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**Health**

# Eastern Equine Encephalitis Preparedness and Response

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March 2, 2021

# Eastern Equine Encephalitis (EEE) virus

Mosquito-borne virus found in eastern US

Rare but serious cause of illness in humans and horses

Reservoir: Passerine birds

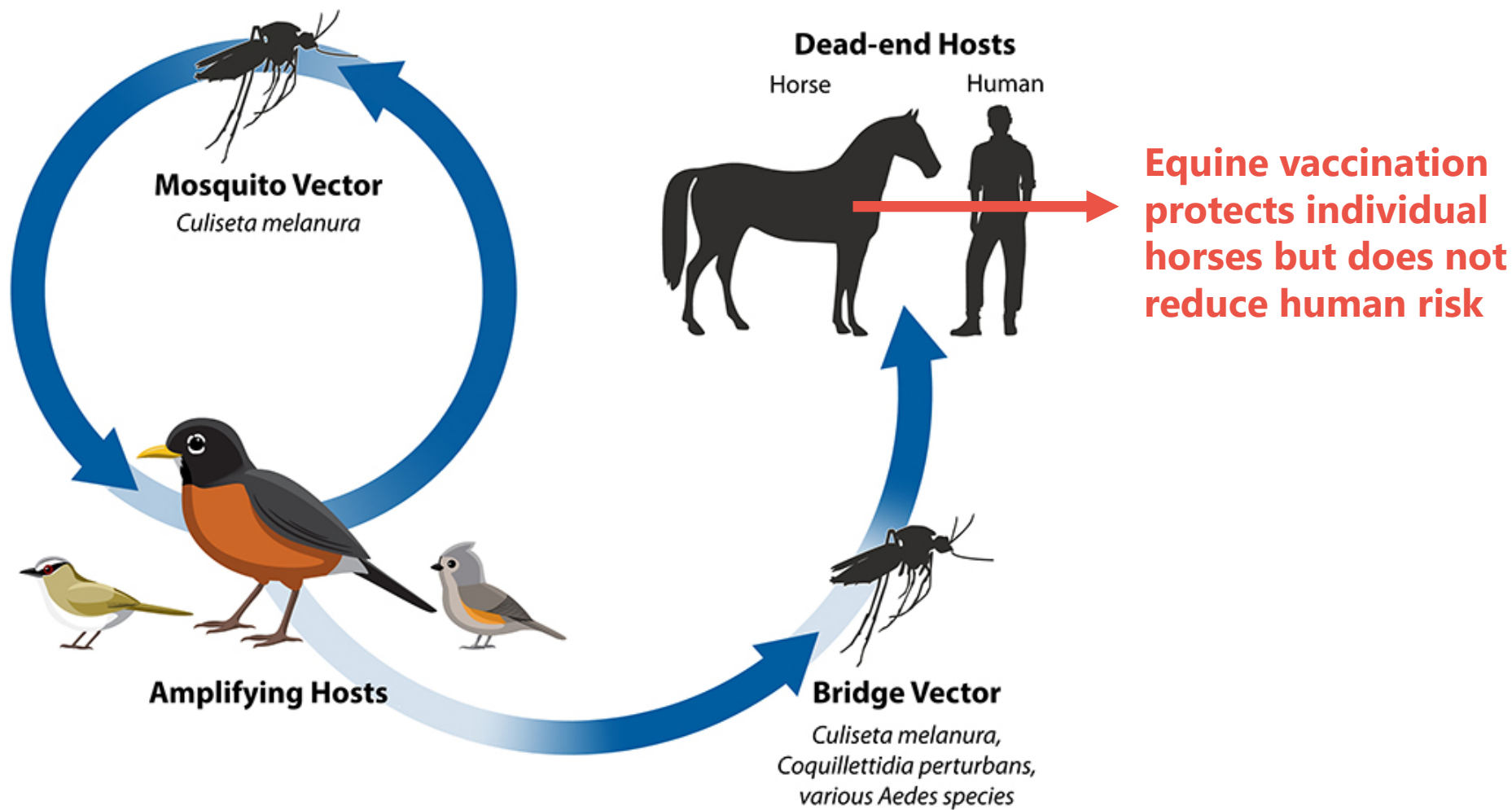
Mosquito vector: *Culiseta melanura*

Habitat: Sphagnum bogs

Bridge vector: *Coquilletidia perturbans*

Habitat: Cattail marshes





## Eastern Equine Encephalitis Transmission

The Eastern equine encephalitis virus **cycles between mosquitoes and birds**. The *Culiseta melanura* mosquito, which primarily bites birds, is responsible for spreading the virus among birds. The virus then multiplies in the birds' bloodstream.

People and other animals, like horses, become infected with the virus when mosquito species that feed on many kinds of animals, feed on infected birds and then bite people. People and horses are considered **dead-end hosts** because unlike birds, they don't develop high levels of virus in their bloodstream and cannot pass the virus on to other biting mosquitoes.



# The clinical spectrum of EEE virus disease is variable.

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## Neuroinvasive disease

Fever  
Headache  
Vomiting  
Diarrhea  
Seizures  
Behavioral changes  
Drowsiness  
Coma  
Death

5%

95%

## Asymptomatic infection Systemic illness

Fever  
Chills  
Malaise  
Muscle and joint aches

# The people at highest risk for severe EEE virus disease are

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**< 15 years**  
**OR**  
**> 50 years**

**One in three people with neuroinvasive EEE virus disease die.**

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**The other two are likely to have permanent complications.**

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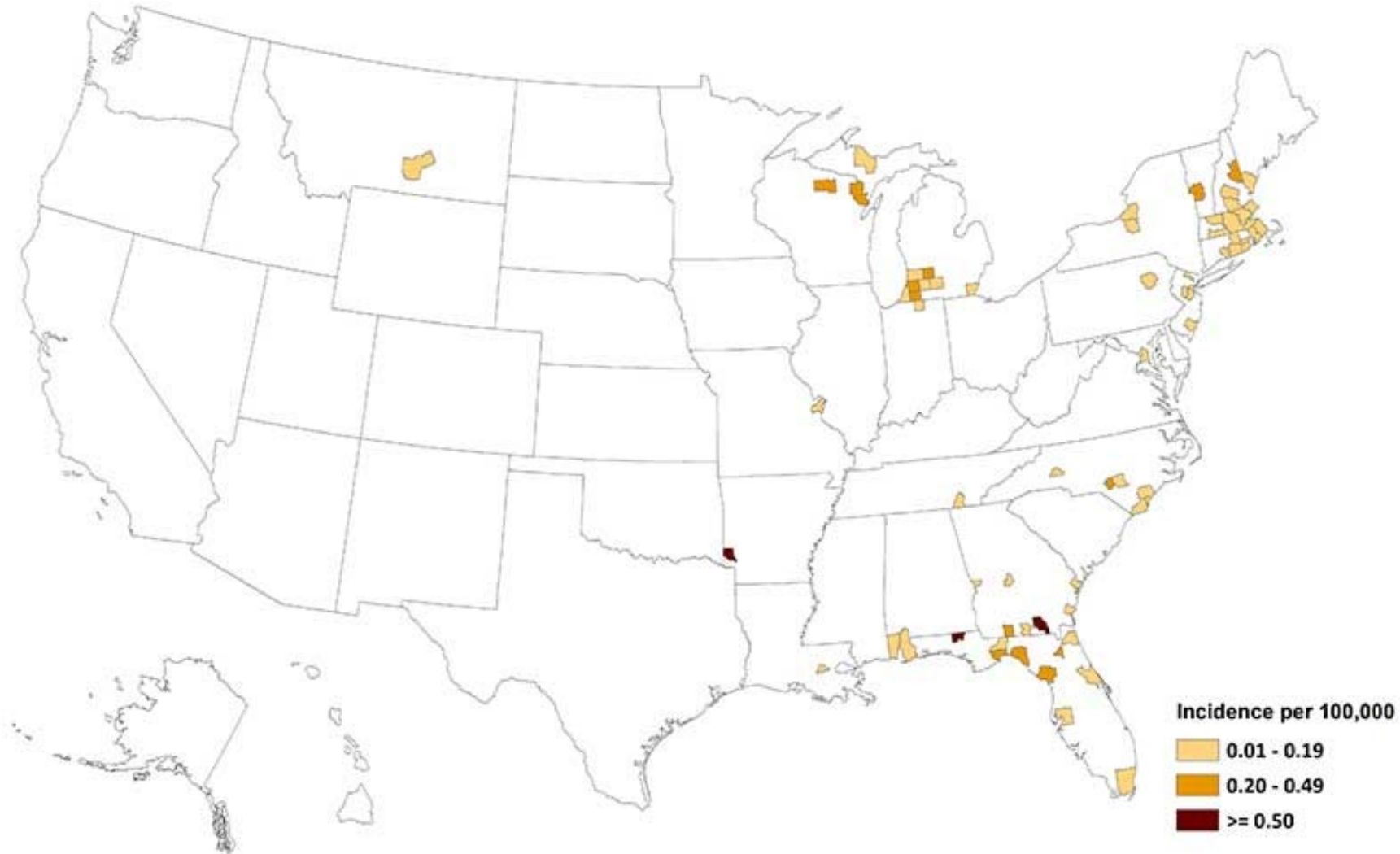


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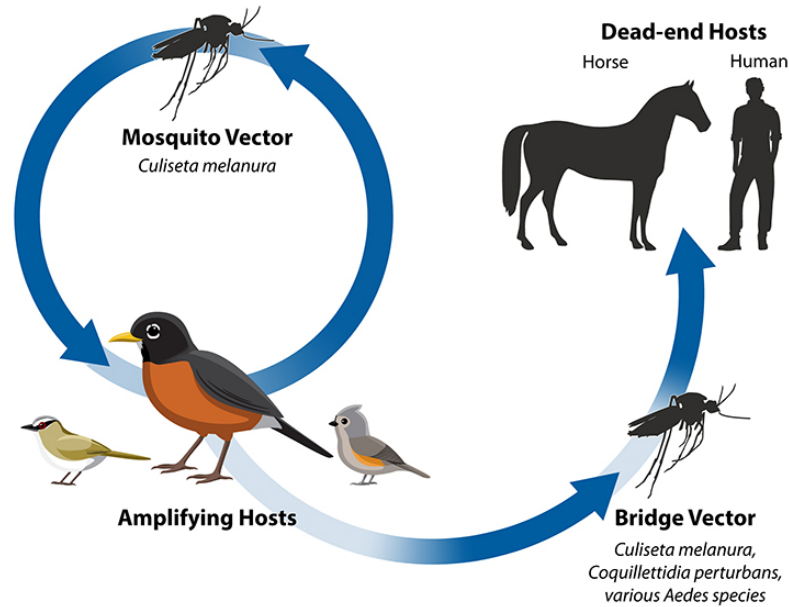
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# There is an area of increased risk for EEE virus disease in southern Michigan and northern Indiana.

Neuroinvasive disease average annual incidence by county of residence, 2010–2019





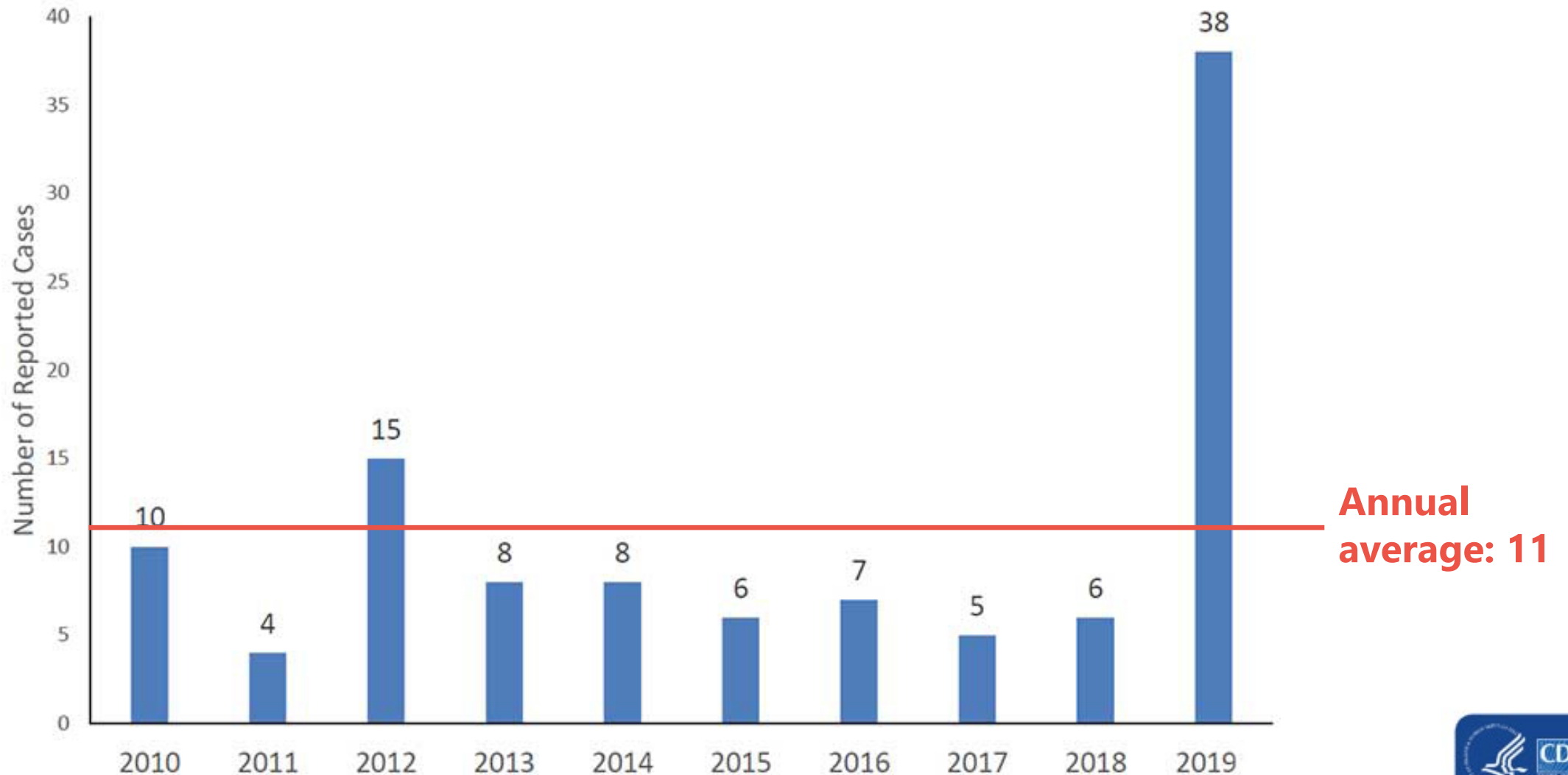


Top: Pinhook Bog, Indiana Dunes National Park. National Park Service.  
Bottom: *Culiseta melanura*. C. Roxanne Connelly, University of FL.

Top: The Great Marsh, Indiana Dunes National Park. Chris Light, CC BY-SA 4.0  
Bottom: *Coquillettidia perturbans*. Lyle J. Buss, University of FL.

# There were regional outbreaks of EEE virus disease in the US in 2019 and 2020.

Neuroinvasive disease cases by year — US, 2010–2019



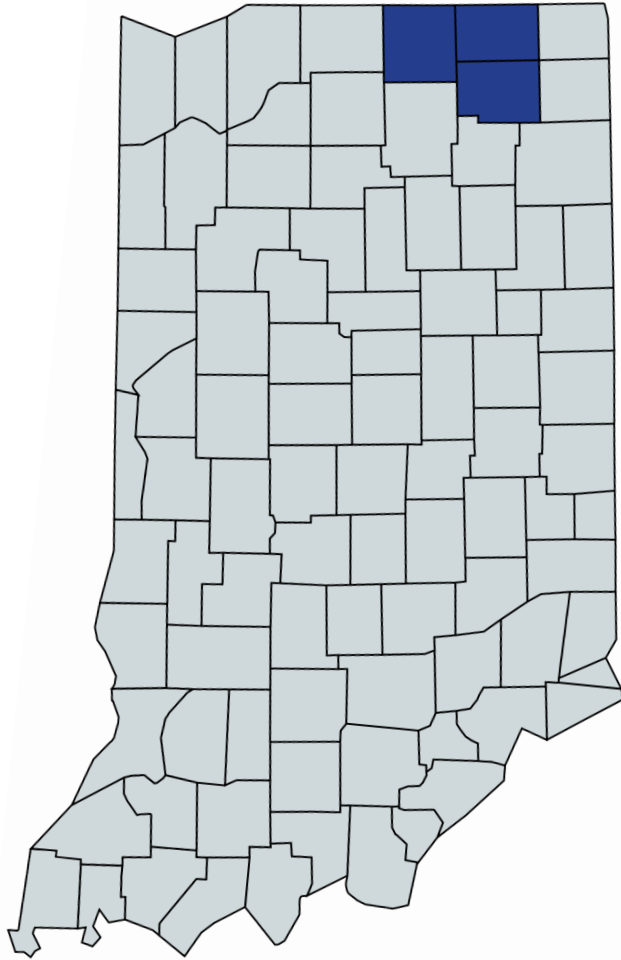
# EEE virus activity was detected in Indiana in 2019 and 2020.

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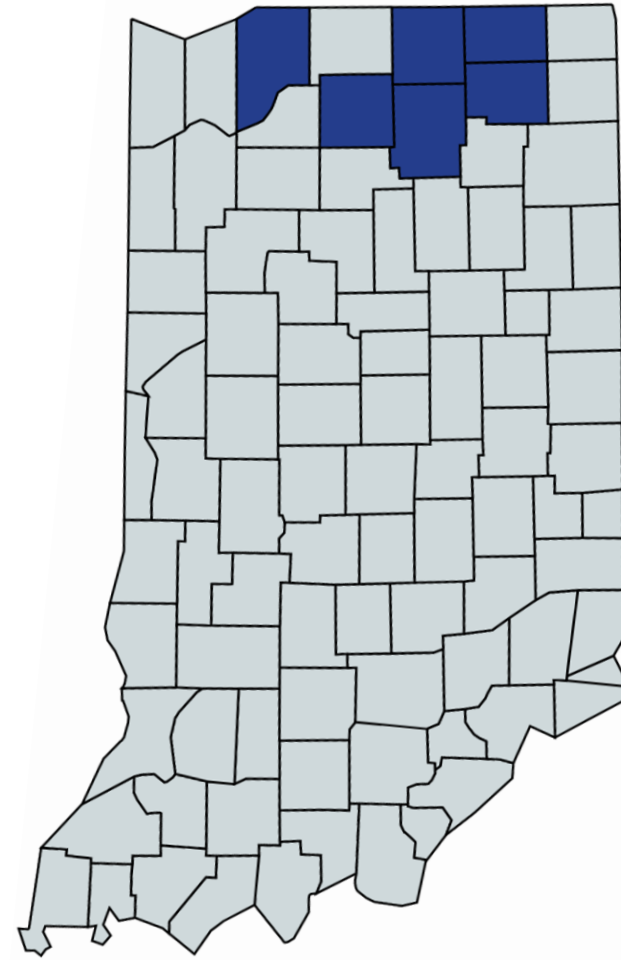
	2019	2020
Human cases	1*	1
Equine cases	14	4
Infected mosquito pools	1	0

\* Fatality

# EEE virus activity affected more Indiana counties in 2020 than in 2019.



**2019**



**2020**



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# Mosquito Control During an Outbreak

Activity	Effect
<b>Adulticiding</b>	Immediate risk reduction
<b>Larviciding</b>	Future risk reduction
<b>Source reduction</b>	Future risk reduction

# Mosquito Control During an Outbreak

Activity	Effect	Methods	Recommended for EEE Virus
Adulticiding	Immediate risk reduction	Barrier treatment	
		Truck-mounted ULV	
		Aerial ULV	
Larviciding	Future risk reduction		
Source reduction	Future risk reduction		

# Mosquito Control During an Outbreak

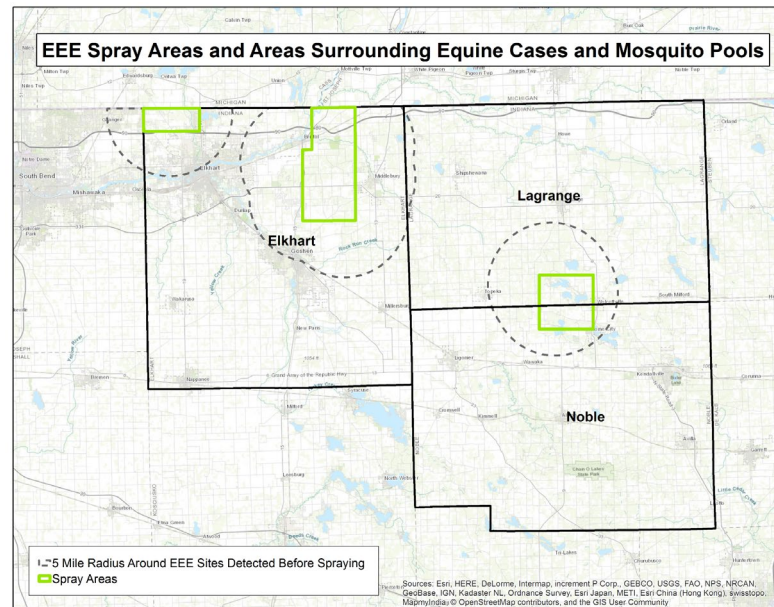
Activity	Effect	Methods	Recommended for EEE Virus
Adulticiding	Immediate risk reduction	Barrier treatment	
		Truck-mounted ULV	
		Aerial ULV	✓
Larviciding	Future risk reduction		
Source reduction	Future risk reduction		

# Product selection

	Dibrom Concentrate	Merus 3.0
Active ingredient	Naled	Pyrethrin
Class	Organophosphate	Pyrethrins/Pyrethroids
Approved by EPA	Yes	Yes
Effectiveness	Up to 96%*	Up to 85%**
Approved for organic crops	No	Yes
Toxic to pollinators	Yes	Yes



**2019**  
**36,000 acres**  
**3 counties**



**2020**  
**351,000 acres**  
**6 counties**



Top right: Michael Caterina, South Bend Tribune. Bottom left: Indiana Department of Health.

# Take home points

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IDOH will only recommend aerial pesticide application if available evidence suggests that there is an immediate threat to human health.

IDOH will not order aerial pesticide application without the consent of local officials.

Dibrom Concentrate will be used for any state-funded aerial pesticide application.

IDOH will take steps to minimize harm to pollinators and certified organic farms.

- Contracting with licensed pesticide applicators
- Issuing a news release a minimum of 48 hours in advance
- Spraying in the evening to minimize pollinator exposure

In 2021, IDOH will conduct additional outreach to organic farms and apiarists.