

New York State Wildlife Health Program

Annual Report 2021-2022



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



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ADMINISTRATIVE SUMMARY

The New York State Wildlife Health Program is a joint effort between the New York State Department of Environmental Conservation (DEC) and the Cornell Wildlife Health Laboratory (CWHL) at Cornell's College of Veterinary Medicine Animal Health Diagnostic Center. This program, started in 2011, was based on the principles of One Health to understand linkages between human, animals, and the environment. We are now in the first year of our third 5-year strategic plan and there is a lot to do.

ONE HEALTH

Over the past year, there have been numerous examples of our work in One Health. The SARS-CoV-2 pandemic is not over, and we have seen a new disease emerge from spillover of the virus from humans into a significant proportion of free-ranging white-tailed deer statewide. We also have been responding to a new strain of avian influenza virus, H5N1 2.3.4.4.b., that has not been previously seen in North America. Not only has this virus affected numerous avian species, but we also documented infections in red fox kits in New York and worked with New York State Department of Agriculture and Markets on response to captive pheasant and mallard outbreaks.

In addition to new emerging diseases, we have taken on long-standing One Health problems, including lead poisoning in both wildlife and humans. In addition to biological data, the DEC initiated a Lead Ammunition Working Group that put forth recommendations for the state to address lead issues. We also have been collaborating with Cornell colleagues to develop and test video messages for hunter education classrooms and survey meat processors about knowledge and practices. Chronic wasting disease also has a marketing study currently running to evaluate messaging to hunters. We continue to focus on improvements in surveillance design and are leading the Surveillance Optimization Project for CWD.

COLLABORATIONS

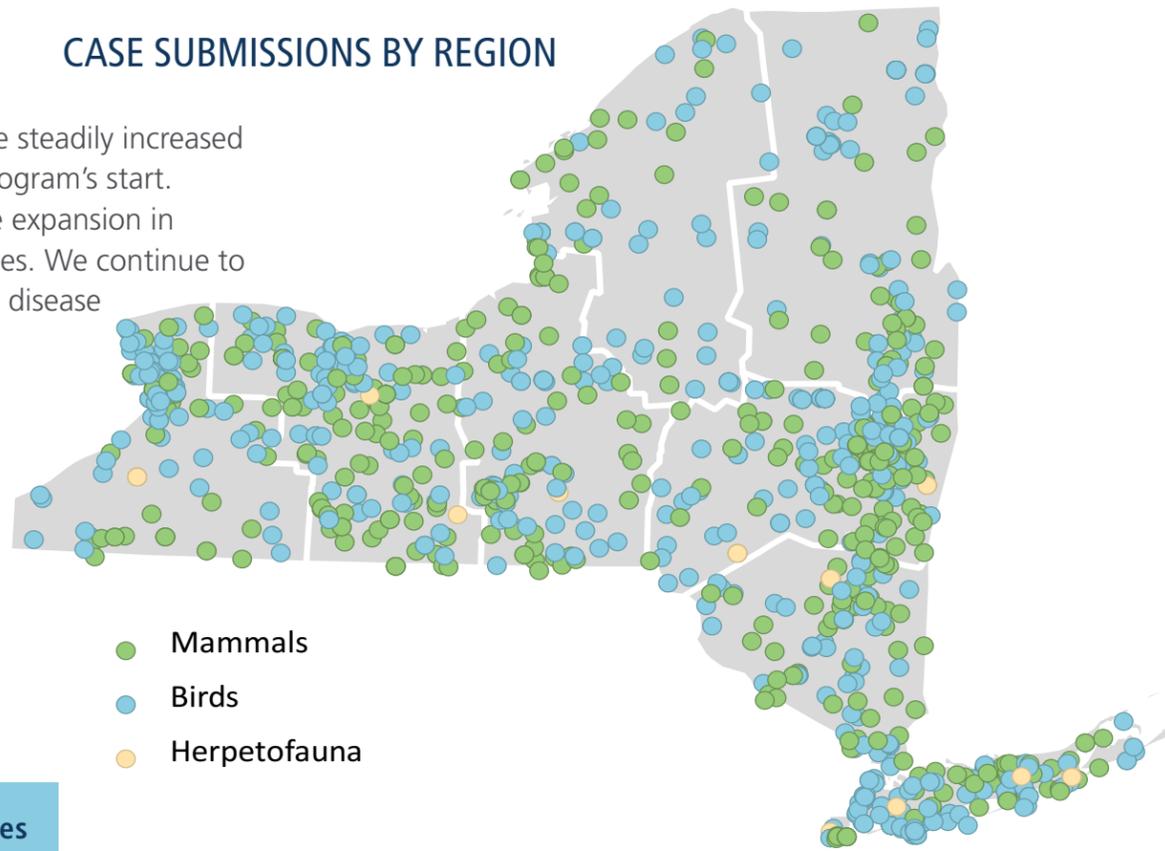
On the research side, we are in the second year of a study on epizootic hemorrhagic disease, which has been causing mortality in deer over the past two years. A new public reporting and data tracking system was implemented in Fall 2021 to handle the increased attention and reports. We are wrapping up several studies within New York and across the Northeast on anticoagulant rodenticides in fishers in conjunction with other universities and partners. We also initiated a juvenile moose survival and health study in the Adirondacks with the USGS New York Cooperative Research Unit and SUNY-ESF.

Other notable activities was that Lauren Miller was hired at the DEC Wildlife Health Unit in Delmar as a Research Scientist to replace vacancies there. Lauren has been responsible for much of the CWD sampling and data entry over recent years and has been involved with new digital deer check and CWD data collection. We continue to strive to reach out to the public through various communication channels including the DEC and CWHL websites, press releases, Twitter, and Instagram. The New York State Wildlife Health Program has grown to be a respected entity in the field of wildlife and One Health with more to come in the future!

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.

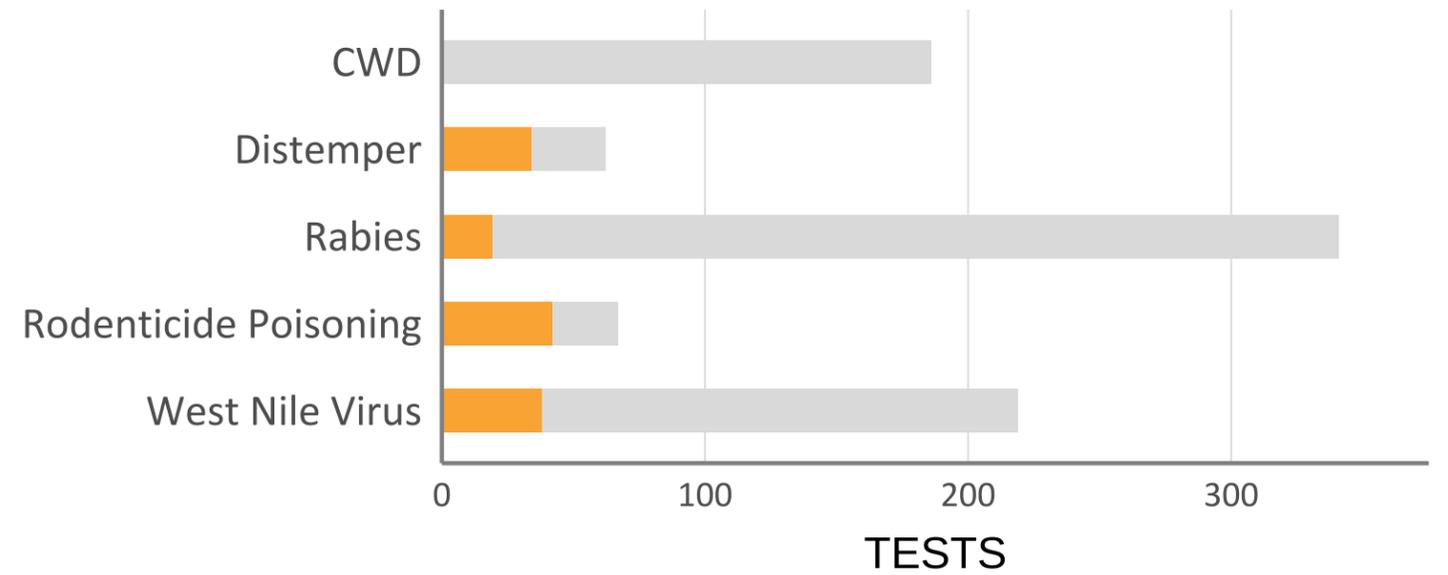


1133 necropsies performed

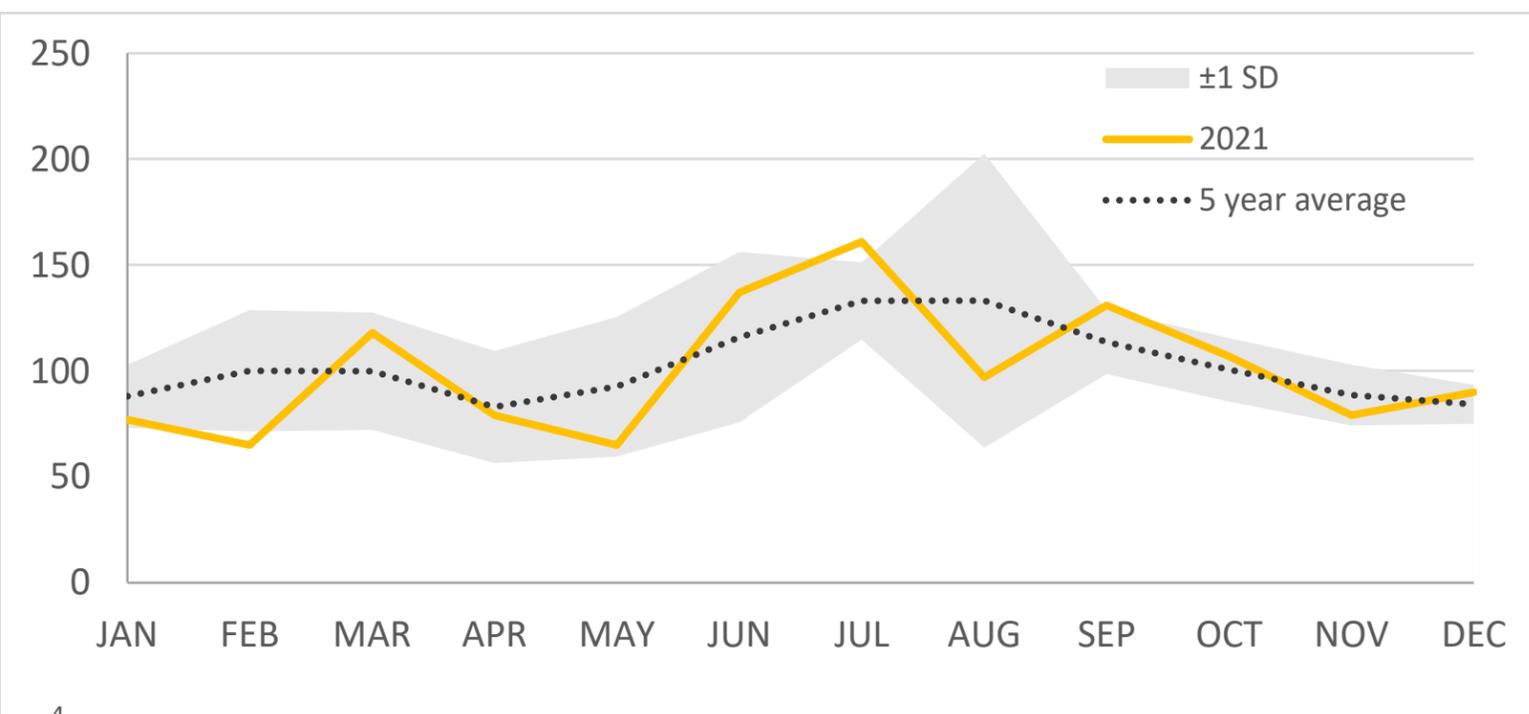
1206 animals examined
52 forensic examinations

628 birds **78** species
523 mammals **31** species
48 herpetofauna **9** species

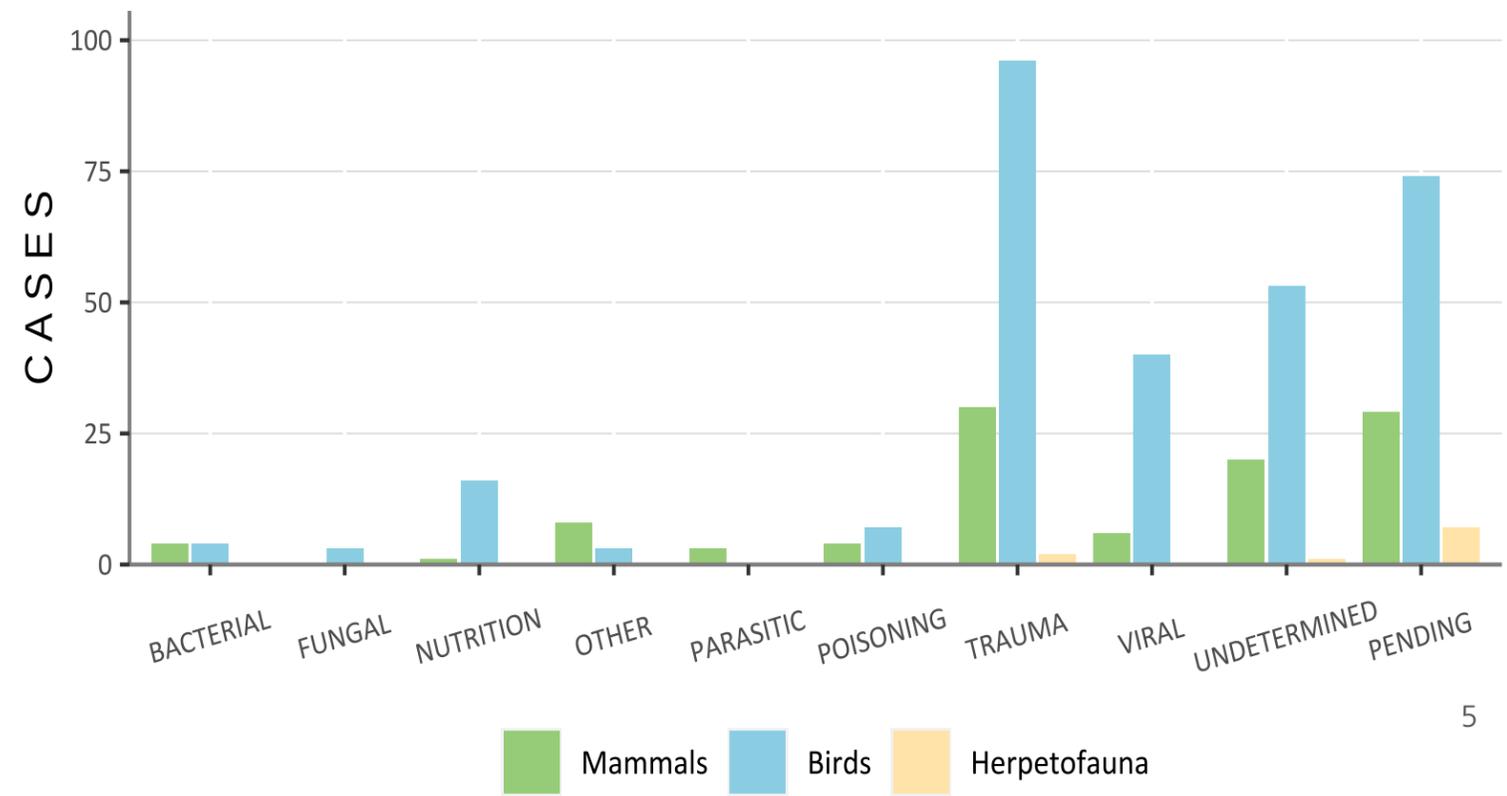
TARGETED DISEASE SURVEILLANCE



MONTHLY CASELOAD



DIAGNOSED CAUSE OF DEATH



EMERGING AND SIGNIFICANT DISEASE ISSUES

HPAI IN MAMMALS

Since late November 2021, numerous outbreaks of highly pathogenic avian influenza (HPAI) have been detected in the United States and Canada in both wild and domestic birds. Cases in New York were first confirmed in February 2022 in Suffolk County and continued in backyard poultry, rehabilitation facilities, shooting preserve/ game bird breeder facilities, zoos, and free-ranging wild birds around the state.

In June 2022, the same strain of HPAI virus that was affecting wild and domestic birds in the US and Canada was detected in several red fox kits that were submitted to wildlife rehabilitators from three separate counties in NY. The fox kits exhibited neurologic signs including tremors, apparent blindness, or

lethargy prior to death. Infected red fox kits have also been detected in MI, WI, IA, MN, and Ontario.

Across North America, other carnivorous and scavenging mammals, including striped skunk, opossum, raccoon, bobcat, American mink, coyote, harbor seal, and grey seal, have been infected with HPAI. It is assumed that mammals become infected with the virus after consuming or coming into close contact with infected birds.

EPIZOOTIC HEMORRHAGIC DISEASE

For the second season in a row, an outbreak of Epizootic Hemorrhagic Disease Virus occurred in New York State. In 2021, the virus arrived earlier and was more widespread, causing outbreak clusters in over 30 counties. The first cases of this outbreak began in July, 2021 and continued through November. The Hudson Valley, Suffolk County, and Jefferson and Oswego Counties were particularly hard hit. In total, over 2,000 dead deer were reported state-wide, likely a significant undercount of the true lethal impact of the virus.

This disease is spread by the bite of *Culicoides* midges ("no-see-ums"). In recent years, this virus has been moving northward, potentially due to impacts of climate change. Due to the novelty of the virus for our deer herd, they are highly susceptible to developing severe disease and acute death. However, we documented several deer that survived infection and developed antibodies to EHD.



Photo courtesy of David O. Brown



SARS-CoV-2 & WHITE-TAILED DEER

Since the start of the COVID-19 pandemic, at least 20 species of animals, including free-ranging white-tailed deer, have been found to be infected with the SARS-CoV-2 virus. Deer are susceptible to infection and can transmit the virus to other deer making this species a potential reservoir for SARS-CoV-2. Testing of more than 5,000 retropharyngeal lymph nodes from hunter-harvested deer in New York collected by WHP for CWD testing revealed that 0.6% of deer were infected with the virus in the 2020-21 season. In the 2021-22 season, 20% of tested deer were infected. Adult males were most likely to be infected, probably related to increased contact with other deer during the breeding season.

With successive virus transmission among deer, virus recombination may occur resulting in new strains of coronaviruses with the potential to spillback into humans. Direct human-deer interactions are widespread through hunting activities, wildlife rehabilitation, and captive deer ownership. Indirect contact may be possible through the environment, and livestock could be at risk if a mutated strain of the virus is able to infect other species. Research at CWHL is ongoing to investigate the extent of infection in deer in New York and to examine the relationship between environmental variables to ascertain how deer may be exposed and spread the virus to other deer.

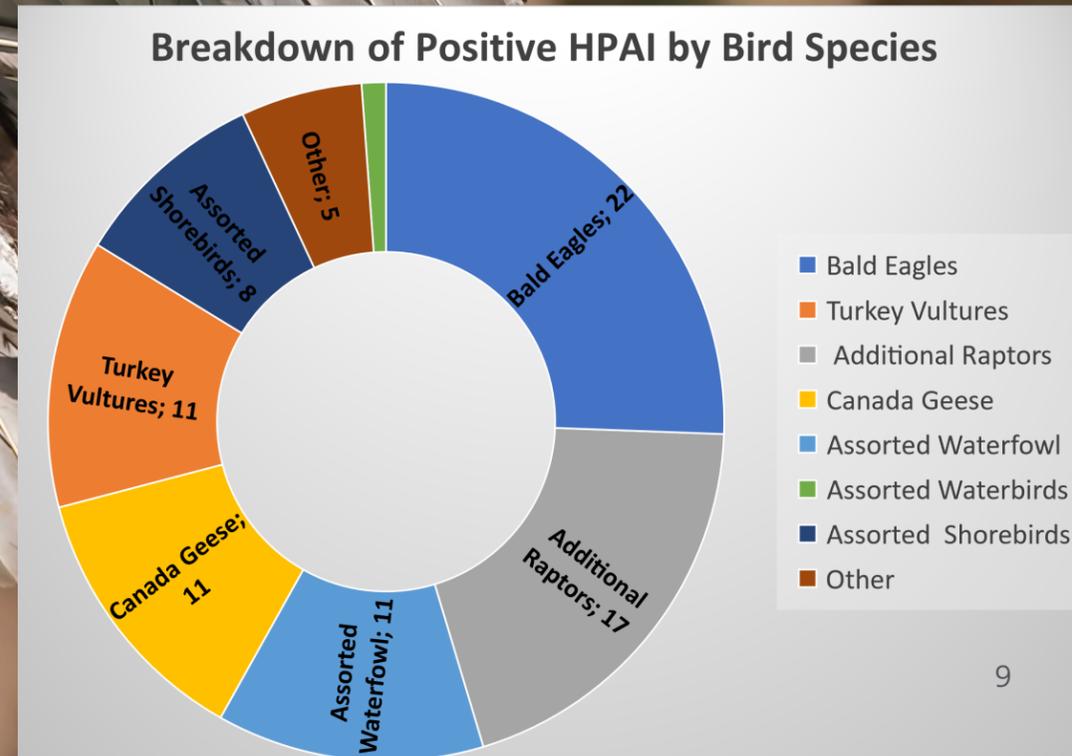
2022 Highly Pathogenic Avian Influenza (HPAI) Outbreak

Starting in February 2022, the Wildlife Health Program detected avian influenza virus in New York birds. Subsequent testing determined that the cases were H5N1 (a highly pathogenic strain), which has since been found in 24 species and 86 individual wild birds within the state, including shorebirds, waterfowl, raptors, and a single passerine (fish crow). Bald eagles, Canada geese, and turkey vultures make up the majority of the bird cases. Eight juvenile red foxes have also tested positive.

The Wildlife Health Program contributed to a DEC press release to inform the public about the outbreak. We provided biosafety guidance to DEC field staff and collaborated with the Special License Unit to communicate to wildlife rehabilitators and domestic game bird breeders. We coordinated information sharing and dissemination with the NYS Department of Agriculture and Markets, NYS Department of Health, and NYC Department of Health and Mental Hygiene.

Because HPAI is a zoonotic and reportable disease, internal laboratory testing processes were adjusted, and all suspect-positive samples were sent to the USDA-National Veterinary Services Lab for confirmatory testing. We worked with USDA Wildlife Services and Veterinary Services on the national reporting website: 2022 Detections of Highly Pathogenic Avian Influenza in Wild Birds.

Across North America, in addition to birds, carnivorous and scavenging mammals (including striped skunk, opossum, raccoon, bobcat, American mink, coyote, and multiple seal species) have been infected with HPAI. It is assumed that mammals become infected with the virus after consuming or coming into close contact with infected birds. Despite some mammalian testing, we have not found it in species other than birds and red fox in New York.



CHRONIC WASTING DISEASE UPDATE

SURVEILLANCE OPTIMIZATION PROJECT FOR CHRONIC WASTING DISEASE

The Cornell Wildlife Health Lab has been coordinating with 24 state wildlife agencies and one provincial agency on CWD through the Surveillance Optimization Project (SOP4CWD). Work over the last year has been development of a CWD Data Warehouse, which is free software to manage CWD and risk-related data, visualize sampling and results, and run models to determine optimal surveillance planning.

This shared data system will enable DEC deer managers to enter data in real time, in conjunction with a digital “deer check” process, to identify progress towards quotas, check results, and plan logistical effort. The CWD Data Warehouse will work with the CWD Alliance and is planned for release in August 2022.

CHRONIC WASTING DISEASE 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 results were reported from tests of the 2721 hunter-harvested, 33 roadkill, and 186 clinical suspect deer during the 2021-2022 season.

Chronic wasting disease continues to be a high priority disease that requires vigilance and proactive thinking from the Wildlife Health Program. As such, we are continuing to adapt as new threats arise. In May 2021, a CWD-positive white-tailed deer was detected at a high-fence captive cervid facility in

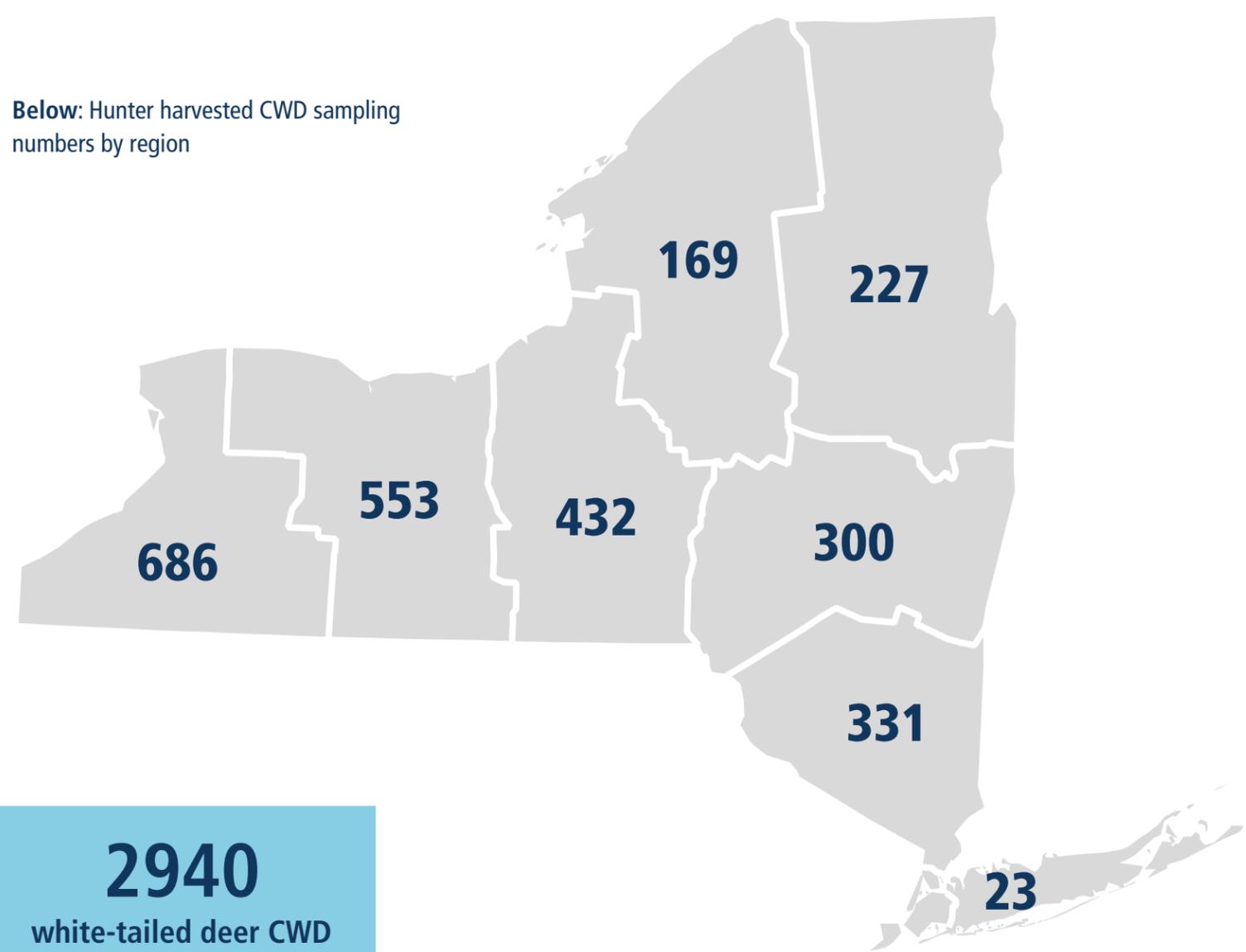
Warren County, Pennsylvania, approximately five miles from the New York border. As a result of the risk-weighted surveillance plan, Chautauqua and Cattaraugus counties were identified as higher risk locations with particular towns located near the positive detection prioritized for sampling. All of the 10 southern tier counties along the Pennsylvania border already had increased sampling because of the wide distribution of CWD in Pennsylvania.

The Wildlife Health Program worked with the Seneca Nation of Indians, also located near the Pennsylvania positive case, to assist their CWD efforts. Dr. Schuler gave a presentation to the Tribal Council and DEC provided sample collection kits. The SNI biologists also were able to participate with DEC at the CWD sample collection at the John White Game Farm to observe the retropharyngeal lymph node extraction and data collection. We hope to expand our efforts to assist other tribal nations with their wildlife health interests.

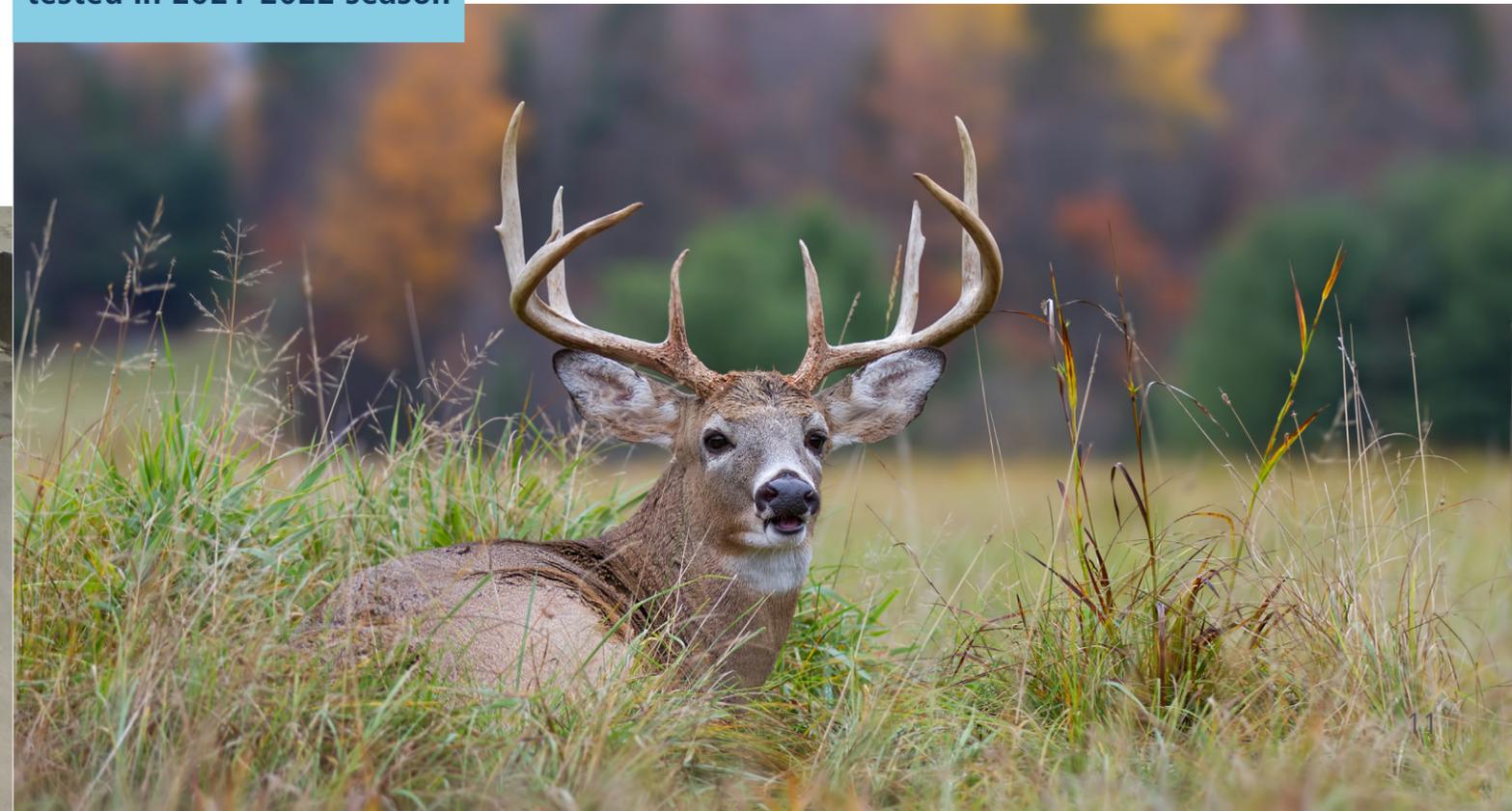
Below: CWD wet lab at Cornell Animal Health Diagnostic Center with DEC personnel, DVM students, pathology residents, and CWHL staff getting started with demonstrating lymph node removal on white-tailed deer head.



Below: Hunter harvested CWD sampling numbers by region



2940
white-tailed deer CWD tested in 2021-2022 season



WILDLIFE HEALTH WEBINAR SERIES CONTINUES

In 2021 with COVID-19 restrictions in place, keeping up with training of DEC personnel in person was not possible. With the online interactive webinar series on wildlife health training available to everyone anytime, we've continued to add to this training library

In March 2022, we added a new webinar on risk communication to our series: "How can we communicate about risk more effectively?" featuring Dr. Dominic Balog-Way from the Department of Communication at Cornell University.

RESEARCH PROJECTS & STUDENTS

In the summer of 2021, CWHL hosted undergraduate students to work on research projects in the lab.

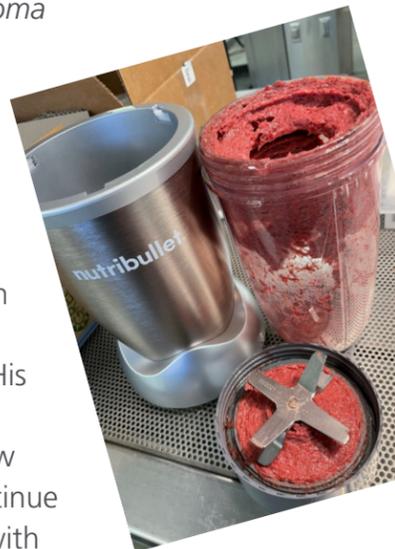
Paula Rocio Blanco-Ortiz joined us through the Collegiate Science and Technology Entry Program. As she developed molecular laboratory skills, Paula contributed to the environmental DNA (eDNA) program by optimizing a species-specific molecular test for the blue-spotted salamander (*Ambystoma laterale*). She presented the results of her summer research with CWHL in a virtual symposium presentation.

David Dayan joined us through the College of Agriculture and Life Sciences while studying Animal Science focusing on infectious disease biology. David assisted with the Waterfowl Contaminant study. His primary role was taking inventory of and processing bird samples received from New York and collaborating states. He will continue seeing the project through and assisting with

the final write-up. He was able to work on the necropsy floor where he processed and pulled samples from the submitted waterfowl.

Darian Gordon, a veterinary student with an anticipated graduation in 2023, split her time between CWHL, Anatomic Pathology, and the Janet Swanson Wildlife Hospital. She not only maintained our tissue archive, but harvested tissue sets from all furbearing species submitted specifically for research projects, and aided the pathologist with wildlife necropsies.

Amanda Bielecki, a second year veterinary student, is also shared with the Swanson wildlife hospital. Amanda continued the work of inventorying our tissue archive. Additionally, she managed incoming spleen and blood samples received for the Epizootic Hemorrhagic Disease in white-tailed deer research project.



CRYPTIC SPECIES DETECTION EFFORTS

CWHL has continued to support the herp health team with development and optimization of environmental DNA (eDNA) detection tools. In 2021, we completed optimization of molecular tools for detection of three species: queen snake (*Regina septemvittata*), Blue-spotted salamander (*Ambystoma laterale*), and Jefferson salamander (*Ambystoma jeffersonianum*). Additionally, we collaborated with biologists from Region 9 to test different methods of eDNA sample collection to improve sensitivity of queen snake detection with eDNA.

We further expanded our capacity for non-invasive species detection by developing molecular methods for species-specific detection of queen snakes from snake sheds.

Far Left: Homogenized waterfowl breast David Dayan is prepping for testing.

Left: Cornell student, Paula Rocio Blanco-Ortiz prepping eDNA samples in the CWHL lab for molecular diagnostics

Right: Alyssa Kaganer with a queen snake (*Regina septemvittata*) captured during population surveys with DEC biologists.



PUBLIC OUTREACH AND WILDLIFE DISEASE FACT SHEETS

From 2021-2022, the WHP has added **4** new [disease fact sheets](#) to the resource library on the website; [Aspergillosis](#), [Mycoplasmal Conjunctivitis](#), [Adenovirus](#), and [Lead Toxicosis](#).

With **44** available sheets with nearly **3,000** views per month on different fact sheets and over **80,000** total views during the year, these valuable tools continue to educate and inform the public, DEC biologists, technicians and staff.

Website visits have nearly doubled this past year and total over **230,000** page views. With daily average visits running between **300-500**, the website has been established as a valuable resource for wildlife health.

Lead Toxicosis

BASICS
Lead is a heavy metal found in mineral deposits around the world. It has been widely used in many industries including ammunition and fishing tackle. Lead has no biological function and is toxic to all animals.

ALL ANIMALS are susceptible to lead toxicosis, although the effects are most often seen in birds, especially loons and swans, condors, vultures, and eagles. Other bird species, including crows, robins, mourning doves, upland game birds, and domestic poultry, have also been seen with lead toxicosis.

CLINICAL SIGNS of lead toxicosis in birds include incoordination, weakness, drooped wings, anorexia, reduced activity, and green watery diarrhea. Toxic effects may cause birds to be more vulnerable to predation, trauma, and other diseases. Birds may become emaciated and die within 2-4 weeks of ingesting lead.

The most common route of **EXPOSURE** to lead for birds is through ingestion of spent lead ammunition fragments and fishing tackle.

In live birds, **DIAGNOSIS** of lead toxicosis is made by assessing clinical signs and measuring lead levels in blood. In dead birds, lead levels in liver and kidney can be measured. Radiographs can be used to detect lead fragments in the gastrointestinal tract or tissues of affected animals.

Lead toxicosis can be **TREATED** with lead chelating agents and supportive care, although many birds are too severely affected for treatment to be successful. Removal of lead particles in the gastro-intestinal tract or tissues of wild species is necessary to prevent continued exposure to lead.

State wildlife agencies, including NYSDEC, and conservation groups encourage the use of **NON-LEAD** ammunition and fishing tackle to reduce lead exposure for wildlife. Because lead ammunition fragments upon impact, lead particles can be found in meat processed from hunter-killed animals posing a risk to people eating those meats.

INGESTION

HUMAN HEALTH HAZARD

ALL ANIMALS

ALERT **HOW** **WHO**

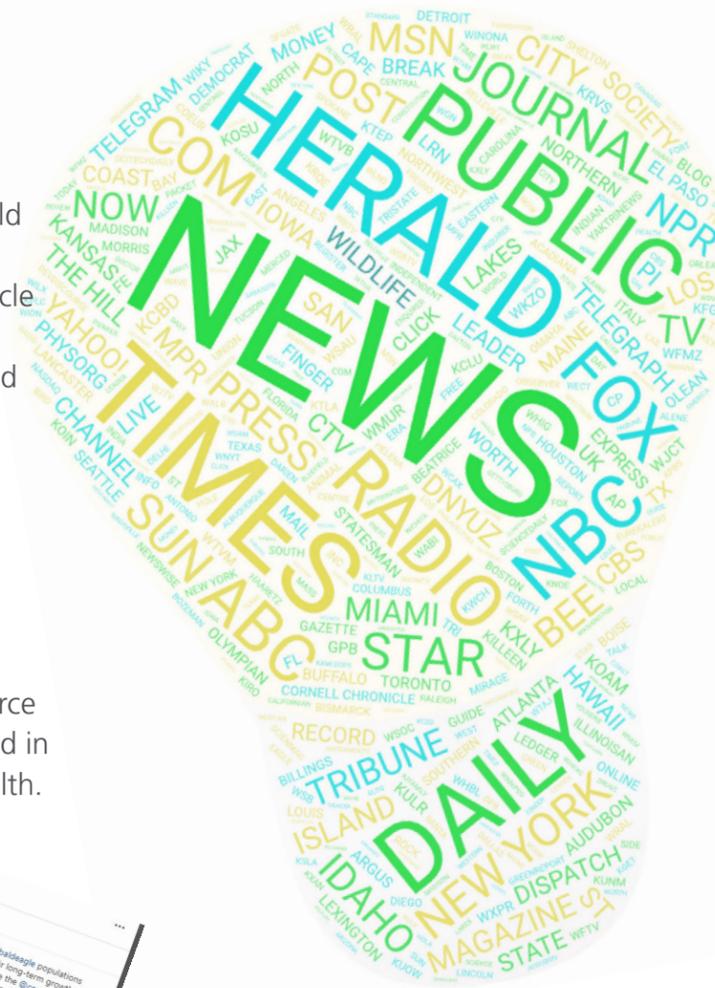
Cornell University
College of Veterinary Medicine
Animal Health Diagnostic Center

The NYS Wildlife Health Program | [cwhl.vet.cornell.edu](#)
A partnership between NYS Dept. of Environmental Conservation and Cornell Wildlife Health Lab

POWER OF PUBLICATION - PRESS RELEASES ON BALD EAGLE AND LEAD PAPER

In 2021-2022, the CWHL generated over **250** tweets, posts, news reports, disease alerts, fact sheets, and more. We published the NE regional study of lead toxicosis in bald eagles in early January: [Environmental lead reduces the resilience of bald eagle populations](#). References to the article showed up in more than **330** newspapers, websites, and news stations across the country and around the world.

By translating the science in research publications into easy-to-read articles on our website, including "[Lead in eagles: Where do we go from here?](#)" based on the above publication, we can provide an additional educational resource for anyone interested in wildlife health.



Twitter Analytics (Jan 2022 - 31 days):
Tweets: 31, Tweet impressions: 13.9K, Profile visits: 1,639, New followers: 25.

Top Tweet earned 1,630 impressions:
Celebrating #NationalBirdDay with a few great photos. From bald eagles, owls, & hawks to crows, waterfowl, woodpeckers, & songbirds, we see them all & more. Using #surveillance & #WildlifeHealth #PopulationHealth @NYSDEC #conservation #cornellvet @ESFWildlife @wildlifeDZeco @ESFWildlife @NYSDEC pic.twitter.com/GOZE4Bba7L

Top mention earned 333 engagements:
12 #moose captured and radiocollared in ADKs of NY on day 11 Native Range Capture is @jgrauer @USGSCoopUnits @CornellICALS @Cornell_CWHL juvenile survival and moose health research. Amazing team @wildlifeDZeco @ESFWildlife @NYSDEC pic.twitter.com/39t5ZP8HfE

Top Follower followed by 15.3K people:
Yale Peabody Museum @yalepeabody follows you

THE SWEET TWEET

Using social media tools like Twitter and Instagram, we've expanded the number of sessions for new users on the website daily. These tweets and posts lead to bumps in followers, bringing people to visit the website, increasing sessions all while educating visitors on wildlife health and the importance of surveillance.

WATERFOWL CONTAMINANT CONSERVATION PROJECT

In the fall of 2021, New York, New Jersey, Connecticut, and Pennsylvania collected waterfowl (mallards, wood ducks, black ducks, green-wing teal, and Canada geese) as part of a Multistate Conservation Grant research project to identify contaminants, such as Hg, PCBs, and PFAs, that might be present in these species most likely to be consumed by hunters. Present Dept. of Health consumption advisories may be outdated and based on other species.

This large-scale collection effort required randomly collected adult birds, which necessitated an online system where hunters could submit photos of wings for aging by agency waterfowl biologists. The data collected from this study will help to assess the health of waterfowl populations, inform new waterfowl consumption advisories by state agencies in the Atlantic Flyway, and facilitate focused research to refine advice that protects consumers while encouraging consumption of low contaminant waterfowl as a healthy source of protein.

Below: Green-wing teal duck submitted for sampling



EPIZOOTIC HEMORRHAGIC DISEASE PROJECT

In 2021, we began targeted surveillance for EHD, working directly with deer hunters, and federal and state partner agencies. We received samples from 332 deer, consisting of deer

from two states (NY and NJ) and 18 New York counties. Serology was performed on all viable samples, and virus isolation was performed on all seropositive individuals.

We found that EHDV serotype 6, an “exotic” serotype first identified in the U.S. in 2007, was the dominant serotype state-wide. EHDV-2, a North American serotype historically known to exist in the southern United States, was also found sporadically across the state. The virus was more widespread than deer mortality reports indicated, with seropositive individuals found in counties with no dead deer reports. Dutchess County had the highest numbers of seropositive deer, with 32.4% of sampled deer (12/37) showing evidence of prior exposure.

We will continue to conduct surveillance for EHDV in New York and surrounding states, with the goal of characterizing the prevalence of infections in deer, the degree of immunity developing among white-tailed deer, and the spatiotemporal dynamics of serotype distribution. Additionally, through this project we seek to better understand the ecological and climatic determinants that drive outbreaks in the Northeast, and improve surveillance and diagnostic methods.

SARS-CoV-2 & WHITE-TAILED DEER

Recent research has identified widespread SARS-CoV-2 infection in free-ranging white-tailed deer (*Odocoileus virginianus*; WTD) in the United States, where the novel virus spilled over from humans into wildlife. To better understand the degree to which white-tailed deer are infected in New York, we conducted a comprehensive evaluation of deer infection and variant type using the retropharyngeal lymph nodes of 5,426 hunter-harvested WTD over the past two hunting seasons (2020-

21, 2021-22). Our objective was to identify “hotspots” of infection (areas with higher than expected infection prevalence) in WTD and to explore why those hotspots occurred. We used the SaTScan spatial analysis software to identify statistically significant clusters of infection. While infections were found in deer across NYS, hotspots were seen in Allegany, Livingston, Chemung, Tioga, Tompkins, Orange, Sullivan, and Lewis counties. Although it was presumed that infections in deer resulted from contact with humans, these hotspots are far away from urban centers with high human densities. Our analysis is a critical first step to understanding the risks of virus spillover and spillback between humans and wild WTD.

FURBEARER MODELING

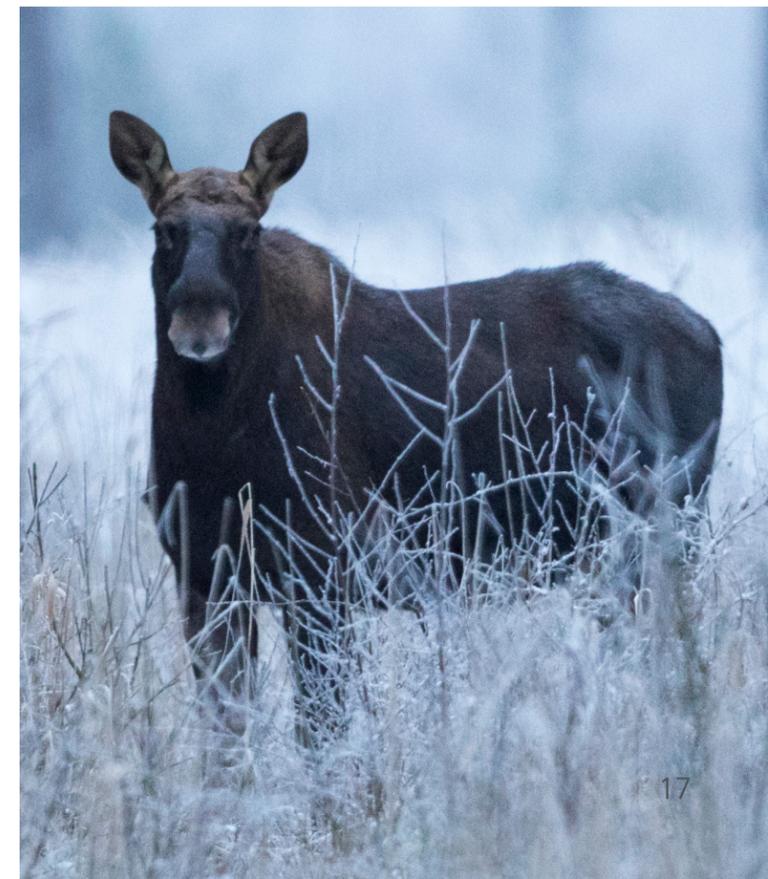
We are working with furbearer biologists at the DEC, Vermont Fish & Wildlife Department, and the Maine Department of Inland Fisheries & Wildlife to conduct novel demographic analyses of population abundances of five furbearer species from harvest and catch data. We have gathered and pooled data by species for bobcat, fisher, marten, muskrat, and otter. Remarkably, these data span up to 30 years of trapping in the Northeast, comprise habitats ranging in elevation from sea level to mountains, and encompass interesting trends such as the popularity and ease (or not) of trapping as a conservation pastime.

Despite being the first collaboration of this scope in the Northeast, the true novelty of this work is that our interdisciplinary team is attempting to use harvest data in lieu of live counts in recently-developed algorithmic methods. If our new method of analysis using this type of data is successful, biologists will be able to examine population trends, proportions, and abundances of furbearers using the most readily available (and economical) data, a task that has been out of reach until now.

MOOSE POPULATION HEALTH

In the last year, considerable progress has been made on the Moose Population Health project. We established a study area for the project in the northern Adirondack Park, consisting of 105 grid cells (each 9 km²) in which all sampling for parasites and moose surveys will occur. We conducted pilot field work during the summer of 2021 to solidify our site selection, obtain permission for land access, and test methods for deer pellet transects and eDNA sampling for giant liver fluke in aquatic environments. Motion-detecting game cameras were deployed in each grid cell in the fall of 2021 to assess moose space use and detect moose hair loss from infections with winter ticks. These cameras will be checked several times each year and will be set for a total of two years.

Additional data on the sources of moose mortality was collected by the DEC as moose were hit by vehicles and/or euthanized by state biologists and samples were submitted to the Wildlife Health Unit.



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.

TRIBAL RELATIONS

One of the goals of our strategic plan is to have better outreach to Native American tribes whose sovereign nations fall within the area serviced by the New York State Wildlife Health Program. We were approached by the Seneca Nation of Indians (SNI) for assistance with CWD education and support.

In September 2021, Dr. Schuler gave a presentation to the SNI Tribal Council on CWD and provided recommendations to the SNI biologists on testing turn-around times on CWD testing using the ELISA at AHDC. The DEC followed up by providing sampling supplies and a CWD sample collection training opportunity at the John White Game Farm. We continue to provide support to SNI in areas of hellbender health and eDNA.

DISEASE RECOMMENDATIONS TO HUNTERS

With the introduction of novel viruses SARS-CoV-2 and Highly Pathogenic Avian Influenza H5N1, the WHP was asked to provide guidance for hunters to minimize their exposure risks. Following guidance developed by the Association of Fish and Wildlife Agencies, we adapted recommendations for best practices for human health and safety. These steps included wearing gloves and masks when handling wildlife, plus hand

washing at the earliest possible availability. Although there has been no documented spillback of SARS-CoV-2 or transmission of HPAI to humans, we remain vigilant that these pathogens have the capacity to infect humans, including the biologists working with these species.



LEAD AMMUNITION

For the Lead Ammunition Working Group, Kevin Hynes (co-leader) and Krysten Schuler participated in the wildlife health section of this multi-agency group. The group produced a report "[Minimizing Risks to Wildlife and People from Lead Hunting Ammunition.](#)" Over the last year, the group interviewed experts from across the country and gathered data on NYS hunters' use and attitudes toward lead. The major recommendations from this group were:

1. Advancing strategic educational outreach to increase public understanding of the potential and realized impacts of lead hunting ammunition on wildlife and people and encourage hunters to use non-lead alternatives;
2. Developing and disseminating best management practices to hunters, deer processors, and food pantries to minimize the presence of lead on the landscape and in game meat consumed by people;
3. Developing programs to increase supply, availability, and use of non-lead hunting ammunition; and
4. Conducting research to further understand the scope and extent of impacts of lead hunting ammunition on people and wildlife.

The WHP will continue to work on fulfilling these recommendations over the next 5 years.

WILDLIFE HEALTH TEAM MEETINGS

Between 2021-2022, the WHP attended meetings with the Big Game, Herp, Migratory Game Bird, Bird and Mammal Diversity, Land Management and Habitat Conservation, and the Furbearer and Small Game Mammal teams as representatives of the WHP and to provide updates on current and emerging wildlife health issues.

ONGOING TEAM TRAINING

Jennifer Peaslee completed the Cornell Naturalist Outreach Practicum, a communications program targeting science communication to students in elementary and grade schools.

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 2021-CURRENT

| DEC Personnel | | WHP Personnel | |
|---------------|----------------------|-----------------------------|-------------------------|
| Region 1 | Leslie Lupo | WHU | Kevin Hynes (co-chair) |
| Region 2 | Christina Knoll | Cornell | Krysten Schuler |
| Region 3 | vacant (Nate Ermer) | Cornell | Beth Bunting |
| Region 4 | Stacy Preusser | BMT Liaison Central Office* | Kevin Hynes |
| Region 5 | Tim Watson | DLE Liaison* | Major Matthew Revenaugh |
| Region 6 | vacant (Andy McDuff) | BMT Liaison (Regional)* | vacant |
| Region 7 | Tom Bell (co-chair) | | |
| Region 8 | Robin Phenes | | |
| Region 9 | Ryan Rockefeller | | |

*DEC Personnel

ANNUAL WORK PLAN FY 2021-2022 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 electronic 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) | Complete |
| Case management and reporting: Wildlife necropsies (>1000/yr) | Complete |

Disease Prevention and Response

| | |
|---|-------------|
| Update CWD Surveillance Plan | 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 | Complete |
| Develop Wildlife Disease Field Response document | Complete |
| Surveillance Optimization Project for Chronic Wasting Disease | In progress |

Training, Teaching and Outreach

| | |
|--|-------------|
| Regional Wildlife Health Workshops | Scheduled |
| 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 | Complete |
| 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) | Complete |
| <i>P. tenuis</i> 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

Currylow, A., **Hanley, B.**, Holcomb, K., Shields, T., Boland, S., Boarman, W., & Vaughn, M. 2021. Identifying population management strategies for avian predators: a decision tool. *Human Wildlife Interactions*, in press.

Hanley, B. J., Carstensen, M., Walsh, D. P., Christensen, S. A., Storm, D. J., Booth, J. G., Guinness, J., **Them, C. E., Ahmed, M. S., & Schuler, K.** 2022. Informing Surveillance through the Characterization of Outbreak Potential of Chronic Wasting Disease in White-Tailed Deer. *Ecological Modelling* 471C, 110054. doi.org/10.1016/j.ecolmodel.2022.110054

Hanley, B. J., Dhondt, A., **Forzan, M., Bunting, E., Pokras, M., Hynes, K., Dominguez-Villegas, E. & Schuler, K.** 2022. Environmental Lead Reduces the Resilience of Bald Eagle Populations. *Journal of Wildlife Management*. 1-18, 10.1002/jwmg.22177

Hanson, M.*, N. Hollingshead, K. Schuler, W. Siemer, P. Martin, and E. Bunting. 2021. Species, causes, and outcomes of wildlife rehabilitation in New York State from 2012-2014. *PlosONE*. DOI:10.1371/journal.pone.0257675

Kaganer, A. W., L. D. Nagel, T. E. Youker-Smith, **E. M. Bunting,** and M. P. Hare. 2021. Environmental DNA-derived pathogen gene sequences can expand surveillance when pathogen titers are decoupled in eDNA and hosts. *Environmental DNA* 3:6;1192-1207.

Perleberg, A., Hanley, D., Kuhn, G., Robinson, D, & **Hanley, B.** 2021. Davenport living snow fence demonstration: fifteen-year survival and growth update. *Washington State University Extension publication*. research.libraries.wsu.edu/xmlui/bitstream/handle/2376/18536/TB06.pdf

Rojas-Sereno, Z., Abbott, R. C., Hynes, K., Bunting, E. M., Hurst, J., Heerkens, S., Hanley, B. J., Hollingshead, N. A., Martin, P., & Schuler, K. L. 2022. Occurrence of mange in American black bears in New York state, USA. *Journal of Wildlife Disease*, in press.

Siemer, W.F., T.B. Lauber, H.E. Kretser, and **K.L. Schuler.** 2021. Risk communication associated with bat-related service calls: exploratory interviews. *Center for Conservation Social Sciences Publ. Series* 21-5. Dept. of Nat. Resources. & the Environ., Coll. Agric. and Life Sci., Cornell Univ., Ithaca, NY. 33 pp. https://ccss.dnr.cals.cornell.edu/

Ufer, D.*, S.A. Christensen, D.L. Ortega, N. Pinizzotto, and **K. Schuler.** 2022. Stamping Out Wildlife Disease: Are Hunter-Funded Stamp Programs a Viable Option for Chronic Wasting Disease Management? *Conservation Science and Practice*. DOI:10.1111/csp2.12779

Zhu, S.*, E. Buckles, E. Bunting, K. Hynes, and **K. Schuler.** 2021. A predictive utility of causes of morbidity and mortality in white-tailed deer (*Odocoileus virginianus*). *Wildlife Biology*. DOI:10.2981/wlb.00860

* indicates a student

Presentations

Abbott, R. Bats for Animals in Global Cinema, Cornell University, April 2021

Hanley, B. Mathematics of bog turtle populations at Bog Brook in New York State. 15-min. presentation to the Herpetology Team, New York State Department of Environmental Conservation. Virtual, 2022.

Hanley, B. Mathematics of fisher populations in New York State. 15-min. presentation to the Furbearer Team, New York State Department of Environmental Conservation. Virtual, 2022.

Hanley, B. Population scale impacts of Pb toxicosis in Bald Eagle. 15-min. presentation to the Division Directors of the New York State Department of Environmental Conservation. Virtual, 2022.

Hanley, B. Surveillance optimization project for chronic wasting disease. 15-min. presentation to the Division Directors of the New York State Department of Environmental Conservation. Virtual, 2022.

Hanley, B. Bald Eagle Dashboard: Software to assess the population scale impact of anthropogenic mortality to bald eagles. 15-min. presentation to the Northeast Association of Fish and Wildlife. Virtual, 2022.

Hanley, B. Surveillance optimization project for chronic wasting disease. 15-min. presentation to the Michigan Department of Natural Resources. Virtual, 2022.

Hanley, B. Combinatorial optimization algorithm for assessing lead toxicosis in Bald Eagle. 15-min. presentation to the Raptor Research Foundation Annual Conference. Virtual, 2021.

Hanley, B. Surveillance Optimization Project for Chronic Wasting Disease. 1.5 hr. presentation for representatives of 22 US state wildlife agencies and 1 provincial wildlife agency. Virtual, 2021.

Hanley, B. Surveillance Optimization Project for Chronic Wasting Disease. 15-min. presentation for the State Commissioners at the Tennessee Wildlife Resources Agency (TWRA) Meeting. Virtual, 2021.

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 interaction of host, pathogen, and host-associated microbiome throughout vaccination and infection. *Arizona State Amphibian Pathogens Virtual Meeting*. 2021. Oral Presentation.

Kaganer, A. W., G. S. Stapleton, E. M. Bunting, and M. P. Hare. Aquatic eDNA can advance monitoring of a small-bodied terrestrial salamander and aquatic pathogen. *The Wildlife Society Virtual Conference*. 2021. Oral Presentation.

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 exposure sheds light on the relationship between host, microbiome, and pathogen in disease. *Joint Meeting of Ichthyologists and Herpetologists*. 2021. Virtual Oral Presentation.

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. Poster Presentation.

Kaganer, A. W., Hands Off! Development and Application of Noninvasive Pathogen Surveillance Tools for Wildlife. *Cornell University Zoo and Wildlife Society Wildlife Conservation Day*. 26 Feb. 2022. Oral Presentation.

Kaganer, A. W., Development and application of molecular methods to enhance understanding of the amphibian-emerging infectious disease pathobiome. *Cornell Wildlife Health Lab Webinar*. 24 Jun. 2021. Virtual.

Hynes, K., Ableman, A., and Miller, L. USFWS Partner with a Payer video shoot at Wildlife Health Unit. September 13, 2021

Hynes, K. DEC Wildlife Health Program, Wildlife Disease, and PPE use. *NYSDEC Division of Law Enforcement Region 4 BLOC meeting* September 29, 2021

Hynes, K. Northeast Furbearer Management Workshop. Furbearer Diseases in the Northeast and Necropsy Demonstration October 7, 2021

Hynes, K. Bald eagles and lead poisoning, interview for *Environmental Health News* (Casey Crownhart) November 12, 2021

Hynes, K. Wildlife Health Program, Wildlife Diseases, Zoonoses, and Outbreak Potential. Presentation to NY State Emergency Management Council November 12, 2021

Hynes, K., Ableman, A., and Miller, L. Wildlife diseases, lab tour, and necropsy demonstration for SUNY Cobleskill Wildlife Damage classes December 8 and 9, 2021

Hynes, K. Bald eagles and lead ammunition, interview for *Associated Press* (Christine Larson) February 11, 2022

Hynes, K. Introduction to the DEC Wildlife Health Program with information on CWD, EHD, and HPAI. Presentation to Grafton Sportsmen Group March 11, 2022

Peaslee, J. Beneficial Beavers - Ecosystem Engineers. *Cornell Naturalist Practicum Outreach Program*. Beverly J. Martin School (1) & Caroline Elementary (2). In-person, 2021.

Peaslee, J. Building Beavers - Keystone Species and Environmental Engineers. *Cornell Naturalist Practicum Outreach Program*. Belle Sherman School System (5) & Fall Creek Schools (2), In-person, 2021.

Schuler, K., B. Hanley, N. Hollingshead, R. Abbott, C. Them, C. Mitchell, and S. Ahmed. The Known Unknowns: How Data Science is Changing CWD for Deer Managers. *Southeast Deer Study Group*. Virtual, 2022.

Schuler, K. Dancing on a tightrope: Chronic wasting disease risk versus conservation. *Workshop: Risk Communication Practices for Wildlife Professionals*. *The Wildlife Society*. Virtual, 2021.

Schuler, K. SOP4CWD: Sample smarter in the Midwest. *Midwest AFWA CWD working group*. Virtual, 2021.

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

Goodman, L., M. Stanhope, **Schuler, K., Bunting, E.,** G. Whittaker, and K. Cummings. 2022. Survey of novel coronaviruses in wildlife for risk assessment studies. *Public and Ecosystem Health Departmental Impact Award*, \$37,905, 1 yr.

Kaganer, A. 2021. There's something in the water! Improving emerging infectious disease surveillance with environmental RNA. *Cornell Atkinson Center for Sustainability Sustainable Biodiversity Fund*. \$6,989; 2 yrs.

Schuler, K. and E. Bunting. 2021. Cornell Wildlife Health Lab: Wildlife Health Services. *New York State Department of Environmental Conservation*. \$6,402,000, 5 yrs.

Schuler, K., N. Hollingshead, and R. Abbott. 2021. Alabama Chronic Wasting Disease Risk Assessment and Surveillance Plan. \$43,896, 2 yrs.

Schuler, K. and Kaganer, A. Punch in the gut- Finding CWD prions and markers of disease risk in fecal samples. *CWD Alliance*. \$84,786; 1 yr.

Schuler, K., Williams, D., **Hanley, B.,** Christensen, S. 2021. SOP4CWD Supplemental Funding. *Michigan Disease Initiative*. \$67,000, 2 yrs.

Schuler, K., Murphy, L., Stiller, J., Richter, W., Gregg, I., Huck, N., Huang, M., Nichols, T., **Hanley, B.,** Spliethoff, H. 2021. Contaminant Loads in Waterfowl of the Northeast Atlantic Flyway: New Threats and Outdated Advisories. *Multistate Conservation Grant Program*. \$287,000, 1 year.

Schuler, K., N. Hollingshead, and R. Abbott. 2021. SOP4CWD hazard identification and software. *Florida Fish and Wildlife Conservation Commission*. \$25,000. 1 yr.

Straka, K. S. Sreevatsan, and **K. Schuler.** A multicenter validation of RT-QulC assay for sensitive detection of chronic wasting disease. *U.S. Department of Agriculture – Animal – Plant Health Inspection Service*. \$246,461. 1 yr.

Software Applications

Hanley, B. J., Them, C. E., Mitchell, C. I., Carstensen, M., Walsh, D. P., Christensen, S. A., Storm, D. J., Booth, J. G., Guinness, J., **Abbott, R. C., Ahmed, M. S., & Schuler, K.** 2022. SLEI Model Software [Software]. *Cornell University Library eCommons Repository*. doi.org/10.7298/csew-h225.2

Hanley, B., Them, C. E., Mitchell, C. I., Carstensen, M., Walsh, D. P., Christensen, S. A., Storm, D. J., Booth, J. G., Guinness, J., **Abbott, R. C., Ahmed, M. S., & Schuler, K.** 2022. SEI Model Software [Software]. *Cornell University Library eCommons Repository*. doi.org/10.7298/csew-h225

Hanley, B., Mitchell, C. I., Walter, W. D., Walsh, D., Jennelle, C., **Hollingshead, N., Abbott, R.,** Kelly, J., Grove, D., Williams, D., **Them, C., Ahmed, S., Miller, L., & Schuler, K.** 2021. Chronic Wasting Disease Surveillance Optimization Software [Software]. *Cornell University Library eCommons Repository*.doi.org/10.7298/p21r-q845

Hanley, B., Mitchell, C. I., Abbott, R., Hollingshead, N., Carstensen, M., Walsh, D., Christensen, S., Storm, D., Kelly, J., **Miller, L., & Schuler, K.** 2021. Wildlife Disease Hazard Software [Software]. *Cornell University Library eCommons Repository*.doi.org/10.7298/w4rn-xq85

Hanley, B., Mitchell, C. I., Abbott, R. C., Hollingshead, N., Carstensen, M., Walsh, D., Christensen, S., Storm, D., Kelly, J., **Them, C., Ahmed, S., Miller, L., & Schuler, K.** 2021. Regional Wildlife Disease Hazard Software [Software]. *Cornell University Library eCommons Repository*. doi.org/10.7298/hqg5-ac08

Mitchell, C. I., Hanley, B., Abbott, R. C., Hollingshead, N., Kelly, J., **Miller, L., & Schuler, K.** 2021. Wildlife Disease Positives Software[Software]. *Cornell University Library eCommons Repository*.doi.org/10.7298/sf7q-8q61

Mitchell, C. I., Hanley, B., Abbott, R. C., Hollingshead, N., Kelly, J., **Them, C., Ahmed, S., Miller, L., & Schuler, K.** 2021. Regional Wildlife Disease Positives Software [Software]. *Cornell University Library eCommons Repository*. doi.org/10.7298/mchw-3e31

Hanley, B., A. Currylow, K. Holcomb, T. Shields, S. Boland, W. Boarman, & M. Vaughn. 2021. StallPOPdV4 Web Interactive: Software to compute population control treatments of a subsidized predator [Software]. doi.org/10.7298/sk2e-0c38.4

Hanley, B., Mitchell, C., Walter, W. D., Kelly, J., **Abbott, R., Hollingshead, N., Miller, L., & Schuler, K.** 2021. Habitat Risk Software [Software]. *Cornell University Library eCommons23 Repository*. doi.org/10.7298/rcz8-nw50



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