

# Early detection and Surveillance For Highly Pathogenic Avian Influenza



**Keith Wehner**

**USDA Wildlife Services**

# Avian Influenzas

- LPAI- Low Pathogenic
  - Minimal concern, potential mutation threat in poultry
- HPAI- Highly Pathogenic
  - Highly virulent and can be lethal to birds
  - Mutations and re-assortment common

# Influenza Subtypes

- 16 Hemagglutinin subtypes
- 9 Neuraminidase subtypes
- 2 Nonstructural subtypes
- Can occur in any combination

# History of Wild Bird AI Surveillance: 2006-2011



- **283,434 wild birds sampled (250+ species).**
- **98% of birds sampled were hunter harvested, agency harvested, or live wild birds.**
- **0.09% of birds sampled were morbidity/mortality events.**
- **1.51% of birds sampled were sentinel species.**
- **86.2% of birds sampled were dabbling ducks, diving ducks, geese, and swans.**

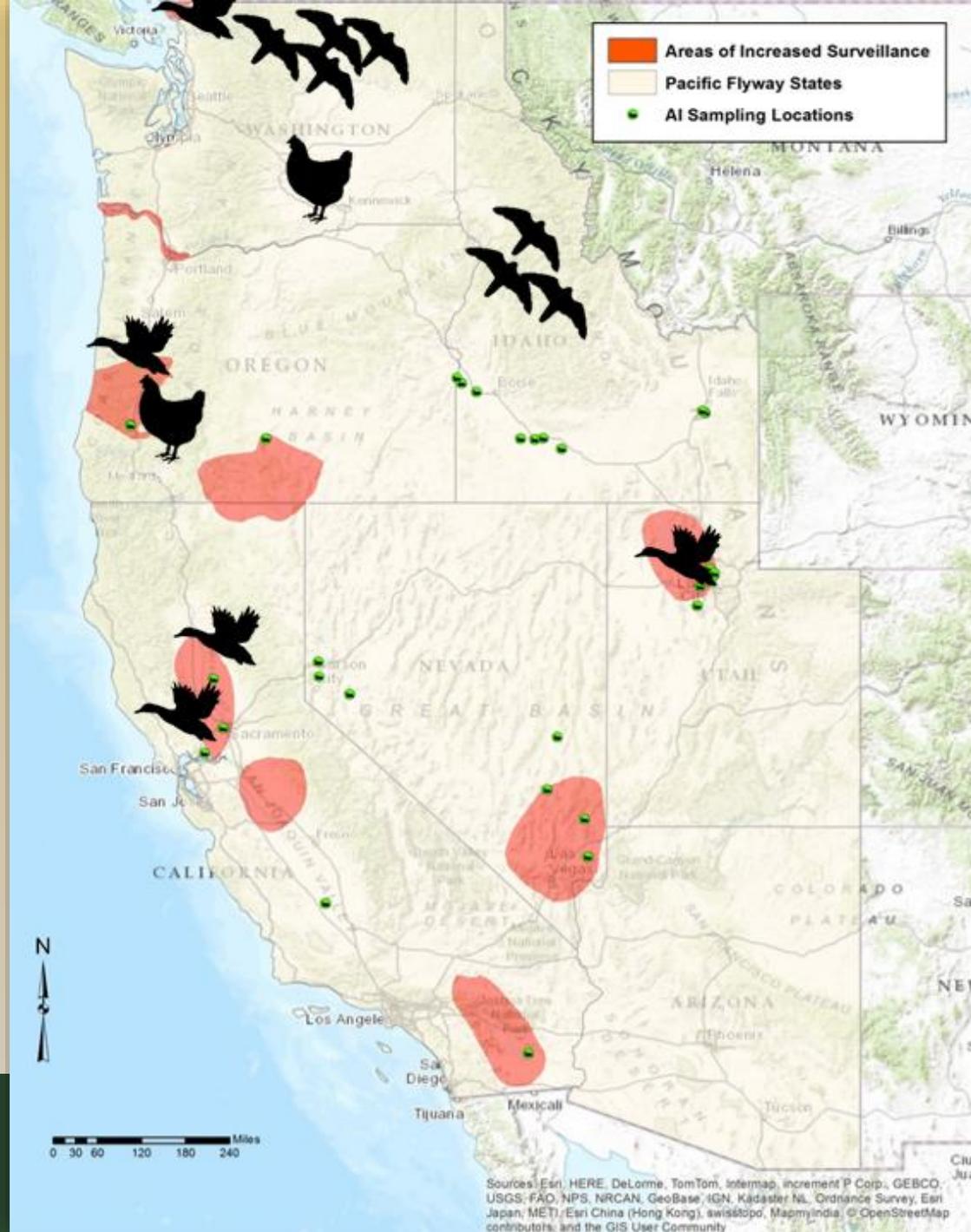
# Wild Bird AI Testing 2006-2011: Lessons Learned



- **All 283,434 birds tested were negative for HPAI.**
- **About 11% of wild birds carried low pathogenic AI virus.**
- **Waterfowl in particular had the highest AI virus prevalence rates as well as the greatest subtype variety.**
- **Dabbling ducks had a disproportionately high prevalence of AI viruses. This reinforces their role as a natural reservoir for AIVs.**

# Initial Detections of Eurasian HPAI Strains in the Pacific Flyway

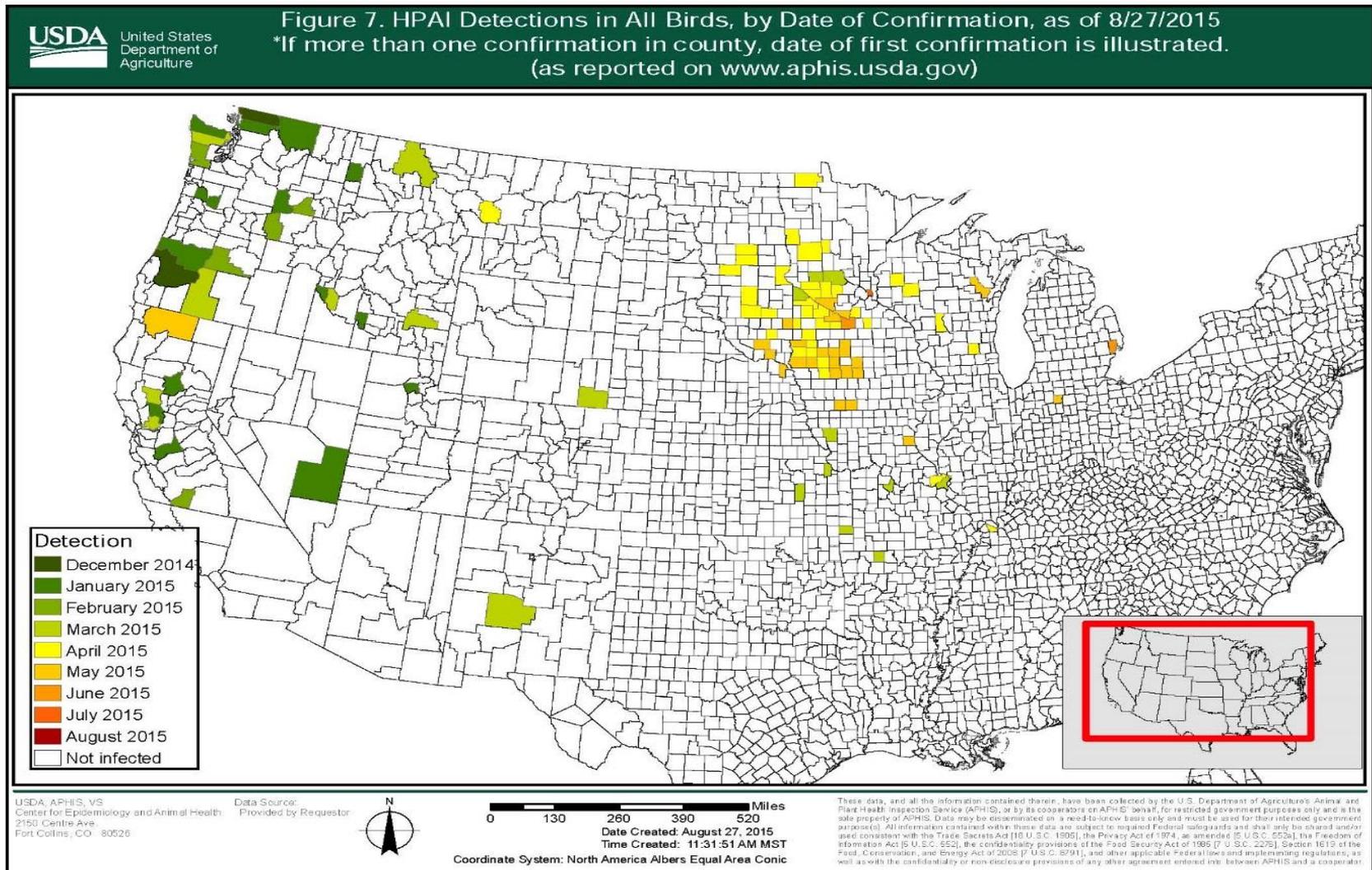
December 2014  
Whatcom county  
Washington  
Captive Gyrfalcons  
Wild Mallard and  
Northern Pintail



# North American Flyways



# Current HPAI Detections By County



# Positive HPAI Wild Birds by Species and State

Species	CA	IA	ID	KS	KY	MI	MN	MO	NM	NV	OR	UT	WA	WI	WY	Grand Total
American Green-winged Teal	1		1								1		1			4
American Wigeon	29										1	1	5			36
Bald Eagle			1													1
Black-capped Chickadee							1									1
Canada Goose				1		11					1		1		1	15
Cinnamon Teal									1							1
Cooper's Hawk							1						1			2
European Starling g		1														1
Gadwall	1															1
Lesser Snow Goose					1			3								4
Mallard	2		5							1	5	1	4			18
Northern Pintail	1										2		3			6
Northern Shoveler											3					3
Peregrine Falcon													1			1
Red-tailed Hawk													2			2
Ring-necked Duck					1											1
Snowy Owl														1		1
Wood Duck											3					3
Grand Total	34	1	7	1	2	11	2	3	1	1	16	2	18	1	1	101

# Positive HPAI Samples by Serotype and State

State	CA	IA	ID	KS	KY	MI	MN	MO	NM	NV	OR	UT	WA	WI	WY	Grand Total
EA H5 d	25	1				7	1	1	1			1				37
EA H5N8	9		4							1	3	1	5			23
EA/AM H5N1													3			3
EA/AM H5N2			3	1	2	4	1	2			13		10	1	1	38
Grand Total	34	1	7	1	2	11	2	3	1	1	16	2	18	1	1	101

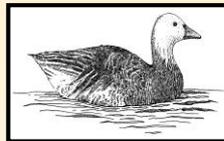
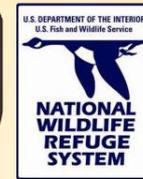
# HPAI Wild Bird Positives By State

Row Labels	Count of SPECIES
CA	19
ID	7
KS	1
KY	2
MI	12
MN	2
MO	3
NM	1
NV	1
OR	16
UT	2
WA	17
WI	1

# 2015-16 Interagency Surveillance Plan for Highly Pathogenic Avian Influenza in Wild Birds in the United States



United States  
Department of  
Agriculture



•**NATIONAL FLYWAY COUNCIL**  
•Pacific est. 1952 - Central est. 1948 - Mississippi est. 1952 - Atlantic est. 1952



Protecting People  
Protecting Agriculture  
Protecting Wildlife

# 2015-2016 Wildlife Surveillance Goals



- Identify distribution across U.S.
- Detect early spread into new flyways/regions
- Provide flexible surveillance framework that can monitor wild waterfowl populations for:
  - re-assortments of influenzas
  - introductions of new viruses
  - estimate prevalence of important influenzas once detected in an area of concern

# Dabbling Duck Target Species

Dabbling Ducks

Green-winged Teal

Mallard

Northern Pintail

American Black Duck

Wood Duck

Blue-winged Teal

American Wigeon

Mottled Duck

Muscovy Duck

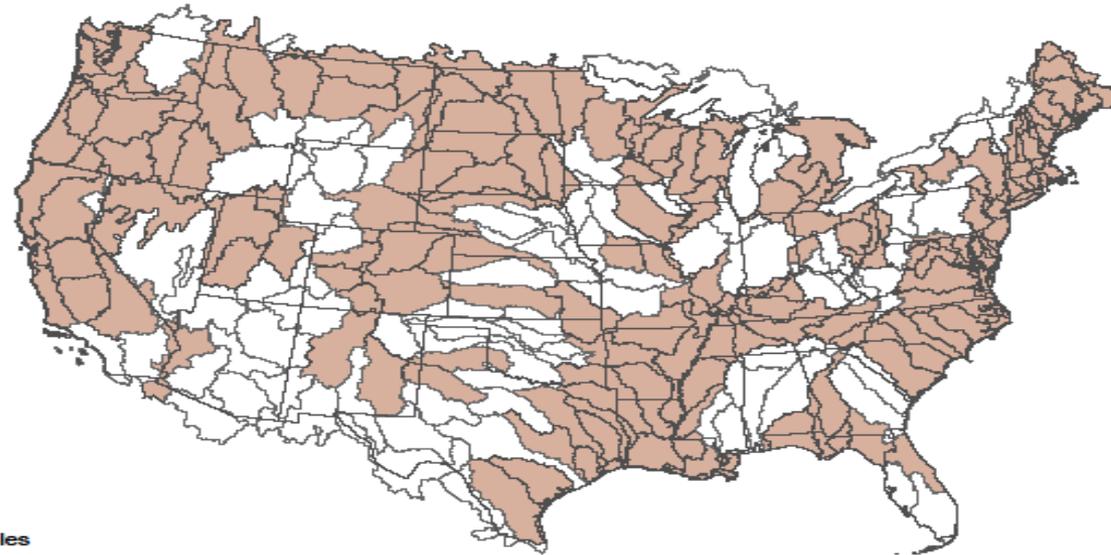
Fulvous Whistling Duck

Gadwall

Northern Shoveler

Cinnamon Teal

# Sampling Effort Map by Watershed

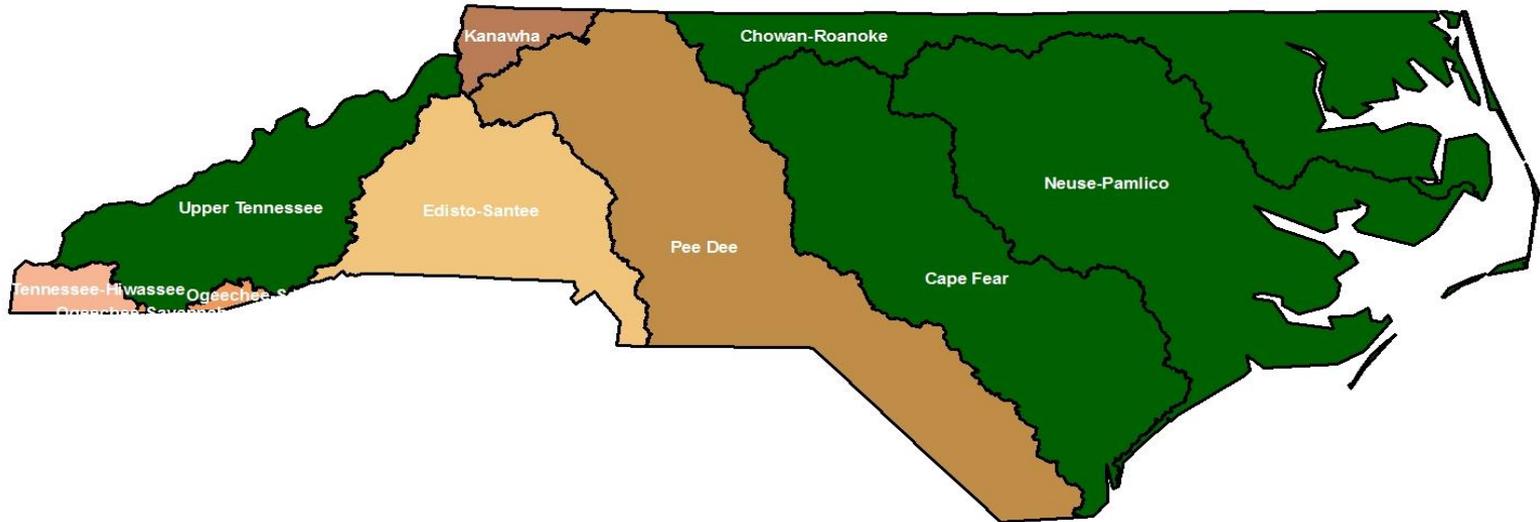


0 200 400 600 800 Miles

# North Carolina Watersheds for HPAI Sampling Efforts BY2015



# North Carolina Prioritized Sampling Watersheds



# Common Wildlife Hosts of Avian Influenza Virus



# North American Wildlife Hosts of AI Virus

**Striped Skunk**  
(*Mephitis mephitis*)



Root JJ, Shriner SA, Bentler KT, Gidlewski T, Mooers NL, Ellis JW, et al. (2014) Extended Viral Shedding of a Low Pathogenic Avian Influenza Virus by Striped Skunks (*Mephitis mephitis*). PLoS ONE 9(1): e70639.  
doi:10.1371/journal.pone.0070639

**Raccoon**  
(*Procyon lotor*)



Root JJ, Bentler KT, Shriner SA, Mooers NL, VanDalen KK, Sullivan HJ, et al. (2014) Ecological Routes of Avian Influenza Virus Transmission to a Common Mesopredator: An Experimental Evaluation of Alternatives. PLoS ONE 9(8): e102964.  
doi:10.1371/journal.pone.0102964

# North American Wildlife Hosts of AI Virus

**Cottontail Rabbit**  
(*Sylvilagus* spp. )



Root JJ, Shriner SA, Bentler KT, Gidlewski T, Mooers NL, Spraker TR, et al. (2014) Shedding of a Low Pathogenic Avian Influenza Virus in a Common Synanthropic Mammal – The Cottontail Rabbit. PLoS ONE 9(8): e102513. doi:10.1371/journal.pone.0102513

**House Mouse**  
(*Mus musculus*)



Shriner SA, VanDalen KK, Mooers NL, Ellis JW, Sullivan HJ, Root JJ, et al. (2012) Low-Pathogenic Avian Influenza Viruses in Wild House Mice. PLoS ONE 7(6): e39206. doi:10.1371/journal.pone.0039206

# Surveillance Update

## Nationwide

- 24,583 samples
- 11,843 live wild birds
- 415 agency harvest
- 138 morbidity/mortality
- 12,187 hunter harvest
  
- 3,664 (14.9%) LPAI

## North Carolina

- 1,079 samples
  
- 14 (1.2%) LPAI

# National Feral Swine Management Program





# Feral Swine Surveillance

## Swine Sampling

- Classical Swine Fever
- Swine Brucellosis
- Pseudorabies
- Toxoplasmosis
- Porcine Reproductive Respiratory Syndrome
- Leptospirosis

## Influenza

### Nasal Swabs

- 114 samples
- 0 positive

### Serology

- 136 samples
- 30 (22%) positive
- Johnston, Duplin, and Bladen Counties