When Alarm Bells Ring:
Interpreting Wastewater Surveillance Signal for Influenza A H5 Infected Wildlife

Michelle Yancey, MPH, PhD

Virginia Epi Seminar 2026
Richmond, VA
March 26, 2026

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

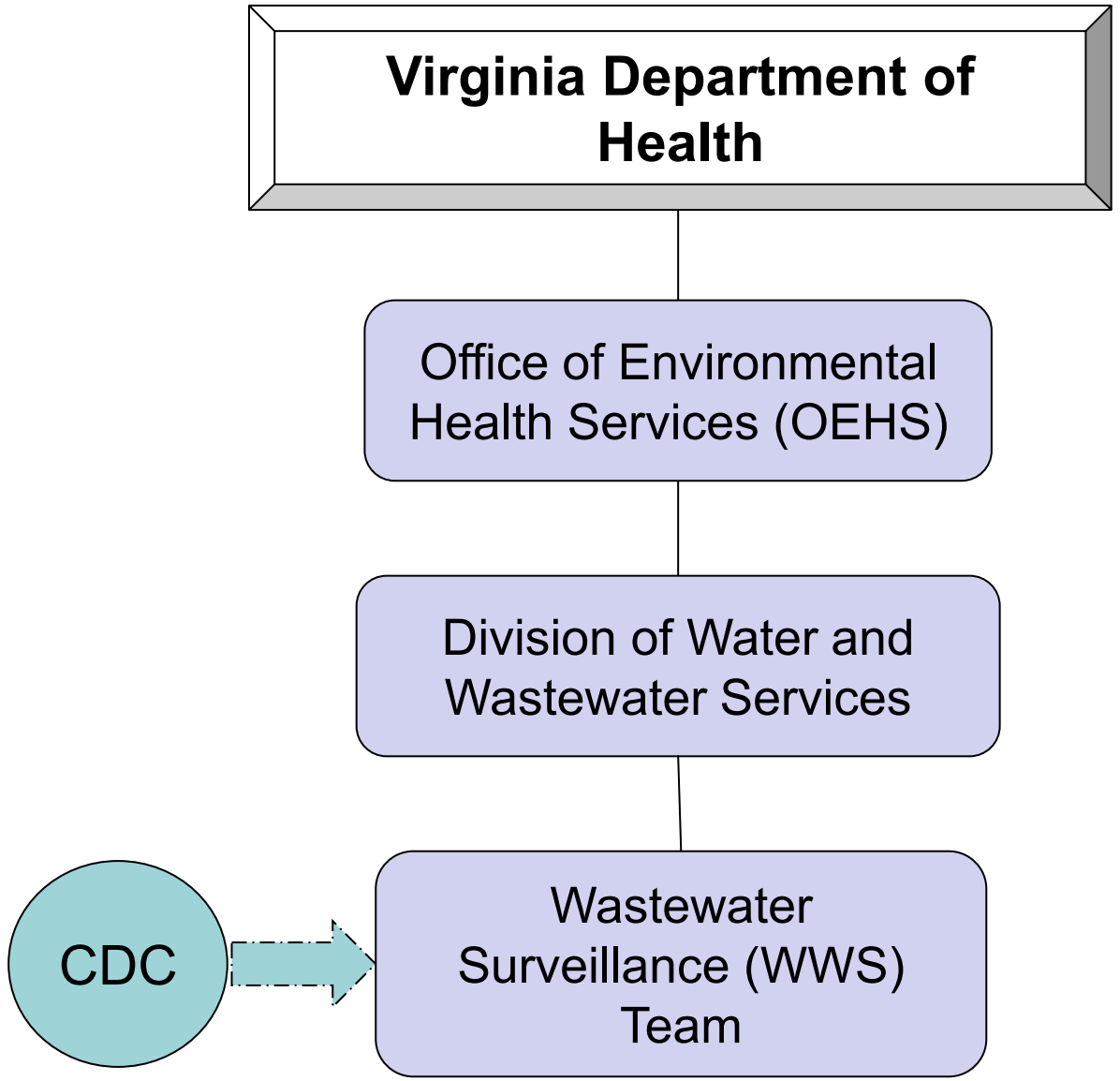
VDH WWS Program

Funded by: CDC ELC grants

- Oct 2020- **$300K** (BP2- start program)
- Aug 2021- **$1.3M** (BP3- state lab & sampling)
- Aug 2022- **$2.1M** (BP4- expand)
- Aug 2023-2025- **$3.6M** (Supplemental)
- Feb 2024-2027- **$3.7M** (NWSS#2- "Right-Size")
- Dec 2024- **$543K** (MPOX supplement)
- May 2026 BP3 - TBD

Purpose:

- Create WWS network in Virginia
- Support CDC's *National Wastewater Surveillance System* (NWSS)
- Aid in disease prevention



Meet Our Team

VDH WWS Program (VDH-WWS@vdh.virginia.gov)

Lance Gregory | Director, Office of Environmental Health Services

Michelle Yancey, MPH, PhD | WWS Data Manager

Isaiah Omerhi, MPH | WWS Epidemiologist

Caroline Marti, MPH | WWS Data Analyst & Technical Support

Haniyyah Majeed, MS | WWS Program Coordinator

Torin Honaker | WWS Data Analyst & Intern

VDH-WWS official team mug (2022)

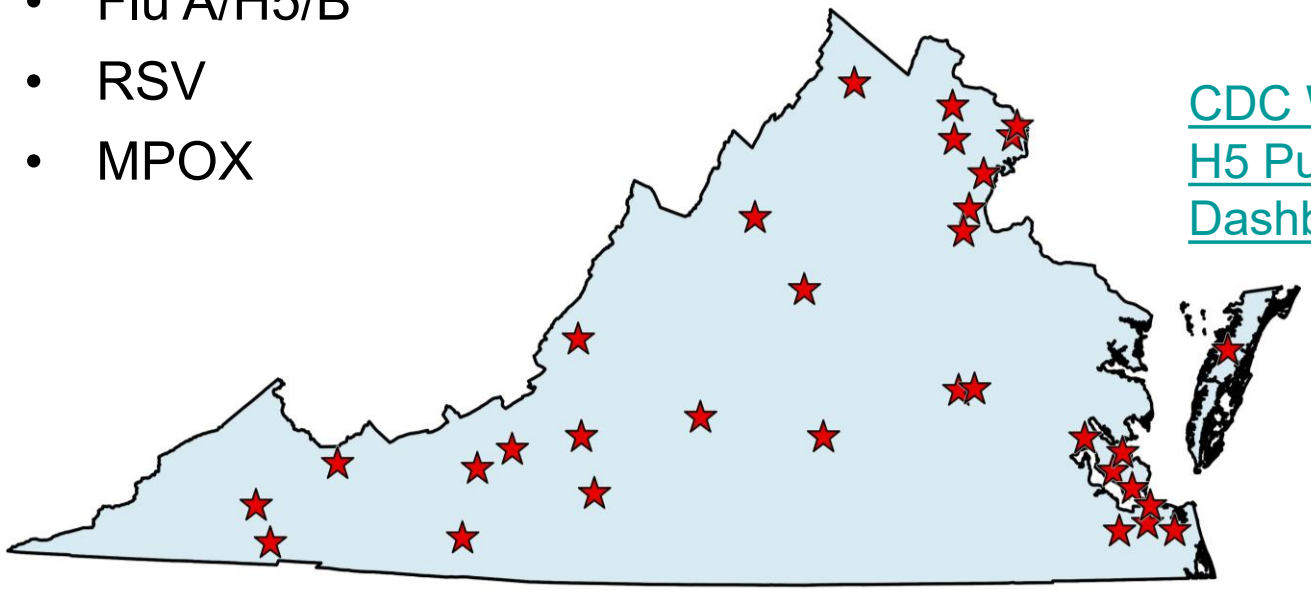
Sentinel Monitoring Program

32 WWTPs:

- ~50% of state population
- 1-2 samples/week

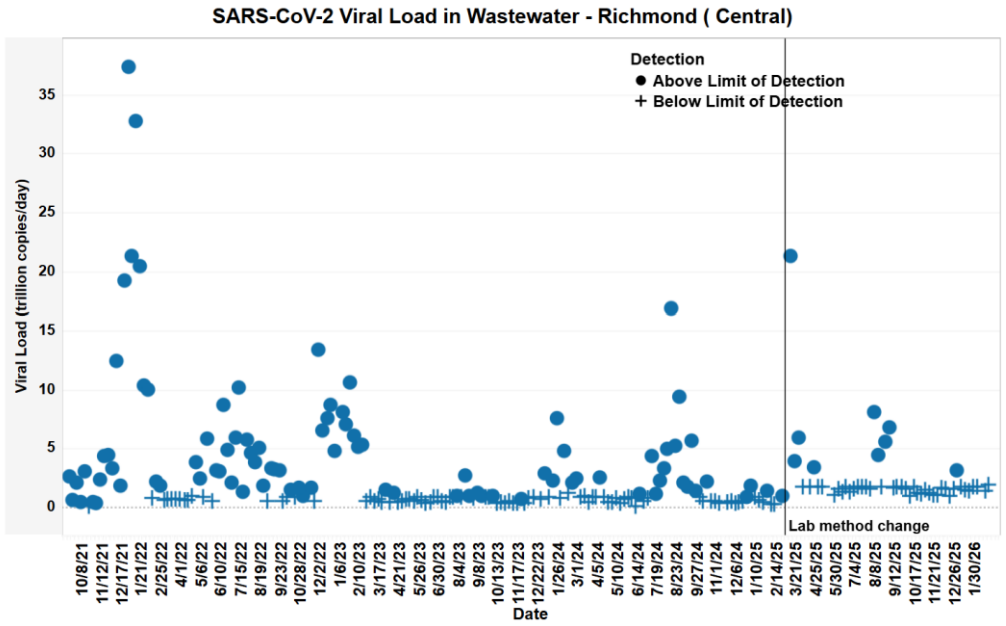
Targets:

- SARS-CoV-2/sequencing
- Flu A/H5/B
- RSV
- MPOX

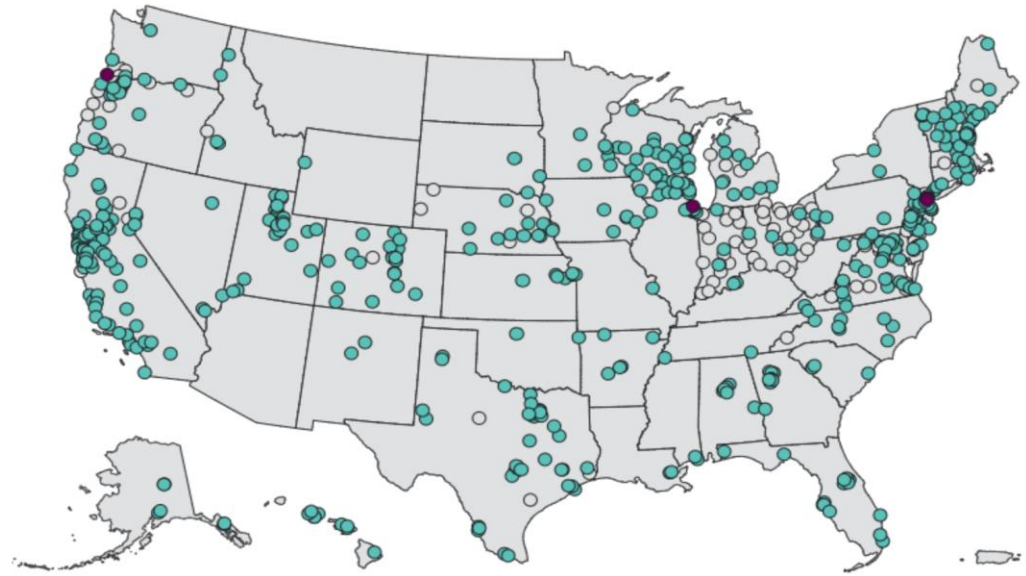


VDH SMP Wastewater Treatment Plant partners currently in Sentinel Monitoring Program

VDH WWS Public Dashboard



CDC WWS H5 Public Dashboard



! Flu A PP Alert !

VDH WWS ⇨ Alexandria Epis

6/11/25

Positivity Alert Status	
0	No detection
1	Detection, below LOD
2	Detection, above LOD

		Flu A Positivity Status By Week												
ALERT STATUS (last 3 sum)	Site	195	194	193	192	191	190	189	188	187	186	185	184	183
0	HRSD: Onancock	0	0	0	0	0	0	0	1	#N/A	0	1	1	1
1	HRSD: Virginia Initiative Plant	1	0	0	0	0	0	0	0	0	1	0	1	1
0	HRSD: Army Base	0	0	0	0	1	0	0	0	0	1	0	1	1
#N/A	HRSD: Atlantic	1	#N/A	0	1	0	0	0	1	1	0	0	0	1
1	HRSD: Nansemond	1	0	0	0	1	1	0	0	0	0	1	0	0
3	Coeburn Norton Wise (CNW) Regional	2	0	1	0	0	1	0	0	1	1	0	0	1
0	HRSD: Boat Harbor	0	0	0	0	0	0	0	0	0	0	0	0	1
0	Tazewell Wastewater Treatment Plant	0	0	0	0	#N/A	0	#N/A	0	#N/A	0	#N/A	0	0
0	HRSD: James River	0	0	0	0	0	0	0	0	#N/A	0	1	0	1
1	HRSD: York River	0	0	1	0	#N/A	0	0	0	0	0	0	0	0
2	Arlington County Water Pollution Cont	0	1	1	0	0	0	1	0	1	1	0	1	1
4	Alexandria Renew Enterprises	0	2	2	2	2	2	1	0	1	1	2	1	2
1	HRSD: Williamsburg	0	1	0	0	0	0	0	1	1	1	1	1	1
0	Little Falls Run Wastewater Treatment	0	0	0	#N/A	0	0	0	0	0	0	0	#N/A	1
0	Aquia Wastewater Treatment Plant	0	0	0	0	1	0	0	0	1	1	0	1	1
0	Lower Jackson Wastewater Treatment	0	0	0	0	0	1	0	0	#N/A	1	1	1	1
1	H.L. Mooney Advanced Water Reclama	0	0	1	0	0	0	1	1	#N/A	1	1	1	1

VDH SMP Flu A PP Alert System indicating aberrant Alexandria Flu A PP

Aberrant Flu A PP activity activated the VDH WWS Alert System (first time for flu).

Conversations:

- Epi: known butcher shop in sewershed, negative milk surveillance & ESSENCE activity
- DWR: known H5 bird detections
- WWS: known *combined* system

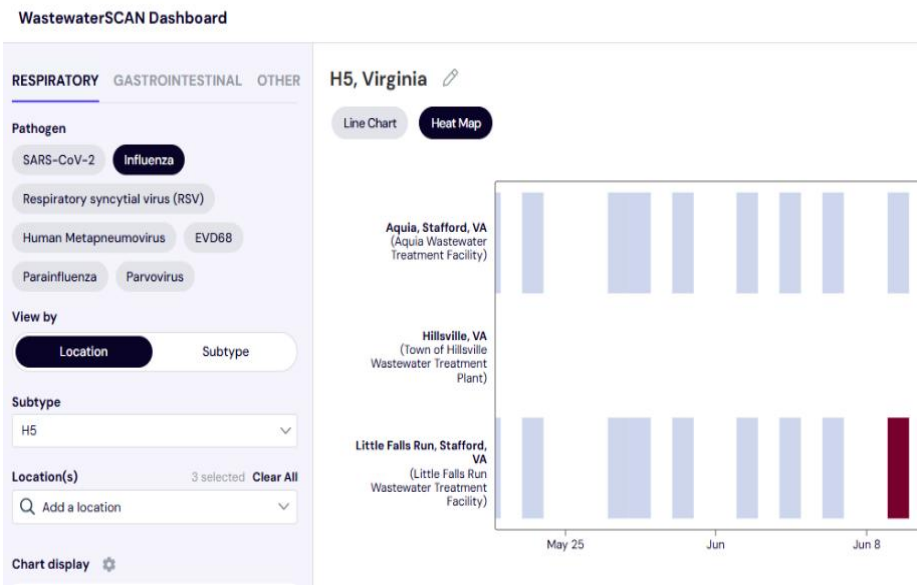
! WWScan H5 Detection !

CDC ⇨VDH WWS

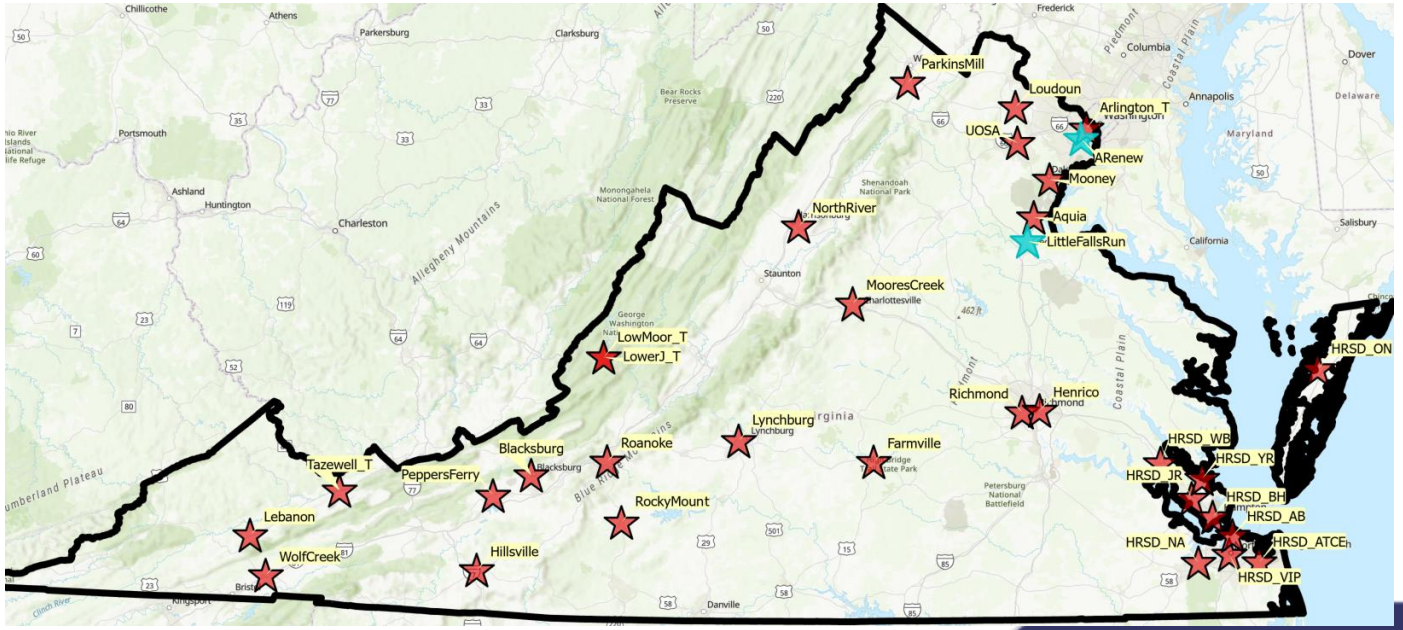
6/12/25

Little Falls Run (6/9 collection) identified H5.

CDC alerted VDH WWS & Epi, engaging the CDC H5 Checklist.



WWScan public dashboard indicating LFR H5 detection



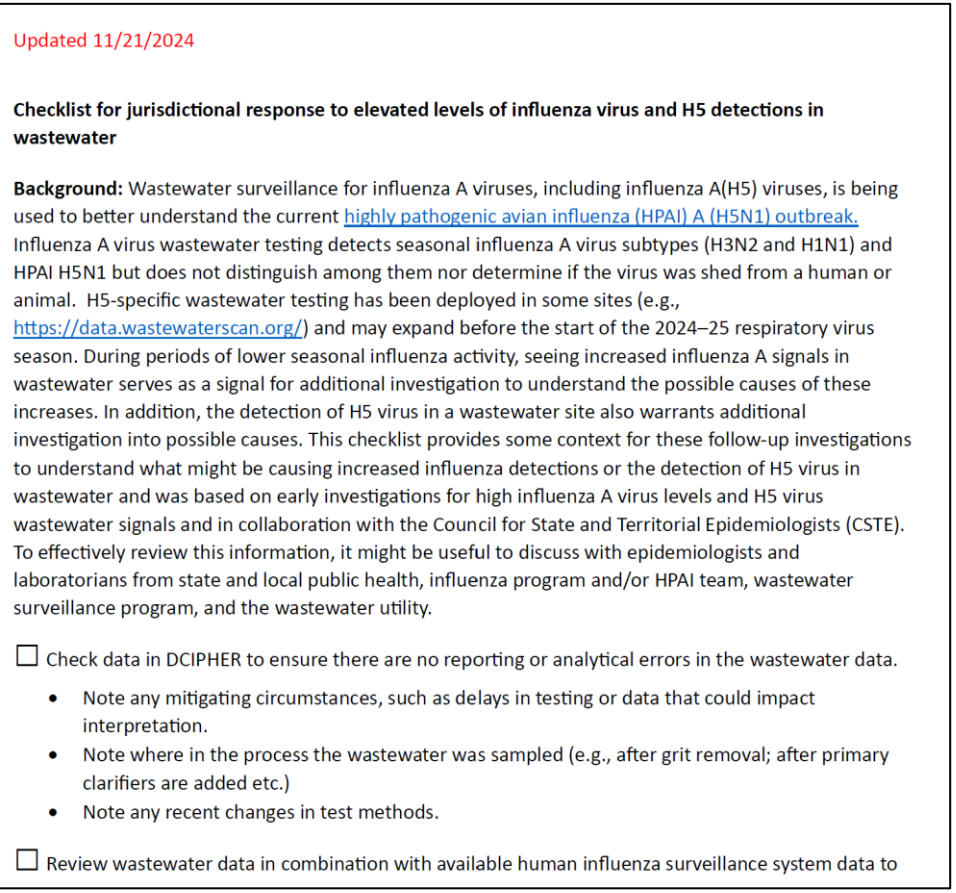
SMP Sites: Alexandria and LFR highlighted blue

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

! WWScan H5 Detection !

CDC ⇨VDH WWS

6/12/25



Updated 11/21/2024

Checklist for jurisdictional response to elevated levels of influenza virus and H5 detections in wastewater

Background: Wastewater surveillance for influenza A viruses, including influenza A(H5) viruses, is being used to better understand the current highly pathogenic avian influenza (HPAI) A (H5N1) outbreak. Influenza A virus wastewater testing detects seasonal influenza A virus subtypes (H3N2 and H1N1) and HPAI H5N1 but does not distinguish among them nor determine if the virus was shed from a human or animal. H5-specific wastewater testing has been deployed in some sites (e.g., https://data.wastewaterscan.org/) and may expand before the start of the 2024–25 respiratory virus season. During periods of lower seasonal influenza activity, seeing increased influenza A signals in wastewater serves as a signal for additional investigation to understand the possible causes of these increases. In addition, the detection of H5 virus in a wastewater site also warrants additional investigation into possible causes. This checklist provides some context for these follow-up investigations to understand what might be causing increased influenza detections or the detection of H5 virus in wastewater and was based on early investigations for high influenza A virus levels and H5 virus wastewater signals and in collaboration with the Council for State and Territorial Epidemiologists (CSTE). To effectively review this information, it might be useful to discuss with epidemiologists and laboratorians from state and local public health, influenza program and/or HPAI team, wastewater surveillance program, and the wastewater utility.

☐ Check data in DCIPHER to ensure there are no reporting or analytical errors in the wastewater data.

- Note any mitigating circumstances, such as delays in testing or data that could impact interpretation.
- Note where in the process the wastewater was sampled (e.g., after grit removal; after primary clarifiers are added etc.)
- Note any recent changes in test methods.

☐ Review wastewater data in combination with available human influenza surveillance system data to

CDC H5 WWS Jurisdiction Checklist for H5 Detection

CDC Checklist:

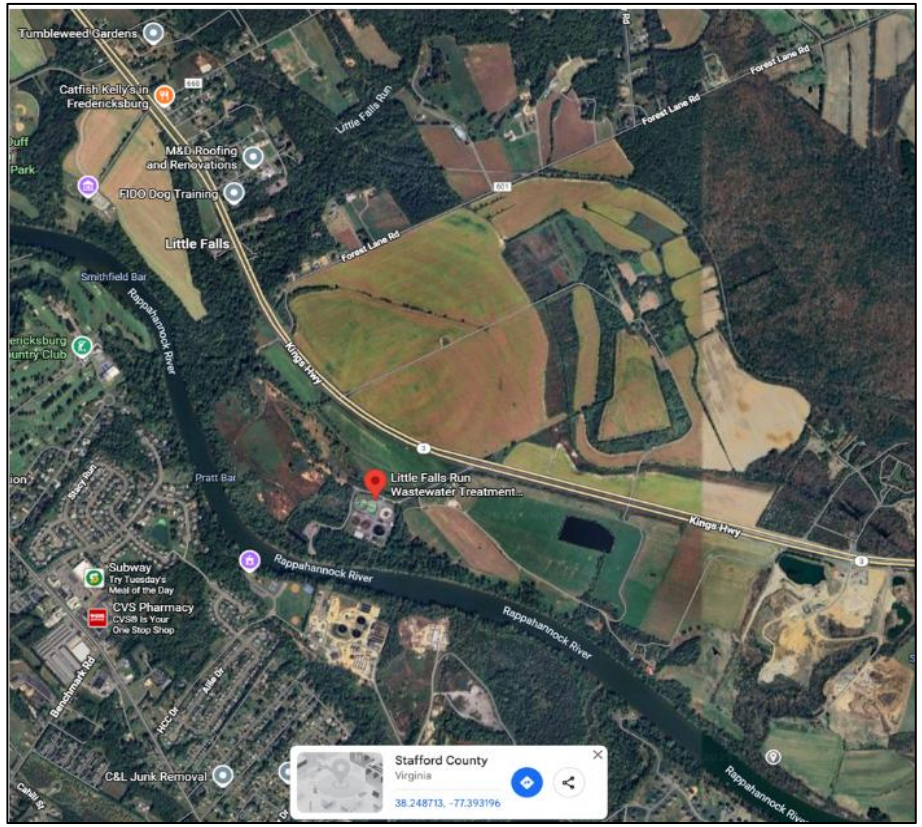
- Lab: data errors / methods changes
- Human flu: flu/syndromic datasets context
- WWTP: sewershed inputs
- WWS: option for additional testing
- Agricultural & environmental inputs: testing context
- Next Step: communication plan/talking points

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

! WWScan H5 Detection !

CDC ⇨VDH WWS

6/12/25



LFR Google aerial view

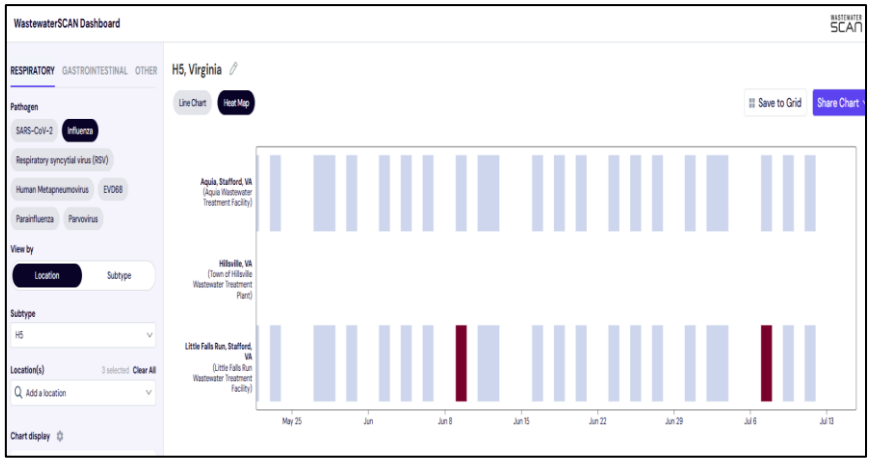
Conversations:

- WWScan: confirmed no data errors
- Epi: confirmed low clinical Flu A cases / no H5 in humans
- LFR: inquired about connected septic discharges at facility (Stafford homes), any unknown livestock truck washing (none), and the wide agricultural fields / open WWTP tanks
- OEHS: confirmed no permitted dairy/milk processing facilities/live poultry markets in sewershed; one meat processing facility
- DWR: known H5 bird detections in Northern VA / some red foxes
- VDACS: no bulk milk specimen detections from VA dairies (National Milk Testing Strategy Surveillance Program) – VA "Unaffected" status; no identified domestic (livestock/poultry) animal detections presently

! WWScan H5 Detection #2 !

CDC ⇨ VDH WWS

7/9/25



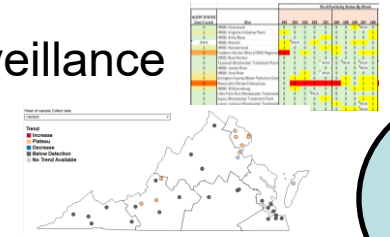
WWScan public dashboard indicating 2x LFR H5 detections

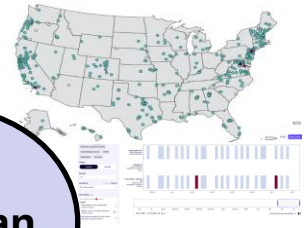
Second Little Falls Run (7/7 collection) identified H5. CDC alerted VDH WWS & Epi, engaging the CDC H5 checklist again.

Conversations:

- WWScan: confirmed no data errors, inquired about LOD (conc 4x LOD)
- Epi: confirmed low clinical Flu A cases / no H5 in humans
- LFR: further inquired about hauled waste & request for pump out logs
- VDACS: confirmed no current detections in poultry/livestock species
- H5N1 Workgroup: reported Richmond black vulture mortalities

VDH WWS:
Wastewater Surveillance Program





CDC NWSS:
National Wastewater Surveillance System
Contractors: WWScan, Verily

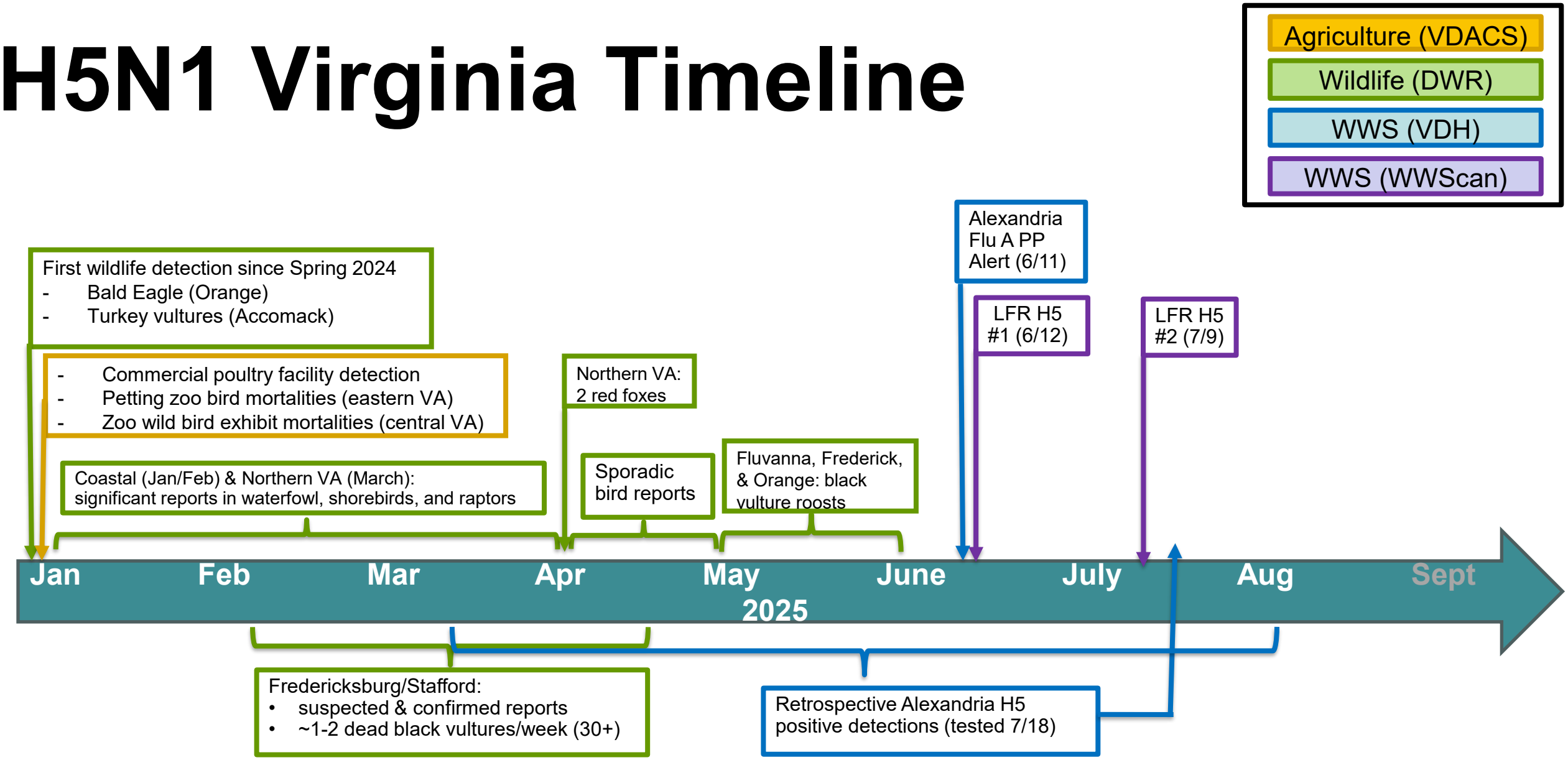
WWTP:
Wastewater Treatment Plant
Point of Contact

VDH Epidemiology:
Office of Epidemiology (OEpi)

VDACS:
Department of Agriculture and Consumer Services
Office of Veterinary Services

Virginia DWR:
Department of Wildlife Resources
State Wildlife Veterinarian

H5N1 Virginia Timeline



*Dairy cattle H5-free status; no poultry detections after January

SMP H5 Retrospective Testing

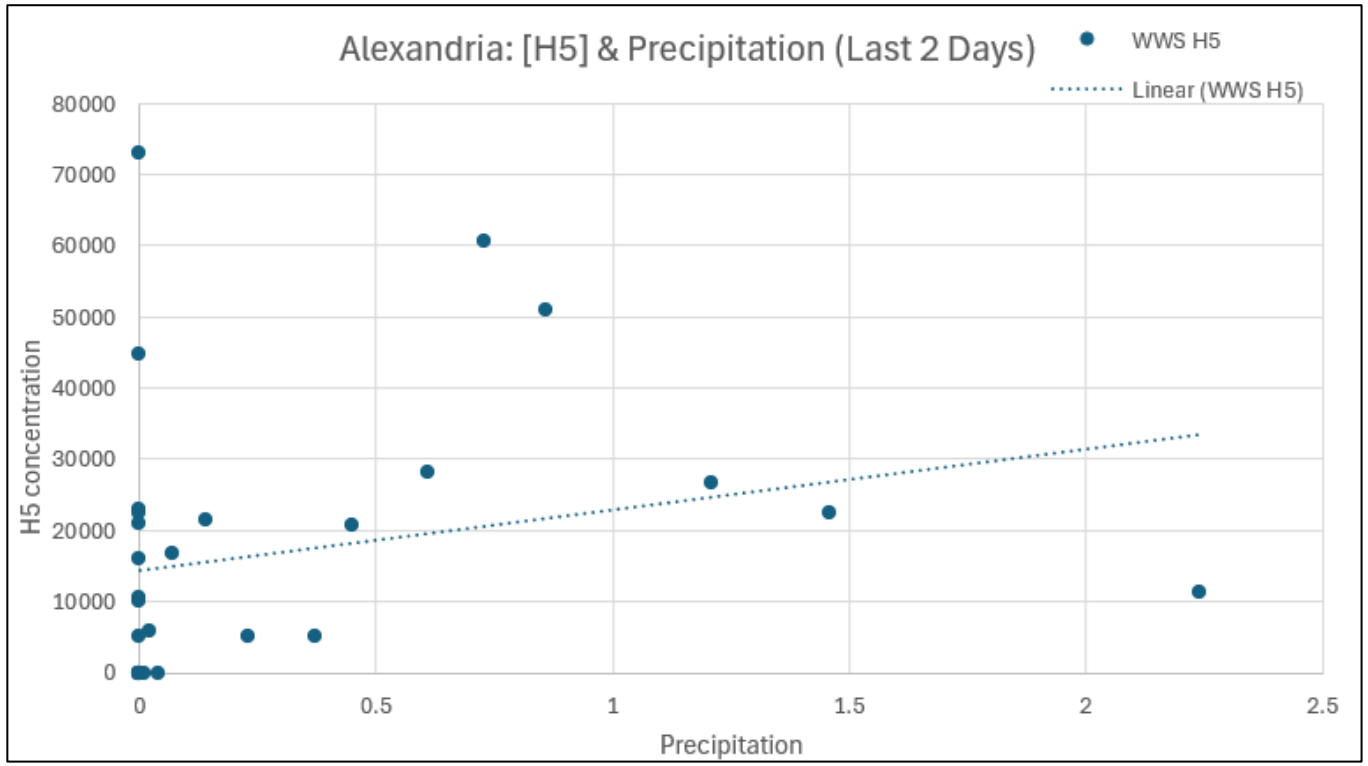
Wk	Target	Date	Site	Positive	Pos>LOD	Detects:
183.0	FLUAV A H5	3/10/2025	Alexandria Renew Enterprises	1	1	305%
183.5	FLUAV A H5	3/12/2025	Alexandria Renew Enterprises	1	1	500%
185.0	FLUAV A H5	3/24/2025	Alexandria Renew Enterprises	1	1	146%
185.5	FLUAV A H5	3/26/2025	Alexandria Renew Enterprises	1	1	144%
188.5	FLUAV A H5	4/16/2025	Alexandria Renew Enterprises	0	0	0%
189.5	FLUAV A H5	4/23/2025	Alexandria Renew Enterprises	0	0	0%
190.0	FLUAV A H5	4/28/2025	Alexandria Renew Enterprises	0	0	0%
191.0	FLUAV A H5	5/5/2025	Alexandria Renew Enterprises	1	1	349%
191.5	FLUAV A H5	5/7/2025	Alexandria Renew Enterprises	1	0	40%
192.0	FLUAV A H5	5/12/2025	Alexandria Renew Enterprises	1	1	156%
192.5	FLUAV A H5	5/14/2025	Alexandria Renew Enterprises	1	0	78%
193.0	FLUAV A H5	5/19/2025	Alexandria Renew Enterprises	0	0	0%
193.5	FLUAV A H5	5/21/2025	Alexandria Renew Enterprises	1	1	192%
194.0	FLUAV A H5	5/26/2025	Alexandria Renew Enterprises	0	0	0%
195.5	FLUAV A H5	6/4/2025	Alexandria Renew Enterprises	0	0	0%
196.0	FLUAV A H5	6/9/2025	Alexandria Renew Enterprises	1	1	115%
196.5	FLUAV A H5	6/11/2025	Alexandria Renew Enterprises	1	1	154%
197.0	FLUAV A H5	6/16/2025	Alexandria Renew Enterprises	1	1	154%
198.0	FLUAV A H5	6/23/2025	Alexandria Renew Enterprises	0	0	0%
199.0	FLUAV A H5	6/30/2025	Alexandria Renew Enterprises	1	0	34%
199.5	FLUAV A H5	7/2/2025	Alexandria Renew Enterprises	1	1	142%
200.0	FLUAV A H5	7/7/2025	Alexandria Renew Enterprises	0	0	0%
200.5	FLUAV A H5	7/9/2025	Alexandria Renew Enterprises	1	1	182%
201.0	FLUAV A H5	7/14/2025	Alexandria Renew Enterprises	1	0	34%
201.5	FLUAV A H5	7/16/2025	Alexandria Renew Enterprises	1	0	36%
202.0	FLUAV A H5	7/21/2025	Alexandria Renew Enterprises	1	0	71%
202.5	FLUAV A H5	7/23/2025	Alexandria Renew Enterprises	1	1	109%
203.0	FLUAV A H5	7/28/2025	Alexandria Renew Enterprises	1	1	414%
203.5	FLUAV A H5	7/30/2025	Alexandria Renew Enterprises	0	0	0%
204.0	FLUAV A H5	8/4/2025	Alexandria Renew Enterprises	1	0	69%

VDH SMP H5 retrospective analysis of fridged Alexandria samples indicating many positive samples

When retrospective testing was applied to fridged Alexandria samples, substantial H5 signal was discovered at least as far back as March.

Environmental Input: Rainfall

Recent H5 concentrations were likely affected by rain.



Linear regression of VDH SMP H5 retrospective fridged Alexandria samples indicating relationship of local precipitation and H5 concentration

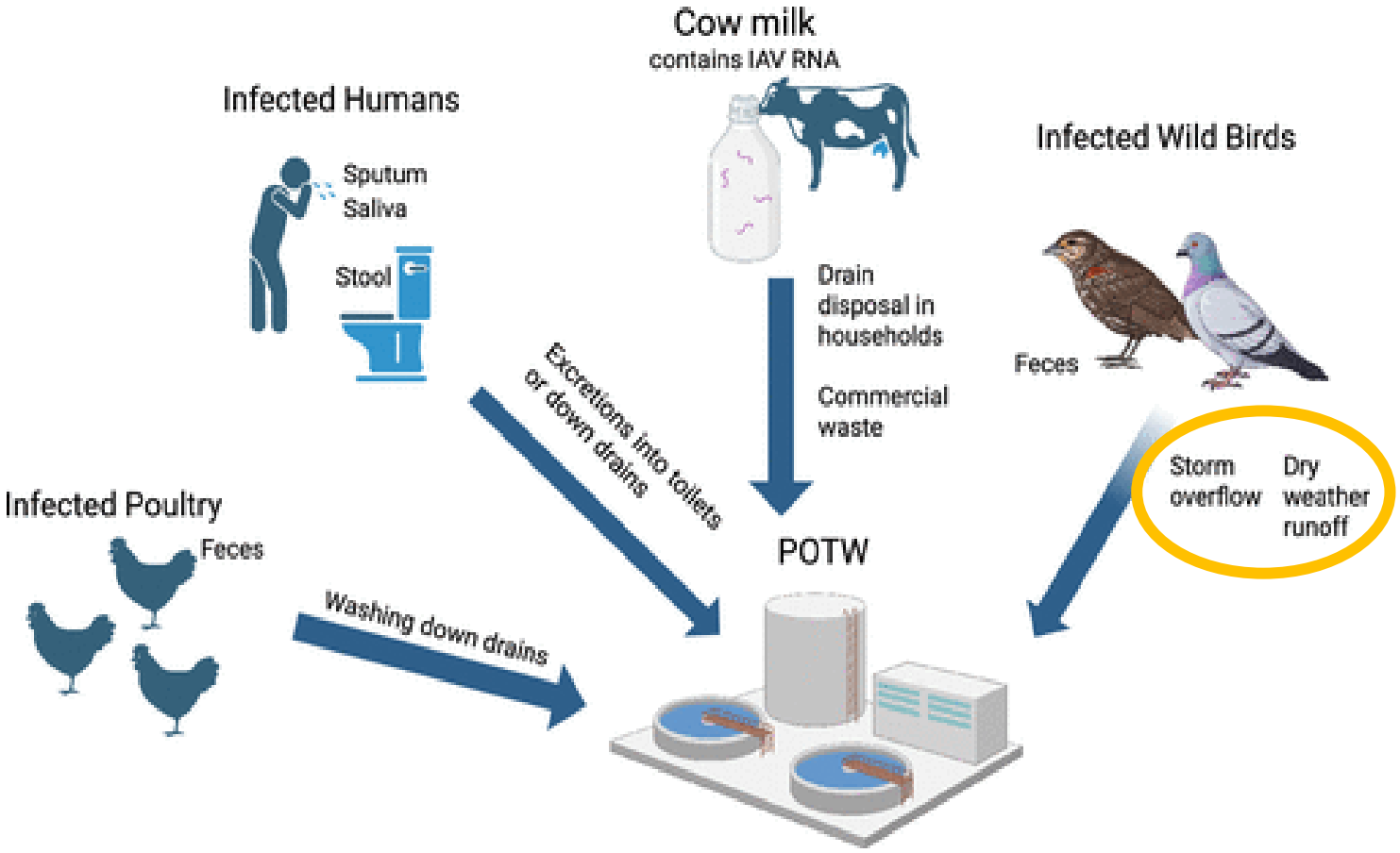
H5 VL* & Rainfall Correlation **n=30**

	R	T-stat	P-value (2-tailed)
Same Day	0.326	1.825	0.079
Last 2 Days	0.333	1.871	0.072
Last 3 Days	0.322	1.799	0.083
Last 4 Days	0.291	1.609	0.119
Last 5 Days	0.206	1.113	0.275

Correlation Coefficient of H5 VL* and local precipitation

Samples: 30 fridged back-tested Alexandria H5 tests (3/10/26 to 8/4/26)

Signal Source Inference



Source tracking H5 in wastewater conceptual image (Paulos et al., 2025)

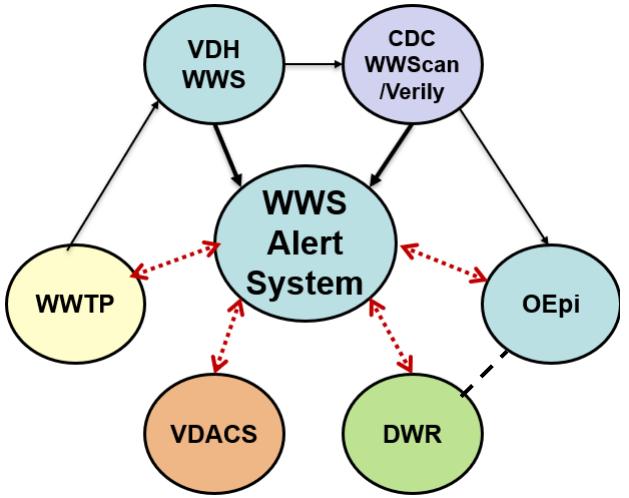
Considering:

1) Lack of human cases
2) Lack of agricultural cases
3) Known environmental detections (wild birds)
4) Precipitation correlation

The H5 signal source was inferred to be wild bird runoff.

Conclusion

- *Interconnectedness* of sewage, humans, agriculture, and environment
- WWS can provide early, independent warning
  - Flu A PP Alert identified aberrant Flu A
  - WWScan identified H5
- Checklist/meetings concluded likely wild bird environmental input for LFR & Alexandria
- WWS can sometimes capture environmental inputs!



And a Special Thanks to…

DWR: John Tracey, DVM

VDACS: Carolyn Bissett, DVM, MPH, DACVPM

VDH OEPI: Tracy Woodall, DVM, MPH; Jenny Crain, MS, MPH, CPH; Elena Diskin, MPH

VDH OEHS WWS: Haniyyah Majeed, MS; Torin Honaker; Marti Caroline, MPH; Isaiah Omerhi, MPH; and Lance Gregory

WWTPs: Alexandria Renew Enterprises, Little Falls Run Wastewater Treatment Facility

Questions?