Final Abstract

Final Report Approved on October 29, 2026

M.L. 2023 Project Abstract

For the Period Ending June 30, 2026

Project Title: Emerging Issues: Highly Pathogenic Avian Influenza Virus in Wildlife (23)

Project Manager: Arno Wuenschmann

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Funding Source:

Fiscal Year:

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 10b-2

Appropriation Amount: $382,000

Amount Spent: $382,000

Amount Remaining: -

Sound bite of Project Outcomes and Results

A network of wildlife health professionals (including wildlife veterinarians, wildlife rehabilitators, DNR and tribal field biologists) was established. Ninety-nine birds and 8 mammals of a total of 4,192 birds and 1,998 mammals were infected with a minimum of two subclades of highly pathogenic avian influenza virus.

Summary of Project and Outcomes

We received samples from 13 organizations including the Minnesota Department of Natural Resources, the four largest wildlife rehabilitation centers in Minnesota, three Minnesota zoos, and five tribal nations. The samples originated from 74 of the 87 counties in Minnesota. As of July 27, 2026, we have tested oropharyngeal and cloacal/rectal swab samples of a total of 6,190 animals including 4,192 birds and 1,998 mammals. The test results were reported to the submitting partners within 3 business days unless, on very rare occasions, a testing failure occurred prompting retesting and delaying the results by 1 to 2 days. We have identified 107 animals (99 birds and 8 mammals) that were positive for influenza A virus. The positive samples came from 39 counties. All samples that were tested at the national reference lab (National Veterinary Services Laboratories) for H5 and for the mutation specific for the highly pathogenic avian influenza virus variant, proved to be highly pathogenic avian influenza virus variants. The Schroeder lab confirmed that 45 out of

100 (45%) positive samples tested to-date were shedding viable H5 viruses based on the viability assay. So far 37 HPAI viruses originating from birds and 5 viruses from mammals (4 skunks and 1 red fox) were successfully grown in culture. In addition, the genome of 49 influenza A viruses originating from birds were partially or entirely sequence. All identified viruses fall into the D.1.1 clade of the highly pathogenic avian influenza A virus clade 2.3.4.4b virus type but can be differentiated into two subclades (D1.1 virus 1 and D1.1 virus 2).

Project Results Use and Dissemination

The core of a network of wildlife health professionals (including wildlife veterinarians, wildlife rehabilitators, DNR and tribal biologists) was established. This network is essential for the investigation of present and future disease outbreaks in Minnesota wildlife. The results of the study inform not only the wildlife health care community but also the agricultural sector and human health care workers about the true impact and spread of highly pathogenic influenza virus across Minnesota. Furthermore, the characterization of the genetic makeup of the viruses from birds and mammals allows to track the potential threat of influenza spillover between wildlife and humans.

Environment and Natural Resources Trust Fund

M.L. 2023 Approved Final Report

General Information

Date: November 2, 2026

ID Number: 2023-260

Staff Lead: Michael Varien

Project Title: Emerging Issues: Highly Pathogenic Avian Influenza Virus in Wildlife (23)

Project Budget: $382,000

Project Manager Information

Name: Arno Wuenschmann

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Project Reporting

Final Report Approved: October 29, 2026

Reporting Status: Project Completed

Date of Last Action: October 29, 2026

Project Completion: June 30, 2026

Legal Information

Legal Citation: M.L. 2023, Chp. 60, Art. 2, Sec. 2, Subd. 10b-2

Appropriation Language: $767,000 the first year is from the trust fund to the Legislative-Citizen Commission on Minnesota Resources to an emerging issues account authorized in Minnesota Statutes, section 116P.08, subdivision 4, paragraph (d).

Appropriation End Date: June 30, 2026

Narrative

Project Summary: To establish a Minnesota wildlife virus surveillance program that can serve as a new resource for future virus outbreaks in Minnesota, whether of HPAI virus origin or new emerging diseases

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Highly pathogenic avian influenza (HPAI) virus is an emerging and ongoing disease threat to the health of MN wildlife, poultry, livestock and humans. Previous HPAI outbreaks such as the 2015 outbreak, were short-lived, having ceased within a few months of it's introduction to the Minnesota wild bird population. The current H5N1 HPAI outbreak continues as best evidenced by the detection of the virus on 22 poultry premises in Minnesota in 2024, alone (172 affected premises since March of 2022). To make matters worse, the 2022 H5N1 HPAI variant has manifested itself in unpredicted forms such as the death of wild mammals (including foxes, bears, mice and others) and in dairy goat kits. Furthermore, the virus has caused widespread infection of dairy cows since March 2024. As resources are being allocated for HPAI-related research on the agricultural and human side, surveillance of wildlife meanwhile has been largely discontinued so that the impact of HPAI on Minnesota's wildlife populations is currently impossible to assess. In this sense, the detection of the virus in a red fox kit in Minnesota in May 2024, likely represents the tip of the iceberg. Therefore the time is now to establish a Minnesotan wildlife virus surveillance program.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

The University of Minnesota is uniquely positioned to study the diversity of HPAI viruses because it has one of only very few Select Agent Biosecurity Level 3 (BSL-3) labs in the nation permitted to work with various HPAI viruses. We propose six research activities. Activity 1: Establishing a wildlife health network throughout Minnesota consisting at its core of DNR-approved wildlife rehabilitators and tribal biologists. Activity 2: Creation of materials to train rehabilitators and tribal biologists in collecting appropriate samples with the necessary metadata and submitting the samples to Minnesota Veterinary Diagnostic Laboratory (MVDL) in a biosecure fashion. Activity 3: Collecting and testing of 9,000 oropharyngeal and/or cloacal swabs from free-ranging birds and mammals Minnesota-wide for HPAI virus via RT-qPCR at MVDL. Activity 4: Running a newly established assay developed in the Schroeder Lab that quickly confirms the presence of live HPAI infection in samples. Activity 5: Performing virus isolation in the secure BSL-3 Veterinary Isolation Facility at the College of Veterinary Medicine of the University of Minnesota for any samples that tested positive in activity 4. Activity 6: Reporting results to the submitters in real time. Reporting anonymized results to the public in weekly updates.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

The proposed study outcomes is a better understanding of which wild animal species, may serve as reservoir for HPAI virus and to begin a Minnesota wildlife virus surveillance program with reference library of HPAI virus isolates that can be used in the future to characterize the virus with the goal to identify specific mutations. To do so, we will establish a Minnesota Wildlife Health Network. Members will be trained in sample collection. Knowledge of the viral diversity is necessary in guiding mitigation strategies (preventative or remediative) for wildlife and in formulating warnings for the public (agriculture and health communities).

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Activities and Milestones

Activity 1: Establishing a wildlife health network throughout Minnesota consisting at its core of DNR-approved wildlife rehabilitators and tribal biologists

Activity Budget: $106,772

Activity Description:
In collaboration with Partners, in particular the Wildlife Rehabilitation Center of Minnesota, we will establish a ”Minnesota Wildlife Health Network”. This network will include other wildlife rehab organizations across the state such as the Department of Natural Resources, Wildlife biology departments of tribal nations, MN zoo and Como zoo, National Wildlife refuges/Voyageur National Park, Humane Society (wildlife unit) and Others (e.g. exterminators).

Activity Milestones:

Description	Approximate Completion Date
Minnesota Wildlife Health Network agreement	July 31, 2025
Minnesota Wildlife Health Network membership policy	December 31, 2025
Minnesota Wildlife Health Network recruitment	June 30, 2026

Activity 2: Creation of materials to train rehabilitators and tribal biologists in collecting and submitting appropriate samples

Activity Budget: $62,147

Activity Description:
Creation of sampling kits to be assembled from various sources. This include the cloacal/oropharyngeal swabs (provided by the VDL), virus culture media, tubes and labels (third party companies). These are to be used on birds and mammals by members of the Minnesota Wildlife Health Network (Activity 1) that will be posted to the VDL for testing of HPAI. We will also train the members, rehabilitators and tribal biologists in collecting appropriate samples with the necessary metadata and submitting the samples to Minnesota Veterinary Diagnostic Laboratory (MVDL) in a biosecure fashion. We will also create simple videos of "how to sample and data input" for partners to follow.

Activity Milestones:

Description	Approximate Completion Date
Procure and assemble sampling kits	December 31, 2025
Mailing of sampling kits to Minnesota Wildlife Health Network membership	June 30, 2026
Training video for Minnesota Wildlife Health Network membership is samping and metadata collection	June 30, 2026

Activity 3: Collecting and testing of samples from free-ranging birds and mammals Minnesota-wide for HPAI virus via RT-qPCR

Activity Budget: $70,936

Activity Description:
Testing of 1,800 samples from free-ranging birds and mammals Minnesota-wide for HPAI virus via RT-qPCR of oropharyngeal and/or cloacal swabs at MVDL. The RT-qPCR assay targets the Influenza A Virus Matrix gene.

Activity Milestones:

Description	Approximate Completion Date
RNA extraction for virus genomes from 1,800 samples	June 30, 2026
Performing Influenza A Virus Matrix Real-Time PCR assays on 1,800 samples	June 30, 2026

Activity 4: Running a newly established assay that quickly confirms the presence of live HPAI infection

Activity Budget: $92,740

Activity Description:
The viability qPCR (V-qPCR) assay utilizes viability dyes, such as propidium monoazide (PMA), prior to nucleic acid extraction and PCR (for DNA viruses) or RT-PCR (for RNA viruses) to evaluate the state of the virion directly. If intact, the virus is considered “viable” and thus retains the potential to cause disease and therefore can be cultured in the lab. The photoreactive dye is membrane-impermeant dye that will selectively penetrate virions which have compromised or damaged, and are thereby considered dead or non-viable. Here we will use this new techniques using the dedicated equipment (Virus nucleic extraction system & qPCR machine) purchased for this project to ensure that we don't get false positives due to cross-contamination from Ag projects. Extracted viral nucleic acids will be stored in the -80C.

Activity Milestones:

Description	Approximate Completion Date
Screening of MVDL HPAI positive samples using V-qPCR method	June 30, 2026
Tabulation of the qPCR results	June 30, 2026
Sharing and publication of preliminary V-qPCR results with Minnesota Wildlife Health Network membership	June 30, 2026

Activity 5: Performing virus isolation in the secure BSL-3 Veterinary Isolation Facility

Activity Budget: $22,744

Activity Description:
All HPAI positive live samples as confirmed by the viability qPCR assay, will be transferred from the Schroeder Lab to the VIF BSL-3 University of Minnesota laboratory. HPAI will be grown in MDCK cell cultures, purified and sequenced. The sequencing will be carried out using the Oxford Nanopore Technologies sequencing MinION platform in the VIF BSL-3 lab. Virus stocks will be stored at -80C for long-term storage.

Activity Milestones:

Description	Approximate Completion Date
Creation of an isolate library of HPAI collected from the Minnesota wildlife	June 30, 2026
Assembly and submission of the reference HPAI genomes to a national bioinformatics database	June 30, 2026
Sharing and publication of preliminary sequencing results with Minnesota Wildlife Health Network membership	June 30, 2026

Activity 6: Reporting of results

Activity Budget: $26,661

Activity Description:
Given the extensive data management and aggregation, we will assemble the spatial layers for data projection, establish a protocol for data management, develop a pipeline for new data integration into mapping tools. We will create a 1-2-3

Survey instrument for data collection. We will clean and add new data into the pipeline for aggregation and dissemination on a weekly basis.

Activity Milestones:

Description	Approximate Completion Date
First iteration of pipeline development for aggregation and dissemination of data on a weekly	September 30, 2025
Assemble the spatial layers collected from the Minnesota Wildlife Health Network for data projection,	June 30, 2026
Establish a final protocol for data management & develop a pipeline for new data integration into	June 30, 2026

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
While we recognize the importance of HPAI on human health, it is critical to provide outreach regarding the value of protecting our wildlife bird and mammal species in Minnesota against HPAI. We propose an educational campaign (via our website) that increases understanding of the risk HPAi poses to our wildlife in Minnesota. Everyone will be kept updated as to progress made throughout the project by means of a well-managed and curated website. Primary data will first be shared with the Minnesota Wildlife Health Network. Interactive maps and easily digestible final summary data outputs will be made available to the public and updated on a weekly basis. We will also submit our result to peer-reviewed scientific journals.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
This project will continue into 2027 with the funding allocated to 2024-306

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount	$ Amount Spent	$ Amount Remaining
Personnel										
Project Investigator		Oversee the project, work with partners, and be responsible for reporting the results			36.6%	0.05		$12,737	-	-
Project Manager & Co-PI		Will maintain the online submission portal, train the TBN Researcher 6 for BSL3 work, design the experiments, co-ordinate the final data analysis, work with PI and partners and assist PI in reporting the results.			36.6%	0.13		$27,278	-	-
Co-I		Will serve as liaison with tribal partners, set up DSOAs with participating tribes, oversee and advise the data management, analysis and aggregation team.			36.6%	0.04		$7,688	-	-
Researcher		Will work closely with and provide expert support to VPH resident on data management and aggregation, assemble the spatial layers for data projection, establish a protocol for data management, develop a pipeline for new data integration into mapping tools.			32.3%	0.05		$4,885	-	-
Program admin		Will enter the metadata (such as finder's name, submitter, location of animal, date of detection of the animal, species) into the lab's IT system.			32.2%	0.03		$2,186	-	-
IT professional		Will extract the date and transfer the data to the epidemiology group			36.6%	0.02		$1,683	-	-
BSL-3 Researcher		To co-ordinate the transfer of HPAI positive samples to the BSL3 facilities. Install the new equipment in the BSL-3 lab and perform the PCR tests, virus isolation and sequencing of the new HPAI variants. Finally, to write the first draft of the BSL-3 focused manuscripts.			36.6%	0.5		$44,395	-	-

VPH Resident		Will create a 1-2-3 Survey instrument for data collection, create a simple video of sampling and data input for partners to follow, assemble, clean and add new data into the pipeline for aggregation and dissemination on a weekly basis.			7.4%	0.1		$5,184	-	-
							Sub Total	**$106,036**	**$106,036**	**-**
Contracts and Services										
							Sub Total	**-**	**-**	**-**
Equipment, Tools, and Supplies										
	Tools and Supplies	Influenza A Virus Matrix Real-Time PCR tests	Testing of samples (5,739 @ $38.50) from free-ranging birds and mammals Minnesota-wide for HPAI virus via RT-qPCR of oropharyngeal and/or cloacal swabs at MVD/eachL					$220,964	$220,964	-
							Sub Total	**$220,964**	**$220,964**	**-**
Capital Equipment										
		Dedicated liquid handler with viral extraction and PCR capability	For semi-automated viral nucleic acid extraction & qPCR testing on wildlife samples.	X				$55,000	$55,000	-
							Sub Total	**$55,000**	**$55,000**	**-**
Acquisitions and Stewardship										
							Sub Total	**-**	**-**	**-**
Travel In Minnesota										
							Sub Total	**-**	**-**	**-**

Travel Outside Minnesota										
							Sub Total	**-**	**-**	**-**
Printing and Publication										
							Sub Total	**-**	**-**	**-**
Other Expenses										
							Sub Total	**-**	**-**	**-**
							Grand Total	**$382,000**	**$382,000**	**-**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Equipment		Dedicated liquid handler with viral extraction and PCR capability	To prevent cross-contamination of HPAI from commercial sources, we require the purchase and implementation of a semi-automated pathogen screening workflow with dedicated equipment assigned to MN ENTRF wildlife projects. **Additional Explanation :** The equipment will be located in a lab that is only accessible to the Schroeder Lab staff. So it will be a dedicated capital purchase that will target current and future ENTRF MN wildlife focussed research.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount	$ Amount Spent	$ Amount Remaining
State						
			State Sub Total	**-**	**-**	**-**
Non-State						
			Non State Sub Total	**-**	**-**	**-**
			Funds Total	**-**	**-**	**-**

Attachments

Required Attachments

Visual Component

File: 4b560a3d-458.pdf

Alternate Text for Visual Component

An overview of the project objectives...

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Spa Approval	249674bb-a17.pdf
Image 1 (for April 01, 2026 status update report)	0fd4991f-7d3.pdf

Media Links

Title	Link
Field Sampling and Submission Procedures for HPAI Testing in Wildlife	https://mediaspace.umn.edu/media/t/1_8tand060
HPAI Wildlife Survey Tool	https://mediaspace.umn.edu/media/t/1_17p7ajaj
About the Minnesota Avian Influenza Virus Dashboard	https://www.arcgis.com/apps/dashboards/d9b5e5819c9340369fb259a9dc893059#
Surveillance program of Minnesota Wildlife for avian influenza virus, including highly pathogenic avian influenza virus	https://vdl.umn.edu/resources/disease-resources/avian-influenza/minnesota-wildlife-avian-influenza-program/about

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

We added further clarification to the final activity milestones indicating whether these are final or temporary reports. Also clarified the equipment justification and moved them to capital equipment category.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

Yes

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

N/A

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR's reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements

N/A

Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Justification For Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Project Manager	Previous Manager: Declan Schroeder (dcschroe@umn.edu) New Manager: Arno Wuenschmann (wunsc001@umn.edu)	SPA needs Dr Wuenschmann on the project documentation	January 29, 2025	Yes	January 30, 2025

Status Update Reporting

Final Status Update August 14, 2026

Date Submitted: August 12, 2026

Date Approved: October 14, 2026

Overall Update

We received samples from 13 organizations including the Minnesota Department of Natural Resources, the four largest wildlife rehabilitation centers in Minnesota, three Minnesota zoos, and five tribal nations. As of July 27, 2026, we have tested a total of 6,190 animals including 4,192 birds and 1,998 mammals. We have identified 107 animals (99 birds and 8 mammals) that were positive for influenza A virus. All samples that were tested at the national reference lab for H5 and for the mutation specific for the highly pathogenic avian influenza virus variant, proved to be highly pathogenic avian influenza virus variants. The Schroeder lab confirmed that 45 out of 100 (45%) positive samples tested to-date were shedding viable H5 viruses based on the viability assay. So far 37 HPAI viruses originating from birds and 5 viruses from mammals (4 skunks and 1 red foxes) were successfully grown in culture. In addition, the genome of 49 influenza A viruses originating from birds were partially or entirely sequence. All identified viruses fall into the D.1.1 clade of the highly pathogenic avian influenza A virus clade 2.3.4.4b virus type but can be differentiated into two subclades.

Activity 1

We have received samples for this study from thirteen partners. These partners include the Minnesota Department of Natural Resources (DNR), five tribal nations located in Minnesota (Red Lake Nation, Leech Lake Band of Ojibwe, Grand Portage Band of Lake Superior Chippewa, Shakopee Mdewakanton Sioux Community, and Fond Du Lac Band of Lake Superior Chippewa), four Minnesota wildlife rehabilitation centers (Minnesota Wildlife Rehabilitation Center (WRC) in St. Paul, Wild and Free in Garrison, Wildwoods Rehabilitation Center in Duluth, and The Raptor Center in St. Paul), and three Minnesota zoos (Minnesota Zoo in Apple Valley, Lake Superior Zoo in Duluth, and Como Zoo in St. Paul). Recruitment of partners to expand the network is still being pursued ad hoc.

Activity 2

We have finalized and disseminated two instructional videos. The first instructional video demonstrates how to take the samples and how to ship the samples maintaining the cold chain. The second video demonstrates which supportive data are needed with every sample and how to enter and transmit these data.
These videos can be viewed using the following links:
Field Sampling and Submission Procedures for HPAI Testing in Wildlife
(https://mediaspace.umn.edu/media/t/1_8tand060)
HPAI Wildlife Survey Tool (https://mediaspace.umn.edu/media/t/1_17p7ajaj)
We have assembled sample kits that have been distributed to the partners. The kits consist at their core of swabs, tubes with broth (aka viral media), and barcode. The tubes with broth require the maintenance of a cold chain.
(This activity marked as complete as of this status update)

Activity 3

We have tested 4,192 birds and 1,998 mammals (for a total of 6,190 animals) from 74 of the 87 counties in Minnesota. The positive samples came from 39 counties. We have identified a total of 107 samples that were positive for influenza A virus based on detection of the matrix gene of the influenza A virus. Of these, 14 avian samples were received between November 2024 to February 2025, 1 mammal sample was received during the March 2025 to August 2025 period, 55 avian samples and 1 mammal sample were submitted during the September 2025 to December 2025 period, 10 avian samples and 4 mammalian samples were received between January and March 2026, and 20 avian samples and 2 mammalian samples were received during April and July 2026. Hitherto, all samples that were tested at the national

reference lab (National Veterinary Services Laboratory in Ames, Iowa), for H5 and for the mutation specific for the highly pathogenic avian influenza virus variant, proved to be highly pathogenic avian influenza virus variants.

Activity 4

We confirmed that our viability-reverse transcriptase quantitative polymerase chain reaction (V-RT-qPCR) assay can reliably detect and quantify highly pathogenic avian influenza virus (H5N1) variants. 45 out of 100 (45%) of the positive samples tested to-date were confirmed by V-RT-qPCR to have viable viruses present indicating that the animals were shedding viable viruses at the time of collection. These positive samples were simultaneously tested to confirm whether we could bring viable isolates into culture (activity 5).

Activity 5

An aliquot of 100 positive samples collected in activity 3 and screened for viability in activity 4, were used to inoculate MDCK cells for virus isolation and culture. Successful virus culture was confirmed by identifying cytopathic effects in the cell line monolayer via light microscopy. Forty-two samples, including 37 viruses from bird and 5 viruses from mammals (4 skunks and 1 red fox), caused a cytopathogenic effect after only one passage. To date, we screened 100 positive samples from birds and mammals. We successfully sequenced 49 isolates and confirmed that the samples were infected with an avian influenza virus (AIV) HPAI H5N1 D1.1 variant. The detected viruses can be differentiated into two subclades (D1.1 virus 1 and D1.1 virus 2).

Activity 6

All samples have been tested at the Minnesota Veterinary Diagnostic Laboratory within a turnaround time of 3 days. The results have been available to all partners in the requested time interval. Additionally, results are reported on an interactive dashboard (https://vdl.umn.edu/resources/disease-resources/avian-influenza/minnesota-wildlife-avian-influenza-program/minnesota-avian-influenza-virus-dashboard) that shows a map and corresponding table with the number of wildlife samples testing positive for avian influenza and geographic distribution. The map and corresponding table can be filtered by taxa and county. Total number of avian influenza tests conducted, percent of wildlife taxa tested for avian influenza, and a bar chart showing the seasonality of H5 positive samples in Minnesota wildlife are also shown. The dashboard is updated with new results and posted onto the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Dissemination

The webpage for the project is housed on the webpage of the Minnesota Veterinary Diagnostic Laboratory (z.umn.edu/wildlifeinfluenza). The webpage includes the interactive dashboard with map where the results are being displayed. The test results were posted on the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Project members gave multiple oral and poster presentations about the project between February 2025 and July 2026. A list of these presentations is available on the project webpage.

Status Update Reporting

Status Update April 1, 2026

Date Submitted: March 29, 2026

Date Approved: October 14, 2026

Overall Update
We expanded the network of wildlife health professionals contributing to this study to 10 organizations and are working to recruit more organizations. So far (as of March 22, 2026), we have tested a total of 3,335 animals. We have identified 85 animals (79 birds and 6 mammals) that were positive for influenza A virus. Hitherto, all samples that were tested at the national reference lab (National Veterinary Services Laboratory in Ames, Iowa), for H5 and for the mutation specific for the highly pathogenic avian influenza virus variant, proved to be highly pathogenic avian influenza virus variants. The Schroeder lab confirmed that 40 out of 85 (47%) positive samples tested to-date were shedding viable H5 viruses based on the viability assay. So far 23 HPAI viruses originating from birds and 2 viruses from mammal (2 skunks) were successfully grown in culture after a single passage in cells of a susceptible cells line (called MDCK cell line). In addition, the genome of 15 positive viruses originating from birds were partially or entirely sequenced showing evolution of the virus.

Activity 1
Thus far, we have received and tested samples from the Minnesota Wildlife Rehabilitation Center (WRC), the DNR, Red Lake Nation, Leech Lake Band of Ojibwe, Grand Portage Band of Lake Superior Chippewa, Shakopee Mdewakanton Sioux Community, Fond Du Lac Band of Lake Superior Chippewa, Wild and Free Wildlife Rehabilitation organization, the Minnesota Zoo, Lake Superior Zoo, and Como Zoo. Active recruitment of partners to expand the network is being pursued e.g. by outreach via email to potential partners and by presenting the projects at meetings of tribal wildlife biologists (Quarterly Minnesota Tribal Fish and Wildlife Committee meeting – Dec 09, 2025) and wildlife rehabilitators (Minnesota Wildlife Rehabilitation spring training – March 21, 2026).

Activity 2
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Activity 3
We have tested 2,227 birds and 1108 mammals (for a total of 3,335 animals) from 70 of the 87 counties in Minnesota. The positive samples came from 40 counties. We have identified a total of 85 samples that were positive for influenza A virus based on detection of the matrix gene of the influenza A virus. Of these, 14 avian samples were submitted November 2024 to February 2025, 1 mammal sample was submitted during the March 2025 to August 2025 period, 55 avian samples and 1 mammal sample were submitted during the September 2025 to December 2025 period, and 10 avian samples and 4 mammalian samples were submitted between January and March 2026. Hitherto, all samples that were tested at the national reference lab (National Veterinary Services Laboratory in Ames, Iowa), for H5 and for the mutation specific for the highly pathogenic avian influenza virus variant, proved to be highly pathogenic avian influenza virus variants.

Activity 4
We previously confirmed that our viability-reverse transcriptase quantitative polymerase chain reaction (V-RT-qPCR) assay can reliably detect and quantify highly pathogenic avian influenza virus (H5N1) variants. Forty out of 85 (47%) of the positive samples tested to-date were confirmed by V-RT-qPCR to have viable viruses present indicating that the animals were shedding viable viruses at the time of collection. These positive samples were simultaneously tested to confirm whether we could bring viable isolates into culture (activity 5).

Activity 5

An aliquot of each of the 85 positive samples collected in activity 3 and screened for viability in activity 4, were used to inoculate MDCK cells for virus isolation and culture. Successful virus culture was confirmed by identifying cytopathic effects in the cell line monolayer via light microscopy. Twenty five samples caused a cytopathogenic effect after only one passage. To date, we screened all 85 positive samples from birds and mammals. We successfully sequenced 15 positive isolates (see image 1) and confirmed that the samples were infected with an avian influenza virus (AIV) HPAI H5N1 D1.1 variant.

Activity 6

There are no updates beyond the ones reported in the last status update report (Dec. 01, 2025): All samples continue to be tested at the Minnesota Veterinary Diagnostic Laboratory within a turnaround time of 3 days. The results have been available to all partners in the requested time interval. Additionally, results are reported on our interactive dashboard (https://vdl.umn.edu/resources/disease-resources/avian-influenza/minnesota-wildlife-avian-influenza-program/minnesota-avian-influenza-virus-dashboard) that shows a map and corresponding table with the number of wildlife samples testing positive for avian influenza and geographic distribution per time period. The map and corresponding table can be filtered by taxa and county. Total number of avian influenza tests conducted, percent of wildlife taxa tested for avian influenza, and a bar chart showing the seasonality of positive samples in Minnesota wildlife are also shown. The dashboard is updated with new results and posted onto the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Dissemination

There are no updates beyond the ones reported in the last status update report (Dec. 01, 2025): The webpage for the project is housed on the webpage of the Minnesota Veterinary Diagnostic Laboratory (z.umn.edu/wildlifeinfluenza). The webpage includes the interactive dashboard with map where the results are being displayed. The test results were posted on the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Status Update Reporting

Status Update October 1, 2025

Date Submitted: September 29, 2025

Date Approved: December 5, 2025

Overall Update
We expanded the network of wildlife health professionals contributing to this study to 8 organizations and are working to recruit more organizations. So far, we have tested 1486 birds and 516 mammals (for a total of 2002 animals) from 64 of the 87 counties in Minnesota. We have identified 14 avian samples from November 2024 to March 2025 with confirmed infection with highly pathogenic avian influenza virus. The Declan Schroeder lab has successfully installed and tested the new equipment and established protocols for storing the samples, for the viability testing, for molecular characterization of the viruses and for isolation of the virus. So far 1 highly pathogenic avian influenza virus originating from a bald eagle was grown in culture while we were unable to grow virus from 2 more known positive samples.

Activity 1
We completed Data Sharing and Ownership Agreements with the Grand Portage Band of Lake Superior Chippewa, Red Lake Nation, and Shakopee Mdewakanton Sioux Community. In addition, we have a Memorandum of Understanding in place with Red Lake Nation, the Grand Portage Band of Lake Superior Chippewa, Fond Du Lac Band of Lake Superior Chippewa, Leech Lake Band of Ojibwe, and Shakopee Mdewakanton Sioux Community. Thus far, we have received and tested samples from the Minnesota Wildlife Rehabilitation Center (WRC), the DNR, Red Lake Nation, the Grand Portage Band of Lake Superior Chippewa, Wild and Free, the Minnesota Zoo, and Lake Superior zoo.

Activity 2
Completion of this activity was reported in the June 01 status update report.
(This activity marked as complete as of this status update)

Activity 3
We have tested 1486 birds and 516 mammals (for a total of 2002 animals) from 64 of the 87 counties in Minnesota. We have identified 14 avian samples from November 2024 to March 2025 with confirmed infection with highly pathogenic avian influenza virus. Our RT-PCR (see activity 4) and sequencing platform was tested and confirmed using our low-pathogenic influenza variants. A selection of negative AIV samples is archived in the -80C freezer for method development purposes.

Activity 4
Our viability (V) RT-qPCR assay was developed using three low-pathogenic influenza variants in our BSL-2 lab. Standard curves and melt data were generated using H1N1, H4N6, and H7N2 to confirm that our RT-PCR primers can capture a range of influenza variants. Two RT-PCR machines were cross-validated in our BSL-2 laboratory and in our BSL-3 laboratory to ensure accurate virus quantification in both labs. We confirmed that our V-RT-qPCR assay can reliably detect and quantify HPAI H5N1 variants. Suspected positive samples are currently undergoing V-RT-qPCR assay validation to confirm that we can reliably detect viability influenza virus particles before culturing is attempted (activity 5).

Activity 5
We have successfully installed and tested the new equipment and established protocols for storing the samples, for the viability testing (activity 4), for molecular characterization of the viruses and for isolation of the virus. The protocol for virus isolation is as follows: An aliquot of the original sample is inoculated into a susceptible cell line for virus isolation and culture. Successful virus culture is confirmed by microscopy to identify cytopathic effects, and additional RT-qPCR to quantify the virus in the culture. To date, we received 14 AI confirmed positives from birds, one positive HPAI H5N1

sample has been successfully cultured from a bald eagle. Three additional samples are currently being cultured. In addition, we have successfully sequenced one putatively AI H5 positive sample from a falcon.

Activity 6

All samples have been tested at the Minnesota Veterinary Diagnostic Laboratory within the turnaround time of 3 days that was proposed in the Memorandum of Understanding and Data Sharing and Ownership agreements with the partners. The results have been available to all partners in the requested time interval. Additionally, results are reported on an interactive dashboard (https://vdl.umn.edu/resources/disease-resources/avian-influenza/minnesota-wildlife-avian-influenza-program/minnesota-avian-influenza-virus-dashboard) that shows a map and corresponding table with the number of wildlife samples testing positive for avian influenza and geographic distribution. The map and corresponding table can be filtered by taxa and county. Total number of avian influenza tests conducted, percent of wildlife taxa tested for avian influenza, and a bar chart showing the seasonality of positive HPAI tests in Minnesota wildlife are also shown. The dashboard is updated with new results and posted onto the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Dissemination

The webpage for the project is housed on the webpage of the Minnesota Veterinary Diagnostic Laboratory (z.umn.edu/wildlifeinfluenza). The webpage includes the interactive dashboard with map where the results are being displayed. The test results were posted on the project webpage within 1 week of completion of the testing as outlined in the funded proposal.

Status Update Reporting

Status Update April 1, 2025

Date Submitted: May 27, 2025

Date Approved: June 2, 2025

Overall Update

One goal of the project is to establish a network of wildlife health professionals that joins forces with the Minnesota Veterinary Diagnostic Laboratory (MN-VDL) and College of Veterinary Medicine of the University of Minnesota to monitor Minnesota's wildlife for diseases in general and for influenza virus (including highly pathogenic avian influenza virus) in particular. To the latter extend the health professionals will submit 9000 samples from avian and mammalian wildlife to be tested for influenza virus at the MN-VDL). In order to process samples from wildlife, the project PI has received the necessary permit from the Department of Natural Resources in the meantime. In order to be able to receive samples from living wildlife, the project PI has received the necessary permit from the Institutional Animal Care and Use Committee (IACUC) of the University of Minnesota. Currently, the process of submitting samples by partners is being finalized including e.g. which barcodes to use. The barcodes have to be durable and long lasting and have to be read by users in the field with hand-held devices.

Activity 1

In order to establish a network of wildlife health professionals, we have started to recruit partners from the Department of Natural Resources, tribal nations and wildlife rehabilitators. To that extend I have presented the project to potential partners of tribal nations at the 1. Quarterly Minnesota Tribal Fish and Wildlife Committee meeting (Feb 14, 2025 @ 11.30AM - 12.10PM; Leech Lake) and to the wildlife rehabilitator community at the Minnesota Wildlife rehabilitator spring training (March 23, 2025 @ 12.45 – 1.30PM; remote). In order to be able to partner with the tribal nations, we are in the process of setting up Data Sharing and Ownership Agreements (DSOAs) and Memorandum of Understanding (MOUs). The Memorandum of Understanding (MOUs) will also be shared with other potential partners such as rehabilitators and other organizations (e.g. zoos that monitor wildlife on their premises).

Activity 2

A) We are in the process of ordering supplies and assembling sample kits that will be distributed to our future partners. The kits will consist of swabs, tubes with broth, and barcodes at their core. The tubes with broth will require a cold chain. The partners will be provided with shipping labels to return the samples to the laboratory in a chilled or frozen state.

B) We are in the process of producing and finalizing two videos that detail how the samples should be collected by the partners from the animals, how the samples should be stored and returned to the Minnesota Veterinary Diagnostic Laboratory and which data need to accompany the samples and how these data ought to be transferred to the Minnesota Veterinary Diagnostic Laboratory.

Activity 3

The PCR testing of samples has not yet begun because the barcode system for the sample submissions still has to be optimized at both, the end of the sample receiving Minnesota Veterinary Diagnostic Laboratory and at the end of the first sample submitter (Wildlife Rehabilitation Center = WRC). Receiving samples from WRC and testing is scheduled to start in mid April 2025.

Activity 4

The protocols for the viability testing of the virus are established but viability testing can only be performed once PCR positive samples for influenza virus have been received. Once we start receiving the first samples from our partners (in

mid to end of April 2025), we will test the samples for influenza virus by PCR and once we have detected the first samples that are positive for influenza virus, we will conduct the viability testing.

Activity 5

The protocols for the virus isolation are established but virus isolation can only be performed once PCR positive viable samples of influenza virus have been received. Once we start receiving the first samples from our partners (in mid to end of April 2025), we will test the samples for influenza virus by PCR. Once we have detected the first samples that are positive for influenza virus, we will conduct the viability testing and once we have detected the first samples positive for viable influenza virus we will perform virus isolation.

Activity 6

Results have not yet been reported to our partners because we have not yet received any samples (please refer to "Activity 3"). Once we start receiving the first samples from our partners (in mid to end of April 2025), we will test the samples within 1 to 2 days for influenza virus by PCR. The results of the testing will be reported to the submitting partners in near real time.

Dissemination

We are in the process of finalizing the public-facing webpage that will be housed on the webpage of the Minnesota Veterinary Diagnostic Laboratory. This webpage will be designed as an interactive dashboard and houses a map of Minnesota (and all its counties). The number of samples tested from each county will be detailed in the map and a table. In addition, the dashboard will detail how many of the tested samples are positive for influenza virus in general and for highly pathogenic influenza virus in particular.