



CREW ReView



Lindner Center for Conservation and Research of Endangered Wildlife • Cincinnati Zoo & Botanical Garden

Fall 2010



Roth's Remarks From Asking to Being Asked



Dr. Terri L. Roth
VP of Conservation & Science and Director of CREW

Scientists new to the field of wildlife conservation research find themselves requesting cooperation and collaboration from many individuals and organizations, often working hard to clarify the importance of their proposed work in hopes of eliciting positive responses. However, if a scientist is successful over time, the direction of those requests is often reversed because the accomplishments of the scientist become known and the value of the work speaks for itself. Such a trend reversal has started to occur at CREW, both because of the achievements of individual CREW scientists and the overall success of the conservation research organization itself. For example, because of his established reputation as an expert exotic cat scientist, Dr. Bill Swanson was asked to help develop a carnivore research program at the Al Ain Wildlife Park and Resort in the United Arab Emirates. Similarly, because of her expertise and success in plant tissue culture, Dr. Valerie Pence was solicited by the U.S. Fish & Wildlife Service to propagate the Autumn buttercup for reintroduction in Utah. CREW Research Associate Helen Bateman was approached to take over an otter research grant by another scientist who could no longer lead the project, and Dr. Monica Stoops was asked to artificially inseminate two Indian rhinos at the Wilds this past winter. Finally, because of my long-term relationship working in Indonesia on rhino conservation issues, I was invited by the the Rhino Foundation of Indonesia to help investigate the recent Javan rhino deaths in Ujung Kulon National Park. These are just a few of many requests we have received, and in all of these cases, CREW staff willingly stepped up and assisted because it was the right thing to do for wildlife and the efforts directly fit with our mission: Saving Species With Science. Besides, it sure feels nice being asked instead of being the one always doing the asking.



Contents

Roth's Remarks.....	1
Plants Wake Up in Endangered Species Beds.....	2
How Low Can We Go?.....	2
Polar Bear Plunge.....	3
African Violets on Ice.....	3
Signature Project Updates	
Tasty Buttercups.....	4
Sandworts Succeed in Sand.....	4
Of Home Runs & Near Misses.....	5
Javan Rhino Investigation.....	5
Successful Science with Sad Outcome.....	6 & 7
Project Updates	
Whiz-Bang Assay for Elephants.....	8
Future Teen Scientists.....	8
CREW Star Scientists.....	9
A New ARTist at CREW.....	9
Scientific Highlights.....	10
Wish List.....	10
How You Can Help	
Friends of CREW.....	11
Freeway's ForeverFund.....	11
Rowe Hoffman's Legacy.....	12

Plants Wake Up in Endangered Species Beds

Four new raised beds have been built behind the CREW building by the Zoo's Horticulture Department for propagating endangered plants. These four beds are providing over 300 square feet of growing space for endangered plants propagated both by CREW and Horticulture. They can provide both sun and shaded habitats, and soils and moisture can be altered to match the conditions preferred by individual species. For example, a bog area supports the state threatened Heart-leaved plantain (*Plantago cordata*), which naturally grows on stream banks, while the Northern wild monkshood (*Aconitum noveboracense*) is provided shade and soil to match its sandy gorge habitat. The monkshood, which has been propagated through tissue culture at CREW, is destined for out-planting at a native site in the Gorge Metroparks in Akron. Plants of this species have thus far shown poor survival when outplanted, and it is hoped that by growing them to a larger size in the Endangered Species Beds, they will be more successful in surviving the transition to the wild. Other endangered species currently in the beds that were propagated by tissue culture include Runyon huaco (*Manfreda longiflora*), Stern's meadow (*Mesaspis canescens*), and Todsén's pen-nuryal (*Hedeoma todsenii*). The beds are also supporting traditional methods of propagation, as cuttings from several genotypes of Short's goldenrod (*Solidago shortii*) and Virginia spirea (*Spiraea virginiana*) are being used by the Horticulture Department to propagate those federally endangered species. The beds will expand the abilities of CREW and Horticulture for producing healthy, robust individuals of a number of endangered plants for a variety of projects.



Endangered Species Bed

How Low Can We Go? (Minimizing Sperm Numbers for Artificial Insemination in Cats)

Artificial insemination (AI) is a potentially invaluable technique for propagation and genetic management of endangered cat species. CREW scientists are testing a novel technique for AI in domestic cats that may help to increase pregnancy success with AI in endangered felids. This new approach targets the oviduct as the site of insemination as an alternative to the standard insemination site in the uterus. We suspect that oviductal AI may be preferable when a semen sample contains low numbers of motile spermatozoa – a problem frequently encountered with some wild cat species. To test this hypothesis, we compared pregnancy percentages in domestic cats after oviductal versus uterine AI using very low insemination doses (~1 million motile sperm/dose). Nineteen cats were inseminated via laparoscopy with semen being deposited into one oviduct and one uterus of each female. For each AI, semen from two different males was used for a different insemination site within each individual female. Our collaborators at the University of California conducted genetic analysis to identify the sire of the resulting offspring and allow determination of fertilization percentages for each insemination site. Amazingly, 14 of 19 females (~74%) became pregnant, despite AI with such incredibly low sperm numbers. Genetic analysis indicated that most (73%, 36/49) of the offspring resulted from oviductal insemination, and most (81%) of the pregnancies had one or more offspring that were produced by oviductal AI. These findings suggest that oviductal AI is superior to uterine AI when few spermatozoa are available. Our future studies will assess the impact of sperm freezing on oviductal AI success as well as investigate the initial application to endangered nondomestic cats.



The Polar Bear Plunge

When most people hear the term "polar bear plunge", they imagine a group of slightly addled people wearing next to nothing in sub-zero weather, jumping into some icy pool of water. However, CREW has a whole new definition of this term. The last step in the process of sperm cryopreservation is to plunge the sample into liquid nitrogen within CREW's CryoBioBank, and in 2010, the first polar bear sperm samples made that plunge. Polar bear sperm banking is the latest expansion of our Polar Bear Conservation Program, and like all other aspects of the program, could not be achieved without the assistance of other zoos across the nation. CREW scientists were offered the opportunity to perform semen collection procedures on three male polar bears at the Reid Park Zoo (Tucson, AZ), Brookfield Zoo (Chicago, IL) and Toledo Zoological Gardens (Toledo, OH) and a sperm rescue attempt on one additional male that had to be euthanized due to liver cancer at the Denver Zoological Gardens (Denver, CO). Of these four attempts, two yielded sperm samples that were cryopreserved and now represent the genesis of CREW's polar bear sperm bank. Although there is still a lot to learn about collecting, processing and freezing this species' sperm, it was encouraging that post-thaw evaluations of these samples revealed that about 20% of the cells survived and were motile. Fortunately, the odds of people surviving their own polar bear plunge are even better. (Project supported, in part, by the Shumaker Family Foundation.)



Polar bear sperm

African Violets on Ice

Despite its widespread use as a houseplant, the African violet is critically endangered in its native habitat of southern Kenya and northern Tanzania. While the houseplant represents a multitude of ornamental varieties that have been bred from one or two species, the six wild species of African violets (previously thought to consist of 20 species of the genus *Saintpaulia*) are threatened by loss of habitat in the forests of east Africa. CREW's African Violet Conservation Fund has been supporting efforts that work to conserve and protect these species, with funds from donations and the sale of African violet notecards and test tube plants (<http://www.cincinnati.zoo.org/earth/CREW/AfricanVioletConservationFund.html>). But, research at CREW is also working to advance the technologies that can be utilized for the conservation of these species.

One example has been the application of cryopreservation methods to shoot tips of several species of *Saintpaulia* at CREW. African violet leaves produce numerous small buds when placed on a tissue culture medium in the presence of plant hormones. These tiny buds can be dissected from the leaves and used for cryopreservation. In several experiments in the CREW Plant Lab, the procedure of encapsulation dehydration successfully preserved shoot tips of *Saintpaulia ionantha* subspecies *velutina*, *grotei*, *rupicola*, and *ionantha* through exposure to liquid nitrogen, and samples of these shoot tips were cryopreserved and stored in CREW's CryoBioBank. While seeds of African violets also can be cryopreserved, methods for tissue cryopreservation could be useful when researchers in remote areas are monitoring plants that are not producing seeds. A small piece of leaf could be removed from the plant, shipped to a laboratory, and used as the start for tissue cultures that could then be cryopreserved, maintaining that genetic line into the future.



African Violet shoot tips growing after being cryopreserved

Signature Project Updates

Tasty Buttercups

On an early June morning in Utah, researchers from CREW, The Arboretum at Flagstaff, the Nature Conservancy, and the U.S. Fish & Wildlife Service met in a field along Highway 98 in south central Utah to introduce 45 new plantlets of the Autumn buttercup to a site on the Sevier Valley Preserve. Conditions had been dry, but moisture in the soil seemed adequate from the underlying high water table of this wet meadow. There was, however, a thick layer of thatch throughout the area formed by a native rush that had become dominant at the site. It is thought that when the site was protected and grazing was eliminated, this rush found an opportunity to take over much of the habitat.

These Autumn buttercup plants were propagated through tissue culture at CREW and sent to Flagstaff in 2008 and early 2009. There they acclimatized to local conditions and became robust, healthy plants. Several volunteers and interns helped with the outplanting, and a few plants were held back at The Arboretum at Flagstaff in order to begin an ex situ population there.

The plants appeared well adapted and survived during their initial weeks in the ground. However, later in the summer when the site was re-examined, the plants seemed to have disappeared without a trace. Further investigation revealed that voles might have been responsible. It is thought that perhaps the vole population has increased due to the thick layer of thatch provided by the rush. As a result of this outcome, emphasis will now be placed on building up the ex situ population at Flagstaff and gaining a better understanding of the causes (and cures!) for the predation that is now threatening the future of buttercups on the preserve. (Project supported, in part, by the U.S. Fish & Wildlife Service).



Sandworts Succeed in Sandy Soils under Stony Shelters



Sandworts

In late July, CREW and Zoo staff joined the U.S. Forest Service for a visit to the Cumberland sandwort experimental outplanting in the Daniel Boone National Forest in southern Kentucky. The goals were to monitor the population, collect environmental data, and provide a few additional plants from CREW. We found that plants from the previous outplantings in 2005 and 2009 continue to grow, flower, and produce seedlings. The original outplanting tested 6 sites within the sandstone rockhouse habitat, and two of these successfully supported the growth of the introduced plants. Previous qualitative measurements were made of light and moisture, but this visit allowed more quantitative measurements of temperature, light, humidity, and soil pH. Whereas temperature, humidity and pH did not vary much between sites, the one factor that appeared to correlate with survival of the sandworts was a higher level of light. While the entire rockhouse is a fairly shaded environment, there are differences in light levels in the microhabitats that were originally chosen for the plants. Microhabitats with relatively higher light levels best supported the plants, and those areas are the ones that have been the focus of subsequent outplantings. This federally endangered species is found only in the moist, sandy soils under sandstone overhangs in the forests of southern Kentucky and northern Tennessee, all within a 15 mile radius of the central location in Tennessee. The work of CREW and the Forest Service has demonstrated that in vitro propagated plants can be successfully used to establish or re-establish populations of this species, should this be necessary for the recovery of the species. (Project supported, in part, by the U.S.D.A. Forest Service).

Lindner Center for Conservation and Research of Endangered Wildlife • Cincinnati Zoo & Botanical Garden

CREW Review

Of Home Runs and Near Misses

In conservation research, as in baseball, sometimes you hit a home run and sometimes you have near misses. In December of 2009, scientists from CREW and the University of Illinois definitely cleared the fences with the birth of the first sand cats produced through in vitro fertilization (IVF) and embryo transfer in collaborative research at the Al Ain Wildlife Park & Resort (AWPR) in the United Arab Emirates. The transferred embryos were created using oocytes and semen collected from the resident sand cats housed at AWPR. In a follow-up study in June 2010, additional IVF embryos were transferred into three female sand cats at AWPR. Based on an ultrasound exam conducted ~40 days later, pregnancies (with fetal heartbeats) were observed in two of the three females with the births predicted to occur by mid-August. Importantly, these transferred embryos resulted from IVF using frozen semen obtained from two sand cat males housed at the St. Louis Zoo and Cincinnati Zoo & Botanical Garden. These two pregnancies were the first in any wildlife species in which frozen sperm had been transported internationally to connect two regional zoo populations. As the expected date of birth approached, anticipation grew. Unfortunately, no kittens were ever observed, suggesting that both females lost their developing fetuses sometime during the last month of pregnancy. Although the final outcome was disappointing, this 'near-miss' was based on a foundation of sound conservation science. We remain confident that our future embryo transfers will have greater success in producing healthy sand cat kittens. These research efforts are integral to developing global management programs for endangered species, a primary goal of CREW's National Leadership Grant from the Federal Institute of Museum and Library Services (IMLS).



Sand cat kittens produced by embryo transfer

CREW Assists with Javan Rhino Investigation



Javan rhino investigative team (in the rain)

CREW's work with Sumatran and Indian rhinos is broadly known, but recently CREW became involved with the third Asian rhino species, the Javan rhino. Approximately 50 Javan rhinos remain in the world and 90% of these live in Ujung Kulon National Park, Java, Indonesia. For many years, conservationists have kept the Javan rhinos safe from poachers while waiting for the population to grow, but instead of increasing, these forest residents appear to be decreasing in number. Therefore, a large-scale survey was conducted by the Rhino Protection Units in the park using camera traps to document individual rhinos and establish a more accurate population size. Sadly, during that effort, two rhino skeletons were found. Because the dead rhinos appeared to be younger animals and were not poached (their horns were still present), the rangers became concerned that a potential infectious disease outbreak was occurring in the park. In response, CREW scientists trekked in the rain into the park with the Rhino Protection Units this past April to collect soil samples and conduct some field tests for infectious diseases. Some testing is still pending, but it seems unlikely that the precise cause of the rhinos' demise will be determined. However, we are hoping that our research will at least rule out the likelihood that some of the more lethal infectious diseases were involved.

Lindner Center for Conservation and Research of Endangered Wildlife • Cincinnati Zoo & Botanical Garden



Successful Science with a Sad Outcome



Nikki

On October 26th, 2010 the newest CREW baby entered the world at the Cincinnati Zoo & Botanical Garden, but not in the manner we had hoped. Indian Rhino, Nikki went into labor about 3:00 AM that Tuesday morning and our Zoo Volunteer Observers alerted staff exactly as they were trained to do. Staff arrived at CREW where they continued to monitor Nikki remotely by camera making certain there were no distractions in the barn that might delay delivery. The calf finally started to emerge at 5:51 AM and was delivered by 6:06 AM. However, the calf was not moving or breathing. By the time the calf was delivered, rhino keepers were at the barn and immediately separated Nikki from her calf so that the calf could be assessed. Just a flutter of a heartbeat could be felt, and the team immediately went to work resuscitating the newborn. As CPR was administered, the heartbeat became increasingly stronger. The staff simply refused to give up, and finally, after several injections of drugs from the veterinary team, the calf miraculously started to move ever so slightly. When the calf finally took an independent breath, the team cried out in joy, and spent the next few hours watching in awe as the calf made progress in baby steps.



Ultrasound image of Nikki's fetus at day 90 of its 491 day gestation.

The next concern was getting nourishment into the calf's weakened body. Mother Nikki, true to form, cooperated beautifully while CREW staff and keepers collected milk into a bottle that could be offered to the calf until strong enough to stand and nurse on his own. Unfortunately, that moment was never to come as the little guy became less active throughout the afternoon, finally undergoing cardiac arrest at 7:15 PM from which no amount of drugs or heroic acts could bring him back.

As with all CREW babies, years of research went into bringing this Indian rhino calf into the world. However, we have all learned over the years that even when the science is successful, the final outcome is often out of our control. For CREW scientist Dr. Monica Stoops and her team, such an outcome has unfortunately now been experienced twice.

Four years ago, Nikki was the first rhino in the world to become pregnant following artificial insemination (AI) with frozen-thawed sperm. Sadly in January 2009, after completing a full term pregnancy, approximately 50% of Indian rhinos that become first time mothers over the age of 10, such as Nikki, experience a stillbirth. Despite the devastating outcome, CREW scientists were optimistic Nikki would become pregnant by AI again, and that this subsequent pregnancy would end with a successful live birth. It was not long before



Staff relaxes slightly after 117 lb male calf breathes on his own following resuscitation.

on June 24, 2009 and one day later Dr. Stoops verified Nikki had successfully ovulated. An ultrasound exam conducted 18 days later confirmed the presence of an embryonic vesicle in Nikki's uterus. Everyone was elated that Nikki was pregnant again!

Not only did Nikki's second pregnancy prove the science of artificial insemination developed by CREW scientists was repeatable, but it also proved the fertility of frozen-thawed sperm from a second male Indian rhino by the name of Vinnu. In 2005, CREW scientists collected and cryopreserved sperm from Vinnu at the Bronx Zoo. Vinnu's sperm remained frozen at -320°F in CREW's CryoBioBank until it was thawed four years later and used to inseminate Nikki.

Despite the sad outcome with the death of the calf, CREW's groundbreaking AI research represents an important and new step in managing captive Indian



Two days after giving birth, Nikki was back out enjoying her exhibit.

Dr. Stoops and her team attempted to repeat the successful AI procedure they had developed. Despite the fact Nikki exhibited estrous cycles during the year following the stillbirth, ultrasound exams revealed Nikki was not successfully ovulating. Without an egg released into the reproductive tract, Nikki had no chance of getting pregnant. Therefore, in January 2009, Nikki was treated with hormones in an attempt to induce ovulation. The trial was successful in triggering ovulation and was repeated in two subsequent estrous cycles. Artificial insemination procedures were performed in conjunction with some of these trials, but Nikki failed to conceive. Then, in June 2009, Dr. Stoops and her team decided to again allow Nikki to ovulate on her own without hormone injections. A single AI procedure was conducted on June 24, 2009 and one day later Dr. Stoops verified Nikki had successfully ovulated. An ultrasound exam conducted 18 days later confirmed the presence of an embryonic vesicle in Nikki's uterus. Everyone was elated that Nikki was pregnant again!



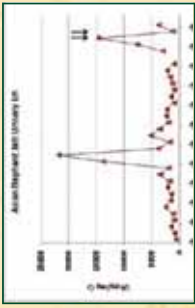
Despite making progress in baby steps throughout the morning, the calf passed away 13 hours later.

rhinos. By producing offspring from non- or under-represented individuals, CREW can help to ensure a genetically healthy captive population of Indian rhinos exists in the future. Furthermore, CREW has demonstrated that assisted reproduction can be used for genetically matching rhino pairs instead of moving rhinos across the country, a primary goal of CREW's National Leadership Grant from the Federal Institute of Museum and Library Services (IMLS). Despite this heartwrenching loss, CREW's science is sound, and we will persevere in our mission: Saving Species With Science.



CREW's New Whiz-Bang Assay for Elephants

Back in 1998, the Cincinnati Zoo & Botanical Garden successfully produced the first Asian elephant calf ever conceived and born in Ohio. Today, the Zoo is hoping history will repeat itself. Our bull elephant named 'Sabu' returned to the zoo in 2007 to be paired up with his previous mate, 'Jati'. Their reunion was a happy one, but pregnancy has not come easy this time around. Bull elephants are solitary by nature, typically meeting up with females only to breed. Because the female elephant's reproductive cycle is four months long, opportunities for breeding are limited each year. Despite the fact that Sabu and Jati are relatively compatible, their breeding activity has ranged from multiple matings weeks before or after ovulation to no mating at all during the entire cycle.



Urinary LH profile in female Jati showing 2 peaks in LH occurring 18 days apart. Arrows denote days when Jati and Sabu bred.

Predicting more precisely when ovulation is likely to occur could help the Elephant Keeper staff time their introductions so that any matings would be during the female's fertile period. Exclusive to female elephants are two peaks of luteinizing hormone (LH) release that occur approximately 21 days apart, but only the second LH peak induces ovulation. Because of the succinct timing of the second LH peak relative to the first, ovulation can be predicted accurately based on the detection of the first LH peak. However, LH has only been measured in elephant serum samples to-date, and collecting daily blood samples is labor intensive and not ideal for the elephants. CREW scientists recently discovered a novel method to measure LH in urine from Asian elephants. In July 2010, CREW scientists measured the first LH peak, followed 18 days later by the second LH peak, in urine samples collected from Jati. Elephant keepers utilized the information to time breeding introductions between Jati and Sabu, and the pair was observed breeding the day of and the day after the second LH peak. In developing a urinary LH assay for elephants, CREW scientists hope to improve the accuracy of both timed introductions for natural breeding and artificial insemination in elephants.

Scientists for the Future Teens Making a Difference

This fall, seven high school teams representing Woodward Career Technical Center, Mt. Healthy HS, Seven Hills HS, Roger Bacon HS and South Dearborn HS in Indiana are participating in Polar Bears International's (PBI) Project Polar Bear Contest, a way for small groups of teens to make a BIG difference! These teenagers are challenged to develop community projects that will reduce the carbon dioxide (CO₂) load in the atmosphere. Innovative team projects range from designing an I-Phone/i-Pad application to track and reduce energy usage, to sponsoring plant adoptions and tree plantings to help absorb CO₂ in the atmosphere. In addition, Michael Young, a Seven Hills teen, represented the Cincinnati Zoo & Botanical Garden (one of PBI's 30 Arctic Ambassador Centers) at their Teen Leadership Camp in Churchill, Manitoba, in October 2010.

CREW has linked with PBI and their researchers on several educational initiatives as part of CREW's own hands-on, inquiry-based overnight programs for high school students-Scientists for the Future. The ultimate goal of these programs is to engage students in hands-on scientific inquiry and to stimulate participants to take real action in their daily lives that will help them become better stewards of the environment. The teens are enthusiastic about their involvement and share similar feelings. "We are learning so much about polar bear research, the effect of melting Arctic ice and the plight of polar bears in the wild. Now it's up to us to get our communities involved because together WE CAN MAKE A DIFFERENCE". (Scientists for the Future is supported by the Shumaker Family Foundation and the William P. Anderson Foundation.)



Future scientists

CREW's Star Scientists Honored

The Cincinnati Zoo & Botanical Garden is proud of the good work CREW scientists perform day in and day out as they strive to save endangered plants and animals from extinction. However, recognition by peers and external organizations is even more rewarding and certainly leads third party validation to the achievements of CREW staff. This past year was an exceptional year of honors for CREW scientists. In February, Research Associate Bernadette Plair received a Minority in Research Science Trailblazer Award at the BEYA Science, Technology, Engineering and Math (STEM) Global Competitiveness Conference. The award recognizes those who are demonstrating outstanding performance that will shape the future course of science and technology. In March, Director of Plant Research Dr. Valerie Pence was pleasantly surprised at the Center for Plant Conservation's annual meeting when she was presented with a Conservation Star Award.

These awards are given to those who demonstrate the concern, cooperation and personal investment needed to conserve our imperiled native plants. Receipt of this award reflects the significant impact CREW's scientists have had on the effort to save many of North America's endangered plants. In May, CREW Director Dr. Terri Roth was chosen as one of eight YWCA Career Women of Achievement in the Greater Cincinnati area for her efforts in leading a successful conservation organization at the Cincinnati Zoo & Botanical Garden and for her accomplishments in breeding and conserving the Sumatran rhinoceros. Finally, in September, CREW Reproductive Physiologist Dr. Monica Stoops was chosen as one of the YWCA Rising Stars in the community because of her excellence in conservation science, particularly with Indian rhinos, and the potential she demonstrates for a successful lifelong career. Although CREW scientists are passionate about their mission: Saving Species with Science, and will carry on with or without winning awards, it is still a tremendous honor and inspiration for these scientists to learn that others recognize and appreciate their efforts and all that they achieve.



Bernadette Plair receiving Research Science Trail Blazer Award



Dr. Valerie Pence with Conservation Star Award



Dr. Monica Stoops with her Rising Star Award



Dr. Terri Roth (fifth from left) with Alfre Woodard and six other YWCA Career Women of Achievement

A New ARTist at CREW

Assisted Reproductive Technology (ART) is a scientific field comprised of cutting edge techniques that are used to conserve and enhance the genetics of animal populations. For example, through CREW's work with Brazilian ocelots, kittens have been born following both artificial insemination (AI) and embryo transfer (ET), resulting in the infusion of valuable genetics back into the dwindling population. However, achieving consistent success following ART in imperiled small cats continues to be a challenge. With significant funding from the Institute of Museum and Library Services, CREW staff is currently investigating the ability and benefits of using genome resource banking and ART to manage and breed endangered rhinoceroses and small cats. Joining CREW in August, post-doctoral trainee Dr. Colleen Lambro, is focusing on optimizing ART for ocelot conservation. The current goals of her project are improving pregnancy success with AI while reducing the amount of semen needed for insemination. Building on our findings in domestic cats, the primary focus will be to assess the relative advantages of oviductal AI over the more common intrauterine AI methods. She also will be studying a new plant-based freezing medium that was developed by CREW as an alternative to traditional semen extenders containing animal proteins such as bovine serum and egg yolk. These animal protein based extenders have been under scrutiny by regulatory agencies for the possibility of disease transmission, and a plant-based medium should make it easier and safer to transport frozen semen worldwide. Dr. Lambro received her BS degree from Cornell University and her DVM from Kansas State University. She then completed a small animal medicine and surgery internship at Louisiana State University prior to accepting the post-doc position at CREW. "I'm thrilled to be a member of CREW. I dreamed about working in this field one day, and now I'm doing something I enjoy while interacting with a dedicated and supportive team," says Dr. Lambro.



Dr. Colleen Lambro

CREW Scientific Highlights

tion programs. Proceedings of the 10th Annual Animal Behavior Management Alliance Conference. Oral presentation, Pittsburgh, PA.

Conforti V, J Reeves, D de Avila, R Bogden, K Stormo, J Newsom, H Bateman, and WF Swanson. 2010. Domestic cat contraceptive using a single-dose, micro-encapsulated LHRH vaccine. Proceedings of the Society for the Study of Reproduction, p. 6 (abstract 26). Oral presentation, Milwaukee, WI.

Herrick J, F Mehrdad, M Campbell, G Lev-ens, T Moore, K Benson, J D'Agostino, G West, D Oleson, R Coke, S Portacio, K Leiske, C Kreider, P J Polumbo and WF Swanson. 2010. Feline immunodeficiency virus (FIV) in wild Mongolian Pallas' cats. Special issue: Feline Retrovirus Research and Genomics Symposium. Veterinary Immunology and Immunopathology 134:90-95.

Herrick JR, JB Bond, M Campbell, G Lev-ens, T Moore, K Benson, J D'Agostino, G West, D Oleson, R Coke, S Portacio, K Leiske, C Kreider, P J Polumbo and WF Swanson. 2010. In vitro methods for ex situ conservation: Possibilities and challenges. In *In Vitro Cellular and Developmental Biology-Plant* 46 (Suppl.) 252. Twelfth World Congress of the International Association of Plant Biotechnology and 2010 In Vitro Biology Meeting of the Society for In Vitro Biology. Invited keynote lecture, St. Louis, MO.

Pence VC. 2009. The possibilities and challenges of in vitro methods for conservation. Plant Conservation for the Next Decade: A Celebration of Kew's 250th Anniversary. Abstracts, <http://www.kew.org/science/anniversary-conference/Kew-250thConference-AbstractBook>. Gardens, Kew, London.

Pence VC. 2010. In vitro methods for ex situ conservation: Possibilities and challenges. In *In Vitro Cellular and Developmental Biology-Plant* 46 (Suppl.) 252. Twelfth World Congress of the International Association of Plant Biotechnology and 2010 In Vitro Biology Meeting of the Society for In Vitro Biology. Invited keynote lecture, St. Louis, MO.

Pence VC. 2010. Phytotissue banking—Meeting the challenge of ex situ conservation for species without bankable seeds. Fourth Global Botanic Gardens Congress. Addressing global change: A new agenda for botanic gardens. Invited oral presentation, Dublin, Ireland.

Roth TL, KM Mackinnon, and MA Stoops. 2009. Non-invasive fecal hormone monitoring for assessing reproductive activity and diagnosing pregnancy in the polar bear (*Ursus maritimus*). *Advancing Bear Care 2009 Conference Proceedings*, p. 19. Bear Care Group conference. Invited oral presentation, San Francisco, CA.

Swanson WF. 2010. In vitro fertilization and embryo transfer in rare felid populations. Proceedings of the Society for Reproduction and Fertility, p. 25 (abstract S7). Invited oral presentation, Nottingham, UK.

GRANTS AWARDED
Funding Source: Morris Animal Foundation. Project: Conjunctival Prevalence and Genetic Sequence of Feline Herpesvirus in Non-domestic Felids in US Zoos. Role: Co-Investigator. Duration: 10/10-09/11. Amount: \$5,520.

Funding Source: Shumaker Family Foundation. Project: Polar Bear Conservation Project.

BOOK CHAPTERS
Wildt D, W Swanson, J Brown, A Silva and A Vargas. 2010. Felids ex situ for managed programs, research and species recovery. In: *Macdonald DW, AJ Loveridge (eds). Biology and Conservation of Wild Felids.* Oxford, UK: Oxford University Press; Pp. 217-235.

PEER-REVIEWED PUBLICATIONS
Brown MA, B Mumfries, JL Troyer, S Ross, R Sellers, A Fine, WF Swanson, M Roelke and S J O'Brien. 2010. Feline immunodeficiency virus (FIV) in wild Mongolian Pallas' cats. Special issue: Feline Retrovirus Research and Genomics Symposium. Veterinary Immunology and Immunopathology 134:90-95.

Herrick JR, JB Bond, M Campbell, G Lev-ens, T Moore, K Benson, J D'Agostino, G West, D Oleson, R Coke, S Portacio, K Leiske, C Kreider, P J Polumbo and WF Swanson. 2010. In vitro methods for ex situ conservation: Possibilities and challenges. In *In Vitro Cellular and Developmental Biology-Plant* 46 (Suppl.) 252. Twelfth World Congress of the International Association of Plant Biotechnology and 2010 In Vitro Biology Meeting of the Society for In Vitro Biology. Invited keynote lecture, St. Louis, MO.

Pence VC. 2009. The possibilities and challenges of in vitro methods for conservation. Plant Conservation for the Next Decade: A Celebration of Kew's 250th Anniversary. Abstracts, <http://www.kew.org/science/anniversary-conference/Kew-250thConference-AbstractBook>. Gardens, Kew, London.

Pence VC. 2010. Phytotissue banking—Meeting the challenge of ex situ conservation for species without bankable seeds. Fourth Global Botanic Gardens Congress. Addressing global change: A new agenda for botanic gardens. Invited oral presentation, Dublin, Ireland.

Roth TL, KM Mackinnon, and MA Stoops. 2009. Non-invasive fecal hormone monitoring for assessing reproductive activity and diagnosing pregnancy in the polar bear (*Ursus maritimus*). *Advancing Bear Care 2009 Conference Proceedings*, p. 19. Bear Care Group conference. Invited oral presentation, San Francisco, CA.

Swanson WF. 2010. In vitro fertilization and embryo transfer in rare felid populations. Proceedings of the Society for Reproduction and Fertility, p. 25 (abstract S7). Invited oral presentation, Nottingham, UK.

GRANTS AWARDED
Funding Source: Morris Animal Foundation. Project: Conjunctival Prevalence and Genetic Sequence of Feline Herpesvirus in Non-domestic Felids in US Zoos. Role: Co-Investigator. Duration: 10/10-09/11. Amount: \$5,520.

Funding Source: Shumaker Family Foundation. Project: Polar Bear Conservation Project.

CREW ReView

Friends of CREW

Our sincere gratitude to the following who gave \$100 or more in 2009:

- \$10,000+ donors**
Fritchfield Tropical Botanic Garden
Mr. and Mrs. Mark Feitling
AZA Conservation Endowment Fund
Carolyn and Ralph Friedman
Shirley Gallagher
Sharon & Robert Gill Family Fund
Mr. and Mrs. H. Rowe Hoffman
Institute of Museum & Library Services
KeyBank
Mohammed Bin Zayed Spectis Aquariums - Conservation Endowment Fund
Conservation Fund
Ms. Janet R. Muckelbauer
Marion C. Rich Estate
Scripps Howard Foundation
Shumaker Family Foundation
Wildco/Bulldog Incorporated
Mrs. Mae S. Wood
Young Family Foundation
- \$5,000 - \$9,999 donors**
William P. Anderson Foundation
Archibald Biological Station
Michael and Tucker Coombe
Mrs. and Mrs. Thomas E. Bell
Ludie and Richard Duval Special Fund
Dr. and Mrs. Roger W. Gress
Mr. and Mrs. Roger W. Gress
The David J. Joseph Company
Miller-Vaughan Group
Morris Animal Foundation
Steve and Margie Nordlund-Conaway
- \$2,500 - \$4,999 donors**
Dallas W. and Helen B. Bowyer
Chantrelle Trust
Environmental Protection Agency
Mr. and Mrs. William J. Janowicz
Mr. and Mrs. J. David Roberts
Dr. Emil, Richard D. William S. Swanson
- \$1,000 - \$2,499 donors**
Agaie Investments Services, Inc.
Anonymous No. 28 Fund of The Greater Cincinnati Fund
Alan and Ann Beach
Mrs. Elizabeth Beiderman
Mr. and Mrs. Timothy R. Brown
Center for Plant Conservation
Ms. Ine de la Motte
Charles M. Dolger and Karen M. Abel
- \$500 - \$999 donors**
Mr. Arnie A. Alperstein, Ms. Audrey, Alan
American Association of Zoo Veterinarians
Ms. Clem Dantic
Tom and Bev Barden
Mr. and Mrs. Robert A. Bechler
Mrs. Mary E. Dockson
Henry Schneider Philanthropic Fund
Mr. and Mrs. Joseph N. Green
Mr. and Mrs. Jeremy S. Hilton
Partisan Pictures, Inc.
Mr. Bobbie N. Ramsey
Redwood Creek Wines
Ms. Debbie Reichel and Mr. Vince Drog
- \$200 - \$499 donors**
Ritter Family Foundation
Mr. and Mrs. Stewart F. Hall
MEEE-Sharp, Jack M. H. H. Habsal
Richard J. Hurdsey
Mr. and Mrs. Jeffrey P. Harris
Andrew T. and Tina Howling of the Greater Cincinnati Area
Dr. Evelyn V. Hess and Dr. Michael Howatt
Mrs. Ann Hannah McKelvey
Mr. Robert A. Ayer
Mr. and Mrs. Peter G. Ayers
Mrs. Kelley Bullock and Ms. Betsy Matthews
Mr. Bernam A. Baloun and Ms. Elaine Kasper
Mr. Robert Barbella
Barbaram Zulliger
Lois G. Benjamin
Ms. May A. Binder
Ms. Catherine B. Black
Glen and Donna Boutlier
Ms. Keanie S. Browne
Gary and Angie Butterbaugh
Dr. Mark C. Campbell
Kenard Carol Stecher
Tom and Dee Stegman
Mr. Ralph E. Stevens
Mr. and Mrs. David E. Taylor
Dr. and Mrs. Kenneth Tompkins
Mr. and Mrs. James L. Wainscott
- \$100 - \$199 donors**
John and Linda Haise
Mr. and Mrs. Stewart F. Hall
Dr. and Mrs. H. B. Habsal
Richard J. Hurdsey
Mr. and Mrs. Jeffrey P. Harris
Andrew T. and Tina Howling
Dr. Evelyn V. Hess and Dr. Michael Howatt
Mrs. Ann Hannah McKelvey
Mr. Robert A. Ayer
Mr. and Mrs. Peter G. Ayers
Mrs. Kelley Bullock and Ms. Betsy Matthews
Mr. Bernam A. Baloun and Ms. Elaine Kasper
Mr. Robert Barbella
Barbaram Zulliger
Lois G. Benjamin
Ms. May A. Binder
Ms. Catherine B. Black
Glen and Donna Boutlier
Ms. Keanie S. Browne
Gary and Angie Butterbaugh
Dr. Mark C. Campbell
Kenard Carol Stecher
Tom and Dee Stegman
Mr. Ralph E. Stevens
Mr. and Mrs. David E. Taylor
Dr. and Mrs. Kenneth Tompkins
Mr. and Mrs. James L. Wainscott
- \$50 - \$99 donors**
Mr. Arnie A. Alperstein, Ms. Audrey, Alan
American Association of Zoo Veterinarians
Ms. Clem Dantic
Tom and Bev Barden
Mr. and Mrs. Robert A. Bechler
Mrs. Mary E. Dockson
Henry Schneider Philanthropic Fund
Mr. and Mrs. Joseph N. Green
Mr. and Mrs. Jeremy S. Hilton
Partisan Pictures, Inc.
Mr. Bobbie N. Ramsey
Redwood Creek Wines
Ms. Debbie Reichel and Mr. Vince Drog
- \$20 - \$49 donors**
The GE Foundation

Freeway's Forever Fund

CREW announces the establishment of a new, special endowment fund that allows individuals to memorialize or honor a special pet, animal or occasion. Contributions to Freeway's Forever Fund will be restricted to CREW's endowment and will support CREW's efforts: Saving Species With Science in Perpetuity. This Fund was initiated by a dear CREW supporter who lost her beloved dog, Freeway, just before Freeway's 16th birthday. CREW scientists realize that there are many people who for a variety of reasons want to do something to honor a beloved animal and adored companion, and Freeway's Forever Fund provides the perfect opportunity for folks to do just that. What better way to honor that exceptional animal in your life than through a gift that will continue to help save wildlife from extinction in perpetuity? (To make a gift to this special fund, make check payable to Cincinnati Zoo CREW/Freeway's Forever Fund or call the Development office at 513-487-3327 for additional information.)



Beloved pet Freeway



Cincinnati Zoo & Botanical Garden
 Center for Conservation and Research of Endangered Wildlife
 3400 Vine Street
 Cincinnati, Ohio 45220-1399 USA

NON PROFIT
 ORGANIZATION
 U.S. POSTAGE PAID
 CINCINNATI, OHIO
 PERMIT #1505

Rowe Hoffman's Legacy

CREW scientists will be the first to tell you that we could not accomplish what we do without the generous support of our donors. Perhaps one of the clearest examples of a single individual's enormous impact on CREW is the story of Mr. Rowe Hoffman and his inspirational philanthropy. Beginning in 1996, until his recent passing in July 2010, Rowe provided CREW with an annual gift that supported a post-doctoral fellow each year. Not only did this support have a tremendous, positive impact on what we were able to accomplish over the years, but Rowe's generosity also gave these young scientists an opportunity of a lifetime. The years these individuals spent training at CREW prepared them for life-long careers conducting research that will help save endangered species from extinction. Because of Rowe, these young scientists were able to pursue their dreams, and in return, there is more hope for the survival of endangered wildlife. At CREW, we will always remember Rowe with great affection, and his legacy will live on through the good work of all the scientists he supported at CREW and their own post-docs and students as they establish their own conservation programs.



Rowe Hoffman



Justine O'Brien
 From: University of Sydney, Australia
 Time at CREW: 5/97 – 12/98



Amy Obringer
 From: Wright State University, OH
 Time at CREW: 4/98 – 12/99



Carrie Vance
 From: Johns Hopkins University, MD
 Time at CREW: 3/00 – 3/02



Andy Kouba
 From: University of Florida
 Time at CREW: 10/99 – 10/01



Megan Jaskowiak
 From: North Dakota State University
 Time at CREW: 1/04 – 9/06



Jason Herrick
 From: Purdue University, IN
 Time at CREW: 1/04 – 10/07



Valeria Conforti
 From: University of Washington (from Brazil)
 Time at CREW: Started 06/07 – 05/10



Monica Stoops
 From: University of California, Davis, CA
 Time at CREW: 12/01 – promoted 1/04