



North Carolina Zoo
Conservation and Research

*Saving Wildlife Around the World
and in Our Own Backyard*

International
Conservation

1

Regional
Conservation

19

Conservation
Education

27

Research

31

Animal
Welfare

37

Green
Practices

41

*Welcome to the
North Carolina Zoo's
Conservation and Research Report!*

*Before you turn the page, please
pause a minute and reflect with me.*

*Remember the last time you were
surrounded by nature?*

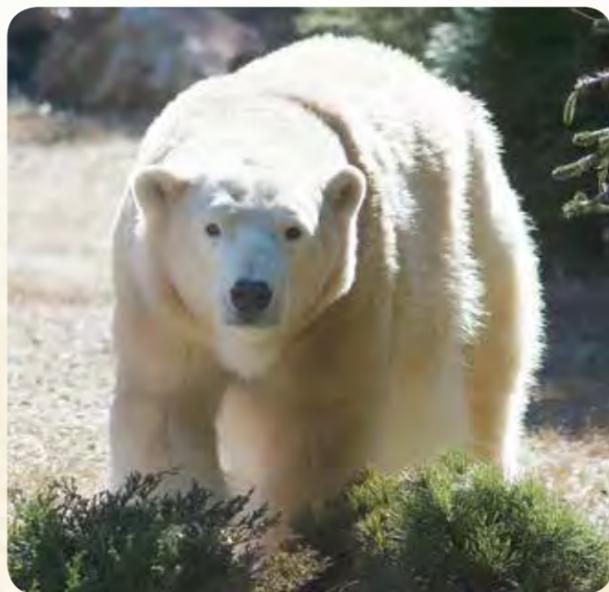
Remember how you felt?

Remember the sounds you heard?

The fresh air on your skin?

*That glint of sun on your face and
the texture of the earth?*

If you are anything like me, the natural world is a place of joy, of calm and wonder. It is a place that creates intense curiosity and a sense of celebration. This is our natural world and it is a part of us.



Each and every day your North Carolina Zoo is devoted to protecting our natural world. From vultures and gorillas in Africa to endangered plants and amphibians in our own state, the North Carolina Zoo has been involved with the conservation of animals in the wild for over two decades.

What began as a modest project focused on one country in Africa has grown into a leading program in zoo-based conservation. Our staff are active in conserving wildlife and their habitats in eight different African countries, the Caribbean, the Mariana Islands in the Western Pacific, and across our home state of North Carolina. We partner with a broad range of other zoos and conservation organizations to maximize our impact. Since conservation challenges cannot be solved overnight, we purposely make significant, long term, strategic commitments to the projects we undertake.

Over the next decade we will be increasing our conservation impact through new programs, engagement of the public and new opportunities for education. We are envisioning an exciting new addition—an innovative center focused on wildlife conservation, science, and education. This one-of-a-kind center will serve both as a training ground for the next generation of conservation biologists and as an educational facility where guests become citizen scientists and get hands-on experience with the high-tech solutions to conservation that the Zoo is using to save animals in the wild.

Through this report, I hope you enjoy learning about all the incredible work our Zoo team is doing to care for our world and the animals within it. And, please know that each time you visit your North Carolina Zoo, you can be assured that your visit supports the animals here at our Zoo and the animals in the wild you may never meet or see. You are making a difference with each visit.

So next time you see our state frog, the Pine Barrens Tree Frog, or watch a program about animals in Africa, or visit the Zoo and see our animals roam in extraordinary spaces, you can know that your Zoo is working hard to ensure a future for wildlife. And a future for us all. We ask you to join us in these efforts to protect our natural world.

A handwritten signature in black ink, reading "L. Patricia Simmons".

L. Patricia Simmons
Director, North Carolina Zoo

International Conservation



The North Carolina Zoo is helping to save gorillas in the wild. We equip rangers with the tools they need to track and reduce threats to gorillas as well as count the gorillas themselves. In addition, we are assessing the potential risk of disease transmission between gorillas, livestock, and people. Finally we are designing drones to better monitor and prevent habitat loss in key forests across Nigeria.

Project Partners

-  Wildlife Conservation Society
-  Nigeria National Parks Service
-  Cross River State Forestry Commission
-  Cameroon Ministry of Forests and Wildlife
-  International Gorilla Conservation Programme
-  North Carolina State University
-  Emory University

Location:

Cameroon
Nigeria
Rwanda
Uganda



Photo by WCS



Saving Gorillas across Africa

Critically Endangered Apes

Inhabiting the rugged highlands on the Nigeria- Cameroon border, the Cross River gorilla is one of the most critically endangered primates in the world. The survival of these gorillas is threatened by both hunting and habitat loss: only about 300 Cross River gorillas remain. Due to persecution by people, Cross River gorillas are found only in very remote and mountainous forests, where hunters are reluctant to go and where steep slopes prevent farming.

Cutting-Edge Approaches to Conservation

Since 2007, the North Carolina Zoo has been working with the Wildlife Conservation



Society (WCS) to help save the Cross River gorilla. Together, the Zoo and WCS are employing a range of cutting edge technologies and approaches to conserve these unique animals. We have put a data collection system based on rugged tablets in the hands of rangers to better track illegal activities and the movements of the gorillas.

The North Carolina Zoo is also conducting research on the threat posed by disease to the gorillas. Working with Emory University, we are testing for disease agents in gorillas, humans, and livestock populations to see if diseases may be transmitted to the gorillas. The results of this study will also benefit the



“ I am proud to be part of the North Carolina Zoo’s efforts to save species in the wild. Our work in North Carolina and around the world is helping to secure the future of wildlife and wild places. ”

Dr. Rich Bergl

Director of Conservation, Education and Science

people who live in communities near the gorillas’ habitat, by providing them with medical screening that they wouldn’t otherwise have access to.

One of the main threats to the gorillas is the loss of habitat. North Carolina Zoo is working with the Aeronautical Engineering Department at NC State University to develop a drone for monitoring habitat loss. When completed, this drone will be able to fly over the forests of Cross River in Nigeria and help us identify when trees are being cut down, so that rangers can go in and stop the destruction of forests.

Expanding our Work to Help Other Gorillas

The success of our Cross River gorilla conservation work has attracted attention from organizations involved with gorilla conservation in other parts of Africa. In Rwanda, the International Gorilla Conservation Programme requested our help in planning the Mountain gorilla census that is conducted every five years. Using the system we developed for Cross River gorillas as a template, we devised a digital data collection system to help them count

these famous gorillas (they are the ones that were studied by Dian Fossey). The system we helped put in place was used by teams from three different countries during the mountain gorilla’s census and helped make this enormous undertaking a success.



Rangers use ruggedized tablets to collect information on gorillas and signs of gorillas in the forest.

By better understanding the needs of and threats to vultures, the North Carolina Zoo staff are addressing the African Vulture Crisis. On-going population monitoring and conservation efforts will ensure the conservation of these critically endangered scavengers.

Project Partners

-  Wildlife Conservation Society
-  Ruaha Carnivore Project
-  Tanzanian National Parks
-  Wildlife Connection



Tracking Tanzania's Vultures

A Disappearing Bird

Vultures are currently the fastest declining group of birds globally and recent work has led to several African vulture species being up-listed to Critically Endangered. The primary threat to vultures is poisoning. People put poison, often in the form of pesticides, on carcasses or dead animals trying to kill lions and hyenas, which occasionally kill their livestock. Over 100 vultures can be killed at just one carcass, so the impact



of this activity has been enormous. Vultures play a critical role in disease control and the potential loss of these crucial scavengers could have significant consequences for many species, who share their savannah ecosystems. Finding solutions to vulture declines in Africa is therefore critical.



Rangers learn how to provide veterinary care for sick vultures in case of poisoning.

A Safe Haven For Vultures

Vulture experts identified Southern Tanzania as an area likely to be important for vultures, but where little was currently known about the status, population trends, or threats to vultures. No systematic studies of vultures had been done in Tanzania. To address this gap in conservation effort, the North Carolina Zoo in collaboration with the Wildlife Conservation Society began conducting surveys of vultures in Ruaha and Katavi National Park in 2013. To establish a collaborative and sustainable vulture



monitoring program, we have trained Tanzanian National Park staff in how to identify vultures and what to do in the case of a poisoning event. Such skills are critical for addressing the threat of poisoning.

Using Vulture Movement to Track Threats

We are using satellite telemetry to follow White-backed and White-headed vultures from Ruaha National Park and understand how they use the landscape. Vultures can have huge ranges and it is important to understand where they go and also what threats may be affecting them in Tanzania if we are going to protect them. Vultures can also be sentinels for threats that may affect many other species. Deaths of tagged vultures have highlighted areas where poisoning may be occurring. In addition, vulture movement can help us determine the presence of disease outbreaks as the birds will make use of the many dead animals during an epidemic. Sadly mortality of three



“ They may not be the most attractive creatures, but vultures are critical to the health of our environment. Without them, carcasses would be left to rot and diseases would spread. The Zoo’s efforts to save vultures in Tanzania have been crucial not just for conserving vultures themselves, but for protecting the entire ecosystem. ”

Corinne Kendall

Associate Curator of Conservation and Research

tagged vultures and a major poisoning event that killed over 50 birds in recent years have highlighted that poisoning is occurring in southern Tanzania. Working with rangers, Wildlife Conservation Society, and our partners from Ruaha Carnivore Project, we can ensure rapid response to poisoning events when they do occur and have worked to ensure that sick birds are cared for and poisoned carcasses are properly disposed of to prevent additional deaths. Through our efforts, we are helping to protect one of the most important strongholds for these critically endangered scavengers.



Corinne and Msafiri Mgumba (WCS) attach a satellite tag to a White-backed vulture. These solar-powered telemetry units can last for over two years and provide valuable information about the threats to this critically endangered species.

In partnership with conservation leaders around the world, the North Carolina Zoo is empowering law enforcement officials with SMART (Spatial Monitoring and Reporting Tool). This software package allows rangers to more easily collect information on threats to wildlife and allows protected area managers to make informed decisions about how best to protect wildlife from illegal activities, like poaching.

Project Partners

-  SMART Partnership
-  Wildlife Conservation Society
-  World Wildlife Fund
-  Frankfurt Zoological Society
-  Zoological Society of London
-  Peace Parks Foundation
-  Panthera

Location:

Global



NC Zoo staff train rangers in the use of mobile devices for collecting data about illegal activities, like snaring, and wildlife sightings. Here rangers from Yankari Game Reserve learn how to use SMART to improve their patrols.

Using SMART Technology to Defend Wildlife

The Front Lines of Wildlife Protection

Wildlife poaching is reaching epidemic proportions in some parts of the world. Driven by a lucrative black market for wildlife products and expanding human populations, illegal hunting threatens iconic species like rhinos, elephants and gorillas. Rangers and other law enforcement staff are the critical first line of defense against illegal animal killing, but in the developing world they are often under-trained and poorly equipped, especially when confronting increasingly sophisticated poachers.



A New Approach to Anti-Poaching

In partnership with some of the world's largest conservation organizations, the North Carolina Zoo has helped to develop a brand new tool to support rangers around the world. SMART (Spatial Monitoring and Reporting Tool) is a software package that allows national parks and other protected areas to be more strategic in their conservation work, allowing them to better



plan, evaluate and implement their activities. SMART puts cutting edge technology in the hands of rangers and other law enforcement staff. Using SMART, conservation agencies can better understand patterns of wildlife distribution and illegal activity, and use this information to better target their actions. The sophisticated technology that underlies



SMART gives rangers the advantage they need to combat poaching in a serious and decisive manner.

Global Impact

SMART has become the global standard for monitoring conservation law enforcement. There are currently over 200 sites in more than 30 countries using SMART to better manage national parks and other reserves. Eight countries have even adopted SMART as their official monitoring system for all their protected areas! The software is now available in over ten different languages and thousands of people have been trained in its use. Despite its success, SMART is continuing to grow. We are currently developing a

cloud-based version of the software and new apps for mobile devices to meet the demands of an increasingly connected global conservation community.



Mapping of data collected on patrols about illegal activities and wildlife can help to inform future patrol efforts. By knowing where the problems and critical species are, managers can ensure that rangers target the most important sites each month.

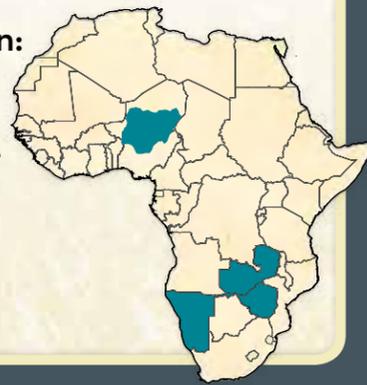
Lions and other African carnivores are threatened by poaching. By equipping rangers with the latest technology, the North Carolina Zoo staff can ensure that they can more effectively protect threatened carnivores and their prey in key protected areas across Africa, including major projects in Zambia, Zimbabwe, and Nigeria.

Project Partners

-  Wildlife Conservation Society
-  Panthera
-  Conservation Lower Zambezi
-  Game Rangers International
-  Conservation South Luangwa
-  Painted Dog Conservation

Location:

- Namibia
- Zambia
- Zimbabwe
- Nigeria



Protecting Africa's Carnivores

Helping Rangers Stop Poaching

Across Africa, populations of large carnivores like cheetahs, lions and leopards are declining. Lion populations have been reduced by almost 50% in the last 20 years and the extinction of many of these species is possible if declines are not reversed.

These amazing animals are targeted by poachers, caught unintentionally in snares meant for other animals, and persecuted in retaliation for livestock predation. By helping conservation staff working on the ground to introduce SMART, the North Carolina Zoo is working in several countries across Africa to help protect carnivores and the national parks on which they depend.

Carnivores of Southern Africa

For some time the North Carolina Zoo's conservation work has focused on the

rainforests of Africa. However, we have recently expanded our work to the savannas of southern Africa in order to help secure critical carnivore populations there.



Park administrators learn how to use SMART software to map data collected from ranger patrols during NC Zoo training sessions.



Lion populations have been reduced by almost 50% in the last 20 years and the extinction of many of these species is possible if declines are not reversed.



Working with our partner Panthera (the world's largest big cat conservation organization) we have been training staff and deploying SMART in national parks in Zambia and Zimbabwe to improve anti-poaching efforts. Improving conservation-focused law enforcement is key because wildlife in Zambia and Zimbabwe is under unprecedented pressure from poachers. Wildlife species are being hunted for an increasingly commercialized trade in game meat and body parts. Large carnivores are particularly affected because they suffer

from reductions in prey populations, mortality in snares and direct persecution. So far we have set up SMART-based monitoring in four different national parks and advised several other areas on their own SMART deployments. We are already seeing improvements in the success and motivation of ranger patrols.

Saving West Africa's Last Lions

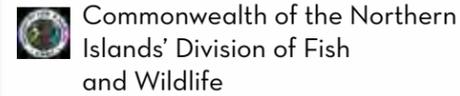
One of the places where the North Carolina Zoo is helping to protect carnivores is Nigeria's Yankari Game Reserve. Yankari is home to Nigeria's last population of lions, in addition to elephants, hippo and other wildlife. The Zoo has been working in Yankari, providing training, equipment and support to over 100 park rangers, for several years. We have conducted wildlife surveys, trained rangers in data collection and analysis, and provided uniforms in order to increase the effectiveness of their actions.



This year we trained Yankari staff in the use of SMART in order to increase their effectiveness even further. We are confident that a new SMART-based ranger program will turn the tide against poaching once and for all.

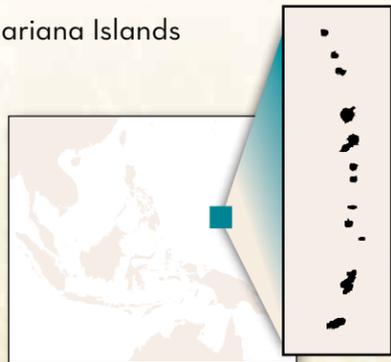
North Carolina Zoo is helping to save Mariana Islands endemic birds. Introduced brown tree snakes threaten Mariana Island's small bird populations. Zoo staff are helping to translocate birds to snake-free islands, where the birds can thrive.

Project Partners



Location:

Mariana Islands



Creating Safe Havens for Endangered Pacific Birds

Working with MAC

The Mariana Avifauna Conservation (MAC) Program's primary objective is to preserve the native endemic population of birds on the Commonwealth of the Northern



Steph Krueger handles a bird recently removed from a mist net.

Mariana Islands (CNMI) from the threat of an accidentally introduced predator—the brown tree snake. Native to Australia and some of the surrounding islands, it is believed that the brown tree snake was introduced to the neighboring island of Guam in the 1950's when it stowed away on cargo ships. By the mid 1980's, nearly all of the birds native to Guam had become extinct in the wild due to predation from this snake.

Captive Breeding of Endemic Birds at the Zoo

To prevent the same fate for the birds of the CNMI, the MAC Program, founded in 2004, works with AZA Zoos, the Department of Fish and Wildlife, and US Fish and Wildlife (USFWS) to help monitor, translocate, and establish captive breeding programs for these endangered birds.

The NC Zoo has been a long time participant of the MAC Program by participating in the captive breeding program for the golden white-eye, a bird native to Saipan. The NC Zoo was the first institution to breed the golden white-eye in captivity!



Birds are housed temporarily as they prepare for transit to a snake-free island, where their chances of survival are much improved.

Translocation as a Conservation Tool

The Zoo has also participated by sending staff out to the islands to help with the capture of target bird species found on islands with records of the brown tree snake and relocating them to "snake free" islands farther up the archipelago. In previous years,



now retired General Curator Ken Reininger and Bird Curator Debbie Zombeck have flown out to participate in the project and in 2017 Steph Krueger, an Aviary Keeper, had her first opportunity to join the team.

In 2017, the project involved capturing two bird species on Saipan and relocating them to the neighboring island of Guguan. A team of over 20 bird staff from 10 AZA institutions trapped 24 Mariana fruit doves and 54 rufous fantails using mist net techniques. Captured birds were housed individually in a climate controlled bird room where keepers weighed, monitored, and feed all the birds up to four times a day. After a thorough health exam from vet staff, all birds were banded with aluminum Fish and Wildlife bands and color bands which will help USFWS staff monitor individual birds



“What excites me most about this conservation project is that we are assisting in translocating birds to snake free islands in the same archipelago. This will help to insure the future survival of these endemic species as they become established on the new islands.”

Debbie Zombeck
Curator of Birds

upon release. Birds were then crated up into transport containers and secured in a boat with several MAC Program staff members. The selected MAC Program staff made the long 13 hour boat ride to Guguan. Once at the relocation site, staff strapped the transport boxes and birds into modified backpacks and hiked them in to the release site. All birds were successfully released, and Fish and Wildlife will return to monitor how the birds do in their new home!



Ken Reininger, retired General Curator of NC Zoo, carefully removes a bird from a mist net. Birds are marked and monitored until they are ready to be transported to a new island, free of invasive snakes.

Habitat loss and climate change threaten the Puerto Rican Crested Toad. Through captive breeding and reintroduction efforts, the Zoo is able to supplement the existing wild population. In addition, a wetland restoration project will ensure safe habitat for the threatened toads.

Project Partners

-  US Fish and Wildlife Service
-  Puerto Rican Department of Natural Resources
-  Para la Naturaleza
-  Citizens of the Karst
-  Puerto Rican Crested Toad SSP

Location:

Puerto Rico



Breeding and Release of the Puerto Rican Crested Toads

Over 30% of amphibian species worldwide are experiencing declines and the Puerto Rican Crested Toad has suffered severe population declines since the 1980s. It is endemic to the island of Puerto Rico,



meaning it is found nowhere else in the world. Currently, there are only two natural breeding sites left, both of which are at risk because of climate change.

The North Carolina Zoo is working with other AZA facilities, United States Fish and Wildlife Service, and many partners in Puerto Rico on a recovery program for the Puerto Rican Crested Toad (locally known as Sapo Concho). The recovery program has been going on for decades and has experienced numerous successes. There are many components, including captive breeding and reintroduction, man-made breeding and head-starting ponds, invasive species removal, education and outreach, and we are planning a wetland restoration project in the near future.

Captive breeding for reintroduction has occurred in AZA facilities since the late 1980s, but has had more success over the last decade. The North Carolina Zoo recently finished building a room to house the toads

with the goal of breeding them to send back and reintroduce in Puerto Rico. Most of the tadpoles produced at North Carolina Zoo and at the other AZA facilities, will be returned to Puerto Rico and released in man-made ponds. These ponds were designed and built by staff from zoos in the US and partners in Puerto Rico as reintroduction ponds, which include man-made breeding ponds for future reproduction. To ensure that the tadpoles are



Zookeepers counting and bagging tadpoles for release in Puerto Rico.

safe from native and invasive predators, the ponds are surrounded by a mesh enclosure. There is also an ongoing invasive species removal program in the area, primarily for Indian mongoose and marine toads.

The Puerto Rican Crested Toad Recovery

The North Carolina Zoo has many partners in Puerto Rico who focus on education and outreach. In addition to raising awareness about the toad, we are also teaching the public about the impacts they have on the environment, which directly affect the toads and species endemic to Puerto Rico.

The largest remaining breeding pond known in Puerto Rico is under threat from rising sea level and thus potential salt intrusion. Currently we are in the process of planning a wetland to be constructed by members of the recovery group, to replace this critical breeding site. This pond will be constructed near the current pond, but at a higher elevation, which should allow the species to reproduce safely for decades.



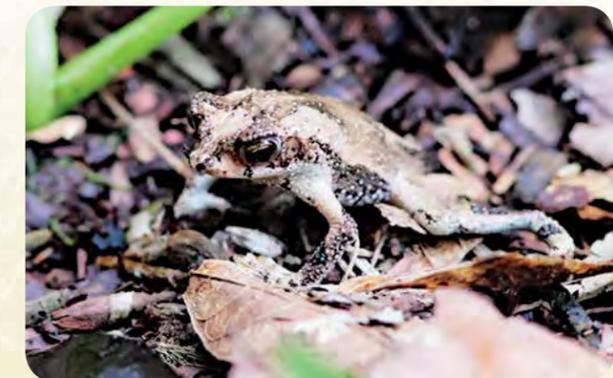
Man-made ponds are installed at release sites for Puerto Rican Crested Toads to breed. There is also an adjacent release pond which is covered by mesh to protect the tadpoles.



“The Puerto Rican Crested Toad recovery program encompasses many aspects to aid in its recovery, including education/outreach, research, collaboration and headstarting. Being able to send tadpoles back to the wild and watch them eventually return to their ponds to breed is motivation to continue our conservation efforts.”

Dustin Smith

Curator of Reptiles, Amphibians, Fish, & Invertebrates



The Hicatee is a critically endangered turtle threatened by hunting for consumption. The North Carolina Zoo is working with partners to expand education and research initiatives to protect this turtle.

Project Partners

-  Zoo Miami
-  University of Florida
-  Belize Fisheries
-  Belize Foundation for Research and Environmental Education (BFREE)
-  Turtle Survival Alliance (TSA)

Location:

Belize



Looking After Belize's Endangered Fresh Water Turtle

The Central American River Turtle, or known in Belize as the Hicatee, is a critically endangered turtle which is listed as one of the top 25 most endangered turtles in the world. This unique turtle is found in Mexico, Guatemala, and Belize, but has disappeared from most of the rivers in which it was historically found. The primary cause for its decline has been human consumption.

Zoo staff participated in a workshop in Belize to discuss what is known about the species and determine the next steps to aid in its recovery. Some of the goals for the future of the program are to increase awareness, expand standardized research programs, support a captive breeding population in Belize and continue the partnership to save this rare turtle. Because the main cause for decline is human consumption, education and outreach



Pictured above is a critically endangered male Hicatee turtle. Once mature, the males have a bright yellow-orange head.

throughout local communities could be the only way to stop the unsustainable use. This is done through billboards, radio advertisements and popular media interviews, school visits, and creation of educational materials. The same partners participating in the education and outreach programs are also conducting a variety of field studies on the Hicatee, including mark-recapture studies and radio-tracking.



North Carolina Zoo is supporting efforts to save cranes in the wild. By monitoring key crane populations, conservation efforts can be carefully directed to ensure a safe future for Uganda's threatened cranes.

Project Partners

-  International Crane Foundation
-  Endangered Wildlife Trust of South Africa
-  Nature Uganda

Location:

Uganda



Protecting Uganda's National Bird

Though once a common resident species, the Grey Crowned Crane has declined significantly through its range. Causes of decline include habitat degradation, trade in chicks, and disruption of breeding activity. Uganda represents an important area for the species but little is known about its status there. The North Carolina Zoo supports the International Crane Foundation and Endangered Wildlife Trust in conducting surveys for the species as well as habitat assessments. Previously the Zoo has funded surveys to assess the population status and distribution throughout the eastern region of Uganda. Recently these surveys have extended to key sites in wetlands around Kampala. On-going research efforts inform conservation planning for the species to help secure its future.



Working with Ngogo Chimpanzee Project the Zoo is able to protect chimpanzees in the wild. Snare removal teams are trained in the use of new technology to better catalogue the snares they remove from Kibale National Park in Uganda. Our support ensures that the park can be a safe haven for chimpanzees and other threatened wildlife.

Project Partners

 Ngogo Chimpanzee Project

 Kibale Chimp Project

Location:

Uganda



Stopping Snaring, Saving Chimps

Uganda's Kibale National Park is home to one of the largest populations of chimpanzees in the world, making it an important area for this threatened species. The main threat to chimpanzees in Kibale is poaching, particularly snaring. People set snares trying to catch other animals for food, but chimpanzees often get caught as well. One-third of the chimpanzees in the park are missing body parts as a result of snare-related injuries.



Snare removal team members from Ngogo Chimpanzee Project learn how to use mobile devices to collect data on presence of snares and chimpanzees.



To protect chimps and other species in Kibale, the North Carolina Zoo works with Ngogo Chimpanzee Project and other partners. Ngogo Chimpanzee Project employs two anti-poaching teams who work with Uganda Wildlife Authority law enforcement to patrol the park and remove snares. The North Carolina Zoo has provided these anti-poaching teams with mobile devices to make for easy collection of data so the location of poaching activity can be documented and used to improve future patrolling efforts. The anti-poaching teams also remove snares which helps to reduce the impact of hunting on chimpanzees and other threatened wildlife living in the park. In addition to supporting the patrols, Ngogo Chimpanzee Project has worked with North Carolina Zoo's UNITE for the Environment conservation education program to improve education in schools around Kibale National Park.



Zoo Staff Making a Difference

At the North Carolina Zoo, conservation is at the heart of what we do. We believe that the animals you see at the Zoo are ambassadors for their counterparts in the wild and that all our staff have a role to play in wildlife conservation. Here are a few examples of ways our staff are making a difference for saving endangered species from extinction.

Arctic Ambassador Center

Our Polar Bear Connection

The North Carolina Zoo is among an elite group of 40 Zoos, Aquariums, and

Museums that are Arctic Ambassador Centers (AAC) through a partnership with Polar Bears International (PBI). PBI is the leading Polar Bear conservation group in the world that works to conserve polar bears and the sea ice that they depend on. Since 2009, the Zoo has supported 4 keepers, 2 volunteers, and 1 Educator to attend PBI'S Climate Alliance Workshop in Churchill, Manitoba. Churchill is considered the Polar Bear capital of the world because the population of bears that migrates through the area (~1,000) outnumbers the



Zookeepers celebrate International Polar Bear Day.

population of people that live there year round (~800). While there, attendees learn about polar bears in a warming Arctic, and how to effectively



“I'm committed to conserving all walks of life, but species in the Arctic hold a special place in my heart as a Rocky Coast keeper of 7 years. I greatly appreciate the North Carolina Zoo's support for our team, which strengthens our passion to preserve a future for Arctic animals in the wild.”

Nicole Pepo

Rocky Coast Keeper; Arctic Ambassadors



interpret climate science to friends, family, and Zoo guests. Attendees are also empowered with the tools to make a big impact within their communities in ways that will have a local and global effect on our environment.

Outreach On Sustainability

As an AAC we participate in outreach programs that promote sustainable practices within the Zoo and within local community entities such as grade schools, community colleges, universities, local businesses, and the YMCA. These outreach programs consist of reusable bag giveaways and recycling presentations, reusable water bottle giveaways and water conservation presentations, and energy efficiency campaigns that help empower individuals to make a positive impact at home. We organize annual tree plantings that help us beautify the community while educating participants about the important role that trees play in cleaning the air we breathe and reducing our carbon footprint. We also strive to facilitate continual improvement of environmental practices within the Zoo and within our own homes.



From Behind the Scenes into the Wild

Every year keepers work tirelessly not just to care for the animals at the North Carolina Zoo but to ensure fun and engaging visitor experiences. As part of these efforts they work closely with the NC Zoo Society to provide incredible behind the scenes tours. Funds from this work goes to support the Zoo's conservation programs and as part of this keepers are asked to select conservation organizations they would like to support.

In 2016, keepers have elected to sponsor VulPro, a vulture conservation organization that rehabilitates and studies South Africa's vultures, the Bongo Surveillance Project, which uses the remaining bongo of Kenya's forests, and the Turtle Survival Alliance, which protects endangered turtle species all over the world.



Regional Conservation



Zookeepers Help Wildlife Conservation

The American Association of Zoo Keepers (AAZK) is a non-profit, volunteer-led organization made up of professional zoo keepers and other interested individuals. The mission of AAZK is to advance excellence in the zoo keeping profession, foster effective communication that is beneficial to animal care, support deserving conservation projects, and promote the preservation of natural resources and animal life.

A primary goal of the North Carolina chapter (NCAAZK) is to raise money for conservation programs we are passionate about. Some of these programs include Bowling for Rhinos, Chopsticks for Salamanders, and the Run Wild 5K.

Bowling for Rhinos (BRF) is an event that raises funds to support the Lewa Wildlife Conservancy, International Rhino Foundation,

and Action for Cheetahs in Kenya. NCAAZK has hosted a BFR event every year since 1991 and has raised over \$166,000! Collectively, chapters like ours across the nation have raised over 6 million dollars since 1990!

Chopsticks for Salamanders began in 2011 to support salamanders living along the Appalachian Mountain Range, from Alabama to Canada. This region has the highest diversity of salamanders in the world, but each year 3 million trees are cut down across the world to produce disposable chopsticks. By raising awareness and encouraging the use of re-usable chopsticks, Chopsticks for Salamanders is able to combat deforestation and help save precious land for our small friends.

Run Wild 5K is a race through the Zoo held every year in June. The race, hosted by the

North Carolina Zoo is put on by the North Carolina Chapter of the American Association of Zookeepers to assist with providing funds for zoo keeper training and professional development, as well as local and global conservation like Bowling for Rhinos, The Kendall Project, Polar Bears International, and UNITE.



North Carolina Zoo is helping to save our state frog – the Pine Barrens Treefrog. Using radio telemetry and censuses, we are learning more about what this secretive species needs to survive and flourish in the wild.

The Zoo is also working to save Gopher Frogs in the wild. By raising tadpoles from wild eggs and releasing them back into the wild, the Zoo is increasing the frog's chance of survival and helping to grow and maintain wild populations of this rare frog.

Project Partners



North Carolina Wildlife Resource Commission



North Carolina Natural Heritage Program

Location:

Sandhills region of North Carolina



Protecting North Carolina's Frogs

A Focus on our State Frog

The Pine Barrens Treefrog, North Carolina's state frog, can be found in portions of the Sandhills and the coastal plain. It has disappeared from many parts of its historic range due to habitat loss and lack of fire on the landscape, which is necessary to maintain its habitat. These specialized frogs utilize the drains and seeps that are too acidic and temporary for many species to successfully reproduce.



A tiny transmitter is used to track and better understand the habitat use of our state frog.

get a clearer understanding of how and where they were moving as well as how they were selecting and using habitat. Our goal is to continue to learn more about the population dynamics of the species throughout North Carolina, and identify

Since 2014 the North Carolina Zoo has partnered with the North Carolina Wildlife Resource Commission to learn more about this secretive species. Through the use of radio telemetry we were able to monitor their movements and



the most effective ways of ensuring this spectacular frog remains part of the landscape. We have also been able to look at how the frogs respond to fire in their habitat. Finally, the telemetry can give us a better sense of how the frogs disperse from one pond to another.



Zoo staff carefully measure a Pine Barrens Treefrog.



Zookeeper Chris Shupp collects eggs to be hatched and headstarted at the Zoo.



Giving Gopher Frogs a Headstart

Working in collaboration with North Carolina Wildlife Resources Commission, the North Carolina Zoo has recently begun a new program with one of the state's rarest amphibians. The Carolina Gopher Frog primarily lives in long leaf pine forests using ephemeral wetlands for breeding. They have disappeared from much of their range in North Carolina because of habitat loss, degradation, and poor fire management.



In response to their decline, we are collecting eggs from the wild and then raising tadpoles for release back to where they were found.

The goal of this process, called head-starting, is to help boost the population by increasing the number of eggs that survive to be tadpoles and froglets without altering the genetics of the population.

“People that work at the North Carolina Zoo are doing so because they want to make a difference. For me that means not only providing the best care for the animals at the Zoo, but just as importantly insuring the survival of their wild counterparts. When I am able to step into the diverse longleaf pine ecosystem of the North Carolina Sandhills (just an hour away from the Zoo) and release a group of headstarted Carolina gopher frogs after months of care, it re-energizes me as it really makes a difference for their conservation.”

Chris Shupp

Animal Management Supervisor;
Cypress Swamp / Desert



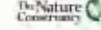
Gopher frog tadpoles grow for approximately 4 months in these “mesocosms” or ponds. Once they reach metamorphosis, they are measured, marked for identification and released back where the eggs were collected.



Gopher frogs rely heavily on refugia such as stump holes for safety. When making their long trek to the breeding pond (and back), finding places to hide from predators and fire is key to their survival.

North Carolina Zoo protects native wildlife and habitat through management of over 2000 acres of undeveloped land around the Zoo. This land provides a sanctuary for native mammal species, like bobcats, and is critical for endangered and rare plants, like the Longleaf pine.

Project Partners

-  Piedmont Land Conservancy
-  Land Trust for Central North Carolina
-  Greater Uwharrie Conservation Partnership
-  US Fish and Wildlife Service
-  The Nature Conservancy
-  US Forest Service
-  NC Wildlife Resources Commission

Location:

Randolph County, North Carolina



Wild Land Preservation in North Carolina

More Wildlife Habitat Protected through Spalding Bequest

The \$1.2 million Juanita Spalding Wildlife Habitat bequest has provided funds to extend permanent protection of wildlife habitat to 102 acres near the Zoo, in addition to the 72 acres protected previously. Purchase of 65 acres of land south of the Zoo widens the connection between Zoo natural areas and the Ward Preserve to the south. This land also provides habitat for two rare plants. An additional 37 acre purchase protects a corridor between forested lands adjacent to the Zoo and U.S. Forest Service land at the top of Harvey's Ridge, a scenic mountain that is visible across from the Zoo's main entrance.



A cricket frog found at the edge of a recently-protected creek south of the Zoo.



A hiker takes in the long view north from the top of Harvey's Ridge. Little Pilot Mountain can be seen in the distance.

Prescribed Burning at Nichols Preserve Improves Plant Diversity

When the Zoo acquired the Margaret J. Nichols Piedmont Longleaf Pine Forest, we knew restoration of the original pine savanna would be a long process. After 100 years or more of fire suppression, oak trees had grown up among the pines, and a thick



NC Forest Service staff begins a controlled burn at the Nichols Preserve.

layer of pine needles and other leaves had choked out the diversity of grasses and wild flowers that characterize a natural longleaf pine savanna. With roots from the 100-300 year old pine trees growing in this layer of semi-decomposed pine



A wood anemone

needles, called "duff", reintroduction of fire to this forest is a tricky process. Too little fire and no duff reduction takes place, too much or too hot and the tree roots are burned up, killing the valuable old trees.

The site has now been burned three times, in March 2013, May 2015 and February 2017. Bare mineral soil is already being exposed in some places. So far we have lost fewer than five longleaf pines. Grasses and wild flowers, once scattered wisps, are creating a carpet of green under the trees in some places, and new seeds that were buried under the duff are sprouting and blooming. These changes also support more animal diversity, especially for grassland birds like bobwhite quail, northern shrike and meadowlark.



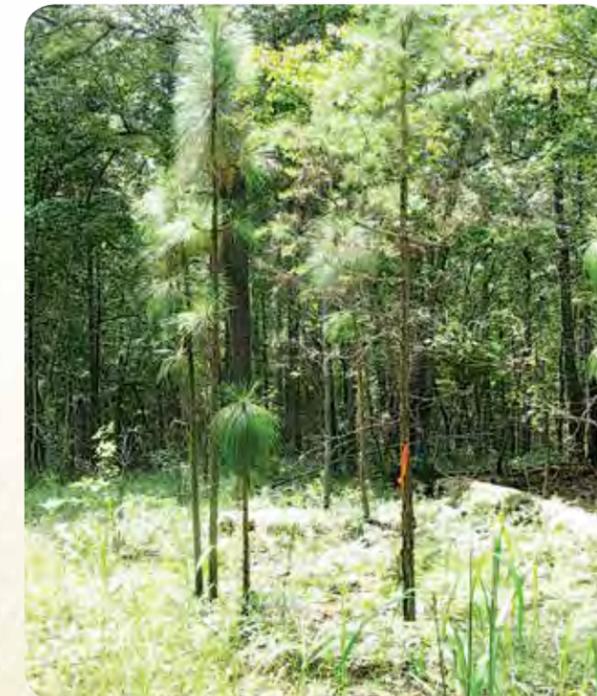
“North Carolina has a surprising amount of biological diversity and the number of endemic species (those found nowhere else) is unusually high. I love sharing the discovery of our local plants and animals with people of all ages.”

Nell Allen

Associate Curator of Conservation and Research



Wildflowers bloom in profusion following a prescribed burn. Above are lobelia, goldenrod and grasses.



Young longleaf are surrounded by green grasses where formerly the ground cover was pine needles and oak leaves.

The North Carolina Zoo's botanists provide valuable insight for land preservation and management. Botanical surveys are just one way that North Carolina Zoo can help partners determine what areas are worthy of further conservation and thus ensure protection of endangered plants.

Project Partners



Location:

Randolph County, North Carolina



Field Studies of Rare Plants

Conservation includes not just protecting animals and habitats, but also preserving plants. Nell Allen, the Zoo's Associate Curator of Conservation and Research for regional projects and Moni Bates, a contract botanist, provide botanical expertise for our partners and other public and private landowners. Nell and Moni conduct botanical surveys that include a plant species list, a description of natural community types, and, if desired, some recommendations for management, for example how to care for any rare or endangered plants or natural communities



Counting Schweinitz's sunflowers at Caraway Prairie. The Zoo manages this site for protection of this Federally endangered plant species. Yearly monitoring helps us track how the plants are doing.



Moni Bates, the Zoo's contract botanist, documents yellow pitcherplants—another fire dependent plant now rarely seen in the Piedmont.

found on site. These botanical surveys help determine the biological importance of a site and if it is worthy of protection.

A botanical site survey of Faith Rock, a site of Revolutionary War significance located on the Deep River 12 miles north of the Zoo, helped bring about the ultimate permanent protection of the area. The survey indicated that the Faith Rock area contained a rare Piedmont Acidic Cliff ecological community. This helped Piedmont Land Conservancy obtain an environmental grant for purchase of the property from a private landowner, for transfer to the Town of Franklinville. After the transfer is completed, the site will be managed as a public nature preserve.

Another recent survey of forested land, this time in Montgomery County to the south, documented the beneficial effect of prescribed fire. Populations of two species of pitcher plants are expanding following several controlled burns and rare snakemouth orchids are now being found there as well.

North Carolina Zoo is saving hellbenders in the wild. Hellbenders are the largest species of salamander found in North America. Working to survey populations and using nestboxes to mitigate habitat damage, the Zoo has played a key role in conserving this important local species.

Project Partners



North Carolina Wildlife Resource Commission



Western Carolina University



University of North Carolina Asheville



North Carolina Natural Heritage Program



North Carolina State Park



Appalachian State University

Location:

Western North Carolina



Providing a Home for Hellbenders



An Endangered Salamander

Hellbenders are giant salamanders, growing up to 30" long that live under rocks in clean, swift-flowing streams. Once widespread in the Eastern United States, they have become rare in much of their range due to habitat loss and poor water quality. The mountains of western North Carolina have some of the best remaining habitat for this elusive, nocturnal salamander.

The Search for Hellbender DNA



Since 2008, the Zoo has been conducting hellbender surveys in the North Carolina mountains. In partnership with the NC Wildlife Resources Commission, Zoo staff

have gathered scientific data on the current distribution and status of hellbenders, as well as health, reproductive success and habitat requirements. This research has supported the development and implementation of conservation action plans for hellbenders.

Zoo staff have also been collecting water samples to analyze for environmental DNA (eDNA). This non-invasive research technique allows scientists to detect if hellbenders are found in a stream by looking for their DNA in water samples. In the future, we will survey additional mountain streams for hellbenders and will further investigate eDNA sampling techniques.

Nest Boxes for Hellbenders

As we have come to a better understanding of Eastern hellbender populations, some conservation recommendations have been developed. One important step for hellbender recovery is finding effective strategies to mitigate habitat degradation. Hellbenders hide in holes underneath rocks. Unfortunately these holes can become filled with silt due to soil erosion.

To help hellbenders find a safe place to live and breed, we are testing artificial nest boxes, which are placed under rocks to ensure a silt-free crevice in which hellbenders can hide. Finally we are continuing to investigate ways to restore hellbender habitat by reducing siltation, caused by soil erosion.



These hellbender nest boxes were designed to allow researchers to check the nest boxes without disturbing the animals.

North Carolina Zoo helps breed red wolves to prevent them from going extinct. Wild red wolves have declined dramatically and the species now depends on captive populations to maintain genetic diversity. By housing and breeding red wolves behind the scenes at the Zoo, we are helping to ensure the survival of this wolf, found only in North Carolina.

Project Partners

 US Fish and Wildlife Service

Location:

Alligator River region,
North Carolina



Expanding the Red Wolf Pack

Red Wolves

North Carolina Zoo supports the conservation of the threatened red wolf and has since 1995. The current wild population has decreased to under 50 animals for the first time in many years. The increased mortality of red wolves in the wild is due to many factors including gun shot, being hit by cars and restricted management options.



Keepers care for new red wolf pups in our behind-the-scenes areas.

The future of the red wolf in the wild is in question. That's why the North Carolina Zoo along with 43 other American zoos and institutions are helping to house and breed red wolves temporarily at the Zoo. There are currently 227 wolves in zoos making the entire living population of red wolves less than 300.

Over the years the Zoo has contributed to breeding and reintroduction of red wolves to North Carolina. Recently, we had a successful breeding with a surviving litter for the first time in 10 years. Although the litter was only one male pup, it represents an important contribution to this threatened species. In addition, we have begun new construction with the goal to expand our collection of red wolves that are housed at the grounds of the North Carolina Zoo. Thanks to \$50,000 from the US Fish and Wildlife Service and \$15,000 from Emily Millis Hiatt Foundation Fund, we have the funds needed to double our off exhibit holding space. This is exciting news for the red wolf population as space is the largest need and the biggest limiting factor to meeting Species Survival Plan goals intended to ensure the future of the species. These new habitats will put the North Carolina Zoo as housing the second largest group of red wolves in the world.



Conservation Education



North Carolina Zoo believes in the power of education both for our visitors and abroad. Through our UNITE for the Environment program, the Zoo is training Ugandan teachers to be better environmental educators and stewards of the natural world. With our support, teachers, their students, and wider communities can better protect the forest and chimpanzees or gorillas living nearby.

Project Partners

 Cleveland Metroparks Zoo

 Max Planck Institute for Evolutionary Anthropology

Location:



Helping Teachers Protect Uganda's Forests

Our UNITEd Approach

The North Carolina Zoo's UNITE for the Environment has been operating around Uganda's Kibale National Park for 15 years.



Kibale National Park is a critical conservation area with the largest chimpanzee population in East Africa. UNITE employs three Ugandan staff members who run

the program year round. UNITE works in partnership with schools that are within a 5 km radius of Kibale National Park to improve teaching methods, enable teachers to incorporate more environmental topics into the classroom, and to help the local

community find ways to reduce their impact on the neighboring National Park. This is done through teacher training, school field trips, work with head teachers (i.e. principals), and creation of conservation clubs. The program is carefully evaluated through classroom observations, student evaluations, and school and home visits.

Partnering in Gorilla Conservation

In 2015, UNITE joined Max Planck Institute for Evolutionary Anthropology (MPI-EVAN) and Cleveland Metroparks Zoo in a new collaborative effort called Bwindi Apes Conservation Education Partnership (BACEP). BACEP is expanding on the work UNITE does by conducting teacher training for schools around Bwindi Impenetrable



Ugandan students learn about the importance of plants and their medicinal values on a field trip to the Tooro Botanical Gardens as part of the UNITE program.



National Park, where the mountain gorillas reside. Work with these schools is done in conjunction with MPI-EVAN's existing work with school children. Ensuring that teachers and students understand environmental science and providing them with ways to improve livelihoods and reduce their impact on the environment will ensure a safe future for local communities and the critically endangered gorillas.

A Sustainable Solution

UNITE for the Environment has always focused on sustainable activities and incorporated these into existing trainings.



“Because Ugandan languages developed when there were very few people in the country, we do not even have a word for conservation. This makes it challenging for people to easily embrace conservation. I therefore feel it is very necessary to educate the young generation so that they can grow up with an understanding and appreciation of the benefits of nature.”

Tinka John

Director, UNITE for the Environment

While the program has been successful in creating changes in knowledge among students and teachers and in improving teacher performance, home visits to evaluate behavior change conducted recently had demonstrated that sustainable activities covered in trainings were not necessarily being used at schools and home. To address this challenge, UNITE is focusing all training on a single sustainable activity and builds on the initial training through follow ups, discussion of challenges, lesson plan development around the activity, and problem-solving solutions. This allows for our program to be truly collaborative with the teachers and communities as we work together to find solutions to problems impacting both livelihoods and the environment. In 2016, the program focused on building fuel efficient stoves and planting tree species that work best for these stoves. Use of these stoves should reduce deforestation in Kibale National Park, an important site for chimpanzees. Since the shift, UNITE has had record attendance at teacher training with more than 80 teachers at each training. In less than one year, 10 UNITE schools built over 150 stoves at schools and

in their community and planted over 2000 trees to help reduce the impact on the forest.

We are continuing to build on the incredible success of UNITE by focusing on an often overlooked problem—waste management. Plastic debris and its improper disposal pose a threat to both human and environmental health. Teachers and students have been coming up with creative solutions to this problem including constructing incinerators to more efficiently burn plastic waste that are modelled of the fuel-efficient stoves they are already familiar with building. We believe that when we work with communities we can truly make a difference for conservation.



Fuel-efficient stoves, like the one pictured above, require less wood and cook faster.

Inspiring the Next Generation of Wildlife Scientists

Wild Animal Science Camps

Conservation and research goes beyond studying animals in the wild and has to involve engaging people in the importance of protecting wildlife as well as training the next generation of conservation biologists. As part of this effort, the North Carolina Zoo teaches the Wild Animal Science Camp, a program for middle and high school students focused on the field research that we do at the Zoo. Campers learn skills necessary for catching birds in



mist nets, using radio telemetry to track tagged individuals, and for studying local amphibians. They get a chance to practice setting up their own remote camera traps, just like the Zoo uses on site to look at densities of local wildlife and in Africa to capture photos of rare and elusive gorillas. Campers also work with the Zoo's North Carolina State University research interns to learn how to collect behavioral data on animals and how this information can improve animals' lives in the zoo and in the wild. Best of all, students get to sleep over at the Zoo, after pitching their tents, of course. An evening at the Zoo gives campers a special opportunity to practice using night vision to spot animals on the African grasslands, listen to the sounds of frogs, lemurs, lions, and elephants, and even

detect our resident bat populations using bat detectors.



Staff conservation biologists work closely with middle and high school students to give them unique experiences in relation to wildlife research as part of our summer camp program—a key step in building the next generation of field biologists.



Research



Science of the Zoo

The North Carolina Zoo isn't just a great place for kids, it is also a learning laboratory for college students and universities. With our diverse and unique collection of animals, the Zoo is an incredible place to answer all kinds of questions. Every year, the North Carolina Zoo partners with dozens of universities to help them collect data on exotic animals to address questions about

welfare, health, evolution, diet, and behavior that would be difficult or impossible to study in the wild.

Recently the Zoo has worked with researchers looking at everything from seabird cognition to red river hog reproduction to chimpanzee genetics. The Zoo provides blood, tissue, and skeletal



Undergraduate students learn valuable skills on how to collect data about animal behavior at the Zoo. In turn, their findings help the Zoo provide the best welfare for our animals.



samples to universities studying genetics, disease, and other health factors. Students will spend weeks or months studying animal behavior or conducting cognitive studies at the Zoo. Finally, keepers and other staff work tirelessly with the Zoo's own research staff to answer important and pressing questions to improve welfare of animals at the Zoo. As a result, the zoo is truly a living lab for exploration and discovery.

The North Carolina Zoo is a living laboratory, offering unique opportunities to better study wild animals.

Research Internship Program

The North Carolina Zoo works closely with many of the surrounding universities in North Carolina to provide unique learning experiences for students as well as to answer important welfare questions about animals at the Zoo. Initiated in 2015, the Zoo partnered with North Carolina State



University on the North Carolina Zoo Animal Behavior and Welfare Internship program. Every semester two to four students work with the Zoo on various animal

behavior studies including work on elephant behavior and welfare, sand cat enrichment, and gorilla enrichment. Occasionally students even stay on to complete honor's theses at the Zoo, including a study of visitor perceptions on elephant behavior. In addition, Master's students from several universities, including NCSU, East Carolina University, and Winthrop College, have worked closely with the zoo's scientists



Research interns get unique opportunities to learn how to study wildlife biology while also providing valuable insights to the Zoo on animal welfare and management.

to design studies on visitor education, bird behavior, and elephant diet and nutrition. Data collected by interns is used by zoo keepers and curators to evaluate management changes and helps to provide

additional insight on animal welfare. For instance, the Zoo has recently shifted elephants to a low-calorie grain and increased the amount of browse (i.e. tree branches and leaves) that elephants get. Interns monitor elephant behavior to see if the changes have also led to an increase in how much time elephants spend feeding and a Master's student takes samples of the leaves to assess how this will impact the nutrition elephants are receiving.



“This internship has been an amazing opportunity to teach, learn, and apply myself in captive animal research. It's exciting to know that I will have contributed to the growing knowledge of animal welfare and made an impact on the North Carolina Zoo's gorilla troop.”

Kelly Kosco
Zoology Intern
North Carolina State University

Catching Native Wildlife on Camera

With over 1000 acres of forested natural areas, the Zoo is home to large variety of wildlife. Because the Zoo's mission covers conservation of wildlife in the wild as well as within the Zoo, staff use camera traps, automated wildlife cameras, to monitor our wildlife. Photos from these cameras show us which species we have and how they use the site. Deer, gray foxes, raccoons, and opossums are especially common.



Cameras have detected presence of unique wildlife species such as bobcat that are still residing on Zoo property.



A photo from a Zoo wildlife camera shows wild turkeys foraging in the oak hickory forest near Purgatory Mountain. Acorns are an important food for wild turkeys.

Also seen are turkeys, coyotes, striped skunks and the occasional bobcat. Sometimes the cameras even record turtles, snakes and birds.

For our next project, Zoo staff will be assisting the NC Museum of Natural Sciences with a state-wide wildlife study. Long term, we would like to design a study to discover where the most important

animal travel corridors are between the Zoo and other wildlife habitats, so that we can protect these areas and keep our wildlife populations healthy.



Marking Snakes to Assess Population Status

Zookeepers are studying wild snakes encountered on the grounds of the North Carolina Zoo by Zoo guests and employees. When encountered and reported, we record the length, weight and the sex of the snake as well as the GPS location and environmental data. Lastly, we insert a Passive Integrated Transponder (PIT Tag) for future identification purposes of each individual. This works similar to the chips that can be put into your dog so that if it gets lost, it can be scanned by a vet to identify the owner. When handling snakes, we



use the opportunity to educate Zoo guests about the importance of snakes in the environment and dispel the many myths surrounding them.

The goal of the study is to learn more about the wild populations of snakes at the Zoo as well as any long-term trends that may be ongoing. We would also like to learn more about how they are utilizing the Zoo grounds and if there are any preferred areas. Since March 2015, we have encountered more than 200 snakes and individually marked over 150 individuals. We have encountered 13 different species, ranging from the tiny worm snake to the timber rattlesnake, which is a species of special concern.



A zookeeper scans the snake to determine if it has a PIT tag, which will inform us whether or not this is a new individual or a snake that has not been captured before.



Snake research on site creates unique opportunities to teach guests about the importance of these misunderstood but critical predators.

Understanding Our Closest Relatives With Duke University

The North Carolina Zoo is home to a thriving troop of chimpanzees and gorillas. Working with our closest relatives offers some unique opportunities to better understand human behavior, cognition, and evolution. Students from Brian Hare's lab at Duke University have been working with the Zoo's chimpanzees to assess how chimpanzees understand and make decisions about their social environment. Chimps are shown images on a video monitor and then use a touch-

screen to choose between various images. Once the chimps get used to the set-up, it can safely and humanely be used to assess the cognitive abilities of chimps. For the chimps, this represents a unique enrichment opportunity where they can "answer" questions to earn rewards like pieces of apple. For the students, it is a chance to ask complex questions to assess how chimps use their intelligence to adapt to their social world.

Students from Daniel Schmidt's lab also at Duke University are studying biomechanics or animal movement using our great apes. The Zoo's gorilla and chimp infants (of which we have had several over the last few years) allow researchers to assess changes in how these large animals move as they grow up. With video images, they can look at how posture, use of hands and feet, and stride change over time. In the near future, they also plan to use force plates—equipment that can measure the amount of pressure an animal's foot or hand creates while it walks. The force plate study will offer new opportunities for understanding how chimpanzees and gorillas move and perhaps even give some insights into how human bipedalism (walking on two feet) evolved.



The Zoo offers unique opportunities to study chimpanzees and gorillas that would not be possible in the wild. Researchers from Duke University are learning how great apes think and move as they work to unravel the mysteries of human evolution.

Animal Welfare



Wildlife Rehabilitation Center

The North Carolina Zoo's Valerie H. Schindler Wildlife Rehabilitation Center was established in August 2001 to provide veterinary medical and husbandry care for sick, injured and orphaned North Carolina native wildlife. The center admits over 800 animals each year representing more than 100 different species including small mammals, birds of prey, songbirds, waterfowl, shorebirds, reptiles and amphibians from counties all over North Carolina.



Veterinary Technician Halley Buckanoff holds a black bear cub for initial examination.

Wildlife rehabilitation is the process of caring for native wild animals affected by human impact (i.e. caught by pets, hit by cars, window strikes, etc) for the sole purpose of return to the wild in a condition that is optimal for survival. The center believes that compassion, civic responsibility and environmental stewardship are lessons best learned in the company of leaders who embody and practice these values. As a teaching facility, the center mentors students, volunteers and interns in responsible and respectful wildlife rehabilitation techniques utilizing the most-up-to-date, evidence-based information. Scientific in the approach and compassionate in the care, participants are trained in all aspects of the wildlife rehabilitation process from triaging new admissions, hand-rearing orphaned songbirds and small mammals to assisting the North Carolina Zoo's veterinary team with treatments and procedures.

The center not only promotes licensed and appropriate wildlife rehabilitation practices but participates in studies to advance knowledge within the field. Conducting innovative research for more than 5 years, the center has been on the forefront of post-release survival studies, banding, mist-netting and radio-tracking songbirds. In addition, the center has participated in relevant research in the field of wildlife rehabilitation, contributing to a cottontail nutrition study, a Canadian-based tick study, and wildlife disease surveillance to name a few. Recently, the center began assisting the

North Carolina Wildlife Resources Commission with Black Bear cubs, hand-rearing orphans as well as contributing to their ongoing research.

Every year, center staff participate in local and/or national symposia learning and teaching about innovations in the field of



Eastern Cottontail with a leg bandage recovers from a cat inflicted wound.

wildlife medicine and care. Active members in both the International Wildlife Rehabilitation Council (IWRC) and National Wildlife Rehabilitators Association (NWRA), the center strives to exceed the Minimum Standards and Code of Ethics for wildlife rehabilitators.



Staff tube feed a sick frog.

Having taught courses in wildlife rehabilitation across North America, and recently in Costa Rica, the center mentors other wildlife caretakers in

respectful and responsible practices. The center was the first facility in the United States to have an internship accredited by the IWRC, and has had over 75 interns throughout North Carolina and the United States complete the internship program. As well, center staff authored a portion of *Wildlife Rehabilitation: A Comprehensive Approach*, the only science-based, peer reviewed, reference for wildlife rehabilitators.



“The Valerie H Schindler Wildlife Rehabilitation Center at the North Carolina Zoo admits approximately 800 sick, injured and/or orphaned North Carolina native wildlife every year. Working with volunteers, members of the public and a large variety of animals provides an opportunity to constantly challenge ourselves, learn and grow, expanding our understanding of human-wildlife interactions and wildlife conservation and medicine.”

Halley D. Buckanoff
Lead Veterinary Technician



Senior Veterinarian Katie Delk examines a red-shouldered hawk handled by Wildlife Center Paid Intern, Halee Schomberg.

Having just celebrated its 15 year anniversary in 2016 with a Wings over Vines raptor release event at a local vineyard in Randolph County, the center could only exist with the

support of its community. The center relies on volunteers and donations to help support its mission to care for and educate about our North Carolina wildlife neighbors.



Northern Mockingbird nestling gapes for food.

Wild Welfare

Zoos strive to maintain the highest standards of animal care and welfare and Association of Zoos and Aquariums (AZA) accredits zoos and aquariums to ensure that all member institutions are meeting these standards. However sadly, many captive facilities around the world have no organised ethical or welfare framework, resulting in poor standards of care and welfare for the animals. Wild Welfare is a captive wild animal welfare program conceived at the North Carolina Zoo, which is solely focused on improving welfare standards in sub-standard wild animal facilities. It facilitates animal welfare training and helps create a positive international captive animal welfare movement through an informed expert approach, knowledge-based decisions and establishment of strong partnerships.

The North Carolina Zoo is committed to the highest standards of animal welfare at our own facility. By working closely with zoos in developing countries, the Zoo is able to improve welfare for animals at other institutions as well.



Wild welfare partners with zoos around the world to improve animal welfare.

Recently, in association with the Brazilian Zoo Association (SZB), Wild Welfare facilitated a Welfare Assessment Training Workshop at Guarulhos Zoo, just outside Sao Paulo. Thirty people from 19 facilities across Brazil attended. After an initial day of training in theory, day two saw attendees carrying out a practical welfare assessment of the zoo itself.

Field Operations Director Dave Morgan was very pleased with how engaged and interested the attendees were on the issue of animal welfare and how well attendees used the assessment criteria. Wild Welfare will be continuing to assist SZB with a series of welfare audits in at least five other zoos, helping each organisation stay committed to making animal welfare improvements wherever they can.

In addition, Wild Welfare visited Hanoi in Vietnam to continue with their work towards developing Vietnam's first ever national zoo animal welfare legislation. They co-hosted a workshop in conjunction with Animals Asia Foundation and Vietnam's central government where draft legislation was discussed. As a result, Vietnam is committed to developing this legislation further which will help oversee national management practices that support higher standards of welfare with Vietnam's zoo and aquariums.



Green Practices



The North Carolina Zoo is committed to sustainability and has an extensive green practices program. Our efforts include waste composting, recycling, solar panels around the Zoo to meet energy demands, and the use of a constructed wetland to filter stormwater.

Project Partners

-  Carolina Solar Energy
-  Randolph Electric Membership Corporation
-  NC Green Power
-  BB&T Bank
-  NC Department of Transportation
-  DENR Environmental Stewardship Initiative
-  NC Clean Water Management Trust Fund

Our Green Approach

The North Carolina Zoo is committed to sustainability and began improving efforts to reduce, reuse, and recycle materials on Zoo grounds as early as 1989. Such efforts are monitored by an employee group called the Conservation Captains.



Even with successes with composting, water conservation and energy controls, the Zoo decided to pursue a more holistic approach to sustainability called ISO 14001 Environmental Management System. With EMS the Zoo identifies its significant impacts on the environment and addresses those impacts through objectives, targets and an action plan. As of 2011, the entire zoo is ISO 14001 certified.



Here is a summary of Zoo green practices:

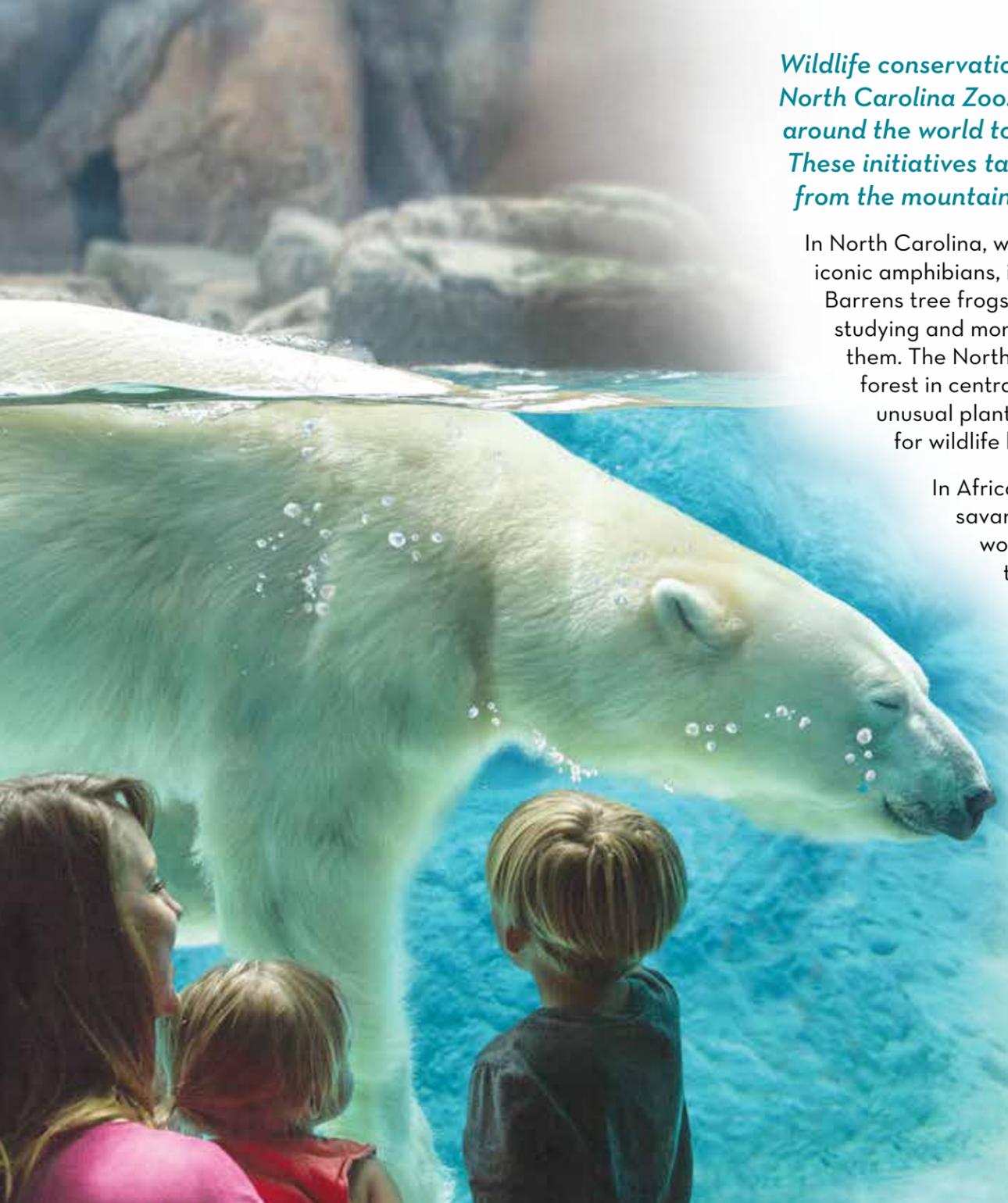
- In 2015 the Zoo composted 1834 tons of animal and plant material, saving \$129,000 in waste disposal. Since 1996, the total composted is 34,600 tons saving \$2,600,000.
- Beginning in 2006, the Zoo has partnered with Carolina Solar Energy and Randolph Electric on a 104kw solar project involving solar panels on three donated picnic pavilions that generate around 130,000 kW hours (about 13 average homes) per year.
- The Zoo has reduced its energy use by 26% on a 2003 baseline with energy updates at the Aviary, Rocky Coast, and Desert as well as new glazing and shade system at the two main Greenhouses. Also the Zoo has converted 2,000 T-12 fluorescent bulbs to the more efficient T-8s and installed new LED lighting donated by Cree and the NC Green Building Council in the Stedman Education Center Multi-Purpose Room.
- The Zoo recycles paper, newspaper, cardboard, used oil, filters, tires, batteries, pallets, wood, aluminum cans, plastic bottles, glass and recently polystyrene foam cups becoming 83% waste to landfill free.

- The Zoo has reduced its water consumption by 37% on a 2003 baseline using meters to detect leaks, making upgrades in filtration systems and practicing more efficient cleaning procedures. Also non-potable water from the Zoo's lakes is used for irrigation and a Master Irrigation Control System determines the amount of water needed for plants based on rainfall and evapotranspiration data.
- Stormwater from the North America Parking Lot is filtered via a constructed wetland at Dragonfly Pointe picnic area and a biocell at the Solar Pointe parking lot.
- The Zoo buys goods made from recycled materials such as recycling containers, decking, mulch and picnic tables. Also the Zoo repurposes used steel, signs, and other construction materials.
- The Zoo has led the local NC Big Sweep cleanups since 2004 and now is the only Zoo based Keep America Beautiful affiliate. In 2015, Big Sweep had 1904 volunteers who covered 59.5 miles of roads and streams and picked up nearly 38,000 lbs. of trash.



- Conservation events include Earth Day, Use Less Stuff Sale, How to Recycle signage, Drink Machine Graphics and Conservation Reminders.





Wildlife conservation is at the heart of what we do at the North Carolina Zoo. Zoo staff work across North Carolina and around the world to protect animals in the wild from extinction. These initiatives take Zoo staff to remote parts of the globe, from the mountains of North Carolina to the jungles of Africa.

In North Carolina, we are helping to protect some of our state's most iconic amphibians, including hellbender salamanders and Pine Barrens tree frogs. Zoo staff spend hundreds of hours each year studying and monitoring these species in order to better conserve them. The North Carolina Zoo also manages over 2,000 acres of forest in central North Carolina. These forests protect rare and unusual plant communities like long-leaf pine, along with habitat for wildlife like bobcats.

In Africa, from the rainforests of Cameroon to the savannas of Tanzania, Zoo staff work with some of the world's most endangered species. We place satellite tracking devices on elephants and vultures, use DNA to monitor gorillas, count lions with smartphones and work on the frontlines of the battle against the international wildlife trade, providing rangers with high-tech tools to stop poachers. We also work closely with people, helping to teach rural communities about the importance of conserving the environment.

By visiting the North Carolina Zoo you are helping to save animals across the state and around the world!

Richard A. Bergl, Ph.D.
Director of Conservation,
Education and Science



Your visit supports the North Carolina Zoo's efforts to save endangered species from extinction.

Thanks for helping us protect wildlife here in North Carolina and around the world!



**To help our efforts
please visit:
www.NCZoo.com**



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