SOUTHEASTERN COOPERATIVE WILDLIFE DISEASE STUDY

SCWDS BRIEFS

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SCWDS News

Dr. David Stallknecht retiring after 40 years at SCWDS

Dr. Stallknecht began his successful career at SCWDS as a Research Technician in 1978 and served as SCWDS Director from 2019-2022.

After more than 40 years of service to SCWDS, unparalleled scientific output, and a wealth of contributions to the wildlife health community, Dave Stallknecht has officially retired…sort of. Fortunately, Dave's retirement is not a clean one and he is working part-time at SCWDS as Professor Emeritus on multiple ongoing avian influenza and hemorrhagic disease research projects. Although we cannot adequately summarize Dave's career in a single SCWDS *BRIEFS* article, we will highlight a few things that begin to acknowledge his amazing career and contributions.

After receiving his MS in wildlife biology from the Warnell School of Forestry and Natural Resources (University of Georgia), Dave was hired as a Research Technician in 1978 by the first SCWDS Director, Frank Hayes. Dave briefly left SCWDS to pursue a PhD in wildlife epidemiology at Louisiana State University (1986-1989) before returning in 1989 as a Post-Doctoral Research Associate. Dave eventually secured a faculty position and ascended the various faculty ranks to ultimately become a full Professor and served as the fourth Director of SCWDS from 2019 to 2022.

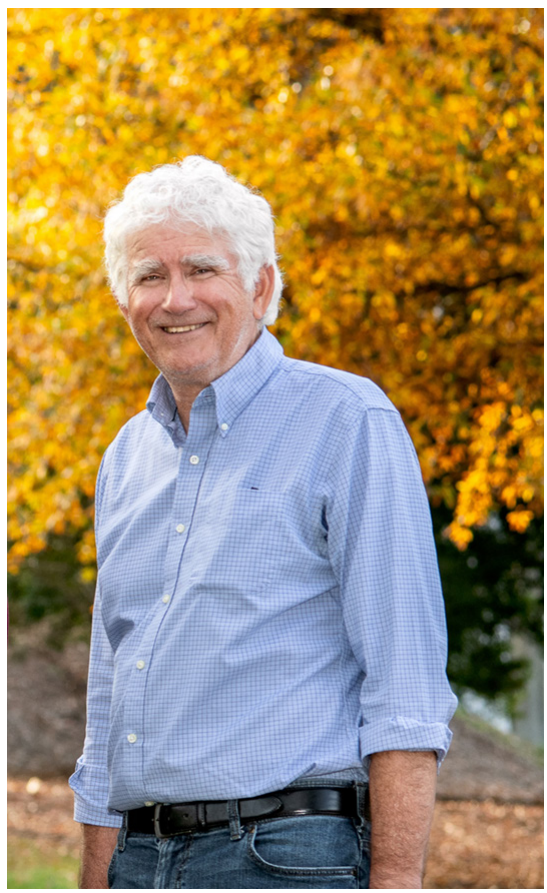
Dave Stallknecht Retires

Over our 66-year history, SCWDS has had a role in creating some of the of the best wildlife disease biologists in the world - Dave Stallknecht fits that mold. Whether in a board room with global scientific authorities on avian influenza, at a biosafety cabinet in a microbiology laboratory, at a computer analyzing data and writing, or in the field collecting and sampling wildlife, Dave is in his element. It is not easy to find an individual who is equally adept and comfortable at navigating these diverse settings. As a wildlife disease biologist, Dave has spent countless hours in the field – from trapping and sampling feral hogs on Ossabaw Island, Georgia or Port au Prince, Haiti, to capturing and sampling ducks throughout the eastern United States. The depth of Dave's experience in the field is paralleled by his experience in the laboratory with both bench-top and animal research.

Dave's combined talents as a field biologist and laboratorian have helped him to design research that asks and answers scientific questions that inform our understanding of disease ecology and management. Over his career, his coordination of research has greatly enhanced our understanding of multiple wildlife pathogen systems, including influenza A virus, epizootic hemorrhagic disease virus, bluetongue virus, West Nile virus, vesicular stomatitis virus, among others. Dave has had an National Insitute of Health-funded research program for over 20 years, no small feat for a wildlife health researcher. Dave has published over **300 scientific articles on wildlife diseases**, given countless scientific presentations, taught hundreds of veterinary students, and trained dozens of graduate students. Dave also served as co-editor of the Journal of Wildlife Diseases and has provided expert consultation to many governmental organizations and professional/scientific organizations.

Dave has been a fixture at SCWDS for 42 of our 66 years – a whopping 63%! During that time, Dave has had a significant role in training dozens of students and staff at SCWDS who have gone on to have impactful careers at academic institutions, as well as numerous state and federal wildlife, public health, and agricultural agencies.

Dave has been instrumental to establishing and maintaining the fabric of SCWDS over our history. Hard working, simple, grounded, critical, creative, passionate, humble, and smart – Dave has had a positive and long-lasting influence on so many other faculty, staff, students, and agency biologists over his productive career. We thank Dave for his many decades of service and expertise, and we wish him the best at spending more time fishing than working!



Prepared by Mark Ruder, SCWDS

Dr. Sonia Hernandez named Meigs Distinguished Teaching Professor for 2022-2023

The Meigs Distinguished Teaching Professorshp is the University of Georgia's highest level of recognition for instruction at both the undergraduate and graduate degree program levels.

Dr. Sonia Hernandez is a Professor of Wildlife Disease in a joint appointment between the Warnell School of Forestry and Natural Resources and the Southeastern Cooperative Wildlife Disease Study, in the Department of Population Health in the College of Veterinary Medicine at the University of Georgia. Sonia received her DVM from Louisiana State University and PhD in Ecology from the University of Georgia, and she is also a Diplomate of the American College of Zoological Medicine. She teaches a variety of undergarduate, graduate, and veterinary courses including a study abroad Conservation Medicine and Biology course in Costa Rica. This course focuses on the principles of One Health, which is an integrated approach to maximizing human, animal, and environmental health.

In addition to teaching activities, Sonia oversees an active research lab that has recieved more than $4 million in grants and produced 90 peer-reviewed journal articles, nine book chapters, and six books. It is through Sonia's student mentoring and advising activities where her abilities really shine. One of her methods is to engage students with active learning techniques. She develops course work involving discussion-based lectures, think-pair-share, minute papers, group projects, and other activities.

On average, she advises eight undergraduate and three veterinary students each year, and to date, has formally advised 21 graduate students. This recent award is one of several teaching honors Sonia has received; she was previously awarded the Russell Award for Excellence in Undergraduate Teaching, a Fulbright Fellowship in Spain, and she was inducted into the UGA Teaching Academy. Join SCWDS in congratulating Dr. Hernandez for this recognition of teaching excellence!

Prepared by Betsy Kurimo-Beechuk, SCWDS

Changing Faces at SCWDS

The SCWDS family tree, with branches all over the world, continues to grow. In recent months, we have had several newcomers to SCWDS, as well as several staff and students leave SCWDS to advance or begin their careers.

As a research unit at a land grant university, training the next generation of wildlife and animal health professionals is an important part of what SCWDS does and our faculty and staff are passionate in helping fuel this effort. We are proud of our former employees and students who are now contributing to the broader wildlife conservation, agricultural, and/or public health communities. We look forward to watching their continued growth and expect great things. We also welcome our new arrivals and look forward to SCWDS supporters getting to know them.

Recent Arrivals:

Nikki Castleberry joins SCWDS as a field research biologist and is primarily working on USDA-funded tick surveillance projects. She has a BSFR from Warnell and MS from West Virginia University in wildlife biology. Prior to her role at SCWDS, Nikki worked as a wildlife biologist for the Georgia Department of Natural Resources, and the Georgia Museum of Natural History.

Dr. Paul Oesterle joins SCWDS as a database management specialist, and works on many SCWDS service and research activities, especially with the Research and Diagnostic Service. Throughout his 25 year career, Paul has worked as a wildlife biologist in various settings, including federal agencies, academic institutions, and non-governmental organizations. He received a BS from University of California, Davis and a MS and PhD from Colorado State University.

Dr. Xuan Hui Teo is currently a veterinary anatomic pathology resident and SCWDS diagnostician. He completed his veterinary training at the University of Melbourne and worked as a government regulatory veterinarian in Singapore for several years prior to joining the SCWDS team.

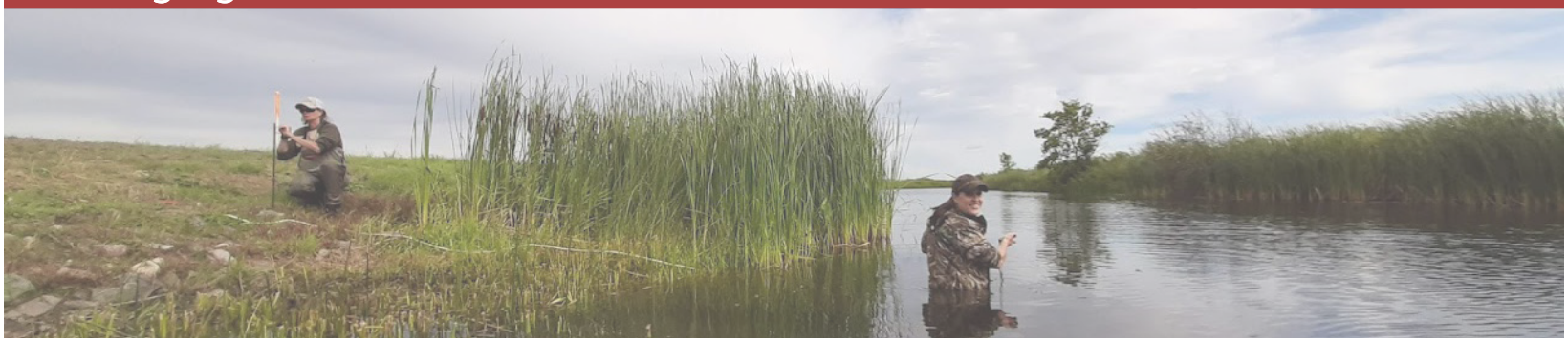
Dr. Aidan O'Reilly joined SCWDS as a full-time PhD student and serves as a diagnostician for the Research and Diagnostic Service. His PhD research will focus on various aspects of lead and anticoagulant rodenticide toxicosis in raptors. He received his DVM from the University of Georgia in 2022.

Nick Friedeman has recently joined SCWDS as a field research biologist and is primarily working on USDA-funded tick surveillance projects. Nick completed his undergraduate studies at the University of Nebraska-Lincoln and his Master's at Purdue University in Fort Wayne studying disease ecology of snake fungal disease, after which he worked briefly in Texas doing ecotoxicology and wetlands work.

Recent Departures:

Jeanenne Brewton retired from SCWDS as an Administrative Associate after 22 years of service. Jeanenne joined SCWDS in 2001 and for over two decades played an integral role in the administrative function of many SCWDS activities (e.g., Research and Diagnostic Service, deer herd health activities,

Changing Faces at SCWDS



SCWDS *BRIEFS*). Jeanenne continuously and diligently documented service and scholarly activities of SCWDS students, staff, and faculty and helped to prepare quarterly and annual reports for SCWDS agency partners. Over time, there was not much at SCWDS that Jeanenne did not influence. In most workplaces, there are individuals who become woven into the fabric of the organization and become a structural and stabilizing presence. Jeanenne is one of those people. Her professionalism, knowledge of SCWDS activities, work ethic, dependability, understanding of our member agency needs, and her service-oriented approach were invaluable. Throughout her time at SCWDS, Jeanenne's service benefited all SCWDS cooperating agencies and all the faculty, staff, and students who have passed through our doors. We appreciate her dedicated service and wish her nothing but the best in retirement.

Dr. Melanie Kunkel arrived at SCWDS in 2018 and recently completed her PhD in the Comparative Biomedical Sciences Program at UGA's College of Veterinary Medicine. Melanie's PhD research focused on multiple aspects of West Nile virus in game birds, and she also was an integral part of the SCWDS Research and Diagnostic Service. Melanie was recently hired as the Northeast Regional Fish and Wildlife Health Coordinator, a partnership with the Northeast Association of Fish and Wildlife Agencies, U.S. Fish and Wildlife Service, and the Wildlife Management Institute.

Stacey Vigil left SCWDS after 15 years of service as a Research Professional. She joined SCWDS in 2008 to work on USDA-funded tick and *Culicoides* surveillance projects. Over this time, Stacey established herself as an expert on the morphological identification and taxonomy of North American *Culicoides* species. Stacey's expertise helped to document new county and state records for multiple species, as well as the range expansion of *Culicoides insignis*, a vector of BTV and EHDV, in the Southeast. Stacey has started a consulting business, Vigil NatureWorks, LLC, and continues to collaborate with SCWDS on several ongoing *Culicoides* projects.

Alinde Fojtik studied wildlife biology at Kansas State University and worked with Minnesota DNR until joining SCWDS in 2013. Alinde was an integral part of the avian influenza research conducted here at SCWDS, and she logged countless hours and miles on annual travel to field sites in Minnesota and Delaware Bay and collected samples from thousands of wild birds. In addition to her extensive field research activities, Alinde was also heavily involved with various serology and virology analyses, as well as keeping the laboratory running smoothly day to day. Recently, she accepted a position at Aruna Bio where she is further honing her laboratory skillset by working on neurodegenerative conditions. We are sad to see her leave, but wish her well in her future endeavors.

Prepared by Becky Poulson and Betsy Kurimo-Beechuk, SCWDS

West Nile Virus in Game Birds

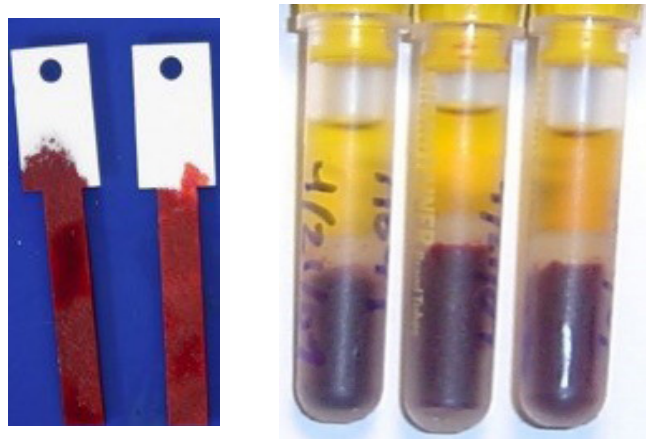
Biologists and researchers collecting blood samples for pathogen surveillance in free-ranging wildlife face many logistical challenges. Such challenges include the need for trained personnel, maintenance of sample viability in the field, which often includes centrifugation and refrigeration or freezing in remote locations, and limited blood volume collection in small animals.

To overcome some of these challenges and increase sampling opportunities, wildlife professionals often utilize Nobuto filter paper strips in place of traditional blood collection when conducting surveillance for antibodies against specific pathogens. In particular, use of filter paper strips for West Nile virus (WNV) serologic (antibody) surveys in game birds expands sampling opportunities, especially in hunter-harvested carcasses. Filter paper strips are easy to use, provide field-adapted storage methods, and require limited training. Although filter paper strip manufacturers claim that long-term storage at ambient temperature does not affect diagnostic test results, some studies identified negative impacts on sample quality and test sensitivity.

We recently published results of a study that revealed variation in WNV antibody detection using filter paper strips stored at varying temperatures and durations. We collected Nobuto filter paper strip samples and blood (later centrifuged to separate the serum, the gold standard sample for serology) from experimentally WNV-infected wild turkeys (*Meleagris gallopavo*; n = 23) and northern bobwhites (*Colinus virginianus*; n = 20) and tested samples with WNV plaque reduction neutralization test (PRNT). The PRNT is a commonly used test to detect antibodies to WNV, and positive detections indicate the bird was previously exposed to the WNV, and developed antibodies against the virus.

The filter paper strip storage methods included storing the filter paper strips for variable time periods prior to elution after placing the blood onto the strips; elution refers to using sterile saline solution to soak the serum sample out of the filter paper strips. The storage conditions included: immediate elution after filter paper strip drying (i.e., one day after drying), and storage at -20°C (i.e., freezer temperature) for three months, -20°C for six months, room temperature for three months, and room temperature for six months prior to elution.

Filter paper strip eluates and sera were co-titrated to determine endpoint antibody titers, which were compared between filter paper strip samples eluted immediately and sera and among filter paper strip samples that underwent the four storage conditions. WNV antibody titers (i.e., levels) from filter paper strips eluted immediately were approximately 4-fold lower than serum antibody titers (i.e., the gold standard) for both species, highlighting the value of collecting serum whenever feasible (**Table 1**). Further, northern bobwhite serum antibody titers generally were lower than the wild turkey serum antibody titers by approximately 10-fold. Overall, our study results suggest that prolonged storage duration (i.e., six months) of filter paper strips and storing filter



Left to right: example of Nobuto filter paper strips appropriately saturated with blood from a harvested quail and blood collected into serum separator tubes. The straw colored fluid at the top of the tubes is the serum needed for routine antibody sampling.

paper strips at room temperature (rather than -20°C) decreased test sensitivity estimates and resulted in lower detectable antibody titers for both species. Antibody titers and test sensitivity were lowest for those samples stored at room temperature for six months for both species. This decline in detectable antibody titers sometimes resulted in false negative test results (and thus, lower test sensitivity), which was more frequently observed in the northern bobwhite samples.

Wild turkey test sensitivity estimates were similarly high for all storage conditions (i.e., >90%) except for those filter paper strip samples stored at room temperature for the longest time period, six months, prior to elution and testing. In contrast, test sensitivity estimates were <70% for all northern bobwhite filter paper strip storage conditions and ultimately dropped to 25% and 10% in those filter paper strip samples that were stored at room temperature for three and six months, respectively. Our results suggest that the utility of filter paper strips in WNV serologic surveys utilizing PRNT may vary by species and filter paper strip storage temperature and duration prior to sample elution.

Overall, filter paper strips may be useful in wild turkey WNV serologic studies but should be used with caution in northern bobwhite WNV serologic surveys, as test sensitivity in our study was <70% in all filter paper strip storage conditions. This species difference likely is attributed to the fact that bobwhites, in general, had lower serum antibody titers as compared to wild turkeys, highlighting the great variation in antibody titers among avian species and individuals within species. However, regardless of species, freezing filter paper strips and eluting samples prior to three months of storage may minimize false negative test results. These results were recently published in the **Journal of Veterinary Diagnostic Investigation**.

Prepared by Melanie Kunkel and Nicole Nemeth, SCWDS

Table 1. Sensitivity of wild turkey and northern bobwhite WNV antibody tests when using serum compared to filter paper strips (FPS) stored at varying temperatures and durations.

	Plaque reduction neutralization test sensitivity %	
Sample type	**Wild turkey (n = 23)**	**Northern bobwhite (n = 20)**
Serum	100	100
FPS sera eluted immediately	100	70.0
FPS stored at -20°C for 3 months	100	65.0
FPS stored at -20°C for 6 months	95.7	50.0
FPS stored at RT for 3 months	91.3	25.0
FPS stored at RT for 6 months	73.9	10.0

Heartland Virus in Georgia Ticks

In **recent work** done in collaboration with researchers at Emory University, we detected and isolated heartland virus (HRTV) from tick samples collected in Georgia in 2019. HRTV is an emerging virus transmitted by the lone star tick (*Amblyomma americanum*, image right) and was first identified in 2009 as the cause of severe illness in two patients in Missouri. Since then, more than 50 additional human cases have been identified in Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, New York, North Carolina, Oklahoma, South Carolina, and Tennessee.

According to the **Centers for Disease Control and Prevention (CDC)**, most people infected with HRTV experience fever, fatigue, decreased appetite, headache, nausea, diarrhea, and muscle or joint pain, with symptoms beginning up to two weeks after a tick bite. Some HRTV infections also cause decreased levels of white blood cells, which help fight infections, and platelets, which help blood to clot. Although severe or fatal HRTV-associated disease often occurs in people with underlying conditions, HRTV can rarely lead to fatal, widespread infections in generally healthy individuals, as evidenced by the death of a 68-year-old landscaper from Tennessee in 2015. Routine testing is not available for this virus so the actual prevalence of HRTV infection is currently unknown and is suspected to be higher than confirmed cases indicate. There is no vaccine or medication available to prevent or treat infections with the virus.

The lone star tick, which is responsible for transmitting HRTV, is common in the Eastern and Southeastern United States, with an increased abundance and distribution observed over the past two to three decades. This tick is comparatively more aggressive than other ticks. Lone star ticks are found in wooded areas and along meadow and stream edges from spring to early fall, with increased activity from mid-March to late June. Although numerous tick species are present in Georgia, the lone star tick is the most common cause of tick bites in humans in the state. Lone star ticks are known to transmit various tick-borne pathogens to humans and animals including HRTV. Evidence of previous HRTV infection has been detected in white-tailed deer, raccoons, coyotes, and moose. These ticks also feed on many other animals including horses, cattle, dogs, skunks, squirrels, raccoons, and migratory birds.

Our work assessed HRTV infection in field collected lone star ticks by testing almost 10,000 ticks of different species collected from central Georgia during the summer seasons of 2018 and 2019. The tick collection area included parts of Jones, Baldwin, and Putnam Counties. These sites were chosen because of their proximity to the location of the only human case of HRTV in Georgia from 2005, later confirmed in 2015. In April 2022, a second human case was reported: a Baldwin County man died from HRTV infection following a lone star tick bite. We found that roughly 1 in 2,000 ticks carried HRTV after three pooled samples tested positive. These pools included males, females, and nymphs. Of the three positives, live virus was isolated from two samples. The viruses found were similar to each other and only 2-5% different from three other HRTV from human cases in Missouri and Tennessee.

This study confirms that HRTV is present in Georgia, and that the lone star tick is likely responsible for transmitting the virus. Efforts to continue testing ticks statewide are underway. The best way to prevent HRTV infection is to protect yourself from tick bites. When going outside, be aware of the locations you and your pets explore, wear tick and insect repellent, wear pants and long sleeves, and check your body to help prevent or monitor any tick bites. We would like to thank our collaborators at Emory University.

Prepared by Kayla Adcock and Daniel Mead, SCWDS

CWD Research and Management Act

The **Chronic Wasting Disease Research and Management Act** (CWD ACT) is part of the **Consolidated Appropriations Act, 2023** that was signed into law by President Biden on December 29, 2022. The purpose of the CWD ACT is to support research and State and Tribal CWD management efforts, and it authorizes funding up to $70,000,000 for each fiscal year through 2028. Funds are to be equally allocated between research and management with at least 75% of management funds going to State or Tribal wildlife agencies.

Congress has found that research on the resistance to, transmission, and diagnosis and epidemiology of CWD is necessary to inform future policies to combat the disease and ensure the health of cervid populations. Additionally, because of the diverse policies among States and Tribes to address CWD, the Federal Government should coordinate financial and technical support to States and Tribes and their departments of agriculture and wildlife agencies, institutions of higher education, and CWD research centers. However, the States retain primacy and policymaking authority for wildlife management, including management of CWD. Research will be conducted by eligible entities under cooperative agreements or other legal instruments in a program established under the Secretary of Agriculture. Awards should not be less than 2% or more than 10% of appropriated research funds and entities receiving awards may not use more than 10% of awarded funds for administrative costs.

White-tailed deer in Kansas with end stage CWD. Photo courtesy of Mike Hopper, KDWP.

Priority will be given to proposals for projects investigating methods and products to:

- Detect CWD prions in live cervids, their excreta, and the environment as well as methods to decontaminate such infectious prions
- Improve sensitivity and accelerate turn-around time for test results from non-live cervids
- Facilitate long-term CWD suppression or eradication
- Identify genetic resistance markers to CWD and strategies for using such resistance to fight the spread of CWD
- Determine sustainable harvest strategies to reduce CWD prevalence and spatial expansion
- Identify factors contributing to local CWD emergence, increasing prevalence and distribution, including transmission mechanisms and barriers to transmission

Management efforts also will be supported under cooperative agreements or similar instruments with the Secretary of Agriculture. State and Tribal wildlife agencies and departments of agriculture are eligible to receive support to develop and implement strategies to address CWD within their jurisdictions.

Priority will be given to applications from States and Tribes that have the:

> Highest incidence of CWD
>
> Greatest financial commitment to manage, monitor, surveil, and research CWD
>
> Most comprehensive CWD management policies and programs
>
> Greatest risk of an initial CWD incursion from surrounding areas
>
> Greatest need for response to new outbreaks in areas where CWD already is known to occur, or in areas with first detection of CWD and where managers intend to contain it

Additional elements of the CWD ACT concern rapid response, public education, and review of the **USDA CWD Herd Certification Program** (HCP). The ACT authorizes the Secretary of Agriculture to immediately issue funds to State and Tribal agencies attempting to control CWD spread in a cervid population experiencing its first detection. It also directs the Secretary, in consultation with State and Tribal departments of agriculture and wildlife agencies, farmed cervid industry organizations, and organizations representing deer hunters, to develop and maintain materials based on current scientific knowledge to educate the public on CWD and strategies to help prevent its spread.

The CWD ACT states that within 18 months after enactment, the Secretary shall publish in the Federal Register a notice soliciting public feedback on potential updates and improvements to the HCP. Comments particularly sought are those related to minimizing or eliminating contact between wild and captive deer, reviewing and updating indemnity practices, including the use of live animal testing to facilitate timely removal of infected deer from the landscape, and increasing participation in the HCP.

Prepared by John Fischer with excerpts from the CWD Research and Management Act

Bluetongue Virus Serotype Classification

Multiple bluetongue virus (BTV) serotypes have circulated among domestic and wild ruminants and *Culicoides* biting midge vectors in the United States for many decades. The **United States Department of Agriculture (USDA), Animal Plant Health Inspection Service (APHIS)** has recently updated the status of BTV serotypes in the United States. While the common nomenclature historically revolved around specific serotypes being considered either "endemic" or "exotic", USDA-APHIS now reports each BTV serotype as either "established", "reported", or "not reported". The new classification of each BTV serotype will be routinely evaluated by USDA-APHIS based on frequency of detection, geographic location, and/or phylogenetic analysis. The new classification was the product of a Resolution passed at the 2020 United States Animal Health Association (USAHA) Annual Meeting titled, "Re-evaluation of Endemic Bluetongue Virus Serotypes in the United States".

In response to the resolution, USDA assembled a stakeholder working group that was comprised of orbivirus experts from USDA, University of Florida, Colorado State University, and SCWDS, which generated a report for USDA in 2021. A group within USDA, APHIS, Veterinary Services was then formed and used this information to update the classification of BTV serotypes in the United States.

The BTV serotype designations below were first outlined at the USAHA Annual Meeting (Minneapolis, MN) during October 2022:

Established: (Serotypes 3, 6, 10, 11, 12, 13, 17) a specific serotype has been reported annually for two consecutive years in a geographic region where vector incursions due to weather events would not be expected; OR there is documented phylogenetic evidence of virus reassortment with previously established strains in domestic and wild animals.

Reported: (Serotypes 1, 2, 5, 9, 14, 15, 18, 19, 22, 24) a detection based on the current APHIS BTV serotype case definitions that has not been detected in the past five years; OR detection in geographic regions where vector incursions due to weather events are expected and have not been detected consecutively for two years.

Not reported: (Serotypes 4, 7, 8, 16, 20, 21, 23, 25, 26)

Globally, BTV is comprised of at least 26 serotypes. The first isolation of BTV in the United States was from a domestic sheep in California during the 1950s. Subsequently, the first association of BTV with mortality in wild ruminants occurred during an outbreak in Texas in the 1960s. Through the early 1980s, four serotypes (BTV-10, -11, -13, and -17) were considered endemic in the United States. In 1982, BTV-2 was first isolated in the Southeast and was subsequently detected on multiple occasions in the region. For the next two decades, these five BTV serotypes were widely recognized as "endemic" in North America. However, since the late 1990s, nearly a dozen additional BTV serotypes have been detected in the United States, prompting the new designations by the USDA. Since the early 1990s, SCWDS has received tissue samples collected from wild deer suspected to have died from hemorrhagic disease (i.e., BTV or epizootic hemorrhagic disease virus).

Over the past 30+ years, we have isolated 11 BTV serotypes from samples submitted by wildlife professionals, including BTV-1, -2, -3, -5, -10, -11, -12, -13, -17, -18, and -24. These virus isolates are regularly shared with USDA and SCWDS will continue to work closely with colleagues at USDA and others to provide wild ruminant BTV surveillance data critical to understanding patterns of BTV in the United States. Additional information about the new designations can be found on the **USDA-APHIS** website.

Prepared by Mark Ruder, SCWDS

First CWD detections in FL, OK

During June 2023, Oklahoma and Florida became the most recent states to report the detection of CWD in free-ranging deer. The Oklahoma Department of Wildlife Conservation (ODWC) announced that a landowner in Texas County reported a white-tailed deer behaving abnormally. Staff with ODWC collected diagnostic samples and CWD was confirmed through laboratory testing. Texas County is in the panhandle of Oklahoma and is dominated by semi-arid grassland habitat, home to three cervid species. ODWC has activated the next phase of their joint ODWC-Oklahoma Department of Agriculture, Food, and Forestry CWD Response Strategy.

The Florida Fish and Wildlife Conservation Commission (FWC) confirmed that a 4.5-year-old, female, white-tailed deer killed by vehicle collision in Holmes County tested positive for CWD. Holmes County is in the panhandle of Florida and is a border county with Alabama. FWC is working closely with the Florida Department of Agriculture and Consumer Sciences and other partners on their response.

There are now 31 states with CWD detections in free-ranging cervids. Among the 17 SCWDS member states, only Kentucky, Georgia, and South Carolina have yet to detect CWD in wild cervids. Updates will be provided in future issues of the SCWDS *BRIEFS*. Additional information about these recent detections can be found in press releases by **ODWC** and **FWC**.

Prepared by Mark Ruder, SCWDS

Diagnostic Case Highlight

Highly Pathogenic Avian Influenza Virus in a Striped Skunk

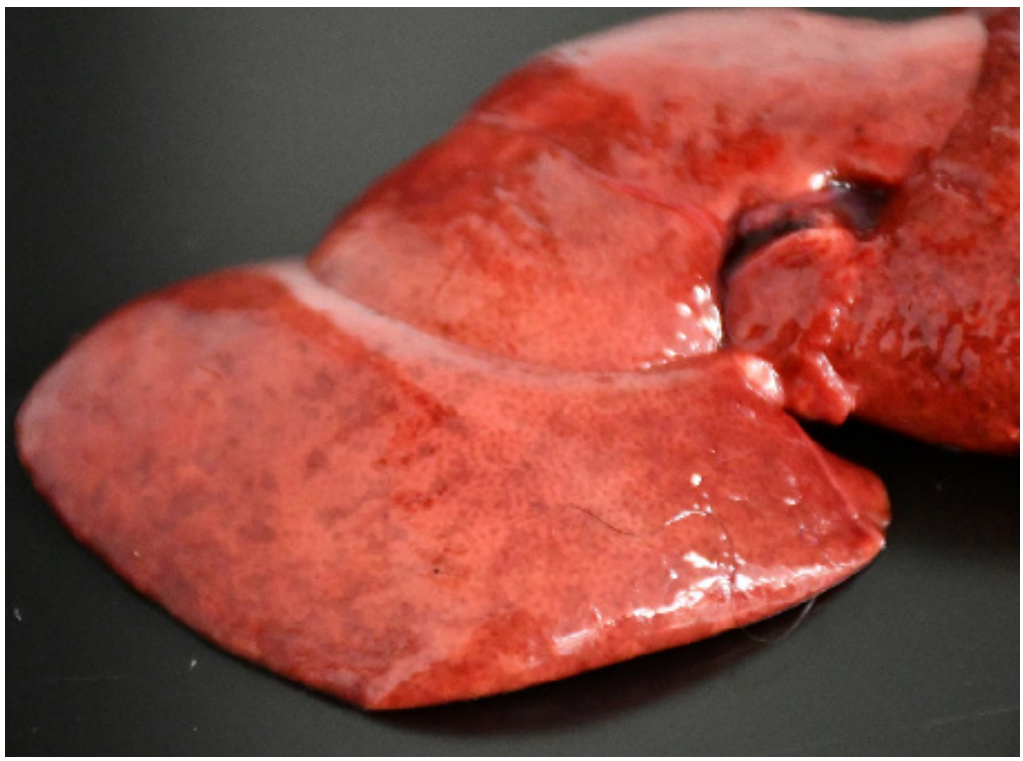
*In the **Winter 2023** issue of the SCWDS BRIEFS, this outbreak was summarized in the article titled HPAI in Wildlife: A Year in Review. At that point, detections at SCWDS were mostly limited to waterfowl, raptors, and shorebirds. More recently, the susceptibility of wild mammalian species to HPAIV infection has become a subject of high interest.*

Highly pathogenic H5 influenza virus (HPAIV) has impacted wild and domestic species of birds during the ongoing outbreak across the United States beginning in late 2021. In January of 2023, a striped skunk (*Mephitis mephitis*, image below) was found dead and submitted to the SCWDS Research and Diagnostic Service by Kevin Klag and Abigail McGuire, wildlife biologists with the Kansas Department of Wildlife and Parks. The carcass was discovered less than 50 feet from a recreational lake. It was surrounded by numerous geese carcasses, many of which had been scavenged.

Upon gross necropsy examination, the skunk was in excellent nutritional condition, with abundant fat stores and appropriate muscle mass. The liver was diffusely soft and mottled red-brown to tan. Dozens of pinpoint red foci were scattered throughout the liver (image, next page), along with larger, paler brown areas. The lungs were diffusely red. Microscopic evaluation revealed severe inflammation and cell death (necrosis) throughout the brain, as well as extensive areas of necrosis in the liver, and a mild pneumonia with a pattern suggestive of viral infection.

HPAIV in a Kansas Striped Skunk

Samples from the skunk tested negative for rabies and canine distemper viruses, while HPAIV was detected in a liver sample by molecular testing (i.e., reverse transcriptase PCR). No evidence of significant co-infections or underlying/concurrent disease was present. Thus, cause of death was attributed to systemic HPAIV infection.



Dr. Elizabeth Elsmo, a previous SCWDS diagnostician with the Wisconsin Veterinary Diagnostic Laboratory, described initial pathology findings of HPAIV infection in wild, terrestrial mammals in North America in a recent pre-print article. Detections in clinically affected animals were most common in red foxes (*Vulpes vulpes*), followed by striped skunks and raccoons (*Procyon lotor*). However, other species including bobcats (*Lynx rufus*), Virginia opossums (*Didelphis virginiana*), a coyote (*Canis latrans*), a fisher (*Pekania pennanti*), and a gray fox (*Urocyon cinereoargenteus*) are also described in the paper.

The majority of animals in the study, including all affected striped skunks, were juveniles, although adults can develop fatal disease. HPAIV has been associated with clinical disease in other species, such as seals, a bottlenose dolphin (*Tursiops truncatus*), and mountain lions (*Puma concolor*).

Overall, most animals were in fair to good nutritional condition at time of necropsy, and if there were gross lesions, they were most prominent in the lungs. Mammals with HPAIV-associated lung lesions typically had bloody or wet lungs, which did not always collapse fully. Microscopic evaluation most commonly reveals severe brain and variable lung inflammation (i.e., pneumonia), and cell death (necrosis) in the brain, heart, and liver. Interestingly, liver necrosis is a particularly consistent finding in striped skunks, consistent with the findings in this skunk from Kansas.

Nasal and oropharyngeal swabs and brain tissue were generally the samples with the strongest PCR results. Given the history of the skunk being found amongst many dead geese with signs of scavenging, the skunk may have become infected by scavenging on HPAIV-infected carcasses, or via HPAIV-contaminated environments (e.g., water). Thus, if an avian outbreak is suspicious for HPAIV and mammal carcasses are found in the vicinity, HPAI should be considered as a differential in both species. The potential effects of HPAIV on wild mammal populations are not well understood at this time and require further diagnostic evaluations and targeted research.

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