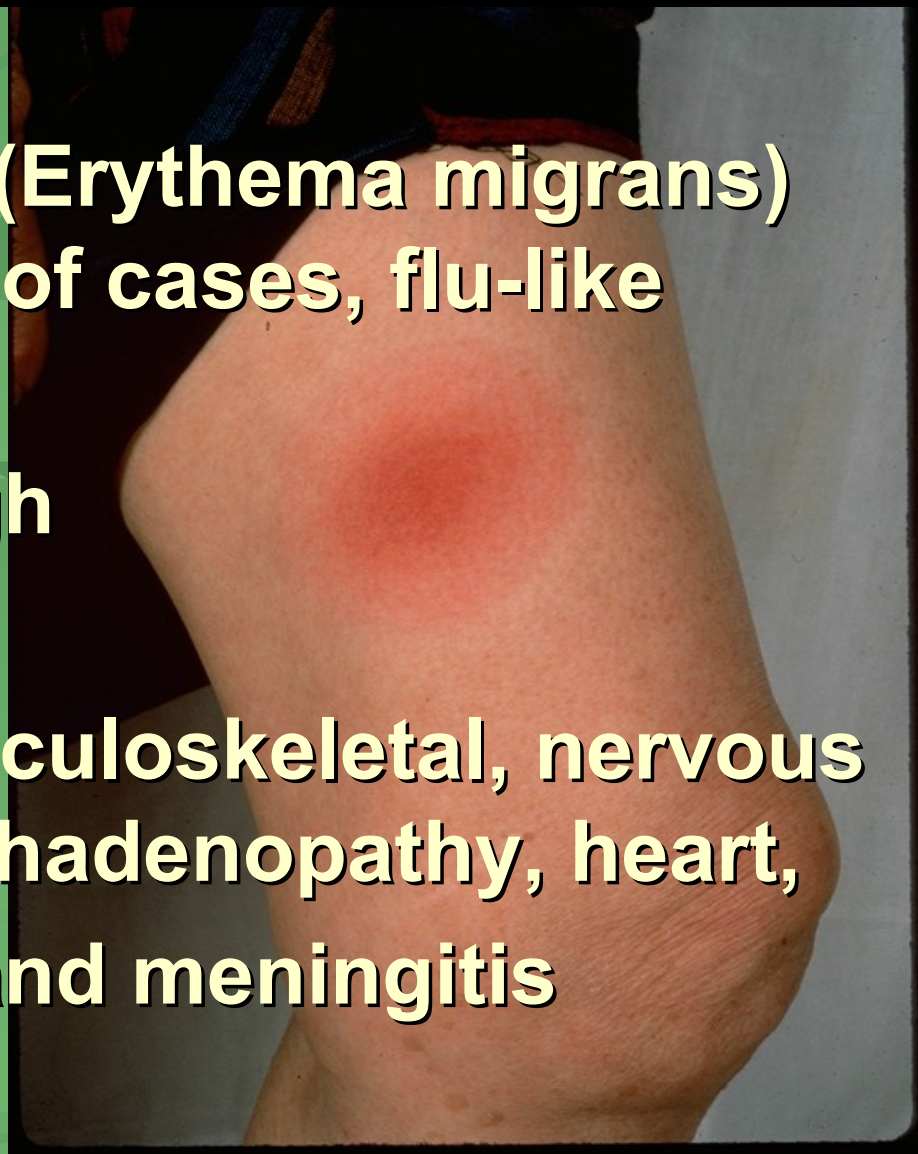
Massive increase in the deer population over the last 100 years

Dispersal of juvenile ticks by migratory birds

Increase in outdoor recreational activities

Lyme Disease: Clinical Stages

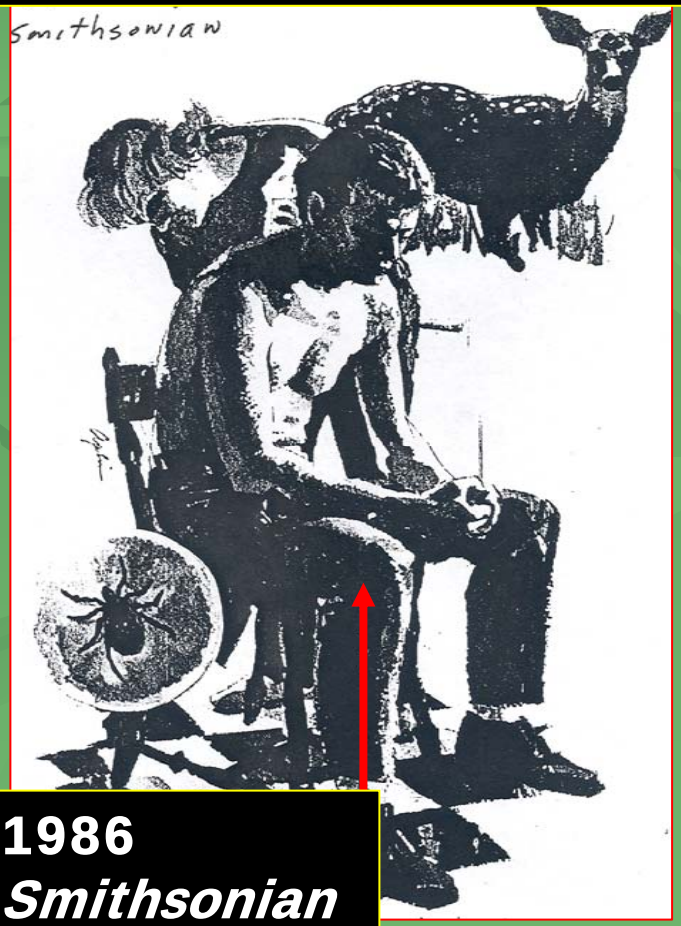
- **Stage 1**
  - "bulls-eye rash" (Erythema migrans) in about 75% of cases, flu-like illness without cough
- **Stage 2**
  - affects skin, musculoskeletal, nervous system, lymphadenopathy, heart, facial palsy and meningitis
- **Stage 3**
  - chronic arthritis or encephalitis



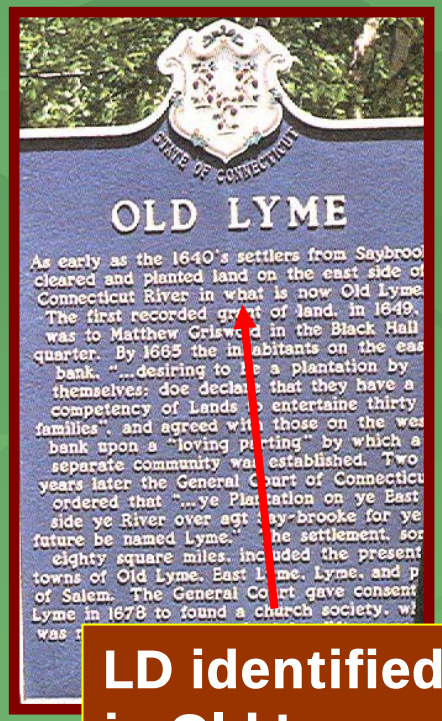
How did this Issue Impact Illinois Department of Public Health ?

Specifically, Environmental Health, Communicable Diseases and Communications Staff

Genesis of Lyme Disease as an issue in the 1980's (Interesting, but this won't affect Illinois...will it ?)



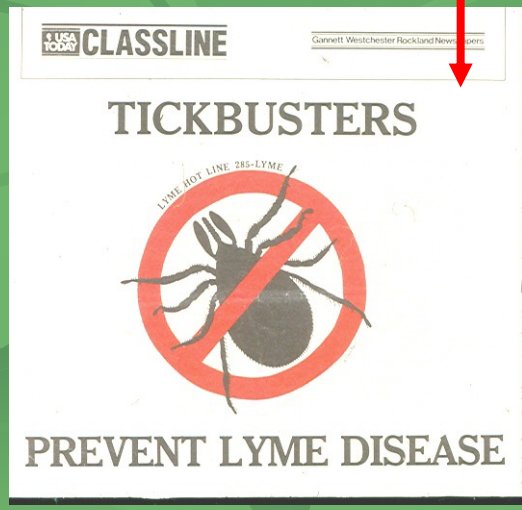
1986 *Smithsonian Magazine*



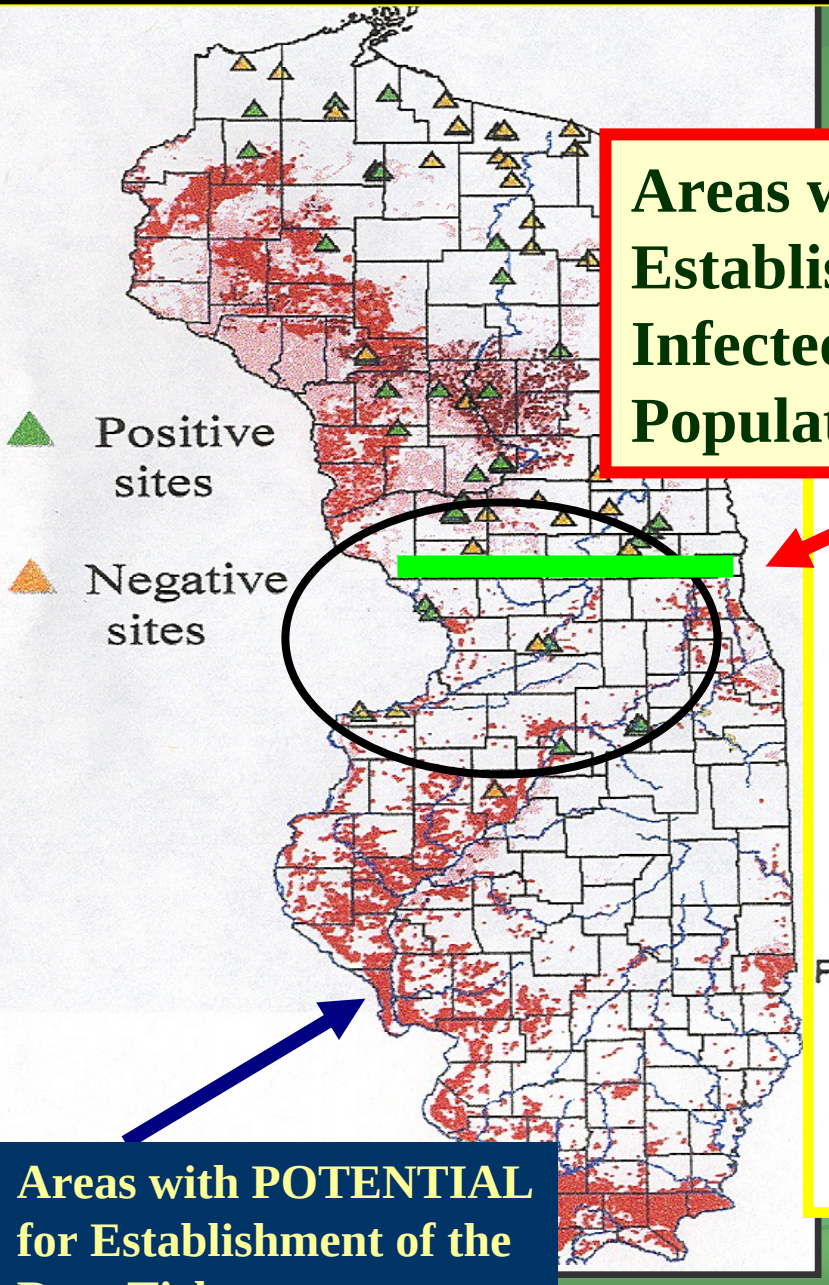
LD identified in Old Lyme, Conn.

NY *USA Today*

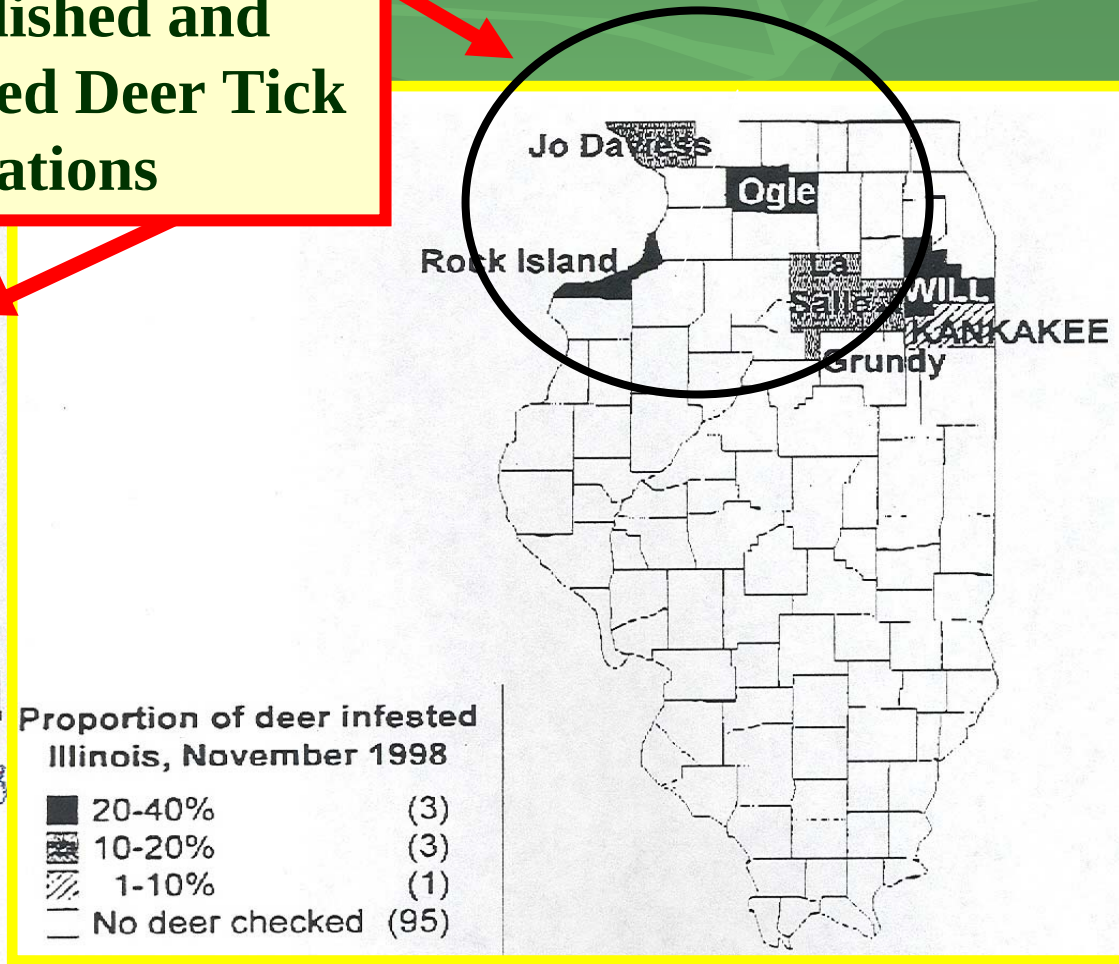
Supplement Cover



Geographic orientation for this presentation…

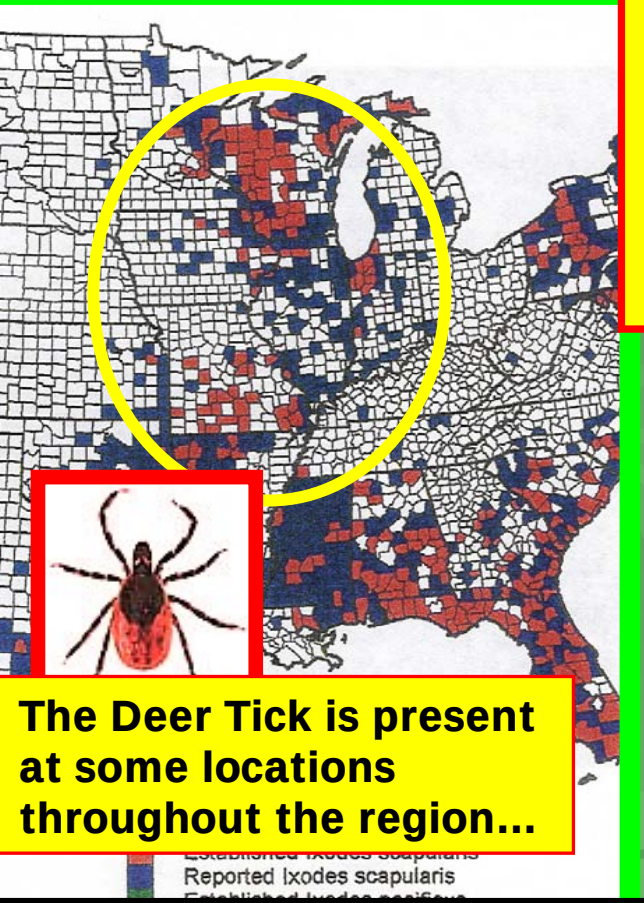


Areas with Established and Infected Deer Tick Populations



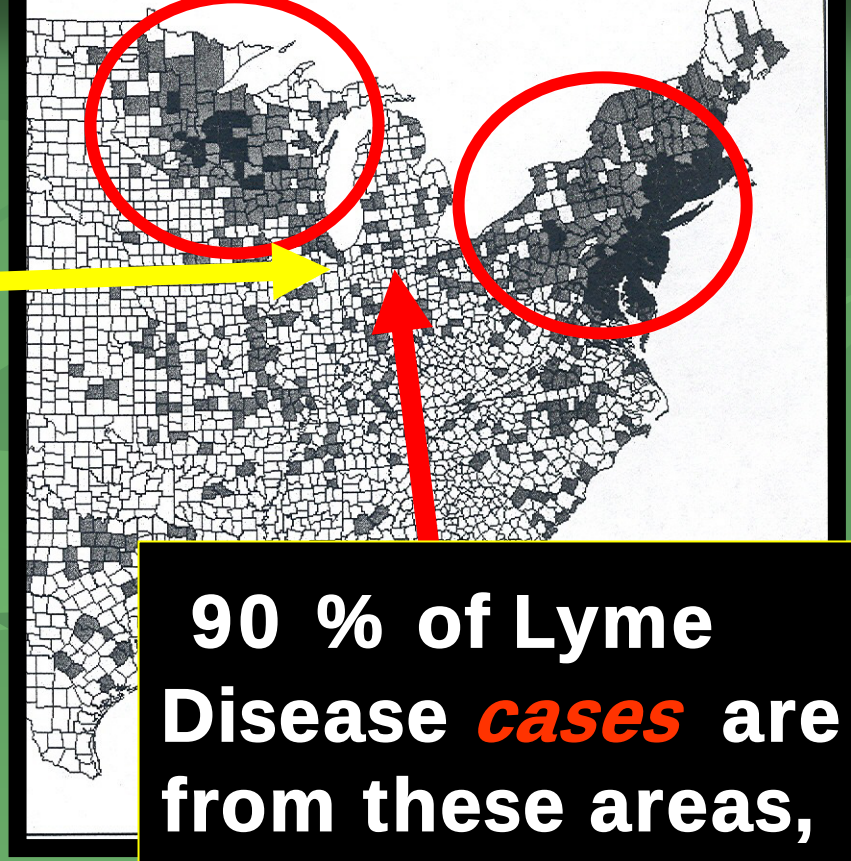
Areas with POTENTIAL for Establishment of the Deer Tick

Map from M Guerra et al, EID, March 2002



The Deer Tick is present at some locations throughout the region…

<u>NOTE</u>: Travel from Chicago area to Wis.; this is a Major Media Market



90 % of Lyme Disease *cases* are from these areas, but…

Public Health officials in Illinois had to deal with the impact of being <u>on the edge</u> of "<u>hyperendemic</u>" Lyme Disease areas

The Difficulties of Presenting a "Complex Message"

News Media Consultants tell you to present a "simple message" to the public, but…

The issue in Illinois was NOT a simple situation, note the following:

We responded to News Media Issues and Public Inquiries of many types…

Cook County issues tick alert

4/11/97 ST

TICKS AND LYME DISEASE

SYMPTOMS
A slowly expanding, ringlike rash appears in most people who have acquired Lyme disease from an infected tick. As the center of the rash clears, it resembles a bull's-eye.

PREVENTION
To avoid ticks, wear light-colored clothing with long sleeves and trousers. Tuck pants into socks. Avoid brushing against weeds.

REMOVAL
Check for ticks frequently. Remove ticks by grasping them with tweezers as close to the skin as possible. Gently and firmly pull them straight out.

THE CULPRIT

By Mark Brown
Cook County Reporter

Deer ticks, the tiny insects that spread Lyme disease, have been found in Cook County fo first time, county officials warned Thursday.

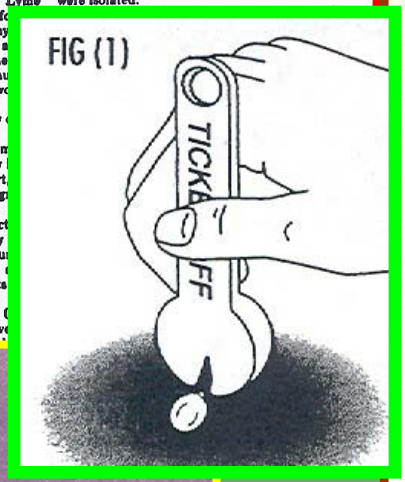
While stressing there is no cause for a officials said the widespread presence of the should prompt area residents to take precau when they go outdoors, especially in wo areas.

Their main advice is simple: Thoroughly for ticks after being outside.

Lyme disease is a bacterial illness transm by infected ticks. Public health experts say cause serious problems involving the heart vous system and joints if not promptly diag and treated.

Dr. Lee Cera, a veterinarian and direct comparative medicine at Loyola University ical Center, said 127 deer ticks were fou Cook County last year as part of a study conducting. About 10 percent of the pests infected with Lyme disease, she said.

Although the study only involved Cook ty, Cera said there was no reason to believe not exactly a surprise. The Illinois Natural History Survey reported in 1994 that the tick had been spotted here. But Cera said those sightings were isolated.



Lyme disease comes to Illinois

Doctors' hunch pays off
Lyme disease tracked to suburbs

Experts searching for Lyme disease

Lyme disease may be fought with wasps

Lessening threat of Lyme disease

Tick trackers look for Lyme disease here

LYME: Researchers search for ticks in area forests
Crabtree center warns of ticks, Lyme disease

LYME: Early diagnosis makes disease easy to treat
Here's how to avoid Lyme's disease

Ann Landers
Lyme disease must be diagnosed early

Lyme disease: Be alert, don't panic

Cattle studied for Lyme link

Health

Life in The Age Of Lyme

As the disease spreads, many scared Americans have declared war on ticks. Summer may never be the same.

News Media Issues – an example of "Collateral Damage" –

Deer Management Controversy, NE Illinois

Deer are protected — for now

By Maribeth Vander Weele
Daily Herald Staff Writer

A Lake County citizens group Thursday won a round in its attempts to save the Ryerson Woods Conservation Area deer from being shot — although the reprieve may be brief.

Judge Stephen Walter of Lake County Circuit Court temporarily barred the Lake County Forest Preserve District from shooting the deer to pare the population of the animals in the Vernon Township preserve.

But both the forest preserve district and the citizens group are scheduled to be back in court today at noon and at 10:30 a.m. Feb. 10 to

conservation experts say.

The Illinois Department of Conservation gave the district permission this week to launch the sharpshooting program, which calls for baiting and shooting about 58 deer. Twelve of the animals would be allowed to live.

In court Thursday, forest preserve attorney Donald T. Morrison argued the issue may affect the public's health. According to the New England Journal of Medicine, deer ticks carry Lyme disease, which can cause crippling arthritis in humans, he said.

"It's no longer a question of aesthetics. It's a question of public health," Morrison said. "We don't

"You can name a dozen different wildlife that carries the disease," Ross said. "If the forest preserve wants to eradicate the disease, they better start destroying all the animals."

Judge Walter said if Morrison proves that the public health is endangered, "the court would certainly weigh that heavily."

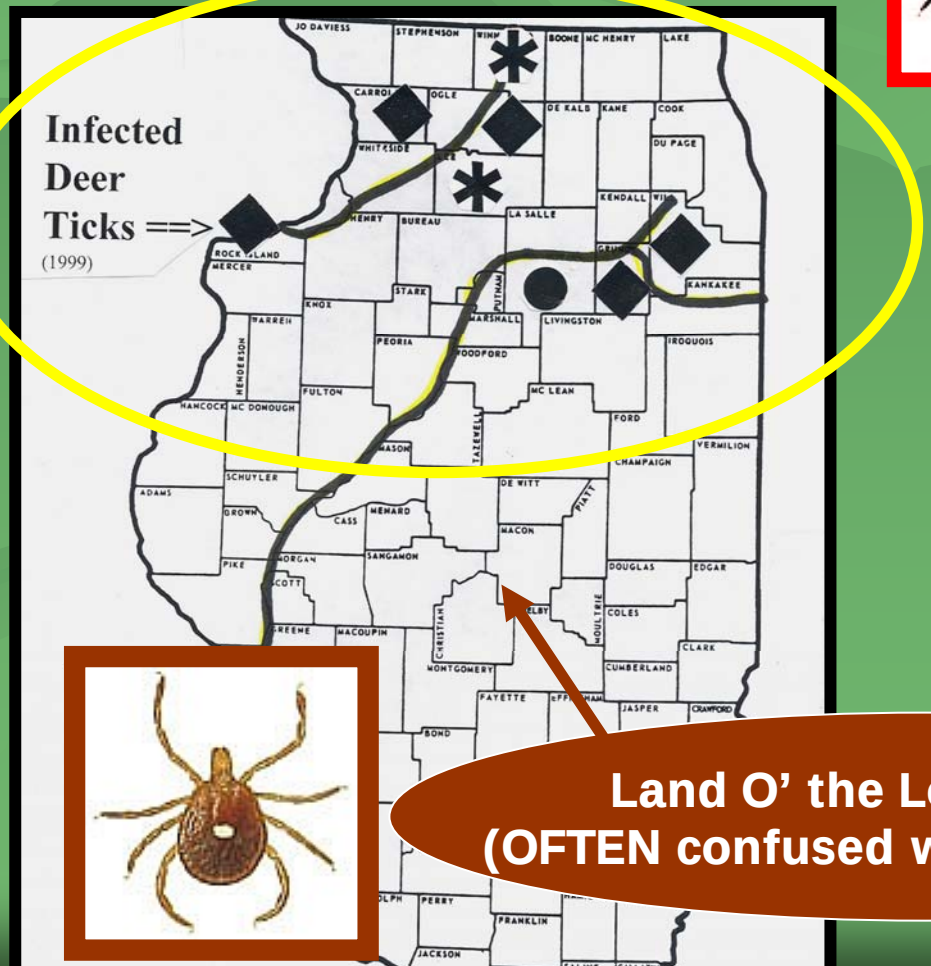
Morrison also argued that the court should not interfere with the state's authority to dispose of the deer. And he contended the citizens group does not have legal standing or the right to take its fight to court.

Walter conceded that case law does not specifically give the citizens group legal standing, but he said le-

Lyme Disease even became an issue in this situation !

The Deer Tick & Lyme Disease :

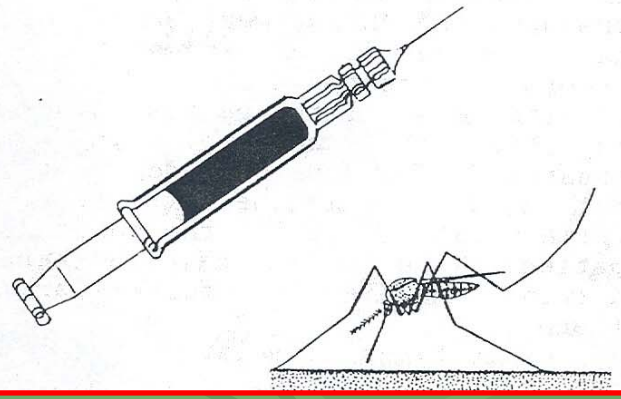
Established Populations vs. "Apparent" Distribution



Land O' the Lone Star Tick
(OFTEN confused with the Deer Tick)

Some issues created by the difficulties of diagnosis and testing of Lyme Disease:

MALARIATHERAPY



Newsletter from Southern Illinois reporting "Malaria Therapy" for Chronic Lyme Disease

Lyme Disease advocates question experts' position about treatment for chronic Lyme disease symptoms

June 17, 2001

Stalking Dr. Steere Over Lyme Disease

"STARI" also known as Lone Star Tick Rash

(Mimics Lyme rash)

Female & Male Lone Star Ticks

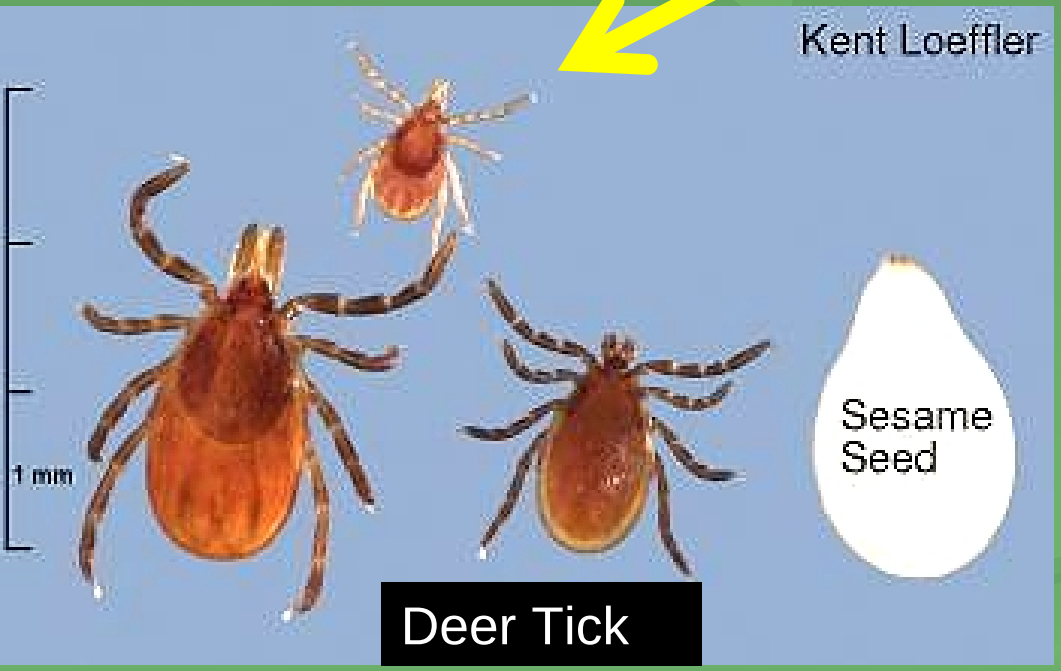
Another complicating factor was that in southern Illinois, Lyme disease cases might be *Southern Tick-Associated Rash Illness* or STARI. The infectious agent is tentatively named *Borrelia lonestarii* and is associated with Lone Star ticks (*Amblyomma americanum*). See http://www.cdc.gov/ncidod/dvbid/stari/index.htm

Early symptoms of STARI are similar to Lyme disease. The same antibiotic therapy for Lyme disease is prescribed to treat STARI.

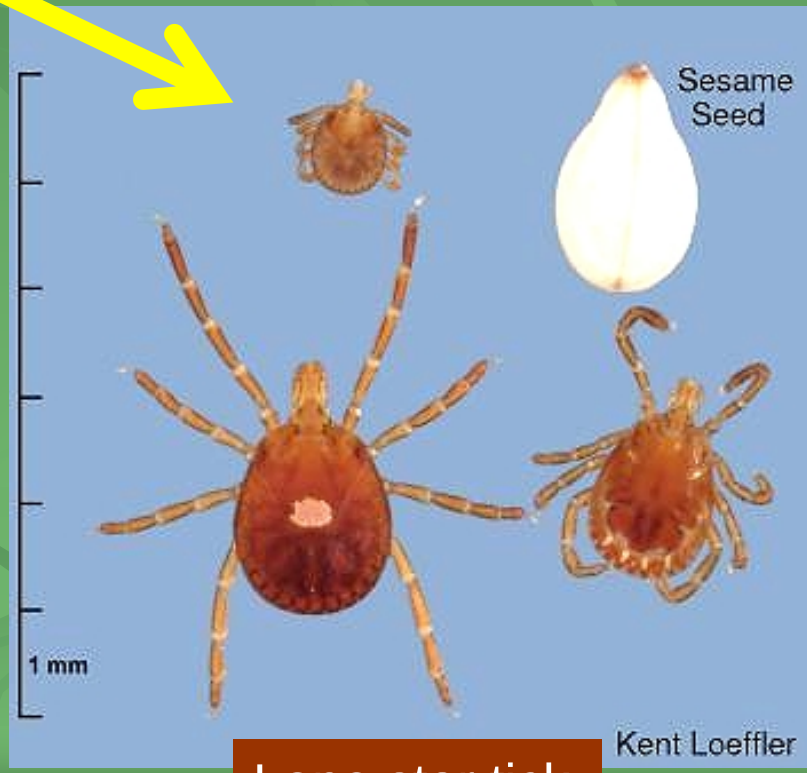
(Mis)-Identification by local agencies and medical personnel:

Lone Star Tick is MUCH more common in the southern 2/3 of the S

All stages very similar in size and appearance

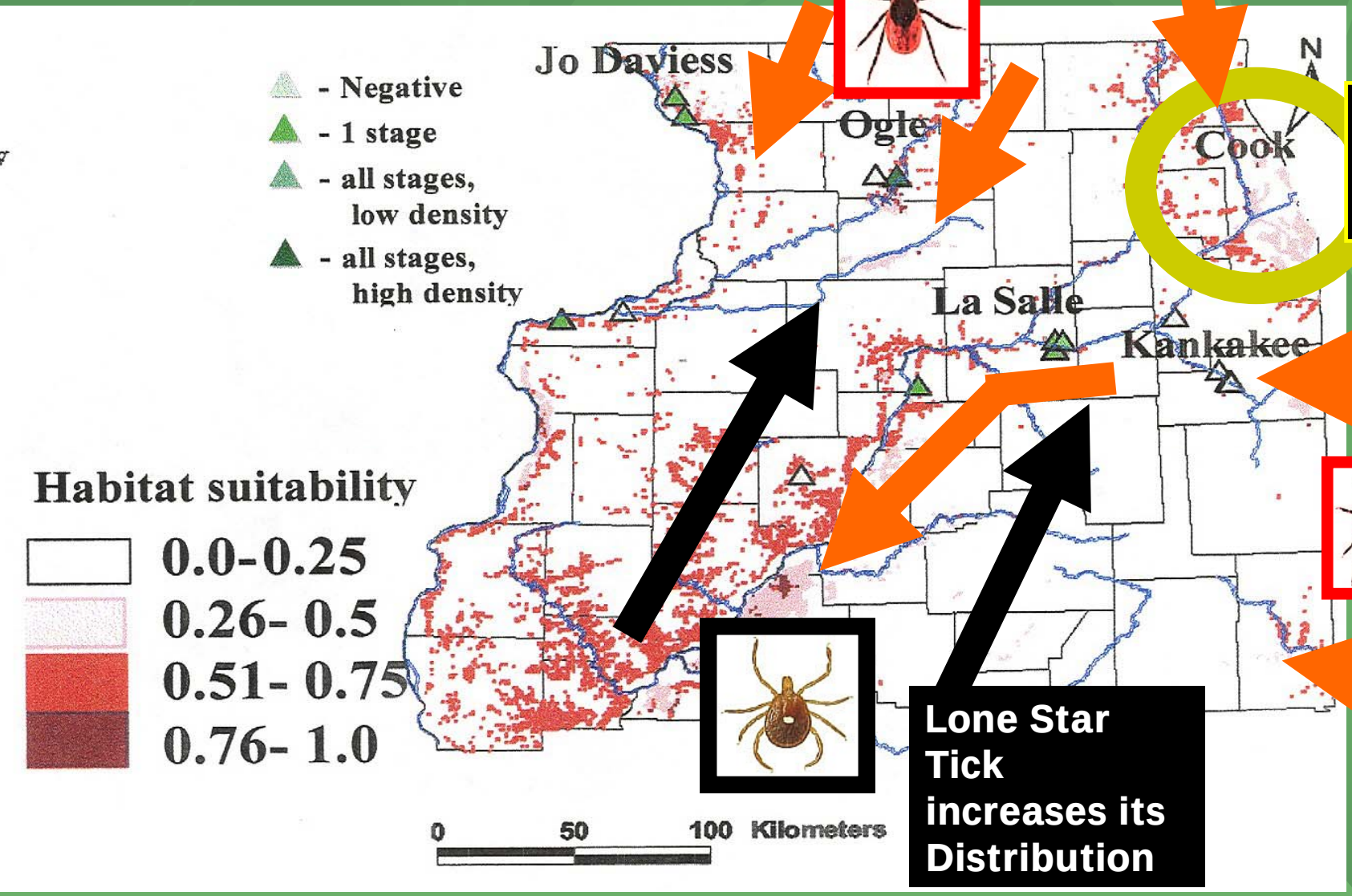


Deer Tick



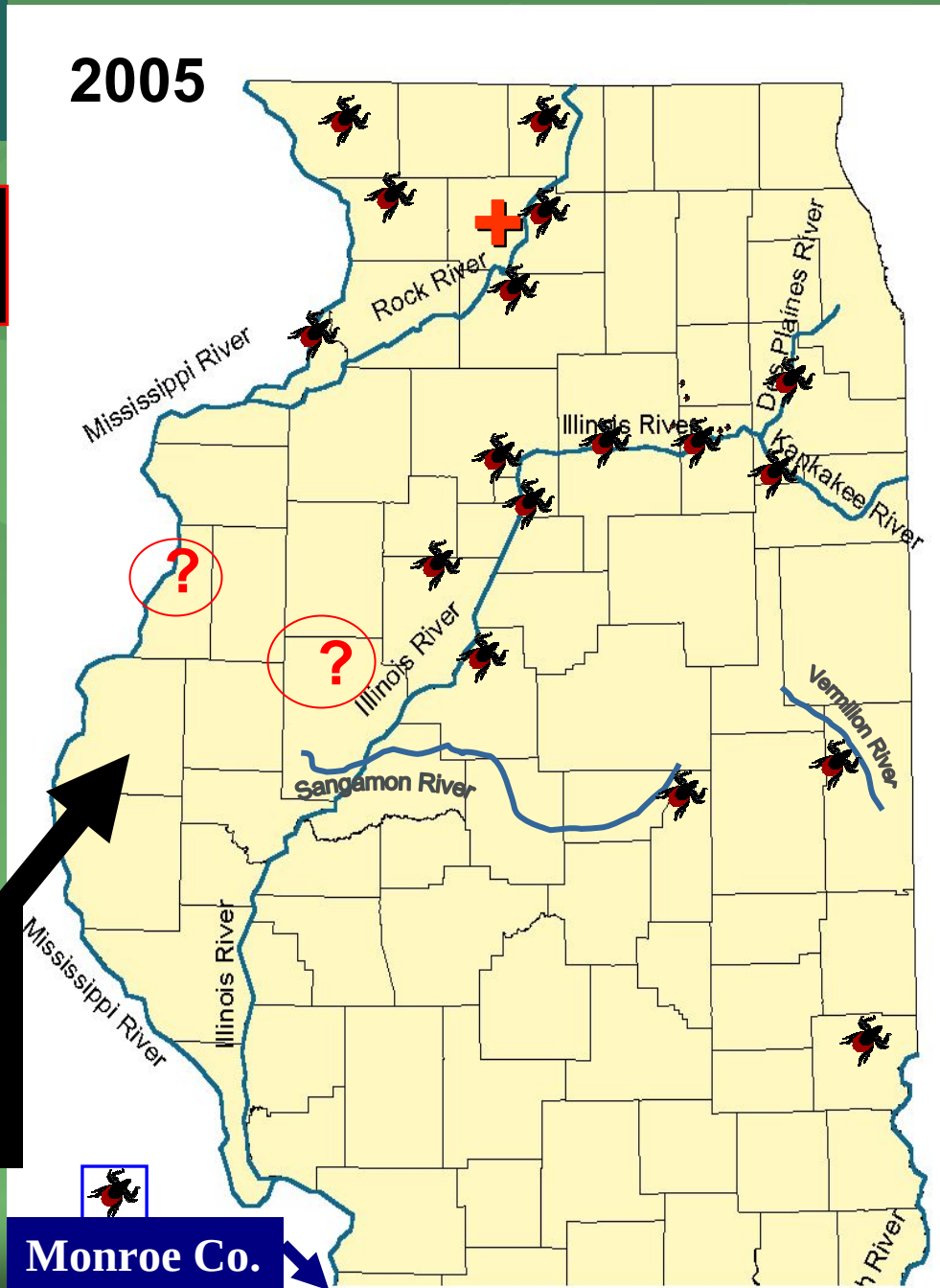
Lone star tick

Creeping Along: Slow increase of Deer Tick Distribution in Illinois



The Blacklegged Tick in Illinois

blacklegged tick is expanding along forested river corridors



Initial Discovery (1988)

Established

? Probable Population

No Specific Funding for Lyme Disease, but…

"We Don't Do ticks…"

is *not* an acceptable response !

When an issue is covered this intensely by the news media, the public and local health departments expect <u>some response</u> from the state public health agency...

Ok, so what can we do ?

What We Lacked: Specific $$$$ for significant field surveys for the deer tick or *Borrelia burgdorferi*

But, we had the following available resources

- Knowledgeable Staff
- Access to Training Seminars
- Cooperation with other State Agencies (U of IL, IL Natural History Survey)
- Cooperation of Local Health Departments
- Technical support from CDC

The result was many, many hours spent on:

- Talking to the public
- Identifying ticks (mostly lone star and American dog ticks)
- Talking to the news media about ticks and Lyme Disease
- Supporting researchers who were working in Illinois
- All without any specific $$$ for Lyme Disease response…

Nevertheless, it <u>was</u> IDPH's responsibility* to inform the public about how to prevent tick-borne diseases…

*Assisted by local health departments

IDPH's Approach to Tick-borne Disease Prevention ("on a shoe-string")

Prevention through Public Information:

1) General news releases and

2) Regulatory newsletters

Illinois Department of
Public Health

George H. Ru

525-535 West Jefferson Street • Springfie

December 10, 1999

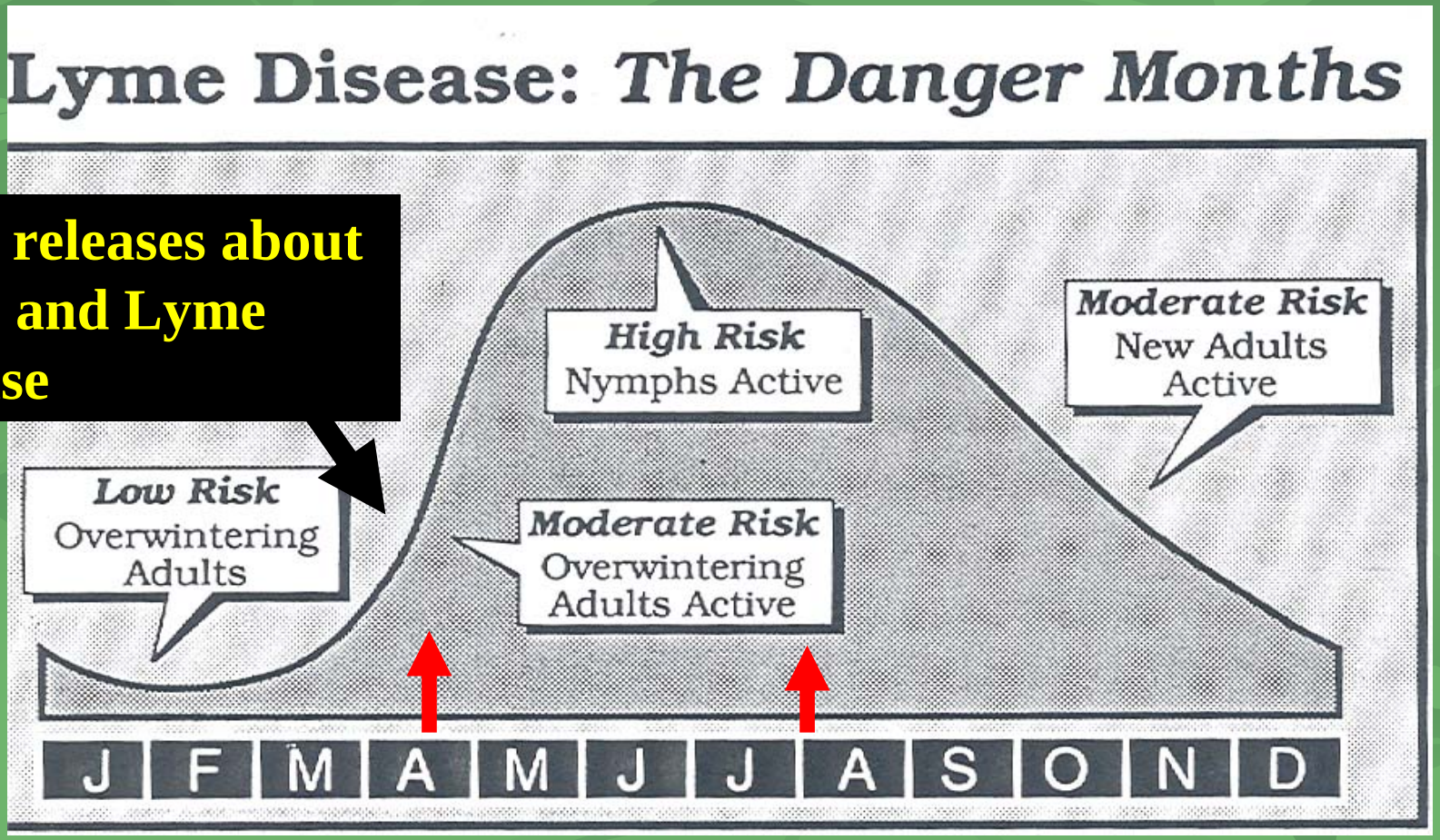
Dear Campground Licensee:

CONTACT: 217-782-5750
TTY: 800-546-0466
FAX: 217-782-3987
WEB SITE: www.idph.state.il.us

FOR IMMEDIATE RELEASE
June 23, 1999

SUMMER IS TIME TO CHECK FOR TICKS

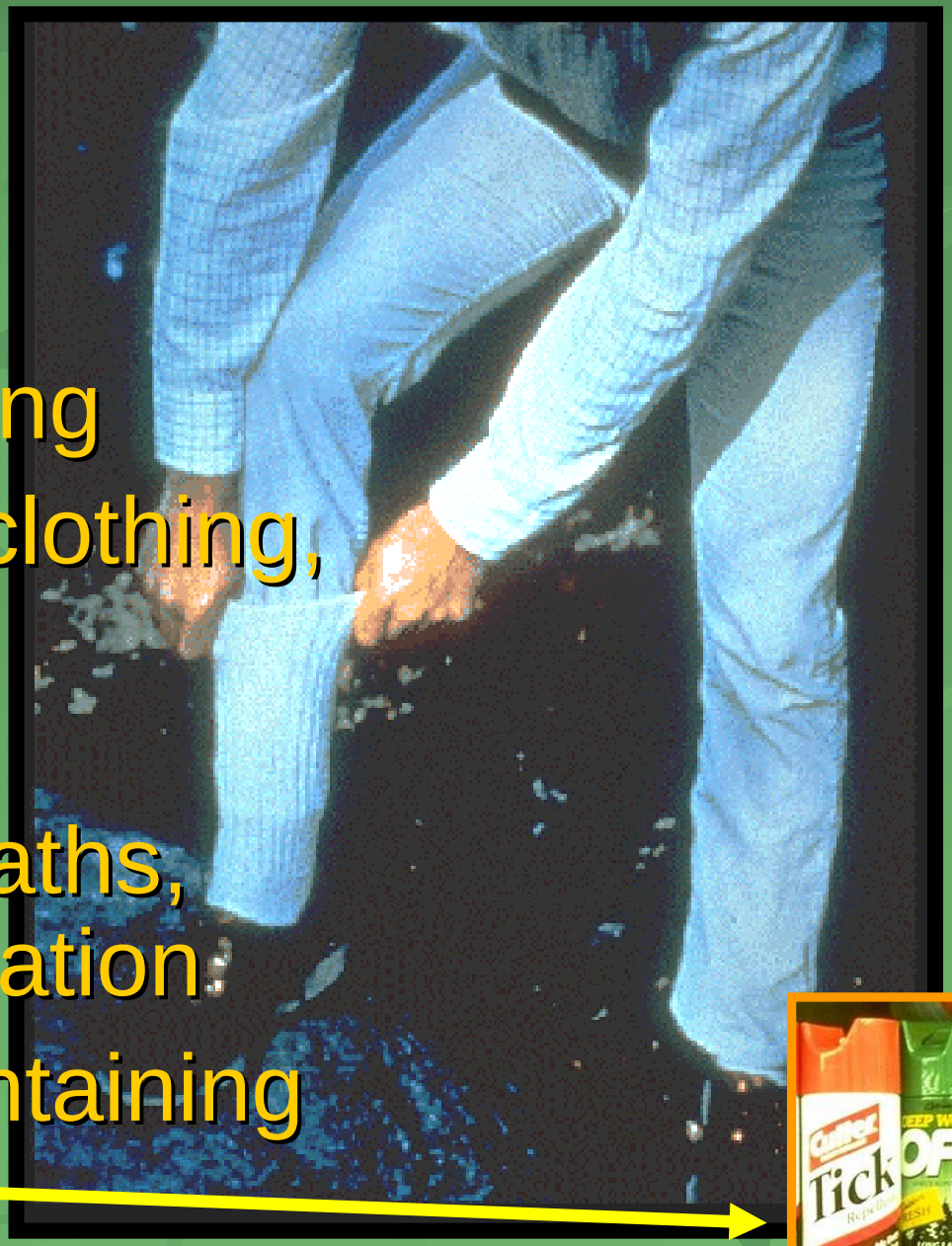
Peak Tick Activity Occurs April through mid-July



News releases about Ticks and Lyme Disease

Preventing Tick Bites

- Avoid woodlands, especially in spring
- Wear light colored clothing, tuck pant legs in socks or boots
- Walk in middle of paths, away from vegetation
- Wear repellents containing DEET (20 -30%)

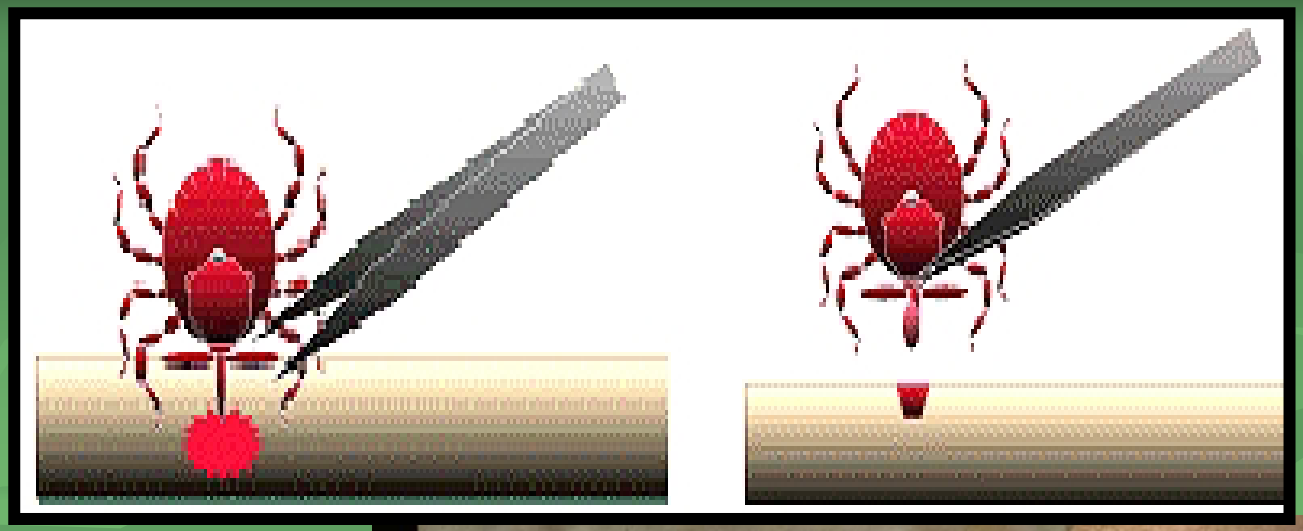


Tick Feeding & Pathogen Transmission

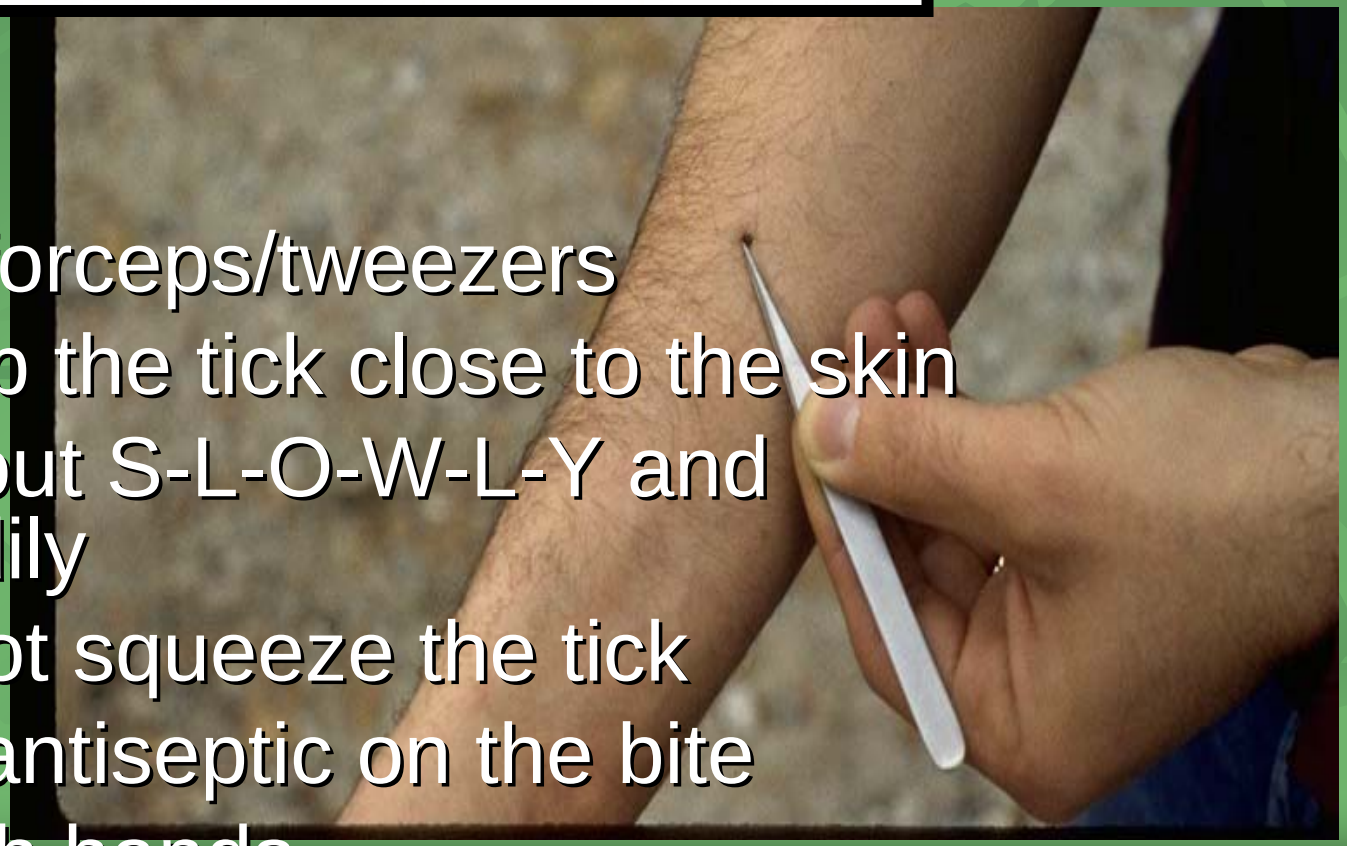
- **First 48 hours:**
  tick penetrates and prepares bite site
- **After 48 hours:**
  rapid uptake of blood (engorgement)

NOTE! Probability of Lyme disease transmission is very low during the first 48 hours of feeding, but rapidly increases after 48 hours.

MORAL: Always check for and remove ticks ASAP



Tick Removal



- Use forceps/tweezers
- Grasp the tick close to the skin
- Pull out S-L-O-W-L-Y and steadily
- Do not squeeze the tick
- Use antiseptic on the bite
- Wash hands

Tick Management

- Treat pets with flea & tick medications
- Eliminate, trim and/or treat vegetation along paths and forest borders
- Fence yards to keep out deer & other animals
- Several residual insecticides can be applied to "ecotones" along the edge of densely vegetated areas
- Use "Tick Management System"™ *

  or something like it; such as cotton balls impregnated with insecticide. Mice will use cotton balls as nesting material, and the insecticide protects mice against ticks.

*** Not known to be widely used in Illinois**

Tick Management System™

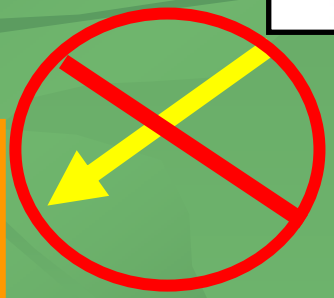
- Stations placed every 10–20 ft. around residence.
- Food attractant lures mice to station
- Mouse contacts insecticide (fipronil)
- Insecticide protects mouse from ticks
- Less ticks (blacklegged tick nymphs) → fewer tick bites → reduced likelihood of Lyme

If the deer tick continues to become more common, could this be in our future ?

The Moral of the Story…

- Lyme Disease, like many pathogens, is not static over time – things can change….
- A state agency can draw on a variety of resources to provide some level of services to the public.
- In our humble opinion, local laboratory staff should become familiar with the most common species of ticks in their regions; unusual specimens can be sent to a specialist. Currently, there are MANY excellent on-line images that can be used to aid identification of adult ticks.

The End



Appendices

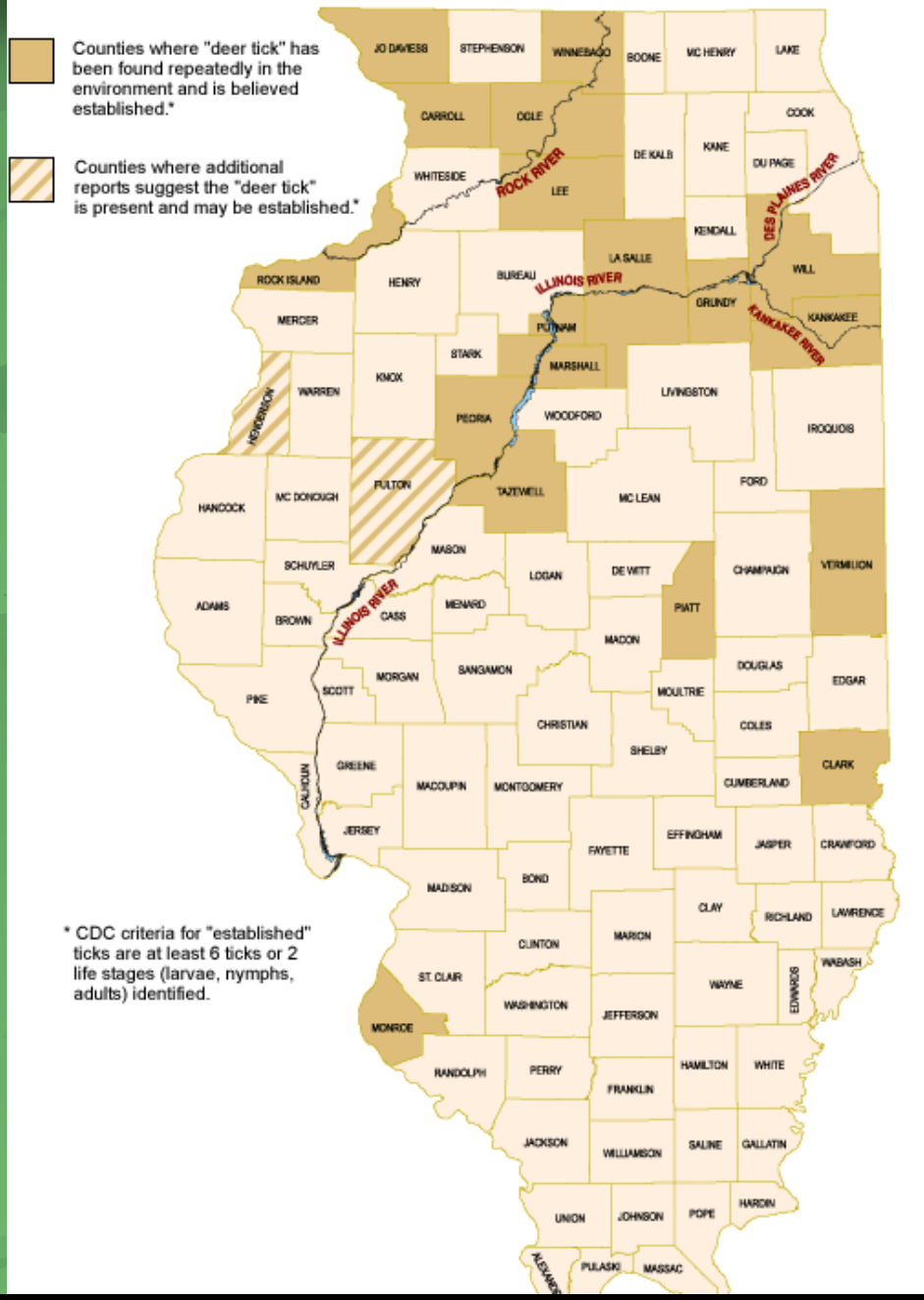
Appendices

…for those who are interested…

- Map of Current Known Distribution of the Deer Tick in Illinois, 2004
- Biology of Ticks for the Novice
- Basic Morphology of Ticks for the (Midwestern) Novice

Appendix I. Known Distribution of the Deer Tick in Illinois, 2004

- *Ixodes scapularis* is also known as the "deer tick" and the "blacklegged tick". *Amblyomma americanum*, the lone star tick, and *Dermacentor variabilis*, the American dog tick, should be presumed present throughout the state.



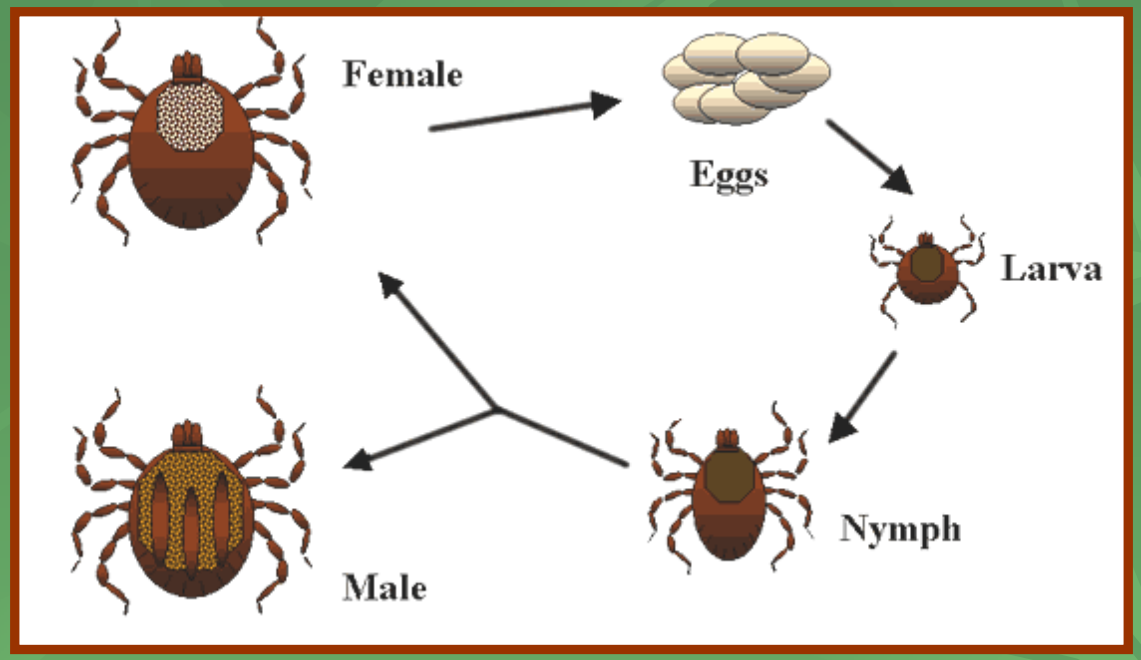
www.idph.state.il.us/envhealth/tick_dist.htm

Appendix II. Basic Biology of Ticks

Blacklegged Tick (female)

- Arachnids (like mites, spiders)
- Abdomen (opisthosoma) unsegmented and broadly joined to prosoma
- 6 legs (larvae) or 8 legs (nymphs, adults)
- Blood-feeding parasites of mammals, birds, reptiles
- Vectors of diseases, mostly bacterial
- Include the “soft ticks” and “hard ticks”

Tick Life Cycle



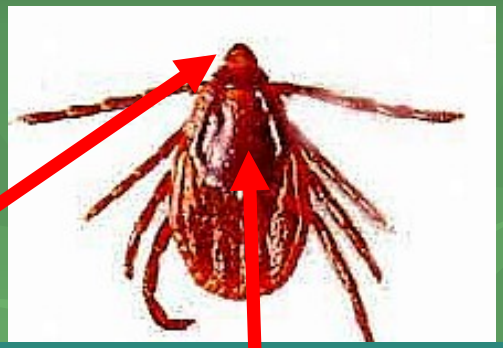
Infected as larvae; most Lyme Disease is transmitted by nymphs

Life cycle can be complex

For the deer tick, the complete life cycle may take as long as 3 years

Hard Ticks

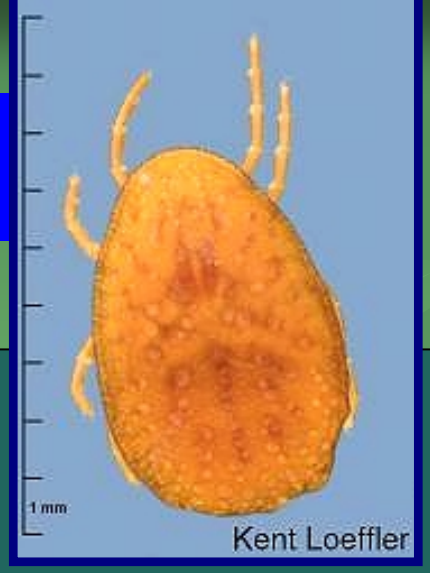
Brown Dog Tick



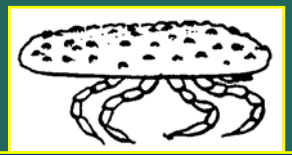
- Mouthparts visible from above, scutum present
- Feed on mammals, birds, reptiles
- Some with lengthy life cycles involving several host species
- Typically found in wooded areas

Soft Ticks

Fowl Tick



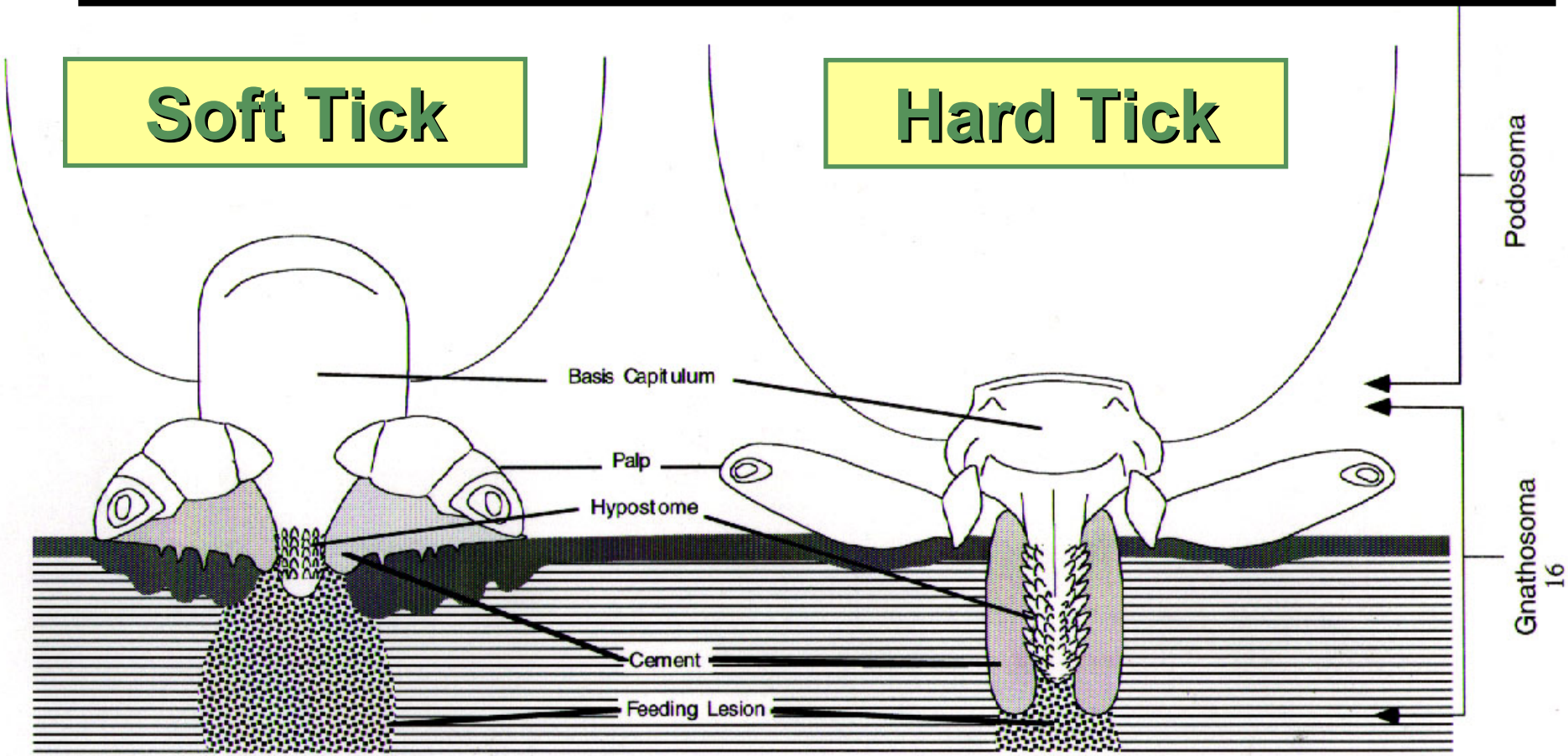
- Mouthparts not visible from above
- Feed on domestic and wild birds, livestock, large and small mammals
- Live in and around host nests
- Typically found in rural areas
- Some soft ticks are vectors of relapsing fever (but not in Illinois)



Side view of soft tick

Tick Bites

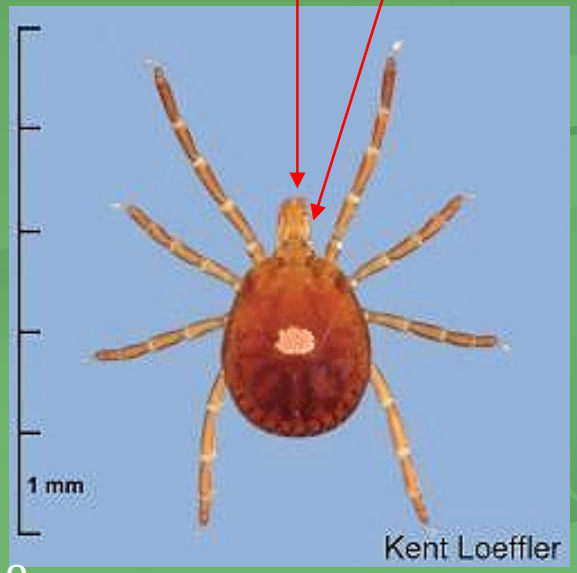
After imbedding on the host, hard ticks feed for several days…



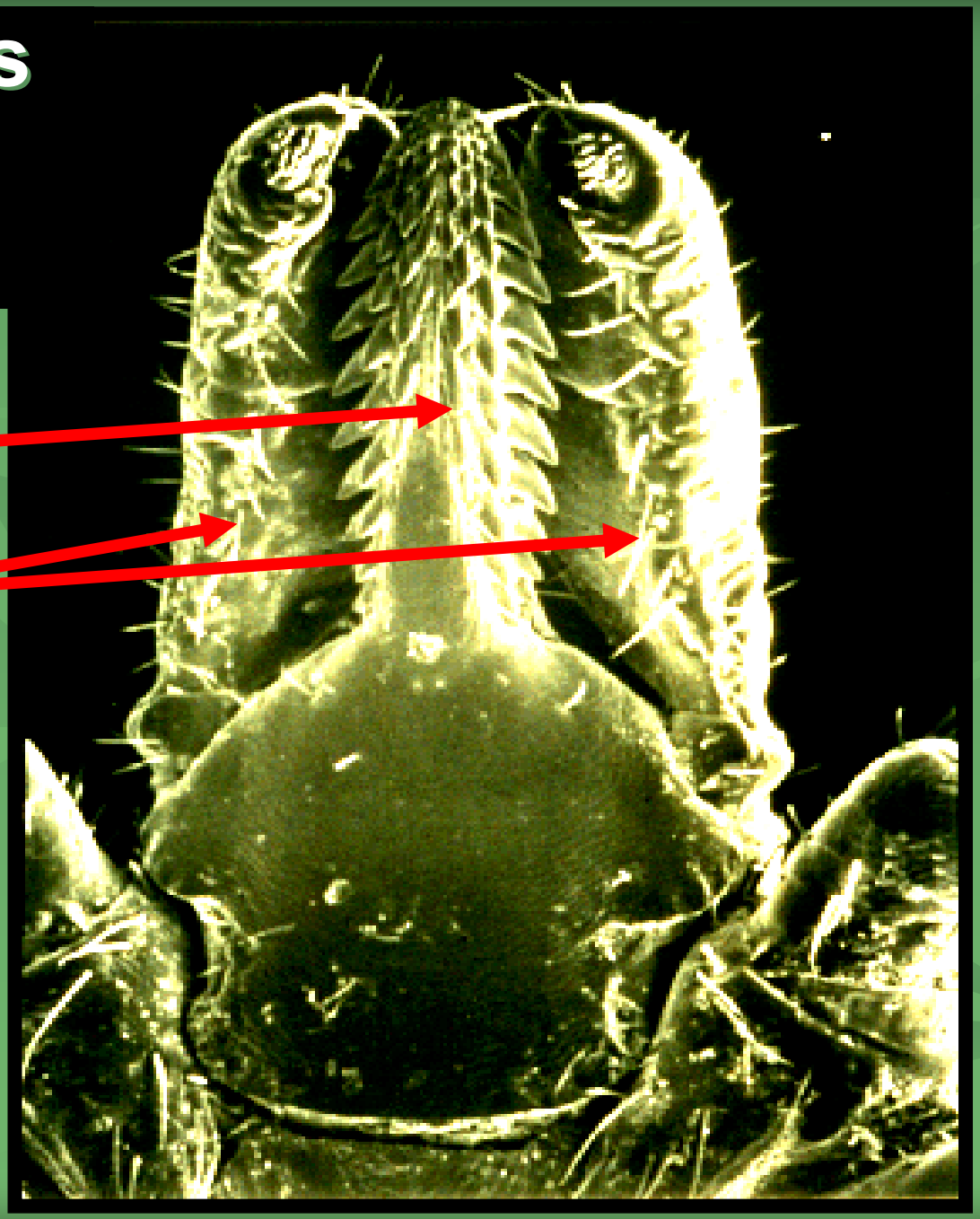
Tick Mouthparts (important for identification)

Hypostome

Palps



Lone star tick



Some WWW Tick Identification Resources

- U. of Iowa:
  http://www.ent.iastate.edu/imagegal/ticks/

- U. of Nebraska:
  http://entomology.unl.edu/images/ticks/ticks.htm

- U. of Rhode Island:
  http://riaes.cels.uri.edu/resources/ticklab/ticks.html

- **Tick Management Handbook, Connecticut Experimental Station:**
  http://www.caes.state.ct.us/SpecialFeatures/TickHandbook.pdf

Appendix III.

Common Ticks in Illinois

Common Ticks of Illinois

- American dog tick

  Dermacentor variabilis

- Lone star tick

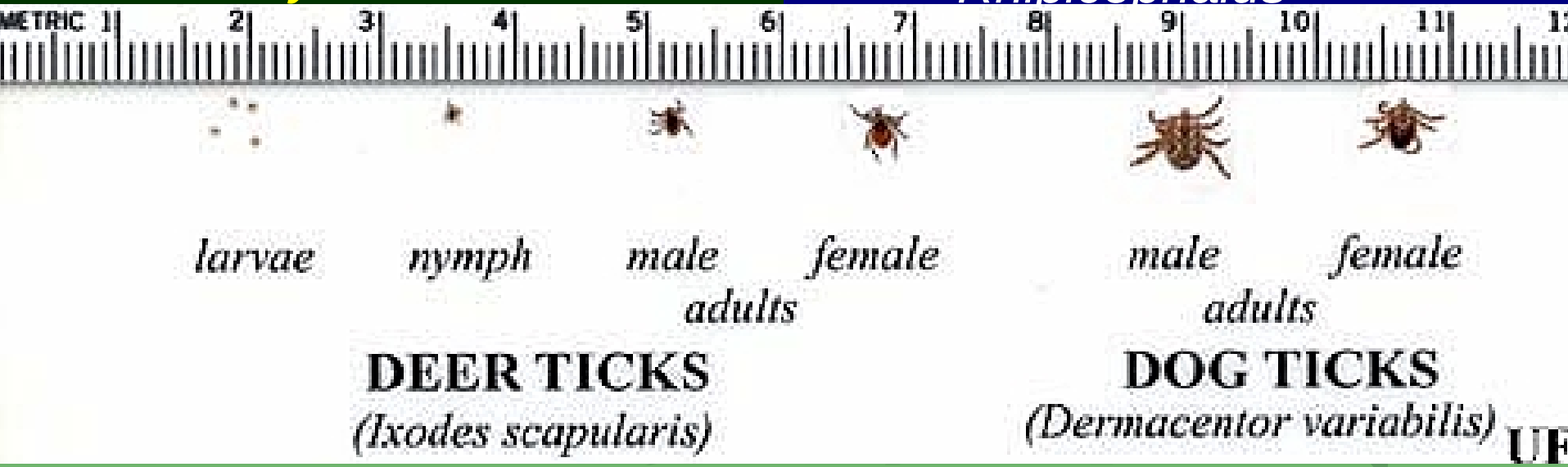
  Amblyomma americanum

- Blacklegged tick

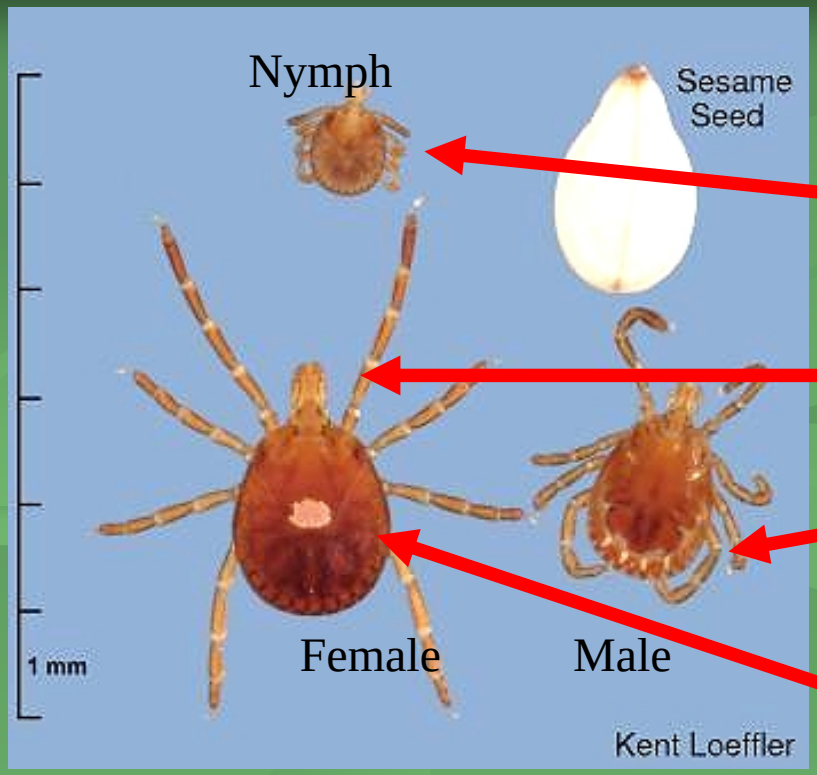
  Ixodes scapularis

- Brown dog tick

  Rhipicephalus



Lone star tick



round shape

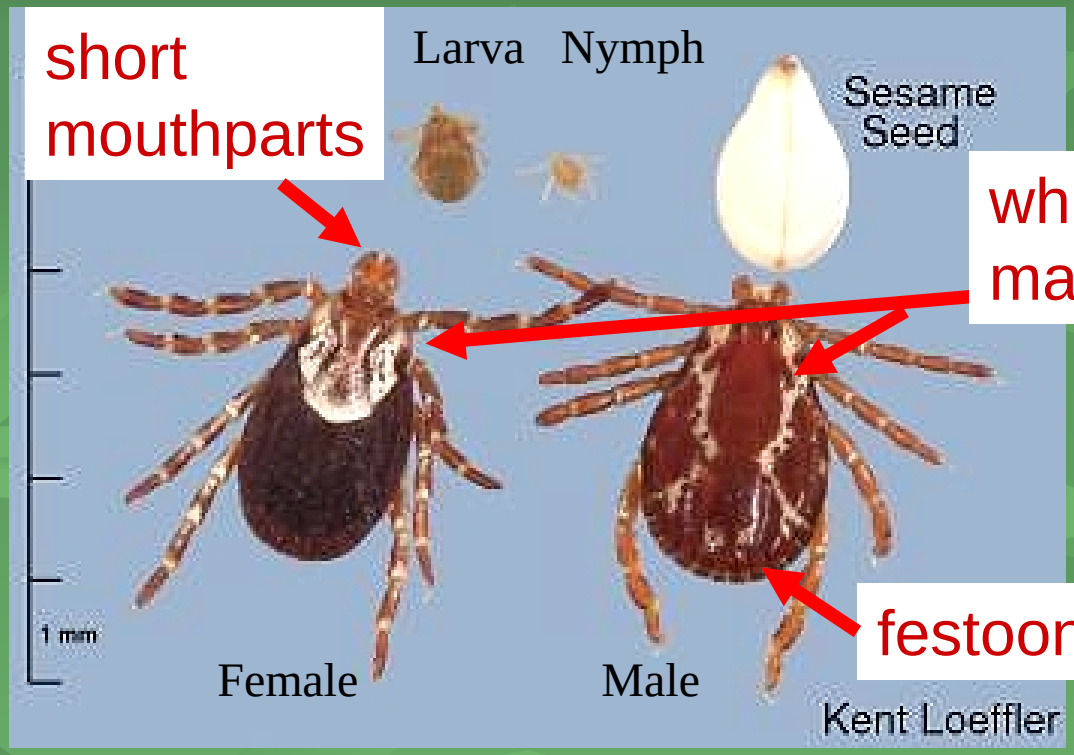
long mouthparts

white markings along festoons

“lone star” spot

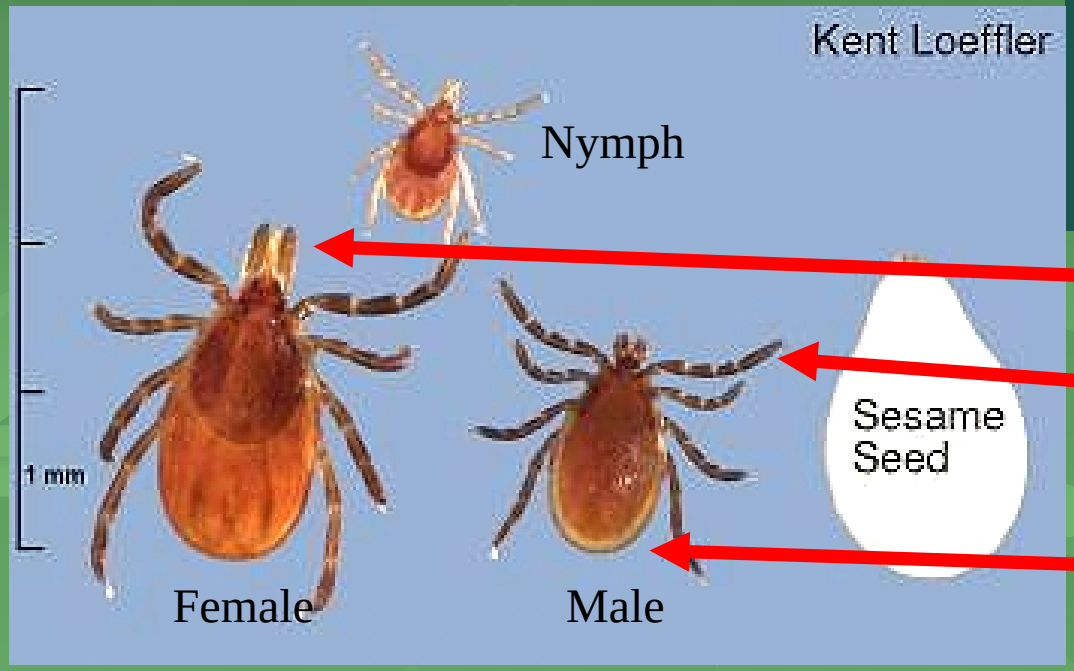
Identification:	Long mouthparts, round shape females with white spot, festoons
Distribution:	Throughout Illinois, especially southern Illinois
Vector of:	STARI, Ehrlichiosis, tick paralysis

American Dog Tick



Identification:	Short mouthparts, festoons, white markings
Distribution:	Throughout Illinois Most common tick submitted for ID
Vector of:	RMSF, Tularemia, Ehrlichiosis, tick paralysis

Blacklegged "deer" tick



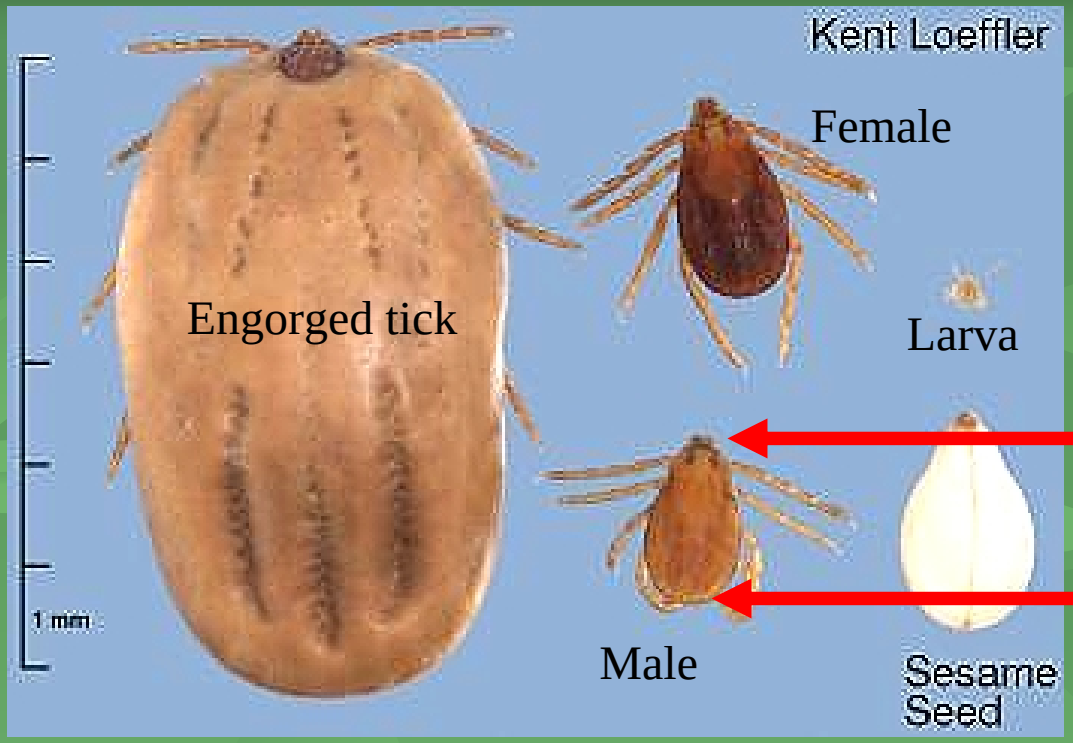
long mouthparts

black legs

no festoons

Identification:	Long mouthparts, black legs, red color, no festoons
Distribution:	Known from 20 Illinois counties, especially northern Illinois river
Vector of:	Lyme, Ehrlichiosis, Babesiosis

Brown dog tick



short mouthparts

festoons

Identification:	Short mouthparts, festoons no white markings
Distribution:	Throughout Illinois, can reproduce indoors
Vector of:	None known in Illinois

Acknowledgements

- Thanks to the University of Illinois Department of Veterinary Pathobiology, Illinois Natural History Survey, the CDC, Mr. Kent Loeffler, Ms. Joan Bestudik of IDPH, the American Lyme Disease Foundation and others for their comments or use of their maps and/or images. Also, thanks to the sponsors of this teleconference for allowing us to address this group.

Registration / Evaluation / CEU Certificate

PHTN URL:
www.phppo.cdc.gov//phtnonline

Course verification code: **TICK**