



**Dr. Terri L. Roth**

VP of Conservation & Science and Director of CREW

## ROTH'S REMARKS

# AI in Conservation Science - Beware the Double-Edged Sword

AI (artificial intelligence) has figured prominently in the the work of CREW's animal scientists for decades, but now there is an entirely new AI (artificial intelligence) that is more powerful and also risky when applied to the wildlife conservation landscape. How can these AI tools help or hurt the cause, and what are their limitations? With the old AI, the answers are easy. It can help us produce genetically valuable offspring, but can only be performed by specially trained individuals and often carries risks associated with anesthesia. Though valuable in some situations, it can never replace the need for naturally breeding populations. In its infancy, new AI already offers a plethora of opportunities to improve the efficiency and accuracy of scientific methodologies integral to conservation such as species identification, climate change modeling, and habitat assessments. It can also objectively analyze metadata, and record specific animal or plant sightings, numbers, locations and/or activities, thereby avoiding human bias and saving countless hours of labor. For example, in 24 hours, a trained machine can survey wildebeest abundance in thousands of images that would take a human 24 weeks to assess. However, the same technologies can be used by poachers, hunters, and illegal collectors searching for the



Image created by ChatGPT

same endangered species we are working to save, and there certainly are limitations to what this new AI can achieve for science. A machine may tell us where animals and plants are and what they are doing, but it cannot always tell us why or what next steps are necessary to ensure their survival. That task is the role of the conservation scientist who can process AI output through cultural, political, and ethical filters within the context of their own vast knowledge to develop potential solutions. Scientists embrace new tools, and CREW will continue to consider both AIs in future endeavors, but the new AI holds more promise for large-scale progress in wildlife conservation efforts, provided we employ safeguards against its potential misuse.

# POLAR BEAR SIGNATURE PROJECT

## Beyond Diabetes:

### What A1c May Reveal About Polar Bear Pregnancy

Although polar bears aren't raiding the candy aisle, understanding their A1c levels may disclose more than just dietary habits. Unlike other bear species, only pregnant polar bears overwinter in dens, fasting before and after giving birth, whereas non-pregnant females actively hunt on sea ice. During spring fieldwork, scientists sometimes observe adult females without cubs, which sparks the question of whether those females dened and lost their cubs versus spent the winter hunting. To address this uncertainty, University of Washington PhD student, Sarah Teman, partnered with CREW to measure polar bear hemoglobin A1c (A1c), which reflects an average three-month glucose concentration, providing insight into a bear's winter caloric intake. After analyzing 77 blood samples from wild polar bears, she discovered that A1c levels were actually higher in bears that had dened and fasted. This increase likely occurs because bears have adapted to become insulin resistant during fasting, leading to elevated glucose levels and, consequently, higher A1c. By measuring A1c in solitary female bears, scientists now may be able to identify cases of cub loss by detecting fasting-related changes in A1c levels, offering a new tool for monitoring both population health and reproductive success. *(This work was funded, in part, by Institute of Museum and Library Services grant #MG-253001-OMS-23).*



## Enhancing Conservation through Zoo Scientist Exchange

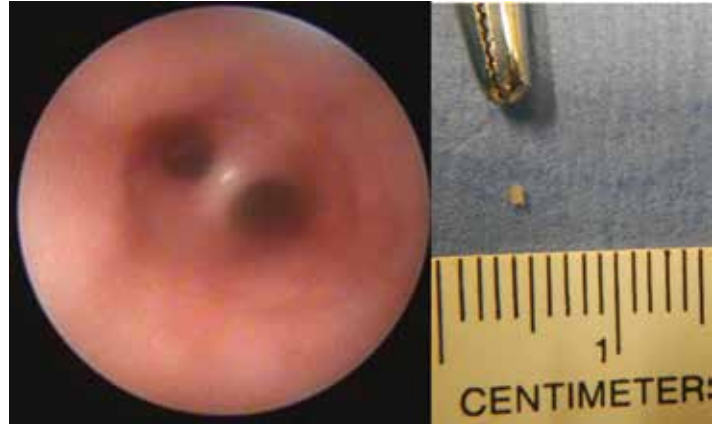
Cross-training opportunities provide scientists the ability to develop new skills to implement in their own careers. As part of an IMLS-funded grant, team members from CREW's Polar Bear Signature Project, Dr. Emily Virgin (Post-Doctoral scientist) and Victoria Hope (IMLS Scholar), traveled to the Memphis Zoo to learn how scientists there are conserving understudied reptiles - a taxon not currently studied at CREW. During their visit, they learned about the unique challenges associated with non-mammalian species like the endangered Louisiana pine snake. Additionally, the grant supports scientists from the Memphis Zoo to visit Cincinnati to learn about CREW's multiplex hormone analyses, which have enabled the quantification of several hormones in polar bear serum samples. In March, Beth Roberts (Senior Conservation Biologist) and Crista Fennessee (Laboratory Technician) arrived with serum samples collected from giant pandas (which experience similar reproductive strategies to polar bears) to validate assays that measure 18 hormones and signaling molecules of



interest. By training colleagues at other institutions, CREW scientists are helping advance the current standards of animal health and reproductive monitoring across zoos in North America. Building strong relationships with other zoos and scientists encourages collaboration and sharing of insights to support conservation efforts. *(This work was funded, in part, by Institute of Museum and Library Services grant #MG-253001-OMS-23.)*

# Scoping Out Polar Bear Infertility

Most polar bear pairs in U.S. zoos are observed breeding; however, very few females give birth each year. Previous research by CREW scientists revealed that male bears are producing viable sperm, and based on long-term fecal hormone monitoring, females seem to be cycling and preparing for pregnancy. Still, the underlying causes of reproductive failure remain elusive, highlighting the need for new approaches in fertility evaluation. It's possible that direct visualization and examination of the internal reproductive tract may provide clues about infertility, leading CREW scientists to adapt techniques developed in humans and domestic species to assess polar bears. By navigating a thin scope through their long reproductive tracts, internal anatomy can be evaluated, and samples collected to assess for irregularities at the microscopic level. Already, abnormalities such as inflammation of the inner lining of the uterus have been detected. Additional examinations are needed to draw firm conclusions, but these initial findings are illuminating potential causes of reproductive failure and may help us prioritize females for breeding based on reproductive health. The inte-



Images of polar bear uterus (L) and biopsy (R) collected during examination

gration of modern diagnostic techniques into reproductive examinations of non-domestic species raises the bar in wildlife diagnostics and contributes to our understanding of polar bear reproductive health. *(This work was funded, in part, by Institute of Museum and Library Services grant #MG-253001-OMS-23.)*

# New IMLS Scholar Position at CREW



Victoria Hope was selected as CREW's first IMLS Scholar, a position funded by an IMLS National Leadership Grant which aims to provide early-career scientists with immersive experiences in conservation science, supported by a generous stipend to remove financial barriers associated with unpaid internships. Originally from Portland, Oregon, Victoria earned a Bachelor of Science at California State Polytechnic University, Humboldt. She completed two zoo animal care internships and volunteered as a beach surveyor where she sampled stranded marine mammals and collected data on Sea Star Wasting Disease. Victoria is passionate about wildlife conservation and has always wanted to work with bear species, making her a great fit for this position. In her new role, Victoria is working alongside CREW scientists to hone her laboratory skills, gain experience in experimental design and analyses, and explore careers in wildlife conservation. Since starting, she has performed assays to quantify hormones in polar bear fecal samples and is optimizing protocols for vaginal cytology, a technique that provides insight into a bear's reproductive status. Her goal is to pursue graduate studies focusing on bear physiology and spatial ecology. Victoria is the first of three consecutive IMLS scholars funded by this award. We are thrilled to have her on the team and look forward to the valuable contributions she'll make towards bear conservation and research. *(This position is funded by Institute of Museum and Library Services grant #MG-253001-OMS-23.)*

# EXCEPTIONAL PLANT SIGNATURE PROJECT



## Establishing Strong Roots for the Exceptional Oak Conservation Bank

The CREW plant lab recently wrapped up a second year of oak collections for our IMLS-funded project, giving us a wealth of extra data and that invaluable scientific gold-standard: replicates! We had 13 of 16 partner gardens participate in collections both years, plus we were able to add two new partner gardens, including the Canadian Forest Service, which increased the range of our collections from San Antonio all the way to New Brunswick! Last year, our biggest issue was fungal contamination of the shoots; using the improved sterilization methods we developed and tested last year, we've decreased fungal contamination by 25% and doubled shoot survival. One of the major aims of our study was to build on our prior research that showed the addition of silver thiosulfate (STS) to the medium increased oak shoot survival. Last year, we saw that adding STS improved survival in 5 of 8 species, but actually reduced survival in the other three species. This was a very interesting result, but we needed to see if that pattern of survival would hold up from year-to-year. Excitingly, this year's data suggests that the pattern of survival with the addition of STS has remained the same in all but one species. Not only are we pushing the boundary of oak conservation science forward with this project, but we're also building one of the most comprehensive in vitro collections of threatened US oaks in the world! (This project was made possible, in part, by Institute of Museum and Library Services National Leadership Grant #MG-252118-OMS-22.)

## Growing New Plant Scientists Through the AmeriCorps Program

This past year, CREW's Plant Division participated in the Zoo's AmeriCorps program for the first time. We welcomed our first ever Plant Conservation & Outreach AmeriCorps Member, Aislyn Tyler, in October 2023. Aislyn is a recent graduate of the University of Cincinnati in Environmental Studies and impressed the whole lab with her experience in phytoremediation and dedication to public science outreach. When Aislyn first started at CREW, she had never set foot near a laminar flow hood, but in one year she's become a pro at plant tissue culture and has even introduced several new species into our tissue culture collection. Aislyn has been indispensable in our oak shoot collection season, even traveling to Dawes Arboretum to harvest shoots with the team. She's also been helping us improve our outreach programs by designing surveys for visitors to share their thoughts on our programs and disseminating results to both staff and volunteers. Perhaps you have noticed plant conservation and research creeping onto the Zoo's social media more frequently. Aislyn's to blame for that too! If you haven't had the chance to

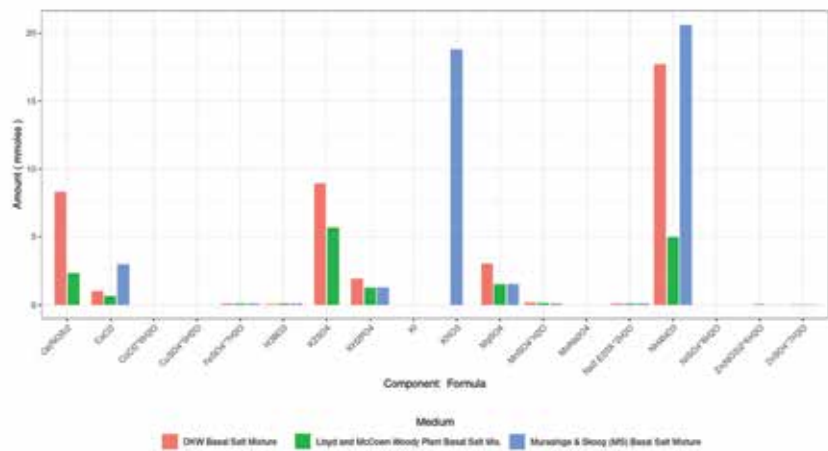


meet Aislyn yet, don't fret – she's decided to sign on for a second year of AmeriCorps with us! We can't wait to see what else she can accomplish here at CREW and as an emerging plant conservation leader.

# Growing the Toolbox for Exceptional Plants

Thousands of exceptional plants exist globally, and most will need cryopreservation for their long-term conservation. This presents a huge challenge, as one of the biggest bottlenecks in applying cryopreservation to scale is the need to develop effective protocols for each species. For example, in vitro propagation protocols are needed for generating fresh tissues (like shoot tips) for cryopreservation. As part of the current IMLS grant, CREW scientists are finding ways to make that work easier and more efficient. Online tools are being created that can help with in vitro work and provide insights into bigger questions about plant tissue propagation. Right now, three tools are available. The Media Comparison Tool compares the components of published culture media to assist in choosing the one best suited for a new species (see chart). Researchers can also use the tool to create their own medium. The Hormone Calculator quickly converts between mg/liter and micromoles, so hormone levels reported differently in two papers can be easily compared.

Finally, the Comparative In Vitro Database is a growing compendium of hormones and media that have been used to culture specific species, providing guidance in protocol development for a new plant. All tools are available on CREW's Exceptional Plant Conservation Network webpages: <https://cincinnati.org/exceptional-plant-conservation-network/tools-for-exceptional-plant-in-vitro-research/>, and there are more to come! They should help protocol development become more efficient, and in doing so, free up more time and resources for conserving more exceptional species.



# Success Breeds Success for Pawpaw Propagation

CREW's plant scientists are known for successfully developing propagation methods for three pawpaws that are among Florida's most threatened species: the Four-petal pawpaw, Rugel's pawpaw, and Beautiful pawpaw. Based on this success, CREW was asked by researchers at the Marie Selby Botanical Gardens to partner with them to propagate the Manasota pawpaw (*Asimina manasota*). This critically imperiled species is found only in two counties in southwest central Florida, with only about 25 individuals known to exist. Like other pawpaws, it's classified as an exceptional species because its seeds are sensitive to drying and cannot be conserved by seed banking. CREW demonstrated in earlier work that shoot tips from in vitro cultures of pawpaws could be successfully cryopreserved, and that approach is currently being tested with the Manasota pawpaw. In vitro shoot cultures have been initiated from wild-collected samples, and these will be propagated to multiply the shoot cultures. When enough material is available, cryopreservation protocols will be tested on the shoot tips, with the goal of ultimately banking this species in CREW's CryoBioBank. Tissue culture methods could also be used to produce plants for restoration if needed in the future. Though each species is different, methods established for other Florida pawpaws have proven useful in developing a protocol for propagating this new-to-CREW exceptional plant. (This project is supported by the Center for Plant Conservation's Florida Plant Rescue project, which specifically designates a portion of their funds to exceptional plant conservation.)



# IMPERILED CAT SIGNATURE PROJECT

## Continuing Pat the Cat's Legacy

Pat the Cat, a beloved jaguar at The Belize Zoo, was a cornerstone of jaguar conservation. Rescued after conflict with humans, Pat became an ambassador, educating visitors about the critical need to protect jaguars and their habitats. The Belize Zoo plays a crucial role in conserving these majestic cats by providing sanctuary for orphaned or problem jaguars like Pat that might otherwise be euthanized. Pat's journey continued when he was transported to the Milwaukee County Zoo, siring two litters and greatly enhancing the genetic diversity of the Association of Zoos and Aquariums (AZA) jaguar population.



Recently, Drs. Lindsey Vansandt and Julie Barnes, alongside colleagues from Minnesota and Milwaukee County Zoos, traveled to The Belize Zoo to perform a reproductive health assessment on Filly, a wild-born jaguar female who was taken in under The Belize Zoo's Human Jaguar Conflict Program. Filly passed her exam with flying colors and is now slated to follow in Pat's footsteps by joining the AZA population. Additionally, reproductive exams were conducted on eight other felids at the zoo, preparing them for potential roles in breeding programs within AZA or European zoos. These efforts help ensure that Pat's impact on jaguar conservation continues, helping other imperiled big cats and wildlife thrive. *(This project was funded by The Pat Gives Back Foundation, which was established to support conservation initiatives, wildlife rescue, and education programs.)*

## Claws for Celebration



CREW has been awarded a prestigious National Leadership Grant of \$693,699 from the Institute of Museum and Library Services (IMLS) to tackle the urgent challenges facing zoo-housed cats. With wild cat populations declining due to habitat loss and fragmentation, ensuring their survival in zoos is critical. Unfortunately, breeding success has been declining over the past two decades due to issues like sexual disinterest and mate aggression. This three-year project, entitled Advancing Felid Reproduction: Integrating Health, Biomarkers, and Assisted Techniques, will focus on jaguars and Amur leopards as model species. The project will utilize a multi-modal approach to assess female reproductive health, develop real-time estrus detection methods, and improve natural cycle breeding protocols. Additionally, the project will build the capacity of the zoological community through advanced training in biological sciences and veterinary techniques. Of the 54 applications received by IMLS in 2024, only 18 projects were selected to receive funding. This is the second National Leadership Grant that Team Cat has received. Successful completion of this project will help genetically valuable cat pairs breed successfully and greatly enhance the sustainability of big cat collections maintained in North American zoos, ensuring these magnificent species thrive for future generations.



# It's Ground-Breaking News!

## Construction of Ocelot Conservation Facility Begins in Texas

Efforts to save America's last wild ocelots received a huge boost this Fall – with a ground-breaking ceremony on October 9th to construct the new Ocelot Conservation Facility at Texas A&M University –Kingsville. As part of the Texas Ocelot Recovery Program, this multi-dimensional infrastructure project, comprised of a veterinary science and research building, breeding facility and rewilding facility, is now being built with a targeted completion date of late 2025. This project, designed by CLK Architects, was developed with input from staff scientists at the East Foundation, Texas A&M University and Cincinnati Zoo & Botanical Garden, including CREW's Dr. Bill Swanson, the SAFE Ocelot program leader and Laura Carpenter, the Ocelot SSP coordinator. With funding from a private Texas donor, the conservation complex will include a state-of-the-art veterinary hospital as well as endocrine and gamete biology laboratories. The breeding facility will be comprised of 16 indoor-outdoor enclosures to house up to 8 ocelot breeding pairs, while the rewilding facility will consist of four expansive vegetated enclosures allowing ocelot kittens to mature in a natural environment and learn



how to live on the wild side. SAFE Ocelot and the Ocelot SSP are working with zoos to provide ocelots for the initial breeding population. These cats will be interbred with their wild counterparts to produce offspring for eventual reintroduction onto Texas ranchlands. With continued progress, the release of the first ocelots into the wild from the Ocelot Conservation Facility is projected to occur in 4 to 5 years.

## Team Cat Roars at Theriogenology Conference

The Imperiled Cat Signature Project recently made waves at the Society for Theriogenology Conference in Oklahoma City. Theriogenology is a specialized field of veterinary medicine that focuses on animal reproduction. It encompasses the study, diagnosis, and treatment of reproductive systems in animals. Leading the charge was Dr. Julie Barnes, who achieved remarkable success by securing first place in the poster competition and second place in the oral presentation category. Dr. Barnes' award-winning poster highlighted the discovery of incidental masses during a reproductive exam in a grizzly bear, showcasing a productive collaboration between CREW's Polar Bear and Imperiled Cat Signature Projects. Additionally, her oral presentation on the transcervical treatment of pyometra in a snow leopard female earned her a second-place finish, further cementing her status as a rising star in the field of veterinary reproduction. Dr. Barnes is currently working toward becoming the first board-certified theriogenologist in a zoo setting, with just one year remaining before she sits for the board examination. CREW's presence at the conference was further bolstered by invited lectures from Drs. Lindsey Vansandt and Bill Swanson, who presented on CREW's groundbreaking research on non-surgical sterilization in domestic cats and assisted reproduction in non-domestic felids, respectively. Moreover, University of Tennessee veterinary student Monica Lee, who conducted a research project at CREW on domestic cat sperm handling media, earned a second-place finish in the student case research poster competition. These achievements reflect CREW's dedication to advancing veterinary reproductive sciences. Our innovative work continues to set new standards and fuel vital conservation efforts. *(These projects were made possible, in part, by Institute of Museum and Library Services grants #MG-245393-OMS-20 and #MG-253001-OMS-23.)*



# RHINO SIGNATURE PROJECT



**American Institute of Rhinoceros Science (AIRS):  
A Model for Saving Species With Science Ex Situ**



## What Happens When a Male Rhino "Crashes" a Bachelorette Party?

Thanks to years of research and innovative reproductive management, white rhino reproduction has recently experienced significant success with more rhinos being born and females once thought to be infertile producing calves. Despite this progress, managed rhino populations are far from self-sustaining. Through our cherished partnership with The Wilds, we are digging deeper to uncover the reasons behind this puzzling challenge. Past studies suggest that although white rhino females are not seasonal breeders, the presence of other rhinos, particularly adult males, may play a crucial role in their reproductive success. During the winter at The Wilds, female rhinos are moved indoors and housed separately from adult males. In the warmer months, the bachelorette crash is reunited with an adult male on the park's expansive outdoor habitat. This novel management style gives researchers at CREW the unique opportunity to examine female rhino cyclicity under contrasting conditions. Thanks to the hard work and dedication of The Wilds staff and current AIRS intern Kandace Krupp, we've started tracking hormone levels in four females that have produced offspring at The Wilds. Initial data indicate the bachelorette crash did not exhibit much reproductive activity



during the winter months in the barn or during the beginning of the summer out on pasture prior to the male's introduction. We now eagerly await data from late summer and fall to see what transpires after the male's introduction. Our hope is that the findings shed light on how to improve reproductive management for rhinos in our care, and ultimately increase reproductive success. *(This project is made possible, in part, by Institute of Museum and Library Services National Leadership Grant #MG-249011-OMS-21).*

**Dr. Shauni Windle is CREW's most recent post-doctoral researcher working on the Rhino Signature Project. Shauni comes from Texas via Oklahoma State University where she completed her M.S. in Animal Science and Ph.D. in Integrative Biology.**



## AIRS Brings Drew to CREW



Two goals of AIRS were to provide opportunities for young rhino scientists and ensure all research pillars work collaboratively. Drew Arbogast's arrival at CREW perfectly demonstrated both. Drew is a passionate George Mason University PhD candidate whose academic voyage in the Environmental Science and Public Policy program is about acquiring knowledge and profoundly impacting wildlife conservation. Drew's journey is a blend of intense curiosity and scholarly endeavor, focusing on animal behavior, well-being, and the intricate dynamics of human-animal interactions. His broad interests led him to the Wellbeing Pillar of AIRS where he is part of a team dedicated to

unveiling new information about rhino wellbeing. To do so, Drew must embark into uncharted territory. That passion has led him to CREW where he is honing his endocrine skills analyzing novel serum biomarkers such as oxytocin, DHEA, and the more common cortisol to integrate physiological data into his behavioral research. With >1000 samples to analyze, and assays never before used in rhinos, the task is not for the weak of heart. However, the results are sure to provide a deeper understanding of rhino wellbeing under human care which is Drew's ultimate goal, shared also by Team AIRS. *(AIRS is made possible, in part, by Institute of Museum and Library Services National Leadership Grant #MG-249011-OMS-21.)*



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# SCIENTIFIC HIGHLIGHTS

## BOOK CHAPTERS

da Paz RCR, **LM Vansandt**, **WF Swanson** and CH Adania. 2023. The Jaguar: *Panthera onca*. In: Silva AR (ed). Assisted Reproduction in Wild Mammals of South America, 1st Ed. Boca Raton, FL: CRC Press, Pp. 1 – 14.

## PEER-REVIEWED PUBLICATIONS

Bateman HL, LK McCaw, JL Seguin, **WF Swanson**, AE Rivas, R Boonstra, GF Mastromonaco and MA Scrafford. 2023. Assessing reproduction in wolverines: fecal progesterone levels in zoo and wild females. *Theriogenology Wild* 3:100054, <https://doi.org/10.1016/j.therwi.2023.100054>.

Carroll RA, ES Rice, WJ Murphy, LA Lyons, L Coghill, **WF Swanson**, KA Terio, T Boyd and WC Warren. 2024. A chromosome-scale fishing cat reference genome for the evaluation of potential germline risk variants. *Science Reports* 14:8073, <https://doi.org/10.1038/s41598-024-56003-7>.

Chen DM, L-D Chen, CK Kouba, N Songsasen, **TL Roth**, PJ Allen and AJ Kouba. 2024. Oral administration of GnRH via a cricket vehicle stimulates spermiation in tiger salamanders (*Ambystoma tigrinum*). *PLoS ONE* 19(7):e0289995, <https://doi.org/10.1371/journal.pone.0289995>.

Chen DM, CK Kouba, N Songsasen, **TL Roth**, PJ Allen and AJ Kouba. 2024. Comparing novel sperm extenders for the internally-fertilizing tiger salamander (*Ambystoma tigrinum*). *Frontiers in Amphibian and Reptile Science*, <https://doi.org/10.3389/famrs.2023.1320803>.

**Curry E**, **J Barnes**, **E Donelan**, **J Wojtusik**, **V Kennedy**, **E Virgin**, **M Philpott** and **TL Roth**. 2024. Reproductive health assessments in female polar bears: Anatomy, pathology, and diagnostic techniques. *Theriogenology Wild* 5:100105, <https://doi.org/10.1016/j.therwi.2024.100105>.

David AS, AM Naccarato, SA Smith, CL Peterson, **VC Pence**, SJH Crate, SM Koontz, HE Dole and ES Menges. 2024. Evaluating long-term introduction success of the Florida scrub endemic *Crotalaria avonensis* (Fabaceae) using a decade of demographic data. *Restoration Ecology* 32:1-11, <https://doi.org/10.1111/rec.14082>.

Dedato M, J Magerman, O Berke, **E Curry** and G Mastromonaco. 2023. Understanding pregnancy-related hormones in female red pandas. *Theriogenology Wild* 3:100053, <https://doi.org/10.1016/j.therwi.2023.100053>.

Nagel M, **V Pence**, D Ballesteros, M Lambardi, E Popova and B Panis. 2023. Plant cryopreservation: Principles, applications, and challenges of banking plant diversity at ultralow temperatures. *Annual Review of Plant Biology* 75:7.1-7.28.

**Pence VC** and EB Bruns. 2024. Scratching the surface: The *in vitro* research that will be critical for conserving exceptional plants to scale. *In Vitro Cellular and Developmental Biology-Plant* 60:266-282, <https://doi.org/10.1007/s11627-023-10405-w>.

Robinson JJ, A Crichlow, CE Hacker, B Munkhtsog, B Munkhtsog, Y Zhang, **WF Swanson**, LA Lyons and JE Janecka. 2024. Genetic variation in the Pallas's cat (*Otocolobus manul*) in zoo-managed and wild populations. *Diversity* 16:228, <https://doi.org/10.3390/d16040228>

**Roth TL**, SL Reboloso, **EM Donelan**, **LA Rispoli** and JP Buchweitz. 2024. Rhinoceros horn mineral and metal concentrations vary by sample location, depth, and color. *Scientific Reports* 14:13808, <https://doi.org/10.1038/s41598-024-64472-z>.

**Roth TL**. 2023. That was then, this is now – Over two decades of progress in rhinoceros reproductive science and technology. *Theriogenology Wild* 4:100065, <https://doi.org/10.1016/j.therwi.2023.100065>.

**Wojtusik J**, **M Philpott**, **E Donelan**, **MA Stoops**, **TL Roth** and **E Curry**. 2024. Testosterone concentrations in juvenile male polar bears (*Ursus maritimus*). *Theriogenology Wild* 5:100104, <https://doi.org/10.1016/j.therwi.2024.100104>.

## SCIENTIFIC PRESENTATIONS

**Barnes J**, Z Gyimesi and **E Curry**. 2024. Incidental masses during a routine transvaginal reproductive examination in a grizzly bear (*Ursus arctos horribilis*). Society for Theriogenology Conference, Oklahoma City, OK. Poster presentation.

**Barnes J**, **L Vansandt**, J Niederlander, B Mazurek and K Volle. 2024. A transcervical approach for treatment of pyometra in a snow leopard (*Panthera uncia*). Society for Theriogenology Conference, Oklahoma City, OK. Platform presentation.

**Brooks RJ**. 2024. Identifying somatic variation in cryopreserved oak species (*Quercus spp.*). Botanical Society of America Conference, Grand Rapids, MI. Poster presentation.

Cutting A, M Owen, T Bechshoft, R Dinon, A Pagano, SD Petersen, **TL Roth**, W Shellabarger and **E Curry**. 2023. Engaging the zoo & aquarium population of polar bears in scientific studies. Association of Zoos and Aquariums Annual Conference, Columbus, OH. Poster presentation.

**Donelan E**, **E Virgin**, **L Rispoli**, **E Curry** and **T Roth**. 2023. An efficient way to evaluate multiple biomarkers in serum samples. 8th International Society of Wildlife Endocrinology Conference, Jim Corbett National Park, India. Oral presentation.

Godin P and **L Vansandt**. 2023. Gene delivery approach with AMH for single-dose lifetime contraception in female cats. Botstiber Institute for Wildlife Fertility Control. Webinar.

Hall L, **A Miller**, A Franklin, S Fritz, **W Swanson** and **L Vansandt**. 2023. Characterization of 13,14-dihydro-15-keto-prostaglandin f2-alpha metabolite (PGFM) in the sand cat (*Felis margarita*) and Pallas' cat (*Otocolobus manul*) as a non-invasive marker for pregnancy resulting from natural breeding or artificial insemination. 8th Conference of the International Society of Wildlife Endocrinology, Corbett National Park, India. Oral presentation.

King E, M Dubin, W Robinson, J Knox, R Tomas, M Patterson, D Bandara, **A Miller**, **L Vansandt**, **L Lam** and A Byun. 2023. Cat calls: Using vocalizations to estimate estrus in Amur leopards. Annual Conference of Association of Zoos and Aquariums, Columbus, OH. Poster presentation.

Lee M, **A Miller**, **L Vansandt**, X Zhu and **J Barnes**. 2024. Comparison of domestic feline sperm vitality in TES-tris egg yolk (TEY), feline optimized culture medium (FOCM) and TRE-tris-citrate-fructose (TTCF). Society for Theriogenology Conference, Oklahoma City, OK. Poster presentation.

**Miller A**, **L Lam** and **L Vansandt**. 2023. Characterization of basic reproductive biology in Amur leopards (*Panthera pardus orientalis*) using non-invasive monitoring. 8th Conference of the International Society of Wildlife Endocrinology, Corbett National Park, India. Oral presentation.

**Pence VC**, EB Bruns, **M Philpott** and M Duda. 2024. Tools and approaches for identifying and filling gaps in knowledge for the conservation of exceptional tree species. XX International Botanical Congress, Madrid, Spain. Oral presentation.

## SCIENTIFIC PRESENTATIONS (cont'd)

**Pennington PM, EM Donelan, LA Rispoli, C Consago and TL Roth.** 2024. Investigating the role of serum progesterone, estrogen, and testosterone in cyclic and acyclic black rhino. *Reproduction, Fertility and Development* 36(2):160, <https://doi.org/10.1071/RDv36n2Ab21>. International Embryo Technology Society 50th Annual Conference, Denver, CO. Poster presentation.

**Philpott M and V Pence.** 2024. Improving oak micropropagation and cryopreservation through GCC collaborations. XX International Botanical Congress, Madrid, Spain. Oral presentation.

**Philpott M and V Pence.** 2024. Building an oak cryo-bank through botanic garden collaborations. Botanical Society of America Conference, Grand Rapids, MI. Oral presentation.

**Philpott M and V Pence.** 2024. Towards a standardized protocol for ex situ oak conservation using cryobiotechnologies. Center for Plant Conservation Conference, San Diego, CA. Oral presentation.

Reeves A and **W Swanson.** 2024. Application of reproductive sciences for conservation of America's last wild ocelots. Society for Theriogenology Conference, Oklahoma City, OK. Poster presentation.

**Rispoli L, PM Pennington, E Donelan and TL Roth.** 2024. The pros and cons of urethral catheterization for semen collection in rhinos. *Reproduction, Fertility and Development* 36(2):161-162, <https://doi.org/10.1071/RDv36n2Ab24>. International Embryo Technology Society 50th Annual Conference, Denver, CO. Poster presentation.

**Roth TL.** 2024. That was then, this is now – Over two decades of progress in rhinoceros reproductive science and technology. International Embryo Technology Society 50th Annual Conference, Denver, CO. Invited oral presentation.

Rzucidlo C, R Beltran, P Robinson, **E Curry**, A Klink, A Hindle and MR Shero. 2024. Novel application of infrared thermography coupled with Eulerian Video Magnification to monitor health and vital signs in wild pinnipeds. Ocean Sciences Meeting, New Orleans, LA. Poster presentation.

**Swanson W.** 2024. Thirty years of ART for ocelot conservation. Society for Theriogenology Conference, Oklahoma City, OK. Invited oral presentation.

**Swanson W.** 2024. ART in domestic cats – helping to cure human diseases and conserve wild felids. Society for Theriogenology Conference, Oklahoma City, OK. Invited oral presentation.

**Vansandt LM.** 2024. A new way to spay: Single-dose, lifetime contraception in the domestic cat with AMH gene therapy. Society for Theriogenology Annual Conference, Oklahoma City, TX. Invited oral presentation.

**Virgin E, L Rispoli and E Curry.** 2023. Validation of a multiplex immunoassay to assess six serum steroid and thyroid hormones in polar bears across life-history states and environmental contexts. The Wildlife Society Annual Conference, Louisville, KY. Oral presentation

**Winkeljohn M and V Pence.** 2024. Optimizing media to increase lateral bud production in the critically endangered Hinckley's oak (*Quercus hinckleyi*). World Congress on In Vitro Biology, St. Louis, MO. Poster presentation.

**Winkeljohn M, V Pence** and T Culley. 2024. Influence of PVS2 Exposure on Oak Shoot Tip Survival. Society for Cryobiology Conference, Washington, D.C. Poster presentation.

## GRANTS AWARDED

Funding Source: The Institute of Museum and Library Services. Project: Advancing felid reproduction: Integrating health, biomarkers, and assisted techniques. Role: Principal Investigator. Duration: 9/1/24 – 8/31/27. **Amount: \$693,699.**

Funding Source: Michelson Found Animals Foundation. Project: Feline Vector Selection. Role: Principal investigator. Duration: 1/1/24 – 12/31/25. **Amount: \$320,456.**

Funding Source: Michelson Found Animals Foundation. Project: Vectored contraception of adult domestic cats. Role: Principal investigator. Duration: 1/10/24 – 12/31/28. **Amount: \$262,565.**

Funding Source: The Arthur L. and Elaine V. Johnson Foundation. Project: Redefining reproductive health standards in Amur leopards through a multimodal approach. Role: Principal Investigator. Duration: 1/1/24 – 12/31/24. **Amount: \$10,000.**

## CREW WISH LIST

**APPLE PENCIL PRO** – An apple pencil would elevate the outreach material we design to get the public excited about plant conservation! **Cost: \$129.**

**DRYING RACK** – This will decrease the time it takes for our glassware to dry before it can be put away! **Cost: \$198.**

**BRASS 8-INCH SIEVES** – Thousands of our Kentucky Clover have flowered and a good sieve set will help us with the seed cleaning process necessary to preserve them. **Cost: \$287.**

**CRICUT MACHINE** – This machine will help us craft everything from CREW stickers to cat enrichment items. **Cost: \$300.**

**IPAD MINI 6** – Item needed to upgrade the mobile computer-assisted sperm analysis (CASA) systems used by rhino and cat teams. **Cost: \$380/each (three needed).**

**VORTEX** – Vortex mixers are used daily by everyone in the lab to ensure samples are thoroughly mixed. **Cost: \$403/each (two needed).**

**TWO HOTPLATE STIRRERS** – New hotplate stirrers from this decade would greatly improve media preparation. **Cost: \$532 each.**

**NEW MICROPIPETTE SET** – Pipettes become rigid with time and new ones increase our efficiency (and decrease the strain on our hands) when pipetting hundreds of times each day! **Cost: \$1,215.**

**RAININ PIPETEMAN** – A set of pipeteman is needed by the bear team to ensure reagents are accurately measured. **Cost: \$1,317.**

**SURGERY ROOM FACELIFT** – The surgical suite is a key stop for visitors touring CREW. A professional paint job with captivating artwork will enhance the space. **Cost: \$1,500.**

**UPRIGHT LAB FREEZER** – A new freezer in the endocrine lab would hold more and ensure samples stay frozen prior to assessment. **Cost: \$1,900.**

**NEW PH SENSOR/METER** – Essential for proper media preparation and we recently learned that ours is malfunctioning. **Cost: \$3,200.**

**VACUUM PUMP** – A new pump for our lyophilizer will prevent delays in drying bear and cat fecal samples for hormone analysis. **Cost: \$3,836.**

**CREW LOBBY REFRESH** – We'd love to bring our lobby back to its original luster with commercial-grade furniture. **Cost: \$8,200.**

**FIXED ANGLE CENTRIFUGE ROTOR** – Polar bear serum samples must be centrifuged to remove fat prior to analyses and this rotor will ensure samples stay cold during processing. **Cost: \$10,760.**



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