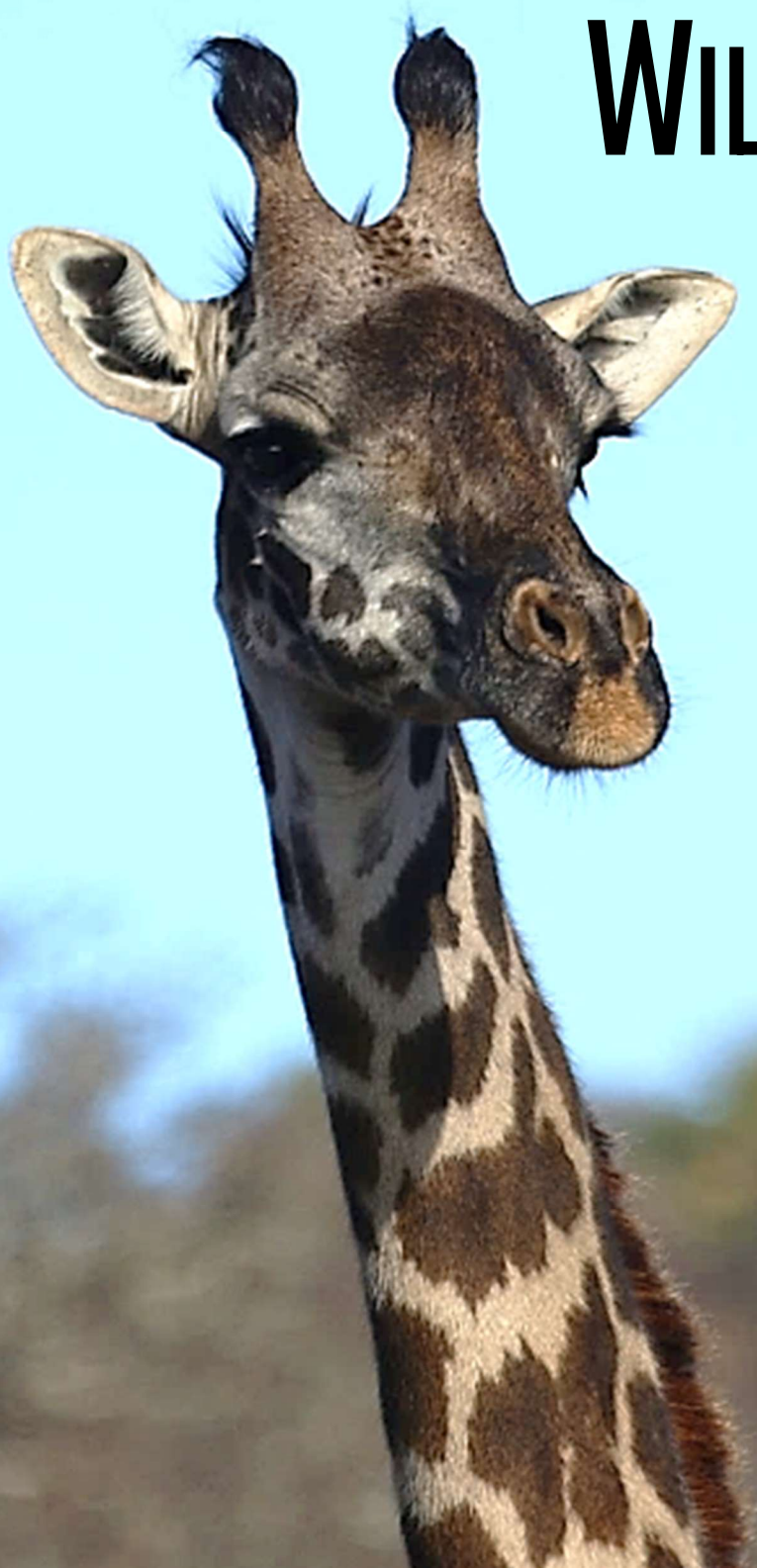


WILD NATURE INSTITUTE

2019

ANNUAL REPORT



From the Founders

In 2019, the Wild Nature Institute continued our long-term science, education, and advocacy work for wildlife in savannas of East Africa and forests of the western U.S.A. Both regions are biologically rich but threatened by human activities.

This year we published five new scientific papers about giraffes and helped obtain endangered status for Masai giraffes. We completed our full set of educational materials and activity guides for all three megaherbivores in our Celebrating Africa's Giants program, continued our education program at schools across Tanzania, organized a Giraffe Fun Day, and planted trees on International Day of Forests. We spread giraffe conservation messages across Tanzania via creative multi-media including a gospel song on the radio, a music video on buses, and videobooks of our children's stories on television. We also launched the first edition of *Nature's Giants* magazine for children in the U.S.A.

We continued and expanded the world's largest demographic study of giraffes, began a new giraffe genetics project, and started integrating social perception surveys into our programs.

We could not have accomplished our goals without your support. As always, you have our deepest thanks.

Dr. Derek E. Lee and Monica L. Bond
Founders and Principal Scientists



Snag Forest Campaign

We study wildfire and wildlife to protect biodiversity in burned forest habitats.

Wild Nature Institute's research has revealed that forest fires usually do not harm Spotted Owls, and fires create more benefits than costs.

Problems arise for the Spotted Owl when people cut down the trees, living or dead, that owls need for nesting, roosting, and perching while hunting.

In 2019, Wild Nature Institute scientists provided:

- Comments on Land and Resource Management Plans for the Sequoia and Sierra National Forests suggesting measures for conserving California Spotted Owls.
- Expert testimony in support of monitoring for Mexican Spotted Owls on all of the National Forests in the range of the subspecies.



Masai Giraffe Conservation

The goal of our Masai giraffe conservation science is to understand where giraffes are doing well and where they are not, and why, and to protect and connect the places most important for giraffes.



Wild Nature Institute is conducting the world's largest individual-based study of giraffes. We use pattern-recognition software to track more than 4,000 individuals over their lifetimes to understand births, deaths, and movements in the Tarangire and Serengeti-Ngorongoro Ecosystems in northern Tanzania.

This year we completed eight years of continuously collected photographic data to monitor individual giraffes in the Tarangire Ecosystem, and we completed one full year of photographic data collection in the Serengeti-Ngorongoro Ecosystem.

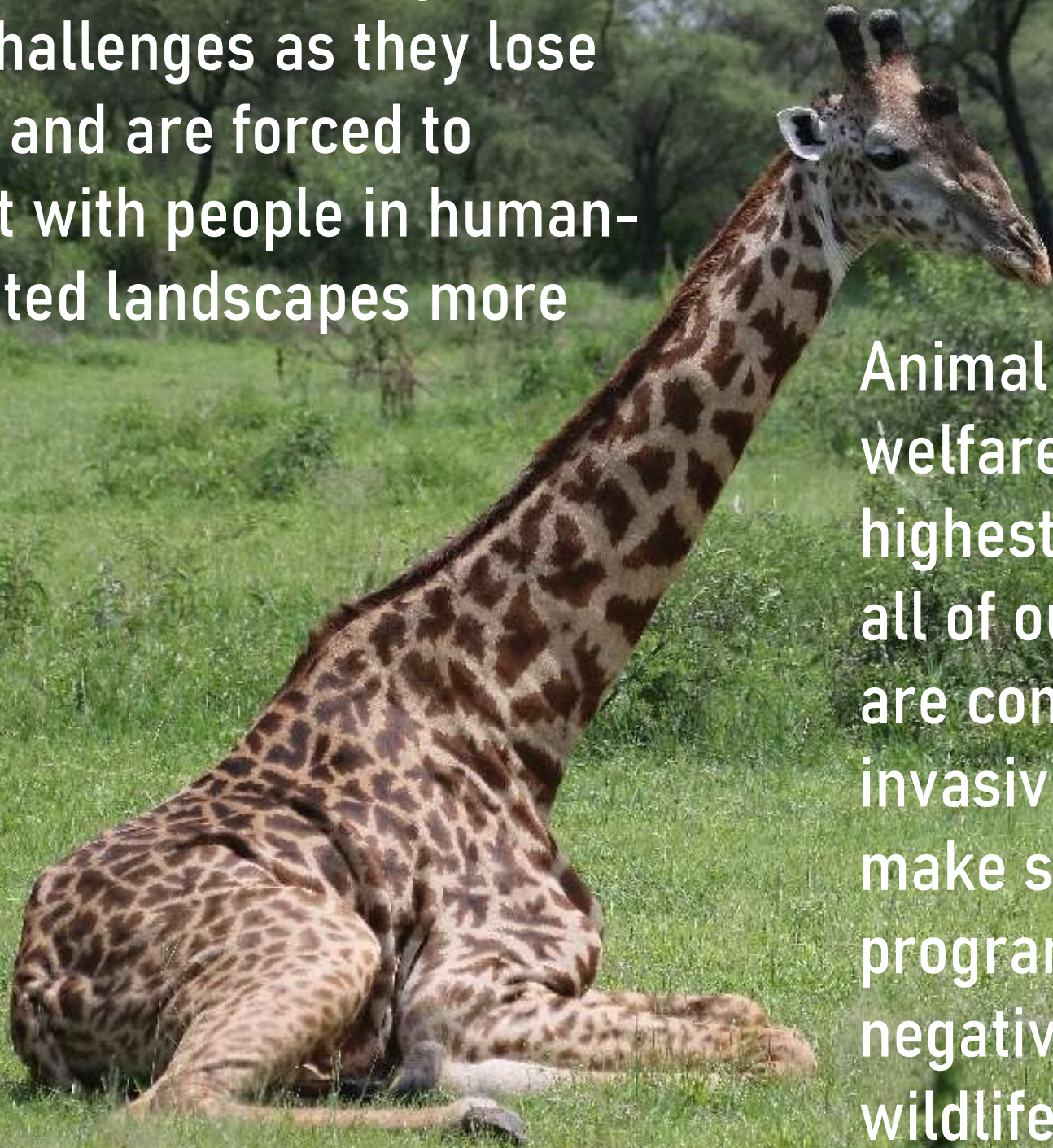


Big Data for Big Animals

← We use an automated program to crop the photos, and a pattern-recognition program to identify each giraffe from their unique spots

Wild animals are facing ever more challenges as they lose habitat and are forced to interact with people in human-dominated landscapes more often.

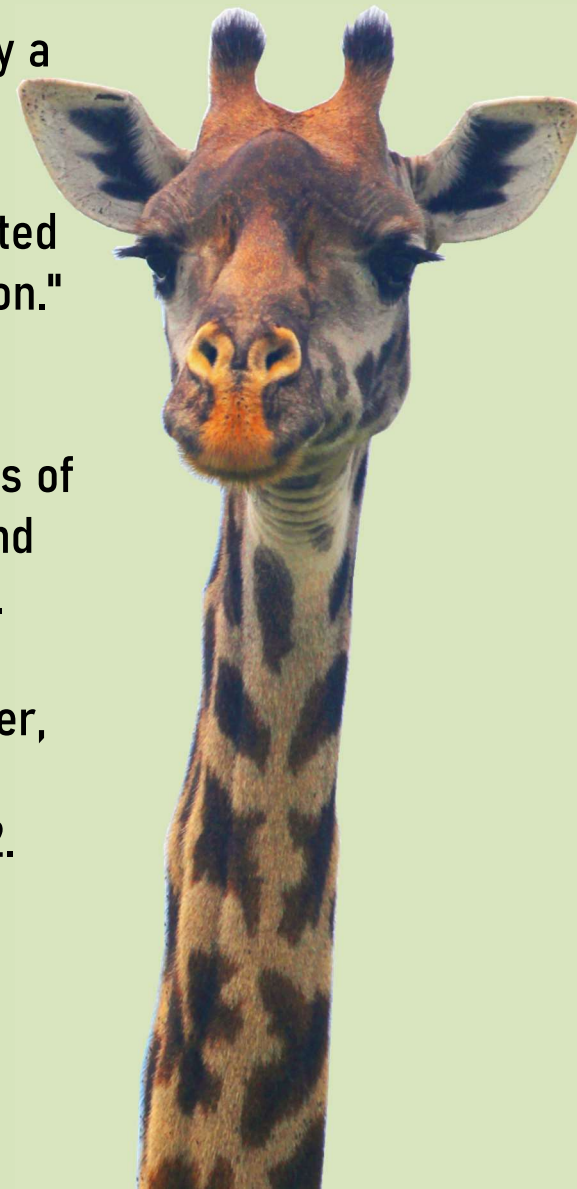
Animal and human welfare are our highest priorities, so all of our methods are completely non-invasive and we make sure our program has no negative effects on wildlife or people.



In 2019, we published these scientific articles about our giraffe research:

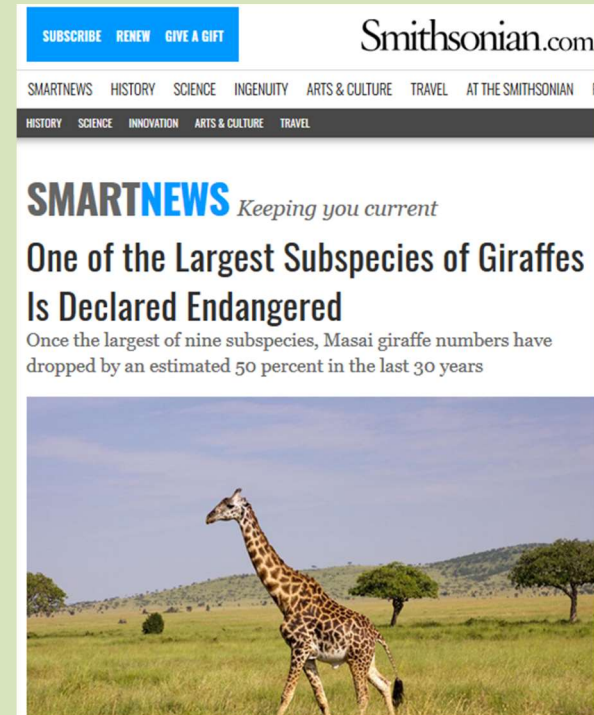
- M. A. Knüsel, D .E. Lee, B. König, & M. L. Bond. 2019. "Correlates of home range sizes of giraffes, *Giraffa camelopardalis*." *Animal Behaviour* 149:143-151. doi:10.1016/j.anbehav.2019.01.017.
- M. L. Bond & D. E. Lee. 2019. "Simultaneous multiple-calf allonursing by a wild Masai giraffe." *African Journal of Ecology* doi:10.1111/aje.12673.
- P. Buehler, B. Carroll, A. Bhatia, V. Gupta, & D. E. Lee. 2019. "An automated program to find animals and crop photographs for individual recognition." *Ecological Informatics* 50:191-196. doi:10.1016/j.ecoinf.2019.02.003.
- M.L. Bond, D. E. Lee, A. Ozgul, & B. König. 2019. "Fission-fusion dynamics of a megaherbivore are driven by ecological, anthropogenic, temporal, and social factors." *Oecologia* 19:335-347. doi:10.1007/s00442-019-04485-y.
- D. E. Lee, E. Fienieg, C. Van Oosterhout, Z. Muller, M. Strauss, K. D. Carter, C. P. J. Scheijen, & F. Deacon. 2019. "Giraffe Translocation Population Viability Analysis." *Endangered Species Research* doi:10.3354/esr01022.

**Our results inform conservation and land management,
and help ensure a future for giraffes.**



This year we helped obtain endangered status for Masai giraffes.

Masai giraffes (*Giraffa camelopardalis tippelskirchi*) live only in Tanzania and Kenya, and their numbers are falling fast. Habitat loss and illegal hunting have caused Masai giraffe numbers to decline over 50% in the last 3 decades. The IUCN Red List status for Masai giraffes was revised this year to Endangered, with a decreasing population trend, based on our work and the work of our colleagues. The endangered announcement resulted in a large media response that helped raise awareness about the plight of Masai giraffes.



Bolger D, Ogutu J, Strauss M, Lee D, Muneza A, Fennessy J, Brown D. 2019. "*Giraffa camelopardalis ssp. tippelskirchi*". IUCN Red List of Threatened Species. 2019: e.T88421036A88421121. doi:10.2305/IUCN.UK.2019-1.RLTS.T88421036A88421121.en.

Giraffe Science 2019: Media Highlights

“Why A.I. trained to recognize giraffe torsos” in Futurity.

“Toward automated animal identification in wildlife research” in Science Daily.

“Machine Learning can be used for automating animal identification in wildlife research” in Express Computer.

“Using the cloud to identify giraffes on the ground” in Wildlife Society Bulletin.

“Researchers work to find the giraffe in the bushes” in Phys.org.

Field Notes

Tools and techniques for today's wildlife professional

Using the cloud to identify animals on the ground

As TWS member Derek E. Lee studies Tanzania's declining giraffe population, his fieldwork occurs in remote areas without cell service or internet, but increasingly, he's also making use of cutting-edge machine learning technology in the cloud.

An associate research professor at Penn State University and principal scientist at the [Wild Nature Institute](#), Lee uses photographs to survey Masai giraffes (*Giraffa camelopardalis tippelskirchi*) in and around Tarangire National Park to try to understand why giraffes have declined about 40 percent in recent decades. “A silent extinction of giraffes is happening right before our eyes,” he said.

The technique allows him to identify every individual — some 3,100 — in the population, far more than traditional tagging could. Software identifies each giraffe's unique spot pattern, but researchers had to crop each photo one by one to show just the torso, where the most markings are visible. That could be 2,000 photos per survey. “It was very laborious and time-consuming,” Lee said.

To eliminate the bottleneck, he turned to the cloud, using machine learning technology to convert photographs into data. He and a team from the cloud computing platform Microsoft Azure describe the technique in a [paper](#) in the journal *Ecological Informatics*.

The Microsoft team trained a program to recognize giraffe torsos using existing photos and to predict cropping squares on new images. With a human to verify or correct the results, a training algorithm improved the system over time. It proved 100 percent accurate in identifying giraffe torsos in high-quality photos, Lee said, and over 90 percent accurate when adding in poorer photos, even where vegetation partially blocked the giraffes. “It takes something that used to be weeks of processing down to hours,” Lee said.

Scientists increasingly use photo recognition for other species, from salamanders to tortoises — even some species hard to distinguish by eye. “Animals that at first glance may appear to be very similar looking, if you look close enough, you often find some feature that is unique,” he said.

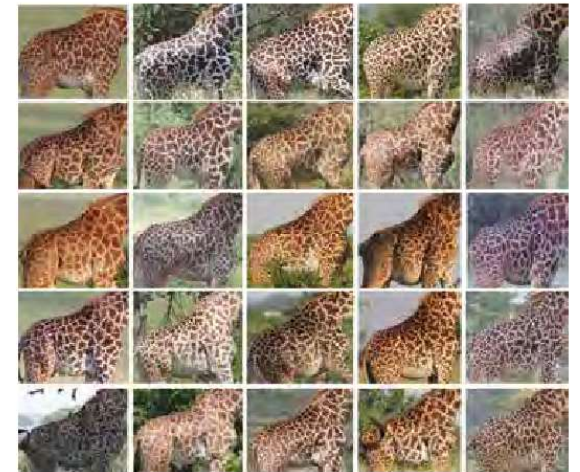
Machine learning streamlines the process, Lee said, making it easier for biologists to use it as an alternative to tagging. That technique has risks for both researchers and wildlife and, in some cases, impacts animal behavior, survival and reproduction, he said. But photos “allow the animals to live their life completely unbothered by the study.”

—Contributed by David Frey ■



Credit: Mudflap DC via Flickr

▲ Masai giraffes are experiencing “a silent extinction,” researcher Derek Lee says.



Credit: Wild Nature Institute

▲ Machine learning allowed a computer program to recognize giraffe torsos in photographs and predict where the images should be cropped, helping researchers use the images to identify individuals.



Credit: Wild Nature Institute

▲ Derek Lee, Monica Bond and James Madeli, of the Wild Nature Institute, pose with students in their environmental education program in Mto wa Mbu, Tanzania.

Giraffe Science: Building Collaborations

We collaborate with institutions around the world to maximize the impact of our research programs.

- **We partner with zoos:** In May, Dr. James Danoff-Burg and Mike Chedester from The Living Desert hosted a social science workshop in Tanzania for Wild Nature Institute and PAMS Foundation. We learned how to assess the ways our work is influencing community knowledge, perceptions, and behaviors.
- **We partner with Nelson Mandela AIST:** Dr. Derek Lee is advising a Tanzanian Master's student, Matana Levi, who is studying giraffe foraging ecology.
- **We partner with Penn State University:** Dr. Derek Lee and Dr. Doug Cavener are working with a Tanzanian post-doctoral researcher, Dr. George Lohay, to conduct genetic studies of giraffes.
- **We partner with University of Zürich:**
 - Monica Bond is advising Master's student Nick James, who is analyzing habitat selection by ungulates in Tarangire using our TUNGO data.
 - Monica Bond is advising Master's student Kin Morandi, who is studying how spot patterns influence social behavior of female giraffes.
 - We are collaborating with Vet Suisse to develop a body condition score for zoo and wild giraffes.



Capacity Building

We are increasing the capacity of Tanzanians to study and conserve their national animal, and ensuring the long-term sustainability of our Masai Giraffe Conservation Science.

In August we began working with Penn State post-doctoral researcher **Dr. George Lohay**. In partnership with Wild Nature Institute, George will develop techniques to non-invasively collect DNA from giraffe dung for a variety of genetic studies.

Our Tanzanian crew continued to conduct giraffe photographic surveys in the field three times per year.

We are co-supervising a Tanzanian Master's student at Nelson Mandela African Institute for Science and Technology, **Matana Levi**, who is studying giraffe foraging ecology in the Tarangire Ecosystem.



Tarangire Ungulate Observatory “TUNGO”

The Wild Nature Institute’s landscape-level population research program for 22 species of ungulates (hoofed mammals).



Grant's gazelle



Kirk's dik-dik



Impala



Common waterbuck

The savanna habitat of the Tarangire Ecosystem is one of the richest areas on the planet for large mammal diversity and abundance, and is a global hotspot for ungulates. TUNGO is monitoring all ungulate species in this ecosystem, and providing the scientific means to reverse population declines.

Our TUNGO surveys provide reliable data for scientific management, land-use planning, anti-poaching enforcement, and conservation. Our Master's student, Nick James, is analyzing habitat selection using our TUNGO data.

Northern Plains Campaign

We shared our data and maps about wildebeest and giraffe movements in the Tarangire Ecosystem at a technical workshop organized by several government institutions: **“Prioritizing Wildlife Movement Corridors in Tanzania.”** We will continue working with these institutions to secure conservation of threatened movement corridors in the Tarangire Ecosystem, so wildlife in the region can roam as they have for millennia.



The sustainability of the Tarangire wildebeest population is critical to the ecological function and economic value of Tarangire National Park.

Environmental Education

CELEBRATING AFRICA'S GIANTS

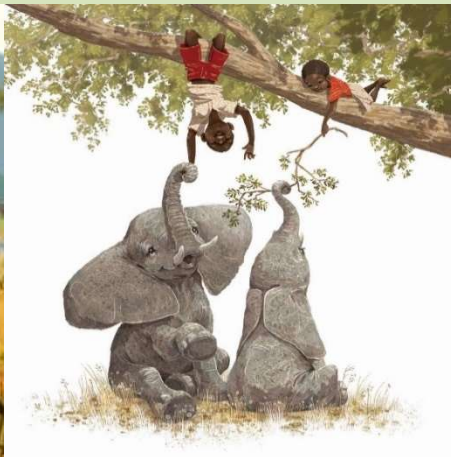


Giraffes, elephants, and rhinoceroses are Africa's giants. These large mammals play critical ecological roles in the places where they live, but their numbers have plummeted because of conflicts with humans.

With "Celebrating Africa's Giants," our team of researchers, educators, illustrators, and designers has developed innovative educational materials and activities for children in Tanzania and the U.S.A.

The materials use Africa's Giants to teach biology, geography, science, math, language skills, art, and conservation.

In Tanzania our program has **trained more than 200 teachers** and **reached over 25,000 school children** across the country.



Very Special Thanks to Chris Barela, David Brown, Kayla Harren, Lise Levy, Megan Strauss, and Sophie Tremblay

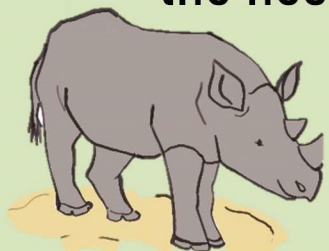
Environmental Education



CELEBRATING AFRICA'S GIANTS



- Full-color bi-lingual (Swahili and English) story books about giraffes, elephants, and rhinoceroses.
- Swahili Africa's Giants activity book.
- Giraffe, elephant, and rhinoceros educational posters.
- A conservation career guide, containing interviews and photographs of people involved in conservation-related work in Tanzania (e.g. researchers, safari guides, wildlife rangers, NGO staff, solar technicians, etc.).
- A website—www.AfricasGiants.org—where materials, lesson plans, and activities are freely available.
- Educator training on how to develop and implement innovative, effective, conservation-oriented teaching strategies.
- A mobile education program “Giraffe/Elephant/Rhinoceros in a Box” to implement the lesson plans and activities in the classroom, and provide the necessary supplies in Tanzania.



www.AfricasGiants.org

Environmental Education

CELEBRATING AFRICA'S GIANTS

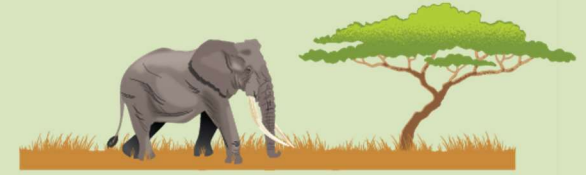


In 2019, Wild Nature Institute distributed our Africa's Giants educational materials to thousands of children throughout the Tarangire region of northern Tanzania, as well as western Serengeti, Arusha, and even in Kenya!



Environmental Education

CELEBRATING AFRICA'S GIANTS



International Day of Forests: 21 March

We planted native seedlings at Lowassa Secondary School in Makuyuni to celebrate trees and their importance both for people and for Africa's Giants.



Environmental Education



CELEBRATING AFRICA'S GIANTS

At our Giraffe Fun Day at Gorowa secondary school in Babati in July, 152 students participated in different activities including sports, drama, art, singing, quizzes, and t-shirts for the children that say “We Protect Giraffes, The Pride of Tanzania.”



In October James took 14 students from Manyara Secondary School to Lake Manyara National Park for safari. The students had a blast visiting the national park in their own backyard for the first time in their lives.

These activities teach and inspire children, parents, and teachers to care for giraffes and other wildlife in fun, exciting, and innovative ways.



Environmental Education

CELEBRATING AFRICA'S GIANTS: USA

In 2019 we launched the inaugural issue of *Nature's Giants* magazine.

The goal of *Nature's Giants* is to connect young people in the U.S.A. with our planet's ecological giants and their conservation challenges, and find ways to keep that connection growing.



Nature's Giants magazine is full of fascinating articles, jokes, games, fun crafts, science prompts, challenging puzzles, comics, and more. The magazine is "narrated" by a funny dung beetle named Doug, who shows that there are many ways to be a giant in nature beyond physical size.



www.AfricasGiants.org

Outreach and Advocacy

We presented our latest giraffe science findings at several venues in 2019.

- We discussed our research and education program with 30 American students from the School for Field Studies in Rhotia, Tanzania in February.
- We presented to 15 students from Penn State University as part of their study abroad program in Tanzania in May.
- We lectured to 20 students at the Integrated Species Conservation and Management class at University of Zürich in Switzerland in May.
- We presented our giraffe project at the Antelope TAG meeting in Berlin, Germany in May.
- We spoke about our giraffe research with 15 students from University of York in the Randilen Wildlife Management Area, Tarangire Ecosystem, Tanzania in September.
- We discussed giraffe biology, ecology, conservation, and our research with 8 safari guides-in-training at &Beyond's Mwemwe Ranger Training School in Tanzania in October.



Outreach and Advocacy

Multimedia Conservation Messages

This year we produced and shared multimedia that celebrates giraffes and urges Tanzanians not to eat giraffes and other bushmeat.

This included: playing our giraffe gospel song about giraffes on the radio; supporting Music for Conservation to make a music video for the hip-hop song 'Okoa Twiga' (Save Giraffes) and showing the video on buses; and playing all four of our children's story videobooks on TBC 1 television station.

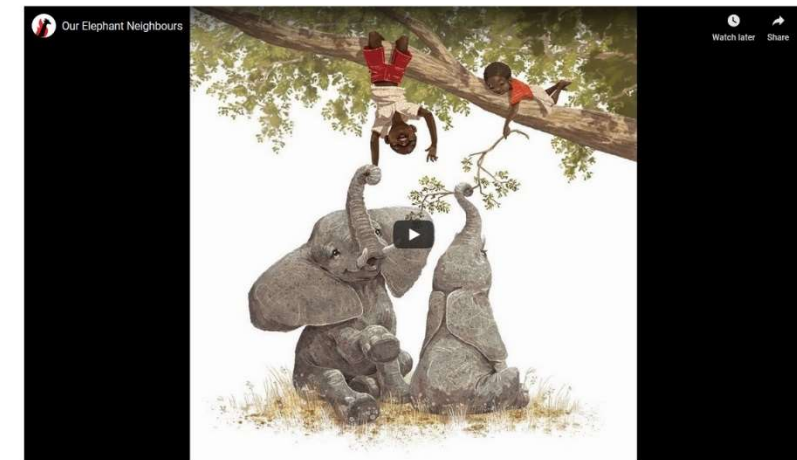
We promote 3 conservation actions for Tanzanians:

- (1) Plant trees
- (2) Use cooking gas (to save trees)
- (3) Do not eat bushmeat

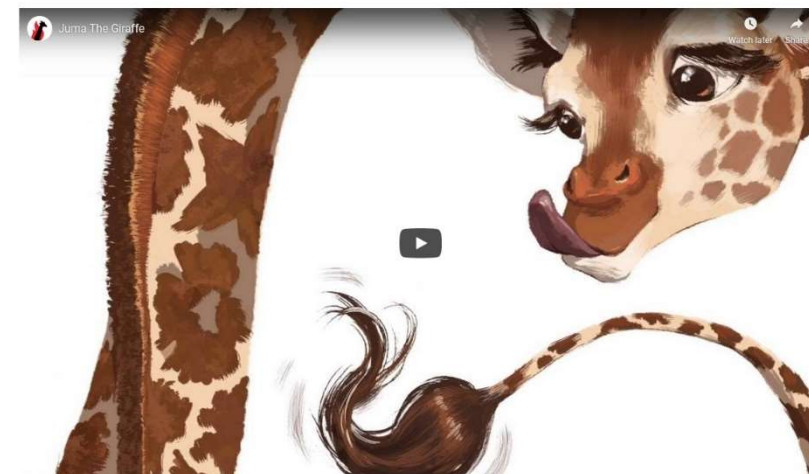
(6) Helping Brother Rhinoceros videobook



(6) Our Elephant Neighbours videobook



(6) Juma the Giraffe Videobook



Outreach and Advocacy

Multimedia Conservation Messages



On World Giraffe Day (June 21), the Wild Nature Institute's Celebrating Africa's Giants team spoke about giraffes, our research and education programs in Tanzania and the U.S.A., and the importance and challenges of conservation around the world in two interviews: Celebrate Picture Books and the Wilderkids podcast.

The screenshot shows a Spreaker podcast page. At the top, there's a search bar and navigation links for Listen, Create, Plans & Pricing, LOGIN, and SIGN UP. The main title is "Monica Bond - World Giraffe Day" from the "Wilderkids (for parents of eco kids)" show. It shows 9 plays and 30 downloads. Below the title is a play button and a waveform. There are social media icons for Like, Facebook, and Twitter, along with Download and Embed options. The "INFO" section contains hashtags like #environment, #children, #childrensbooks, #conservation, #eco, #environment, #giraffes, #nature, #picturebooks, #science, and #wildlife. A short text snippet reads: "Today is World Giraffe Day and I couldn't think of a better way to celebrate it than chatting to giraffe expert and children's author Monica Bond." The "AUTHOR" section identifies the host as "Twig.fm" with 0 followers and a "FOLLOW" button. A "FIND US ON FACEBOOK" section shows the Spreaker logo with 253,300 likes. At the bottom, a small audio player shows the title "Monica Bond - World Gira..." and a play button.

The book cover features a giraffe standing in a grassy field with small birds. The title "JUMA the GIRAFFE" is written in a stylized font. Below the title, it says "written by Monica Bond" and "Illustrated by Kayla Harren". In the top left corner, the date "Jun 21" is displayed. In the top right corner, the number "4" is visible.



Outreach and Advocacy

Assessing The Impacts Of Our Work

In May, Wild Nature Institute and PAMS Foundation hosted a social science workshop run by The Living Desert. We now strive for social perception surveys to be integrated into all facets of our work to objectively gauge whether and how people's knowledge, perceptions, and behaviours are affected by our programs.



Very Special Thanks to Dr. James Danoff-Burg and Mike Chedester from The Living Desert

Our Major Donors and Supporters

Sacramento Zoo · Columbus Zoo · Tierpark Berlin · The Living Desert

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Thanks to all the additional wonderful donors who supported our work!

Our Partners

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Music for Conservation

Nelson Mandela AIST

Ngorongoro Conservation Area Authority

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Peace for Conservation Serengeti

Tanzania National Parks

Tanzania Wildlife Authority

Tanzania Wildlife Research Institute

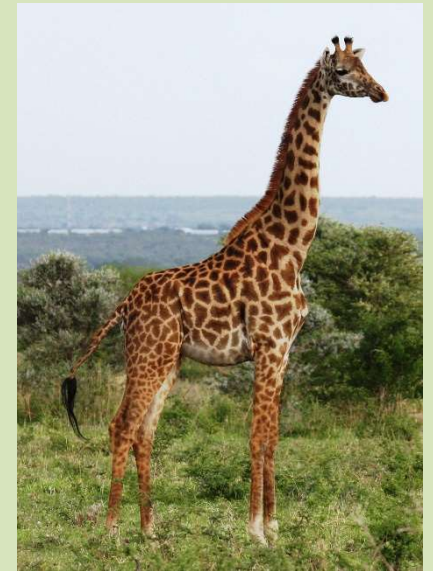
Statement of Activities 2019

INCOME

Grants from Foundations	\$ 92,364
Individual Donations/Family Trusts	\$ 19,118
Total Income	\$ 111,482

EXPENSES

Field Research (Permits, Vehicle, Equipment, Food and Fuel, Tanzanian Field Assistants)	\$ 41,432
Travel (Including Conferences)	\$ 11,197
Conferences/Meetings/Membership Fees	\$ 1,324
Services (Educational Activities, Create Videobooks and Hiphop Videos, Printing Books and Posters)	\$ 15,379
Mailing and Office Expenses (Rent, Phone, Utilities)	\$ 8,150
Total Expenses	\$ 77,482
Starting Balance (carryover from 2018)	\$ 30,239
Income - Expenses	\$ 34,000
Ending Balance	\$ 64,239



Officers

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Monica Bond, Secretary-Treasurer

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