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Cornell University
College of Veterinary Medicine

Wildlife Health Cornell

A College of Veterinary Medicine Center of Excellence

Because we need nature, and nature needs us

Fall 2018

Addressing Wildlife Health in a Rapidly Changing World

© R. Gilbert

The *Wildlife Health Cornell* Center of Excellence represents an unprecedented approach to the health challenges wild animals face here in the northeast U.S. and around the world - a comprehensive, science-based response by a team of the world's top wildlife and ecosystem health experts.

It's been an exciting few months for our **Wild Carnivore Health Program** - we received two grants, from the *Atkinson Center for a Sustainable Future* and the *Cornell Feline Health Center*, to expand our wild carnivore health and conservation efforts in Asia.

The first project, " Doing More with Less: Sustainable Management of Livestock and Wildlife," takes us to Tajikistan's Pamir Mountains, where human livelihoods and the entire ecosystem are threatened by livestock overgrazing. By improving animal health and reducing herd size, we can help communities limit their environmental footprint - relieving pressures on wild sheep and goats, as well as the snow leopards that rely on them.

The second project, " Canine Distemper Virus as a Threat to Tiger Conservation in Tropical Range States," will further our investigations into the prevalence of canine distemper virus infection in the previously unstudied tiger populations of Indonesia, Thailand, India, and Nepal. Ultimately, this project will enable countries supporting 88% of the world's tigers to evaluate the risks posed by this very important pathogen, first found to impact wild tigers in the Russian Far East.

For more information on the work of the *Wildlife Health Cornell* Center of Excellence, please visit www.wildlifehealthcornell.org. As in the past, we hope you find this e-newsletter useful and thought-provoking. Please let us know!

- Steve Osofsky, DVM
Jay Hyman Professor of Wildlife Health & Health Policy

Training Veterinary Students to Protect Pollinators

Honeybees are crucial for New York's agricultural economy. A new course at Cornell University's College of Veterinary Medicine trains students on how to protect these important pollinators.

AHEAD Celebrates 15 Years

The *Animal & Human Health for the Environment And Development* (*AHEAD*) Program was launched 15 years ago at the International Union for Conservation of Nature's World Parks Congress in Durban, South Africa. Since then, the program has focused on interrelated challenges impacting land-use, animal and human health, wildlife conservation, and poverty alleviation.

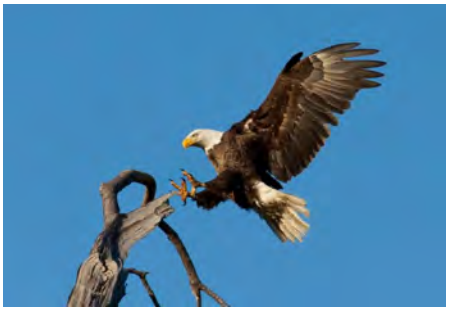
Training Veterinary Technicians in Wildlife Medicine

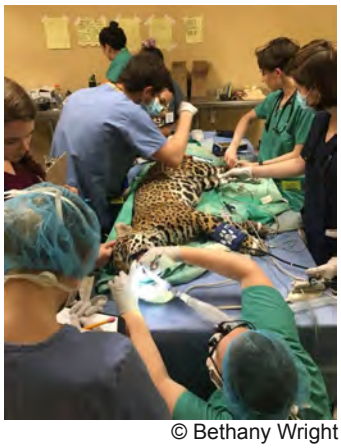
Cornell sets the bar for training vet techs in wildlife medicine. The Veterinary Technician

Student Preceptorship in Wildlife Medicine is the first of its kind in the northeast U.S., and gives veterinary technicians-in-training concentrated wildlife-focused experience.

Bald Eagle Poisoning

The mystery behind the deaths of 13 bald eagles found in a Maryland field has recently been solved by investigators: the birds were poisoned with the pesticide carbofuran, which came under scrutiny three decades ago for killing an estimated two million birds a year.





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Veterinary College Partners Open New Clinic at Belize Zoo

The residents of the Belize Zoo have a brand-new veterinary clinic that will serve the medical needs of everyone from Sparks the tapir to Chiqui the jaguar. Members of the College of Veterinary Medicine celebrated this milestone with zoo staff when the clinic opened this summer.

New York State Wildlife Health Program Annual Report

The New York State Cooperative Wildlife Health Program is a partnership between the New York State Department of Environmental Conservation (DEC) and our Cornell Wildlife Health Lab (CWHL) focused on safeguarding the long-term health of wildlife in New York.

The Emerging Field of Planetary Health

The NIH's National Institute of Environmental Health Sciences (NIEHS) journal, *Environmental Health Perspectives*, describes the origins of the field of planetary health, including Cornell's role.

A Deadly Virus Carried by Fruit Bats

As human populations increase around the world, people have increasingly encroached on wildlife habitats, sometimes causing previously unknown, deadly diseases to jump from animals to humans. To counter this threat, Cornell's Dr. Hector Aguilar-Carreno and his lab study how the Nipah virus jumps from bats to people.

Read about Cornell Veterinary Student Adventures in The Field!

Elvina Yau '20: The Cheetah Chronicles

Victoria Albano '21: Sea Turtle Conservation in Costa Rica

Bryan Clifford '20: My Summer with the New York State Wildlife Health Program

Fayme Cai '22: Investigating Lead Levels in New York City's Pigeons

Jonathan Gorman '21: The Embryonic Lives of Spotted Salamanders

Your gift literally means the world to us!

Please consider supporting *Wildlife Health Cornell* by giving online, or contacting Sheila M. Reakes at 607-253-4310 or <smr45@cornell.edu>.

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The *Wildlife Health Cornell* Center of Excellence envisions a healthy future for wildlife, people and planet. We strive to develop proactive, science-based approaches for sustaining a healthier world. By improving knowledge, understanding, and capacity at the interface of wildlife health, domestic animal health, and human health and livelihoods, environmental stewardship can be enhanced today, and for tomorrow.

To learn more about *Wildlife Health Cornell*, please contact Dr. Steve Osofsky at s.osofsky@cornell.edu or visit our website .

Please let us know if you have any comments on this e-newsletter, an d if you find it useful! Thank you for your support.

Confirm that you like this.

Click the "Like" button.

College projects on sustainability awarded funds to further research

Wednesday, July 11, 2018 - 9:22am

Livestock herders are pictured in Burgut Conservancy, Alichur, in eastern Tajikistan. Photo by Martin Gilbert.

Three projects from the College of Veterinary Medicine have been awarded funds from the Atkinson Center for a Sustainable Future for their emphasis on sustainability research either locally or internationally. The center's Academic Venture Fund (AVF) supports collaborations that cut across disciplines to address today's greatest sustainability challenges. In 2018, the fund awarded $1.5 million to a range of projects that will provide sustainable solutions around the world, from the Finger Lakes to the Pamir Mountains in Central Asia.

Dr. Martin Gilbert and Gen Meredith, both of the Department of Population Medicine and Diagnostic Sciences, and Dr. Helene Marquis of the Department of Microbiology and Immunology will each partner with cross-campus collaborators for the following projects:

Doing More with Less Livestock: The Pamir Mountains of Tajikistan support a fragile ecosystem of limited resources that is increasingly at risk due to unsustainable numbers of livestock. Wild ungulates, in particular, are threatened by grazing competition and disease, which also impact the endangered snow leopards that hunt them. This project aims to develop a self-sustaining veterinary support system that will help Pamiri communities achieve the

same or greater productivity from maintaining smaller, healthier livestock herds, with a reduced environmental footprint.

Investigators: Dr. Martin Gilbert, population medicine and diagnostic sciences; Edward Mabaya, Cornell SC Johnson College of Business, Dyson.

Opening the Door to Nature-Based Engagement: Young people today show greater rates of stress and anxiety, a trend that coincides with a growing recognition of the threats to the natural environment. Employing a One Health approach, researchers will examine how curricular programing that provides students more time in nature can lead to healthier populations and environments. The project will specifically focus on elementary schools serving low-income communities in urban and rural areas, and will identify curricular best practices and generate data to inform programs and state policy for long-term social and environmental impact. The project also received a Engaged Cornell supplemental grant. Co-sponsored by MPH.

Investigators: Gen Meredith, population medicine and diagnostic sciences; Don Rakow, horticulture; Nancy Wells, design and environmental analysis; Janis Whitlock, Bronfenbrenner Center for Translational Research; Monika Safford, Weill Cornell Medicine; Samantha Hillson, Tompkins County Health Department.

Waste No More: Creating Aquaculture Feed from Seafood Industry Byproducts: World demand for seafood is rising as wild fish stocks decline, creating an urgent need for new sources of protein to grow fish. This project aims to develop a novel system for making sustainable aquaculture feed from commercial fish processing waste, whereby liquefied, acid-preserved fish protein – or fish silage – is transformed into mass quantities of pellets for farm use. By salvaging high-quality proteins to replace controversial fishmeal in aquafeeds, the silage-based feed system will make aquaculture more sustainable and economically viable while reducing pressure on wild fish stocks.

Investigators: Eugene Won, animal science; Joe Regenstein, food science; Dr. Helene Marquis, microbiology and immunology.

Twleve projects total

Among the 12 total projects are efforts aimed at transforming nutrient-rich poultry waste into economically viable fertilizers; developing in-situ conservation strategies for African rice; boosting nature-based engagement for elementary schools in low-income communities; and connecting rural and urban areas across New York state through a public “Internet of Things” infrastructure.

Three projects are co-sponsored by Cornell’s Master of Public Health program, an interdisciplinary degree that grew out of the Atkinson Center in fall 2017. The Atkinson Center is also partnering with the Office of Engagement Initiatives (OEI) in support of Engaged Cornell, which provides $10,000 grants for AVF projects that incorporate undergraduate research opportunities and community engagement.

The list of 2018 funded projects also includes:

Using Data to Boost Drought Resilience in the Caribbean: From 2013 to 2016, the Caribbean region endured its worst drought in over half a century. To help farmers in the Dominican Republic cope with the changing climate, researchers will design and deploy low-cost soil moisture and plant stress-monitoring sensors that transmit information to a cloud-based computing platform. This technology will enable improved near-term forecasts of drought conditions, alerting farmers to drought hazards by text message. Researchers will conduct surveys to understand the barriers to weather and climate data, and assess the efficacy of the new tools.

Investigators: Toby Ault, earth and atmospheric sciences; Abraham Stroock, chemical and biomolecular engineering; Shorna Allred, natural resources.

Stay or Go? How Environment Affects Migration in Mexico: Studies have examined how economic, political and social factors affect migration in Mexico, but the role of the environment has not been explored. This project links environmental events to individuals' decisions to migrate from rural to urban areas in Mexico, and from Mexico to the United States. Researchers will combine novel environmental measures and in-depth interviews with the largest existing survey on Mexican migration that captures more than 150,000 individuals' movements from 1965 to 2017. The goal is to identify behaviors and structures that shape adaptation responses and to design policies that foster resilience in collaboration with local organizations. Received Engaged Cornell supplemental grant.

Investigators: Filiz Garip, sociology; Allison Chatrchyan, earth and atmospheric sciences; Nancy Chau, Cornell SC Johnson College of Business, Dyson; Ariel Ortiz Bobea, Cornell SC Johnson College of Business, Dyson; Amanda Rodewald, Laboratory of Ornithology.

The Role of Nitrogen in Toxic Blooms in the Finger Lakes: Toxic cyanobacteria blooms are increasing globally. Since 2015, several Finger Lakes have experienced blooms for the first time, threatening lake health and sustainable use for drinking water and recreation. These blooms were unexpected because stringent phosphorus standards were established years ago to protect water quality in some of the lakes. Researchers aim to confirm a new ecological theory that suggests high nitrogen inputs – spurred by a changing climate – may be the cause, a finding that could lead to new watershed management strategies and an added emphasis on the relationship with climate variability. Co-sponsored by MPH.

Investigators:Robert Howarth, ecology and evolutionary biology; Todd Walter, biology and environmental engineering; Roxanne Marino, ecology and evolutionary biology.

The Future of Fibers May Be Local: Small flock fiber farmers struggle to survive in a global economy that favors standardization and commoditization of a narrow set of breeds and genetic stock to produce cheap material that must compete with synthetic, low-cost competitors. However, as interest in locally produced goods grows, small flock fiber farms may have an opportunity to thrive by influencing development of specialized textile markets. This project seeks to evaluate small flock-based fiber market value chains and connect rural and urban fiber-textile economies, growing rural economies and helping similar markets do the same. The project received Engaged Cornell supplemental grant.

Investigators: Mark Milstein, Cornell SC Johnson College of Business, Johnson; Miguel Gomez, Cornell SC Johnson College of Business, Dyson; Tasha Lewis, fiber science and apparel design; Anu Rangarajan, horticulture; Michael Thonney, animal science.

Sustainable Intensification and Conservation of African Rice: Three hundred years ago, the Saramaka people in Suriname escaped from plantation slavery to the rainforest interior of the country and lived in relative independence by hunting, gathering and growing African rice (Oryza glaberrima). But with increased population, rice self-sufficiency can no longer be guaranteed, and Saramaka leaders seek new sustainable solutions to increase rice productivity and protect its biodiversity. Researchers will work with farmers to characterize rice diversity and improve agronomic practices. They will also use genetic analysis to identify the origins of the Saramaka rice and assist communities in developing in-situ conservation strategies. Received a $5,000 Engaged Cornell supplemental grant.

Investigators: Erika Styger, International Programs in the College of Agriculture and Life Sciences; Susan McCouch, plant breeding and genetics; Chelsea Specht, plant biology.

Sounds of Soil: Root-feeding insects reduce belowground plant productivity and disrupt soil carbon cycling, ultimately eroding plant and soil health. Current methods for monitoring these insects are time-consuming, cost-prohibitive and often unreliable. Researchers will develop inexpensive acoustic sensors to detect, monitor and characterize populations of soil-dwelling organisms, distinguishing them from other complex sources of acoustic signals belowground, while also assessing overall soil health. The result will be a reliable method for pest monitoring that is accessible and profitable to farmers, leading to more judicious pesticide use and enhanced agricultural sustainability and food security.

Investigators: Kyle Wickings, entomology; Johannes Lehmann, soil and crop sciences; Holger Klinck, Laboratory of Ornithology; Greg McLaskey, civil and environmental engineering.

Making Farm-to-Fork Food Safety More Sustainable: Food safety decisions are typically made without taking conservation into account. This project models the trade-offs between food safety and conservation aims associated with specific food safety practices. Specifically, the project examinesthe impacts of pre-harvest food safety practices for preventing wildlife from entering fields on surface water quality.The project will provide growers with a conceptual framework that they can use to develop farm management plans that minimize economic and environmental costs, while optimizing food safety outcomes, ultimately improving on-farm food safety and sustainability as well as the economic resiliency of farm communities. Co-sponsored by MPH.

Investigators: Martin Wiedmann, food science; Aaron Adalja, Cornell SC Johnson College of Business, SHA.

Recycling Poultry Litter for Fertile Fields: As the world's largest producer of poultry meat, the U.S. generates approximately 55 million dry tons of poultry litter ever year, resulting in expensive disposal costs and a large environmental footprint. This project seeks to achieve long-term food security by transforming nutrient-rich poultry waste into economically viable fertilizers. The team will couple innovative technology development with energy-environmental-economic systems analysis. The researchers' partnerships with key stakeholders in the poultry industry and support from the U.S. Environmental Protection Agency will maximize the impacts of the project. Received Engaged Cornell supplemental grant.

Investigators: Fengqi You, chemical and biomolecular engineering; Johannes Lehmann, soil and crop sciences; Xingen Lei, animal science; Jefferson Tester, chemical and biomolecular engineering.

Bridging the NYS Rural and Urban Divide through a Public 'Internet of Things': Rural areas have been plagued by poor cellular connections and a lack of investment by wireless telecommunication companies. This project aims to use affordable Low Power Wide Area Network (LPWAN) technology to create a testbed in Tompkins County with 100 percent coverage and through 30 Cornell Cooperative Extension offices across New York state that will be equipped with LPWAN-based electricity and water metering. This statewide, public "Internet of Things" infrastructure will bridge the digital divide between rural and urban areas, spur new economic activities, and be a game-changer for sustainability. Received Engaged Cornell supplemental grant.

Investigators: K. Max Zhang, mechanical and aerospace engineering; Stephen Wicker, electrical and computer engineering; Kenneth Schlather, Cornell Cooperative Extension of Tompkins County; David Kay, development sociology.

By David Nutt

A version of this story appeared in the Cornell Chronicle.

2018 - 2019 Funded Research Projects

The Cornell Feline Health Center Research Grant Program provides vital financial support to Cornell researchers investigating issues that affect feline health. Projects currently funded by the Cornell Feline Health Center range from studies of feline infectious peritonitis (FIP) to finding the genetic causes of certain inherited diseases.

Scientific research has made feline medicine what it is today, and it's making a healthier, happier tomorrow possible for cats around the world. If you believe in the positive power of our work to make a difference, please consider making a donation to the Cornell Feline Health Center today.

2015 - 2016 Funded Research Projects

2016 - 2017 Funded Research Projects

2017 - 2018 Funded Research Projects

Feline coronavirus as a cause of upper respiratory infection in shelter cats

Upper respiratory infections (URI) are an important feline disease in shelter cat populations, as cats with URI are less likely to be adopted, can transmit infections to other cats, and ultimately end up staying in shelters longer, thereby increasing the burden on shelters that are already commonly overcrowded. While a number of viral and bacterial organisms have been identified as being important contributors to the development of URI in shelter cats, feline coronaviruses (FCV) have not been historically thought of as being involved in this common syndrome. More recently, FCV have come under consideration as being a potential contributor to the development of URI in shelter cats. This study will investigate the prevalence of FCV in shelter cats both with and without URI to determine the relationship between FCV infection, URI, and the more commonly diagnosed clinical syndrome that is associated with FCV infection, feline infectious peritonitis (FIP).

Investigator: Gary Whittaker, PhD

Canine distemper virus as a threat to tiger conservation in tropical range states

Tigers (*Panthera tigris*) have been classified as endangered by the International Union for Conservation of Nature since 1986, and despite significant efforts by countless dedicated conservationists, both the number of wild tigers and their range have decreased by 50% in the past 20 years. Recently, canine distemper virus (CDV) has been identified as a new threat to wild tiger populations in the Russian far East, and the potential effect of this new threat on wild tiger populations is considerable. This project will investigate the prevalence of CDV infection in the previously unstudied tiger populations of Indonesia, Thailand, India, and Nepal, as the first step in characterizing the potential risk of CDV to these vulnerable populations. The protocols established by this study will then facilitate future surveillance of these populations for CDV, information that will prove vital in the design of rationale control strategies for CDV, should they be needed.

Investigator: Martin Gilbert, MRCVS, BVMS, PhD

Applying novel pathogen discovery to the investigation of infectious causes of heart disease in cats

The causes of two types of feline heart diseases called endomyocarditis (EMC) and endomyocardial fibrosis (EMF), in which the inner lining of the chambers of the heart are replaced by inelastic fibrous tissue, are currently unknown. The fact that EMC has been associated with pneumonia in cats suggests the possibility of an infectious cause for this syndrome, and EMC has been proposed as being a precursor to EMF, which generally occurs in older cats. While evidence for infectious causes of analogous syndromes has been identified in people, similar infectious causes have not previously been identified in cats. This study will use cutting edge molecular biological techniques in an effort to identify infectious agents that may cause EMC (and, subsequently, EMF).

Investigator: Laura Goodman, PhD

Entry and Egress of the novel feline morbillivirus (FeMV)

Feline morbillivirus (FeMV) was first described in a group of stray cats in China in 2011, and this and subsequent identification of FeMV in association with a kidney disease called tubulointerstitial nephritis (TIN) in cats in Japan, Germany, and the US have raised concerns for this novel virus causing TIN. An infectious cause for TIN would have the potential to cause significant illness in a large number of cats in many regions of the world. This study will use cutting-edge technology to determine how FeMV virus gains access to kidney cells as the first step in understanding the mechanism of FeMV infection. An improved understanding of this mechanism has the potential to improve our ability to diagnose, treat, and prevent FeMV infections in cats worldwide.

Investigator: Hector Aguilar-Carreno, PhD

CORNELL CHRONICLE

Provided

A group of veterinary students learn what a healthy hive looks like as Cornell Dyce Laboratory Master Beekeeper Scott McArt demonstrates the proper technique of conducting a health exam on a hive.

New course trains veterinary students to protect pollinators

By Lauren Cahoon Roberts | August 21, 2018

Veterinarians are trained to handle patients with four legs, two legs and sometimes no legs – but six legs might pose some new challenges.

Nevertheless, new federal regulations require veterinarians around the country to examine and treat honeybee colonies, and training for this new job is needed. That's why Cornell veterinarian **Dr. Robin Radcliffe** (https://www2.vet.cornell.edu/research/faculty/robin-radcliffe-dvm) partnered with Cornell faculty members to offer the first honeybee health course at Cornell for veterinary students.

Provided

William Fugina, fourth-year veterinary student and teaching assistant for the course, demonstrates the proper attire and frame holding technique to evaluate the frames of a hive.

"The veterinary field has a lot to offer bee colonies and beekeepers," said Radcliffe. "And there is a real need here in New York state as well."

Honeybees are crucial for New York's agricultural economy. Crops such as apples, grapes and strawberries rely completely on pollination – leaving an estimated $383.5 million per year in the "hands" of the hive. Increasingly, these tiny engines of economic productivity have faced growing threats, ranging from hive management practices to climate change.

New York has only two state bee inspectors, placing the onus on individual beekeepers to monitor and maintain colony health. Veterinarians are also now required to prescribe antibiotic treatments to honeybee colonies due to a 2016 U.S. Food and Drug Administration directive categorizing honeybees as food-

Provided

To assess the health of a hive, a bee veterinarian must look at the comb and the brood, and analyze the behavior of both individual and groups of bees.

producing livestock.

Radcliffe's course takes a more holistic view of the hive. "The goal of our course is to show veterinarians that they should not approach this as just providing a pharmacy for beekeepers," he said. "Our approach is to emphasize that veterinarians have a lot of skills to offer, and that includes understanding infectious disease, pathology, the parasites and their life cycles, as well as bee anatomy and physiology." The course will be offered each year to roughly a dozen second-year veterinary students. Ninety students requested to take it this summer.

Said William Fugina, a fourth-year veterinary student and teaching assistant for the course: "It is a completely novel area of veterinary medicine that is not only unexplored, but also has extremely important agricultural and conservation implications. My passion in wildlife conservation and public health certainly resonates with the veterinary role for the honeybee."

Radcliffe has always had a keen interest in honeybees. This passion eventually connected him with honeybee expert **Thomas D. Seeley** (http://nbb.cornell.edu/thomas-seeley), the Horace White Professor of Biology, and other bee researchers across the campus. Radcliffe and Seeley devised a novel method of locating wild honeybee trees in deep forest, a method that they published in the August issue of **American Bee Journal** (https://americanbeejournal.com/), and which Radcliffe wrote about in the June issue **New York State Conservationist** (https://www.dec.ny.gov/docs/administration_pdf/0618consmag4web.pdf).

These collaborations have informed Radcliffe's new course. "The idea that veterinary medicine could be a part of training for bee health is kind of new," said Radcliffe, noting that honeybee health has been a part of veterinary programs in South America but the concept is relatively foreign to North American veterinary medical colleges.

Beyond the fact that bees are invertebrates and possess many different physiological systems compared with vertebrates, honeybee care is "more herd health, and has a lot of parallels to population medicine and public health. Our patient is not the single bee, but the whole colony – biologically the complex communication and cooperation among bees known as the 'superorganism.'"

Cornell University

Cornell's Beekeeper Tech Team is an interdisciplinary group based in the College of Agriculture and Life Sciences that works directly with New

Radcliffe teaches students what normal "brood" looks like – the eggs and developing pupae – so they will

York beekeepers to improve honey bee health, reduce colony losses and increase profitability of the beekeeping industry.

recognize signs of the America foulbrood, a bacteria that will kill larvae and easily spread from hive to hive. Students are also schooled in the honeybee's greatest foe, the varroa mite. These invasive parasites from China arrived in New York in 1995. They feed off adult bees and their brood, causing the entire colony to weaken and, if left untreated, collapse.

Radcliffe's veterinary students also learn about threats human activity pose to honeybees. The use of harmful insecticides on crops, the rapid shift in food sources due to climate change, and dwindling habitat due to land development add more pressure on honeybees and other pollinators. Today, 75 to 80 percent of all domestic honeybee colonies are transported to California to pollinate almond groves, threatening bees' normal functioning and stressing whole colonies.

"There are many stressors that affect honeybees today. It's a really complex mix of problems," Radcliffe says. Thanks to his new course, Cornell veterinarians will soon be helping to solve them.

Lauren Cahoon Roberts is assistant director of communications for the College of Veterinary Medicine.

YOU MIGHT ALSO LIKE

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Partnership to assess pollinator-friendly solar farms (/stories/2018/07/partnership-assess-pollinator-friendly-solar-farms)

Study: Bigger honeybee colonies have quieter combs (/stories/2017/12/study-bigger-honeybee-colonies-have-quieter-combs)

AHEAD Update – September / October / November 2018

Dear ***AHEAD*** Colleagues:

* Welcome to the latest issue of the ***AHEAD* Update**. As always, if you would like to post an item in the next Update, please just send it to us – thanks.

MINI-TORIAL

AHEAD at 15: Reflections on Maintaining Support to Support Change for the Better

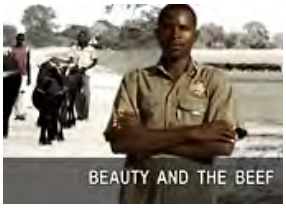
The *AHEAD* Program was launched 15 years ago this month, in September 2003, as a by-invitation 2-day event at the IUCN World Parks Congress in Durban, South Africa. The focus of the working meeting was a set of important issues at the wildlife / livestock interface that were clearly not being addressed. I was betting that the breadth and depth of expertise available in southern and East Africa would be willing to come to the table and brainstorm on new solutions to long-standing problems. The overarching context was a fairly young transfrontier conservation areas (aka 'peace parks') movement, and a sense of excitement that more sustainable and diversified land-uses and livelihoods were within reach. We published the *AHEAD* launch proceedings as a book, and I confess I am pleased and humbled by what has unfolded over the 15 years since.

What I believe was the first applied *One Health* program, *Animal & Human Health for the Environment And Development* has learned a lot in earnest partnership with many of you since 2003. Keeping what is essentially a facilitative, cross-sectoral program moving forward is certainly challenging, and the range of supporters we've had over the years, from world-renowned foundations and agencies to individuals who clearly recognize that complex problems don't get solved overnight, has inspired us to 'keep at it' even when prevailing political and/or policy winds were sometimes daunting. For some of our colleagues and financial supporters, the work is about wildlife conservation. For others, it is about enhancing prospects for rural livestock farmers. For most, the work of focus is above all about improving prospects for sustainable socioeconomic development as underpinned by earnest environmental stewardship, and about poverty alleviation as a foundational step. As I confess to saying more than once,

Of course with great opportunity, comes great responsibility. A collective investment in earnest stewardship of natural resources, with an eye towards our children's children, must be made by all sectoral stakeholders dependent on southern Africa's precious land-base. There is now, for the first time in several generations, an opportunity to find ways to optimize land-use choices in the interest of system resilience and diversified livelihood opportunities. Neither the livestock nor wildlife sectors should seek to dominate the other. Instead, it is time to make land-use decisions that will be socially, ecologically and economically sustainable for generations to come.

Our journey is of course not complete, and I find *AHEAD* at a crossroads. Over the past 15 years, raising funds to keep the work going has never been easy, and my sense is that it is perhaps getting harder. That could be an artifact of my being 15 years older (!), but I think it actually reflects (1) the fact that there are more global challenges than ever that increasingly depend upon philanthropy, and (2) the reality that, over the past 15 years, we have 'outlasted' many of the funding initiatives that we've benefitted from at different points in time. Philanthropic institutions and programs change leadership and thus thematic priorities regularly — at the same time, we have not wavered from our objectives. This thus means

New Video:
Beauty and the Beef: Achieving Compatibility Between Wildlife Conservation and Livestock Production
(21 min, 48 sec)



PDF:
"Beyond Fences: Policy Options for Biodiversity, Livelihoods & Transboundary Animal Disease Management in Southern Africa"

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For options to download PDF, right-click or control-click.

PDF:
"Para Alem Fronteiras: de Política para a Biodiversidade, Meios de Subsistência e Gestão de Doenças Transfronteiriças dos Animais na África Austral"

Cornell University College of Veterinary Medicine

Site design:
Timeless DVD

we are essentially constantly re-engaging old and new potential partners, bringing them up to speed using what could perhaps best be described as “an elevator speech… in a very tall building.” As readers of the *AHEAD* Update certainly know, this work is somewhat complicated, and it takes a sophisticated donor to “get” the how's and why's of what we do. We have always managed though, which gives me hope. We will of course continue to do our best to keep *AHEAD* efforts funded; I think it will likely take another 10 years to fully capitalize upon the synergies represented by the triangle of wildlife health, domestic animal health, and human health and livelihoods, all as underpinned by environmental stewardship, that *AHEAD* and collaborating partners have long envisioned.

- Steve

KAZA Transfrontier Conservation Area Animal Health Sub-Working Group Revived, Meets in Maun, Botswana

The five-nation KAZA Treaty (2011) allows for the establishment of ad hoc specialist advisory groups (Working Groups - WGs) to advise the KAZA Joint Management Committee (JMC) on their areas of specialisation, represent different sectors of society in the KAZA developmental process, and facilitate exchange of information on matters of mutual interest among the partner states. One such group, the Animal Health Sub-Working Group (AHSWG) under the official auspices of the Conservation WG, has remained dormant for many years. However, in February 2018 the JMC supported its revival so that veterinary challenges across KAZA could continue to be addressed through a cross-sectoral, integrated approach.

AHEAD has been pleased to support the KAZA Secretariat to facilitate an Animal Health Sub-Working Group meeting in Maun, Botswana on August 1st and 2nd, 2018 that allowed the leaders of wildlife and livestock veterinary efforts across the KAZA partner countries to:

• Review and agree on the Terms of Reference of the reconstituted Sub-Working Group;
• Revisit and reaffirm a common understanding of the key animal health challenges found in the KAZA TFCA;
• Identify key next steps for prioritized action, to be submitted to the KAZA Conservation Working Group for review.

More developments from this important Sub-Working Group will be shared over time.

SADC Livestock Technical Committee (LTC) Recommends Adoption of Commodity-Based Trade (CBT) of Beef *Guidelines* as a SADC Document

The SADC Livestock Technical Committee (LTC), comprised of the national directors of veterinary services and animal production in SADC Member States, meets one or more times annually to discuss livestock sector cooperation. The LTC in turn reports to the SADC Council of Ministers responsible for livestock through the SADC Secretariat.

AHEAD was pleased to be able to support the most recent meeting of the LTC held in Johannesburg, South Africa, on July 13, 2018. The morning session on “Improving Livestock Trade through a CBT / Value Chain Approach and Enhancement of FMD Management” provided an opportunity to familiarize LTC members with the recently updated *Guidelines* for beef exporting enterprises located in areas not free of foot and mouth disease.

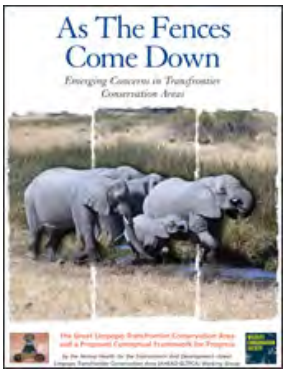
During the session, LTC members agreed that the *Guidelines* were quite useful, and that CBT could benefit livestock farmers of the region by enhancing prospects, for example, for intra-SADC as well as intra-Africa trade. Consensus was also reached on recommending that the *Guidelines* be adopted as a SADC document, with minor amendments, and it is anticipated that this decision will be ratified at the next LTC meeting, with a recommendation for Ministers' approval.

NEW RESOURCES / PUBLICATIONS

*** Ecosystem Service Flows from a Migratory Species: Spatial Subsidies of the Northern Pintail (2018) Bagstad KJ, Semmens DJ, Diffendorfer JE,**

Clique na página para visualizar. Para opção de descarregar o PDF, clique no botão direito do rato ou faça control-click.

PDF:
"As the Fences Come Down: Emerging Concerns in Transfrontier Conservation Areas"



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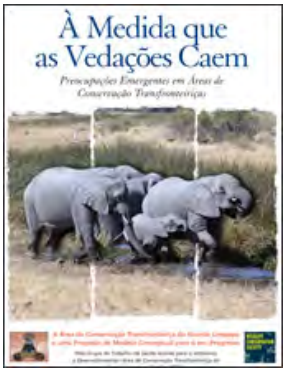
PDF:
"À Medida que as Vedações Caem: Preocupações Emergentes em Áreas de Conservação Transfronteiriças"



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AHEAD Book

Mattsson BJ, Dubovsky J, Thogmartin WE, Wiederholt R, Loomis J, Bieri JA, Sample C, Goldstein J, López-Hoffman L. Ambio, https://doi.org/10.1007/s13280-018-1049-4 – *Migratory species provide important benefits to society, but their cross-border conservation poses serious challenges. By quantifying the economic value of ecosystem services (ESs) provided across a species' range and ecological data on a species' habitat dependence, we estimate spatial subsidies—how different regions support ESs provided by a species across its range. We illustrate this method for migratory northern pintail ducks in North America. Pintails support over $101 million USD annually in recreational hunting and viewing and subsistence hunting in the U.S. and Canada. Pintail breeding regions provide nearly $30 million in subsidies to wintering regions, with the "Prairie Pothole" region supplying over $24 million in annual benefits to other regions. This information can be used to inform conservation funding allocation among migratory regions and nations on which the pintail depends. We thus illustrate a transferrable method to quantify migratory species derived ESs and provide information to aid in their transboundary conservation.*

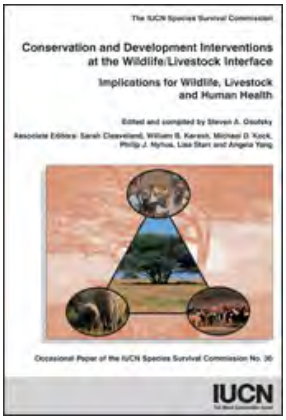
*** Reducing Food's Environmental Impacts through Producers and Consumers (2018) Poore J and Nemecek T, Science,** http://science.sciencemag.org/content/360/6392/987 – *Food's environmental impacts are created by millions of diverse producers. To identify solutions that are effective under this heterogeneity, we consolidated data covering five environmental indicators; 38,700 farms; and 1600 processors, packaging types, and retailers. Impact can vary 50-fold among producers of the same product, creating substantial mitigation opportunities. However, mitigation is complicated by trade-offs, multiple ways for producers to achieve low impacts, and interactions throughout the supply chain. Producers have limits on how far they can reduce impacts. Most strikingly, impacts of the lowest-impact animal products typically exceed those of vegetable substitutes, providing new evidence for the importance of dietary change. Cumulatively, our findings support an approach where producers monitor their own impacts, flexibly meet environmental targets by choosing from multiple practices, and communicate their impacts to consumers.*

*** The Vegan Craze: What Does it Mean for Pastoralists? (2018) Scoones I, Pastoralism, Uncertainty and Resilience,** https://pastres.wordpress.com/2018/06/22/the-vegan-craze-what-does-it-mean-for-pastoralists/ – *...The bottom line is that extensive livestock production on open rangeland is a livelihood that supports people in some of the most marginal areas of the planet. In most cases there is no alternative. Growing vegetables and soy beans is simply not feasible. And in many respects (despite all the biased, negative imagery), pastoralism is probably the most sustainable, low impact use of such environments. There are impacts for sure, but there are also impacts from dispossessing pastoralists of land and livelihoods too (a facet ignored in the [above mentioned] Science article and associated media commentary)....*

*** Global Foot-and-Mouth Disease Research Alliance (GFRA)- latest newsletter (2018) now available,** https://www.ars.usda.gov/GFRA/files/GFRA newsletter no.8.pdf – *The GFRA aims to expand FMD research collaborations worldwide and maximize the use of resources and expertise to achieve its five strategic goals. Several research programs are currently active in Europe, North America, South America and South-East Asia. GFRA programs will continue to expand the alliance in these areas and will actively reach out to new areas of the world.*

• Goal 1. Facilitate research collaborations and serve as a communication gateway for the global FMD research community
• Goal 2. Conduct strategic research to better understand FMD
• Goal 3. Development of the next generation of control measures and strategies for their application
• Goal 4. Determine social and economic impacts of the new generation of improved FMD control
• Goal 5. Provide evidence to inform development of policies for safe trade of animals and animal products in FMD-endemic areas

*** Serological Responses of Cattle Inoculated with Inactivated Trivalent Foot-and-Mouth Disease Vaccine at the Wildlife-Livestock Interface of the Kruger National Park, South Africa (2018) Lazarus DD, van Schalkwyk OL, Burroughs REJ, Mpehle A, Reininghaus B, Rikhotso O, Heath L, Maree FF, Blignaut B, Fosgate GT, Preventive Veterinary Medicine,** https://www.sciencedirect.com/science/article/pii/S016758771730613X – The current cattle vaccination programme at the wildlife / livestock interface along the



Osofsky, S.A., Cleaveland, S., Karesh, W.B., Kock, M.D., Nyhus, P.J., Starr, L., and A. Yang, (eds.). 2005. Conservation and Development Interventions at the Wildlife/Livestock Interface: Implications for Wildlife, Livestock and Human Health. IUCN, Gland, Switzerland and Cambridge, UK. xxxiii and 220 pp.

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What is *AHEAD*?

Animal & Human Health for the Environment And Development was launched at the 2003 IUCN World Parks Congress in Durban, South Africa. By assembling a 'dream team' of veterinarians, ecologists, biologists, social and economic scientists, agriculturists, wildlife managers, public health specialists and others from across East and southern Africa, we were fortunate to have tapped into some of the most innovative conservation and development thinking on the African continent- and ***AHEAD*** was born. Since then, a range of programs addressing conservation, health, and concomitant development challenges have been launched with the support of a growing list of implementing partners and donors who see the intrinsic value of the *One World, One Health* approach.

***AHEAD* is a convening, facilitative mechanism, working to create enabling environments that allow different and often**

western border of South Africa's Kruger National Park elicits sero-conversion in a high proportion of vaccinated cattle. However, the predicted peak antibody response was generally below the level previously established as necessary to protect against development of FMD (as long as there is a good 'match' between the virus strains incorporated into the vaccine and the viruses circulating in the field, which was not evaluated in the paper). In addition, especially in young cattle, the duration of significant antibody responses was found to be unusually short-lived. The authors conclude that more research is needed to address these important issues.

Again, if you have items for the next ***AHEAD* Update**, please just let us know – thanks.

"What is ***AHEAD***?" Animal & Human Health for the Environment And Development was launched at the 2003 IUCN World Parks Congress in Durban, South Africa. By assembling a 'dream team' of veterinarians, ecologists, biologists, social and economic scientists, agriculturists, wildlife managers, public health specialists and others from across East and southern Africa, we were fortunate to have tapped into some of the most innovative conservation and development thinking on the African continent – and ***AHEAD*** was born. Since then, a range of programs addressing conservation, health, and concomitant development challenges have been launched with the support of a growing list of implementing partners and donors who see the intrinsic value of the *One World, One Health* approach. ***AHEAD* is a convening, facilitative mechanism, working to create enabling environments that allow different and often competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods. We convene stakeholders; help delineate conceptual frameworks to underpin planning, management and research; and provide technical support and resources for projects stakeholders identify as priorities. *AHEAD* recognizes the need to look at health and disease not in isolation but within a given region's environmental and socioeconomic context.**

All the best,

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competing sectors to literally come to the same table and find collaborative ways forward to address challenges at the interface of wildlife health, livestock health, and human health and livelihoods. We convene stakeholders, help delineate conceptual frameworks to underpin planning, management and research, and provide technical support and resources for projects stakeholders identify as priorities. *AHEAD* recognizes the need to look at health and disease not in isolation but within a given region's socioeconomic and environmental context.

In short, *AHEAD* recognizes the importance of animal and human health to both conservation and development interests. Around the world, domestic and wild animals are coming into ever-more-intimate contact, and without adequate scientific knowledge and planning, the consequences can be detrimental on one or both sides of the proverbial fence. But armed with the tools that the health sciences provide, conservation and development objectives have a much greater chance of being realized – particularly at the critical wildlife/livestock interface, where conservation and agricultural interests meet head-on. *AHEAD* efforts focus on several themes of critical importance to the future of animal agriculture, human health, and wildlife health (including zoonoses, competition over grazing and water resources, disease mitigation, local and global food security, and other potential sources of conflict related to land-use decision-making in the face of resource limitations). Historically, neither governments, nongovernmental organizations, the aid community, nor academia have holistically addressed the landscape-level nexus represented by the triangle of wildlife health, domestic animal health, and human health and livelihoods as underpinned by environmental stewardship.

Cornell sets the bar for training veterinary techs in wildlife medicine

Tuesday, August 28, 2018 - 12:42pm

Christina Parsnick, one of the veterinary technician students who participated in the preceptorship at the Janet L. Swanson Wildlife Health Center this summer, feeding a cottontail kit. Photo by the College of Veterinary Medicine.

On the road to Ithaca one summer morning, Christina Parsnick pulled over to save an injured squirrel that had been hit by a car. The Niagara Falls native was on her way to Cornell's Janet L. Swanson Wildlife Health Center (WHC), where the squirrel could be treated and where Parsnick herself was about to begin an intensive six-week training program for licensed veterinary technician (LVT) students.

The Veterinary Technician Student Preceptorship in Wildlife Medicine is the first of its kind in the Northeast and gives veterinary technicians-in-training concentrated education in treating wild animals. That July morning was Parsnick's first day, and when she got to the WHC, the clinicians immediately started treating the squirrel.

"It was pretty cool that on my first day I was able to dive in and help with its treatments," says Parsnick. The squirrel recovered and was sent to a wildlife rehabilitator for release.

The WHC has long provided training in wildlife medicine to veterinary students and graduate veterinarians. When Sara Childs-Sanford, D.V.M. ’99, became chief of service at the WHC, she and her team broadened their offerings to include a preceptorship specifically for LVT students.

Alice VanDeMark instructs the preceptors. Photo by the College of Veterinary Medicine.

“There is definitely a lack of wildlife medicine training in LVT education, which is understandable given the short time period of the degree and the volume of material to cover regarding domestic animals,” said Childs-Sanford. Technicians are essential to any professional veterinary team, providing patient care and contributing to clinical operations and services.

“Most veterinary students will likely get this exposure in their schooling, but technicians won’t,” says Alice VanDeMark, who runs the six-week program twice a year with fellow LVT Tina Hlywa.

Now in its second year, the preceptorship delivers immersive, specialized training. For two six-week blocks, three students receive hands-on training as soon as they walk into the hospital. “In the summer, we have anywhere between 20 and 30 animals hospitalized, so it’s very busy,” says VanDeMark.

Students learn how to provide multifaceted care for each animal. After six weeks at the center, they will have contributed to the treatment of each animal – whether it’s properly disinfecting a porcupine’s cage, preparing a hummingbird’s medications, restraining a turtle while veterinarians examine it or entering information into a fawn’s medical records.

An injured owl undergoes an exam at the WHC. Photo by the College of Veterinary Medicine.

According to the New York State Wildlife Health Program, a partnership between the College of Veterinary Medicine and the New York Department of Environmental Conservation, about 20,000 wild animals receive care each year from rehabilitators and veterinarians across the state. All participants in the training program have been from New York, though it's advertised to accredited veterinary technician schools in Connecticut, New Jersey and Pennsylvania.

"It is an amazing learning opportunity and completely different from any other clinic setting," says Amanda Hartman, an Elma, New York, native who completed the program this summer.

Stephanie Jones of Charlotteville, New York, similarly felt like she was making a difference on day one. "There was not a single aspect of this job I didn't like. It was all for the welfare of animals, from assisting in surgery to even sweeping and mopping."

Most veterinary technicians will go into domestic animal private practices that may accept and treat wildlife patients, said Childs-Sanford. "Technicians with some experience and training in basic techniques pertaining to wildlife will not only be desirable applicants, but will also be able to contribute to the appropriate veterinary care of these unique patients."

VanDeMark agrees. "When you put that information on your resume that, yes, you can handle a red-tailed hawk, a snake, a fox – and you know where to give injections on all those animals or how to oversee their anesthesia – that's helpful on your resume when you're looking for a job."

Tina Hlywa teaches LVT student Amanda Hartman how to capture a raptor. Photo by the College of Veterinary Medicine.

Program leaders VanDeMark and Hlywa have a combined total of more than 40 years of experience in wildlife medicine. “They serve as dedicated and patient mentors for our preceptors,” said Childs-Sanford.

“The doctors and techs are the best in their field and to learn from them is an absolute honor,” says Parsnick. “They were supportive, eager to teach and always there where I had a question, but they also trusted us to go off and do things on our own.”

Samantha Brown, an LVT student from Rotterdam, New York, recalled feeling trust right away. “On the second day, I was already trusting Dr. Hopf to restrain a juvenile bald eagle while I administered pills into its esophagus with only my finger,” she said.

The WHC plans to expand the program with regular training modules. VanDeMark also hopes to integrate this training with opportunities at the Cornell University Hospital for Animals and to provide financial assistance to students.

“Cornell’s Janet L. Swanson Wildlife Health Center is in an excellent position to set the bar for education of veterinary technicians in wildlife medicine,” said Childs-Sanford. “During their six weeks with us, we see the students grow tremendously into being confident, knowledgeable and capable in their skills.”

“Cats and dogs are great,” says Brown, “but how many times can someone say they fed a fawn from a baby bottle?”

A cottontail kit fed at the WHC by a preceptor. Photo by the College of Veterinary Medicine.

By Melanie Greaver Cordova

This story also appeared in the Cornell Chronicle.

The Washington Post

Animalia

Thirteen bald eagles were found dead in a field. This is what killed them.

By Karin Brulliard and Dana Hedgpeth
June 20

The 13 bald eagles were found lifeless on a Maryland farm more than two years ago, many with wings splayed, bodies intact, and talons clenched. Several were too young to have their species' distinctive white heads. And at least six, according to a federal lab report, had ingested a highly toxic pesticide that essentially has been banned from the U.S. market, in part because it is lethal to birds.

The 2016 report, obtained by the Annapolis radio station WNAV and shared with The Washington Post, answers one big question in a mysterious wildlife crime that angered conservation organizations and stumped U.S. Fish and Wildlife Service investigators, who were involved because the bald eagle is a federally protected species. Tests showed that the birds were poisoned, as officials suspected. What remains unsolved is who did it.

"There was no smoking gun," said John LaCorte, a special agent for the Fish and Wildlife Service who spent six months interviewing more than a dozen landowners and property managers in the Eastern Shore area where the eagles died. "It's very frustrating."

The chemical that killed the birds, carbofuran, came under scrutiny three decades ago for killing what the Environmental Protection Agency estimated were as many as 2 million birds a year, threatening the bald eagle's then-fragile road to recovery. The granular form, which a Fish and Wildlife official in 1987 told The Post was the primary cause of death for bald eagles in the Chesapeake Bay region, was banned in the mid-1990s. The EPA disallowed the use of liquid carbofuran on food crops in 2009, saying the residue posed an unacceptable safety risk. Environmental groups hailed the decision as a victory for human health and for wildlife.

Today, the pesticide is off the market and the bald eagle is no longer endangered, though it is protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. But carbofuran still occasionally kills birds and other wildlife in the United States. Sometimes those deaths are intentional, and sometimes they are collateral damage after an animal scavenges a poisoned carcass.

In November, a Montana farmer was fined $1,000 for the killing of a bald eagle that fed on a calf carcass he had injected with carbofuran in a bid to kill coyotes; it also killed three coyotes and a hawk. Last June,

a Pennsylvania man was fined $3,500 after sending Furadan, the brand name carbofuran was previously sold under, to workers at his New York farm and instructing them to pour it on sheep carcasses to kill hawks that had preyed on his lambs. It killed two red-tailed hawks, a rough-legged hawk and two bald eagles. A Wisconsin father and son were each ordered to pay more than $100,000 in 2014 after killing more than 70 wild animals, including bald eagles, as they targeted wolves and coyotes with carbofuran.

California authorities recently raised alarm about the widespread use of carbofuran at illegal marijuana grow sites. Mourad Gabriel, a wildlife biologist who has documented that trend, said in an interview that the chemical is usually found in Spanish-labeled bottles, suggesting illegal importation.

"They're not using it as a pesticide. . . . They're using it as a rodenticide to kill the animals that will come and eat the plants," U.S. Attorney McGregor Scott told reporters in Sacramento in May. "This is a game-changer, because it's a lethal poison."

Carbofuran is an acute toxin, which means it can kill after a single exposure or an exposure of a short duration. And it doesn't take much. Farmers in Africa have used it to kill lions that eat livestock.

Karyn L. Bischoff, a toxicologist at Cornell University's Animal Health Diagnostic Center, recently examined a dog that had been fatally poisoned by carbofuran in the Caribbean. "It's a pretty ugly way to die," said Bischoff, whose lab sees carbofuran poisoning cases every year or two. The chemical can cause diarrhea, vomiting, seizures and excessive salivation, she said. It can also cause glands in the lungs to secrete fluids, causing animals to "drown in their own fluids."

Robert Edgell, 89, owns the property of more than 100 acres outside Federalsburg, Md., where the eagles were discovered in February 2016. He had just gotten out of his truck when he stumbled upon the first carcass, which he described this week as a "young, immature eagle." Walking on, he found two more dead eagles and then, nearby, a fourth standing upright with its tail feathers seemingly stuck in the ground. It looked as though it had been stuffed, he said.

Others were discovered in the same area by a man Edgell said he had allowed to look for deer antlers on the property. Federal officials who came to investigate collected them all — 13 total — as well as a partial raccoon carcass and fur found nearby. Killing just one bald eagle is punishable by up to two years in prison and a fine of $250,000.

"I was dumbfounded," said Edgell, a retired state trooper whose farm has been in his family since 1910. "Usually you see one or two soaring over the place, but to see 13 in that area and all deceased. . . . In all my years, I'd not seen anything like this."

Six of the bald eagles were sent to the Fish and Wildlife Service Forensics Laboratory in Oregon, which determined that all had carbofuran in their stomachs or in their crops, or both. All had consumed a

“recent meal,” states the report, which was obtained via a Freedom of Information Act request by WNAV reporter Donna L. Cole. Five of the six had eaten raccoon, and some had eaten deer or chicken; the sixth had dined on marsh rice rat, but the report notes that any of the birds could have vomited other stomach contents.

The lab also examined the raccoon carcass and fur. It could not determine a cause of death, but carbofuran was detected on both samples. LaCorte said investigators believe the birds fed on the carcass of the raccoon, which may have been the target, and then perished.

“Bald eagles don’t normally predate on raccoons,” Gabriel said, because the latter are primarily nocturnal and eagles do most of their hunting during the day. “The raccoons probably succumbed to the carbofuran and they were out there decomposing and the bald eagles capitalized on the tainted meat.”

Although carbofuran can no longer be purchased, there is probably plenty of it still out there, Bischoff said.

“A lot of people have an old shed somewhere that’s got all this stuff in it that has been sitting there for 40 years,” Bischoff said. “They may or may not know it’s there.”

Edgell, who grows soybeans and wheat on about 70 acres of his property, said he appeared before a grand jury in U.S. District Court in Baltimore, where he was questioned about the eagle deaths. Fish and Wildlife investigators also questioned him and his farm managers, including about chemicals used on the farm. Edgell said this week that neither he nor his employees had ever used carbofuran.

LaCorte said he believes Edgell did not use the chemical on his property. It’s possible, he said, that one eagle picked up the raccoon carcass elsewhere and then carried it to Edgell’s property, where other eagles also consumed it.

But even if eagles weren’t the targets, someone illegally used the carbofuran, and in doing so added a particularly egregious case to what LaCorte called an “epidemic on the Eastern Shore” of wildlife-poisoning crimes. A 2016 case in which five bald eagles were poisoned in Delaware remains under investigation, officials said.

“It’s every year where we get a couple of poisonings,” LaCorte said. Poisoning a nuisance animal or predator, rather than trapping it or building a fence, is “the cheaper and easier way out,” he said. The cases are hard to solve, LaCorte said, because there are usually few to no witnesses — or none willing to talk. “If anyone wants to see things get done about this, they need to be courageous and come forward,” he said.

Edgell said the eagles’ deaths disturbed his friends, and he assured them he was upset, too.

“It was certainly nothing done on the farm that killed them. It’s something else,” he said. “I love to see eagles flying. They’re a beautiful bird.”

Read more:

Mystery remains in case of 13 dead bald eagles on Maryland’s Eastern Shore

How officials will try to figure out what killed 13 bald eagles on a Maryland farm

People love watching nature on nest cams — until it gets grisly

Nest cam live-streams bald-eagle parents feeding a cat to their eaglets

Karin Brulliard
Karin Brulliard is a national reporter who runs the Animalia blog. Previously, she was an international news editor; a foreign correspondent in South Africa, Pakistan and Israel; and a local reporter. She joined The Post in 2003. Follow

Dana Hedgpeth
Dana Hedgpeth is a Washington Post reporter, working in the early morning to report on traffic, crime and other local issues. She joined The Post in 1999. Follow

CORNELL CHRONICLE

Veterinary college partners open new clinic at Belize Zoo

By Melanie Greaver Cordova | September 13, 2018

The wild residents of the Belize Zoo have a brand-new veterinary clinic that will serve the medical needs of everyone from Sparks the tapir to Chiqui the jaguar. Members of the College of Veterinary Medicine celebrated this milestone with zoo staff when the clinic opened this summer. Since 2012, the college has made biannual visits to the Belize Zoo to collaborate on the clinical care of its residents.

Bethany Wright/Provided

Dr. Lindsey Schneider examines the teeth of a jaguar, named Sylvia, in preparation for a few extractions.

"[We are] now poised to provide exemplary nutrition and veterinary services for our wildlife, as well as vital training and capacity building for both our zoo keeping staff, and local and international wildlife care partners," said the zoo in a Facebook post about the opening. "We were thrilled to be able to highlight this wonderful partnership by honouring the driving force behind it: Dr. George Kollias Jr."

Kollias, the Jay Hyman Professor Emeritus of Wildlife Medicine, initiated the partnership between the college and the Belize Zoo in 2011. The zoo held the opening on the last day of the Cornellians' trip this summer, inviting local donors and guests including the British ambassador. A plaque honoring Kollias was unveiled at the clinic.

Trips led by Kollias and Drs. Santiago Peralta, Robin Gleed and Jordyn Boesch have included veterinary students as well as representatives from the sections of anesthesiology, zoological medicine, and dentistry and oral surgery. In 2016, they received a two-year grant from the John T. and Jane A. Wiederhold Foundation to support their efforts.

"This has been a very positive and productive relationship from a teaching, clinical research and personal perspective," said Kollias. "The students and residents who have enrolled in and contributed to our course have had experiences that they would be unlikely to have anywhere else."

Said Peralta, “These trips to the Belize Zoo broaden the experience of Cornell veterinary students and specialists, and provide high-quality specialized medical services to the zoo animals.” Practitioners also collect medical and scientific information relevant to the conservation and welfare of endangered and nonendangered species indigenous to Central America.

Bethany Wright/Provided

The Cornell team examines a female tapir recently acquired by the Belize Zoo.

“The development of the clinic was key to the continued overall advancement of the animal health program at the zoo by virtue of improved diagnostic and treatment options for the animals there and for similar indigenous species brought in by the public or Belizean wildlife and forestry agencies,” said Kollias.

The zoo is home to over 175 animals, representing more than 45 native species. It opened in 1983 as part of an effort to provide a home for wild animals used in the making of documentary films about tropical forests. They now keep animals that were orphaned, rescued or born at the zoo, in addition to rehabilitated animals and those sent to the zoo as donations from other zoological institutions. More than 86,000 people visit each year.

“Everyone wins in this collaboration, and it has been a wonderful partnership,” said Peralta. “Despite the challenging conditions that exist by virtue of being in the middle of the jungle, together we’re able to maintain the highest standards of veterinary care.”

Said Kollias: “Every time our teams visit the zoo, both the zoo staff and Cornell team members learn something new that can benefit the animals. We look forward to continuing our great working and teaching relationship with the zoo, and to continue to help make improvements and contributions to the great care the animals already receive.”

Melanie Greaver Cordova is a staff writer at the College of Veterinary Medicine.

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Veterinary team cares for native species at Belize Zoo

(/stories/2017/03/veterinary-team-cares-native-species-belize-zoo)

Cornell sets the bar for training veterinary techs in wildlife medicine

(/stories/2018/08/cornell-sets-bar-training-veterinary-techs-wildlife-medicine)

New York State Wildlife Health Program

Annual Report 2017-2018

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 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. The program completed its seventh year of operation and second year of the current five-year contract in March 2018. This report is submitted in fulfillment of the DEC contract requirements with Cornell. Program activities are reported for DEC Fiscal Year 2017 (April 1, 2017 to March 31, 2018); and disease surveillance case data are summarized for the calendar year (January 1, 2017 to December 31, 2017).

Case load increased by over 40%

Over 1600 wildlife cases were submitted to our three necropsy laboratories (WHU at Delmar, CWHL at the Animal Health Diagnostic Center in Ithaca, and Cornell Duck Lab on Long Island) in 2017, an increase of more than 500 from 2016. A significant increase in the apparent prevalence of West Nile virus since 2016, and a great shearwater mortality event along the east coast of the United States contributed to these numbers.

Expanded capabilities with more staffing

Regional caseloads were also shifted from the WHU in Delmar to the Cornell facilities to accommodate staffing changes. All cases from DEC Regions 7, 8 and 9 are now being processed at the CWHL, and cases from Region 1 are being processed at the Cornell Duck Lab. The addition of a full-time veterinary pathologist at the CWHL in January 2017 and the use of the Duck Lab facility helped absorb these changes and also reduced turn-around time for case reports.

Melissa Fadden, formerly a wildlife diversity technician in DEC's Region 3, was hired as a full time program technician at the CWHL to support the additional case load. As part of the strategic planning initiative to improve communications, Jennifer Peaslee was added to the CWHL team on a part-time basis to assist with designing educational materials, developing web content, and managing social media accounts.

Website launched to improve communication and operations

In late March of 2017, the CWHL launched a new website (cwhl.ahdc.vet.cornell.edu) to improve communication between the WHP and DEC staff. DEC personnel can use the site to access case reports, receive updates on diagnostic testing results, and examine historic case data through maps and other analytical tools. The website also includes a growing library of training resources, including videos and reports on current wildlife health topics, and a "basic training" series intended for new DEC staff.

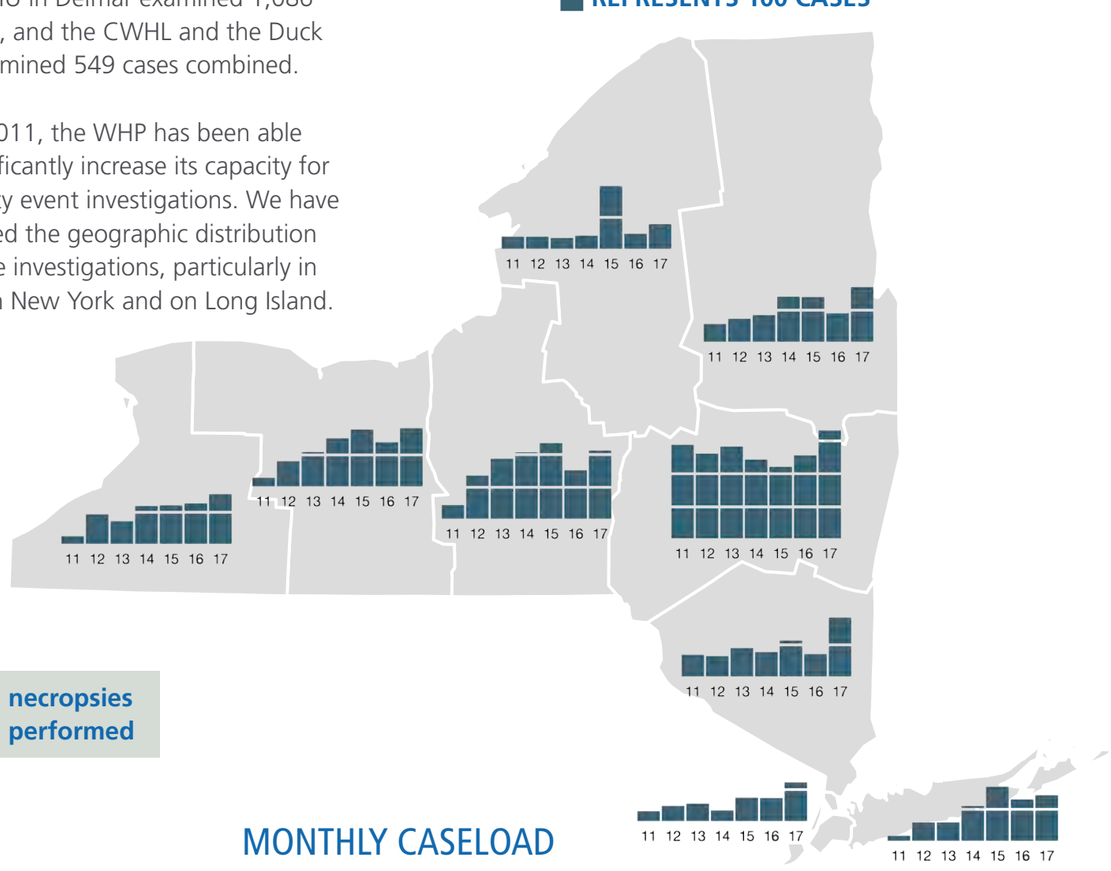
Other significant accomplishments include the approval of the Chronic Wasting Disease Risk Minimization Plan, development of an online wildlife rehabilitator case reporting system, research grants to support moose and bald eagle health, and a collaboration with a wildlife filmmaker to create outreach materials.

HEALTH AND DISEASE SURVEILLANCE

In 2017, the WHP examined 1,618 animals, an increase of 41% from 2016. The WHU in Delmar examined 1,086 animals, and the CWHL and the Duck Lab examined 549 cases combined.

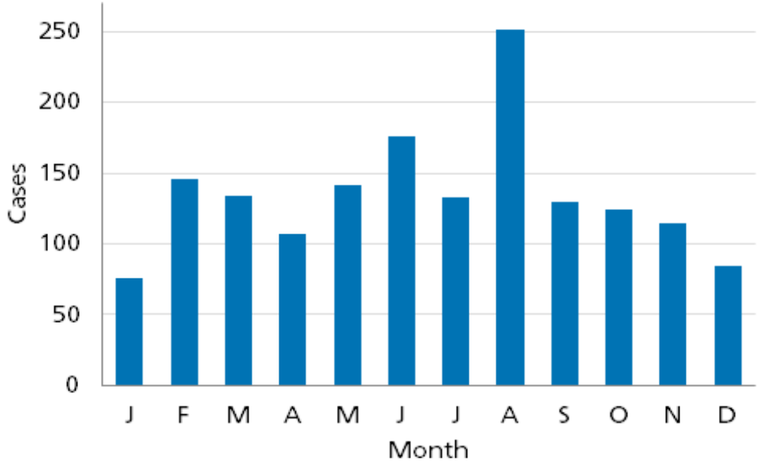
Since 2011, the WHP has been able to significantly increase its capacity for mortality event investigations. We have improved the geographic distribution of those investigations, particularly in western New York and on Long Island.

CASE SUBMISSIONS BY REGION 2011-2017

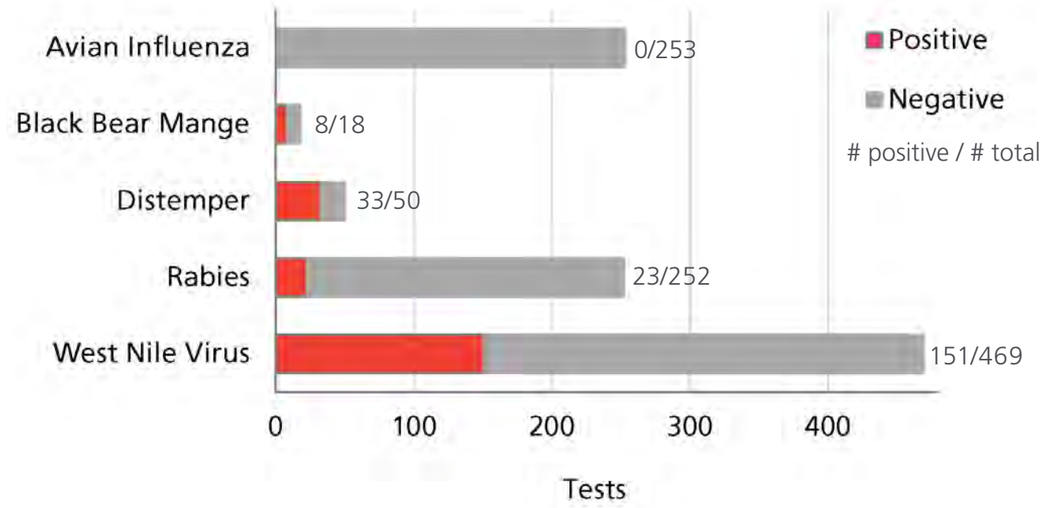


1191 necropsies performed

MONTHLY CASELOAD



TARGETED DISEASES



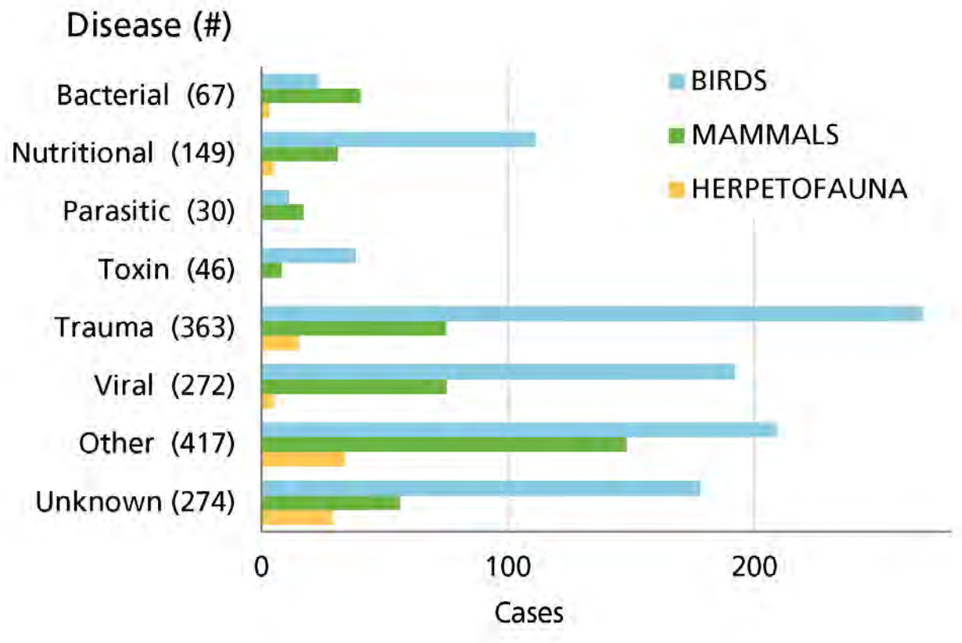
1618 animals examined

1000 birds from **90** species

450 mammals from **32** species

90 herpetofauna from **23** species

DIAGNOSED CAUSE OF DEATH

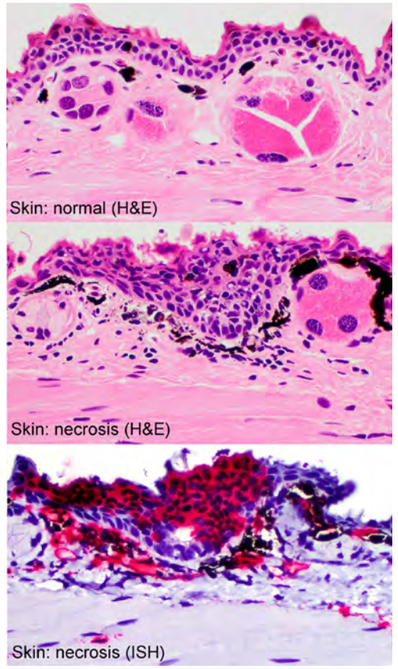


TEST DEVELOPMENT

We often use standard domestic animal tests to detect diseases in wildlife. Sometimes wildlife have diseases that are rare in domestic animals, and we don't have available tests. Some domestic animal tests may require antibodies that are species-specific so an antibody based test developed for a dog is unlikely to work in a red-tailed hawk. And sometimes we have newly introduced diseases for which tests don't yet exist.

The lab works to remedy these situations by adapting or developing entirely new diagnostic tests for wildlife. So far we have developed a new PCR for white nose fungus, added PCR testing for ranavirus, chytrid, trichomonas, avian herpesvirus, circovirus and lymphoproliferative disease virus and have tests pending for cytauxzoon (a parasite of bobcats) and Bsal.

It can be difficult to determine when a virus or bacteria is actually the cause of death, or when it might be just randomly present in the animal. For that we need to have in-situ hybridization (ISH). This test uses probes to detect the DNA of a pathogen in microscopic sections of tissues, where we can see if it's associated with disease. Our new pathologist, Dr. María Forzán, has developed in-situ tests for ranavirus and reovirus and is now working on detecting two herp-related diseases, perkinsus and snake fungal disease.



Top, healthy newt: normal skin (H&E stain)
Middle, sick newt: lesion in skin with inflammation and tissue death, suspect ranavirus (H&E stain)
Bottom, sick newt: red dye confirms presence of ranavirus in lesion (ISH stain)


Parasitology technician preparing samples for cytauxzoon PCR testing


Cornell DVM student, Sean Stapleton collecting water samples for eDNA testing

eDNA

Alyssa Wetterau, PhD student at the CWHL, is working on techniques that use environmental DNA (eDNA) for a wide range of applications, including disease detection and species identification. Probes are used to detect DNA that is shed in water samples.

This a new and promising field of research that can be used for detection of cryptic amphibians and pathogens around the state.

Alyssa is providing sampling kits to DEC staff and finalizing test protocols that would facilitate mapping of a number of rare and threatened amphibians around New York.


Eurycea longicauda, long-tailed salamader

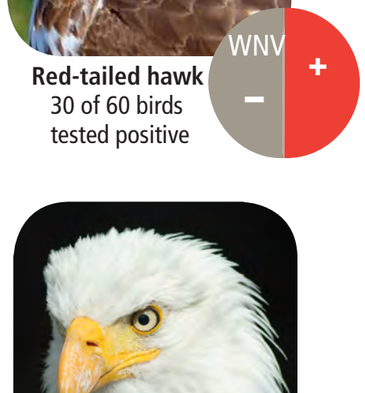
eDNA water pump set-up for DEC workshop demonstration

EMERGING AND SIGNIFICANT DISEASE ISSUES

West Nile Virus

West Nile Virus, a disease that is endemic in New York, was very active in wildlife in 2017. Sixty different species of birds tested positive or suspect-positive for WNV. The total number of positive tests (195) was the highest that the WHP has seen. WNV was the single most common cause of death in animals submitted to the WHP in 2017.

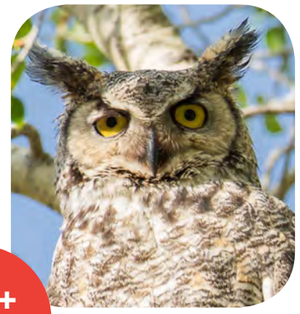
In 2017, 68 of 241 raptors tested positive for WNV.



Red-tailed hawk
30 of 60 birds
tested positive

464 **birds tested in 2017**

Although our program saw a large increase in avian cases, human cases were similar to previous years: 56 human cases were documented in New York.

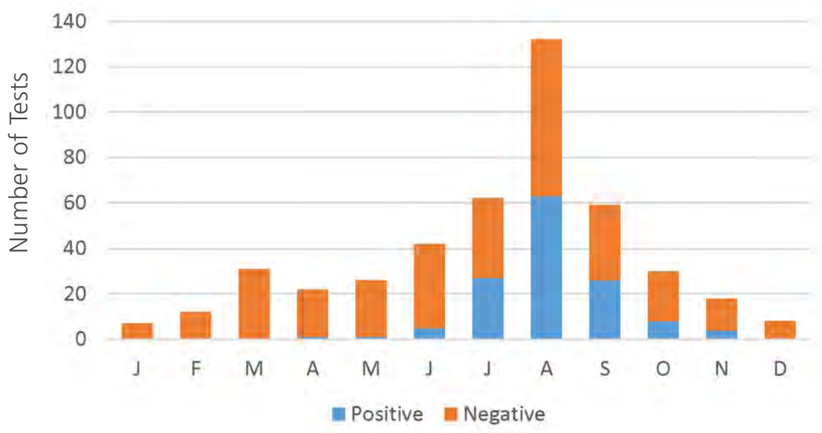


Great horned owl
14 of 32 birds
tested positive

The CWHL is collaborating with the new Master of Public Health program at Cornell to analyze our WNV data for information that could be of use in predicting and reducing future cases in humans.

Bald eagle
5 of 50 birds
tested positive

Monthly WNV Testing



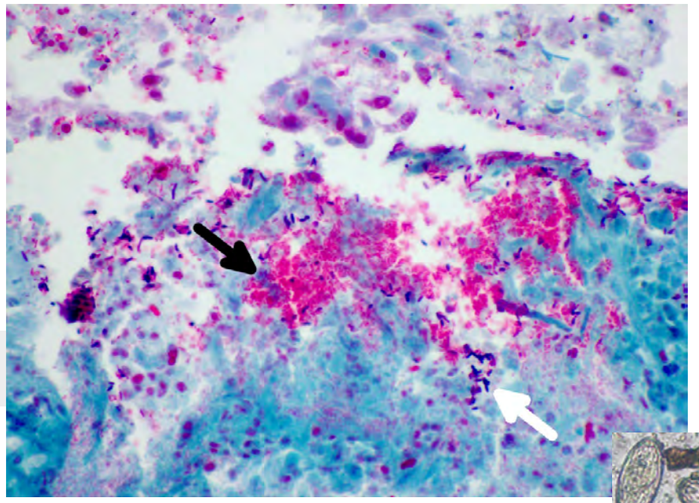
Crows are the most frequently affected bird species with WNV

American crow
64 of 118 birds
tested positive

Bluebird Mortality Event

Over three dozen adult Eastern bluebirds were reported dead by nest box monitors during the spring and summer of 2017. Of 23 examined by the WHP, the most common cause of death was a combination of trauma to the intestinal wall due to thorny-headed parasitic worms (*Acanthocephala sp.*) and a secondary bacterial infection.

The parasite is commonly found in otherwise healthy bluebirds and the bacteria are normal flora of the gut. Therefore, there seems to be an underlying factor, yet to be identified, that caused the infections and resulted in the birds' deaths. Dr. María Forzán continues to investigate those factors.



Numerous bacteria in a lesion in the intestine of a bluebird. The bacteria are both Gram (-), which are pink (black arrow), and Gram (+), which are blue and marked by the white arrow.

Microscope view of thorny-headed parasitic worm, *Acanthocephala sp,* found in the intestinal wall during necropsy. Photo provided by AHDC Parasitology lab.

Shearwater die off

In mid-June, during an extended period of strong onshore winds, ocean-going great shearwaters were observed unusually close to shore at various locations on the east coast of the U.S. from Long Island to Virginia. Some were found dead on the shore, many live birds were stranded, too weak to fly. The WHU received 55 birds (mostly juveniles) collected by the Town of Hempstead along the Atlantic shore of western Long Island. The majority of these birds were found alive but had died enroute to, or shortly after submission to, a wildlife rehabilitation facility.

Necropsy and histopathological findings indicated starvation as the cause of death, with no evidence of pathogens or parasites as important contributing factors. The cyanobacterial toxin beta-methylamino- l-alanine (BMAA) was detected by University of New Hampshire researcher Jim Haney in liver samples from a subset of the birds necropsied. The significance of the exposure to BMAA is unknown.

Similar mortality events involving this species in late spring or early summer have occurred sporadically along the east coast of the U.S. for at least the last few decades. The chief post-mortem findings in these events have all been similar: emaciation in young birds. It has been speculated that the emaciation might be a reflection of foraging conditions in the South Atlantic. Unfavorable weather events may also be an important factor. The significance of the non-juvenile birds in the 2017 event is unknown, although it could suggest that inexperience may play less a role in these events than might be intuitively surmised.

Specimens being prepped for necropsy by DEC wildlife biologist, Joe Okoniewski.

Some internal contents discovered include various plastic debris, ribbon pieces, and nematodes.

CWD PREVENTION AND RESPONSE

New York State continues to be a leader in chronic wasting disease management and prevention. After several years of development, the Interagency CWD Risk Minimization Plan was distributed for public comment and input was collected until September 15, 2017. DEC assembled responses from the public comment and provided an updated plan. A press conference was held on May 16, 2018 to announce release of the plan and included Commissioner Basil Seggos, DEC, Commissioner Richard Ball, Agriculture & Markets, Dr. Schuler, and Dr. Wayne LaRoche, Pennsylvania Game Commission.

Dr. Schuler co-authored chapters in the Association of Fish and Wildlife Agencies CWD Best Management Practices document. This will be a guiding document produced for state wildlife agencies.

Dr. Schuler and other Cornell researchers collaborated with the National Deer Alliance to conduct a survey on messaging around CWD and use of deer urine lures for hunting. This study showed that while most hunters have used deer urine in the past, they supported a ban on natural deer urine because of the CWD risk. There are currently two manuscripts submitted for publication from this study.

Commissioner Basil Seggos, DEC, Tony Wilkinson, DEC, Dr. Wayne LaRoche, Pennsylvania Game Commission, Commissioner Richard Ball, Agriculture & Markets, and Dr. Krysten Schuler, Cornell Wildlife Health Lab at the press event to launch the CWD plan.

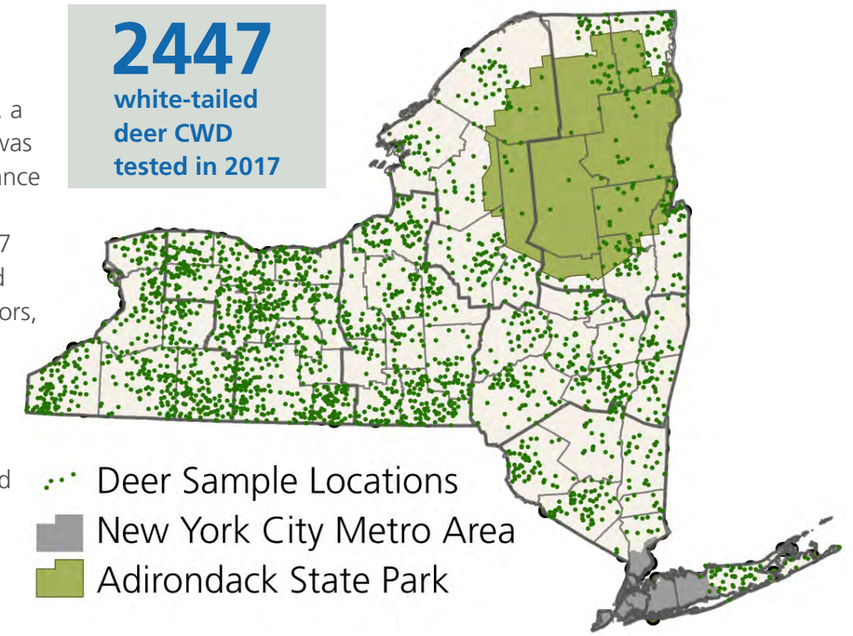
States and provinces where CWD has been detected, 2000-2018

CWD Surveillance Efforts Continue

Surveillance for CWD continues to operate using a weighted risk-based approach. There were 2447 deer sampled in 2017-18. Most are hunter-harvested samples collected from meat processors and taxidermists. Taxidermists were very successful in collecting lymph nodes for testing – 29 participating taxidermists submitted 693 lymph nodes. DEC staff submitted 169 clinical suspect deer, which are a valuable surveillance sample.

The current CWD surveillance plan has been in place for five sampling seasons. As planned, a reassessment of disease risks was initiated and a revised surveillance plan will be in place for the 2018 sampling season. In 2017 NYSDEC field staff interviewed taxidermists and meat processors, and captive cervid facilities were assessed by Agriculture & Markets veterinarians. We anticipate further joint agency activities, such as captive cervid facility inspections, sample collection and shipping, and paperwork streamlining.

2447
white-tailed deer CWD tested in 2017



TRAINING, TEACHING, AND OUTREACH

Agency Chemical Immobilization Training

In 2017, 27 DEC staff attended the annual Safe Capture workshop, which was held for the first time at Greek Peak Mountain Resort. Of those, 11 were new trainees and 16 were refreshing their skills. Staff take the course every three years to keep training up-to-date.

WHP staff were guest instructors at both the Migratory Bird Banding Workshop held at the Montezuma National Wildlife Refuge and the annual Fur School for trapper education.

Academic Teaching

In late November, the WHP hosted a chronic wasting disease workshop at the AHDC for veterinary, graduate, and undergraduate students and DEC Region 7 staff. This workshop included a lecture and a wet lab that taught participants to collect lymph nodes. They also learned about deer brainworm and how to identify adult worms in the meninges of deer brains.

In April, Dr. Bunting held a career discussion session for the SUNY ESF pre-vet club. Dr. Schuler gave a lecture and wet lab for the SUNY-ESF Wildlife Field Techniques course. Students were introduced to the concept of wildlife health and had a necropsy demonstration and hands-on practice session with a variety of birds and mammals.

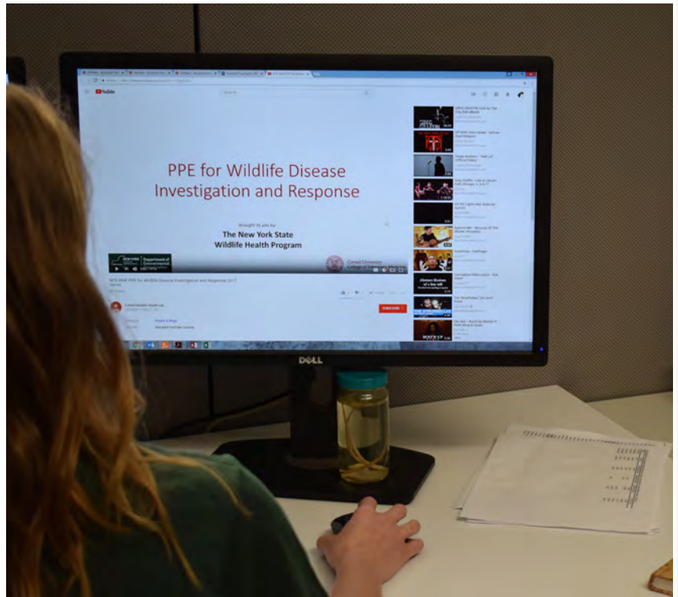
Student researchers make significant contributions to our program while gaining valuable training and experience. This past year, 12 students from high school to graduate level worked at the CWHL. They participated in moose and fisher research projects, assisted with developing our online resource library, analyzed rehabilitator data and supported our day-to-day case surveillance operations.

Online Training

With the launch of the CWHL website in March 2017, DEC staff have access to a growing library of wildlife health-related training materials. The public and wildlife professionals can find videos and articles on current wildlife health and disease topics, including presentations on CWD by Dr. Schuler, and a recent presentation by Dr. Forzán on infectious disease testing for reptiles and amphibians.

An online library of Disease Fact Sheets focused on wildlife disesases of concern in New York is a useful tool for DEC staff and the public to view and print. These new references for wildlife diseases provide pertinent information on transmission, clinical signs, treatment, and prevention.

Staff watching a video on appropriate personal protective equipment (PPE) for handling wildlife



Wildlife Health Training Module for DEC Staff

One of the main priorities of the WHP is to provide training on wildlife health topics to DEC staff. By understanding wildlife disease, especially emerging diseases, DEC field staff can help safeguard the health of wildlife populations, as well as domestic animals and people. In the field, DEC staff may come in contact with sick or injured animals, and must understand how to protect themselves using personal protective equipment, and how to use safe handling techniques for the safety of the animal.

We created a series of videos and presentations aimed specifically at new staff, to provide information about common zoonoses, the appropriate use of personal protective equipment, the submission process, and responding to a wildlife disease outbreak in the field.

The series is divided into two segments, each containing four modules. Completion of the module series provides new DEC employees with the equivalent of our biannual half-day training workshop for DEC staff.

This series is available to all DEC staff and to the public through the CWHL website.

Course Components

I. Introduction to the Wildlife Health Program and wildlife disease

- Module 1. Wildlife Health Program Overview
- Module 2. Wildlife Diseases 101
- Module 3. The 411 on Wildlife Disease: Zoonoses
- Module 4. Wildlife Disease Outbreak Investigation

II. Personal safety and handling wildlife specimens

- Module 5. PPE for Wildlife Disease Investigation and Response
- Module 6. Disinfection Techniques
- Module 7. Handling and Shipping Dead Wildlife Specimens
- Module 8. Wildlife Sample Submission

Public Outreach

We encourage public engagement with our program through guest lectures, workshops, and discussion panels, in addition to online content. The website has undergone a user friendly redesign with multiple news and resource sections. Members of the public can read current topics of interest in wildlife health, find links to news articles about the program, be alerted to disease outbreaks, or explore our research projects.

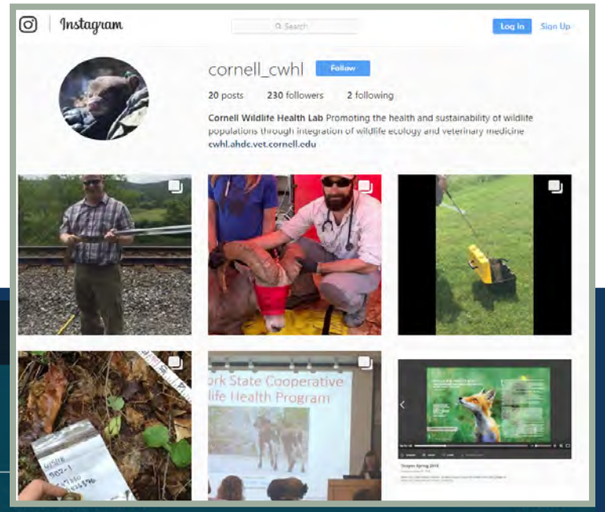
We recently launched a CSI-style case report for members of the public to explore our most interesting and unusual submissions. We also post notices when we have significant disease outbreaks and update those regularly so that readers can follow them in real-time.

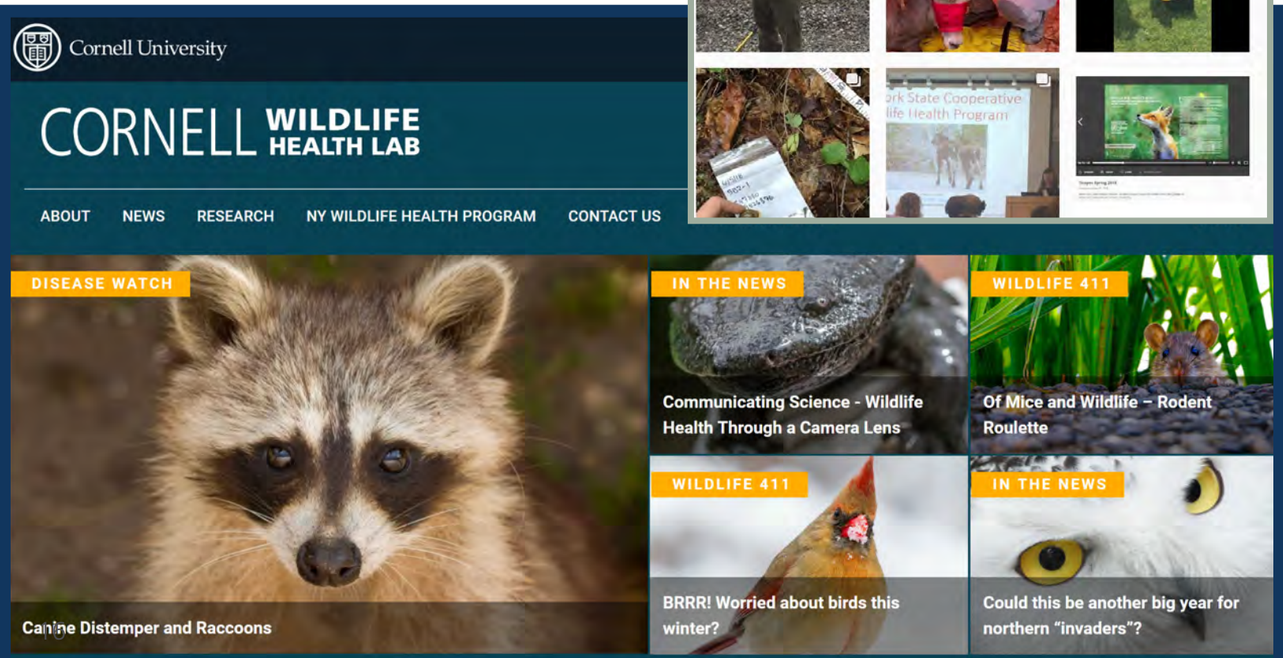
This year, we promoted media articles about the importance of using non-lead ammunition to reduce lead exposure in both bald eagles and hunters, emergence of harmful algal blooms, risks of CWD introduction through urine based lures, and threat to the salamander population due to a new fungal disease.

The program also supports outreach by external organizations by providing data and medical expertise. We recently helped Audubon New York develop new brochures and handouts on the impacts of rodenticide in wild birds.

Finally, the CWHL opened social media accounts on Instagram and Twitter to promote wildlife health messaging and post our media articles and interviews.

Below: Instagram home page for cornell_CWHL
Bottom: CWHL website Disease Watch and public outreach content





Snake Fungal Disease

Cornell University
College of Veterinary Medicine
Animal Health Diagnostic Center

BASICS

The organism responsible is the fungus *Ophidiomyces ophiodiicola*, within the family Onygenacea. Snake Fungal Disease (SFD) was first definitively identified in a population of Timber Rattlesnakes residing in New Hampshire in 2006.

KNOWN AFFECTED species include milk snakes, black rat snakes, garter snakes, timber rattlesnakes, eastern massasauga, cotton mouth snakes, and black racer snakes.

The characteristic **CLINICAL SIGN** of SFD is facial swelling. The disease can progress from the nasal cavity internally via the eyes, throat, and lungs causing eye infections and pneumonia. The fungus additionally **SPREADS EXTERNALLY** along the neck, body, and tail forming scattered nodules (lumps) or ulcerations.

The fungus can be shed into the environment by infected animals and **SPREAD** from the environment to other snakes, particularly in animals that share dens. There is no definitive evidence of snake to snake transmission. Spread of the fungus to new locations may occur when people track contaminated **SOIL** imbedded in clothing or shoes.

SFD is **DIAGNOSED** by identification of the typical skin lesions as well as laboratory identification of the **FUNGUS** by culture or DNA detection and microscopic examination of tissues.

TREATMENT with antifungal medications has not been successful in colubrid snakes.

Over 1500 views of the online Snake Fungal Disease Fact Sheet

The NYS Wildlife Health Program | cwhl.ahdc.vet.cornell.edu
A partnership between NYS Dept. of Environmental Conservation and Cornell Wildlife Health Lab

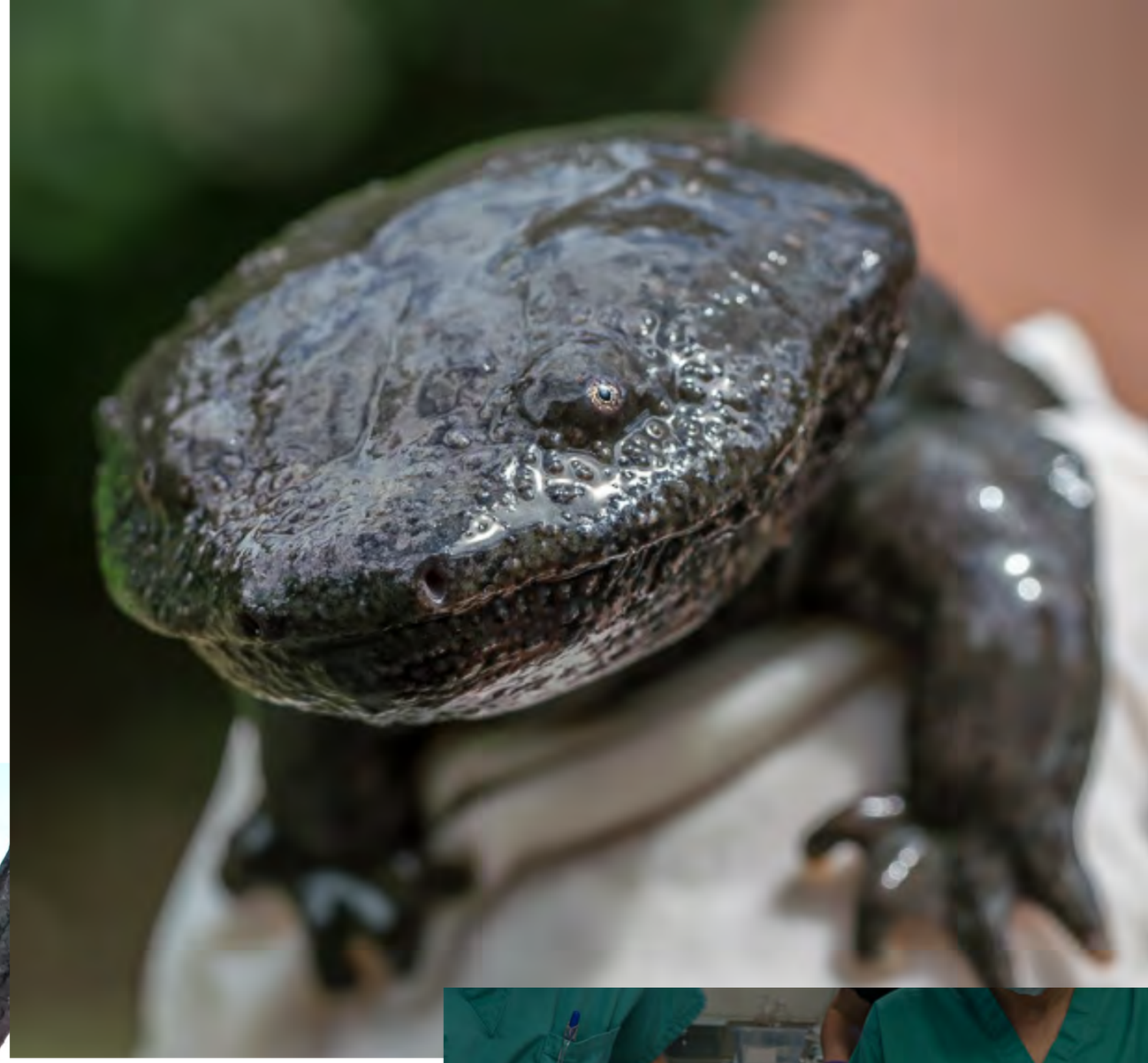
ALERT HOW WHO

Above: Photographer/videographer David Brown during an underwater shoot
Below: Bald eagle nestling video shoot by David Brown

Expanding Science Communication

To jump-start our science communication, the CWHL partnered with professional photographer and award-winning nature videographer David Brown to shed some visual "light" on the science behind wildlife health. As a filmmaker with special expertise in aquatic species, he became interested in documenting our eastern hellbender salamander project as a way to highlight the struggles amphibians face in the wild.

Through a grant from the Temper of the Times Foundation, he will be helping the CWHL produce compelling visual media for distribution on the website and social media accounts. We plan to test media products for different demographics to see what communications strategies are most effective.



Photos by David Brown

Above: Hellbender health survey
Right: Hellbender transmitter surgery

RESEARCH

Fishers and Rodenticide

Anticoagulant rodenticides are commonly used to control rodent populations. However, other wildlife can be accidentally exposed either by consuming the bait or by eating the poisoned rodents (secondary toxicity).

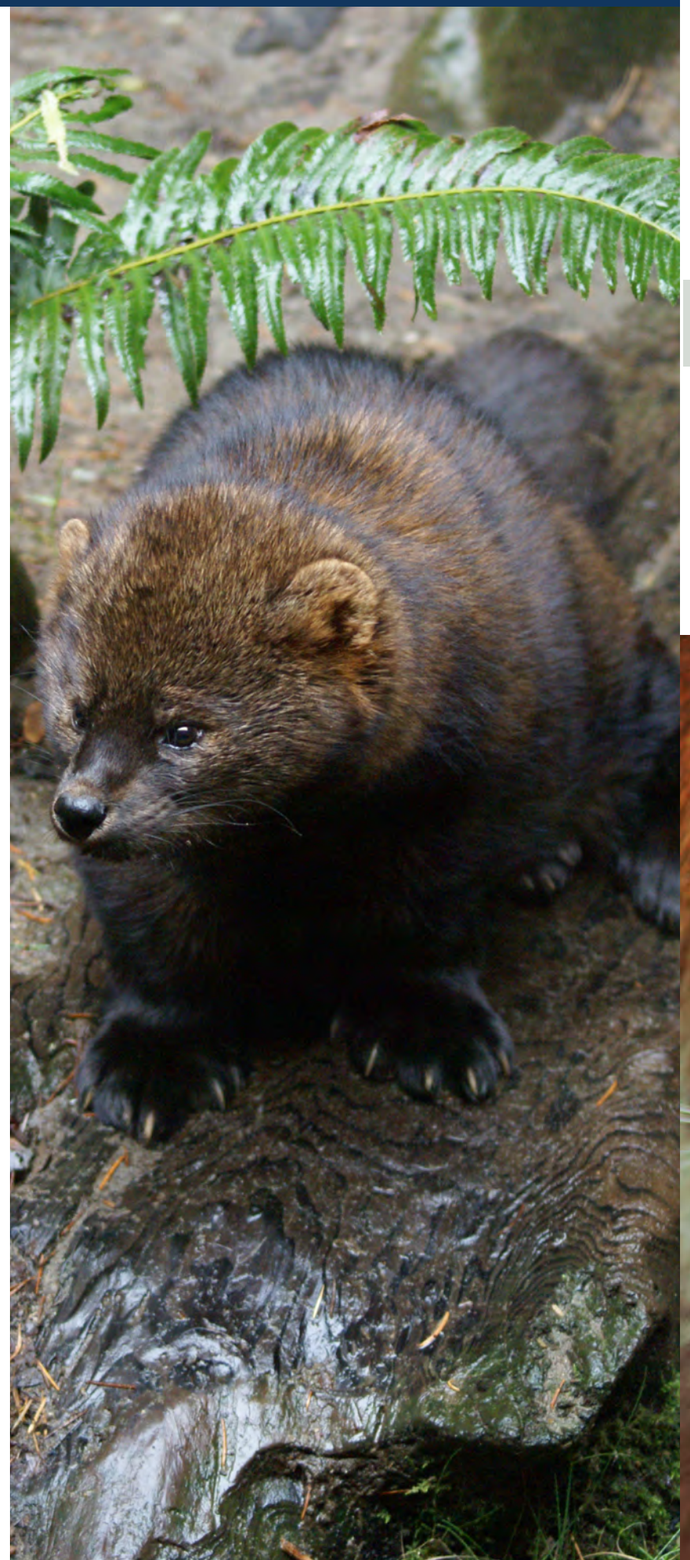
7 of 10
tested positive for rodenticide

In 2017, ten fisher livers collected in 2013 and 2014 and stored in the CWHL wildlife tissue bank were tested for the presence of anticoagulant rodenticides. Tissue bank samples are collected from animals submitted for either cause of death determination or training purposes in necropsy workshops or fur school demonstrations. Samples were tested for the most common compounds including chlorophacinone, diphacinone, warfarin, brodifacoum, bromodialone, difenacoum, and difethialone.

The majority of the samples tested positive for brodifacoum, followed by bromodialone and diphacinone. Of the seven samples that tested positive for rodenticide, three of them were positive for more than one type. Because there is only one rodenticide in any one commercial product, it shows that these animals are being exposed multiple times over a short period to these compounds.

The toxicity of rodenticides is dependent on both the dose and the susceptibility of the species. Unfortunately, such toxicity data is not available for wildlife species. However, levels were high enough in two samples to suggest that rodenticide poisoning could be the primary cause of death.

3 of 7
positives had more than one type of rodenticide



Cytauxzoon

Cytauxzoon felis is a protozoal blood parasite that affects felid species such as the bobcat and domestic cat. It is transmitted by dog ticks (*Dermacentor*) and Lone Star ticks (*Ambylomma*). Although we have these ticks in New York, the parasite hasn't been confirmed further north than Pennsylvania.

The WHP is are engaged in research projects on a variety of species.

The WHP is working with the parasitology lab at AHDC to develop a test for cytauxzoon. We have supplied the lab with tick samples from across the state. We are also providing tissue samples for examination. The tissue samples are from our tissue bank, hunter-harvest, and from road-killed animals.

Hellbenders

In our 4th year of field research on eastern hellbenders, we partnered with Buffalo State College to study release strategies with a small group of 20 animals. They were implanted with transmitters at Cornell and monitored by Master's student Megan Kocher during the summer of 2017.

Four-toed Salamander eDNA

Identifying cryptic or elusive species in their natural habitat is vital for conservation planning and habitat management. However, finding species that are small, well-camouflaged, or live in hard-to-reach places is challenging. Traditional survey methods are both time and labor intensive, and may still yield inadequate findings.

Environmental DNA (eDNA) is a novel approach for wildlife population monitoring. It works by identifying and quantifying traces of genetic material that an animal has left behind in the environment. We are applying this tool to detect the four-toed salamander (*Hemidactylium scutatum*), a cryptic amphibian species of concern in New York.

We are developing a new quantitative PCR (qPCR) test specific to the four-toed salamander. This will allow us to identify DNA from four-toed salamanders in filtered water samples from candidate breeding ponds more quickly and accurately than with traditional survey methods.

18 salamander species in NY

We are validating this eDNA method by comparing the results with traditional survey methods at test ponds in New York. We collected water samples from May through July 2017 from ten pools with historic or contemporary reports of four-toed salamander presence. Once validated, we will be able to improve the distribution map for this species by testing water samples collected from locations across the state.

eDNA water sampling locations

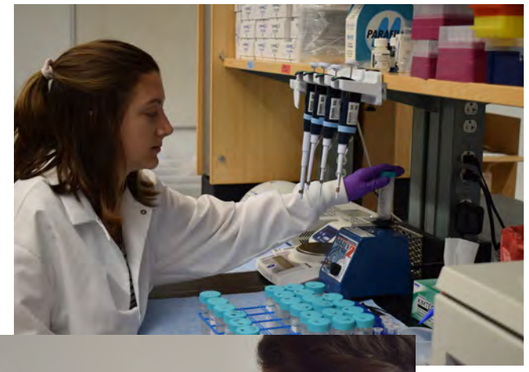
Moose Health

We are wrapping up an intensive look at moose health in New York using both live-captured animals and investigation of mortalities. Between 2015 and 2017, we obtained samples from live moose to examine a variety of health parameters. From necropsies, we identified internal parasites: deer brainworm (*Parelaphostrongylus tenuis*), giant liver fluke (*Fascioloides magna*), *Echinococcus* (tapeworms) and *Neospora caninum* as threats to moose health.

1200 samples collected

We are in the third year of a study examining deer fecal samples and gastropods for brainworm and liver fluke to identify risk factors on the Adirondacks landscape. We are collaborating with SUNY-ESF to develop PCR tests for Echinococcus and Neospora in canid feces to better understand these parasite cycles.

Moose Health from field to lab: undergraduate and vet students collecting fecal and gastropod samples in the field and preparing them for PCR and Parasitology testing in the lab



Bald Eagles

We are in the process of conducting a meta-analysis of lead-poisoned bald eagles for Northeast states and provinces. The goal is to determine if lead is impacting eagles at a population level despite increasing overall numbers.

Data have been provided from New York, Pennsylvania, Maine, Massachusetts, Quebec, Prince Edward Island, and Newfoundland, beginning with samples collected as early as 1994. Current estimates indicate that 17% of annual mortalities are due to lead poisoning. We have secured funding from Morris Animal Foundation to fund a post-doctoral fellow to conduct more intensive population modeling to assess potential impacts.

POLICY SUPPORT

Disease Prevention and Response

This year, we revised and finalized the Disease Response Framework. This document was created to guide the DEC's response in the event of any disease outbreak for which a specific response plan has not already been created.

As requested, we also continue to provide policy support to the DEC and Dept. of Agriculture & Markets on chronic wasting disease. We assessed and responded to public comments following the release of the CWD Risk Minimization Plan. We traveled to Albany to meet with lobbyists and attend public hearings on live captive-cervid import bans.

We were also engaged in CWD-related policy discussions at the national level. We submitted comments from the DEC and The Wildlife Society Wildlife Disease Working Group to the USDA on proposed changes to the CWD Herd Certification Program Standards.

Dr. Schuler co-authored chapters in the Association of Fish and Wildlife Agencies (AFWA) CWD Best Management Practices document. Dr. Schuler also gave a presentation on CWD to the Northeast Wildlife Administrators Association (NEWAA), which contributed to the group's decision to pass a resolution to ban the use of natural deer urine.

Dr. Forzán leads the Diagnostics Group of the North American Bsal Task Force, which aims at preventing the introduction of the deadly salamander chytrid fungus into the continent. The Task Force, which is composed of wildlife professionals from Canada, the USA and Mexico, has developed a Rapid Response Plan and is currently working on a Strategic Plan.

Public Health

We also worked with the DEC and the Department of Health to address issues of lead contamination from ammunition and venison donation. At the request of the Department of Health, we provided background information and recommendations. This resulted in a warning label at food pantries to alert potential consumers of the risks to children and pregnant women.

Wildlife Capture, Handling, and Safety

We regularly provided input on external research permit applications that involve wildlife, ranging from salamander to white-tailed deer. In addition, this year, we also provided reviews of the DEC's Coyote Capture Plan and its Peregrine Falcon Management Plan.

Disease Information and Prevention

To aid DEC field staff responding to suspected rabies and canine distemper cases, we developed user friendly disease fact sheets. We also assisted in the revision of DEC website pages on the Care of Young Wildlife, CWD, Rabies, Avian Influenza, EHD, and White Nose Syndrome.

Ambystoma tigrinum, tiger salamander.
By Kuribo - Own work, CC BY-SA 3.0

Grant Reporting Requirements

An interim USFWS Federal Aid Performance Report was submitted in fulfillment of grant requirements.

Wildlife Rehabilitation Electronic Data Capture and Analysis

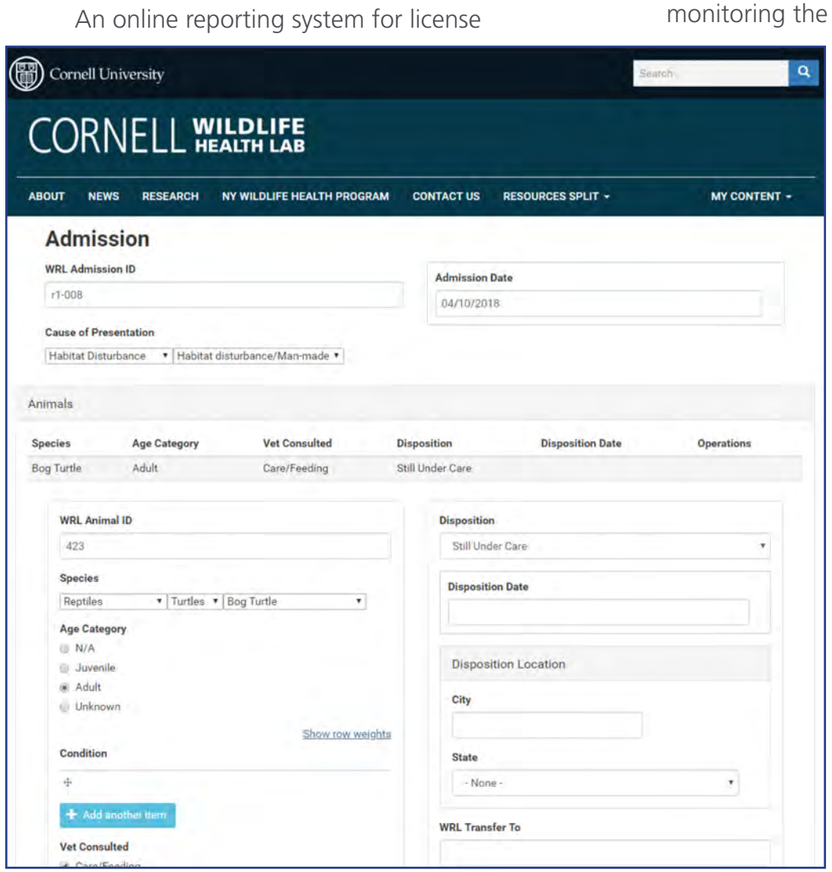
Each year, the DEC Special Licenses Unit collects data on tens of thousands of wildlife from licensee and permit holders, including bird breeders, wildlife rehabilitators, and nuisance wildlife control officers.

This data resource could provide valuable information for monitoring wildlife health, management decisions, and policy development – all issues important to the WHP.

The WHP is working with the SLU to modernize their approach to data collection. An online reporting system for license and permit holders is being developed. Not only will this new system make it easier for license and permit holders to submit required documents and records, the SLU will also be able to shift away from an inefficient paper-based system for managing and reviewing reports.

The collaboration will focus first on the Wildlife Rehabilitator License. Wildlife rehabilitators come in contact with nearly 20,000 animals each year. Changes in the frequency of submissions, spatial distribution, or causes for presentation may be indicators of change in the health of a species.

The online reporting system for wildlife rehabilitators is expected to be made available in the first quarter of 2019. With its deployment, the WHP can begin using this valuable data resource as another tool for monitoring the health of New York's wildlife.



CWHL online database for rehabilitator submissions

WILDLIFE HEALTH TEAM

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.

Dr. Bunting discussing disease surveillance

WILDLIFE HEALTH TEAM MARCH 2017-CURRENT

Region 1	Leslie Lupo
Region 2	Sandy Chan
Region 3	Elaina Burns
Region 4	Karl Parker
Region 5	Tim Watson
Region 6	Steve Heerkens
Region 7	Tom Bell (Co-Chair)
Region 8	Jenny Landry
Region 9	Ryan Rockefeller

WHU	Kevin Hynes (Chair)
Cornell	Krysten Schuler
Cornell	Beth Bunting
BMT Liaison Central Office	Patrick Martin
DLE Liason	Major Matthew Revenaugh
BMT Liaison (Regional)	Michelle Gibbons

Kevin Hynes preparing for a field necropsy demonstration given to DEC staff at a regional workshop

ANNUAL WORK PLAN FY2017 REVIEW

Administrative

Administration: budgeting, fiscal, personnel, T&A, LATS, FMIS	Completed
Create guidance document for facilities and equipment	In Progress
Wildlife Resources Center (WRC) infrastructure, equipment management and maintenance	Completed
WRC incinerator operation, lab maintenance, facility maintenance and grounds	Completed
Annual Wildlife Health program report	Completed
Biannual wildlife health program review (Central Office or Cornell)	Completed

Policy Support

CWD Risk Minimization Plan out for public comment	Completed
Maintain wildlife health website and case data access (Cornell)	Completed
Amend CWD regulation (Part 189) as per Risk Minimization Plan	In Progress
Participate in wildlife health related meetings IRC, CWD, BOW, Wildlife Health and other meetings	Completed
Providing wildlife health consultation (public, staff, partners, regulatory, research projects, SLU licenses, etc.)	Completed
Wildlife rehabilitation, NWCO, and Game Bird electronic data capture and analysis	Completed

Health and Disease Surveillance

Case management and reporting: Wildlife necropsies (>1000/yr)	Completed
Participate with Northeast Wildlife Disease Cooperative as a partner	Completed
Chemical immobilization policy document (AFWA guidance document)	In Progress
2017 CWD surveillance (sample collection, Taxidermy Partnership Program, reporting)	Completed
Development of eDNA tools for amphibian and virus detection (yr 4)	In Progress

Megan Kocher (Buffalo State College), Shelby Priester (Buffalo State College), and Niki Dean (CWHL), doing a health survey on released hellbenders in the Allegany River system

Training, Teaching, and Outreach

Advanced topic workshop for staff (Bird Banding, Fur School)	Completed
Create training module for new hires on wildlife health website	Completed
Training workshops for DLE staff	Completed
Communicate with veterinarians regarding wildlife health issues	Completed
Collaborate and coordinate with federal agencies on wildlife health issues	Completed
2017 Safe Capture International chemical immobilization training	Completed
Wildlife health presentations for public	Completed
Forensic services for DLE	Completed

Kevin Hynes and Dr. María Forzán demonstrating necropsy techniques

Disease Prevention and Response

5-year CWD risk assessment update for CWD Surveillance Plan	In Progress
Hellbender vaccination field trial in Allegany River	Completed
Moose population health assessment	Completed

Research

Virtual Tissue Bank website (in partnership with NWDC)	In Progress
Wildlife health and wildlife rehabilitators listserv maintenance	Completed
Northeast bald eagle lead poisoning retrospective study (publication product)	In Progress
Bear mange statewide surveillance (publication product)	In Progress
P. tenuis study final report	In Progress
Development of a P. tenuis test for cervids	In Progress

PUBLICATIONS, PRESENTATIONS, AND GRANTS

Publications

Alger K, **E Bunting, KL Schuler,** CM Whipps. 2017. Risk Factors and Spatial Distribution of Lymphoproliferative Disease Virus (LPDV) in Wild Turkeys (*Meleagris gallopavo*) in New York State, USA. *Journal of Wildlife Diseases*. 53(3):499-508.

Fenton H, PY Daoust, **MJ Forzán**, RV Vanderstichel, JKB Ford, L Spaven, S Lair, S Raverty. 2017. Causes of mortality of harbor porpoises (*Phocoena phoceona*) along the Atlantic and Pacific coasts of Canada. *Diseases of Aquatic Organisms*. 122(3):171-183.

Forzán MJ, J Heatley, KE Russell, B Horney. 2017. Clinical Pathology of Amphibians: A Review. *Veterinary Clinical Pathology*. 46(1):11-33.

Forzán MJ, KM Jones, E Ariel, RJ Whittington, J Wood, RJF Markham, PY Daoust. 2017. Pathogenesis of Frog Virus 3 (*Ranavirus sp, Iridoviridae*) infection in wood frogs, *Rana sylvatica*. *Veterinary Pathology*. 54(3):531-548.

McBurney S, W Kelly-Clark, **MJ Forzán**, R Vanderstichel, K Teather, S Greenwood. 2017. Persistence of *Trichomonas gallinae* in bird seed. *Avian Diseases*. 61(3):311-317.

Peltier SK, JD Brown, M Ternent, KD Niederinghaus, **K Schuler, EM Bunting**, M Kirchgessner, MJ Yabsley. 2017. Genetic Characterization of *Sarcoptes scabiei* from Black Bears (*Ursus americanus*) and Other Hosts in the Eastern United States. *Journal of Parasitology*. 103(5):593-597.

Pessier AP, **MJ Forzán**, JE Longcore, L Berger, L Rollins-Smith, L Skerratt. 2017. Letter to the editor: Comment on chytrid *Batrachochytrium dendrobatidis* fungal infection in freshwater prawn, *Macrobrachium rosenbergii* (de Man)-a new report. *Aquaculture*. 468(1):326-327.

White CL, EW Lankau, D Lynch, S Knowles, **KL Schuler**, JP Dubey, VI Shearn-Bochsler, M Isidoro-Ayza, NJ Thomas. 2018. Mortality trends in the Washington population of northern sea otters (*Enhydra lutris kenyoni*) during 2002-2017. *Journal of Wildlife Diseases*. 54(2):238-247.

Presentations

Bunting, Elizabeth. **"**Chronic Wasting Disease: Evaluating Public Health Risks." Eighth Annual Public Health Symposium, Cornell University College of Veterinary Medicine, Ithaca, NY, September 8-9, 2017.

Bunting, Elizabeth. **"**Wildlife Health At Cornell." Cornell Alumni Leadership Conference, Cornell University, Ithaca, NY, February 2, 2018.

Dean, Nicole. "New York Wildlife Health Program." State University of New York Oswego, Oswego, NY, 2017.

Driscoll, Cindy P. (*presenter*), Erica A. Mille, Sherrill Davison, Perry Habecker, Lisa Murphy, **Elizabeth M. Bunting**, Mark Pokras, Julie Melotti, Ginger Stout, Fiep De Bie, Anne Ballmann, David Earl Green, Susan Knowles, Julia S. Lankton, Marcos Isidoro Ayza, Valerie I. Shearn-Bochsler, Jason Weckstein, Ellen Bronson, Allison Wack. "Snowy Owl (*Bubo scandiacus*) Health and Mortality Investigations With Project SNOWstorm During the Great Irruption of 2013-2015 and Beyond." Wildlife Disease Association 66th International Conference, Chiapas, Mexico. July 23-28, 2017.

Lithobates sylvaticus, Allegany County, NY, USA - Chubby Wood Frog, CC BY 2.0

Hanson, Melissa. "NYS Wildlife Rehabilitator Reporting: Making Paperwork Work." Annual Conference, New York State Wildlife Rehabilitation Council, Binghamton, NY, November 10-12, 2017.

Hollingshead, Nicholas. "NYS Wildlife Rehabilitator Reporting: Making Paperwork Unnecessary." Annual Conference, New York State Wildlife Rehabilitation Council, Binghamton, NY, November 10-12, 2017.

Hopf, Cynthia (*presenter*), Noha Abou Madi, Marjory Brooks, **Elizabeth Bunting**. "Prevalence of Anticoagulant Rodenticide Exposure in Red-tailed Hawks (*Buteo jamaicensis*) in New York State and Diagnostic Utility of Russell Viper Venom Test for Detecting Associated Coagulopathies." Wildlife Disease Association 66th International Conference, Chiapas, Mexico. July 23-28, 2017.

Schuler, Krysten. "Once Bitten, Twice Shy: New York's Risk-based Approach to Chronic Wasting Disease." Disease: Science Politics, and Management, the 40th Annual Meeting of the Southeast Deer Study Group, St. Louis, MO, February 28, 2017.

Schuler, Krysten, Mary Wood, Kelly Straka, Darrel Rowledge, John Fischer (*panelists*). "Panel Discussion: What we know about chronic wasting disease." 2017 North American Deer Summit, National Deer Alliance, Austin, TX, June 7-8, 2017.

Schuler, Krysten. "Chronic wasting disease: current science and policy decisions." New York Farm Bureau, Albany, NY, 2017.

Schuler, Krysten. "Taking the piss out of CWD." Northeast Wildlife Agency Administrators, Minnowbrook, NY, 2017.

Schuler, Krysten. "Taking the piss out of CWD." Webinar for the Rhode Island Department of Environmental Management Division of Fish and Wildlife, 2017.

Forzán, María. "Influence of climate on emerging diseases of amphibians." Special Species Symposium, College of Veterinary Medicine, Cornell University, Ithaca, NY, April 22, 2017.

Forzán, María. "Forensic Pathology in Wildlife Cases." Mini-Symposium on Veterinary Forensic Pathology, College of Veterinary Medicine, Cornell University, Ithaca, NY, October, 2017.

Forzán, María. "Amphibian diseases and conservation medicine." Invited lecture for Conservation Medicine: A Veterinary Perspective. College of Veterinary Medicine, Cornell University, Ithaca, NY, July 21, 2017.

Forzán, María. "Bleeding techniques for amphibians." Filariasis Research Reagent Resource Center, University Wisconsin, Oshkosh, WI, April 2017.

Forzán, María. "Advanced Special Topics: Wildlife Disease." University of Vermont, Burlington, VT, March, 2017.

Posters

Song H, K McComas, **K Schuler**. "The role of similarity and trust in psychological reactance against public policy." Society for Risk Analysis, Arlington, VA. 2017. Awarded b*est student poster*.

Wetterau A. "eDNA." Smithsonian Institute, Washington, DC, April, 2017.

Stapleton S, A Wetterau, M Hare, **E Bunting. "**Developing eDNA tools for elusive herpetofauna and viral diseases of conservation concern." Cornell Veterinary Investigators Symposium, Cornell University, Ithaca, NY, August 2017.

Grants

Schuler, K, A Fuller. Parasitic threats to moose on the Adirondacks landscape. USDA-National Institute of Food and Agriculture, Animal Health nd Disease Program. $87,409. (August 2017-August 2019)

Bunting, E. Hope for Hellbenders. Temper of the Times Foundation. $10,000. (April 2018-April 2019)

Schuler, K, and also K Bischoff, B Bodenstein, J Brown, **E. Bunting, MJ Forzán**, S Gildos, **K Hynes**, M Pokras, and D Winn. Northeast regionals meta-analysis of lead toxicosis impacts on bald eagles. Morris Animal Foundation. $105,043. (August 2018-February 2020)


NEW YORK
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Department of
Environmental
Conservation
Cornell University
College of Veterinary Medicine
Animal Health Diagnostic Center
WILDLIFE RESTORATION

n: The Emerging Field of Planetary Health

18 | 072001 | https://doi.org/10.1289/EHP2374

Tools Share

net have become so profound that many researchers now favor a new name for
ropocene.**1** The underlying premise of this term is that essentially every Earth
ans to the upper atmosphere, has been significantly modified by human activity.

epts like the great acceleration, planetary boundaries, and tipping points may be of
n, to ecologists, biologists, and climatologists. Yet viewed through an environmental
zes the critical links between human health and the food we eat, the water we
ne—humans' growing influence on the planet threatens the very long-term survival

that we're seeing for the last 100 to 150 years," says Michael Myers, managing
ockefeller Foundation. "Exploitation of the environment has contributed to human
resources we have a more comfortable existence, and our life spans have increased
w at a tipping point in which the exploitation of the environment is beginning to
human health." The same natural systems that have benefited us for so long, he
collapse.

ome another new term: planetary health.**2** There is significant overlap between
ional environmental health; both examine the relationship between human health
res originating outside the body, be they extreme temperatures, chemicals and
rne diseases, or any number of other potential factors. However, planetary health,
unts for the importance of natural systems in terms of averted cases of disease
t comes from human-caused perturbations of these systems—a consideration that
d into environmental health research to date.

logical footprint has ballooned so rapidly over the last few decades that we're
d function of natural systems in ways that are now making us vulnerable all over
ers, a principal research scientist in the Department of Environmental Health at the
f Public Health. Yet our influence can also be a force for good, he says. Implicit in
g is the acknowledgment that sustainable environmental stewardship on a global
uman health.

al to planetary health have been around for decades in fields including global
icine,**4** OneHealth,**5** and EcoHealth.**6** Similar dynamics play a role within the

ange and health. But the framework of planetary health gives these ideas cohesion.

ıow human-caused perturbations of natural systems influence human health. This
fied by the shifting ecology of Lyme disease. The vectors that spread Lyme disease
their habitat and distribution as a result of both warming northern climates and
t lands into smaller wooded areas.**36** This means the disease is spreading into areas
ore. Image: © shipfactory/Shutterstock.

core connections and concepts behind planetary health without ever using the
apidly transforming most of Earth's natural systems," wrote the authors, who were
called HEAL (Health and Ecosystems: Analysis of Linkages**8**) supported by the
ı Wildlife Conservation Society. "How this transformation is impacting human
greatest risk, and the magnitude of the associated disease burden are relatively new
environmental health."**7**

gently needed new branch of environmental health focused on characterizing the
ogenic alterations in the structure and function of Earth's natural systems, says
sky, a professor at Cornell University and HEAL founder. Osofsky is also science
ard-based Planetary Health Alliance, a consortium of nearly 100 universities, NGOs,
rch institutes, and other partners committed to advancing the field.

hief of the journal *The Lancet*, is credited with coining the term "planetary health" in
'From Public to Planetary Health: A Manifesto."**9** "The harms we continue to inflict
ıre a threat to our very existence as a species," Horton wrote. "The gains made in
recent centuries, including through public health actions, are not irreversible; they
we have failed to learn from previous civilisations."**9**

cet published a second seminal piece in the field, the result of a year-long analysis ion–*Lancet* Commission on Planetary Health. In a podcast published alongside the an Andy Haines, a professor of public health and primary care at the London al Medicine, explained that "the aims of the commission really are to review the g place and to outline implications for human health, and also to assess potential oth improve environmental sustainability and human health."**10** The report, titled th in the Anthropocene Epoch,"**11** served as a simultaneous rallying cry, proof of ew for the nascent field.

ence organized by the Planetary Health Alliance,**12** Howard Frumkin of the urther rallied the students and researchers in attendance. "This is not just an l. "We need planetary health. We need it because our house is on fire. We face val, to the health of human civilization, and to the natural systems on which we s a radically innovative step forward."**13**

etary Health Studies

and how planetary health differs from yet also encapsulates related fields is . Harvard research scientist Christopher Golden, who in 2017 helped teach the etary health at Harvard and who serves as associate director of the Planetary example.

igation on ways that human-caused changes to global fisheries affect diet, nutrition, ound the planet, especially in low-income nations near the equator.**14** The project ners with specialties as diverse as ecosystem services, nutritional epidemiology, and e of 19 funded since 2013 through the Wellcome Trust's expansive new research Health.**15** Wellcome was among five cosponsors of the 2017 Planetary Health gh it has never funded or joined the alliance, says portfolio lead Saskia Heijnen.

aught his octopus by hovering over a hole in the floor of Antongil Bay, waiting for
g that fisheries remain sustainable typically involves seasonal closures, quota
lic understanding of the vulnerability of marine species to overharvesting. Chris
nal case studies in Madagascar and other areas to assess local-level health impacts
e environment. Image: © Rebecca Gaal.

by Golden and colleagues describes how declining numbers of marine fish and
n could increase the number of malnourished people in developing nations.**16** The
million people (11% of the global population) risk becoming undernourished if
as a result of declines in fisheries. That's because they already live near a
t in zinc, iron, or vitamin A, and they get more than 10% of their vitamin A or zinc or
from wild harvested fish.

due to the usual suspects of overfishing, pollution, and human population growth.
considers a less direct factor in fish declines that is far less widely known: the
species toward cooler waters, driven by rising sea temperatures.

he University of British Columbia projected that warming ocean temperatures will
ellfish stocks toward the poles,**17** reducing fish catch in the tropics by as much as
olumbia, although far from the equator, marine fish and invertebrates of
nificance to coastal First Nations will migrate at a median rate of 10–18km (6–11
lative to 2000, the authors estimated.**19** Across all 98 species studied, population
northward by an average of 50–90km (31–56mi) during the first half of the 21st

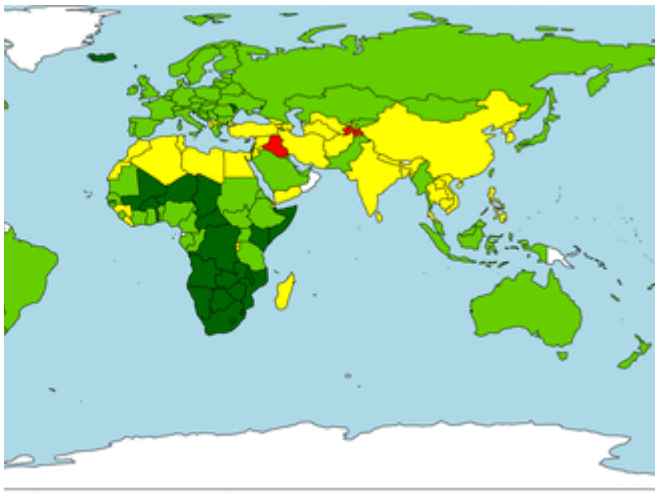
pon these findings by conducting regional case studies in Bangladesh, Madagascar,
n Islands, and British Columbia. Homing in on each locale individually, the
derstand a long chain of reactions linking human influence on natural systems to
lth outcomes: climate change and ocean warming causes the migration of fish
nand for alternative food sources, contributing to nutritional vulnerabilities and
placement foods people might adopt, whether meat, eggs, or local agricultural
ods, Golden says they are likely to be nutritionally inferior to seafood, which he calls

authors of the 2016 *Nature* commentary, this factor alone could have major
lth given the importance of off shore fish stocks to diet and nutrition in low-
. The 2016 commentary concludes with what Golden considers its main point: a call
national agencies to pay more attention to human health when deciding how to
nts and fisheries. The team's subsequent case studies are critical if its message is
ssary scales, Golden says.

other angle of access to nutritious food as a planetary health issue. Myers's
sessed the potential impact of rising carbon dioxide (CO_2) levels on the nutrient
s and the consequent nutritional impact on hundreds of millions of

er in *EHP*,**20** Myers and colleagues estimated that more than 148 million people
for protein deficiency by midcentury if CO_2 emissions continue at roughly 2010**24**

mated that declines in insect pollinators could cause up to 1.4 million excess deaths
nvestigating the health impacts of fires used for land clearing in Indonesia. Last
at such fires caused around 100,000 excess deaths in 2015 alone.**26**



ospheric CO2 increase plant growth, they also reduce concentrations of protein
nost vascular species, including many staple crops. In a 2017 *EHP* article, Samuel
nated that CO2 emissions at roughly unchanged levels could decrease the mean
han 5% in 18 countries. Source: Medek et al. (2017).**20**

e as Golden's fisheries work would likely not have been possible without the
et, Our Health program, he says. The project is representative not only of the
ion in the field of planetary health, Golden says, but also of the specific role that
orting research.

at holistic approaches require interdisciplinary teams, but interdisciplinary teams
opportunities," Golden says. "Interdisciplinary research is not something that
ething that you really need to work for. There needs to be money at the table to
l of cooperation, because it doesn't happen naturally. Something being intuitive
xecuted."

ur Health initially struggled to get off the ground, says Heijnen, because its holistic
ntrast to the Wellcome Trust's traditional focus on funding biomedical health
coming to us with ideas because it was not known that we were interested in it,"

Vellcome redoubled its efforts, issuing two calls for proposals over 2 years that
o examine links among nutrition, urbanization, climate change, and health. "By

vide, we received many applications," Heijnen says—about 900, in fact. During the ojects were funded.

ugh Our Planet, Our Health explore environmental and nutritional interventions for ealth in rural China; the potential role of insects as a sustainable global food source ch as protein, iron, and zinc; and ways of better factoring human health into urban can account for acute impacts like heat stress and air pollution as well as long-term patterns and noncommunicable diseases.**15**

ate both social science and public interventions. For example, after evaluating ts of cardiovascular disease, the team in rural China will study cultural, social, and ing which interventions may be most successful and where. The "insect farming" ly cultivation methods and human uptake of minerals from insects, but also, over ourage cultural acceptance of insects as a food source.

ce acknowledges the field's breadth and interconnected nature by identifying 15 ay be mixed and matched in research projects, many of which encompass entire of these deal with health effects of human-driven ecosystem transformations such and climate change, and six refer to the role of environmental change in public ctious disease, mental health, and civil strife.**27** The ultimate purpose of such Planetary Health Alliance emphasizes, is to mitigate the negative human health ental change.

following a catastrophic 2014 flood in Kelantan, Malaysia, which was widely ened by deforestation.**37**,**38** Planetary health focuses on human-driven ecosystem anging land use) and human health outcomes (such as those related to mental and civil strife following natural disasters). Image: © muhd fuad abd

ence

o its credit three new journals dedicated solely to the emerging discipline: *The* he American Geophysical Union's *GeoHealth*,**29** and Nature Publishing Group's

Rockefeller Foundation–*Lancet* Commission published "Safeguarding Human Health ı,"**11** the field began making headway into educational and governmental ere's been very rapid penetration and adoption of this framework, I think because it ople," says Myers. "Human activity is disrupting our planet's natural systems at ng a very large share of the global burden of disease, and one that is growing."

system launched a Planetary Health Center of Expertise in late 2016.**31** Doane arts college in Nebraska, followed suit in May 2017 by creating its Institute for th.**32** Meanwhile, the University of Sydney has appointed the world's first professor and environmental health expert Anthony Capon,**33** and the University of Toronto vel pilot course in planetary health, says Planetary Health Alliance education fellow sity has just launched the first master of public health program based on planetary ofsky.

worldwide have introduced planetary health concepts through courses, lectures, ts at the graduate or undergraduate level over the last couple of years, according to ams are coming all the time.

undation launched a second commission on planetary health, this time to ationale for the field. Hosted by the Oxford Martin School at Oxford University and president Ernesto Zedillo, now a professor of economics, politics, and international he effort signals the field's expanding reach and seeks to strengthen its economic

embracing planetary health as a concept. Together with the Rockefeller tions Framework Convention on Climate Change secretariat launched Momentum th in November 2016. This three-year venture is designed to identify new ways of ystem health in part by highlighting community-level efforts that have produced lying planetary health principles.**35**

unding committee for Our Planet, Our Health, serves on the steering committee of ce, and contributed to the original Rockefeller–*Lancet* report—believes the field's in part on its ability to impact higher education and interrupt disciplinary siloing ndergraduate-level course at Harvard offers a good model because "it sets out its disciplines, but by reference to big challenges, big problems—a transdisciplinary *We*'re seeing young people who combine the insights of different fields very fluidly, ll need in this field in coming years."

Osofsky, the field will also need to play an active and deliberate role in shaping . For example, he recommends formally including public health considerations in ssments for major development projects.

e infrastructure projects like a dam on the Mekong, and millions of people are micronutrients and protein, that's really important—and yet we don't do robust sments," says Osofsky. "If you're building a highway through the Amazon, you need at that means for vector-borne disease. And today, we don't do that. We have to

f these actions in terms of economic impact, social impact, environmental impact,

epublic is in the midst of an aggressive push to build hydropower capacity, with d to be in operation by 2025.**39** Major development projects like these can improve people. But Steven Osofsky posits that potential negative impacts on human health f natural systems should be considered during planning stages as a way to mitigate

Jakkrit kladpu/Shutterstock.

The Lancet Planetary Health, agrees that the field is inherently political. “We need to e, and then once we build it, it must help us strengthen the case for policy action,” an revise and practically change the way we interact with the environment.”

ne field of planetary health is an optimistic one. It makes the case that complex nan modification of the environment and human health outcomes can be thoughtfully and proactively addressed. “If you measure something, then you can ves—accountable,” he says. “The planetary health message gives one prospect for

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ence and the environment from the San Francisco Bay Area. His work on subjects and environmental health has appeared in a wide variety of regional, national, and

A Deadly Virus Carried by Fruit Bats

Intrigued by how viruses jump from animals to humans, Hector Aguilar-Carreno studies Henipaviruses, which have caused deadly outbreaks of Nipah virus.

Featured

Hector Aguilar-Carreno
Microbiology and Immunology, College of Veterinary Medicine

by Jackie Swift

As human populations have increased around the world, people have increasingly encroached on wildlife habitats. Often the animals lose in these encounters, but for humans there has also been a price to pay: previously unknown, deadly diseases that have jumped

from animals to humans. Ebola is one of the most well-known, but there are others—viruses that have lived with their animal hosts for thousands of years in a carefully orchestrated balance where neither host nor virus can completely destroy the other.

When these viruses finally have the chance to infect humans, they cause high mortality rates. "Killing the host is not a good thing for the virus," says Hector Aguilar-Carreno, Microbiology and Immunology. "Most likely the viruses that have been living with humans for thousands of years, like influenza, have co-evolved with us. They know how to replicate within us and spread from human to human without killing us, for the most part. But a virus that did not evolve with us, one that we've just encountered recently, can't do that yet."

Nipah Virus Outbreaks

Aguilar studies Henipaviruses, a genus of the family of viruses known as *Paramyxoviridae.* Common human illnesses such as measles, mumps, and parainfluenza are caused by viruses from this family, but until very recently the Henipaviruses, carried by fruit bats, were not known to infect humans. That changed in 1999 when the first outbreak of Nipah virus occurred in Malaysia and Singapore. Other outbreaks followed over the course of the next two decades in Bangladesh, the Philippines, and India in the summer of 2018. "Nipah virus kills from 40 to 100 percent of infected individuals," Aguilar says. "All of these outbreaks were eventually contained. They happened in remote villages, but if even one of those infected people had gotten into a big city with a dense human population, it may have been a completely different story."

Studying How the Nipah Virus Infects

To understand and counter the threat of Henipaviruses, Aguilar and his lab study how the Nipah virus, and its cousin the Hendra virus, enter and infect a cell. "We look at the mechanisms of that entry," Aguilar says. "It's very clever. The virus has an attachment protein and a fusion protein that act in concert, kind of like a burglary, to get inside the cell."

"Most likely the viruses that have been living with humans for thousands of years, like influenza, have co-evolved with us. They know how to replicate within us and spread from human to human without killing us."

The researchers discovered the relevant receptors on the surface of a cell—ephrinB2 and ephrinB3—to which the Nipah virus attachment protein binds. They also pinpointed the

mechanism by which the attachment protein triggers the fusion protein to open and insert a spike through the cell's membrane, thereby fusing the virus and the cell membranes together. Once fused, the virus' RNA can move inside the cell cytoplasm and replicate thousands of copies of itself.

"Something uncommon about Nipah virus is that it fuses the infected cell together with uninfected cells around it," says Aguilar. "It forms a syncytium, a fusion of up to hundreds of cells. That's how it gains additional machinery to make more of itself."

Since Nipah virus requires the highest-level biosafety lab, which Cornell does not have, Aguilar collaborates with the National Institutes of Health's Rocky Mountain Laboratory in Hamilton, Montana and the Center for Disease Control in Atlanta, Georgia to work with the live virus. Much of his research, however, does not require the full virus. "We do 99 percent of our work right here at Cornell in my lab," he says. "We've engineered ways to look at viral entry and viral assembly without using the full, live virus."

The researchers create viral-like particles by removing a part of the virus, the infectious genetic material. Then they study the part that remains. They also engineer pseudoviruses by putting a piece of a dangerous virus like the Nipah virus glycoproteins onto another virus that is not virulent. This allows them to investigate the attachment and fusion proteins of the Nipah virus without having to worry about the actual Nipah virus infecting a cell. "We make mutations to the proteins as well," Aguilar explains. "The mutations help us determine which part of the protein has a certain effect. So, if I mutate a certain part and the protein can no longer carry out a particular action, then I know that part must be important for that action."

The DARPA Project on Henipaviruses

Aguilar and his lab are part of a large project, headed by Raina Plowright at Montana State University that recently received a grant for about $10 million from the United States Defense Advanced Research Projects Agency (DARPA). Involving at least a dozen labs, the DARPA project will look at Henipaviruses carried by fruit bat populations around the world. The bats carry the viruses without becoming ill themselves and transmit the virus through their urine, saliva, and feces. Aguilar's collaborators will take urine samples from fruit bats and sequence them to obtain the RNA sequences of Henipaviruses the bats are carrying. Then those sequences will be sent to Aguilar's lab where he and his colleagues will analyze the likelihood of a particular virus leaping into humans.

"We know that Nipah and Hendra viruses are two of around 20 discovered Henipaviruses that have the potential to jump into humans. We want to see how closely related these other Henipaviruses are to Nipah and Hendra," Aguilar explains. "We will look at the RNA sequences, but we also have several functional assays we'll use. For example, we'll look at

whether they bind to the same receptors on the cell surface of their hosts as Nipah and Hendra; whether they can fuse with the cell in the same way; and whether they can enter the cell and assemble there to make new viruses."

Working on a Vaccine, Now

In the end, all the data generated by Aguilar's lab and others will be analyzed by computer modelers to generate a worldwide scenario of the odds that a particular virus will spill over to humans. No matter the results, Aguilar is also working on the possibility of a vaccine for the Nipah virus and its relatives. Using virus-like particles, he and his laboratory and collaborators are testing whether these are capable of priming the immune system without infecting the host. So far, the results look promising.

Aguilar has respect for the viruses he studies. "They are extremely remarkable," he says. "You can consider them either the simplest form of life, or not really alive at all. They are basically a piece of genetic material. The Nipah virus, for example, is just six genes. A human being has over 20,000 genes, yet these six genes are able to overcome a whole human being. It's amazing to see this, to discover how this happens."

Featured Researchers

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THE CHEETAH CHRONICLES: AN INTRODUCTION

BY MCM358 | JUNE 20, 2018 | FEATURED, UNCATEGORIZED

Greetings from Otjiwarongo, Namibia! My name is Elvina Yau and I am a rising 3rd year veterinary student at Cornell. My professional interests are quite varied, as I enjoy Small Animal Medicine, practice ownership, and wildlife conservation. Although companion animals and wildlife seem like disparate fields, there are pragmatic overlaps between the two disciplines that nonetheless require the advocacy of any aspiring veterinarian. I first participated in the Expanding Horizons program last summer, a formative experience studying Asian elephant welfare in Chiang Mai, Thailand. In order to further increase my exposure to wildlife species and international veterinary medicine, I am currently pursuing my second Expanding Horizons opportunity here in Namibia, Africa.

This summer, I have partnered with the AfriCat Foundation to conduct research on cheetah nutrition. Located on the Okonjima Nature Reserve, AfriCat is a non-profit organization established in 1993 whose mission is to promote the long-term conservation of large carnivores through education and research. According to the IUCN Red List, cheetahs are listed as Vulnerable. Namibia has the largest global population of roughly 2000 wild cheetahs, 90% of which can be found on livestock and game farms throughout the country. Since felids are predators that require large habitats and the majority of cheetahs live on commercial farmland, human-wildlife conflict often arises due to overgrazing from cheetahs and retaliatory killing by farmers. Clearly, transboundary conservation initiatives are needed to improve tolerance

and livestock management at the human-wildlife interfac
education at all levels of society in order to sustain a viab

My project specifically investigates the clinical, metabolic,
cheetahs. The resident cheetahs at AfriCat are rescued fr
spacious enclosures of 12-50 acres. Nutritional disease—
in captive and semi-free ranging cheetahs. Normally, che
obtained through consumption of the carcass componen
Glycine is a precursor for several important biomolecules
intracellular antioxidant). Glycine also plays a critical role
detoxification of organic acids, and maintainance of conn

Although cheetahs can synthesize glycine from other ami
inefficient, and endogenous synthesis of glycine does not
tolerable, a chronic deficiency can be profoundly detrimental to the animal's growth, immune response, and metabolism. Considering glycine's properties and therapeutic benefits, our study seeks to supplement an appropriate glycine dose to the cheetahs' diets to assess whether it is clinically promising towards their health and well-being.

Feeding trials will be conducted with sub-adult cheetahs by adding a glycine powder supplement to their standard diet for 4 weeks. Before the trial commences, each cheetah will be anesthetized to collect baseline data and samples (e.g. urine, blood). Hematology, serum chemistry panels, and urinalysis will be conducted on each cat to measure metabolites and physiological parameters like electrolytes and cortisol levels. Furthermore, abdominal ultrasounds will be performed and flexible endoscopes will be used in order to obtain gastric biopsies from each cheetah. After the 4-week trial, the cheetahs will again be anesthetized and endoscoped to collect another round of biological samples so we can compare pre- and post-glycine data. During the study, the cheetahs will also have their activity levels monitored to assess for any changes in behavior or sleep patterns. Since glycine is an inhibitory neurotransmitter, a potential side effect of dietary supplementation could be increased drowsiness.

Our dietary trials can thus illuminate the precise metabolic profile of cheetahs and test whether a glycine powder supplement helps improve the pathological conditions associated with glycine deficiency. By providing further insight into this unique and less understood aspect of carnivore health, our goal is to advance understanding of the metabolic alterations associated with malnutrition and intestinal dysbiosis, and hopefully develop a safe, inexpensive form of nutritional intervention.

Through Expanding Horizons, I am spending eight weeks in Namibia, where I can intimately experience the vibrant fauna and flora of the Okonjima Reserve. With an exciting and highly educational itinerary ahead of me, I will gain clinical perspective with big cat species in an international setting, and collaborate with esteemed professionals to learn how to better manage cheetahs in captivity and protect their population at large.

Veterinary care is essential in maintaining the health of cheetahs, while education of the global community is necessary to promote conservation efforts. In addition to my cheetah research this summer, I will be participating in AfriCat's outreach initiatives by assisting with their Environmental Education Program. Working with local Namibian schoolchildren, we will be providing interactive lessons and activities to teach the young generation about carnivore conservation and the agro-ecosystem.

I look forward to embracing the new experiences and challenges that will accompany field research with cheetahs in Namibia this summer. Through my endeavors to improve the welfare of cheetahs and their conservation status, I am excited to dedicate my summer to impacting the lives of others as well as fulfilling my own.

ABOUT THE AUTHOR:

Elvina Yau is a third-year veterinary student from Long Island, New York. She graduated from the University of Pennsylvania in 2016 with a degree in Behavioral Neuroscience and double minor in Creative Writing & Biology. Elvina aspires to split her time between practicing Companion Animal Medicine in the U.S. and contributing to conservation efforts abroad both as a clinician and freelance photojournalist.

Check out Elvina's personal blog at Elvina The Explorer!

BOOKMARK THE PERMALINK.

« The Embryonic lives of Spotted Salamanders

Wildlife Health comes to New York City – Investigating Lead Levels in Pigeons »

SEA TURTLE CONSERVATION IN COSTA RICA

BY MCM358 | MAY 9, 2018 | FEATURED, UNCATEGORIZED

As a senior in my undergraduate career, I had the wonderful opportunity to travel to Ostional, Costa Rica for a once in a lifetime experience. With one of the highest rates of biodiversity in the world, Costa Rica is a fascinating place to visit, especially if you are interested in wildlife. The town of Ostional is internationally recognized for its extensive sea turtle population, and I was very fortunate to spend two weeks at their National Wildlife Refuge. The Olive Ridley turtle (*Lepidochelys olivacea*) is their most common inhabitant, but Ostional is also home to some Leatherback (*Dermochelys coriacea)* and Green (*Chelonia mydas*) sea turtles.

Ostional is a small town located along the coast of the Nicoya Peninsula. The flight into San Jose International Airport and the eight hour bus ride to Ostional were more than worth it. The beaches of Ostional were like nothing I had ever seen before. Watching the sunrise and sunset as it reflected off of the black sand was a wonderful way to begin and end each day. The local people and the staff of the refuge were very welcoming and excited about working with wildlife.

Working on the beach during the day is extremely difficult, so to avoid the blazing sun, volunteers work in the very early morning and the late evenings. The night shifts were my favorite part of my trip to Ostional. During these shifts, we were able to go out with the patrollers to scale the beaches for trespassers and collect measurements on nesting turtles. We were required to wear all dark clothing and a red-shining headlamp in order to not disturb the individuals. Using just moonlight, we were able to see the trackings of the mother turtles coming up from the water; the indentations in the sand from their flippers and plastron were very prominent without an external light source. The trackings were the first sign of a turtle's presence on the beach, and as we followed, we could start to hear the turtle as she dragged her heavy body to her preferred nesting site.

As soon as a turtle was sighted, we would observe her to determine what stage of the process she was in, or if she was just emerging, we would remain as far as possible until she had decided on a location. Once settled, the nesting turtle will begin securing that spot by tossing sand and making an indent, where she will begin using her back flippers to dig a hole. Soon after, she will begin laying her eggs, and we would use this opportunity to take measurement length

and width, flipper length, nest depth, and the number of pper
in the hopes of seeing her again for longitudinal studies. up
the hole, and then she packs the sand by driving her plas

One night while patrolling the beach, it became very appa t of
turtles nesting. The local patroller notified us that this wa ting
time. Sea turtles are usually known for their individual ne
However, the Olive and Kemp's Ridley turtles are specific ssibly
in relation with specific patterns of the moon. The "arriba Olive
Ridley turtles emerged from the water over a three day p ted
that as many as 20,000-60,000 turtles can come to the be as
many as 90,000-150,000 turtles emerge from the water w where
they hatched. Because of the exuberant amount of turtle on
another's nest and, unfortunately, many nests from the e n
noted by the people of Ostional in the past and, as a result, a legal egg harvesting program was enacted in the 1980's. This development was a hopeful way to merge economic advancement for the people of Ostional with a scientific venture to theoretically increase the success rate of nestings by increasing sand quality. It was also proposed that this program may also heavily decrease the temptation of poaching specifically on sea turtles that lay their eggs individually. These legal egg collections are only allowed for a specific number of hours after a declared "arribada", and they are regulated by biologists in studied sections of the beach. Many have viewed the program as a success for both humans and wildlife, but many are also skeptical. Although there have been many longitudinal studies on the economic and scientific implications, this is still an active area of research and ethical conversation for the community.

Seeing thousands of Olive Ridley turtles was an experience in Ostional that I will never forget; however, I also had the additional experience to witness a leatherback sea turtle emerge from the water to lay her nest. Leatherback sea turtles are found periodically nesting on this beach, but they are definitely not as common as the Olive Ridley turtles. When the leatherback was sighted, it was truly a sight to behold, and word of her presence woke up many in the community to come to the beach. Leatherback sea turtles can weigh more than a thousand pounds, and the sound that the turtle made while traveling up the beach demonstrated just how massive she was. In Ostional, I got to learn from a special group of researchers as they collected the data on the less common species: the leatherback and green sea turtle. For this leatherback, the researchers collected her eggs to incubate in a more regulated environment. They do this in the hopes of having a better survival rate and an increase in the Ostional population of the leatherback because they are unfortunately declining. After the eggs hatch, a time is determined to release these newborns on the sand for optimal survival rates. During my stay, I was privileged to see the release of a hatched leatherback nest, and I will never forget the site of these small newborns as they quickly ran towards the open ocean.

Volunteering in Ostional was an extraordinary experience, and I would highly recommend it to anyone interested in wildlife. During my two weeks, I was able to work alongside wonderful local mentors and experience the effect of international wildlife programs. I am eternally grateful to the National Wildlife Refuge and my homestay family for this opportunity; it was surely an experience that shaped my desire to become a zoo and wildlife veterinarian.

If anyone has any questions or would like to talk more about this opportunity, please feel free to email me – vra23@cornell.edu

ABOUT THE AUTHOR:

Victoria Albano is a first year veterinary student from Staten Island, NY. She received her Bachelor of Science from Cornell University in May of 2015, with a major in Animal Science. She is excited about zoo medicine and its impact working in conjunction with conservation education. She hopes to one day work as a zoo or wildlife veterinarian.

BOOKMARK THE PERMALINK.

« Lunch Lecture: "What can we really do about emerging amphibian diseases"

Sea Turtles: An Overview »

MY SUMMER WITH THE WILDLIFE HEALTH PROGRAM

BY WILDLIFE BLOG EDITOR | APRIL 11, 2018 | FEATURED

For the summer of 2017, I was fortunate enough to work with Dr. Elizabeth Bunting of New York State's Wildlife Health Program (WHP). Dr. Bunting is based out of Cornell's Animal Health Diagnostic Center (AHDC) and works in conjunction with the New York State Department of Environmental Conservation (DEC). The goal of the Wildlife Health Program is "to safeguard the long-term health of the wildlife populations of New York". This is accomplished through disease surveillance, research, and data analysis. My work, as a research assistant, was varied and fulfilling.

About two-thirds of my time were spent at the AHDC in an assistant capacity. Dr. Bunting would have questions pop up, and I would comb the literature trying to find answers for her. Some examples of the types of issues I looked into were: life cycle, vectors, and diagnostics of acanthocephalans (thorny headed worms) that affect passerines (songbirds); distemper virus in raccoons and vaccine protocols for wildlife rehabilitators; and the proper antibiotics to use, and at what dosage, to treat hellbender salamanders suffering from infections due to surgical complications. While at the AHDC, I got to perform several necropsies on wildlife including a juvenile black bear, an adult white tailed doe, and several white tail fawns. I also continued work on a project involving muskrat pelts that I started while working with Dr. Bunting over the winter break. This included giving a presentation in a DEC furbearer meeting on the work I had been doing and the results we had at that point. In my down time, I also did routine office work, including data entry.

Now on to the really fun stuff! Dr. Bunting was very generous in letting me spend about one-third of my time out in the field. She and Dr. Krysten Schuler of the WHP got me in contact with several wildlife biologists, technicians, and graduate students who I was able to accompany on various projects around the state. I spent the first two weeks of the summer assisting on a white tail deer fawn survival study. A graduate student had placed vaginal implant transmitters (VIT) in about 20 does which we would monitor through radio telemetry every few hours. When the doe gave birth, the VIT would fall out and change its signal, alerting us that fawns were on the ground. We would go in, and take measurements of the fawns, collect blood, hair, and saliva samples, and place radio collars on the fawns.

I also got to assist with two monitoring studies of both of New York's venomous snakes, timber rattlesnakes and massasauga rattlesnakes. Both studies involved locating the snakes, taking measurements, and checking for microchips on previously captured snakes, or implanting microchips in newly captured snakes. The goal of both studies was to monitor the health and population numbers of the snakes to ensure that they are at sustainable levels in the state. I was also present at Cornell's Janet Swanson Wildlife Health Center to witness the surgical implantation of a radio-telemetry tracker into a timber rattlesnake.

00:00

1. “Timber Rattlesnake”	**0:11**
2. “Massasauga Rattlesnake”	0:08

Some of my favorite work of the summer involved Hellbender salamanders. Hellbender numbers have been declining in the state, so several years ago several egg masses were hatched in captivity to be released into the wild to supplement the population. Unfortunately, these released animals were dying in the wild due to a fungal infection called chytridiomycosis. Vaccine trials have been performed in the past with inconclusive results. This past year the last 20 salamanders from one egg mass from the Buffalo Zoo were brought to Cornell for a vaccine and release protocol trial. All of the salamanders had telemetry trackers implanted surgically. I was able to assist in anesthetizing and recovering many of the salamanders from surgery. Later in the summer, I was with the group that released the salamanders into streams in the wild. Half of the animals were released into cages for the summer, while the other half were released nearby in the streams. I made several trips back out to help monitor the salamanders and catch them to swab for fungal cultures. I also had the chance to help the DEC on a wild hellbender survey late in the summer.

I got to assist with a few other cool projects over the summer. One involved accompanying trained dog teams in the Adirondacks collecting moose scat for a moose population estimate study. Another involved monitoring bat numbers at known summer roost sites. I was able to spend a day banding Canada geese with the DEC. I also went out collecting black bear hair from various research sites.

My summer with the Wildlife Health Program was a great experience. I learned that being a wildlife veterinarian doesn't just involve field work and hands-on animal experience. Research, surveillance, and relying on biologists out in the field is a huge component of being a state wildlife veterinarian. Much time is spent in the office but it is important work and is crucial to the job. That being said, my hands-on experiences over the course of the summer were fantastic. I don't know too many people that can say that they personally handled 2 types of rattlesnakes, a threatened amphibian species, and baby deer all in a couple of months. My summer experience makes me excited for a possible future as a wildlife veterinarian. I would like to thank Dr. Beth Bunting very much for the opportunity to work with and learn from her. I would also like to thank Dr. Krysten Schuler, Nikki, Nick, Richalice, and Jennifer from the Wildlife Health Program for being so great to me over my time with them. I would also like to thank Dr. Hermanson, Dr. Buckles and the various graduate students, wildlife biologists, and wildlife technicians that allowed me to join them out in the field.

ABOUT THE AUTHOR:

Bryan Clifford is a veterinary student at Cornell University College of Veterinary Medicine in the Class of 2020. Bryan is also a student technician at the Janet Swanson Wildlife Health Center. He is interested in pursuing a career working with free-ranging wildlife and wildlife rehabilitation.

BOOKMARK THE PERMALINK.

« Dinner lecture and lab: Turtle shell Repair

Dinner lecture: Reproductive Aging in Female Cheetahs and Naked Mole Rats »

WILDLIFE HEALTH COMES TO NEW YORK CITY – INVESTIGATING LEAD LEVELS IN PIGEONS

BY WILDLIFE BLOG EDITOR | AUGUST 1, 2018 | FEATURED

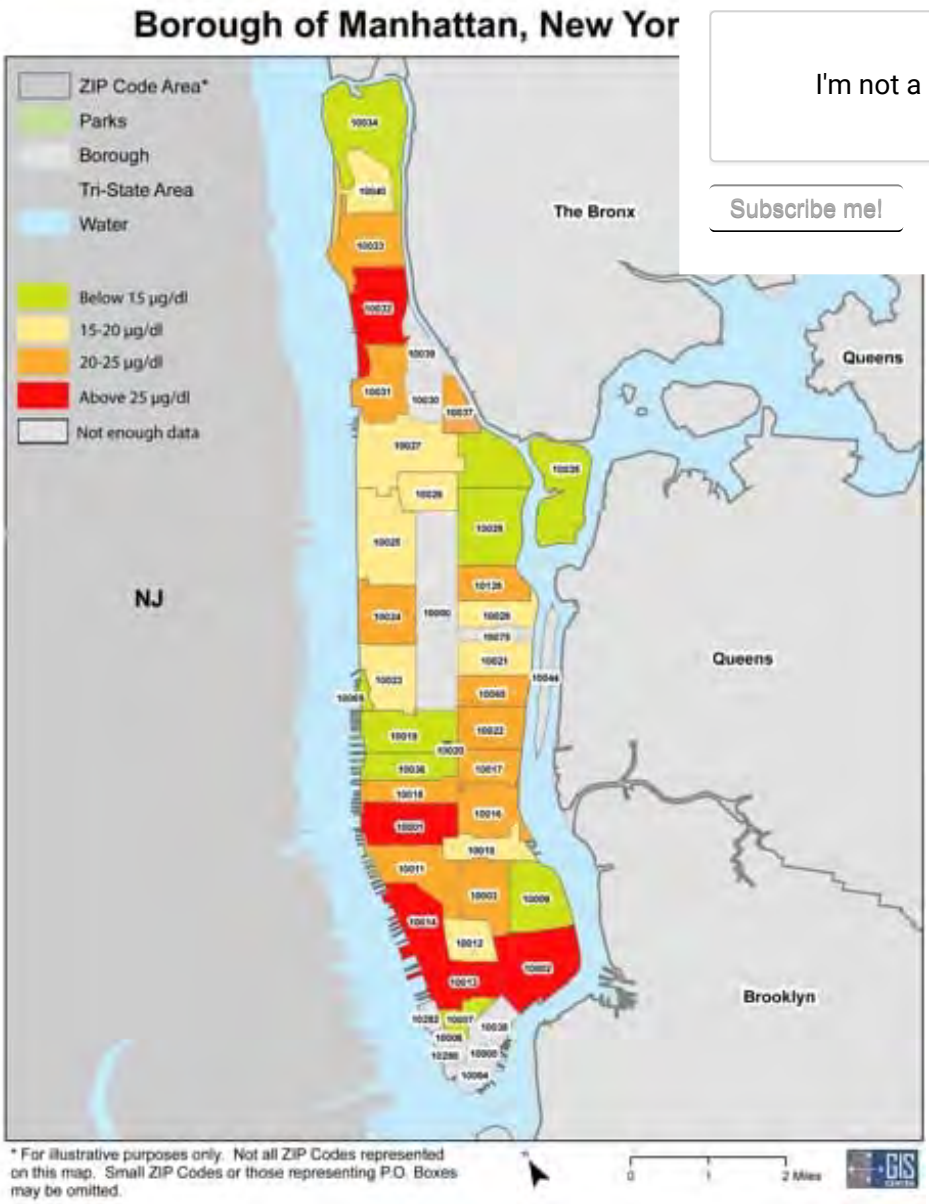
Credit: Jennifer Morrow, https://www.flickr.com/

Wildlife in New York City. It sounds like an oxymoron, but every year, concerned New Yorkers find thousands of injured animals lying on the sidewalk. They take to Google and end up at the only wildlife rehabilitation center in NYC – the Wild Bird Fund. I was one of those people.

In 2009, two children brought a sparrow into the dog & cat clinic that I worked at. The bird wasn't putting any weight on its right leg. After my shift was over, I made the two-hour subway ride to the Upper West Side and stepped through the front door of the Wild Bird Fund. Hens roamed freely in the lobby. A gull honked from its perch on the chair next to me. Mourning doves cooed from huge window aviaries, and a rehab worker bustled by cradling a swan, one hand supporting its long neck. I was instantly hooked. The very next week, I attended orientation tc

er.

Although the Wild Bird Fund accepts all animals, more th most commonly sighted animal in New York City – the infamou over a million in NYC alone. That means thousands of sick pigeo ering for a while, I became interested in learning more about le g our patients.



Map of pigeon mean blood lead levels in Manhattan by zip code.

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d from these

ands of hand-written records took me the better part of an entire summer. Turns out it wasn't in vain – I found consistently high levels of lead poisoning in small pockets of the city, areas such as Lower Manhattan and the Gowanus Canal in Brooklyn. My results also matched child lead poisoning reports published by the US Department of Health in 2010 and 2014. Sick children and sick pigeons live in the same neighborhoods.

It's still unclear where this lead is coming from, although it's most likely a combination of several different sources, including leaded paint, leaded gasoline, and small airplane fuel. The Wild Bird Fund data also revealed another trend: lead poisoning is significantly higher in the summer. This correlates with lead poisoning studies done on human children; Laidlaw *et al.* (2005) suggest that soil humidity is lower in the summer, leading to increased suspension of and exposure to lead dust.

In the end, it's hard to look past some of the similarities between human and animal pathology, especially when we live in the same neighborhoods, breathe the same air, and eat the same food. (If you've never seen a pigeon chowing down on a discarded pretzel, have you truly seen New York City?) Mine is just one of many studies being published every year about human-ecosphere interaction. One emerging field involves the use of animals as bioindicators for human health. The bioindicator is the proverbial canary in the coal mine; if the wildlife falls ill, we may expect humans to fall ill as well.

Just like any other time science happens, I submitted my paper with more questions than I had answers. Wildlife is suffering, and it is by no uncertain terms our doing. It's hard not to notice this when three of the most common problems treated at the Wild Bird Fund are lead poisoning, collision with windows, and cat attacks. Shortly after my study was published in *Chemosphere*, it was picked up by *The New York Times* and a slew of other online papers. In

particular, *The New York Times* debated the true efficacy of predicting human disease using pigeon lives. As I read the news article, my heart sank.

I'd written a paper on pigeon health, but I was getting the impression that very few people cared if it didn't have immediate applications to human medicine. It wasn't entirely their fault — I had, after all, dedicated many pages of my study to drawing comparisons between pigeon and human child lead toxicity. But as accurate as these comparisons were, I'd done them in part because I hadn't been confident that anyone would notice a study on just pigeon lead poisoning. I thought my results were important, and I wanted them to be published; writing about human medicine would help that process.

It's not that I don't care about human medicine — far from it. We should raise our voices, loudly and clearly, when a human is poisoned. And we should raise our voices, loudly and clearly, when an animal is poisoned as well. Lead toxicity or otherwise, it's becoming more and more obvious that connections between human and animal health exist everywhere we turn. I guess this is a call to everyone to care just a bit more about what happens to the life that we're surrounded by: the earthworms tunneling underfoot, the warblers migrating south, and yes, maybe that pigeon strutting past too, even if it just pooped on your windshield.

The paper published from Fayme's research can be found here. Click here to read the New York Times article about it.

ABOUT THE AUTHOR:

Fayme Cai, class of 2022, was born and raised in NYC and graduated from Columbia University with a Bachelor's in Ecology & Evolution and a minor in Psychology. Although it's still up in the air for now, she's mostly interested in small animal and companion exotic animal medicine.

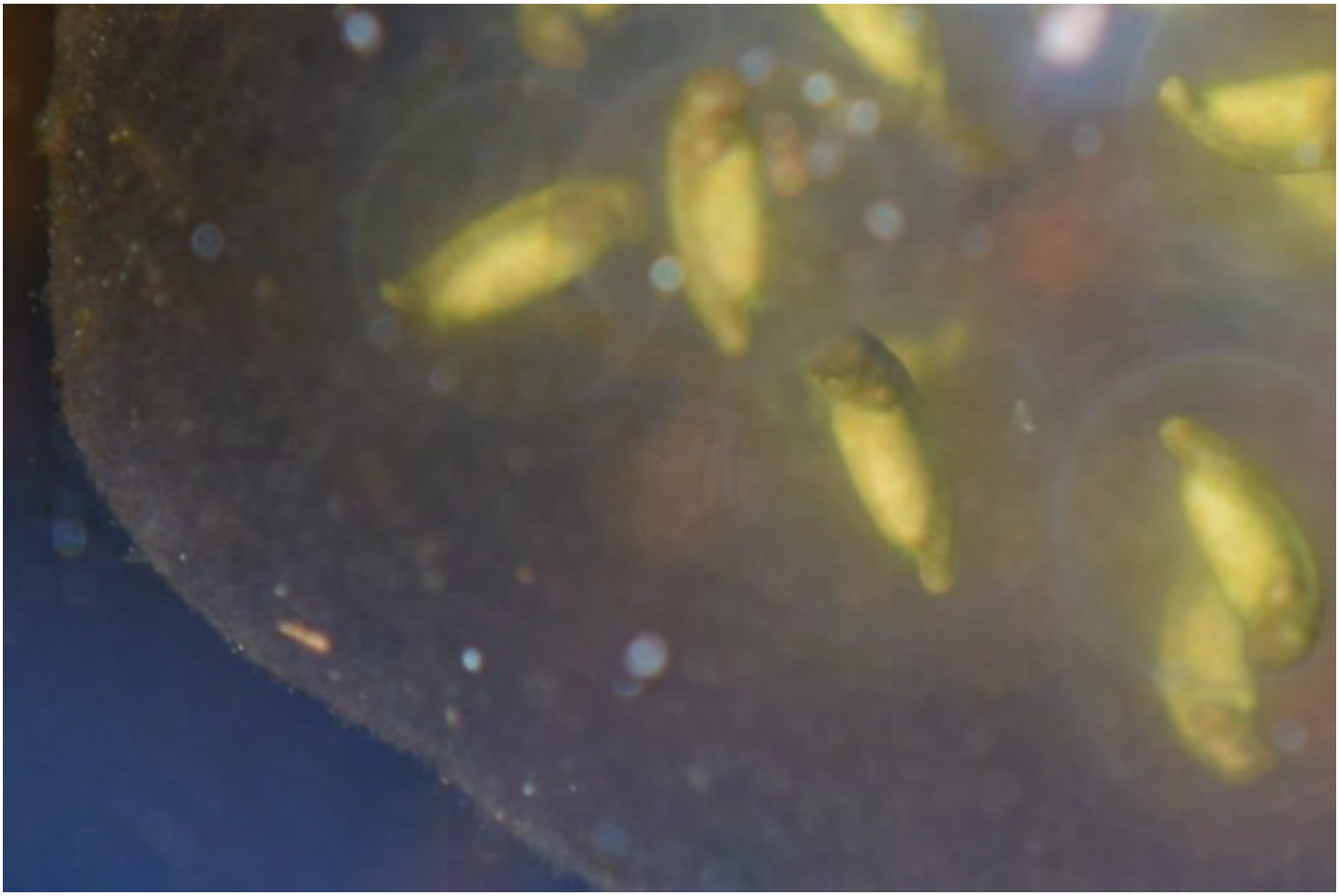
BOOKMARK THE PERMALINK.

« The Cheetah Chronicles: An Introduction

What Wildlife Workers Should Know About Avian Anatomy »

THE EMBRYONIC LIVES OF SPOTTED SALAMANDERS

BY JONATHAN GORMAN | JUNE 6, 2018 | FEATURED, UNCATEGORIZED

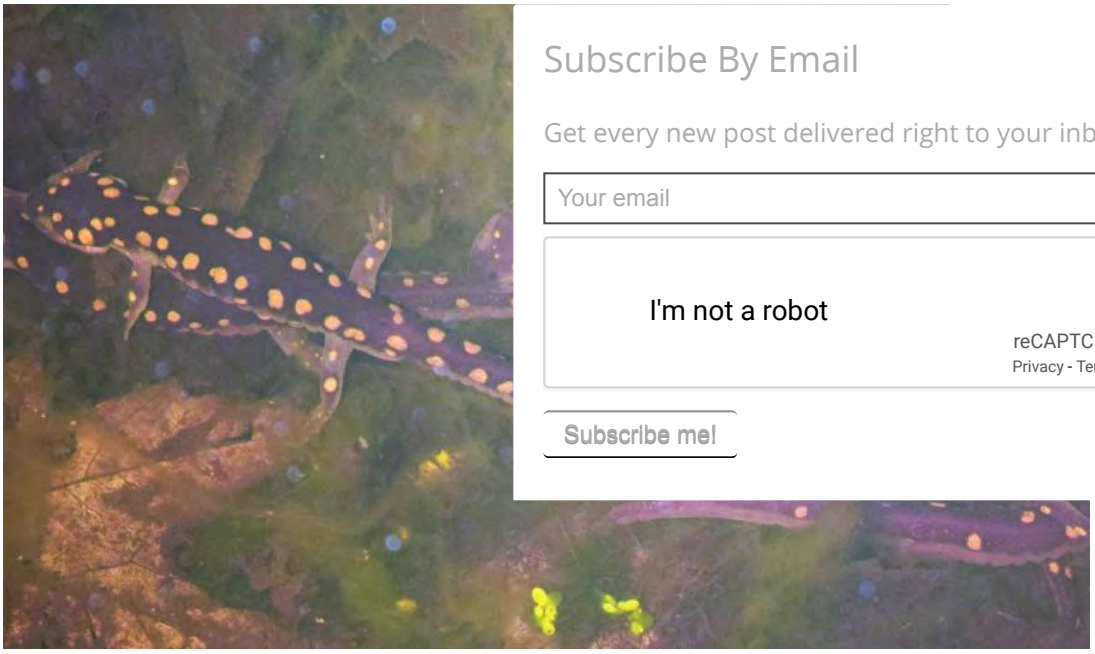


~Four week old spotted salamander embryos.

Over the past couple of weeks, the last of the spotted salamander larvae around Ithaca have left their eggs and are now swimming around in vernal pools, pools that form in the spring and dry up later in the year. They will feed and grow in these pools until they become adult salamanders and adopt a terrestrial lifestyle. To the larvae, their lives have just begun, but to an outside viewer, a lot has already happened.

Back in April, Jonah Marion ('20) wrote a blog post about the spotted salamander migration in Ithaca, which occurred on May 29. In the rain and under the cover of darkness, the salamanders had migrated from their forest habitat to the vernal pools where they reproduce. The salamander migration is just the beginning of a fascinating life history. With camera in hand, I have been continually checking up on the spotted salamanders and their embryonic offspring throughout the season.

Breeding



A group of spotted salamanders breeding in a vernal pool the night after the migration.

A salamander returning from the water's surface after taking a breath.

The spotted salamander breeds in vernal pools which are free of predatory fish since they dry up later in the year. Because adult salamanders are normally terrestrial, they have lungs, not gills. Thus, during breeding, they have to return to the surface of the water every few minutes to breathe. Despite being terrestrial most of the year, the salamanders are well adapted to swimming; with the help of their muscular tails, they can propel themselves through the water by moving in an S-shaped pattern.

During breeding itself, the males deposit sperm-filled spermatophores, which females pick up and store in their spermathecae. The spermathecae are organs used to store sperm for later use, sometimes even for future breeding seasons.[1] When the females are ready, they will use their stored sperm to fertilize their eggs, and then deposit them onto sturdy pieces of vegetation.

After breeding, the adult salamanders return to land to continue their terrestrial lifestyle. The migration from their vernal pools doesn't occur as simultaneously as the migration into their vernal pools; males can leave earlier than females since they don't have to lay eggs, and individuals don't all necessarily leave at the same time.

The Eggs

A spotted salamander egg mass secured to a branch in a vernal pool. The eggs are collectively surrounded by a thick protective jelly.

Spotted Salamander egg masses are wrapped around sturdy objects such the living branches of woody plants. The individual eggs are all packed within an outer gelatinous coat that protects them from predation. However, this thick coat makes it difficult for oxygen to diffuse to the developing embryos. To solve this problem, spotted salamanders have developed a symbiotic relationship with a type of green algae, *Oophila amblystomatis.* The algae grows within the individual eggs, producing oxygen through photosynthesis while acquiring nutrients from the embryonic waste products.[2,3] More recent research has shown that these algae invade the embryonic salamander cells themselves and then disappear during later stages of development.[4] This represents a unique case of endosymbiosis between a vertebrate and an alga which is still the subject of active research.[5]

~Five week old embryos. The eggs can be seen filled with symbiotic green algae.

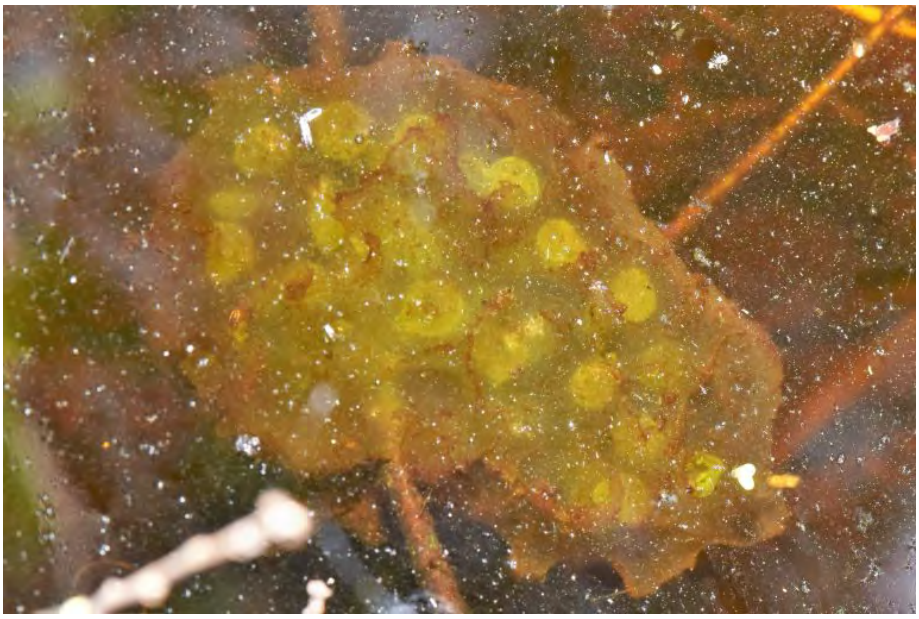
A diving beetle larva standing on top of a mature egg mass. The thick outer jelly protects the salamander embryos from this predator.

The Larvae

Two larvae, days before hatching. You can make out their eyes and the black spots of pigment covering their skin. Some of their nest-mates have already left.

The pace of embryonic development can vary between populations and between egg masses; usually it takes 4 to 7 weeks for the larvae to finally leave their eggs. For the Ithaca population it took about 7 weeks, with some variation between and even within egg masses.

When I checked on the egg masses in late May some of them were completely empty, with the eggs inside broken open. This was a sure sign that the larvae had outgrown their eggs and had taken refuge among the abundant leaf litter. Larval salamanders are adapted to life in their vernal pools; they have external gills and no legs. They will feed and grow in these pools for 2 to 4 months until they metamorphosize into adult terrestrial salamanders. Then, they will move onto land to seek permanent shelter in the forest. It may take 2 to 3 years before they become sexually mature, and the cycle can start all over again.



An empty salamander egg mass.

References

1. Chandler, C. H., and K. R. Zamudio. "Reproductive success by large, closely related males facilitated by sperm storage in an aggregate breeding amphibian." *Molecular Ecology* 17.6 (2008): 1564-1576.
2. Bachmann, Marilyn D., et al. "Symbiosis between salamander eggs and green algae: microelectrode measurements inside eggs demonstrate effect of photosynthesis on oxygen concentration." *Canadian Journal of Zoology* 64.7 (1986): 1586-1588.
3. Pinder, A., and S. Friet. "Oxygen transport in egg masses of the amphibians Rana sylvatica and Ambystoma maculatum: convection, diffusion and oxygen production by algae." *Journal of Experimental Biology* 197.1 (1994): 17-30.
4. Kerney, Ryan, et al. "Intracellular invasion of green algae in a salamander host." *Proceedings of the National Academy of Sciences* 108.16 (2011): 6497-6502.
5. Kerney, Ryan, John Burns, and Eunsoo KIM. "Investigating Mechanisms of Algal Entry into Salamander Cells." *Algal and cyanobacteria symbioses*. 2017. 209-239.

ABOUT THE AUTHOR:

Jonathan Gorman, class of 2021, is the chief coordinator for and a contributor to the WildLIFE blog. He graduated from Cornell with a B.S. in biological sciences before returning to Cornell for veterinary school. Jonathan has a strong interest in wildlife and many years of nature photography experience.

« Sea Turtles: An Overview

The Cheetah Chronicles: An Introduction »

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