# New York State Wildlife Health Program

## Annual Report 2020-2021

**Promoting the health and sustainability of wildlife populations through integration of wildlife ecology and veterinary medicine**

# ADMINISTRATIVE SUMMARY

The New York State Cooperative Wildlife Health Program (WHP) is a partnership between the New York State Department of Environmental Conservation (DEC) and Cornell University's College of Veterinary Medicine Wildlife Health Lab (CWHL) that works to safeguard the long-term health of wildlife in New York. Initiated in 2011, the program is responsible for monitoring wildlife disease and toxin impacts on species statewide, staff training and support, policy input and research.

This report covers the case submissions from Jan 1-Dec 31, 2020. This year, the program processed 1487 cases, including 647 necropsies, an increase of 7% over the previous year. Two significant mortality events contributed to much of this increase: the death of a large number of crows in Orange County suspected to be from a chemical spill and an Epizootic Hemorrhagic Disease outbreak that killed an estimated 1400 deer. The first since 2011, this outbreak of EHD was the largest documented in New York to date.

## COVID Impacts

From March 2020 through December of 2020, the Wildlife Health Program was impacted by the worldwide pandemic due to SARS-CoV-2 (COVID-19). COVID restrictions severely reduced travel, typical field work, and research performed by DEC and WHP. With the vast majority of businesses and schools shut down, there were fewer people out and about to interact with wildlife and report concerns.

While DEC staff at Delmar were deemed essential workers and staffed the lab on a reduced schedule, the CWHL staff primarily worked remotely with twice weekly coordination meetings. Pathology services were still running necropsies throughout the pandemic and adjustments were made to collect some samples in the field. For instance, deer were sampled by Region 3 staff to document the EHD outbreak. Some COVID adjustments were beneficial; the usual in-person training workshops were converted to a webinar series, allowing more people to attend without travel and scheduling conflicts, or watch online at their convenience.

## Policy Guidance

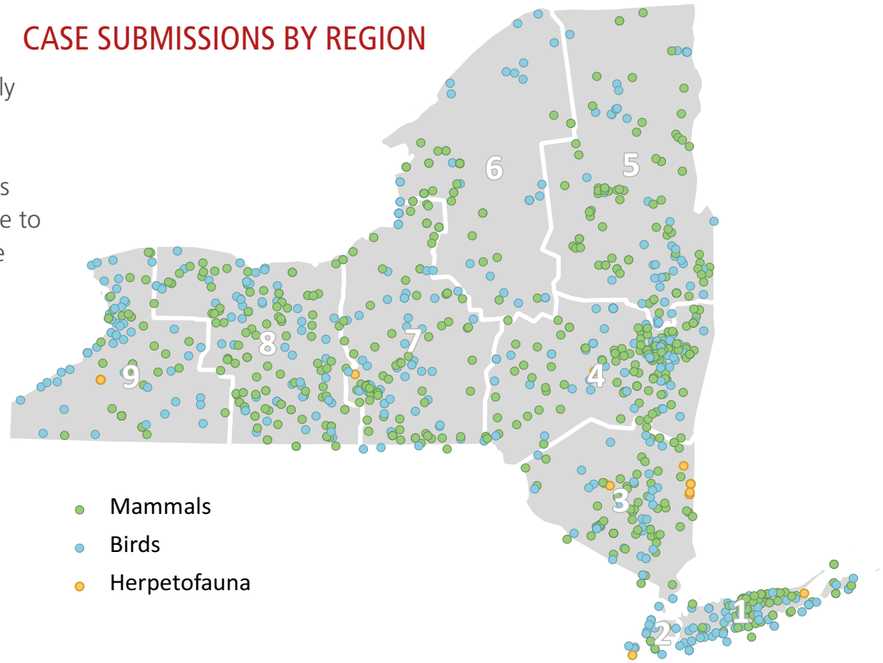
The SARS-CoV-2 virus focused worldwide attention on the importance of wildlife disease detection and management. Due to the suspicion that SARS-CoV-2 may have been transmitted from bats to humans in China (and infections were documented in dogs, cats, and farmed mink) there was considerable concern that it could spill over into North American wildlife.

The WHP assisted with providing guidance for wildlife rehabilitators and researchers to minimize the risks of virus transmission through the use of PPE, reduced handling, and careful disinfection. Protecting the health of free-ranging wildlife from novel diseases is paramount to our health mission.

# HEALTH AND DISEASE SURVEILLANCE

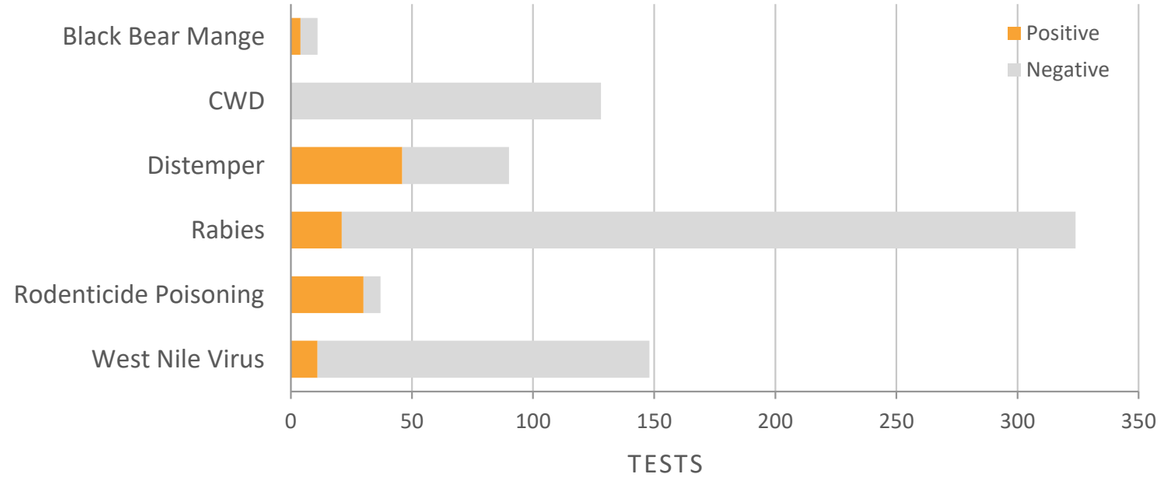
## CASE SUBMISSIONS BY REGION

Case submissions have steadily increased each year since the program's start. There is also a notable expansion in species diversity in cases. We continue to streamline and inform disease surveillance efforts.




**647** necropsies performed

## TARGETED DISEASE SURVEILLANCE




**1487** animals examined

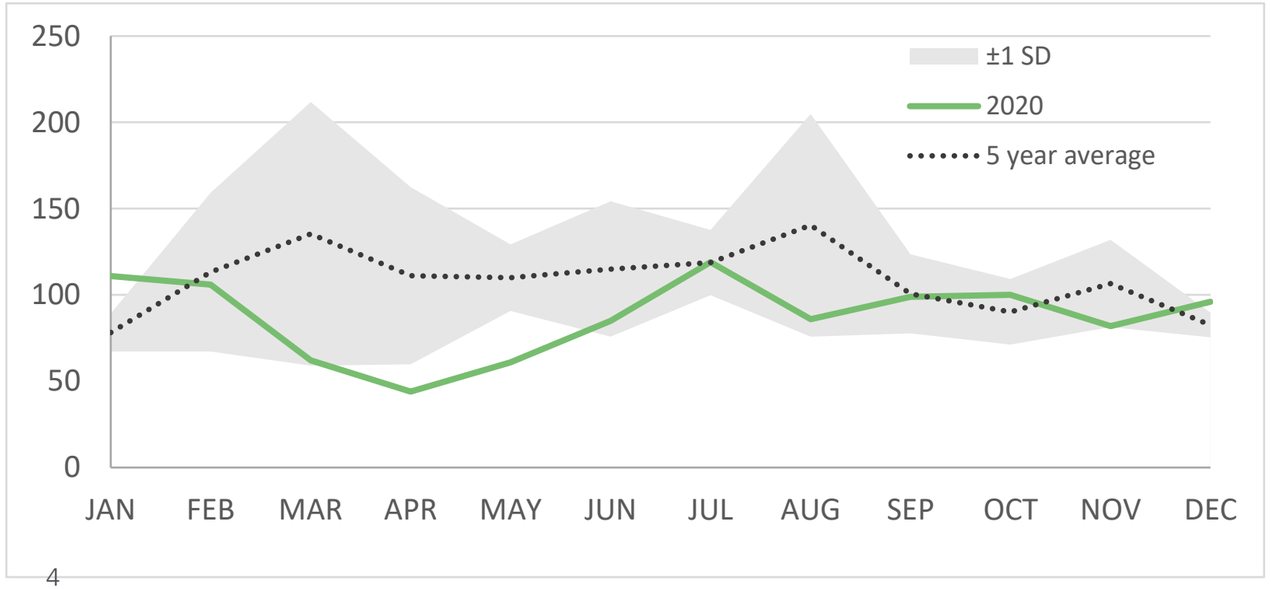
**57** forensic examinations

**690** birds **76** species

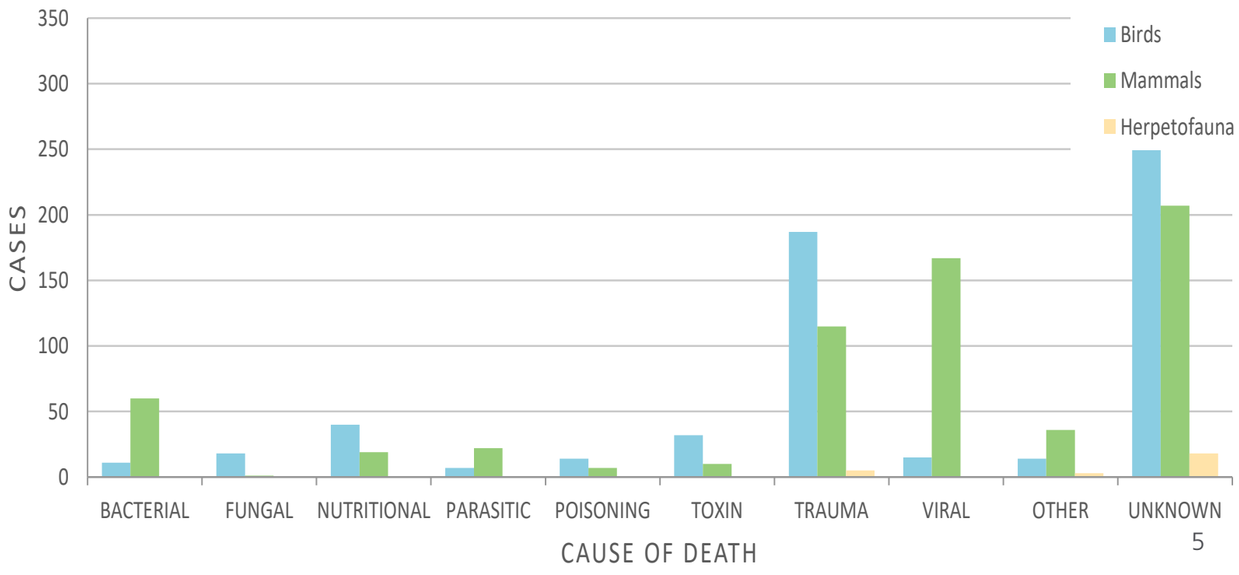
**770** mammals **35** species

**27** herpetofauna **10** species

## MONTHLY CASELOAD




## DIAGNOSED CAUSE OF DEATH



# EMERGING AND SIGNIFICANT DISEASE ISSUES

## NEUROLOGIC RED FOX KITS

During routine surveillance, we monitor for clusters of cases with similar symptoms which might indicate a disease outbreak. If caught early, we have a better chance of containing pathogen spread. In the spring and early summer of 2020, we examined nine juvenile red foxes that had neurologic signs, indicating a disease or injury to the brain. As it often turns out, this was not a single disease causing problems, but a number of different issues that looked the same. Two of the animals had rabies. One had hydrocephalus, a malformation of the brain which causes fluid to accumulate inside the skull, which we have previously seen in red fox kits.

Last but not least, we identified two fox kits infected with Canine Adenovirus (CAV1). Adenovirus can cause hepatitis and encephalitis in dogs, and a few cases have been documented in foxes. Despite adenovirus being a well-studied virus in dogs with a routine vaccine, there has been little published on circulation in North American wildlife. A similar and more common virus (CAV2) cross reacts on antibody tests, making it difficult to distinguish adenovirus strains. We will be testing more cases to determine how CAV1 behaves in foxes.

Also of interest, we detected *Babesia* in the blood of four of the fox kits in which the cause of death was either trauma or hydrocephalus. *Babesia* is a protozoal blood parasite that can

be transmitted by ticks or from animal to animal. There are multiple types of *Babesia* including one common to foxes called *Babesia vulpes*. In infected domestic dogs, *Babesia* can damage blood cells, causing anemia and low platelet counts. Because the type of tick involved in transmission of *B. vulpes* has not been identified, the risk of transmission to pets is unclear at this time. Infected foxes show no clinical signs of disease, which was consistent with the fox kits we examined.

## LEPTO ON LONG ISLAND

Occasionally we see animals that have more than one infectious cause of death. We examined 18 raccoons from Suffolk County on Long Island in 2020. With raccoons, we have a high suspicion of rabies, but due to an extensive oral baiting field vaccination program - Suffolk County is free of raccoon rabies.Usually sick raccoons from this area will have canine distemper virus, as was the case for 16 of these animals.

However, on histologic examination of tissues from four of these cases, Dr. Gavin Hitchener detected kidney inflammation not typical of distemper virus. Testing indicated infection with *Leptospira*, a type of bacteria that can cause liver and kidney damage. Multiple types of leptospires circulate in mammals. Worldwide it is one of the most frequent diseases transmitted from animals to humans, typically from infected rodent carriers shedding the bacteria in urine.

## COVID-19 AND WILDLIFE

There have been cases in the past year in which SARS-CoV-2, the virus that causes COVID-19, has been transmitted through close contact from infected humans to animals, including domestic pets (dogs, cats and ferrets); zoo animals (tigers, lions, puma, snow leopards and gorillas), and farmed mink. White-tailed deer have been experimentally infected. While the virus has been linked to bats in China, there are no documented cases of transmission from humans-to-bats or bats-to-humans in the United States. Research on the big brown bat by the National Wildlife Health Center indicates that they are resistant to infection, but there is still concern that some other North American bat species might be susceptible.

According to the Centers for Disease Control and Prevention (CDC), the risk of any animal passing the disease to humans is low. However, it is important that we continue to minimize any potential for SARS-CoV-2 to be transmitted between humans and wildlife, and we will be monitoring and testing any animals with consistent symptoms or known exposure to the virus.

## NEW YORK EPIZOOTIC HEMORRHAGIC DISEASE VIRUS OUTBREAK

For the first time since 2011, Epizootic Hemorrhagic Disease Virus caused an outbreak in NYS. The virus is spread by *Culicoides* midges and can result in hundreds and sometimes thousands of deaths of white-tailed deer. It is occurring more often in the northern US due to warming temperatures. Previously it was confined to southern states where deer are more resistant after decades of exposure.

The first case in this outbreak was confirmed on September 2, 2020 in Putnam County, followed by another in Orange County the next day. Detection quickly expanded to surrounding areas in Regions 3 and 4. Carcasses were necropsied and the virus was confirmed by PCR. DEC staff also collected samples in the field to supplement testing results.

Region 3 collected reports from the public and conducted field surveys to estimate mortality: 650 dead deer were found east of the Hudson River and 805 were found west of the river, although this is likely an undercount at 1455 deer. The midges are no longer active after the first hard frost, and the last positive case was detected October 26, 2020.

New York shares this data with the Southern Cooperative Wildlife Disease Study based at the University of Georgia. They compile reports from all over the US and are able to provide analysis of trends in the EHD type and geographic range. They identified the type of EHD in New York as EHDV-6, a newer strain that is also capable of infecting cattle.



**Right:** Regions 3's Mike Menza doing a water retrieval of a deer carcass.

**Bottom:** Typical signs of EHD in white-tailed deer: swollen face and/or tongue and blood-red eyes. (Images from 2007 outbreak)


# CHRONIC WASTING DISEASE PREVENTION & UPDATE

## SURVEILLANCE OPTIMIZATION PROJECT FOR CHRONIC WASTING DISEASE

The Surveillance Optimization Project for Chronic Wasting Disease (SOP4CWD) began in 2020 to bring together states and provinces in a regional effort to use mathematical modeling to improve surveillance effectiveness, minimize cost of sampling, and maximize the probability of discovering new infections. Twenty-two states and one Canadian province have signed on as project partners, with invitations sent to the remaining states in the Eastern US.

Wildlife agency partners have submitted disease testing, demographic, hunter harvest, and hazard data. In return for the provision of data, each participating agency will receive access to interactive software apps, each fitted with data and/or data-driven modeling results. Beta-testing of these apps have been conducted by state agency biologists prior to a large-scale roll-out.

In collaboration with DJ Case, we are developing a data warehouse that will be secure and available online to agency staff where they will be able to manage their CWD data, seamlessly supply it to mathematical models, and have interactive web applications to: 1) provide information on situational awareness, 2) conduct predictive analytics, 3) assess sampling optimization based on agency budgets, and 4) identify actions to pre-emptively suppress a CWD outbreak in a specific location.

All of these products, as well as those from other modeling efforts, will be accessible through an easy "one-stop shop" experience for CWD information hosted by the CWD Alliance.

*Apps developed so far include the following:*

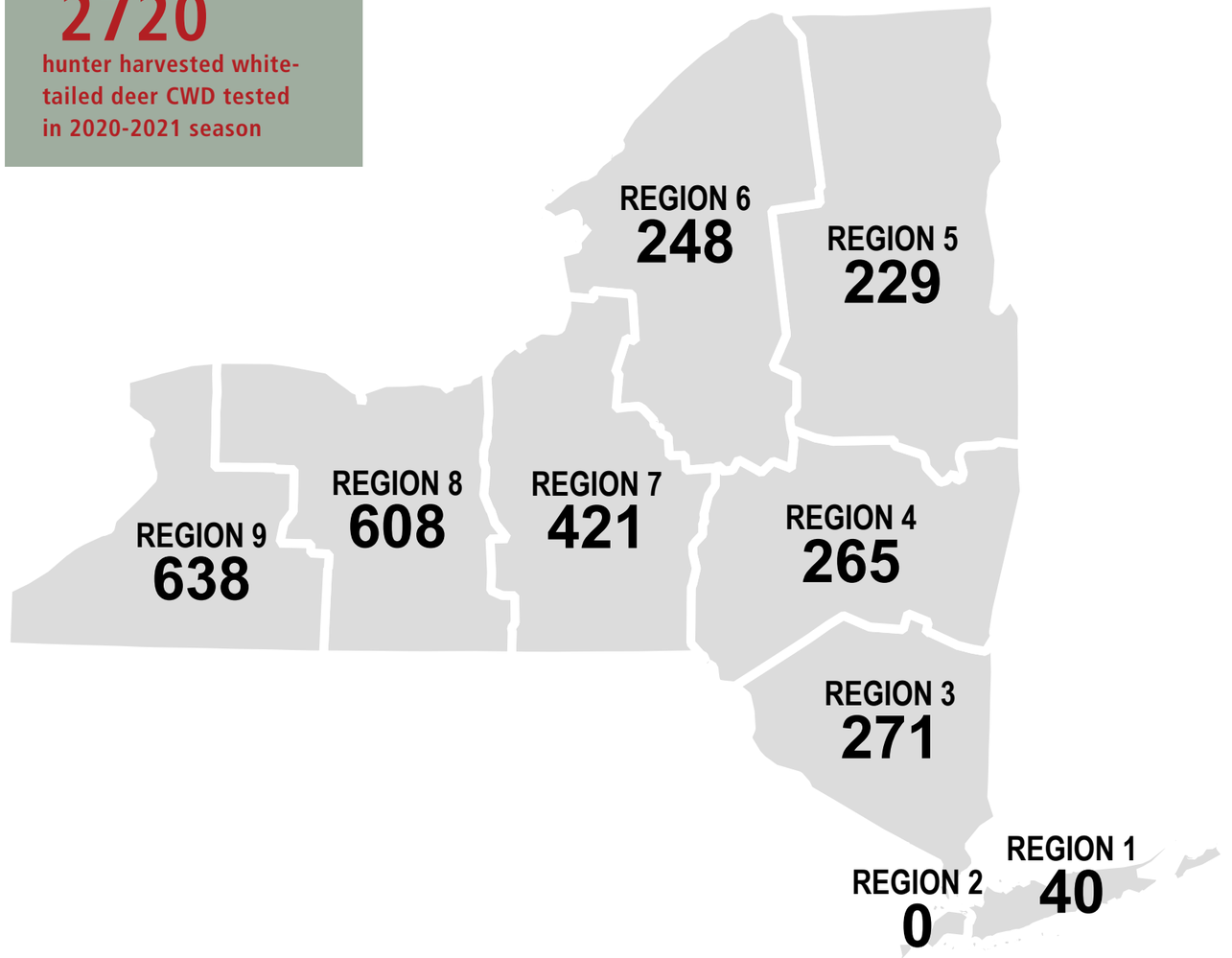
1. The Wildlife Disease Positive Software includes summaries of the CWD testing data from white-tailed deer by location to county level with positive deer, testing efforts, and CWD prevalence by age and sex.
2. The Regional Wildlife Disease Positives Software gives the same information as the Wildlife Disease Positives Software but on a regional scale spanning all SOP4CWD partnering agencies of the eastern US and Canada.
3. The Wildlife Disease Hazard Software accounts for demographic parameters, such as harvest mortality and deer density, as well as factors that identify counties where infectious prions are likely to be introduced by human activities. Agencies will be able to identify how various transmission parameters can influence outbreak likelihood in order to target surveillance and management in areas of higher concern.
4. The Wildlife Disease Regional Hazard Software gives a sense of the regional scale and distribution of hazards to provide opportunity for cooperation across contiguous areas to mitigate the spread of CWD.
5. The Habitat Risk Software provides location-specific information regarding habitat characteristics that play a role in CWD persistence and spread to enable managers to plan activities, such as targeted removals and placement of head-drop collection boxes.
6. The Optimization Software balances the agency cost of CWD sampling with the risks on the landscape allowing state agencies to allocate financial resources between areas with novel outbreaks that are likely to persist and areas with established CWD infections.



## CHRONIC WASTING SAMPLING

New York continues to conduct CWD surveillance to detect the disease at the earliest intrusion into the state. Support and participation from meat processors and taxidermists is critical for surveillance efforts. No positive deer were reported from tests of the 2720 hunter harvested deer and 206 clinical suspects during the 2020-2021 season.

**2720**
**hunter harvested white-tailed deer CWD tested in 2020-2021 season**



# TRAINING AND TEACHING

## WILDLIFE HEALTH WEBINAR SERIES

With COVID-19 restrictions in place, keeping up with training of DEC personnel in person was not possible. The WHP staff decided to offer wildilfe health training via an online interactive webinar series. The series' live sessions garnered over 500 registered viewers and the recordings have been watched over 700 times online.

**COVID-19 in Wildlife (June) -** what we know about COVID-19 and wildlife. Learn where we are with testing and risks to species with Dr. Krysten Schuler, how to protect yourself and wildlife with appropriate PPE from wildlife biologist Kevin Hynes, and get the inside scoop on using and understanding mathematical models with Dr. Brenda Hanley.

**Common Diseases in Wildlife (July)** - From deer diseases and avian pox to rabies and West Nile Virus, the Wildlife Health Program covers it here.

**Emerging Risks to Wildlife (August)** - It covers emerging disease threats to free-ranging wildlife and the importance of disease surveillance in New York State.

**The NYS Wildlife Health Program (Sept)** - Topics included an overview of the program and its activities, the case submission process, how necropsies are performed, interesting recent wildlife mortality cases, and training resources and technical materials on the website.

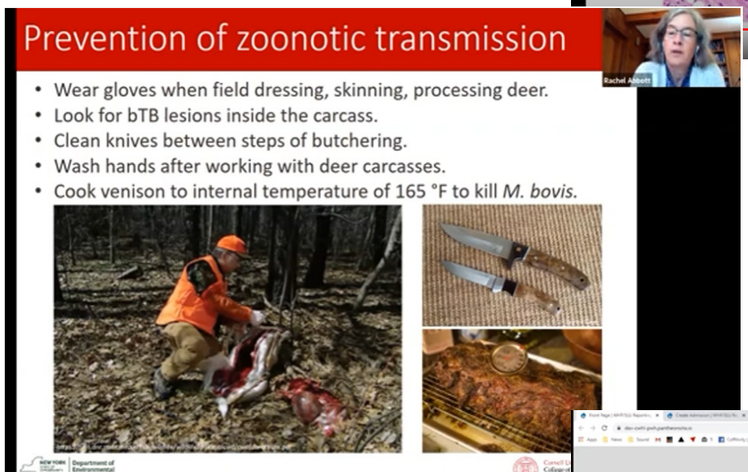
**Research Highlights (Oct)** - It covers WHP research projects at the Wildlife Health Unit at Delmar and at the Wildlife Health Lab at Cornell.

**Wildlife Forensics (Nov)** - Learn about wildlife forensics from some of the people directly involved in the investigations. We cover what it takes to process a case and a scene, how specimen collection and documentation keep the evidence secure, what the Wildlife Health Unit sees from a pathology perspective.

Left: COVID-19 and Wildlife with Kevin Hynes discussing using Personal Protective Equipment (PPE) and sample collection


Right: Emerging Risks to Wildlife with Dr. Gavin Hitchener covering Adenoviruses in cervid species.

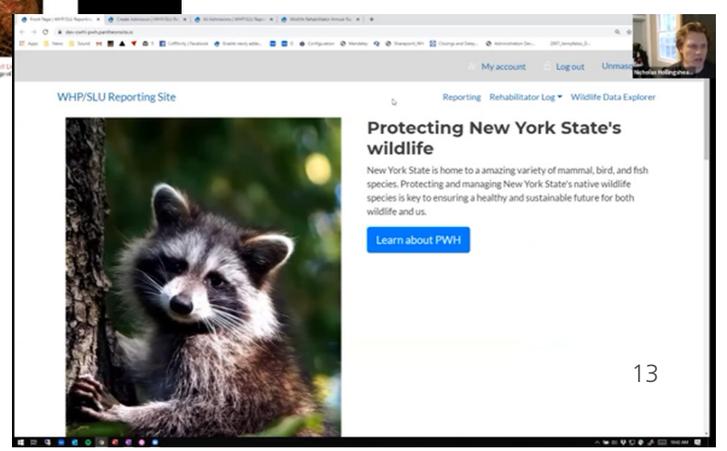
Below left: Emerging Risks to Wildlife with Dr. Rachel Abbott detailing the risks of Bovine Tuberculosis (bTB) transmission in white-tailed deer.





Right: NYS Wildlife Health Program Updates with Ashley Ableman discussing interesting cases submitted to the Wildlife Health Unit in Delmar.

Right: NYS Wildlife Health Program Updates with Nick Hollingshead demonstrating the upcoming database for the Special Licenses Unit.



# SCIENCE COMMUNICATION AND OUTREACH

## PUBLIC OUTREACH AND WILDLIFE DISEASE FACT SHEETS

The WHP has written and posted **40** disease fact sheets on the website for a range of wildlife diseases, with more on the way. With an average of 300-500 views per month on different fact sheets and almost 32,000 total views during the year, these valuable tools continue to educate and inform the public, DEC biologists, technicians and staff.


## WEB ANALYTICS AND SOCIAL MEDIA

In 2020-2021, the CWHL generated over **250** tweets, posts, news reports, disease alerts, fact sheets, Lab Bites, wildlife 411s, and newsletter emails. Both social media accounts, Twitter and Instagram, have been successful in driving traffic to the website, highlighting wildlife health, promoting our disease fact sheets, and stimulating community engagement in preventing disease spread. Our use of social media has been key in expanding our public outreach and education efforts. By reviewing website visits following targeted postings, we can see the link between social media posts and website traffic. In 2020 our Instagram program grew from 600 followers to over 800 and Twitter increased from nearly 400 to over 500 followers. Both of these outlets continue growing and have proven to be important factors in our public outreach efforts.

## CHRONIC WASTING DISEASE WILDFED PODCAST

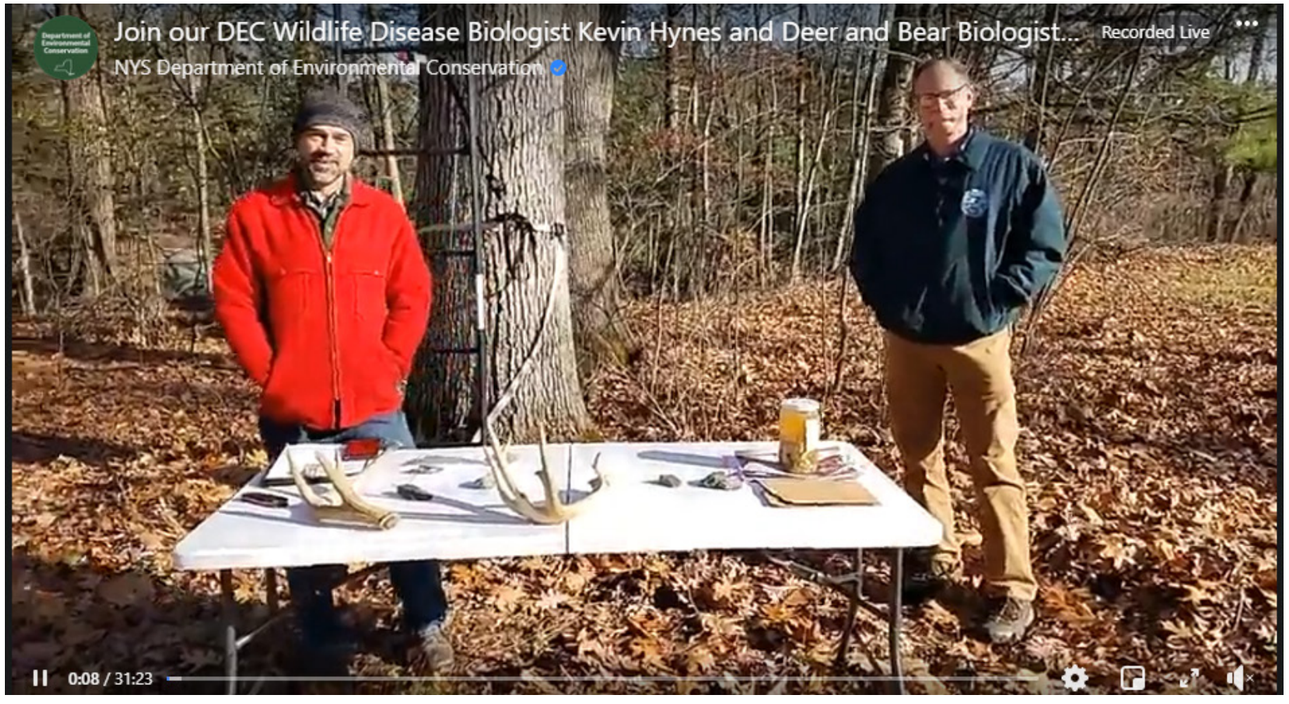
Dr. Krysten Schuler was invited by WildFed, a television and podcast series discussing the ecology of hunting, fishing, and sustainability, to discuss chronic wasting disease.

WildFed Podcast #60 What You Need to Know About Chronic Wasting Disease

## BIG GAME HEALTH IN NYS ON FACEBOOK WATCH

Watch DEC biologists Jeremy Hurst and Kevin Hynes discussing impacts to big game. Understand how monitoring the health of white-tailed deer and black bears is an important part of population health.

Deer & Bear Health in NYS




**Above:** DEC's Kevin Hynes and Jeremy Hurst discuss the importance of big game health surveillance.

**Left**: The EHD Disease Fact sheet was viewed and/or downloaded over 8500 times last year.

## BALD EAGLE LEAD PROJECT WRAP-UP

The Northeast bald eagle population assessment involved collaboration with researchers from academia, state, and federal agencies in a seven-state area in the northeastern United States. We assessed necropsy records from 1200+ bald eagles and found that lead toxicosis had led to a 4-6% depression in the long-term growth rate of wild eagles. Our data has been shared in open repositories https://doi.org/10.7298/3p9p-j249 and https://doi.org/10.7298/wr25-4m46 and our manuscript is in peer review.

Once the manuscript for the northeast eagle analysis is accepted for publication, we will submit two follow-up manuscripts that discuss lead in bald eagles in NYS and the dashboard that can be used to assess impact of toxicosis in any other location of interest. Preliminary results are also archived at https://doi.org/10.7298/rsse-e634 and https://doi.org/10.7298/0dm3-tf51.



## FISHER REPRODUCTIVE HEALTH

A doctoral research project assessing factors that may impact fisher populations in northern New York is being conducted in collaboration with SUNY ESF. One aspect focuses on the reproductive health of fishers. Ovaries from harvested female fishers are being examined histologically to identify reproductive stages in order to estimate potential reproductive success.

Another aspect of the project is examining exposure to toxic anticoagulant rodenticides. Livers from harvested fishers are being screened for 11 rodenticides, including products available for purchase by general consumers at hardware stores and compounds restricted to professional pest companies.

In addition, clotting times of blood samples drawn from live fishers are being measured by the Comparative Coagulation Section of the Animal Health Diagnostic Center as a measure of potential rodenticide exposure. These data will be analyzed to determine geographical variations across regions of NYS and factors associated with reproductive success of fishers tto understand how fisher populations may be impacted.

# POLICY SUPPORT

The NYS WHP provides support on any wildlife health topic, not just limited to disease outbreaks. We routinely review research permit requests, management plans and project proposals to assist staff in working safely with wildlife and reduce potential health impacts.

## WILDLIFE DISEASE FIELD RESPONSE

Field Response for Wildlife Diseases was completed and online in October 2020. This wildlife response plan from the Wildlife Health Program will identify steps to take if morbidity or mortality is detected in wildlife and a response is appropriate. It includes detailed information on steps for Regional Wildlife field staff to follow during wildlife disease investigations.

## WHIP DATABASE UPGRADE

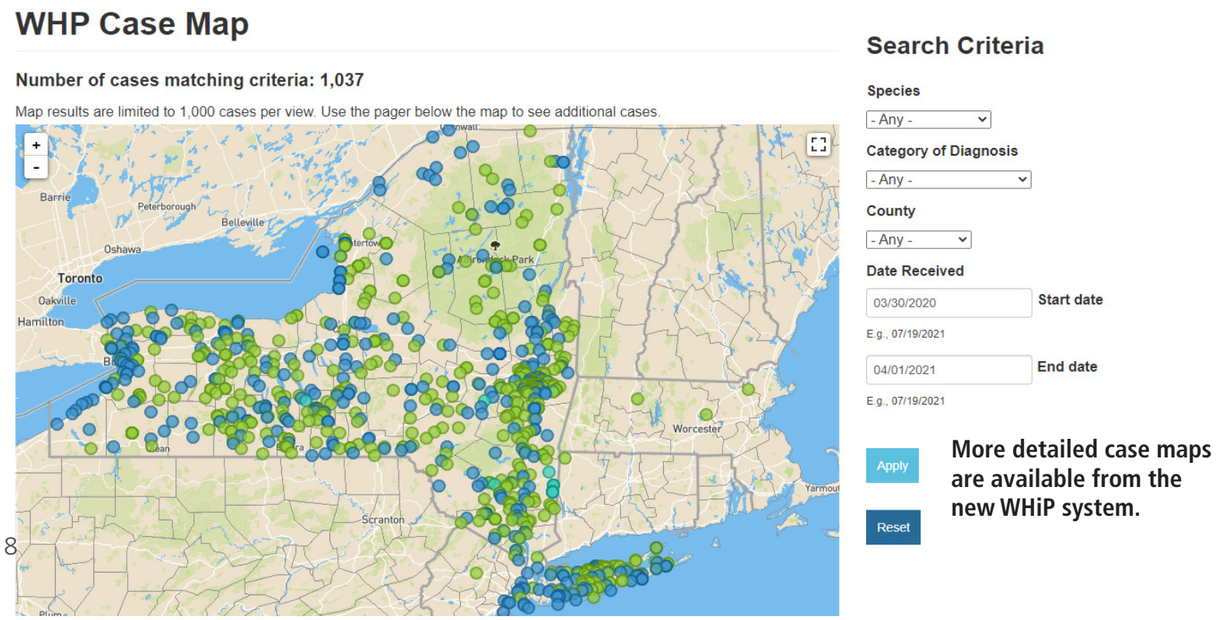
The Wildlife Health Program maintains a wildlife mortality event database that captures all animal, sample, testing, and disease data from samples collected by DEC personnel throughout NYS. The database helps the WHP identify emerging diseases and examine long-term trends.

In 2020, the WHP worked with the Canadian Wildlife Health Cooperative to migrate the database to a new system called the Wildlife Health Intelligence Platform, which is built using a modern system architecture and includes a new web application user interface.

The transition to this new system will allow for the integration of other technologies for data collection, management, analysis, and delivery; and, ultimately, support the WHP's objectives to provide situational awareness, aid in disease response, and understand threats to the health of New York State's wildlife.

## ONGOING TEAM TRAINING

Melissa Fadden completed the *Wildlife Forensic Sciences* graduate certificate program at University of Florida in December. She joins Ashley Ableman, who completed the training earlier in the year. Ashley also completed a course on *Wildlife Toxicology: The Ecohealth Perspective* at University of Florida Fall 2020.






## GUIDELINES FOR WILDLIFE REHABILITATORS: RHDV2 & SARS-COV-2

A large scale outbreak of Rabbit Hemorrhagic Disease Virus 2 in domestic and wild rabbits in New Mexico, Arizona, Texas, Colorado, and Nevada, wild rabbits in California, and an isolated case in domestic rabbits occurred in New York City in 2020. A high level of concern that RHDV2 will be spread to New York wild rabbits (eastern cottontail and endangered New England cottontails) prompted an alert to NYS wildlife rehabilitators. Movement of domestic rabbits and parts could transport the virus, so it was important to keep wildlife rehabilitators up to date on the threat of RHDV2 and to report unusual mortalities in wild or domestic rabbits.

While the impact of SARS-CoV-2 on wild animals is currently unknown to a large extent, there is evidence that SARS-CoV-2 has been transmitted from infected humans to some animals (anthropozoonosis or reverse zoonosis), including domestic cats, tigers, lions, ferrets, mink, and domestic dogs.

As we learned more about the virus through the course of the pandemic, we issued guidelines on handling wildlife to researchers, wildlife rehabilitators, and nuisance wildlife control operators. The emphasis was on minimizing contact with wildlife, using personal protective equipment if handling was necessary, and obtaining vaccination as soon as possible to limit wildlife exposure to the virus.

### The scope of the wildlife health team encompasses all wildlife health related issues involving Bureau of Wildlife programs and responsibilities.

The Wildlife Health Program incorporates the One Health concept, which fosters collaboration among multiple disciplines involving health of humans, domestic animals, and ecosystems. Other specialists from the academic community, Departments of Health and Agriculture & Markets, and federal agencies may participate or provide information as needed.

## WILDLIFE HEALTH TEAM MARCH 2019-CURRENT

*DEC Personnel*

| | |
|---|---|
| Region 1 | Leslie Lupo |
| Region 2 | Sandy Chan |
| Region 3 | Giovanni Pambianchi |
| Region 4 | Karl Parker |
| Region 5 | Tim Watson |
| Region 6 | Joe Lydon |
| Region 7 | Tom Bell |
| Region 8 | Jenny Landry |
| Region 9 | Ryan Rockefeller |

*WHP Personnel*

| | |
|---|---|
| WHU | Kevin Hynes |
| Cornell | Krysten Schuler |
| Cornell | Beth Bunting |
| BMT Liaison Central Office | Kevin Hynes |
| DLE Liason | Major Matthew Revenaugh |
| BMT Liaison (Regional) | Sandy Chan |

# ANNUAL WORK PLAN FY 2020-2021 REVIEW

## Administrative

| | |
|---|---|
| Annual Wildlife Health program report | Complete |
| Biannual wildlife health program review (Central Office or Cornell) | Postponed |
| Wildlife Resources Center (WRC) infrastructure, equipment management and maintenance | Complete |
| WRC incinerator operation, lab maintenance, facility maintenance and grounds | Complete |
| Administration: budgeting, fiscal, personnel, T&A, LATS, FMIS | Complete |

## Policy Support

| | |
|---|---|
| Summary and analysis of SLU data for wildlife disease risk assessment (captive cervids, taxi/ processors, NWCO, Game Birds, Shooting Preserves reports) | In progress |
| Wildlife rehabilitation web-based data management and reporting system | In progress |
| Converting SLU to electonic reporting system for select licenses (NWCO, Game Bird) | Central Office |
| Wildlife rehabilitation procedures evaluation | Complete |
| Participate in wildlife health related meetings IRC, CWD, BOW, Wildlife Health and other meetings | Complete |
| Providing scientific/medical wildlife health consultation (public, staff, One Health partners, regulatory, research projects, SLU licenses, etc.) | Complete |
| Wildlife health and wildlife rehabilitators listserv maintenance | Complete |
| Collaborate and coordinate with federal agencies on wildlife health issues under the One Health approach | Complete |

## Health and Disease Surveillance

| | |
|---|---|
| Migrating to new CWHC case database (WHIP) | Complete |
| Annual CWD surveillance (sample collection, Taxidermy Partnership Program, reporting) | Complete |
| Chemical Immobilization Protocol | Complete |
| Wildlife rehabilitation 2012-2014 evaluation (publication) | In review |
| Case management and reporting: Wildlife necropsies (>1000/yr) | Complete |



## Disease Prevention and Response

| | |
|---|---|
| Update CWD Surveillance Plan with Captive Cervid Site Visits | In progress |
| Implement CWD Risk Minimization Plan action items | Complete |
| SARS-COV-2 guidance webinars and documents | Complete |
| RHDV2 guidance documents | Complete |
| Bald eagle population impact study | In progress |
| Develop Wildlife Disease Field Response document | Complete |
| Surveillance Optimization Project for Chronic Wasting Disease | In progress |

## Training, Teaching and Outreach

| | |
|---|---|
| Regional Wildlife Health Workshops | On hold |
| Training workshops for DLE staff | In progress |
| Communicate with veterinarians regarding wildlife health issues | Complete |
| Collaborate and coordinate with federal agencies on wildlife health issues under the One Health approach | Complete |
| Safe Capture International chemical immobilization training | Complete |
| Wildlife health presentations for public | In progress |
| Annual Furbearer training at DEC Fur School | Scheduled |
| Forensic services for DLE | Complete |
| Provide the public information about wildlife health issues on CWHL website | Complete |

## Research

| | |
|---|---|
| Fisher project - reproductive assessment | In progress |
| Fisher project - rodenticide testing | In progress |
| Bobcat cytauxzoon study | Complete |
| Development of eDNA tools for amphibian and virus detection | Complete |
| Complete tissue archive system | Complete |
| Bear mange statewide surveillance (publication) | In draft |
| *P. tenuis* study (publication) | In draft |
| Construct software applications to support research and disease surveillance efforts | In progress |
| Moose population health assessment (publication) | In draft |

# PUBLICATIONS, PRESENTATIONS AND GRANTS

## Publications

Carmen,J., Stallknecht D., Leyson C., Berghaus R., Jordan B., Pantin-Jackwood M., **Hitchener G.**, Franca M. 2020. Recombinant hemagglutinin glycoproteins provide insight into binding to host cells by H5 influenza viruses in wild and domestic birds. *Virology*. doi: 10.1016/j.virol.2020.08.001

**Okoniewski, J. C**., Vanpatten, C., **Ableman, A. E., Hynes, K. P., Martin**, A. L., & Furdyna, P. 2020. Anticoagulant Rodenticides in Red-tailed Hawks (*Buteo jamaicensis*) from New York City, New York, USA, 2012-2018. *Journal of Wildlife Diseases.* doi:10.7589/jwd-d-19-00003

**Schuler, K., K. McGarvey,** J. Mawdsley, and **R. Abbott**. 2021. Chronic Wasting Disease Testing: Diagnostic Labs are Key Partners. *The Wildlife Professional.*

**Schuler, K.,** J.R. Mason, and N. Pinizzotto. 2021. Parallels between COVID-19 and Chronic Wasting Disease: Biosecurity Stops Disease Spread. *Fair Chase – Official Publication of the Boone and Crockett Club.*

Siemer, W.F., T.B. Lauber, H.E. Kretser, **K.L. Schuler,** M. Verant, **C.J. Herzog,** and K.A. McComas. 2020. Predictors of intentions to conserve bats among New York property owners. *Human Dimensions of Wildlife.* DOI:10.1080/10871209.2020.1817628

## Presentations

**Abbott, R.** "Bovine tuberculosis in white-tailed deer." Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.

**Abbott, R.** "Development of vaccines and delivery methods to manage white-nose syndrome in bats." Research Highlights, Wildlife Health Webinar. October 2020.

**Ableman, A.** "Rabies and Distemper in Wildlife." Common Diseases in Wildlife, Wildlife Health Program Webinar. July 2020.

**Ableman, A.** ": Interesting Wildlife Cases." The New York State Wildlife Health Program, Wildlife Health Program Webinar. September 2020.

**Ableman, A.** "Chain-of-Custody and Forensic Specimen Handling." Wildlife Forensics, Wildlife Health Program Webinar. November 2020.

**Buckles, E.** "Pathology as a Monitoring Program."The New York State Wildlife Health Program, Wildlife Health Program Webinar. September 2020.

**Fadden, M.** "Wildlife Health: Conservation in Motion." Groton Agricultural Education STEAM Program, December 2020.

**Fadden, M.** "Wildlife Crime and Forensic Science Investigations." Wildlife Forensics, Wildlife Health Webinar. November 2020.

**Fadden, M.** "Submitting Cases to the WHP." The New York State Wildlife Health Program, Wildlife Health Webinar. September 2020.

**Fadden, M.** "Bsal- Our Salamanders in Jeopardy." Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.

**Fadden, M.** "Mange- The Mighty Mite." Common Diseases of Wildlife, Wildlife Health Webinar. July 2020.

**Hanley, B. "**The population dynamics of Bobcats in New York." Furbearer team meeting at the New York State Department of Environmental Conservation. Virtual. 2020

**Hanley, B. "**The population scale impacts of Pb toxicosis in Bald Eagle." The Wildlife Society national meeting. Virtual. 2020

**Hanley, B. "**The population scale impacts of Pb toxicosis in Bald Eagle in the NE, US and in NY, US.". New York State Department of Environmental Conservation Meeting. Virtual. 2020

**Hynes, K.** "Bald Eagle Mortality causes." Wildlife Health Program Research Highlights, Wildlife Health Webinar. October 2020.

**Hynes, K., and Hurst, J.** DEC Facebook Live education series Deer Diseases. November 2020.

**Hynes, K., Ableman, A., Fadden, M.,** and Przyklek, K. "Wildlife Forensic Pathology. " Wildlife Forensic Sciences, Wildlife Health Webinar. November 2020.

**Hynes, K.** "Proper use of PPE." COVID-19 in Wildlife Health Webinar. June 2020.

**Hynes, K.** "Can I eat this? Diseases and parasites hunters might see in deer." Common Diseases in Wildlife, Wildlife Health Webinar. July 2020.

**Hynes, K. "**RHDV2: Rabbit Hemorrhagic Disease Virus 2 and EHD," Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.

**Hynes, K. "**Introduction to the DEC Wildlife Health Program." The New York State Wildlife Health Program Update Wildlife Health Webinar. September 2020.

**Hynes, K. "**Chronic Wasting Disease" DEC Big Game Team meeting. June 2020

**Hynes, K. "**EHDV update." DEC Division of Law Enforcement Officers. September 2020.

**Hynes, K.** "Epizootic Hemorrhagic Disease (EHDV) in Hudson Valley deer." Media communications. September 2020.

**Kaganer, A. W., R. J. Ossiboff, N. I. Keith, E. M. Bunting,** and B. Gratwicke. "Cutaneous immune response of eastern hellbender salamanders (*Cryptobranchus alleganiensis alleganiensis*) during vaccination and challenge with *Batrachochytrium dendrobatidis*." The Wildlife Society Virtual Conference. 2020.

**Kaganer, A. W.**, "Environmental DNA: There must be something in the water." Cornell Wildlife Health Lab Webinar. 2020. Virtual.

**Kaganer, A. W., E. M. Bunting**, and M. P. Hare. "Application of environmental DNA methods for amphibian pathogen monitoring." Cornell University Center for Vertebrate Genomics Symposium. 2020. Virtual.

**Kaganer, A.W.*, R.J. Ossiboff, N.I. Keith, K.L. Schuler**, P. Comizzoli, M.P. Hare, R.C. Fleischer, B. Gratwicke, and **E.M. Bunting.** "Immune priming prior to pathogen exposure sheds light on the relationship between host, microbiome, and pathogen in disease." Joint Meeting of Ichthyologists and Herpetologists. Virtual.

**Kaganer, A.W.*, R.J. Ossiboff, N.I. Keith, K.L. Schuler**, P. Comizzoli, M.P. Hare, R.C. Fleischer, B. Gratwicke, and **E.M. Bunting. "**Functional characterization of host and pathogen during vaccination and infection in fungal disease." Ecology and Evolution of Infectious Diseases. Virtual.

**Miller, L.** "Chronic Wasting Disease Surveillance: Sample Collection and Submission."Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.



**Miller, L.** "Submitting Cases to the Wildlife Health Program."The New York State Wildlife Health Program, Wildlife Health Program Webinar. September 2020.

**Schuler, K.** "Why Do Disease Surveillance?"Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.

**Schuler, K.** "CWD: Expanding Threats, Surveillance & Update."Emerging Risks to Wildlife, Wildlife Health Webinar. August 2020.

**Hanley, B.,** A. Dhondt, **M. Forzan, E. Bunting,** M.Pokras, **K. Hynes**, E. Villegas-Dominguez and **K. Schuler**. "The Influence of Lead on Bald Eagle Dynamics In The Northeast United States." Ecological Society of America. Virtual.

Gillin, C., J. Fischer, K. Straka, and **K. Schule**r. "Association of Fish and Wildlife Agency Chronic Wasting Disease Best Management Practices." Minnesota Center for Infectious Disease Research and Policy. Virtual. https://www.youtube.com/watch?v=v3AucngCEFE

**Schuler, K.** "Wildlife in a time of COVID-19." Special Symposium, The Wildlife Society, Virtual Conference.

## Posters

**Kaganer, A. W., R. J. Ossiboff, N. I. Keith, K. L. Schuler,** P. Comizzoli, M. P. Hare, R. C. Fleischer, B. Gratwicke, and **E. M. Bunting. "**Functional characterization of host and pathogen during vaccination and infection in fungal disease." Ecology and Evolution of Infectious Diseases Virtual Conference. 2021.

## Grants

**Schuler, K.**, D. Williams, S. Christensen, A. Belsare, W.D. Walter, D. Walsh, C. Jennelle, and **B. Hanley**. 2020. SOP4CWD Dashboard: A Web Application for Disease Visualization and Data-Driven Decisions. Multistate Conservation Grant Program. $244,946, 1 yr. *In review.*

**Schuler, K.**, D. Williams, S. Christensen, A. Belsare, W.D. Walter, D. Walsh, C. Jennelle, and **B. Hanley**. 2020. Surveillance Optimization Project for Chronic Wasting Disease: Streamlining a Web Application for Disease Visualization and Data-Driven Decisions. Michigan Department of Natural Resources and Michigan State University Wildlife Disease Initiative. $243,285, 3 yrs.

Walsh, D., S. Christensen, J. Cook, T. Harms, T. Hefley, C. Jennelle, J. Marten, J. Mawdsley, E. Michel, D. O'Brien, **K. Schuler,** D. Storm, W. D. Walter. 2020. Pulling on the Same End of the Rope: Developing a Regional CWD Adaptive Management Framework. Michigan Department of Natural Resources and Michigan State University Wildlife Disease Initiative. $114,381, 2 yrs.

Walter, W.D. and **K. Schuler**. 2020. Linking Genetics to Movements of White-Tailed Deer to Assist Surveillance for Chronic Wasting Disease. U.S. Geological Survey, $199,256, 2 yrs.

## Software Applications

**Hanley, B**., Dhondt, A., **Forzan, M., Bunting, E.**, Pokras, M., **Hynes, K.**, Dominguez-Villegas, E., & **Schuler, K.** 2021. Veterinary Data Package: Lead in Bald Eagles in the Northeast United States [Data]. Cornell University Library eCommons Repository. https://doi.org/10.7298/3p9p-j249

**Hanley, B**., Dhondt, A., **Forzan, M., Bunting, E.**, Pokras, M., **Hynes, K.**, Dominguez-Villegas, E., & **Schuler, K.** . 2021. Time Series Data Package: Lead in Bald Eagles in the Northeast United States [Data]. Cornell University Library eCommons Repository. https://doi.org/10.7298/wr25-4m46

**Hanley, B.**, Currylow, A., Holcomb, K., Shields, T., Boland, S., Boarman, W., & Vaughn, M. 2020. StallPOPd V3 Web Interactive: Interactive software to calculate the combination of egg addling and bird culling needed to stall or halt population growth of subsidized ravens [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/sk2e-0c38.3

**Connelly, P., Hanley, B., Bunting, E., & Schuler, K.** 2020. NYCounterPOPd Web Interactive: Software to investigate the population scale impacts of lead in New York State from 1990-2018 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/rsse-e634

**Connelly, P., Hanley, B., Bunting, E., & Schuler, K.** 2020. NYClosedCounterPOPd Web Interactive: Software to investigate the population scale impacts of lead in New York State from 1990-2018 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/ewr7-xj09

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**Connelly, P., Hanley, B., Bunting, E., & Schuler, K**. 2020. NYPlastiPOPd Web Interactive: Software to investigate the population scale impacts of lead in New York State from 1990-2018 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/ptfv-y690

**Connelly, P., Hanley, B., Bunting, E., & Schuler, K.** 2020. NYDensiPOPd Web Interactive: Software to investigate the population scale impacts of lead in New York State from 1990-2018 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/z3ym-1357

**Connelly, P., Hanley, B., Bunting, E., & Schuler, K.** 2020. NYEaglePackage Web Interactive: Software to investigate the population scale impacts of lead in New York State from 1990- 2018 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/67x6-ef86

**Hanley, B**., Dhondt, A., **Forzan, M., Bunting, E.**, Pokras, M., **Hynes, K.**, Dominguez-Villegas, E., & **Schuler, K.** 2020. EagleDashboard: Assessing the population scale impacts of a disease, toxin, or contaminant in Bald Eagles [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/0dm3-tf51

**Connelly, P., Hanley, B.,** Frair, J., & **Schuler, K.** 2020. MoosePOPd Web Interactive: Software to investigate the demography of Moose in New York, USA from 2015-2019 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/k033-va79

**Connelly, P., Hanley, B.,** Frair, J., & **Schuler, K.** 2020. MooseCounterPOPd Web Interactive: Software to investigate the population scale impact of Brain Worm and Liver Fluke in Moose in New York, USA from 2015-2019 [Software]. Cornell University Library eCommons Repository. https://doi.org/10.7298/kxme-kq04

**Hanley, B.,** Dhondt, A., & **Schuler, K.** 2020. BandingPOPd: Software to investigate the USGS bald eagle banding and encounter data in the Northeast United States [Dataset]. Cornell University Library eCommons Repository. https://doi.org/10.7298/1n7f-xs53


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