



Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE



**Center for
Epidemiology and
Animal Health**

2024
IMPACT REPORT

Message from the Director

The Center for Epidemiology and Animal Health (CEAH) provides applied and innovative analyses to generate science-based information and solutions for complex animal health issues. We have 6 units with varying missions and are staffed with an amazing group of dedicated civil servants who are experts in their respective fields. These individuals are the heart of our organization and include veterinarians, epidemiologists, biological scientists, statisticians, geographers, and communications specialists, to name a few.

CEAH is a World Organisation for Animal Health (WOAH) Collaborating Centre, providing scientific expertise, support, and international collaboration on animal health issues to WOAH and its members. CEAH has partnerships with other Collaborating Centres, laboratories, and research organizations, and can leverage these relationships during emerging animal health events such as highly pathogenic avian influenza (HPAI) H5N1 and African swine fever (ASF).

This past year has been a busy one as we tackle large, real-world problems. We continue to prioritize foreign animal disease (FAD) prevention, mitigation, and response. The HPAI outbreak in poultry has been ongoing in the United States since 2022, and in March of this year, HPAI was detected in U.S. dairy cattle. It is an evolving incident, and CEAH is aiding response efforts in impacted States. Additionally, ASF is another disease we have been actively supporting. It has not affected U.S. swine populations yet, and we are working hard to keep it that way. We are collaborating with Federal and State governmental agencies, the swine industry, and producers to keep ASF out of the United States and its Territories. CEAH stands ready to respond to other FAD threats to the United States, such as New World screwworm.

CEAH also continues our other vital missions of animal health analysis and management, focusing on industry trends, animal productivity, and domestic disease surveillance, mitigation, and reporting. This includes actively conducting activities to support nine national commodity studies to inform industry partners on animal health and management trends. Additionally, CEAH conducts cutting-edge scientific research and creates various analytical products, such as disease-spread models and maps. This year, CEAH scientists published 23 peer-reviewed scientific articles and created thousands of maps and other statistical products.

This 2024 Fiscal Year (FY) Impact Report allows us to share some of our outstanding work on issues impacting the United States and the entire world. Our biggest strength is our people, and this report illustrates the immense impact these people have on solving animal health problems and addressing various scientific challenges in this ever-changing, fast-paced world.

Robert Alan Huddleston

Dr. Robert Alan Huddleston, Director

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Our Mission

CEAH provides applied and innovative analyses to generate science-based information and solutions for decision making around complex national animal health issues.

CEAH is made up of the following units:

GAPS

Geospatial Analytics, Products, and Services

GAPS provides map-centric products and solutions, as well as geospatial analyses that support emergency planning and response, disease risk analyses, epidemiology investigations, disease monitoring and reporting, and the overall mitigation and prevention of animal disease introduction and spread in the United States.

NAHMS

National Animal Health Monitoring System

NAHMS is a source of Federal animal production statistics and one of 16 recognized statistical agencies and units in the Federal government. NAHMS conducts nationally representative studies on the health and health management of livestock, equine, aquaculture, and poultry populations within the United States at regular intervals.

TDA

Transboundary Disease Analytics

TDA identifies and characterizes global animal health hazards, assesses hazards and strategies to prevent the entry of transboundary diseases into the United States, conducts pathways assessments, and contributes to animal disease preparedness and response planning, implementation, and evaluations.

DAHA

Domestic Animal Health Analytics

DAHA supports domestic disease programs through risk analysis, epidemiologic evaluations, and provides indemnity and compensation analyses and tools.

PCI

Program Coordination and Implementation

PCI strengthens CEAH's mission by providing solutions-based management and operational support that includes but is not limited to strategic planning, program management, communications, and compliance.

SDA

Surveillance Design and Analysis

Through collaborative surveillance design, analysis, and evaluation, SDA develops and enhances animal disease surveillance ranging from single-premises sampling plans to robust national-level surveillance systems, including the proposed National List of Reportable Animal Diseases. SDA also serves as the WOAHP Focal Point for U.S. animal disease reporting.



World Organisation for Animal Health (WOAH) Collaborating Centre

- Ensure excellence in scientific expertise in surveillance systems, risk analysis, and disease modelling
- Encourage cooperation and collaboration through networks and partnerships
- Strengthen the capacity of veterinary services

Foreign Animal Disease (FAD) Prevention, Mitigation, and Response

- FAD surveillance
- Global monitoring and reporting
- Response planning and implementation

Trending Topics:

- Highly pathogenic avian influenza
- African swine fever

Animal Health Analysis and Management

- Industry trends
- Animal productivity
- Domestic disease surveillance, mitigation, and reporting

Scientific and Analytical Product Creation

- Maps
- Peer-reviewed publications and posters
- Modeling

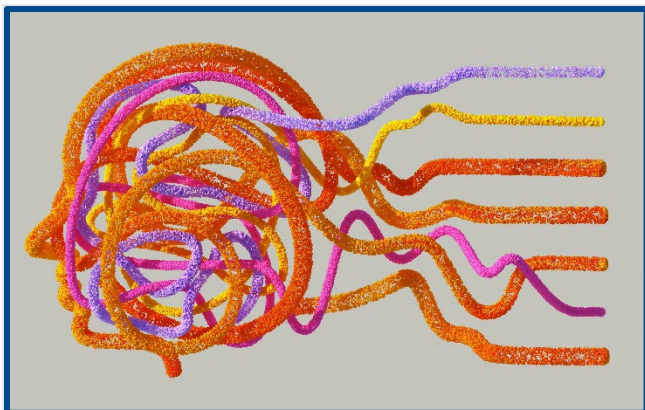
A photograph of a brown cow and a brown calf facing each other, positioned on the right side of the page. The cow is on the right, and the calf is on the left, both looking towards the center. The background is a solid blue color.

CEAH Strategic Missions



WOAH Collaborating Centre

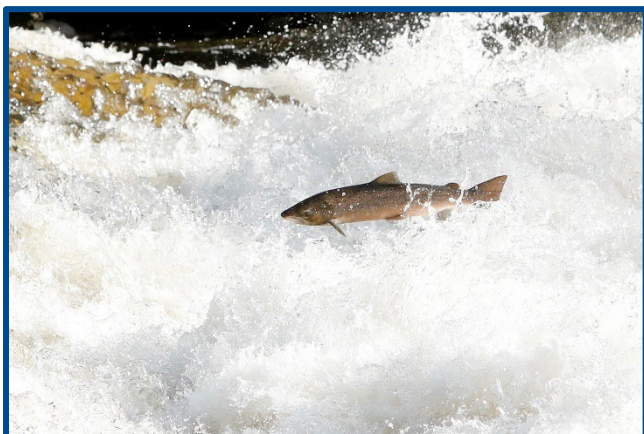
CEAH is a WOAH Collaborating Centre for modeling, surveillance, and risk analysis. Centres are designated for a specific specialty within a focus area and work together with other WOAH member countries to globally safeguard animal health. CEAH's Collaborating Centre annual report is available online through the WOAH website.



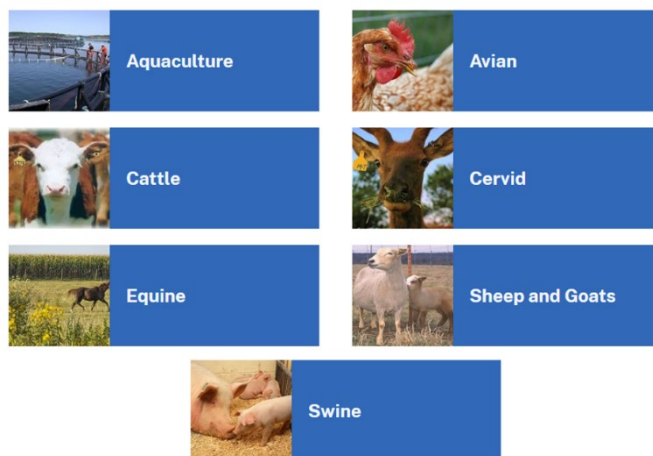
In FY 2024, CEAH published 73 animal health-related documents: 23 peer-reviewed scientific articles and approximately 50 non-peer-reviewed publications. This achievement demonstrated excellence in scientific expertise and a commitment to collaborating with other [WOAH](#) Collaborating Centres, reference laboratories, and organizations to identify, devise, and apply solutions critical to animal health management.

The WOAH reporting team compiled, verified, and submitted 104 follow-up HPAI poultry and non-poultry reports, 40 HPAI unusual hosts mammal follow-up reports, eight contagious equine metritis follow-up reports, and immediate notifications for two other disease events. This supported our national and international responsibilities to preserve safe trade, public health, and food security.

Evaluated six pathogens for live salmonid fish, eggs, and gametes during a Pathways Assessment; these pathogens are WOAH-listed. These assessments will help inform the prevention of aquatic transboundary disease establishment in the United States.



Drafted 25 reportable disease case definitions using a cross-agency subject matter expert panel. These will advance initiatives to promote and expand comprehensive and integrated surveillance for animal diseases in the United States. Case definitions provide the basis for consistent reporting with uniform case findings and reporting criteria. Information about animal disease reporting and case definitions can be found on the USDA's [National Animal Health Surveillance](#) webpage.



Managed and participated in 15 [National Animal Disease Preparedness and Response Program \(NADPRP\)](#) cooperative agreements, ensuring money is executed in support of Farm Bill program priorities. Topics included animal movement, biosecurity, and outreach and education. Through NADPRP, APHIS provides funding to States, producer organizations, universities, and others to carry out high-value projects that help the United States prepare for the most critical animal health threats and combat animal disease outbreaks.

Oversaw 18 cooperative agreements with universities totaling \$2.4 million in awards. Formed partnerships with other WOAH Collaborating Centres, laboratories, and research organizations, helping to provide top-tier research, support, and training for global animal health management. CEAH leverages these collaborative partnerships during emerging animal health events, such as HPAI in both poultry and livestock. These relationships also help the United States formulate plans for remaining free of diseases like ASF.



Highly Pathogenic Avian Influenza (HPAI)

HPAI is a contagious, viral disease of wild birds and domestic poultry. It has also started to impact livestock to include dairy cattle. The severity of HPAI varies depending on the species affected. It is a major threat to industries, animal health, trade, and the world economy. HPAI is a FAD; however, there has been an ongoing poultry outbreak in the United States since 2022 and an ongoing livestock incident in the United States since March 2024. The USDA has been working hard in responding to these events.

Produced publicly available [national HPAI in poultry epidemiologic reports](#) to support outbreak response and serve as a historical record of the outbreak.



Developed a 22-page HPAI dairy questionnaire and collected data from 144 premises across 14 States as of September 30, 2024. Gathered trends on common clinical signs of HPAI-infected cattle and hypothesized risk factors of disease spread. These data will inform stakeholders and offer insight in how to prevent further spread of the disease. Additionally, updated the existing poultry HPAI questionnaire in May 2024 to capture information on poultry exposure to dairy premises.

Identified 87 watersheds to prioritize for wild bird surveillance using advanced statistical tools that integrated location and seasonal occurrences of influenza A. USDA Wildlife Services used this model to prioritize sampling and reduce the possibility of waterfowl introducing HPAI to higher risk poultry premises.

Migrated the HPAI Routing Tool interactive map to ArcGIS Online for access by Canada and other international users. Maintained the tool by updating

zones, allowing poultry exporters to develop safe routes around restricted HPAI areas while traveling from the United States to Canada.

Completed a spatial analysis of 64 HPAI-infected dairy premises in Colorado to provide information of mean transmission distance, relative risk of infection at different distances, and identification of optimal surveillance zone sizes.

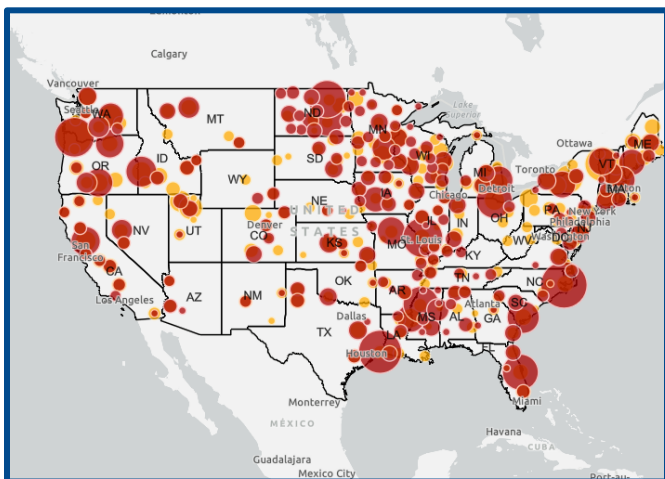
Completed a time of introduction analysis on more than 30 commercial poultry premises in 6 States to support epidemiologic investigations as of September 30, 2024.

Produced an information sheet describing challenges in implementing biosecurity practices for commercial turkey and table egg producers using results from the HPAI turkey and table egg producers case control studies.



Developed and delivered over 5,000 map products used to minimize HPAI trade impacts in the United States. This included daily situation report maps for HPAI affected States and “ineligible trade zone” maps for international trading partners.

Developed and updated surveillance guidance for the avian [HPAI Red Book](#) which provides current policy on preventing, diagnosing, and managing HPAI outbreaks.



Maintained the Wild Bird Avian Influenza Surveillance [interactive dashboard](#) as part of the USDA Wildlife Services National Wildlife Disease Program's wild bird surveillance program. Pictured above, the circles on the interactive map indicate clusters of HPAI detections in wild birds throughout the United States since 2022. These maps were used to inform active surveillance sampling in domestic operations.

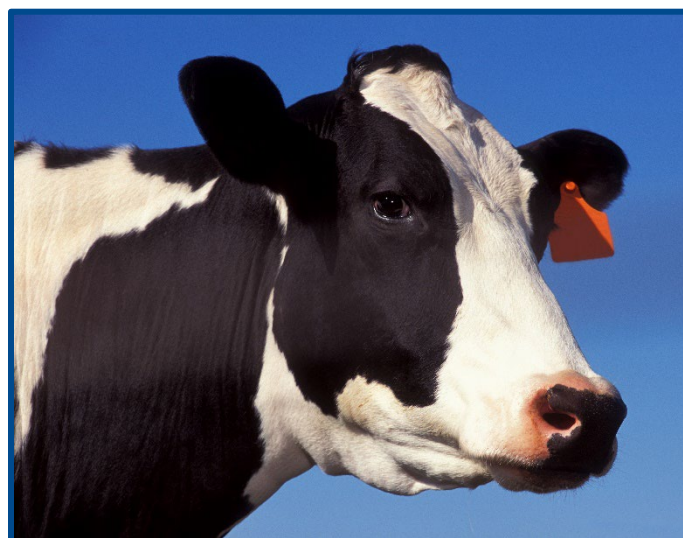


In collaboration with the USDA Poultry Health Team, data were mined and categorized into five topic areas,

leading to an illustrative timeline for premises within an HPAI control area that broke with the disease following either a movement or an audit.

Completed analysis of epidemiologic links using weather and laboratory data to inform targeted sampling, and time of introduction analyses. These efforts supported HPAI field investigations in multiple States, resulting in targeted analytical reports for individual State needs.

Developed comprehensive surveillance plans for dairies affected by HPAI and guided the USDA's national milk testing strategy to address HPAI in dairy herds.



Created an Incident Management Team Transition Map Application tool to convey high-level information to transitioning deployed teams across multiple States.

Analyzed 25 HPAI between-flock avian modeling scenarios to support HPAI forecasting and a cost-benefit analysis for a proposed biosecurity audit rule.

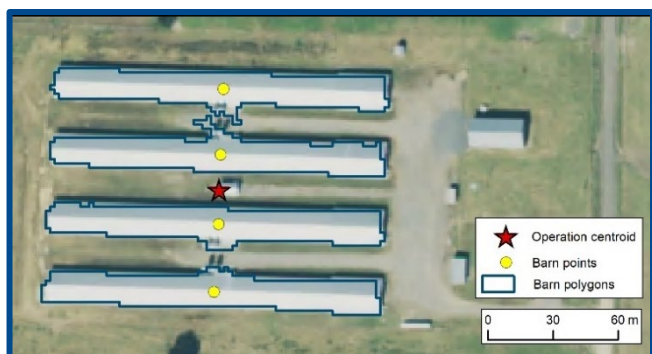
Analyzed four within-herd HPAI dairy modeling scenarios to develop a model dairy population and configuration. This will simulate between-herd HPAI spread in dairy populations to better understand disease transmission.



African Swine Fever (ASF)

ASF is a contagious and deadly viral disease affecting domestic and feral swine of all ages, though it does not affect humans. It is a FAD and a threat to the United States. Work is being done with Federal, State, and Tribal governmental agencies, the swine industry, and producers to keep ASF out of the United States. It is also important for us to be prepared to rapidly respond if ASF is detected in the United States.

Hosted 20 oral presentations, 10 lightning talks, 7 poster presentations, and 5 live demonstrations as part of the first-ever CEAH ASF symposium in Fort Collins, Colorado.



Conducted a pilot project using geospatial methods to validate that premise identification number coordinates match the swine farm (animal) location for operations across six counties in Iowa and Minnesota. Verified farm locations enhance the United States' ability to respond to disease outbreaks such as ASF.



Collaborated with the Ohio State University to conduct over 1,600 surveys at local and State-level pig shows in six States to better understand the potential for disease transmission within the show pig industry. The surveys collected data on pig movements to and during shows, biosecurity, and show pig owner disease knowledge.

Led the swine surveillance and diagnostics working group, composed of 24 experts across APHIS, serving as a forum to discuss ASF related preparedness topics.

Developed feral swine density estimates for Puerto Rico for a disease spread model. Provided data on the known distribution of feral swine and mean expected number of pigs at a 1km resolution.

Completed 14 modeling scenarios using the ASF National Disease Spread Model to evaluate the epidemiologic impact of proposed U.S. Swine Health Improvement Plan (US SHIP) free area surveillance standards. US SHIP is a collaborative effort among stakeholders that provides standards for certifying the health status of swine across participating farms, supply chains, and States. It serves as a mechanism to help prevent and control swine diseases such as ASF.



Advanced the implementation of the ASF National Preparedness Plan by improving the current disease spread model in feral swine to investigate ASF introduction pathways into the United States and allow for evaluation of targeted surveillance approaches.

Analyzed 16 within-herd ASF modeling scenarios to evaluate barn-level surveillance protocols to inform updates to the next version of the [ASF Response Plan: The Redbook](#).

Provided analytical and epidemiological expertise to studies that evaluated swine oral fluid samples and other diagnostic techniques on Romanian farms with active ASF infection exploring new detection methods for the disease.



Animal Health Analysis and Management

Conducted activities to support 9 national studies impacting 11 different commodities informing industry partners on animal health, health management, and disease prevalence. These studies include a needs assessment for the Poultry 2025 Small Enterprise and 2027 Upland Game Bird studies; design and planning for Poultry 2025 and Equine 2026 studies; data collection for Sheep 2024 and Backyard Animal Keeping 2024 studies; data analysis for Bison 2022 study; and reporting for Feedlot 2021, Swine 2021, and Goat 2019 studies.



Collaborated with the National Agricultural Statistics Service (NASS) to contact 4,940 sheep producers in 30 top sheep-producing States for participation in Phase I of the Sheep 2024 study. Operations with 20 or more ewes that completed Phase I were eligible for participation in Phase II which included biologic sampling to estimate the prevalence of gastrointestinal parasites and anthelmintic resistance, enteric microbes (*Salmonella*, *E. coli*, *Campylobacter*, and *Clostridium*) and antibiotic resistance, foot rot pathogens (*Dichelobacter nodosus* and *Fusobacterium necrophorum*), and genetic resistance to scrapie. Additionally, blood samples were collected for storage in the national serum bank for future research.

Collaborated with the California Department of Agriculture and Antimicrobial Use and Stewardship Program to provide mandated data on antibiotic usage on farms in California during Phase I of the Sheep 2024 study.

Completed data collection for the 2024 Backyard Animal Keeping National and City Surveys. The study

was designed in collaboration with the Centers for Disease Control and Prevention (CDC), universities, and the USDA Office of Urban Agriculture and Innovative Production. Reports will provide valuable information about households that keep poultry, pigs, rabbits, and goats, as well as animal health and management practices.

Initiated the sharing of national study metadata for the [Standard Application Process \(SAP\) data catalog](#), fulfilling the Evidence Act requirement to provide a portal for requests to access confidential data from Federal agencies covered under the Confidential Protection and Statistical Efficiency Act (CIPSEA). This streamlines and standardizes requests for public access to confidential data for evidence building.

Gathered and analyzed data from 1,430 individuals and 87 leaders from selected equine groups to publish [An Evaluation of Industry and Owner Concerns to Help Guide Future NAHMS Studies](#) which will inform priorities for the 2026 Equine study. Top industry priorities included unwanted horses, veterinarian availability, and biosecurity practices. These priorities were used in the design and planning for the Equine 2026 study.



Updated the Farm Location and Agricultural Production Simulator model using the results of the NASS census to simulate the locations and farm sizes of livestock populations in the United States. This model is used in a variety of applications to include disease spread simulation modeling.

Updated 244 different commodities for the [2024 VS Indemnity Table](#) to include the addition of 4 new categories of production classes, giving more support to producers during disease events.

Provided biosecurity, antimicrobial resistance, and antimicrobial use updates to the United States National Action Plan for [Combating Antibiotic-Resistant Bacteria \(CARB\)](#) progress report.

In collaboration with the Hawaii Department of Agriculture, Animal Industry Division, and Wildlife Services, tested wildlife on Moloka`i to determine the prevalence of bovine tuberculosis (*Mycobacterium bovis*) in axis deer and feral swine, informing State and Federal agency actions to prevent future spread of the zoonotic disease from wildlife to livestock and people.



Publication and findings of brucellosis quarantine procedures for American bison in Yellowstone National Park led to policy changes that enabled the export of 116 brucellosis-free bison to Native American Tribes.

Provided information on production practices on swine operations in 13 large enterprise and 38 small enterprise States as part of the Swine 2021 study.

Published two Reference of Management Practices on large-enterprise ($\geq 1,000$ pigs) operations dashboards and one additional dashboard for small-enterprise ($< 1,000$ pigs) swine operations. These dashboards provide nationally representative estimates of the management, breeding, and biosecurity practices on U.S. swine operations.

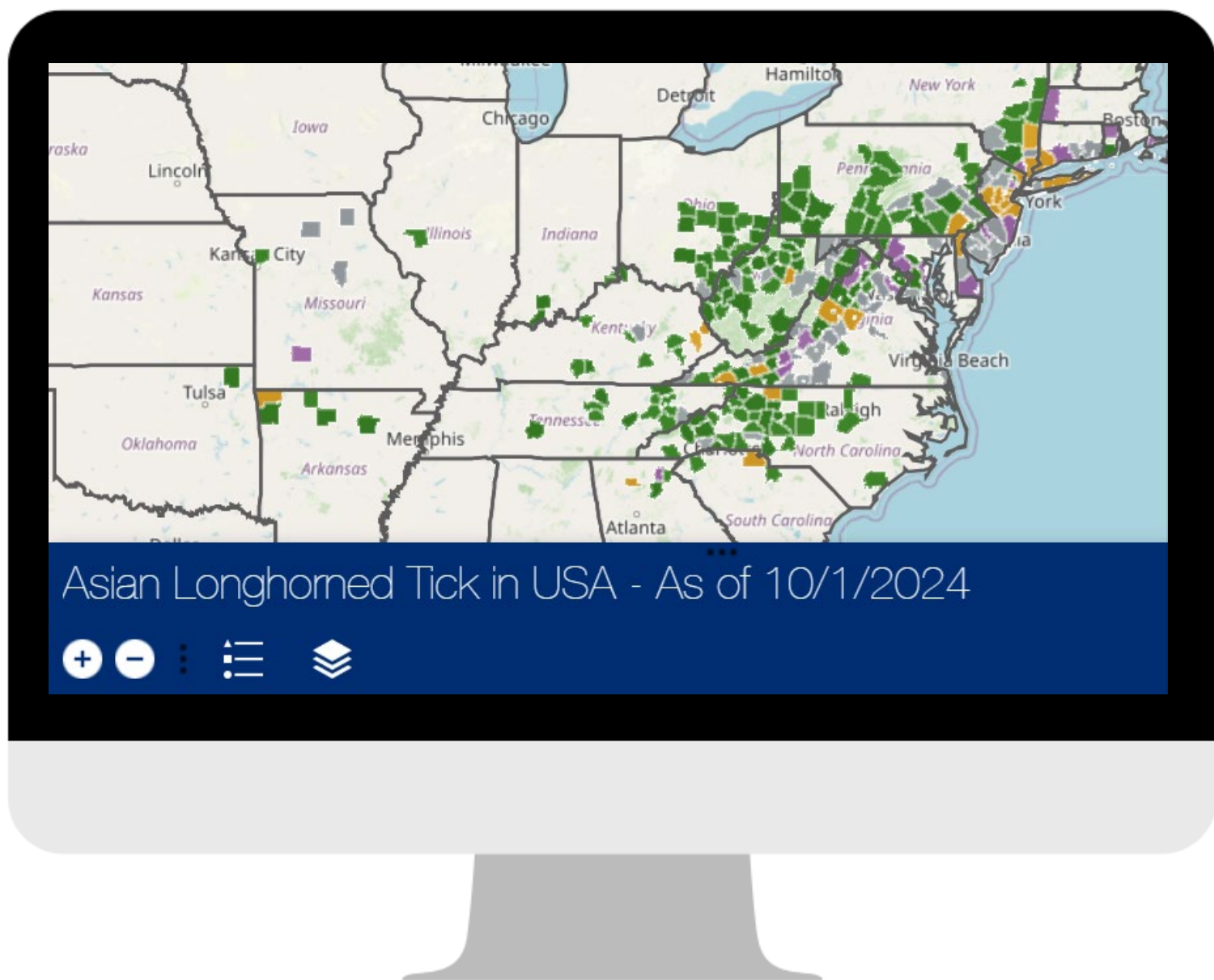


Produced the [Goat 2019 Part II report](#), which provides nationally representative estimates of health, kidding, and biosecurity practices on U.S. goat operations.

Published an info sheet using Goat 2019 data on the [Prevalence and Characteristics of Enteric Microbes on U.S. Goat Operations](#), which describes bacterial prevalence, antibiotic susceptibility, and risk factors for enteric microbes on U.S. goat operations.

Updated the bulk tank somatic cell count (BTSCC) dashboard with the most current data, providing 22 years of data trends. BTSCCs are indicative of the quality of the U.S. milk supply and are important indicators of animal health.

Developed an interactive map application tool to help plan site visits for biological sampling of sheep as part of the Sheep 2024 study. This application included resource planning tools such as mail drop sites, local veterinary and laboratory partners, and the most efficient routes for farm visits.



Scientific and Analytical Product Creation



Created a [mapping tool](#) to provide data on changes to Asian longhorned tick populations based on host presence, host abundance, and vegetation. This information is critical in the development of future disease spread models and the creation of surveillance plans for animal diseases. Asian longhorned ticks in the United States could potentially transmit a disease that causes bovine infectious anemia in cattle and could lead to major economic losses to farmers.

Updated three different map applications quarterly including the [rabbit hemorrhagic disease map application](#), the [wild bird Avian Influenza surveillance operational dashboard](#), and the [Asian longhorned tick story map](#). These interactive map applications help inform producers and other stakeholders of potential disease risks in their area of the United States.

Created a web-based map application that improves the ability of field operations to align resources and synchronize capabilities for prevention, mitigation, and animal health emergency response. Worked with partners in Ohio and North Carolina to expand and standardize resource planning through this tool.

Collaborated with CDC and the National Veterinary Services Laboratories to publish two manuscripts sharing the results of a [Coxiella burnetii seroprevalence study](#) using samples collected from 7,736 domestic goats located in 24 States. These samples were collected during the Goat 2019 study. *Coxiella burnetii* is a bacterium that can cause coxiellosis in animals and Q fever in humans. These publications enhanced One

Health messaging by incorporating advancements in science while promoting effective biosecurity for owners and animals.

Increased data efficiency and accuracy of two national studies by implementing Qualtrics survey software for electronic data collections of surveys and biologic samples. This will increase timeliness of data validation and improve questionnaire tracking completion rates.

Performed weekly syndromic surveillance for unusual disease events occurring at slaughter facilities across the United States, resulting in 108 follow-ups and promoting early detection of emerging disease nationwide.

Filtered and analyzed 2,871 data sets collected over 20 years to identify and categorize reasons for salmon mortality in Maine; identified 10 categories of salmon mortality that are being used in research performed on infectious salmon anemia virus.

Reported the results of a national study focusing on cattle health and management on [U.S. feedlots](#). Additionally, published the results of a national study focusing on health management, productivity, and antimicrobial usage on [small enterprise](#) and [large enterprise](#) swine operations.



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