FOLLOWING H5 INFLUENZA AS IT MOVES THROUGH NORTH AMERICAN FOOD ANIMALS

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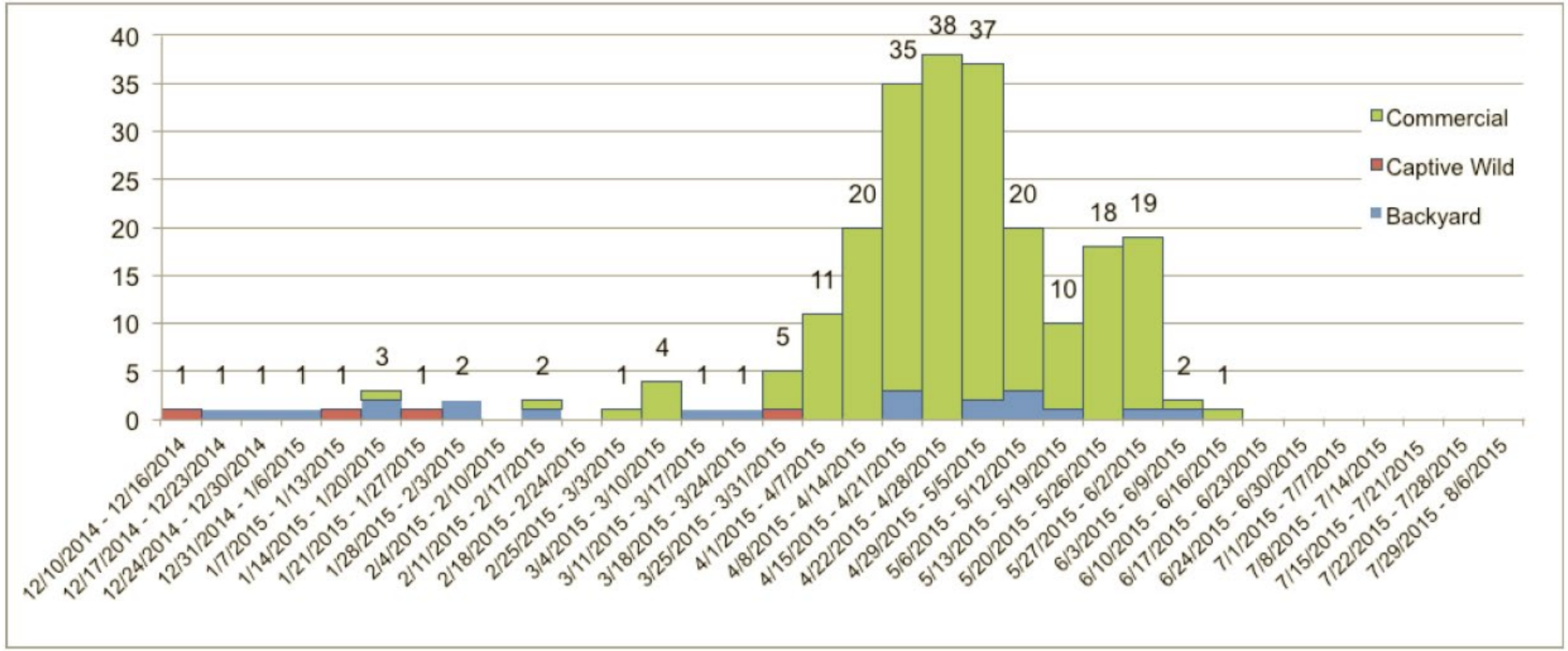
LET'S TALK

- The initial incursion of Gs/GD H5 into North America in 2014
- The return of the virus in 2021 and it's path to endemicity
- Expansion of hosts
- New pathways of spread and maybe new reservoirs?
- Options for H5 influenza control in animals
- Addressing frequently asked questions

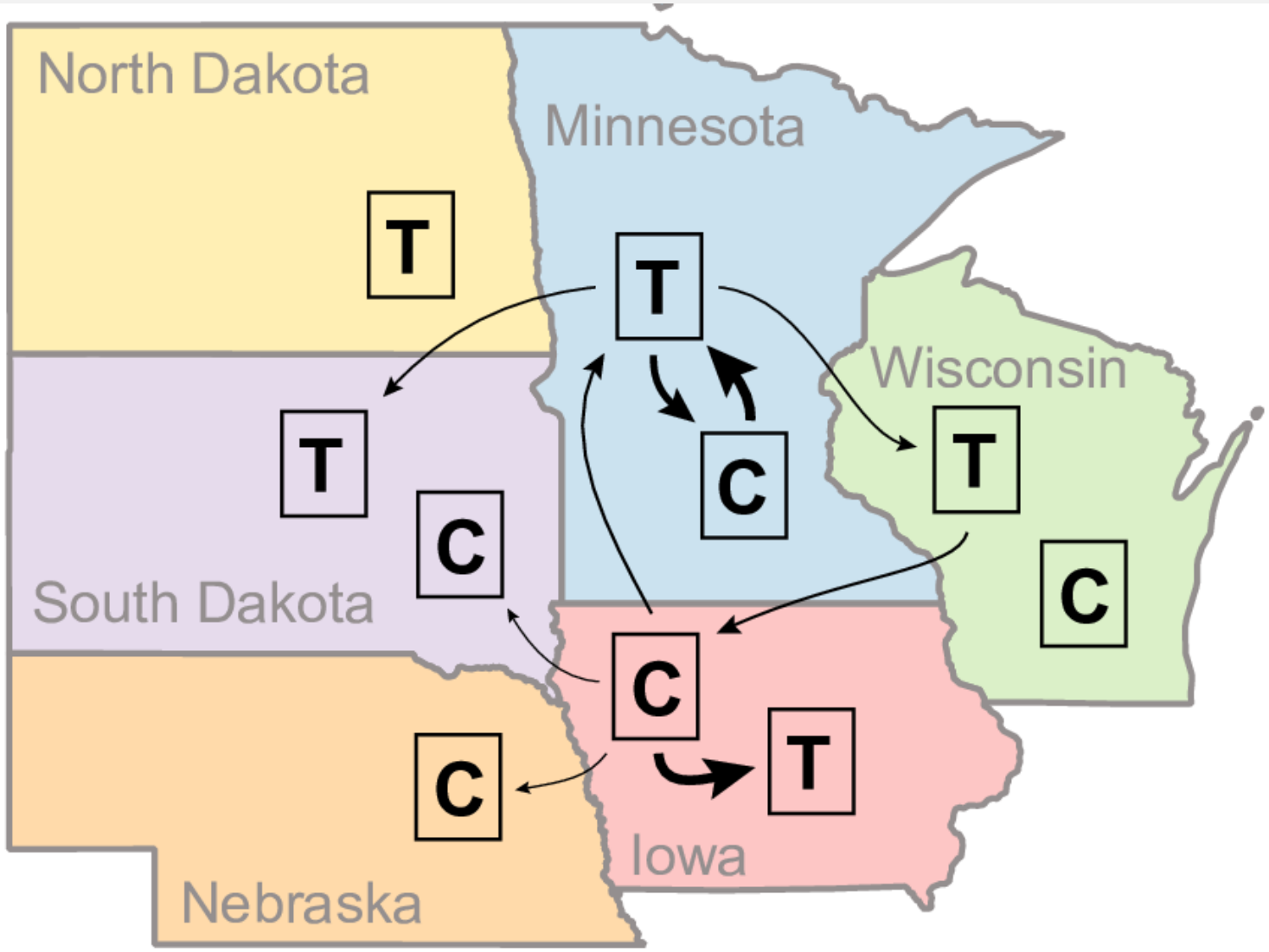
THE INITIAL OUTBREAKS OF GS/GD H5 IN NORTH AMERICA IN 2014/5

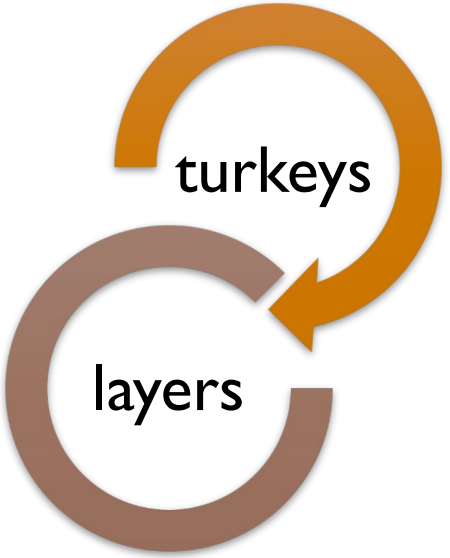
Epidemiological Curve

(August 7, 2015)



MINNESOTA BOARD of ANIMAL HEALTH



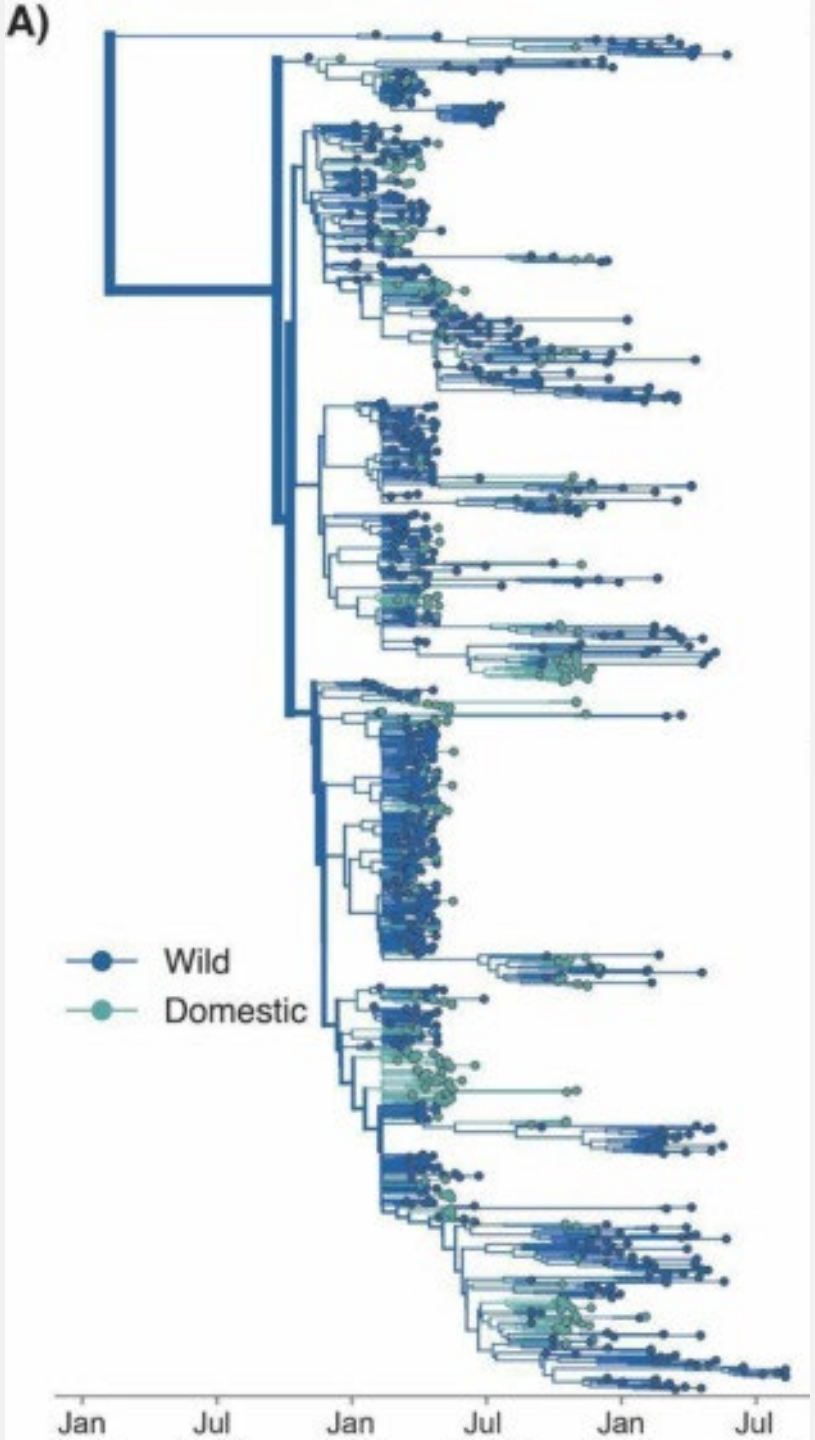


Hicks JT, Lee DH, Duvvuri VR, Kim Torchetti M, Swayne DE, Bahl J. Agricultural and geographic factors shaped the North American 2015 highly pathogenic avian influenza H5N2 outbreak. PLoS Pathog. 2020 Jan

STAMPING OUT WORKED BECAUSE IT ELIMINATED THE SOURCE

- The 2014/5 outbreak of H5N2 HPAI was introduced by wild birds and perpetuated by transmission in commercial poultry
- After stamping out 50M birds, the virus was eradicated

THE RETURN OF THE VIRUS IN 2021 AND IT'S PATH TO ENDEMICITY



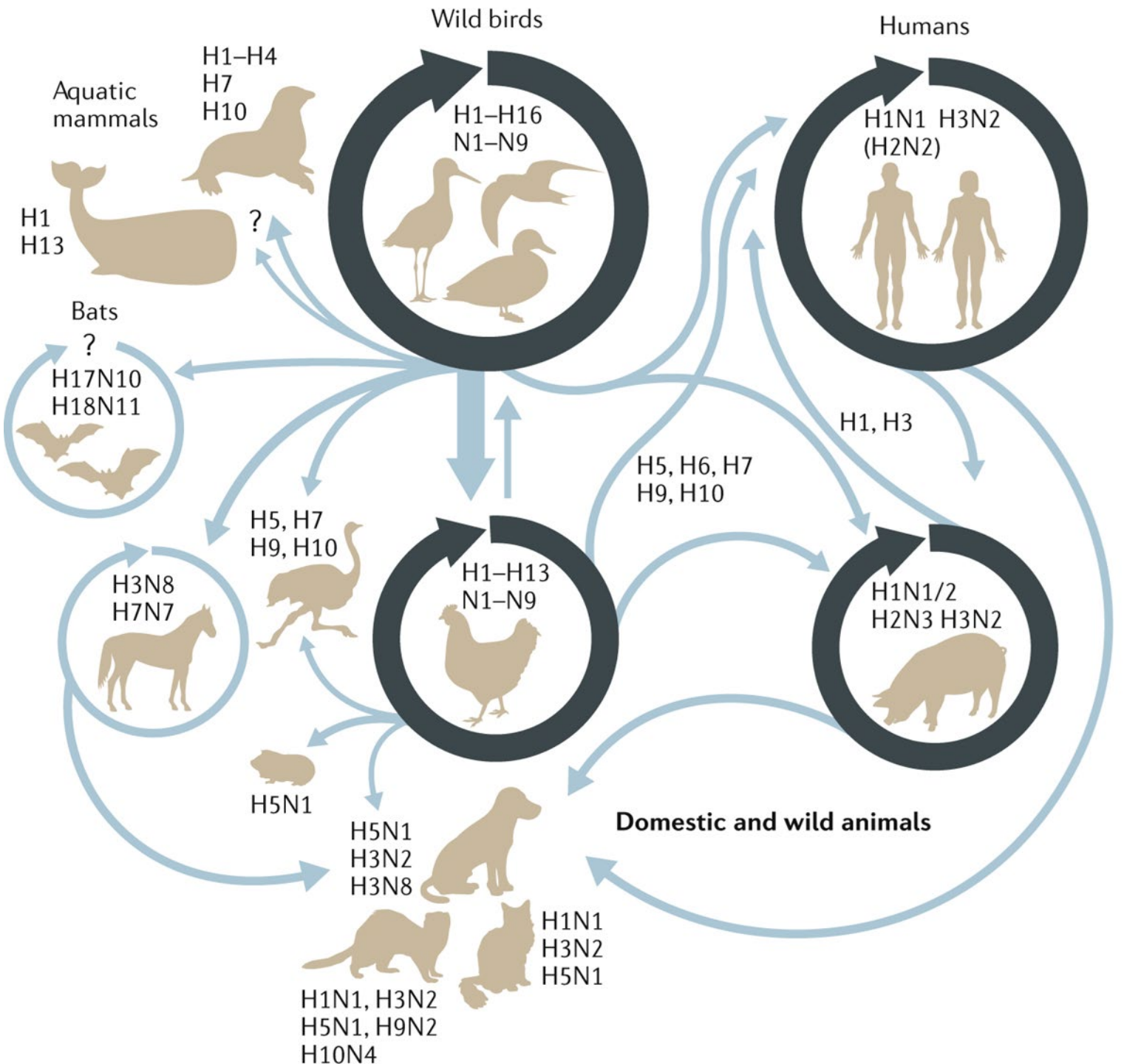
Damodaran L, Jaeger A, Moncla LH. Intensive transmission in wild, migratory birds drove rapid geographic dissemination and repeated spillovers of H5N1 into agriculture in North America. bioRxiv [Preprint]. 2024 Dec 20:2024.12.16.628739. doi: 10.1101/2024.12.16.628739. PMID: 39763879; PMCID: PMC11702765.

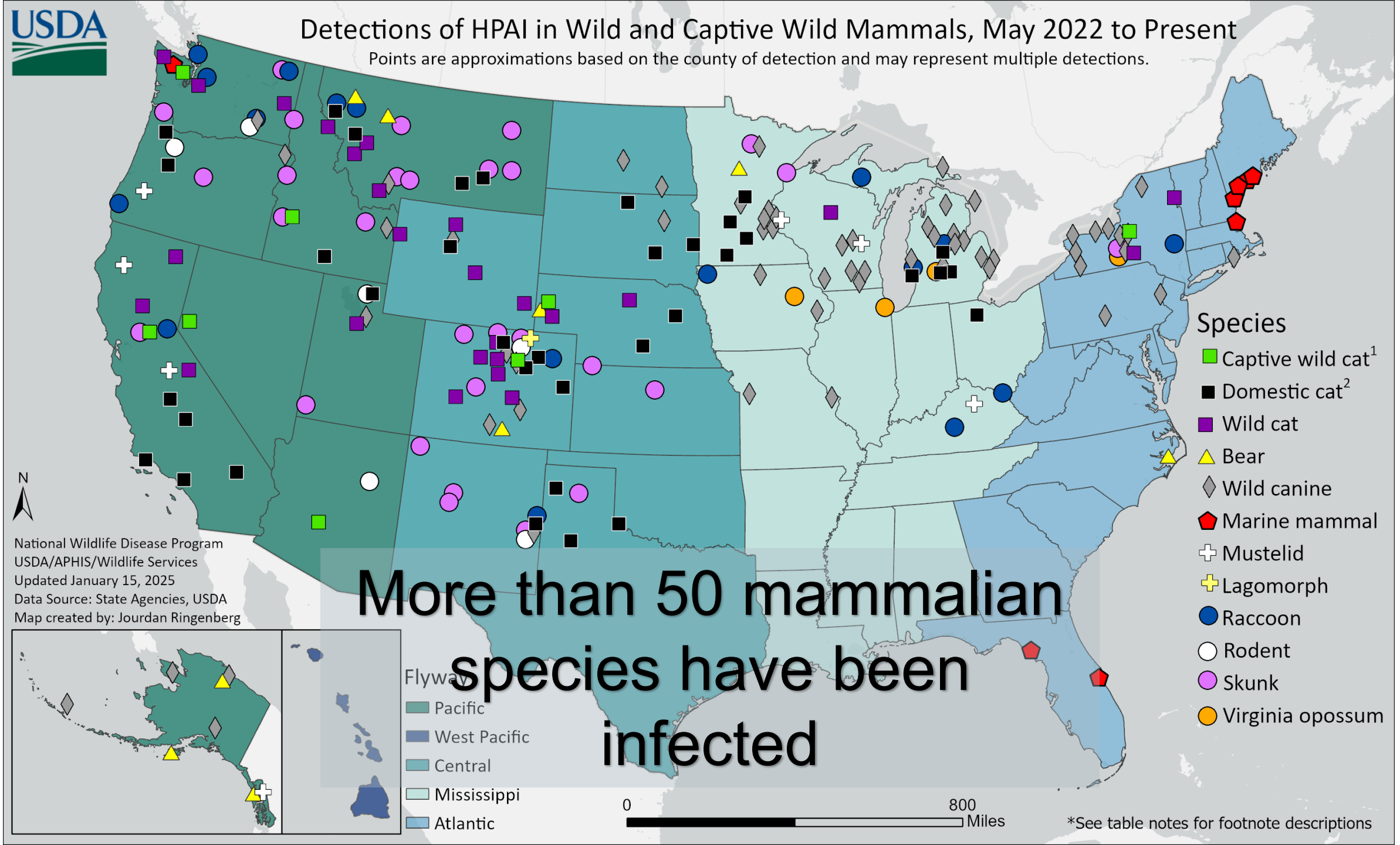
THE SOURCE OF THE CURRENT OUTBREAK ARE WILD WATERFOWL

- The virus source of the 2021/2/3/4/5 outbreak is maintained in wild waterfowl
- Stamping out poultry prevents spread from farms but it will not end the outbreak because it is not perpetuated by that source
- 150M birds depopulated with no end in sight

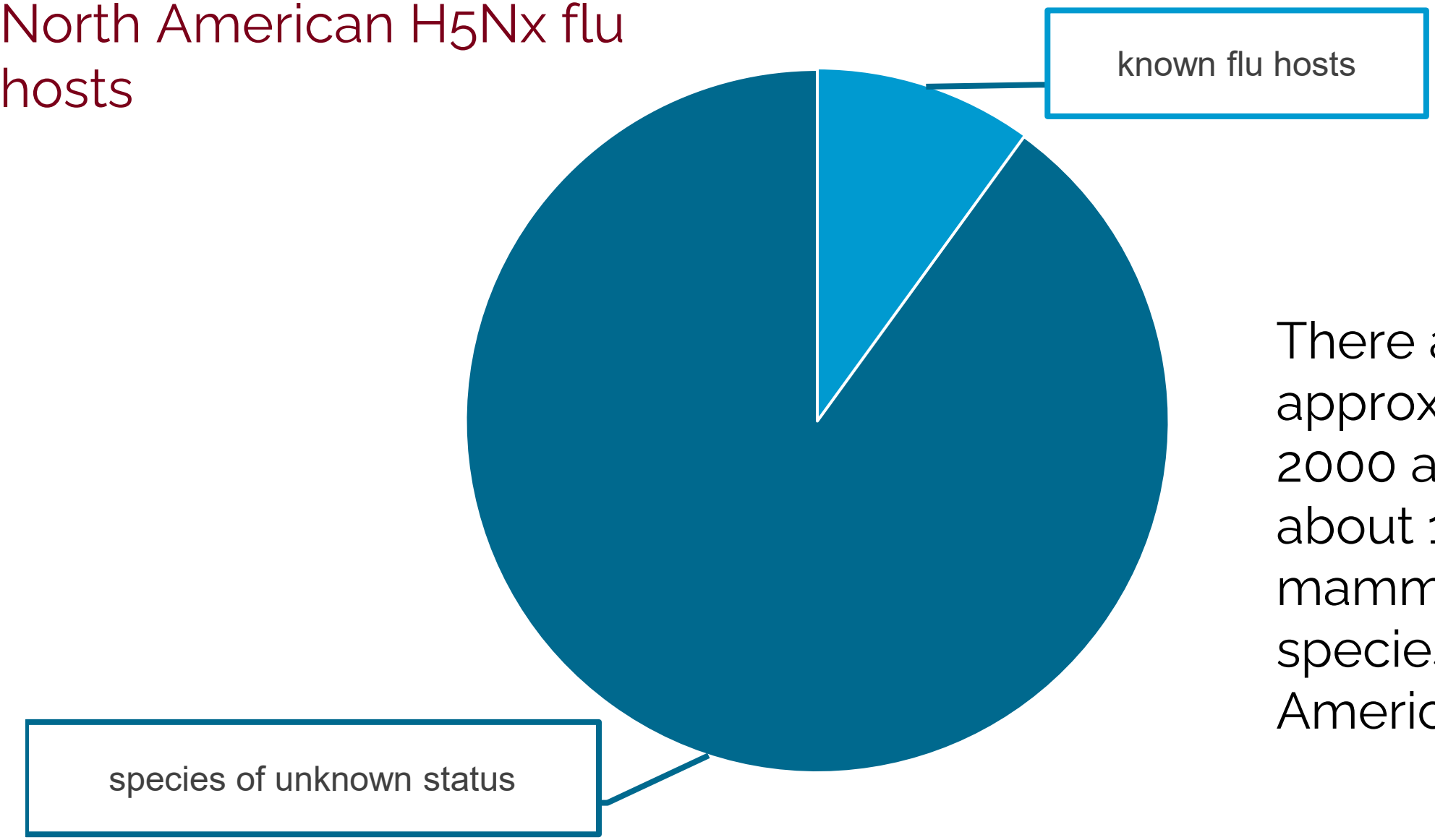
EXPANSION OF HOSTS

Influenza A viruses like naive hosts




USDA
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.
N
National Wildlife Disease Program
USDA/APHIS/Wildlife Services
Updated January 15, 2025
Data Source: State Agencies, USDA
Map created by: Jourdan Ringenberg
Species
Captive wild cat[1]
Domestic cat[2]
Wild cat
Bear
Wild canine
Marine mammal
Mustelid
Lagomorph
Raccoon
Rodent
Skunk
Virginia opossum
Flyway
Pacific
West Pacific
Central
Mississippi
Atlantic
0
800
Miles
*See table notes for footnote descriptions
More than 50 mammalian species have been infected

North American H5Nx flu hosts

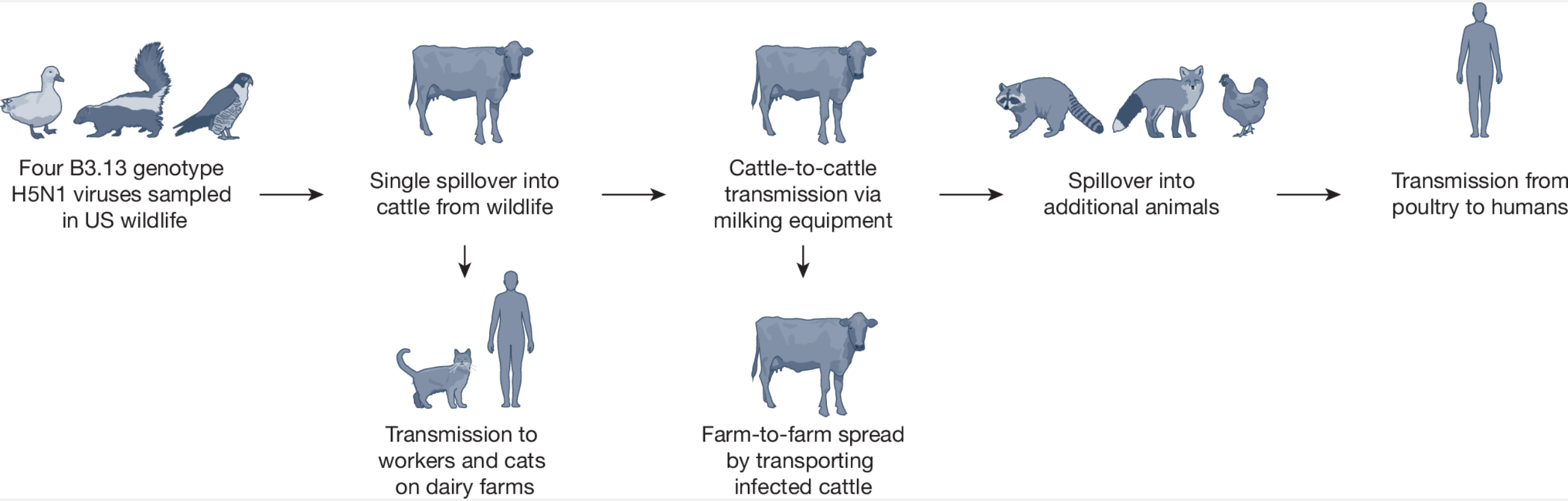


There are approximately 2000 avian and about 1000 mammalian species in North America.

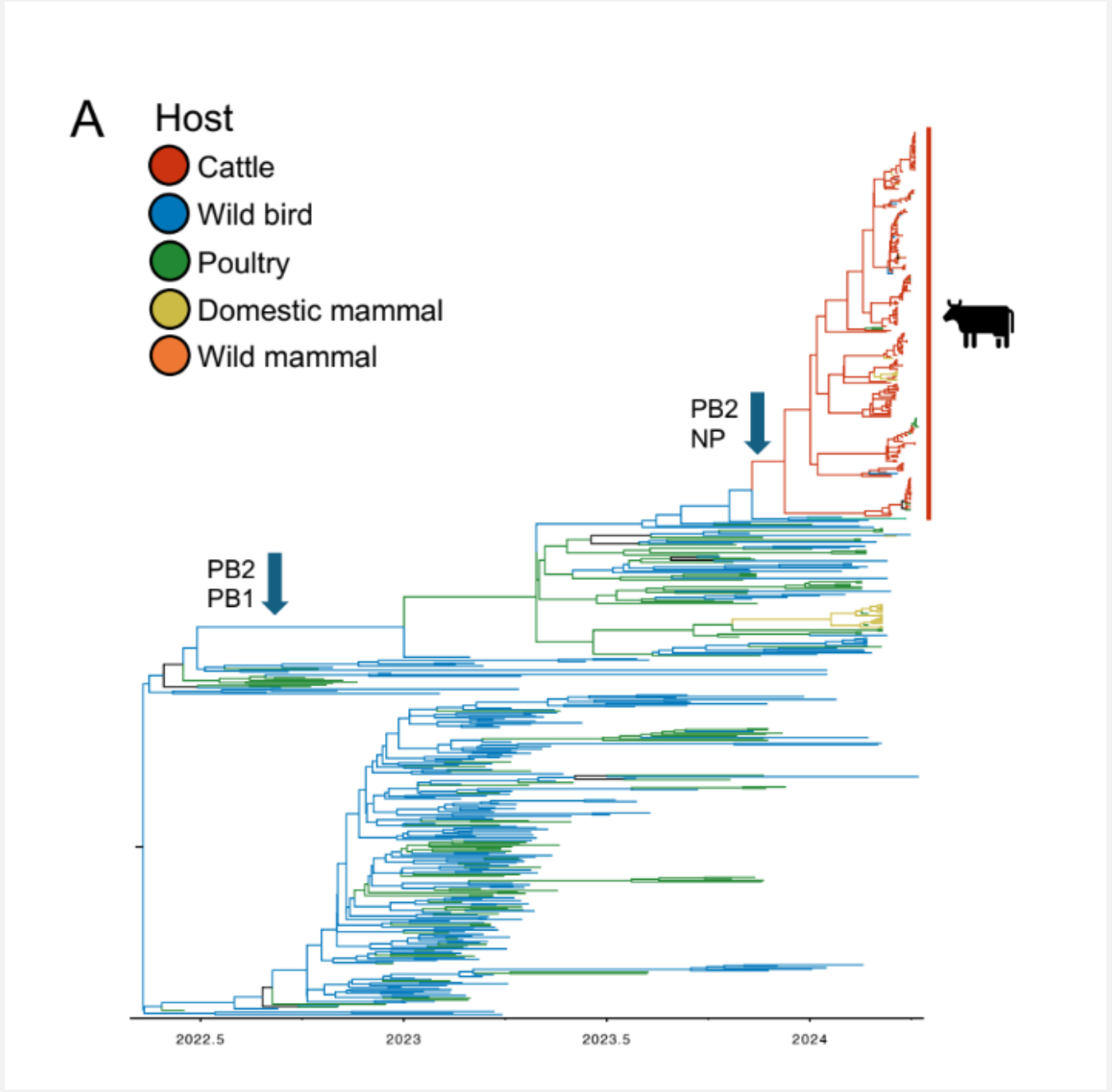
PREVENTION IS THE ONLY OPTION

- Since the source of the virus (wild waterfowl) cannot be controlled, the only option is to improve prevention to reduce infections in domestic animals.

NEW PATHWAYS OF SPREAD AND MAYBE NEW RESERVOIRS?



Peacock, T.P., Moncla, L., Dudas, G. *et al.* The global H5N1 influenza panzootic in mammals. *Nature* **637**, 304–313 (2025). https://doi.org/10.1038/s41586-024-08054-z



Nguyen et al., Emergence and interstate spread of highly pathogenic avian influenza A(H5N1) in dairy cattle

WHAT LED TO THE SPREAD OF FLU IN POULTRY SYSTEMS?

Production & marketing systems that expand and transmit IAV

- Limited biosecurity in production, transport and sale
- Geographically widespread and fragmented industry segments

The weakness of veterinary systems (both public and private)

Lack of incentives for reporting disease outbreaks

Limited trust in veterinary services and/or government

Availability of alternative avenues for sale of sick or even dead animals

OPTIONS FOR THE CONTROL OF H5 INFLUENZA IN ANIMALS

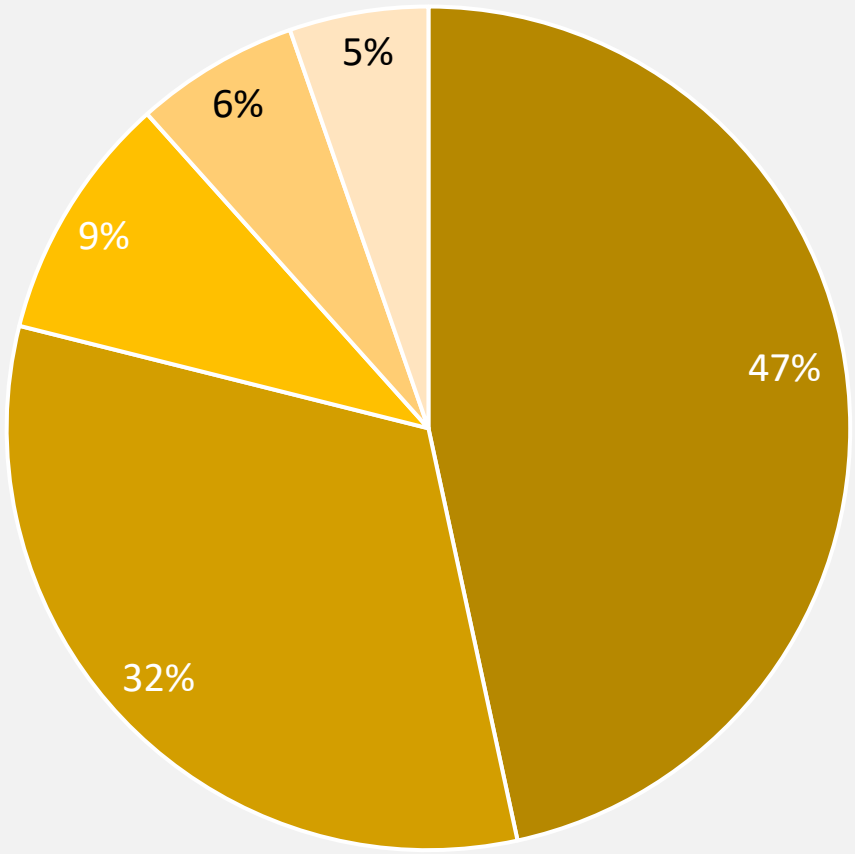
STAMPING OUT

- After the identification of a positive case, all poultry on a premises are rapidly depopulated to prevent spread of the outbreak.
- The United States has agreed to stamp out highly pathogenic avian influenza, a type 1 FAD
- Why not stamp it out in cows? Because it has been determined to be a type 2 FAD.
- If positive, eggs and birds would not be moved from the farm

VACCINATION

- Vaccination for HPAI has to be approved by USDA APHIS before it can be used in the US
- Vaccination strategies:
  - Vaccination can be used to prevent clinical signs (virus may circulate undetected)
  - Or to prevent infection (if virus is detected, the flock will be depopulated)
- We don't vaccinate currently because not all poultry are the same when it comes to H5 HPAI infection

WHERE HAVE INFECTIONS BEEN?



backyard turkeys egg layers broilers ducks and UG

HPAI 2022/2023 Confirmed Detections
as of August 29, 2025
Last reported detection Wednesday, August 27, 2025
Data updated weekdays by 12 PM (ET)

WHAT ABOUT GENETIC RESISTANCE?

- People often propose to use genetic resistance to improve the ability of poultry to survive HPAI
- Genetic resistance to clinical disease is possible and something we see in wild and domestic ducks and a characteristic that has resulted in the global spread of H5 influenza.
- Interactions between a highly mutable virus, a lot of hosts, and infection without signs in an entire population creates a real risk to humans (and other hosts) and there are no known mechanisms of genetic resistance to infection.

SCIENTIFIC AMERICAN, MARCH 11, 2024
CRISPR Will Likely Not Solve Bird Flu, C. Cardona and M. Kromm

CONTROLLING H5 INFLUENZA

- Stamping out is the only available option for the control of H5 outbreaks in poultry currently but because there is no control of H5 in dairy or wild bird populations, the threat of infection continues.
- Biosecurity acts to protect poultry by preventing exposures but is not perfect. There is a need for more epidemiology to understand spread into poultry farms so that prevention with biosecurity can be improved.
- Vaccination seems like a good option but there are economic consequences that need to be addressed to make it available.

ADDRESSING FREQUENTLY ASKED QUESTIONS

WHY DOES FLU IMPACT EGG PRICES?

- Eggs are sold fresh. Turkeys have also been heavily impacted by H5 but because product is often sold frozen, it can be stored making it less sensitive to production ups and downs.
- Eggs are produced on very large complexes
- A bird is 20 weeks old when she starts laying eggs
- To produce the sizes of eggs consumers prefer, it takes years to populate large complexes

IS FOOD SAFE?

- YES!
- Eggs and birds from infected flocks are not marketed. Only eggs that have been pasteurized can be marketed from infected premises and most of those eggs are from uninfected hens.
- Pasteurization works to kill the H5 influenza virus in egg products and milk.
- Raw milk and products made with raw milk may have infectious H5 virus.

CAN'T WE JUST LET THE UNINFECTED BIRDS ON A FARM LIVE?

- Unfortunately, we don't have a way to stop the movement of the virus through a farm.
- If the birds next door live, they will become infected and amplify the virus even more creating a bigger hazard for birds and animals on other farms or for other species.

WHY DON'T ANIMAL WORKERS JUST WEAR THE RIGHT PPE?

Table 2. Self-reported personal protective equipment (PPE) usage and seasonal flu vaccine among poultry workers and others exposed to in[fluenza] outbreaks, Minnesota 2015 and 2022–2023.

PPE component, Seasonal flu vaccine, or other occupational detail	Exposed wo[rkers] (201[5]) N = [redacted] n (%)	[redacted] n (%)	p-value[a]	duals[b] n (%)
Coveralls	263 (73.3)	249 (80.6)	0.03	343 (73.1)
Gloves	291 (81.1)	239 (77.3)	0.24	376 (80.2)
Boots	297 (82.7)	285 (92.2)	<0.01	402 (85.7)
Mask or respirator of any kind	254 (70.8)	198 (64.1)	0.07	282 (60.1)
Eye protection	186 (51.8)	103 (33.3)	<0.01	168 (35.8)
Wearing full PPE[c]	[redacted]	[redacted]	<0.01	134 (28.6)
Wearing full PPE, excluding poultry workers em[ployed at] a turkey breeding facility[d]	[redacted]	[redacted]	<0.01	-
Seasonal Flu Vaccine	[redacted]	[redacted]	<0.01	*N* = 340 118 (34.7)

It's too hot.

I can't work in it.

I got thirsty.

Recommended PPE for high exposure settings

- NIOSH Approved® particulate respirator

Can you recommend something better for human protection?

- Face shield over the top of goggles and respirator
- Outer work gloves to protect the disposable gloves

CONCLUSION

- H5's trip across North America has so far been devastating
  - There are still naïve hosts for it to explore so, its probably not going anywhere soon
  - And it is endemic in wild waterfowl
- We have to always look to understand what is happening and develop new strategies to control outbreaks and protect human and animal health
  - We need to control and prevent what we can

IF YOU'VE SEEN ONE FLU SEASON, YOU'VE SEEN ONE FLU SEASON.

-NANCY COX, HEAD OF FLU SECTION AT CDC, RETIRED


Questions for me?
ccardona@umn.edu