ON THE RIGHT TRACK

After years of trials, talks, tweaks and test runs, EarthRanger has now come of age and is being rolled out across Africa. But can the brainchild of the co-founder of Microsoft make a serious difference in the fight against the illegal wildlife trade?

Text and Photography by Joanna Eede

Thunder is grumbling through slate-grey clouds over Sasakwa Hill as we drive across the Singita-Grumeti reserve, a private concession on the western edge of Serengeti National Park. We are searching for Ukungu, a bull elephant.

Wesley Gold, law enforcement manager at the Grumeti Fund, is tracking Ukungu on his smart 'phone, with EarthRanger, a piece of conservation software developed by Vulcan Inc. Ukungu is one of 30 elephants on the Grumeti Reserve wearing a GPS-enabled satellite collar, which feeds real-time information about their movements into EarthRanger. If an elephant strays from the reserve, an orange alert is sent; if it walks in to a human settlement, the alert is red.

Out of control poaching in the Grumeti Reserve had decimated wildlife by the time the Grumeti Fund assumed management in 2003. Since then, careful management has ensured that populations of lion and elephant have at least quadrupled. A simultaneous increase in both animal and human populations, however, means added interactions between wildlife and the people who live on the boundary. With human population doubling in Tanzania every 20 years, conflict with the animals that raid farms and prey on their livestock is becoming one of the most critical issues facing Singita-Grumeti.

The EarthRanger software leads us across golden savannah studded with deep green grewia shrub, where herds of buffalo gather under flat-topped acacia trees and lionesses doze in sandy-bottomed waterholes. We find Ukungu stripping bark from a marula tree on the banks of the Grumeti River, famous for its enormous Nile crocodiles. Wesley points out that Ukungu's trunk is slightly cropped – a familiar injury from a wire snare.

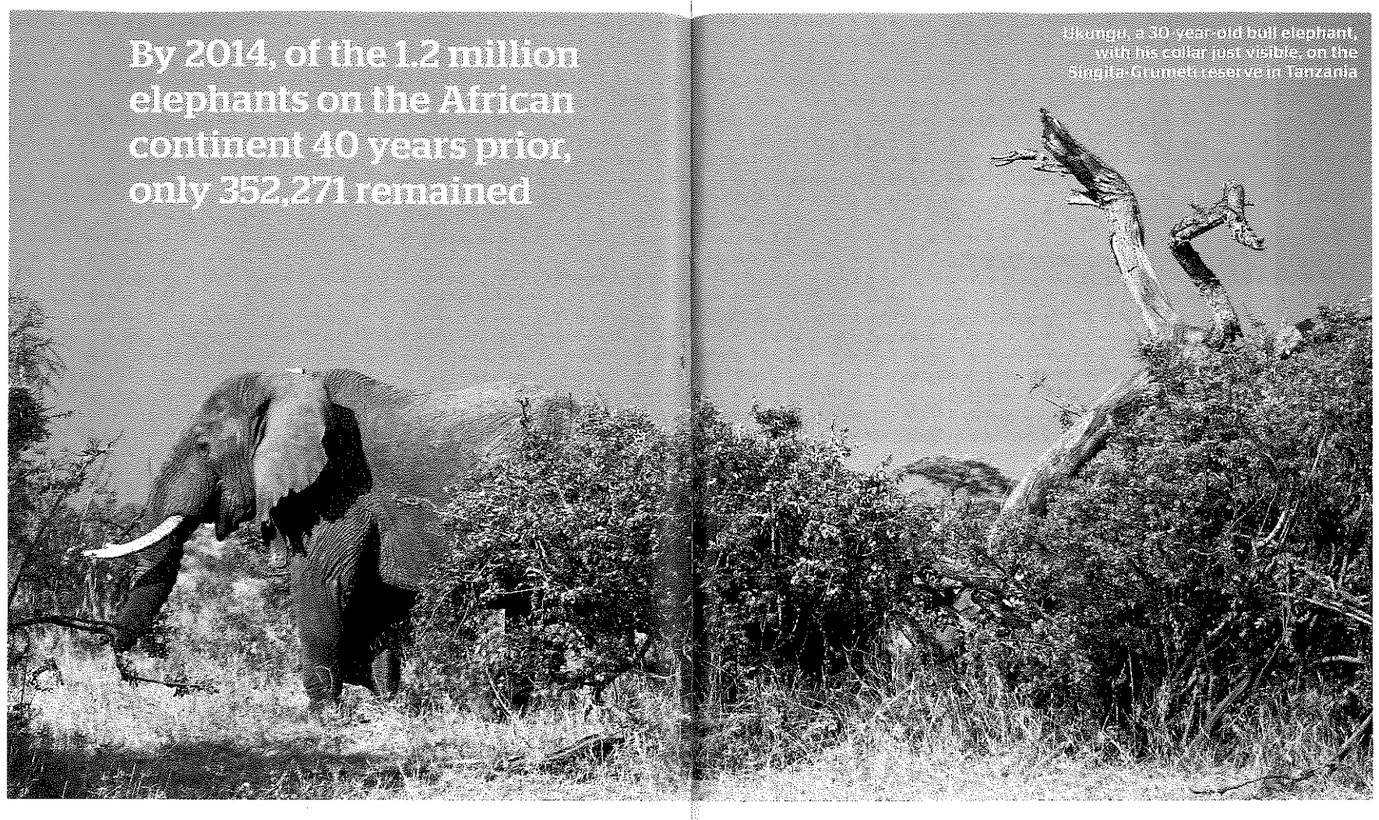
It has taken us less than an hour to find him. Before the EarthRanger system was installed in 2017, it might have taken rangers hours or even days; elephants can move up to 50km in 24 hours. 'You can imagine the damage a big guy like this can do to crops in a village,' says Gold. 'Now we can follow him in real-time, we are protecting both him and the community's livelihood.'

DATA TRACKING

The damage being done to the planet can too often seem like a nightmarish work of apocalyptic fiction: plastic-congested seas depleted of fish; deforestation of the Amazon; global warming; loss of bio-diversity; the near-obliteration of species that have survived for thousands of years.

A major U.N. biodiversity assessment, published in May 2019, revealed that one million animal and plant species are threatened with extinction, and that 'transformative' global changes on economic, social, political and technological levels are needed to protect nature. 'We share a collective responsibility to take action,' wrote the late Paul Allen, co-founder of Microsoft, philanthropist, founder and chairman of Vulcan Inc., and a committed conservationist.

By 2014, of the 1.2 million elephants on the African continent 40 years prior, only 352,271 remained



Ukungu, a 30-year-old bull elephant, with his collar just visible, on the Singita-Grumeti reserve in Tanzania

Africa's exploding human population, which leads to habitat loss, human-wildlife conflict and a growing bush-meat market, is one factor behind the steep decline in its own wildlife numbers; the relentless demand from Asia for products such as rhino horn, elephant ivory and pangolin scales, is another. The illegal trade in wildlife – a trans-national, corrupt and bloody racket carried out by organised criminal gangs – is estimated to be worth approximately $19bn a year.

Allen was extremely concerned about the historic levels of poaching and had, 'a deep and sincere personal passion for Africa and elephants,' James Deutsch, director of biodiversity at Vulcan, says. 'He also felt that the world wasn't paying enough attention.' So together with conservation organisation Elephants without Borders, he and his sister Jody Allen conceived the Great Elephant Census (GEC), the first-ever scientific, pan-African survey to provide accurate data about the number and distribution of African savannah elephants. '[This was] real data, that no one could deny,' says Deutsch.

Over two and a half years, and with the involvement of nearly 100 scientists, 81 aeroplanes flew 463,000 square kilometres over 18 countries, counting herds and carcasses from the air. The disturbing numbers revealed that populations had dropped 30 per cent between 2007 and 2014. Of the 1.2 million elephants on the continent 40 years ago, only 352,271 remained.

Paul Chidyera, head of law enforcement at Liwonde National Park, Malawi, points to machetes and wire snares left by poachers in Liwonde

'How are we going to save them once we stop counting?' asked Allen.

The answer, he hoped, would lie partially in data and technology. 'Paul thought of himself as a technology incubator,' says Ted Schmitt, Vulcan's principal business development manager. 'He believed that you change the world through data and science.' The horrifying results of the GEC were the catalyst for three years of 'listening efforts' with park managers in Africa. Schmitt tells of how 'parks were inundated by data streams – tagged elephants, VHF radios – and that it was hard for them to integrate the data.'

After months of trials, tweaks and test runs, EarthRanger was born. It's 'real-time conservation data visualisation and analysis software' which collects data and GPS readings from multiple sources – animal collars, digital ranger radios, vehicle tracking devices, camera traps and human intelligence – and aggregates this 'big data' on to a centralised platform. The data are then projected on to a single, interactive, digital map which gives park managers an accurate picture of an area and the whereabouts of its assets in real-time, thus allowing them to make decisions and deploy ranger teams faster.

Crucially managers can also use EarthRanger to analyse poaching patterns, in order to anticipate incidents and gain the upper hand over poachers. 'We want to be apprehending poachers *before* an animal is killed, not chasing after them,' says Schmitt. Wesley Gold agrees. 'We are now able to focus on interdiction rather than just response. That's how wildlife numbers go up.'

BEYOND THE SCREEN

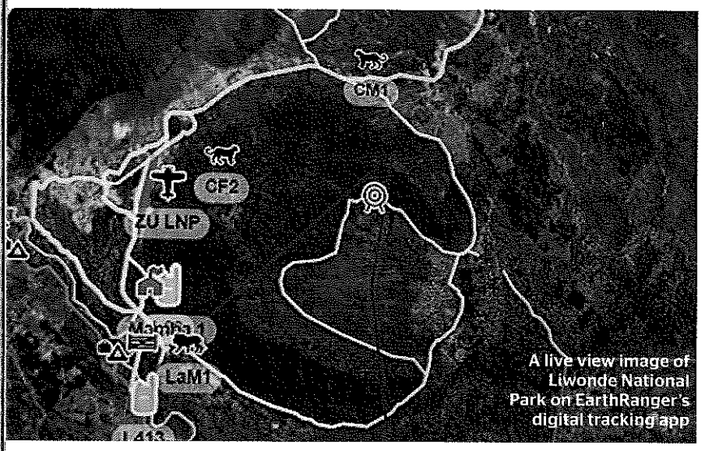
In Singita-Grumeti's old stables, I watch DJ, a tawny-brown Belgian Malinois dog from the reserve's K9 unit, respond to his handler, Mgoye Rugatiri, during a training session. Agile, obedient and focussed, DJ tears around the paddock when asked to sniff out a hidden piece of wildlife contraband. Having found it, he returns to Mgoye for encouraging words and a rewarding game with his tug-toy. Their bond is touching.

The K9 unit is one branch of the Grumeti Fund's impressive 100-strong Anti-Poaching and Law Enforcement team. Many of the scouts were former local poachers driven to poaching by poverty, before being converted by Singita-Grumeti. As scouts, they undergo rigorous training: self-defence courses, trauma medicine, weapons and field-craft training. They are fit, determined and have a sophisticated armoury at their disposal: Remington pump-action shotguns and state-of-the-art night vision capability, which allow them to 'own the night'.

However, scouts at Grumeti and other parks across Africa spend dangerous days and nights in vast, remote wildernesses, risking their lives in defence of

EARTHRANGER IN NUMBERS

- A total of 13 locations in Africa are actively using EarthRanger to date.
- The four sites that were the first to deploy EarthRanger are: Lewa Wildlife Conservancy and Northern Rangelands Trust, Kenya; Akagera National Park, Rwanda; Liwonde National Park, Malawi; and Grumeti Game Reserve, Tanzania.
- Since its first deployment in 2017, rangers and park managers have logged more than 32,000 security reports, removed more than 13,000 animal trap snares and made more than 1,170 arrests.



A live view image of Liwonde National Park on EarthRanger's digital tracking app


Wesley Gold, law enforcement manager at the Grumeti Fund, shows Janet Greenlee of Vulcan the EarthRanger app

their country's natural heritage. Worldwide, nearly 900 rangers have died in the line of duty over the past decade. The Joint Operations Room at Singita-Grumeti is named after scout Kitaboka Wagora, who was killed by a poacher's poisonous arrow a decade ago.

Wesley Gold, a former British army officer with experience of counter-insurgency warfare from his operational tours to Bosnia, Iraq and Afghanistan, believes that wildlife poaching is now being fought along the same principles. 'It's a 360-degree poaching environment,' he says. 'There is no fixed line. It's all around us.' EarthRanger acts as a 'force multiplier,' allowing him to allocate Grumeti Fund's limited resources more efficiently. 'You'll never get away from needing boots on the ground,' says Stephen Cunliffe, executive director of the Grumeti Fund, 'but technology can make sure those boots on the ground are in the right place at the right time.'

OFFICIAL SUPPORT

Liwonde National Park, a small reserve in Malawi, suffered similarly from poaching before African Parks took over its management in 2015. 'The park was in state of terminal decline,' says Craig Reid, Liwonde's park manager. 'Roads were non-existent, bridges were collapsing and there was a terrible poaching problem.'

We talk while motoring along the calm waters of the Shire River at dusk; the serenity of the river is at odds with the chaos Reid describes. Flocks of white egrets fly low over reed-beds, hippos puff then slowly submerge while an African fish eagle flaps languorously over our boat before landing in a fever tree. As daylight dies, and the sky over the mountains of the Mangochi Forest Reserve turns lilac, a near-circular silver coin floats on the river's flat surface: the waxing moon's reflection. A full moon – referred to as the 'poacher's moon' for the light it affords them – always puts security teams on high alert; Liwonde's marine ranger team will be patrolling the Shire later, manoeuvring their boats quietly to known illegal fishing places, in order to arrest poachers.

When Reid and his team arrived they found thousands of wire snares, 'gin traps' that crushed elephants' feet, spent AK-47 cartridges and illegal


Mgoye Rugatiri and 'DJ' the Belgian Malinois, of Grumeti Fund's K9 unit

fishing nets fashioned from mosquito nets. 'Animals were being driven to extinction quickly,' says Reid. But in the three years since African Parks assumed management of Liwonde, the park has undergone an extraordinary restoration: habitat has been revitalised, poaching curbed and lion and cheetah reintroduced.

In 2016, Malawi's Parliament passed the National Parks & Wildlife Act, which gives courts the power to put wildlife criminals behind bars for up to 30 years.

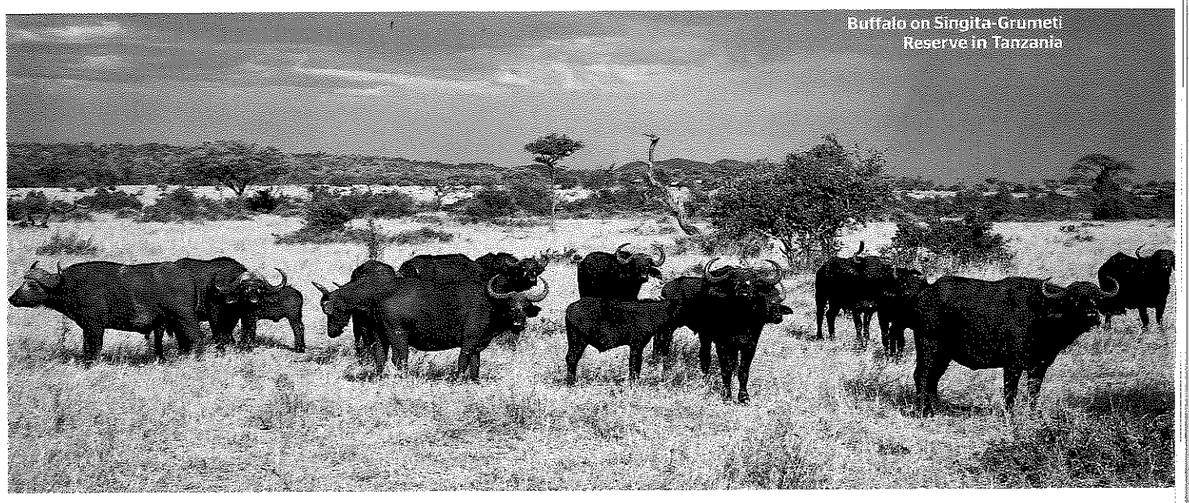
In the same year, Liwonde was the site of one of the largest elephant translocations in history: 366 elephants were moved from the park and released in Nkhotakota Wildlife Reserve. 'Human-wildlife conflicts had been rife, with many people on the park's boundary experiencing crop loss,' says Reid. Elephants could – and often did – destroy a farmer's annual income in a single nocturnal crop-raiding maraud. Lives were lost too: more than 50 locals were killed by elephants during the five years prior to African Parks' arrival.

Today, through a combination of strong law enforcement, 144km of perimeter fence and live feeds from EarthRanger, human-elephant conflict in Liwonde has been reduced. 'Before, villagers would keep vigil at night, beating drums to scare away the elephants,' says David Nangoma, Liwonde's community extension manager. 'Now they are back in their beds.'

before setting up home ranges,' says Andrea Reid, Liwonde's project manager. 'Cheetah are vulnerable to predation by lion and by using the heat map function we can keep track of them and intervene if needed.'

The collation of data such as spoor, snare and carcass reports, moon phases, pay days, camera trap photos and poacher camps allows managers to recognise patterns latent in the data and thus predict ecological trends. 'For many years I had to build a picture of the park using maps and magnets,' says Lawrence Munro, Liwonde's field operations manager. 'Now that picture is instantly built for me.'

New analytical tools are being tested that reveal hitherto little-known facts: the 'heat map' feature, for example, is not only useful for tracking cheetah but also shows that most poaching incidents happen close to Liwonde's boundary.


Buffalo on Singita-Grumeti Reserve in Tanzania

In Liwonde's Operations Room, at the foot of the ancient Chinguni Hill, I study EarthRanger's digital map to find data for the cheetah that were released into the park in 2017, after an absence of a century. Cheetahs have been eradicated from 90 per cent of their historical range in Africa and are listed as a 'vulnerable' species on the IUCN's Red List. Two females – called CF1 and CF2 – have LoRa trackers within their collars, which feed movement data to EarthRanger every eight minutes.

CF2 recently had six cubs, bringing the total population in Liwonde to 18, while CF1 is 'denning' on Chinguni Hill, an extinct volcano whose rocky crevices provide shelter for their cubs and cover from predatory lions. CF1's movements – which appear on the digital map as child-like black and red lines – show that she traversed the hill's miombo-wooded flanks many times, presumably in her search for a secure den, and that she had recently walked within 300 metres of our camp, down to the banks of the Shire and back up to the crest of Chinguni.

'Frequent updates have enabled us to monitor reintroduced animals, which tend to move around

MORE TO DO

EarthRanger has been referred to by Save the Elephants as, 'a critical tool for the defence of some of Africa's most iconic landscapes,' and as 'game-changing' by Lewa Wildlife Conservancy. But it's not a silver bullet. Poaching incidents have decreased in Singita-Grumeti, Liwonde National Park and other African protected areas and new technologies such as EarthRanger are an invaluable boon to the inspiring work of experienced conservationists and rangers. But the threat to African wildlife is constant and those on the front lines are adamant that tackling the very demand for high-value wildlife products is critical. If the buying stops, so could the killing.

Scientists agree that there is little time left to effect lasting changes before catastrophic damage is done to the planet, and that we may be the last generation to ensure that animals in the wild are not lost in our lifetime. 'I think future generations would judge us very harshly if we did not take action to protect some of these last great wilderness areas and wildlife populations,' says Stephen Cunliffe. 'The opportunity is now. In ten years from now, it will be too late.'