TICKS & LYME DISEASE MANAGEMENT AT FORT DRUM, NY

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A NR perspective on a pest control and public health issue...
TICK MANAGEMENT ON FORT DRUM

Goal: To Minimize Tick-Borne Diseases
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TICK MANAGEMENT ON FORT DRUM
Fort Drum is an active US Army installation and largest training area for Reserve and Guard units in the northeastern US.
“We’re thinking of moving to another part of the country—somewhere between Lyme disease and killer bees.”
1975: “Lyme Arthritis” first identified in Old Lyme, CT
1981: Tick *Ixodes scapularis (dammini)* linked to Lyme Disease
1988: In June, wildlife inspected for ticks on Fort Drum—none found
1988: In July, first Fort Drum Soldier diagnosed with Lyme Disease
1989: In March, first *I. scapularis* documented in Schoharie Co. (further north and inland—outside of Hudson Valley)
1991: In June, first *I. scapularis* documented on Fort Drum.
1988-1996
Lyme Disease Chronology

1998: First person known to contract Lyme Disease in Jefferson Co. from a local tick.

2005: Veterinarians in area noted an increase in canine Lyme Disease over the past few years.

2006: 15 confirmed cases of Lyme Disease in Jefferson Co. – 14 were contracted in the county.

2007: First tick noticed by Cultural Resources staff on Fort Drum.

2009: First Cultural Resources technician on Fort Drum treated for Lyme disease.

2010: 115 confirmed cases of Lyme Disease in Jefferson Co.

2012: 39 embedded ticks on 10 people out of 11 Cultural Resources staff—3 got Lyme disease and 1 hospitalized
TICK MANAGEMENT ON FORT DRUM

During years of plentiful acorns, rodent populations increase, providing more hosts for the ticks and bacteria.

Larval ticks attach to an infected rodent in the summer, feed on the rodent’s blood, acquire the bacterial parasite, and then fall off.

Infected nymphs attach to various animals in the spring, feed on a host’s blood, and then fall off.

Tick nymphs molt into adult ticks.

Infected nymphs overwinter under leaves.

Infected larval ticks molt into tick nymphs.

Tick eggs hatch into tick larvae.

Female ticks lay eggs in spring.

Borrelia burgdorferi

Spring

Summer

Fall

Winter

Year 1

Year 2
TICK MANAGEMENT ON FORT DRUM

Small Mammal Mgmt

Vegetation/Landscape Mgmt

Deer Mgmt

Outreach

During years of plentiful acorns, rodent populations increase, providing more hosts for the ticks and bacteria.
1. Ticks?

2. Small mammals?

3. Indicator of small mammal populations as an indicator of Lyme disease?

Conventional Wisdom: Deer Mice & Deciduous Forests
TICK MANAGEMENT ON FORT DRUM

Goal: To Minimize Tick-Borne Diseases

- Lyme Disease
- Anaplasmosis
- Rocky Mountain Spotted Fever
- Babesiosis
- Ehrlichiosis
- Powassan
- Bourbon Virus
- Etc.
- Etc.
TICK MANAGEMENT ON FORT DRUM

Goal: To Minimize Tick-Borne Diseases

- 1907 Rocky Mountain Spotted Fever (RMSF)
- 1957 Babesiosis (BAB)
- 1975 Lyme Disease (LD)
- 1986 Human Monocytic Ehrlichiosis (HME)
- 1994 Human Granulocytic Anaplasmosis (HGA)
- 1999 Ewingii ehrlichiosis (EE)
- 2005 Tidewater Spotted Fever (TWSF)
- 2006 Panola Mountain Ehrlichiosis (PME)
- 2009 Ehrlichia sp. Wisconsin (EML)
- 2012 Heartland virus (HRTV)
- 2013 Borrelia miyamotoi infection
- 2015 Borrelia mayonii infection
- 2016 Borrelia bissettii infection
TICK MANAGEMENT ON FORT DRUM

Goal: To Minimize Tick-Borne Diseases

Longhorned Tick
Haemaphysalis longicornis
FORT DRUM CANTONMENT AREA = SUBURBAN AREA ANYWHERE USA
Small Mammal/Tick Project: 2015-2016

1. Ticks?
2. Small mammals?
3. Mast as an indicator of small mammal populations as an indicator of Lyme disease?
Small Mammal/Tick Project: 2015-2016

Relative abundance of *Ixodes scapularis*

- **Nymph 2015**
- **Nymph 2016**

Months: April, May, June, July, August, September, October, November

Number of individuals: 0 to 140
Small Mammal/Tick Project: 2015-2016

Relative abundance of *Ixodes scapularis*

- **# of individuals**
- **Month**
  - April
  - May
  - June
  - July
  - August
  - September
  - October
  - November

**TICK MANAGEMENT ON FORT DRUM**

Relative abundance:

- **Adult 2015**
- **Adult 2016**
# Small Mammal/Tick Project: 2015-2016

## Development Stage

<table>
<thead>
<tr>
<th>Development Stage</th>
<th># Total Individuals</th>
<th># Individuals positive for <em>B. burgdorferi</em></th>
<th>% Infection Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>711</td>
<td>340</td>
<td>47.8%</td>
</tr>
<tr>
<td>Nymph</td>
<td>535</td>
<td>97</td>
<td>17.6%</td>
</tr>
</tbody>
</table>

Army Public Health Command  
Fort Meade, MD  
Ben Pajac  
Melissa Miller  
Meagan Marshall
TICK MANAGEMENT ON FORT DRUM

Small Mammal/Tick Project: 2015-2016

Developed
Small Mammal/Tick Project: 2015-2016

Grassland
Small Mammal/Tick Project: 2015-2016

Shrub

Shrub = Invasive (Buckthorn & Honeysuckle)
Small Mammal/Tick Project: 2015-2016

Deciduous Forest
Small Mammal/Tick Project: 2015-2016

Coniferous Forest
Small Mammal/Tick Project: 2015-2016

Mixed Forest
Small Mammal/Tick Project: 2015-2016

TICK MANAGEMENT ON FORT DRUM

Landcover Types

- Grassland
- Developed
- Deciduous
- Shrub
- Coniferous
- Mixed
TICK MANAGEMENT ON FORT DRUM

Small Mammal/Tick Project: 2015-2016

Estimated index of abundance of questing total ticks/square meter

- Coniferous
- Mixed
- Developed landscape
- Shrub
- Deciduous

Estimated index of abundance

Month:
- April
- May
- June
- July
- August
- September
- October
- November

West Virginia University
Landcover Types

- Grassland
- Developed
- Deciduous
- Shrub
- Coniferous
- Mixed
Small Mammal/Tick Project: 2015-2016

Species Composition (n=212)

- White-footed mouse: 38%
- Eastern chipmunk: 27%
- Eastern red squirrel: 17%
- Eastern gray squirrel: 9%
- Short-tailed shrew: 1%
- Meadow vole: 1%
- Southern flying squirrel: 1%
- Northern flying squirrel: 1%
- Long-tailed weasel: 1%

9 different species
## Small Mammal/Tick Project: 2015-2016

<table>
<thead>
<tr>
<th>Species</th>
<th># Total Individuals</th>
<th>% of mammals captured</th>
<th># Individuals with tick burdens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer Mouse</td>
<td>80</td>
<td>38%</td>
<td>46 (58%)</td>
</tr>
<tr>
<td>E. Chipmunk</td>
<td>57</td>
<td>27%</td>
<td>19 (33%)</td>
</tr>
<tr>
<td>Red Squirrel</td>
<td>34</td>
<td>17%</td>
<td>17 (49%)</td>
</tr>
<tr>
<td>Gray Squirrel</td>
<td>20</td>
<td>9%</td>
<td>13 (65%)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>191</strong></td>
<td><strong>90%</strong></td>
<td><strong>50%</strong></td>
</tr>
</tbody>
</table>

These were the 4 most abundant species and only species with ticks.
Tick Management Project: 2018-2020

RESERVOIRS?
Tick Management Project: 2018-2020

RESERVOIRS?
Tick Management Project: 2018-2020

RESERVOIRS?
Tick Management Project: 2018-2020

RESERVOIRS?

Determine species by assessing blood meals from tick stomach cells
Tick Management:
TICK MANAGEMENT ON FORT DRUM

1. Small Mammal Mgmt

2. Deer Mgmt

3. Vegetation/ Landscape Mgmt

4. Outreach

During years of plentiful acorns, rodent populations increase, providing more hosts for the ticks and bacteria.

Tick eggs hatch into tick larvae.

Female ticks lay eggs in spring.

Larval ticks attach to an infected rodent in the summer, feed on the rodent’s blood, acquire the bacterial parasite, and then fall off.

Infected larval ticks molt into tick nymphs.

Infected nymphs attach to various animals in the spring, feed on a host's blood, and then fall off.

Infected adults attach to a deer in the fall, feed on its blood, mate with other ticks, and then fall off.

Tick nymphs molt into adult ticks.
1. Fawn Survivorship?
2. Population?
3. Movement?
TICK MANAGEMENT ON FORT DRUM

A fawn from June 2016 was seen on a trail camera 121 miles from Fort Drum in Feb 2018.
TICK MANAGEMENT ON FORT DRUM

Fort Drum is only 318 miles from Lyme, CT.
Survival to 1 Year: 0.54
TICK MANAGEMENT ON FORT DRUM

Cantonment Area Deer Project: 2015-2018

18 Mar – 01 Apr 2018
40 deer/mile$^2$
18 Mar – 01 Apr 2018
Up to 150 deer/mile²
DEER DENSITIES
Current: 40 deer/mile$^2$

Forest Regeneration: 17-20 deer/mile$^2$

Tick Reduction: 7-9 deer/mile$^2$?
TICK MANAGEMENT ON FORT DRUM

Cantonment Area Deer Management

Methods

- **Hunttable/Less Developed Areas (35%)**
  - Deer Management Area Program Permits (DMAPs)

- **Non-hunttable/Residential/Administrative Areas (65%)**
  - Nuisance Deer Permits

- **Monitor Effectiveness**
  - Cornell University
  - West Virginia University
  - Fort Drum Natural Resources

Recreational Hunting

- Lethal control by USDA-APHIS-WS

- Continue camera surveys & tracking deer movements.
- Expanding # tick transects.
- Continue monitoring deer browse & exclosures.
TICK MANAGEMENT ON FORT DRUM

Cantonment Area Deer Management

Methods

- Huntable/Less Developed Areas (35%)
  27 Sep – 09 Dec 2018 (74 days): 87 deer

- Non-huntable/Residential/Administrative Areas (65%)
  September 2018 (3 nights): 87 deer
  Feb 2019 (3 nights): 73 deer
  Mar-Apr 2019: TBD

Recreational Hunting

Lethal control by USDA-APHIS-WS
QUESTIONS?

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