WildTrack Annual Report 2020

Modern Technology meets Ancient Indigenous Expertise: Drone footage captures an expert indigenous tracker in Namibia following a territorial 'scrape' marking along a black rhino trail.

Welcome and thank you for joining us

Zoe Jewell & Sky Alibhai,
co-founders of WildTrack

The Covid-19 pandemic impacted every sector of society over 2020, and wildlife conservation was particularly affected. There were unexpected plus events (wildlife reclaiming some urban areas, and proliferating in others) but others were less welcome (the huge decline in eco-tourism that pays for much conservation). One thing is for sure, humanity has a new global awareness of how much we depend on the natural world, and how much work we have to restore ecological equilibrium.

2020 was equally a year of new challenges for our work at WildTrack. We ran a very successful WildTrack workshop in the USA, generously hosted at JMP software - just before international travel ban. We adapted, with everyone else, to video meetings, improved our outreach materials to allow for more self-teaching, and took the opportunity to focus more on our research and development work. We were surprised and honoured to received two awards. The first was for our collaborative AI project with the UC Berkeley I-School to develop an AI pipeline for rapid footprint classification. A few months later we were nominated by senseFly and honoured to win a humanitarian award for our drone work.

We continued to support our field projects with social media and fundraising initiatives, we onboarded several new projects, built a new and very successful WildLabs conservation technology community and were widely reported in print and movie documentary around the world.

Together, even when apart, we can make the world a safer place for all species.

Species are becoming extinct at up to 10,000 times background rates, yet humanity depends on a healthy biodiversity.

We need:

1. Reliable current data on species numbers, distribution and trends (IPBES, 2020).

2 More data, processed faster. This requires the engagement of AI and the democratization of data collection

Nearly 21,000 populations of 4,400 species around the world, declined an average of 68% between 1970 and 2016 (WWF Living Planet Report 2020).

WildTrack's Footprint Identification Technology (FIT) offers a transformative solution

We have developed the world's first end-to-end solution to monitor species using footprints.

Footprints are a rich source of data, and a transformative solution for conservation monitoring. They're much easier to find than animals themselves, they're easy to collect with a smartphone app, and they're rich in information (Jewell et al, 2020)

Footprint Identification Technology	Other commonly used techniques
Footprints are ubiquitous data - easy to collect and accessible for citizen scientists	Locating endangered species is difficult, and sometimes dangerous
Footprint collection is cheap - using just a smartphone app or simple camera, large volumes of data can be collected	Fitting instrumentation to animals is very expensive so can only be undertaken with small subsets of populations.
Collection is non-invasive, no impact on data quality	Tagging/collaring etc is invasive, which can negatively impact physiology and behaviour
Is based on expert tracking skills, so engages local indigenous communities.	Rarely engage traditional ecological knowledge
Objective and rapid classification at species, individual, sex and age-class using AI	Are often dependent on subjective assessment - eg Camera trap arrays and usually only to species level

Our Mission and Objectives

WildTrack's Mission is to protect endangered species using a unique combination of advanced data analytics, artificial intelligence, and traditional ecological knowledge. By integrating traditional ecological tracking skills with a customised model in JMP software and artificial intelligence, WildTrack engages the whole community from scientists, to indigenous trackers, local communities and recreational citizen scientists. We believe in the intrinsic power of traditional ecological knowledge to engage communities to protect wildlife. The data we gather together, inform on species protection and the mitigation of human-wildlife conflict. These data are also essential to reduce the risk of future pandemics.

A two way learning process - we learn from traditional ecological expertise, and we help local communities use technology to democratize data collection for conservation. It's a win-win.

Objectives:

To develop and apply non-invasive and objective censusing and monitoring techniques as a fundamental resource for wildlife conservation.

To revive, value and engage expert local ecological knowledge in communities who have lived with endangered and elusive species over generations.

To use the power of scientific networking to augment data collection from endangered species around the world. Footprints are ubiquitous, and can be easily and opportunistically collected by anyone with a smartphone or camera

WildTrack Board Members

Zoe Jewell, President and co-founder of WildTrack, Programs and Strategy. M.Sc., M.A., Vet. M.B., M.R.C.V.S.

Sky Alibhai, Director and co-founder of WildTrack, Programs and Software Development. D.Phil.

James Baker, Director. Legal Affairs. B.S., J.D, Attorney at Law, Hedrick Gardner Kincheloe & Garofalo LLP.

Laurie Durham, Director, Finance. B.A. Finance Director, SAS.

Charles Hall, Director, Web applications. B.Sc. Web Applications Developer, SAS.

Joseph Morgan, Director, Technology and Innovations, B.Sc. Principal Research Statistician, JMP.

Onyi Nwafor, Director, Operations and Logistics. Ph.D. Assistant Professor, Bryan School of Business, UNC Greensboro

Maggie Sergio, Director, Marketing and Communications. M.A. Environmental advocate, writer and non-profit consultant

In 2020 we welcomed Maggie Sergio as a new member of our board of Directors.
WildTrack is a Platinum member of GuideStar and our organisational <u>reports and credentials are available here</u>.

Where We Work

Dormouse

Golden Jackal
Wolf

Carpathian Lynx

Amur Tiger

Amur Leopard

Fisher

Bengal Tiger
Box Turtle

Eurasian River Otter

Leopard

Giant Panda

Tortoise
Striped Hyena
Monitor Lizard
Eurasian River Otter

Indian Rhino

Snow Leopard

Jaguar

Bengal Tiger

Lowland Tapir

Lowland Tapir

Cheetah
Black Rhino
White Rhino

African Lion
Leopard

Jaguar

African Elephant

Harlequin Gecko

Mountain Lion

WildTrack™
Non-invasive Wildlife Monitoring
Footprint Identification Technology FIT.

Where We Are In 2020: By Numbers

35 Total Projects
+4 added 2020

14
Students
Undergraduate
and Postgraduate

15 Partner Universities

25 scientists supported
to use FIT in JMP
software

14 Species Algorithms Developed

18 Countries across **5** Continents

Footprint Identification
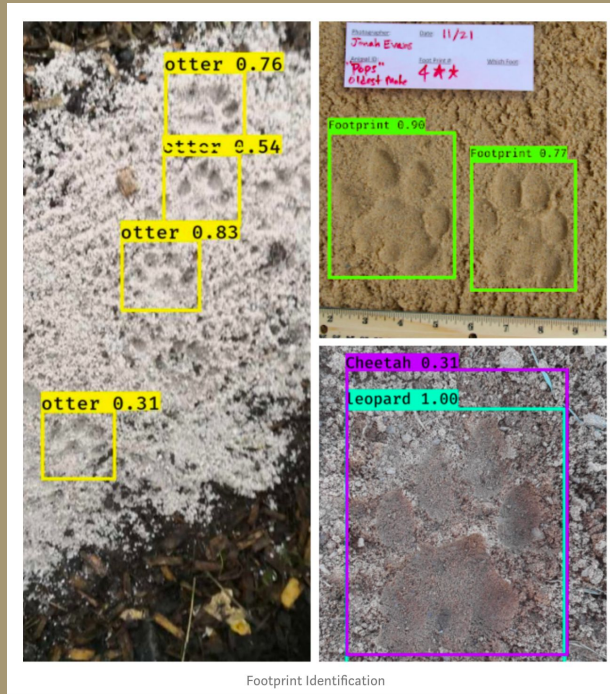
In 2020 we teamed up with a group of data engineers at UC Berkeley's I School to harness the power of AI to help us process our footprint data faster and in greater volumes.

Our WildTrackAI is a now cloud-based system that enables an end-to-end pipeline for collection and aggregation of field data (including images), followed by AI-powered analysis, the results of which are available to via a web portal (www. wildtrack.ml). Data are coming into this system continually and each increment strengthens our footprint classification algorithms.

We were honoured to win the **UC Berkeley 2020 Hal R. Varian Award for this AI application.**

🐾 WildTrack AI   👁 Observations   📷 Images   🎋 System Details   🖧 Species   👥 Users   💬 Feedback   📖 About   ❓ Help   ✉ Feedback

WildTrackAI aims to enhance the state of the art in non-invasive wildlife monitoring using artificial intelligence and computer vision.

Images Uploaded	Species Modeled	Species Classification	Individual Identification
6846	**13**	**85%** accuracy	**65%** accuracy
42 Contributors 45 Species	4294 Training Images Covers 204 Individual Animals	Evaluated on 1752 images Average Image Quality: 4.29/5	Evaluated on 451 images Average Image Quality: 4.69/5
Details	Details	Details	Details

WildTrack AI integrated into FIT in June 2020.

Smartphone App takes footprint images and uploads to cloud.

AI Solution classifies species, individual and potentially sex and age-class

User gets rapid feedback, education and ongoing engagement as part of community of collectors

Database grows, algorithms strengthen, conservation strategies become solidly data-driven.

Drone Adventures' excellent account of the technology we're using is here

WildTrack is pioneering the use of drones, in collaboration with our partners senseFly and Skydio, for non-invasive wildlife monitoring. The objective is to use drones to collect and identify the cryptic ground evidence left behind by endangered species, in this case the black rhino.

We were honoured to win an award in the humanitarian category of the Association of Unmanned Vehicle Systems International (AUVSI) Xcellence Awards, for our work in Namibia with Kuzikus Wildlife Reserve, senseFly, Skydio and Drone Adventures.

senseFly   Skydio   DRONE ADVENTURES   Kuzikus WILDLIFE · RESERVE · NAMIBIA

Fred Kistner is a Ph.D. student at the Karlsruhe Institute of Technology in Germany. He's a member of the WildTrack group and the IUCN otter specialist group. Fred's work is focused on monitoring otters (expanding to other species) using FIT in JMP to predict species, sex and individual using their footprints. In 2020 he has focused primarily on three areas:

1. The imputation of missing values. This will be particularly valuable in enabling us to use a greater proportion of the data we collect. For example, a footprint that has a missing toe, but is otherwise clear, can now be used.

2. Generating species specific algorithms for the Eurasian otter (Lutra lutra). He currently has classification rates of >90% for individuals and sex

3. Comparing different classification models to discriminate the sex of different species. He was able to increase the classification accuracy particularly by implementation of support vector machines and XG Boost features in JMP.
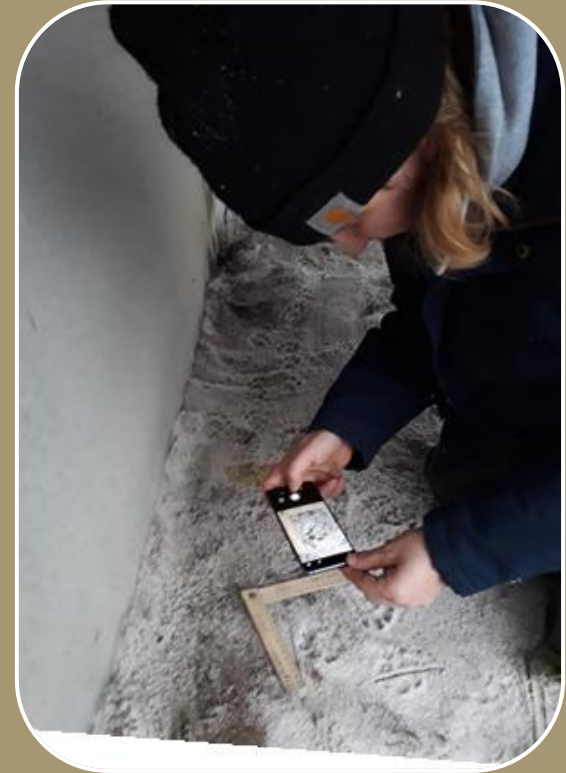
#5 Field partners working remotely with WildTrack

Dr. Friedrich and Berend Reinhard from Kuzikus Wildlife Reserve, Namibia, using WildtrackAI to monitor their Black Rhino Custodianship population

Drone pilot Jean Marais in South Africa captured leopard footprints, and a whole body imprint, at night using an IR camera
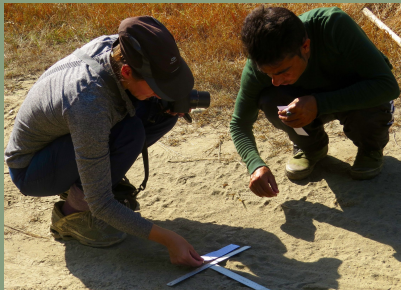
Amy Fitzmaurice collecting tiger prints in Nepal

Dr Juca Pezzuti collecting jaguar prints in Brazil

Snapshots from the field: New projects

2020 was a challenging year for collaboration with field projects in light of travel restrictions. In addition, many of our field partners struggled without tourist income. However, we were able to focus on supporting our current project partners with better remote outreach material and regular Zoom meetings. We were also able to onboard new projects looking for more cost-effective approaches to monitor their species.

Gharial monitoring using drones and AI in Nepal with Oxford University student Phoebe Griffith

The Lebanon Reforestation Initiative is pioneering conservation in Lebanon

LEBANON REFORESTATION INITIATIVE
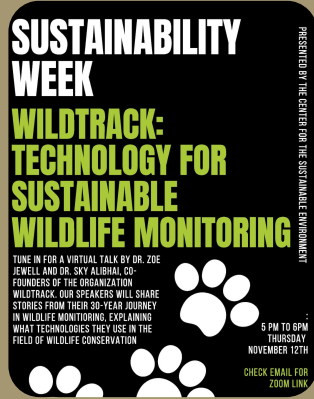
Leopard Ecology and Conservation project ecologist Pogiso Ithuteng captures a leopard footprint image in the Kalahari sand

Working with the Olifants West team including the all-women black mambas anti-poaching unit

Reaching out to the international academic and field communities

SUSTAINABILITY WEEK

WILDTRACK: TECHNOLOGY FOR SUSTAINABLE WILDLIFE MONITORING

PRESENTED BY THE CENTER FOR THE SUSTAINABLE ENVIRONMENT

TUNE IN FOR A VIRTUAL TALK BY DR. ZOE JEWELL AND DR. SKY ALIBHAI, CO-FOUNDERS OF THE ORGANIZATION WILDTRACK. OUR SPEAKERS WILL SHARE STORIES FROM THEIR 30-YEAR JOURNEY IN WILDLIFE MONITORING, EXPLAINING WHAT TECHNOLOGIES THEY USE IN THE FIELD OF WILDLIFE CONSERVATION

5 PM TO 6PM
THURSDAY
NOVEMBER 12TH

CHECK EMAIL FOR ZOOM LINK

PeerJ
Life & Environment

View 17 tweets 🐦

Related research ⌄

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Monitoring rhinoceroses in Namibia's private custodianship properties

Research article   Biodiversity   Conservation Biology   Ecology   Statistics

Zoe C. Jewell ✉[1,2,3], Sky Alibhai[1,2,3], Peter R. Law[4], Kenneth Uiseb[5], Stephen Lee[6]

Published August 14, 2020   PubMed 32864211
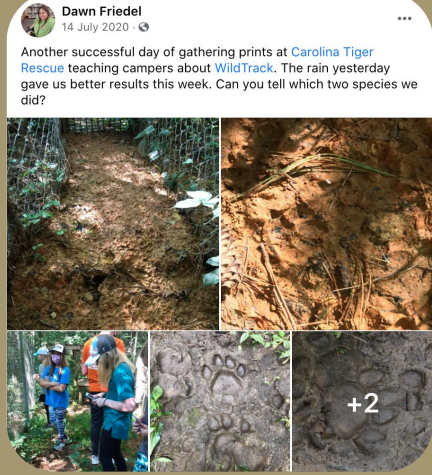
Oct 27, 2020, 09:00am EDT | 1,036 views

AI For Good Is Saving The Planet By Accelerating Human Sustainable Development And Transforming Wildlife Conservation

Mark Minevich Contributor ⓘ ⊕
AI
Global Digital Cognitive Strategist , Digital Visionary, Artificial Intelligence expert, Venture Capitalist, Innovation CTO, author & AI contributor to Forbes.com

Forbes

Dawn Friedel
14 July 2020 · 🌐   •••

Another successful day of gathering prints at Carolina Tiger Rescue teaching campers about WildTrack. The rain yesterday gave us better results this week. Can you tell which two species we did?

+2

WildTrack's FIT listed in <u>50 Social Media Innovations that might save the world!</u>

SCIENTIFIC AMERICAN®
COMPUTING

New App Tracks Black Rhinos through Their Footprints

Indigenous trackers inspire a safer way to help rhinoceroses

<u>..and many more</u>

ConservationFIT ex-situ partner highlights 2020

WildTrack's ConservationFIT project, managed by Karin Schwartz, Ph.D., is a program linking zoological institutions and field conservation projects for the conservation of endangered carnivore species.

Fit Cheetahs
@FitCheetahs · Community

ⓘ Learn More

fitcheetahs.com
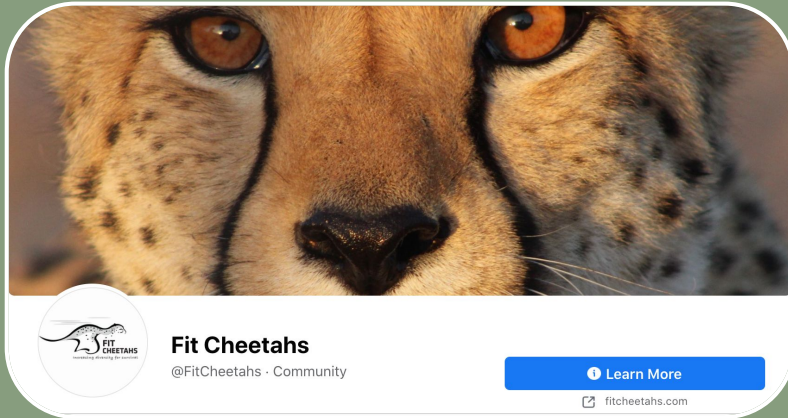
Larissa Slaney, a Ph.D. student at Heriot-Watt University in Scotland continued to study the relatedness of cheetahs through their footprints and was able to work with several ex-situ institutions including Longleat Safari Park in the UK to build her dataset.

Collecting prints from captive animals isn't always as easy as it sounds. In this interview with Dayle Sullivan-Taylor from the New England Zoo we see how she overcame all the challenges by learning to think like a tracker ... and was able to make a great contribution to our jaguar footprint database

Duke Interdisciplinary Social Innovators (DISI) WildTrack Project

About WildTrack

WildTrack was founded in 2004 by Dr. Zoe Jewell and Dr. Sky Alibhai, a veterinarian and wildlife biologist who had been working for many years in Africa monitoring black and white rhinos. While in Zimbabwe, in the early 1990s, they collected and presented data to show that invasive monitoring techniques used for black rhinos were negatively impacting female fertility. In their search for alternative approaches, they worked with indigenous trackers to develop a footprint identification technique. Interest from researchers around the world who needed a cost-effective and non-invasive approach to wildlife monitoring sparked the formation of WildTrack. In the past year, WildTrack has started implementing a mobile platform called Epicollect5 to encourage partners to upload footprints.

Project Goal

Create a survey to better understand how WildTrack partners interact with Epicollect5, in order to improve their user experience.

Objectives

➢ Gain a deep understanding of WildTrack partners and representative Epicollect5 users
➢ Improve the design of WildTrack's original survey
➢ Plan the distribution of our survey in preparation for data collection and analysis
➢ Increase user engagement and data submission on the Epicollect platform
➢ Help WildTrack in their effort to promote wildlife monitoring and conservation

Meet some WildTrack users…

A professor in Brazil who works with indigenous hunters in the Amazon to study the mating habits of fresh river turtles.

A manager and wildlife tracker in South Africa.

A conservationist who works with volunteers to track box turtles in North Carolina while protecting them from poachers.

A field researcher who works with bush trackers and farmers in Botswana to study the territories of leopards.

A life scientist and PhD student who studies both cheetahs in zoos in the UK and wild big cats in UAE and Namibia to secure the future of endangered species, and tracks neighborhood animals ranging from squirrels to foxes in her spare time to construct a noninvasive tracking framework.

A researcher who has spent more than a decade on the African continent conserving endangered species and reducing conflicts between southern Africa's large cats, like cheetahs and leopards, and local farmers.

Meet the DISI WildTrack team…

Raven Luo

Daniel Shang

Rishab Negi

Jonathan Liu

Patricia Johnson

Akash Chopra

Coco Jiang

Malika Mohan

Results

➢ 12 WildTrack partners interviewed
➢ 3 survey drafts completed
   ➢ 53 questions
   ➢ Emphasis on options and rankings rather than former free response methods
   ➢ Users are stratified and receive different survey questions based on whether they have used Epicollect5
➢ Survey incentives
   ➢ Merchandise raffle
   ➢ Survey participants' projects will be featured on the WildTrack website
➢ Survey was approved for release on November 5, 2020 to 72 WildTrack partners
➢ 21 responses from 10 countries

Future Directions

➢ Analyze survey data
➢ Report survey conclusions to WildTrack partners
➢ Modify Epicollect5 based on partner feedback
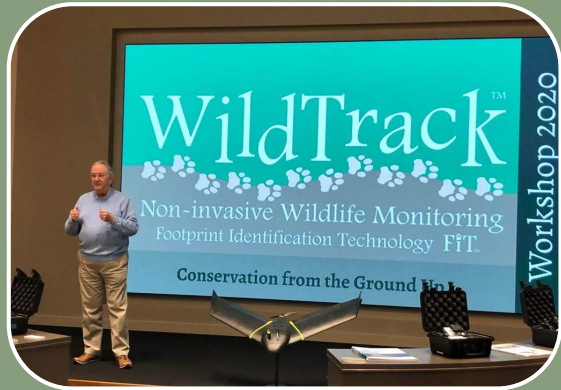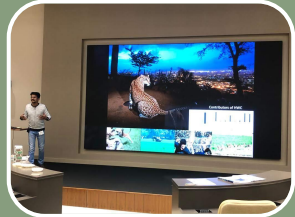
Acknowledgements

We would like to thank the co-founders of WildTrack, Dr. Zoe Jewell and Sky Alibhai, for giving us the opportunity to contribute to WildTrack's mission and supporting our project. We are also grateful for the WildTrack partners who provided us with feedback during the survey design process.

WildTrack Workshop 2020

Thanks to generous hosting from JMP software, we began 2020 with a very successful WildTrack workshop for our core users. This sparked the formation of the WildTrack Core Group which continues to share data and field news from around the world every day on our group app.
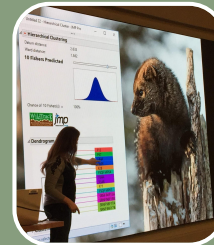
Our new interactive FIT data-collection training videos

ConservationFiT™

Guide to Footprint Collection

WildTrack™

Non-invasive Wildlife Monitoring
Footprint Identification Technology (FIT)

Music: 'Footprints' by Wayne Shorter played by Zeb J-A

Created by Learn It Digitally, LLC

Learn IT Digitally

https://wildtrack.org/footprint-guide-2021/story.html

WildLabs Net: New FIT Community

In 2020 WildTrack established an FIT interest group on the conservation technology community WildLabs.net

We started with 8 members and grew the group to 38 over the course of the year. The image shows a sample of the posts we've shared.

We thank our extraordinary partners, who contributed so much to WildTrack's success in 2020, including:

jmp Statistical Discovery.™ From SAS.

DRONE ADVENTURES

U.S. ARMY

Berkeley SCHOOL OF INFORMATION

senseFly

Kuzikus WILDLIFE · RESERVE · NAMIBIA

WILDLABS.NET [The conservation technology network]

Skydio

...and we're grateful for all WildTrack's colleagues and supporters across disciplines and geographic boundaries. Thank you for continuing to inspire our work...

The six-nations team from WildTrack, Kuzikus, Drone Adventures, senseFly and Skydio innovating drone use for non-invasive wildlife monitoring