



TRAILBLAZING TECH

HOW AI DECODES WILDLIFE FOOTPRINTS

Conservation technology and wildlife monitoring techniques have come a long way with tracking once being a survival skill, to now being an important component of conservation. The use of cutting-edge technology to conserve wildlife and their environment is an important component of this ever-evolving field. Picture being able to determine the population size within a species and conserve wildlife with the science of footprint technology. That's what Zoë Jewell and Sky Alibhai at WildTrack do in their global conservation work.

Written by: *Chelsea Whittingham*

Zoë Jewell and Sky Alibhai
Photo credits: WildTrack

WildTrack
Non-invasive Wildlife Monitoring

CONSERVATION **FiT**
Footprint Identification Technology (FIT)

www.wildtrack.org
www.conservationFIT.org

CAN
CONSERVE AFRICA NOW

- Small mammal track plate
- Photo credits: WildTrack

“TO PROTECT WILDLIFE, WE DON’T HAVE TO BE HANDS-ON, WE SHOULD RESPECT THEIR NEED TO HAVE SPACE.”

WILDTRACK’S STORY

WildTrack is an independent nonprofit based in North Carolina, founded by Zoë Jewell and Sky Alibhai. The story of WildTrack goes back to the 90s with their initial work in Zimbabwe. Zoë’s passion for wildlife began at a young age with her earliest memory being visiting her grandfather’s furrier business. Unlike her grandfather, Zoë couldn’t understand killing animals for their fur. “He picked me up... and I remember having a slight feeling of discomfort that turned to shock when he told me that these were the skins taken from these beautiful animals.”

This childhood fascination and love for animals led to her first pursuing a career in veterinary

medicine. Shortly after graduating as a vet, Zoë and her partner Sky Alibhai, a lecturer at the University of London, were given a unique opportunity to help monitor black rhinos for the Zimbabwean government. This intended one-year sabbatical became a lifelong journey. Over the years Zoë and Sky would continue their work across multiple countries with WildTrack officially becoming a registered nonprofit in 2011 and then relocating to the US in 2012.

WildTrack’s goal is to protect endangered species and monitor their populations using three major components; data analysis, artificial intelligence, and traditional ecological knowledge (TEK). This unique synergy of the ancient and modern is

used to develop only non-invasive approaches, to reduce harm like stress or physical injury to sensitive populations, and minimize human-wildlife contact risks such as transmission of novel diseases. Zoë’s advice to conservationists and people aspiring to get into the field is to think about all signs and aspects of nature when out in the field. “We’re all so busy that we sometimes forget to look around us to see the impacts we have on the delicate balance of the natural world.”

In 2000, WildTrack had a breakthrough that would aid them in their conservation efforts and become the forefront of their work. They developed a Footprint Identification Technology (FIT) in JMP software that can identify species, individuals, sex, and age classes purely from an individual’s footprints, ensuring non-invasive monitoring. Although Zoë and Sky both worked closely with local trackers in Zimbabwe — who could identify sex and age by seeing a footprint in real life — the possibility of doing this with technology had once seemed far-fetched. “We don’t have to interfere with the physiology or behavior of these sensitive animals to understand what’s happening,” Zoë

said, “To protect wildlife, we don’t have to be hands-on, we should respect their need to have space.” Their use of FIT has gained international recognition and many awards; in 2022 WildTrack won the Otter Oscar award from the International Otter Survival Foundation for research they conducted on otters where they identified three different species using the same habitat.

WILDTRACK’S CONSERVATION EFFORTS

Currently, WildTrack has 35 projects taking place worldwide. There is also an impressive global network of biologists and conservation experts called the WildTrack Specialist Group. The network comprises of specialists from twelve different countries working on community-friendly projects to achieve their mission of conserving wildlife using non-invasive monitoring. The experts monitor a range of different species across many continents, including the black and white rhino in Botswana, tigers and leopards in Nepal, jaguars in Brazil, and small mammals in South Africa.



San grandfather and son using modern and ancient technology at Naankuse, Namibia
Photo credits: WildTrack

WORLDWIDE

Unfortunately, one of the barriers that WildTrack's conservation efforts face is access to funding. Zoë's words are clear, "We only need about 1% of the planet's Gross Domestic Product (GDP) to protect biodiversity, and that not only helps us fight against climate change but also protects our land against pollution. All these things combined are essential for human life, so putting 1% of our global GDP towards that seems like a small effort."

Their Footprint Identification Technology (FIT) uses a combination of morphometric data —the size and shape of an organism or organ— and AI algorithms to ensure noninvasive monitoring. This technology allows them to identify species, individuals, sex, and age class purely from an individual's footprint. The use of morphometric and AI algorithms by WildTrack aids in the conservation of species worldwide by allowing large amounts of data to be filtered to identify species and individuals. "Such data can be used in construction and human development projects. Through footprints, we can determine what kind of effects development projects such as windmills and solar farms have on wildlife abundance at that specific location, before, during and after the development," says Sky. WildTrack is currently researching the impact of human development projects using FIT, showing that conservation is a human issue involving local communities.

THE CONNECTION BETWEEN CONSERVATION AND LOCAL COMMUNITIES

Alongside their conservation work and amazing research, WildTrack also focuses on uplifting and providing opportunities for local communities as well as promoting the importance of Indigenous ecological knowledge. The organization works with many Indigenous groups, giving elders the tools to teach tracking skills to youth. This is crucial to preserving the incredible breadth of ecological knowledge held by indigenous groups around the world. They are essential in protecting the environment and working with WildTrack benefits them by allowing traditional indigenous

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knowledge about the environment to be shared with aspiring conservationists and tourists. Also, WildTrack has workshops that give aspiring and current conservationists as well as local communities the opportunity to gain knowledge and skills such as footprint identification and wildlife monitoring techniques.



A track plate setup
Photo credits: WildTrack



Black Rhino with calf in Namibia
Photo credits: *WildTrack*

WORLDWIDE

ZOË AND SKY'S EXPEDITION

Currently, Zoë and Sky are participating in a three-part research project across Southern Africa with their most recent trip being to South Africa. Funded by JRS Biodiversity, and working with expert local partners Oppenheimer Generations Research and Conservation, Dr. Nico Avenant of the National Museum in Bloemfontein, and Dr. Maria Oostenhuizen, their project aids in building their database, and in doing so they train their AI model to become better at recognizing footprints, including ones that are completely scattered or have multiple prints overlapping each other. It also involves tracking small mammals by using track plates and smart boxes to determine a baseline of the species present in the area. "The smart boxes have a window to allow us to see which species enters the track plate and how it moves," says Sky. As small mammals make up 30-40% of mammal species, and their numbers fluctuate rapidly with environmental changes, they are very sensitive indicators of environmental change caused by factors like climate change and biodiversity loss. With their current project, they are building their Southern African database, however, to create a good overview of small mammal species living around the world, much more data will need to be collected. "You have to understand your environment to be able to work well with footprints. It evolved with humanity. If an early human was able to track and read the science of their environment, they could survive," says Zoë.



WILDTRACK'S FUTURE

The future of WildTrack is bright with the dedicated team having many plans in mind. They are hoping to expand their research and use FIT on a worldwide basis. Zoë and Sky's next trip is due to take place in October with the intent of studying different areas and landscapes. "Our third and last part of our expedition is due in October. We hope to study different areas and landscapes this time, further understanding small mammals in this area of the world. As our expedition comes to an end, we plan to showcase our findings at a research conference in Johannesburg," says Zoë. "But that doesn't mean we're done in Southern Africa. Namibia, Botswana, and other countries are also high on our list to expand our research to." In the end, they plan to create a database to allow for further research and the development of their AI tool.



Photo credits: L. Diederiks

"THE ULTIMATE OBJECTIVE IS TO POPULATE A WORLD MAP WITH FOOTPRINTS THAT CAN TELL US WHERE ENDANGERED SPECIES LIVE AND HOW WE CAN PROTECT THEM BEST."



Sky showing students results on a track plate
Photo credits: L. Diederiks

WildTrack project distribution



The organization also aims to engage with more members of the community such as recreational hikers, school children, and university students. To this end, they have built an app, 'WildTrackAI', that enables people to take part in footprint identification themselves. Sky adds, "You only need a phone and a ruler, to capture footprints of local wildlife. Upload the image – with the ruler alongside the print to clarify its size – and you're now part of community science!" WildTrack and Edge Impulse, both members of the 1% for the Planet community, are partnering to provide immediate identification of images taken on the app.

WildTrack is also building a web platform interface that will allow community members to see their contributions and how they are being used. Zoë adds: "The ultimate objective is to populate a world map with footprints that can tell us where endangered species live and how best we can protect them. Anyone in the world can contribute and because footprints are everywhere, the potential for conservation is vast!" If all comes together, their long-term goal is to have a WildTrack institute that can host workshops, teaching and training opportunities, and provide resources to aspiring conservationists and local communities.

SUPPORTING WILDTRACK

If you want to support WildTrack with their current projects and future endeavors conserving global wildlife, you can help by becoming a donor. You don't have to have a scientific background to make a difference in the conservation field. If you would like to get involved with WildTrack, you can volunteer or partner with them directly. Also, if you want to implement your own conservation project using FIT, you can contact the organization through their website. And if you want to receive regular updates on WildTrack's journey and future ambitions, you can follow their journey one step at a time by checking out their website and following them on social media.



Part of Team WildTrack
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MOST THREATENED PLACES AROUND THE WORLD

Across all our continents are unique and biodiverse ecosystems threatened by human activity. From the Amazon, to the Congo Basin, and the Great Barrier Reef, these places are home to a diverse range of species who rely on these biodiverse ecosystems to survive and thrive.

50% HALF OF BORNEO'S RAINFOREST WAS LOST BETWEEN 1973 AND 2015

39% BETWEEN 2000 AND 2018, ROUGHLY 39% OF BORNEAN TROPICAL FORESTS WERE CONVERTED INTO PALM OIL PLANTATIONS

400 SINCE 1995, MORE THAN 400 SPECIES OF FLORA AND FAUNA HAVE BEEN IDENTIFIED ON THE ISLANDS, WITH OVER 50 OF THESE COMPLETELY NEW TO SCIENCE



The Smallest Rhinoceros: Sumatran Rhino is the smallest of the living Rhinoceroses, has a population of just 40 individuals, and hence listed on the IUCN Red List as Critically Endangered.

OTHER SPECIES THAT LIVE HERE



Deforestation: Pulp and paper industry demands have led to increased legal and illegal logging, which has caused a devastating amount of deforestation.

Illegal Wildlife Trade: Borneo and Sumatra have faced rampant poaching over the years as a direct result from the growing number of roads and logging trails.

Agricultural Expansion: Crucial habitats for conservation have been destroyed to make way for palm oil and coffee agriculture.

615 FROM 1999 TO 2010, SCIENTISTS HAVE DISCOVERED 615 NEW SPECIES, INCLUDING 41 MAMMALS AND 61 REPTILES

90% OF MADAGASCAR'S FLORA AND FAUNA SPECIES ARE ENDEMIC TO THE ISLAND



Habitat Loss: Widespread clearing of forests for wood and charcoal could jeopardize the existence of Madagascar's flora and fauna that have evolved over millions of years.

Illegal Trade: Forest degradation and deforestation have opened Madagascar's wildlife to international trade. Plants, rosewood trees, tortoises, geckos and snakes are a few notable, and most threatened, animals targeted by traffickers.

OTHER SPECIES THAT LIVE HERE



Unique diversity: Madagascar is home to some of the most unique animal and plant species that we know. A median of 92% of Madagascar's reptile, plant and mammal life exists nowhere else on Earth.

2X ARCTIC TEMPERATURES HAVE RISEN 2X FASTER THAN THE GLOBAL AVERAGE

13% SUMMER ARCTIC SEA ICE EXTENT IS SHRINKING BY 13% PER DECADE



Climate Change: Temperatures in the Arctic are warming twice as fast as the rest of the world. This has lowered sea ice levels, melted permafrost and is directly causing a rise in sea levels.

Oil and Gas Drilling: Intensive offshore oil drilling in Arctic waters is a risky practice that can result in disastrous oil spills. This affects all species within the Arctic food chain from marine to terrestrial life.

Mining: A proposed Pebble Mine in Bristol Bay, Alaska, threatens to destroy salmon habitats and generate toxic waste in freshwater ecosystems. Interventions have so far prevented the proposal from proceeding.