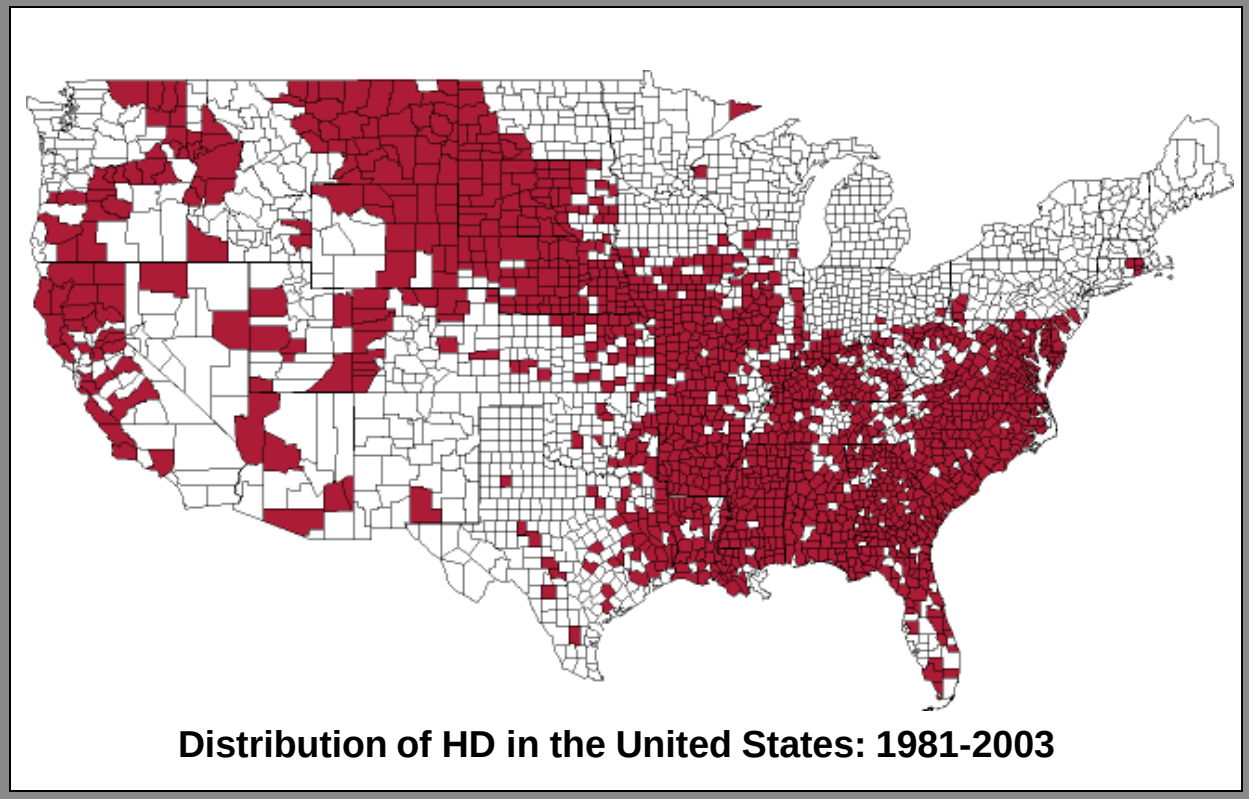
Culicoides Biting Midges and Hemorrhagic Disease of White-tailed Deer

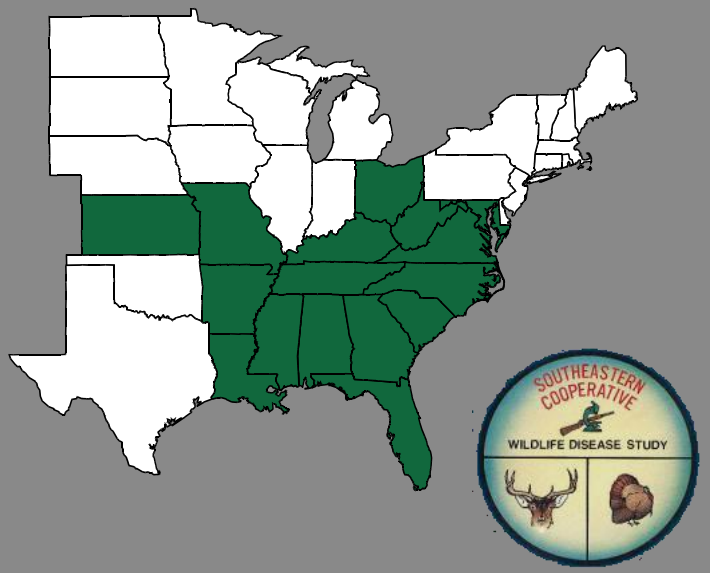


Distribution of HD in the United States: 1981-2003

Mark G. Ruder
Southeastern Cooperative Wildlife Disease Study
College of Veterinary Medicine
University of Georgia

White-tailed Deer: Not Always Abundant

- Many populations nearly extirpated
  - 3-500,000 left at turn of Century
- Reintroductions 1930s-50s



SCDDS - Southeastern Cooperative Deer Disease Study

Established in 1957

What is HD?

- One of the most significant infectious diseases of WTD in North America
- Caused by two closely related orbiviruses
  - Epizootic hemorrhagic disease viruses (EHDV)
  - Bluetongue viruses (BTV)
- Outbreaks since late-1800s
  - Annually since 1970s

Insect killing deer

By Mike McKee
Outdoors
Published: Friday, October 8, 2010 5:15 PM CDT

A tiny midge insect appears to be knocking off a considerable number of deer in north central La Porte County.

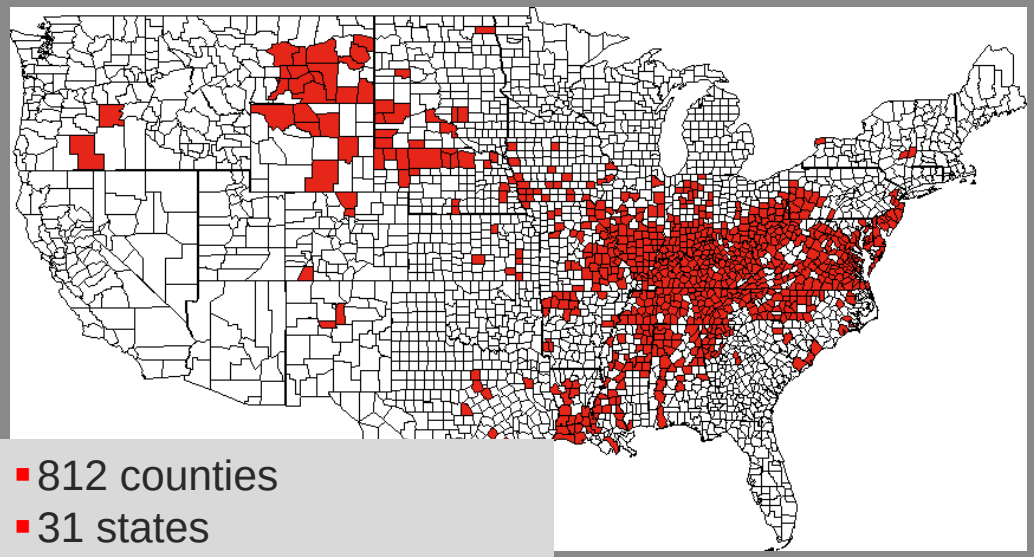
"I've heard of a couple dozen," said Linda Byer, Indiana's District 2 wildlife biologist.

"The deer are victims of EHD (Epizootic Hemorrhagic Disease), not (the more serious) CWD (Chronic Wasting Disease) or Bluetongue."

EHD is set in motion by a Culincoides biting fly, which is smaller than the average mosquito. Within a week of infection, deer develop fever-like symptoms and hemorrhaging that is often fatal.

Some sportsmen believe the problem may be worse than the DNR believes.

"My estimation, by the number of people that come through here and have seen them (dead deer), is about 150," Dale Elkins of Elkins Taxidermy in New Carlisle, said.



- 812 counties
- 31 states
- >100 mortalities per county reported from 11 states
- >65,000 deer mortalities

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Disease taking heavy toll on deer population in Salem County this fall

Published: Tuesday, October 19, 2010, 7:39 PM Updated: Tuesday, October 19, 2010, 7:54 PM

Deena DiBacco/Today's Sunbeam
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Staff photo by Lori M. Nichols

PENNSVILLE TWP. — Since Sept. 18, at least 80 deer in Salem County have died from a disease common in the South, 78 of them in Pennsville Township lone, according to the state Division of Fish & Wildlife.

Fish & Wildlife Pathologist Dr. Douglas Roscoe, who runs the division's Office of Health and Forensics, said the deaths are being caused by the Type 2 strain of Epizootic Hemorrhagic Disease (EHD).

Roscoe said the 80 deaths in Salem County have apparently resulted from an EHD outbreak, which was confirmed by testing, between Sept. 18 and Oct. 15.

According to Roscoe, the only reports of Type 2 EHD in New Jersey so far this year have come from Salem County. In Pennsville, 78 dead deer were found, with two other cases reported in Alloway and Pittsgrove townships.

The spread of the disease is being

How Do The Viruses Cause Disease?

Virus replicates in endothelial cells lining blood vessels

→ Damage to blood vessels

Hemorrhage Edema

→ Coagulation system attempts repair

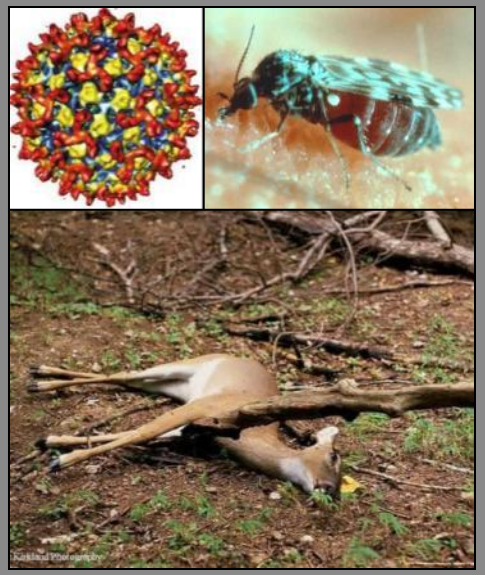
→ Clotting factors get used up

→ Worsening hemorrhage and edema

What is the Outcome of Infection?

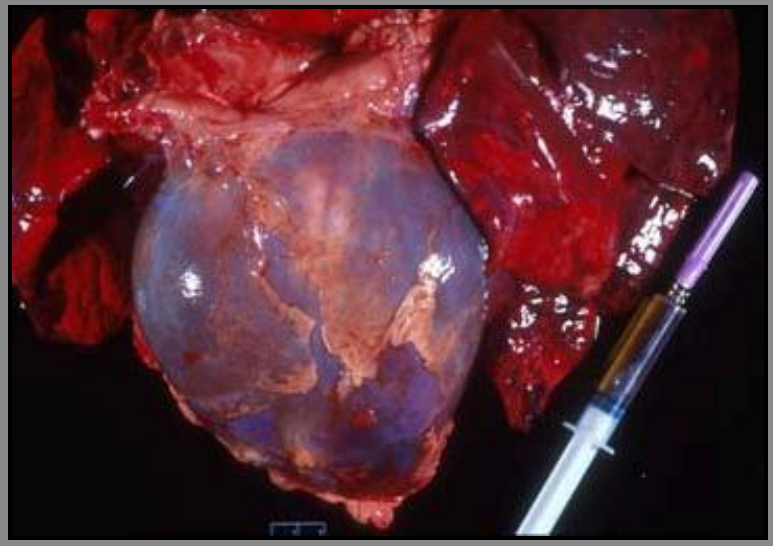
- Highly variable
  - Subclinical ->peracute death -> chronic form
  - Depends on host immunity, virus strain, and vector competence and abundance

- Three forms of HD
  - Peracute
  - Acute
  - Chronic



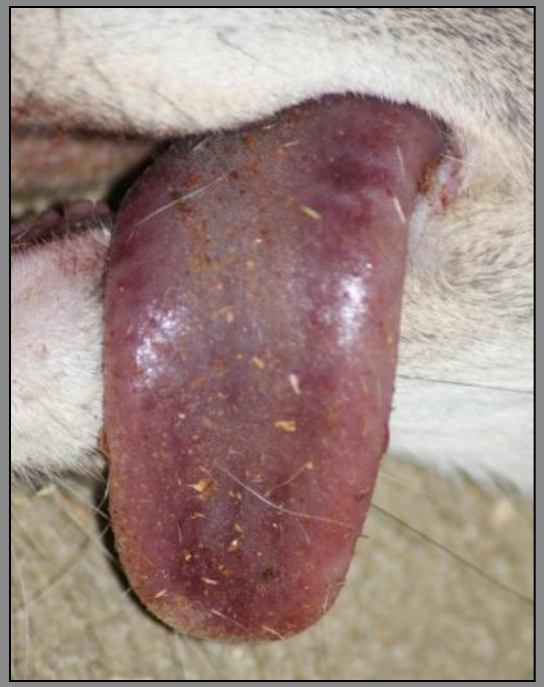
Peracute HD

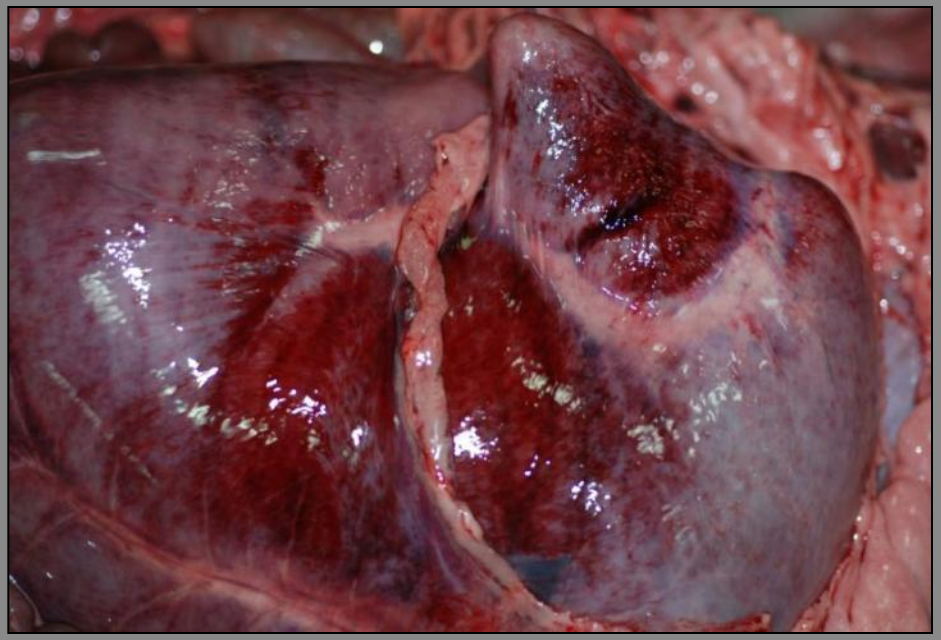
- Clinical signs
  - Fever, depression, weakness, decreased activity, death

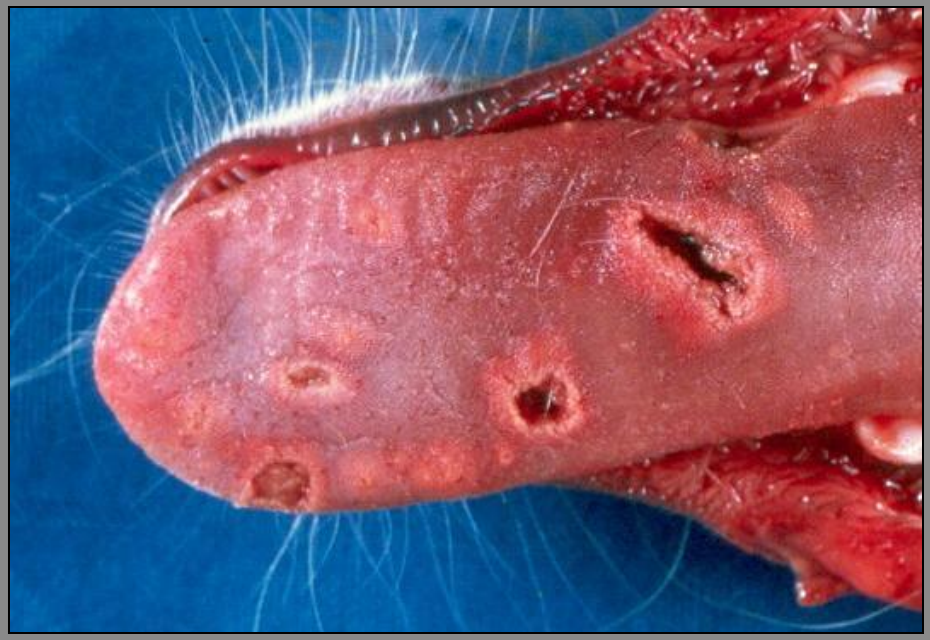


Acute HD

- Clinical signs
  - Depressed, decreased activity, lameness, death

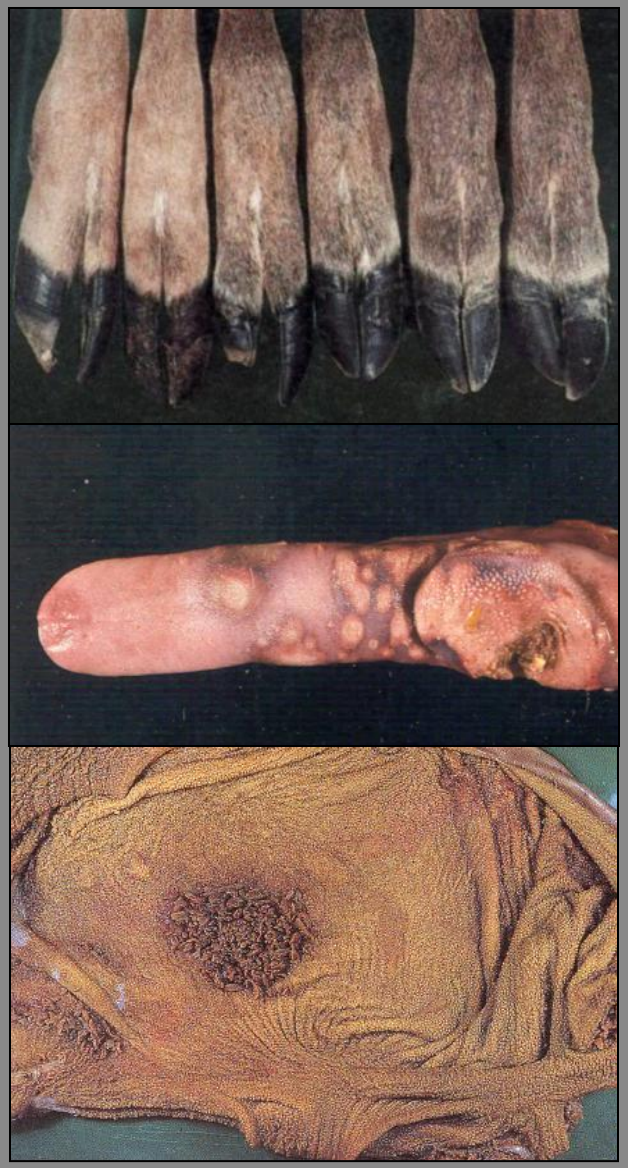






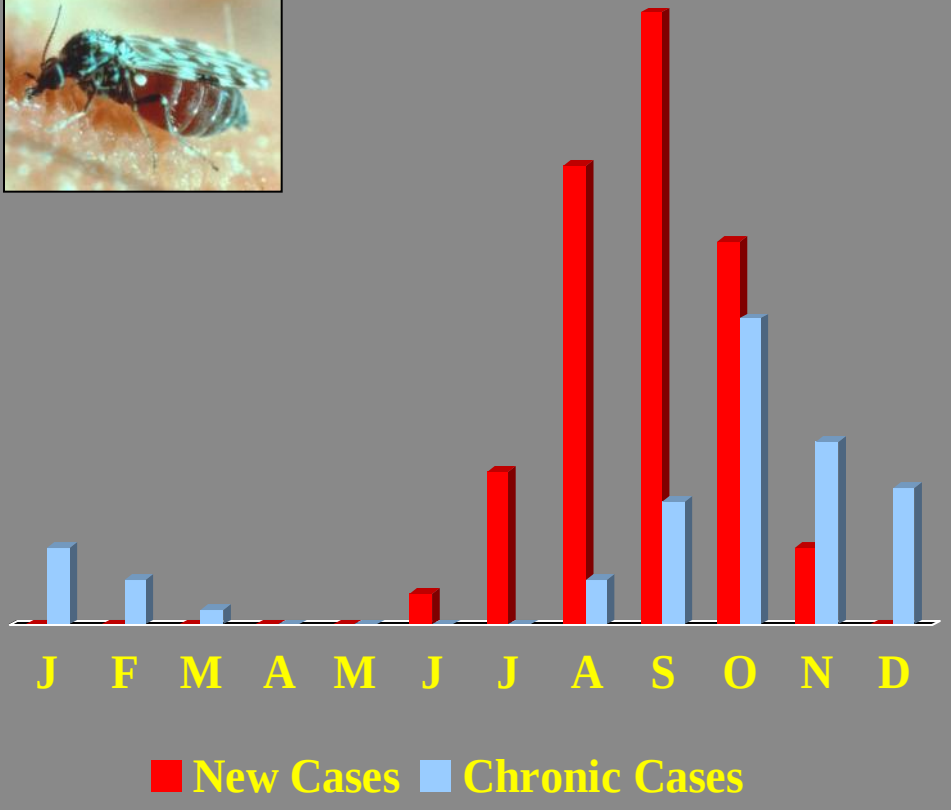
Chronic HD

- Clinical signs
  - Weight loss, lameness, emaciation, death

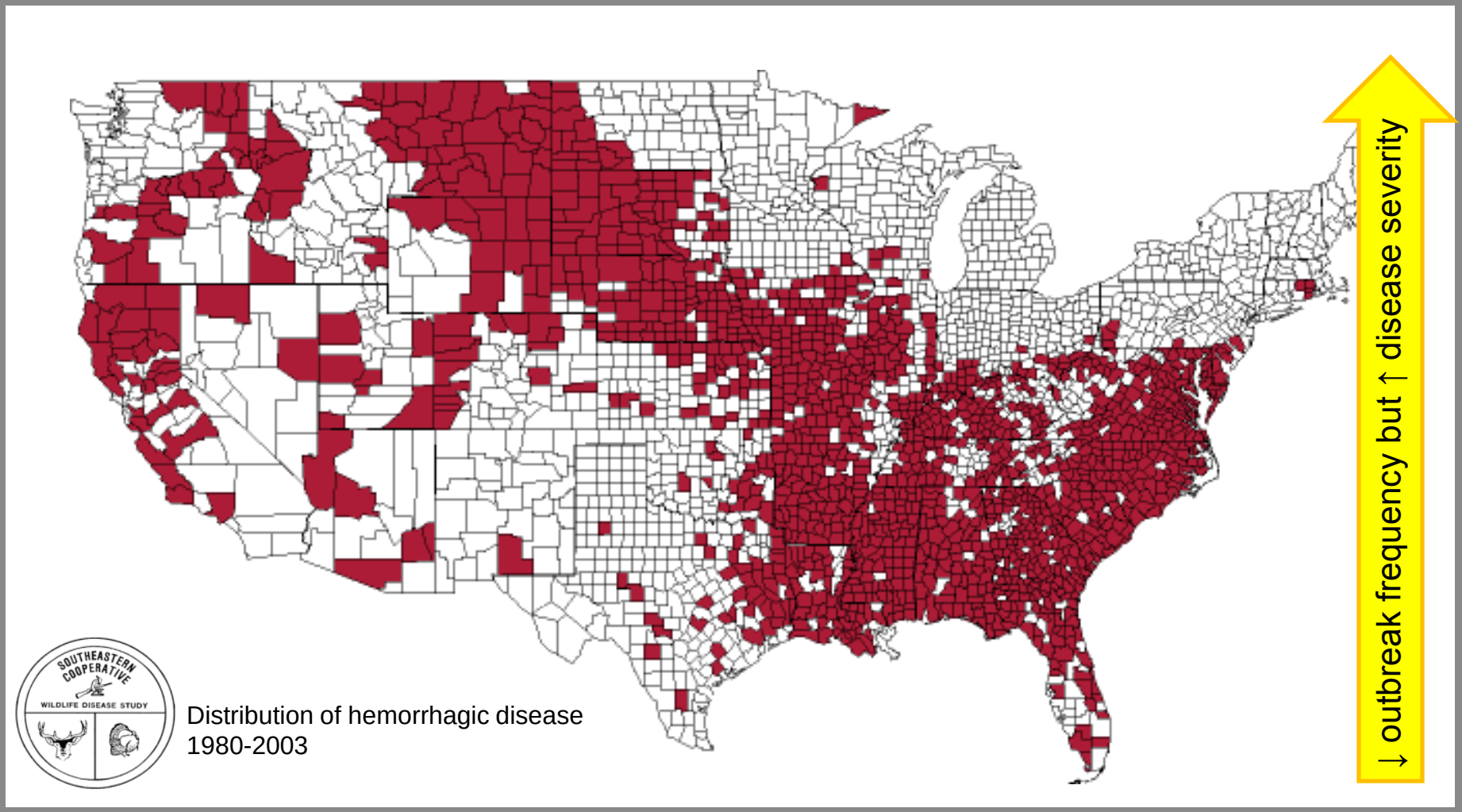


When Does HD Occur?

- Predictable seasonality – August to November



Where Does HD Occur?



Distribution of hemorrhagic disease
1980-2003

Field Signs

- White-tailed deer mortality
- Late summer and early fall

Visibility of Outbreaks

- Outbreaks can be highly visible or go completely unrecognized

The Vector

Tenacity of *Culicoides*

Culicoides

- Order Diptera, Family Ceratopogonidae
  - >1,200 spp worldwide
  - <1% proven vectors
  - 1-3 mm…"no-see-ums"
- Proven competent vectors
  - EHDV: *C. sonorensis*
  - BTV: *C. sonorensis, C. insignis*

Life History

- Life cycle duration variable
  - Weeks to > 1 year
- Aquatic or semi-aquatic habitats
  - Larval development requires moist substrate
    - Margins of waterways, tree holes, manure, enriched moist soils, etc

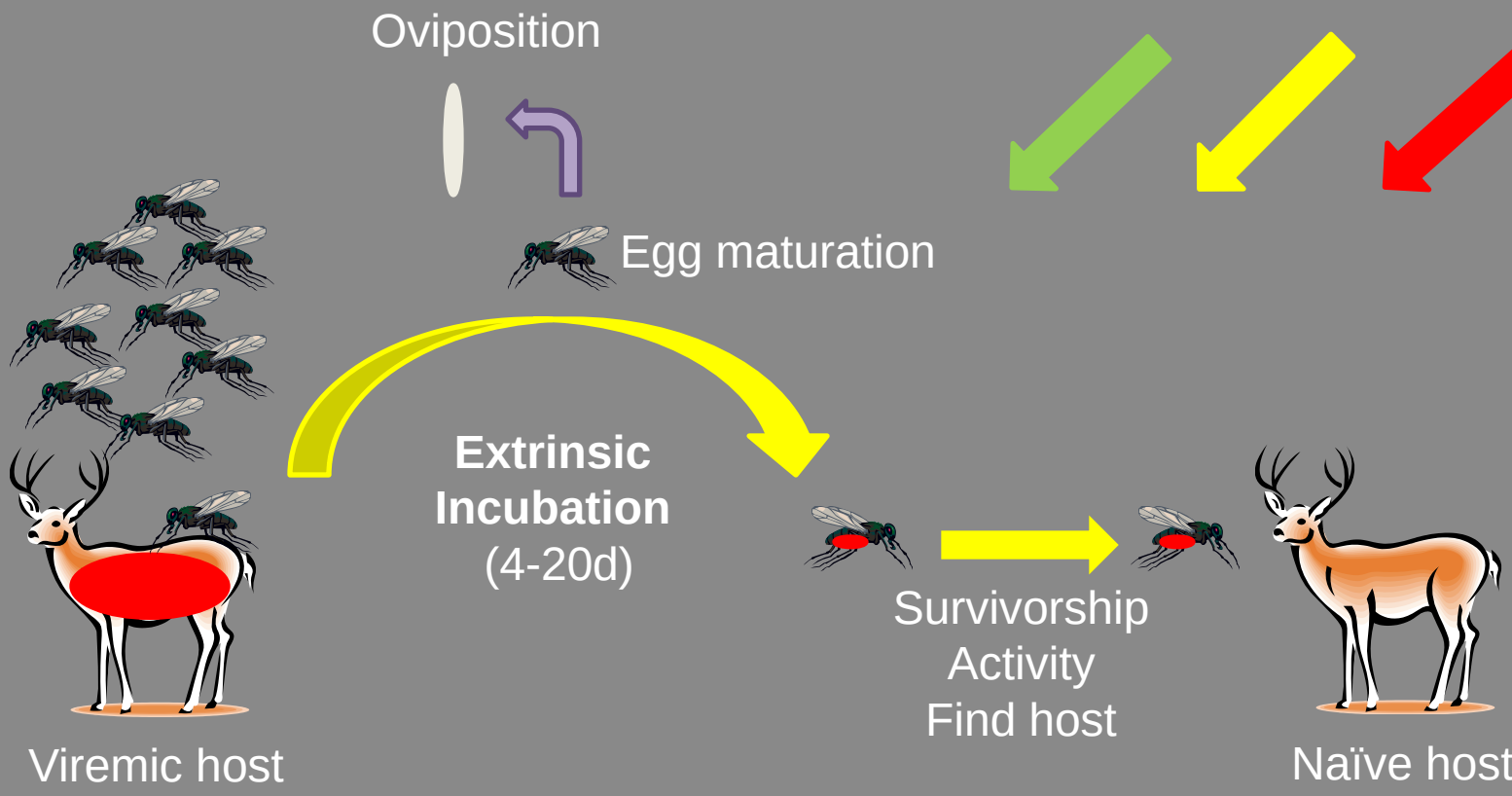
Life History (cont.)

- Adults emerge from pupal stage in late spring
- Females seek blood meal for egg development
- Duration of larval development variable
  - Overwinter as 4th instars

- Adults not strong fliers
  - Often remain near breeding sites
  - Passively disperse on winds

Virus Transmission

- Optimal conditions create perfect storm



C sonorensis / EHDV / Temperature

- Midge life cycle
  - ↓ duration of life cycle parameters
  - Ideal temp. → ↑ generations and ↑ adult pop.
    - Excessive temperatures can ↓ daily survivorship
- Viral replication
  - ↑ temp → greater replication rate → ↓ EIP

Questions?

Kansas Flint Hills