



COLORADO STATE UNIVERSITY

SUSTAINABLE SOLUTIONS
FOR ANIMAL AGRICULTURE

Animal Infection and Transmission of H5N1

PPE for Influenza A (H5N1) in High-Risk Farm Settings:
A Workshop

Jason Lombard, DVM, MS
Livestock Epidemiologist, CVMBS and AgNext
Colorado State University

Timeline of H5N1 Detections in the U.S.

Dec 2021

Wild Birds

- Carolinas
- Blue-winged Teal
- American Widgeon
- Gadwall
- Northern Shoveler



2022-early 2024

Numerous

- First H5N1 genotype B3.13 detected in wild birds
- Commercial and backyard poultry
- 1st Human Case – maybe
- Goats B3.13 genotype



Commercial Turkeys

- Indiana



Feb 2022

Dairy Cattle

- B3.13 genotype
- Texas and KS
- Spread to multiple states
- Commercial and backyard poultry
- Human Case in Texas
- Alpacas
- Swine D1.2 genotype



2024

Feb 2025

Dairy Cattle

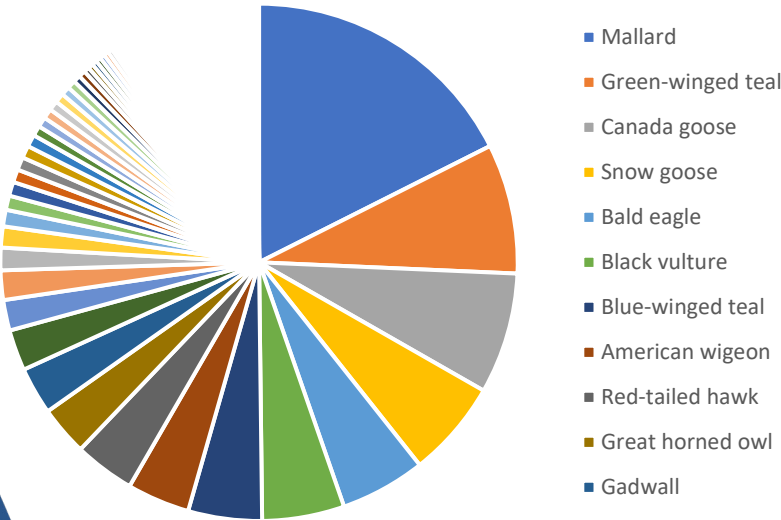
- Genotype D1.1
- Arizona and Nevada



Detections of Highly Pathogenic Avian Influenza in Wild Birds

Summary

- First detection 1/13/2022
- 222 different bird species
- 14,497 wild birds/ducks
- Detections in all 50 states

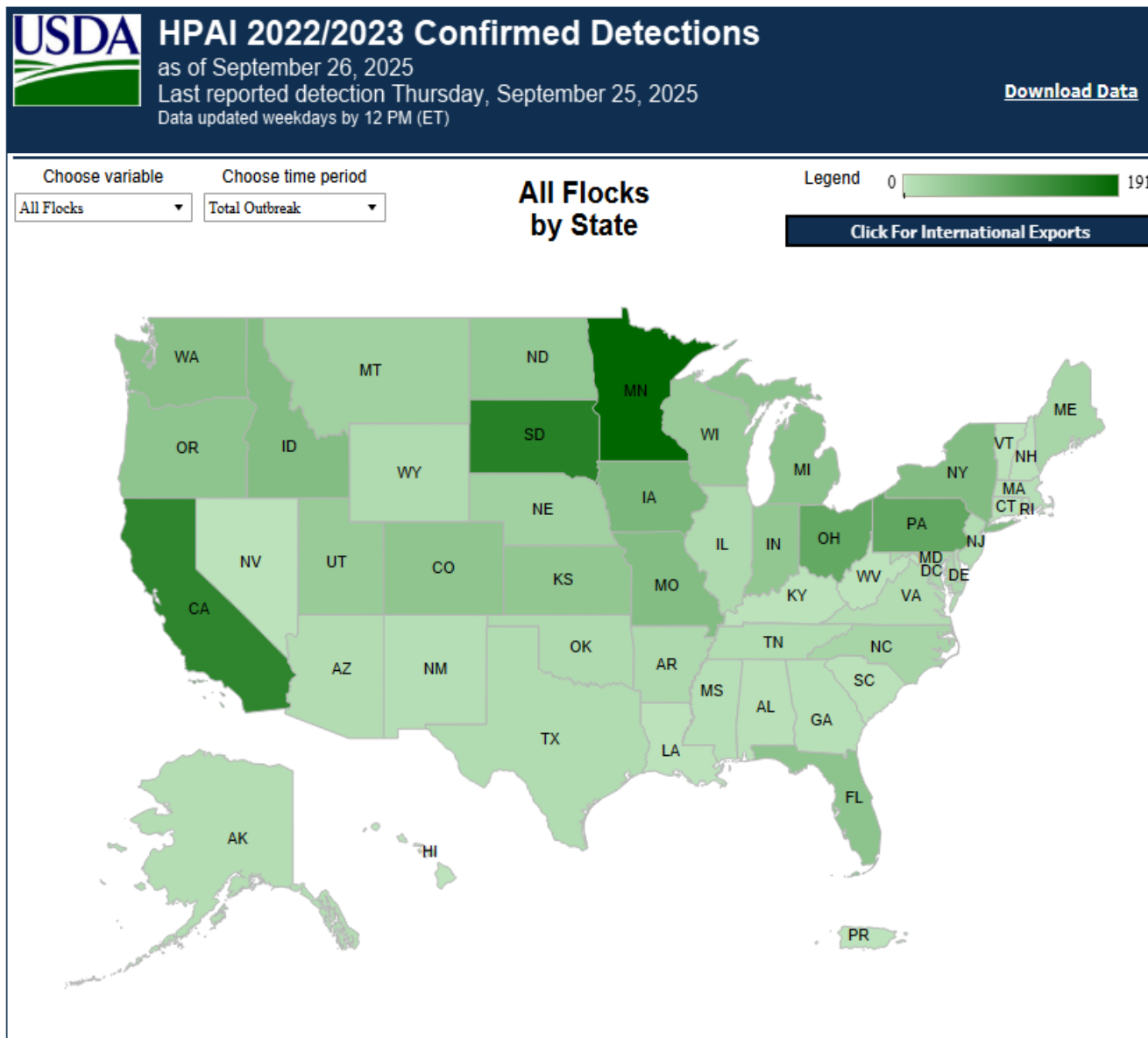


Species

Count

Mallard	2548
Green-winged teal	1177
Canada goose	1097
Snow goose	880
Bald eagle	774
Black vulture	745
Blue-winged teal	669
American wigeon	569
Red-tailed hawk	549
Great horned owl	448

Commercial and Backyard Flocks



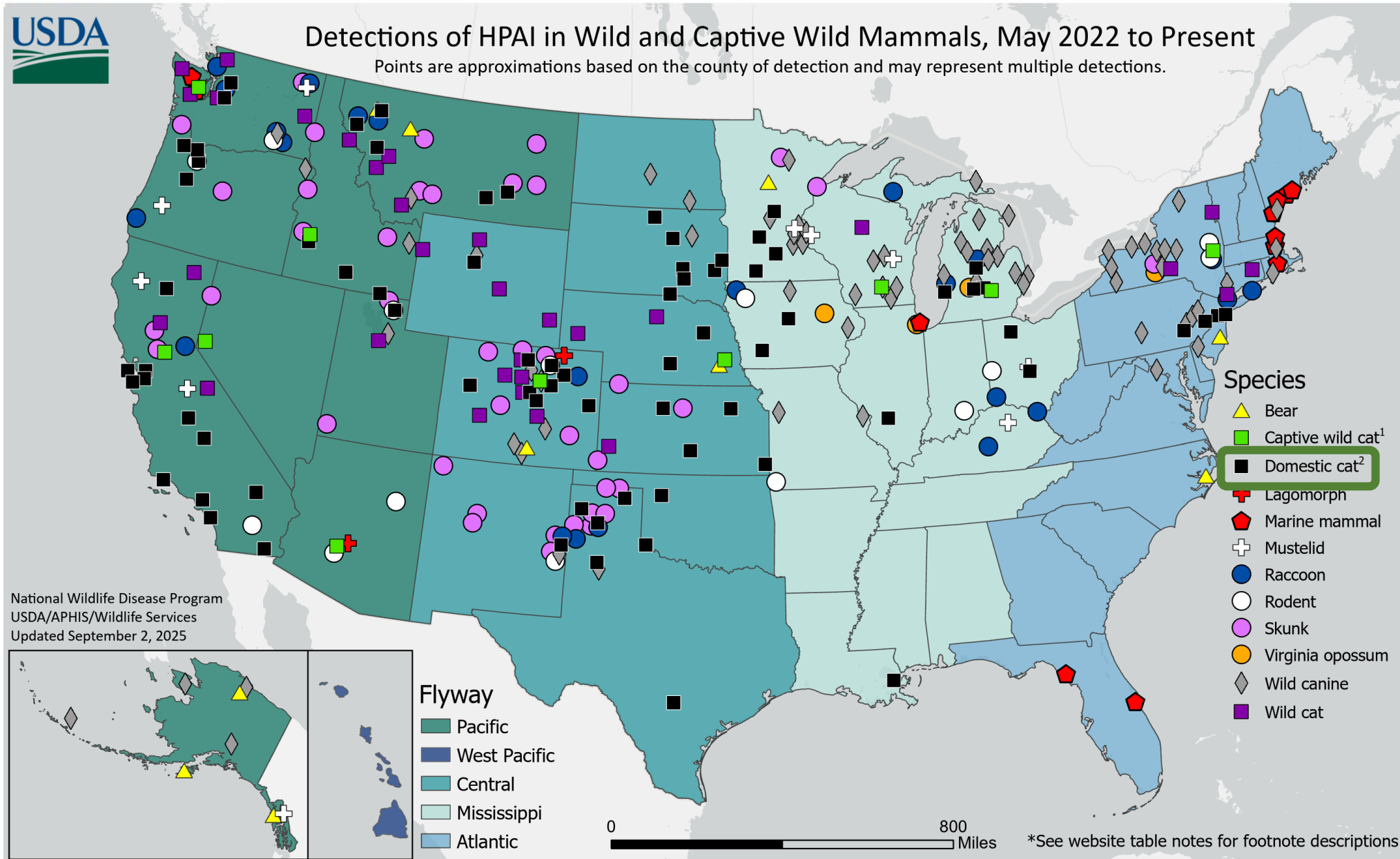
1st Detection – February
2022

Total Outbreak
1,733 Flocks affected
175.52M Birds affected

Last 30 days
23 Flocks affected
0.69M Birds affected

Detections of HPAI in Wild and Captive Wild Mammals, May 2022 to Present

Points are approximations based on the county of detection and may represent multiple detections.



National Wildlife Disease Program
USDA/APHIS/Wildlife Services
Updated September 2, 2025

Horses and Beef Cattle

Horses

- Susceptible to AIV H3
- Vaccine available
- >3,600 samples from 30+ states tested in KY
- No H5 cases detected in the US



► Emerg Infect Dis. 2025 Jan;31(1):183–185. doi: [10.3201/eid3101.241266](https://doi.org/10.3201/eid3101.241266) 

Evidence of Influenza A(H5N1) Spillover Infections in Horses, Mongolia

[Batchuluun Damdinjav](#)¹, [Savitha Raveendran](#)¹, [Laura Mojsiejczuk](#)¹, [Ulaankhuu Ankhanbaatar](#)¹, [Jiayun Yang](#)¹,
[Jean-Remy Sadeyen](#)¹, [Munir Iqbal](#)¹, [Daniel R Perez](#)¹, [Daniela S Rajao](#)¹, [Andrew Park](#)¹, [Mafalda Viana](#)¹, [Pablo R Murcia](#)^{1,✉}

Beef Cattle

- Not known to be susceptible
- No known clinical cows
- **Minimal** antibody surveillance
 - ~150 head tested in CO and CA
 - No confirmed cases



HPAI Confirmed Cases in Livestock Herds

Reporting period: March 25, 2024 through September 26, 2025

Last reported new confirmed case: Monday, September 15, 2025

Data updated weekdays by 12pm Eastern

[Download Data](#)



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Choose time period

Choose species

Total Outbreak

Cattle

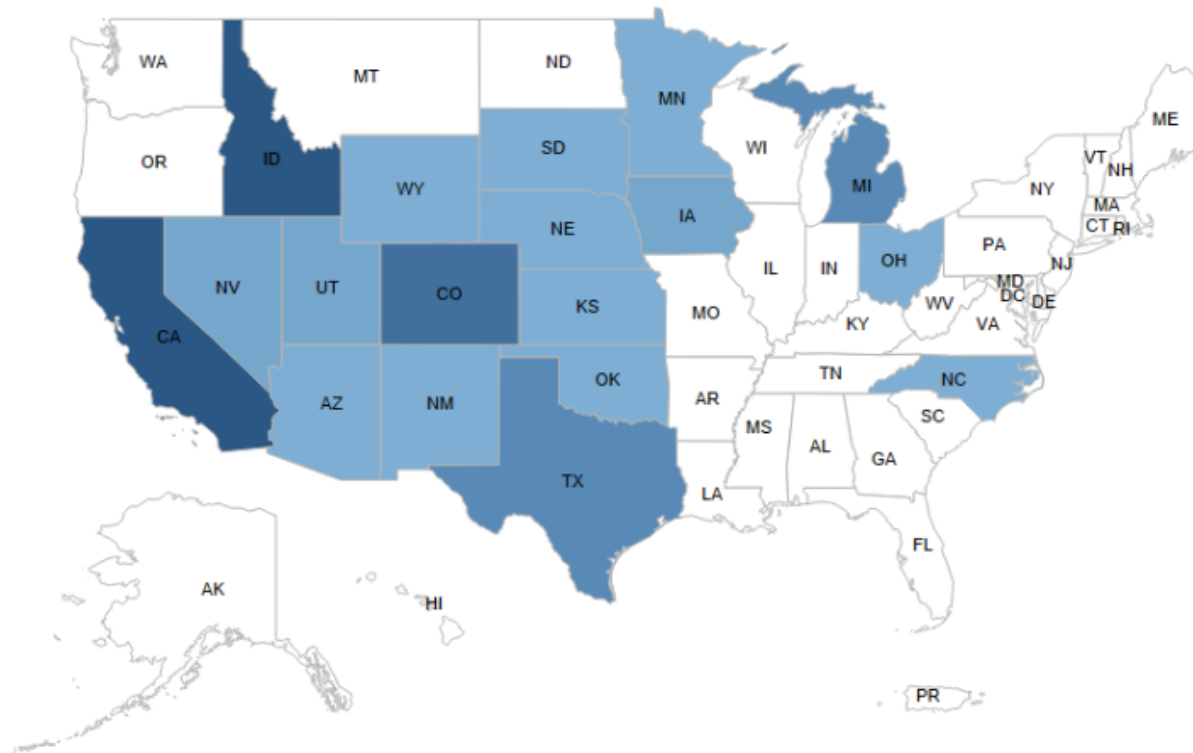
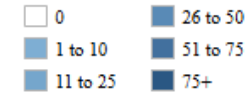
Situational Update

[Click for International Exports](#)

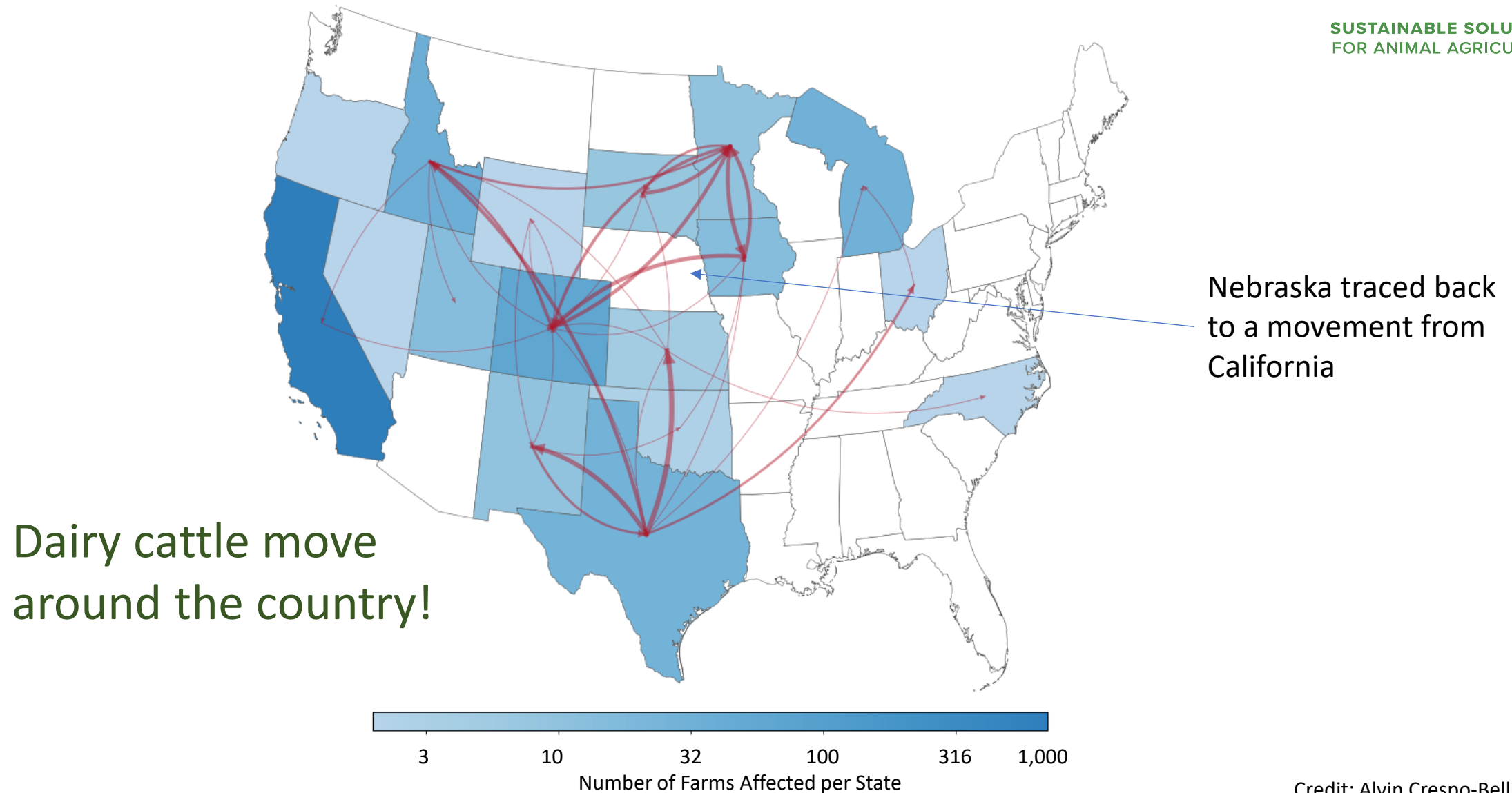
In the Total Outbreak, in Cattle, there were:
1,080 Confirmed Cases in 18 States

Number of Confirmed Cases in Cattle by State, Total Outbreak

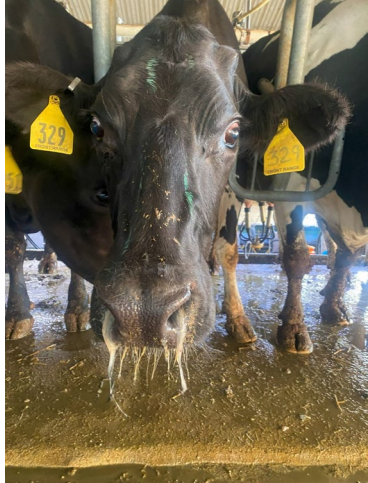
Legend



H5N1 State-to-State Movement



H5N1 Shedding in Cattle



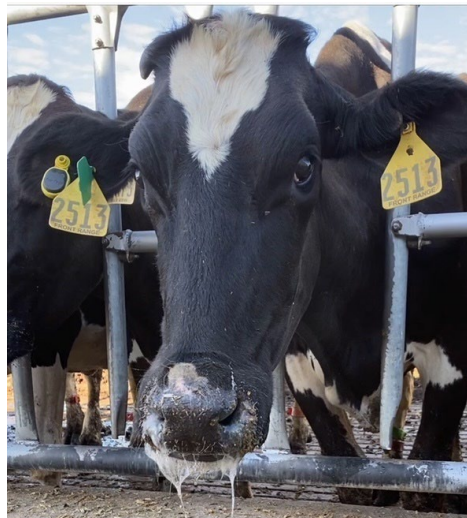
Nasal/Respiratory Secretions`



Urine



Feces



Saliva



MILK!

Bovine Disease Exposure Routes



Ocular



Respiratory



Bites



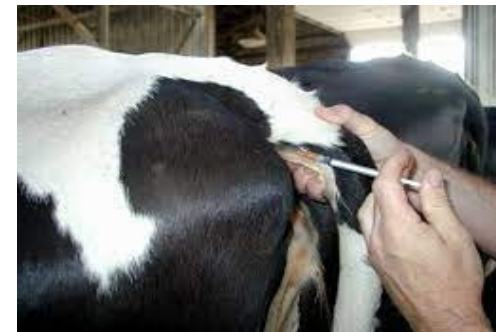
Rectal/Vaginal



Oral



Feet



Injections

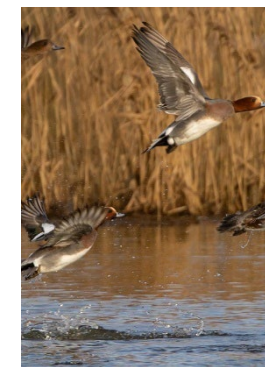


Teat/Udder

Herd-to-Herd Potential Transmission Routes

- **Known Risk**
 - Lactating cattle
 - People
- **Assumed Risk**
 - Service personnel
 - Vehicle movements
- **Assumed Low Risk**
 - Feces
 - Manure
- **Low Risk**
 - Milk trucks
 - Migratory waterfowl
 - Peri-domestic birds

?



Detection of Virus in Bulk Tank Milk and Pen Milk Samples



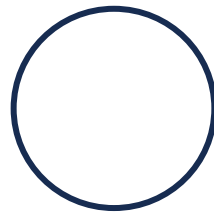
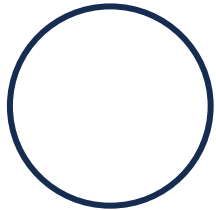
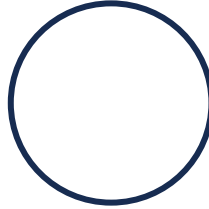
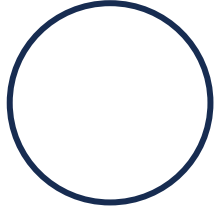
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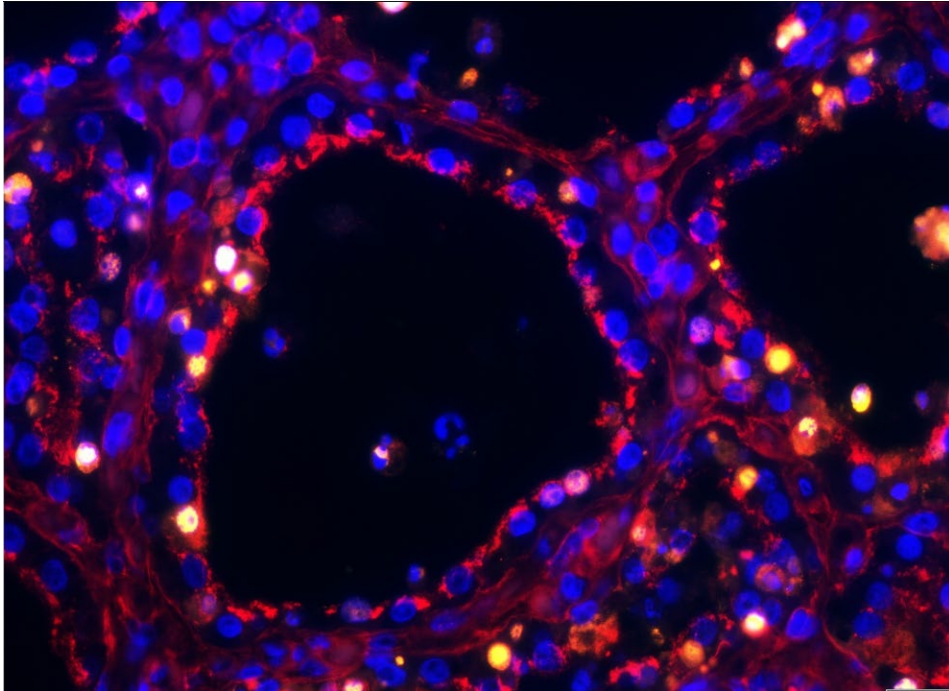
**Individual pen
samples mirror
the BTM.**

**The virus
spreads quickly
throughout the
herd.**

**Duration of
detection:
33+ days**

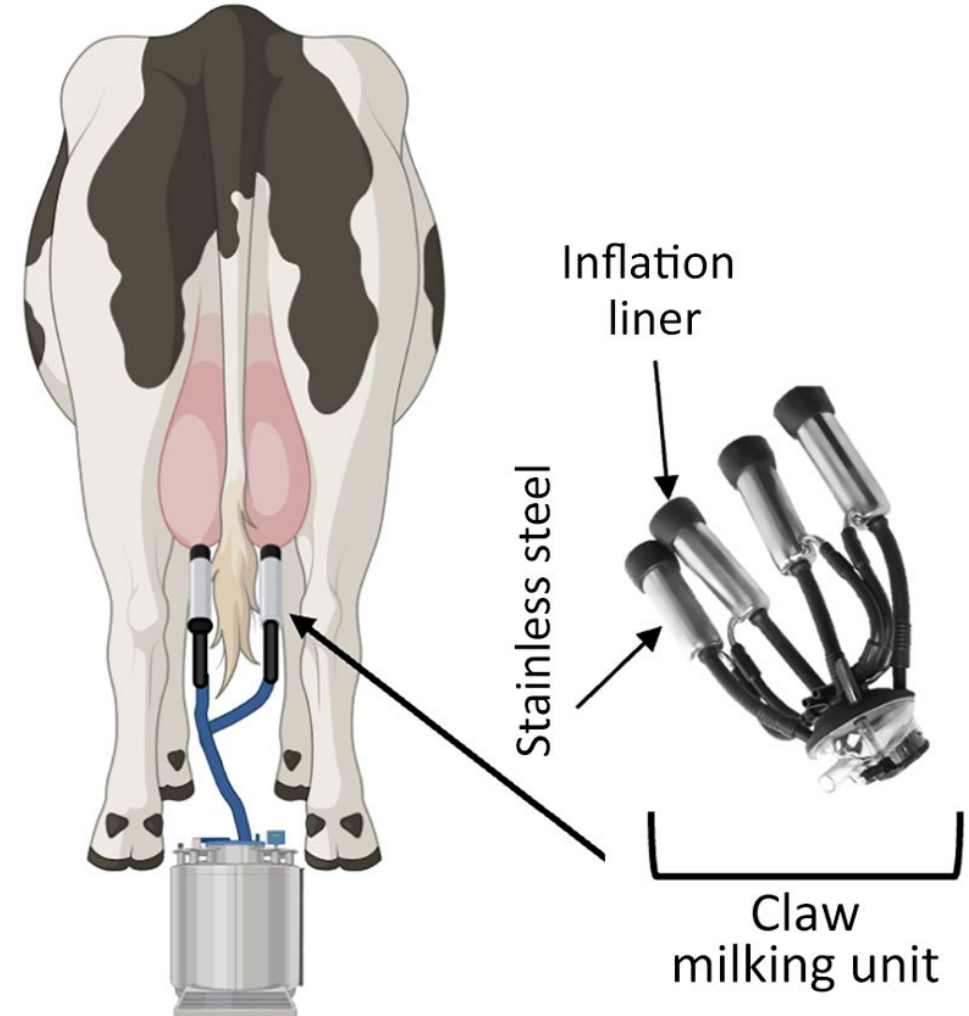


It's in the milk!!



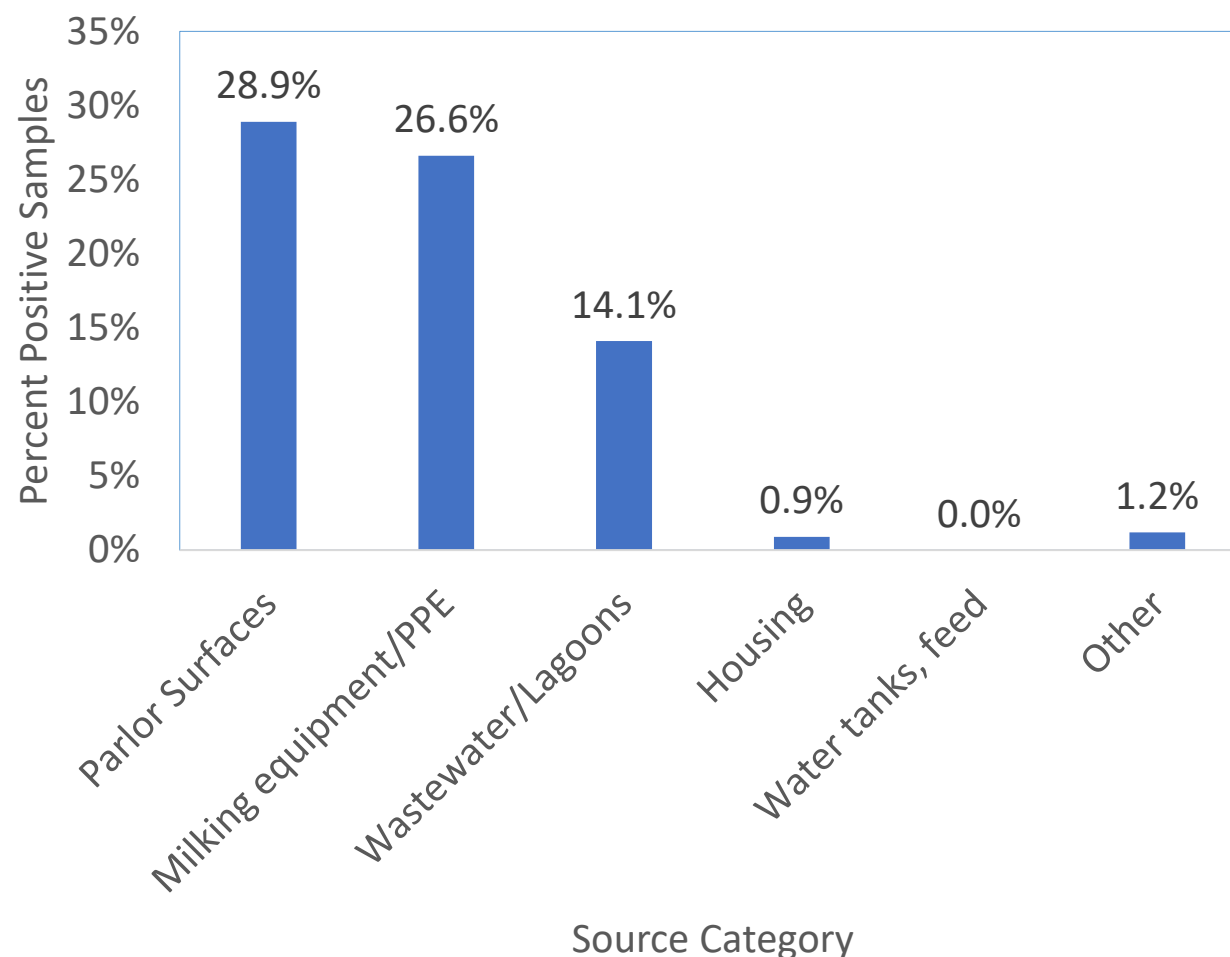
- Sialic acid receptors = red
- AIV = yellow

Nelli RK, Harm TA, Siepker C, et al. Sialic Acid Receptor Specificity in Mammary Gland of Dairy Cattle Infected with Highly Pathogenic Avian Influenza A(H5N1) Virus. *Emerging Infectious Diseases*. 2024;30(7):1361-1373. doi:10.3201/eid3007.240689.



Le Sage V, Campbell A, Reed DS, Duprex W, Lakdawala SS. Persistence of Influenza H5N1 and H1N1 Viruses in Unpasteurized Milk on Milking Unit Surfaces. *Emerg Infect Dis*. 2024;30(8):1721-1723. <https://doi.org/10.3201/eid3008.240775>

Parlor and Environmental Sampling Results

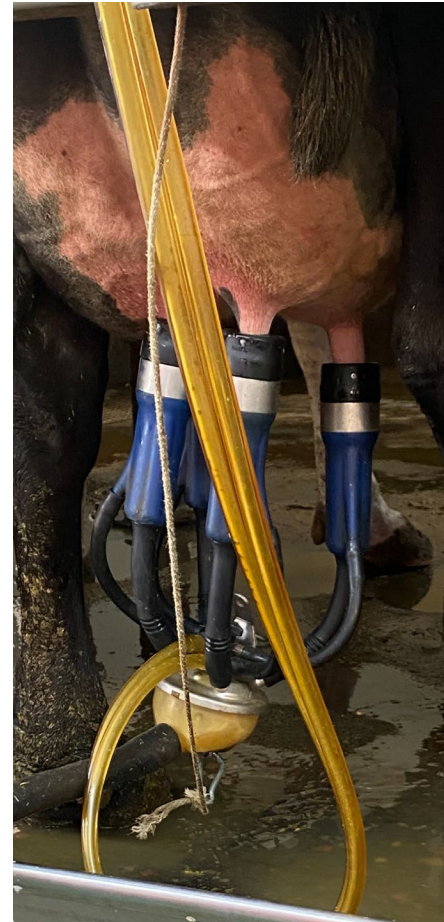


H5N1 most commonly detected in the environment close to the parlor

Milk appears to be a major risk for disease transmission between cows and from cows to humans.

Cow-to-Cow Potential Transmission Routes

- Milking machines – unlikely 1° route based on research and field data
- Oral exposure – lack of H5N1 found in feed or water
- Flies – high viral loads found in fly vomit
- Aerosol exposure – rarely detected





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- The Cows ☺
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