

Transformative tech

NEW TECHNOLOGY COULD BE A REWILDING GAME CHANGER.



In the Southern Carpathians rewilding area in southwest Romania, a small herd of reintroduced European bison move slowly through the winter landscape. Breath steaming, shaggy coats dusted with ice, the animals have wandered down from the higher slopes of the Tarcu Mountains, searching for food. Up ahead, near the village of Armeniș, are several haystacks, draped in a thick mantle of snow.

But before the bison come anywhere close to scenting these appetising mounds of dried grass, they pass through the boundary of a virtual fence. GPS collars, attached to several of the animals, immediately send out a warning signal. Bison rangers, stationed in Armeniș, receive an SMS alert on their smartphones and begin keeping a watchful eye on the herd's movements. After an hour the hefty herbivores

change course, head back towards the hills, and the rangers stand down.

For bison ranger Matei Miculescu, the bovine early warning system is a godsend.

"We receive the alerts quite regularly in the winter now," he explains. "So far we haven't had to intervene because the animals have moved away from human food sources of their own accord. Technology is not only helping us to keep relations between bison and villagers harmonious, but saves us time and cold hands tracking the animals in the field."

Transformative impact

For those involved in ecology and environmental management, the whirlwind pace of technological development is understandably exciting. New tools and techniques are allowing practitioners across the globe to perform more effectively, more cooperatively, at lower cost and greater scale as they tackle pressing and complex problems such as climate change and biodiversity decline.

Today, the growing mobility, affordability and connectivity of tools for data collection and analysis – from DNA sequencers and camera traps to GIS systems and photo sharing apps – is revolutionising how we research, monitor and restore our natural environment. Remote sensing and visual representation technologies are evolving rapidly through increasingly sophisticated satellites and drones, while developments in areas such as artificial intelligence, the Internet of Things and the blockchain suggest further radical change.

"Technology is often viewed as a useful tool, but it can be much more than this," says Rewilding Europe Supervisory Board member Dr. Paul Jepson. "Technological systems are shaping the future of society. If conservation aspires to maintain its position as a cultural force it needs to embrace technology to create new ways of doing things."

People power

Over the last few years, the development and distribution of digital technology has empowered productive collaboration between volunteer non-scientists and professionals, with the



Bison rangers Matei Miculescu and Daniel Hurduzeu fix camera traps in the Southern Carpathians rewilding area.

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introduction of portable technologies such as GPS and image processing allowing citizens to collect and share environmental data with little more than a smartphone.

"Underpinned by the latest technology, citizen science is proving to be an incredibly powerful force in conservation," says Kate Moses, a project manager with the Zoological Society of London's (ZSL) Conservation Technology Programme. "By democratising science, it really engages the public and fosters connections between people and nature. It also facilitates the processing of huge amounts of data, which is now being generated in ever greater quantities."

Instant innovation

An ongoing research partnership between ZSL and Rewilding Europe demonstrates the burgeoning digital citizen science trend. Since August 2019, camera trap photos from the Central Apennines rewilding area has been fed into ZSL's groundbreaking Instant Wild platform, which allows online wildlife enthusiasts to collectively identify animals they may contain.

BY THE NUMBERS

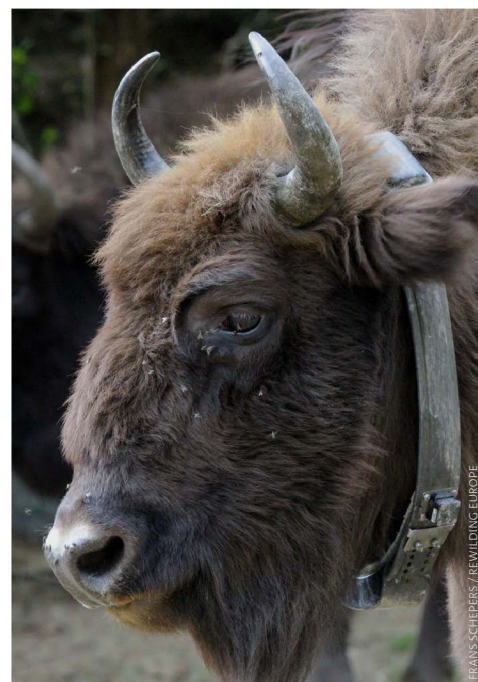


9672 images from the Central Apennines have been uploaded to the Instant Wild platform to date, with **6728** wildlife identifications made.

This means that a minimum of **67,280** identifications have been made by users, due to the consensus algorithm used.



Members of the Southern Carpathians team track European bison in the field.



A European bison with a GPS collar.

The use of a consensus algorithm means 10 people have to agree before an animal is definitively identified in a particular Instant Wild image. Internet users from around the world have already helped to tag Central Apennines species as diverse as wolves, wild boar, pine marten and porcupine in this way.

"What's great about Instant Wild, which is completely free to use, is that you don't need any qualifications or particular expertise to take part," explains Kate Moses. "With the community working together to make the right identification, users really feel engaged in conservation projects around the world."

The results of the Instant Wild animal tagging are captured in a database and periodically shared with participating conservation projects, enabling better conservation-related decision making. In this way the data generated by the platform will have a beneficial impact on rewilding efforts in the Central Apennines.

Clued up conservation

The Central Apennines was the location for another tech-focused pilot project in 2019. Kicking off in October, a four-month collaboration with Amsterdam-based non-profit Sensing Clues saw the local rewilding team collect data in the field to determine whether there were suitable opportunities to generate "risk maps".

Generated by algorithms, risk maps are designed to give a clearer picture of when a conservation-related incident is likely to occur. This could be anything from poaching to an outbreak of wildfire to the movement of an animal

through a wildlife corridor. Such a predictive system would allow the Central Apennines rewilding team to conserve the area's Marsican brown bear population more effectively, and generally be more proactive in their work on the ground.

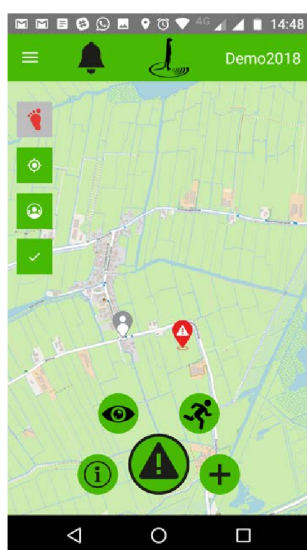
The pilot began with a training workshop, which saw Sensing Clues founder and director Dr. Jan-Kees Schakel teach members of the rewilding team how to use an app to upload field data. Over the course of the next four months the team uploaded more than 3000 pieces of geolocated, conservation-related information – including everything from wildlife observations to bear damage prevention measures.

"Overall, the experience was very positive," says Rewilding Apennines team leader Mario Cipollone. "The risk maps generated largely coincided with our assessment of the presence of bears across the rewilding area."

Keeping track

European bison in the Southern Carpathians aren't the only animals that local rewilding teams are monitoring through GPS technology. GPS collars and transmitters have also been fitted to griffon vultures in Greater Coa Valley, and griffon vultures, red deer and fallow deer in the Rhodope Mountains. A group of Dalmatian pelicans will also be tagged with transmitters as part of the Rewilding Europe-coordinated "Pelican Way of LIFE" project, which kicked off in 2019.

In every case the data these devices are supplying is leading to a better understanding of animal behaviour and improving rewilding outcomes.



The Sensing Clues "Cluey" app.



LIFE Vultures Project Conservation Officer Volen Arkumarev releases a griffon vulture tagged with satellite transmitter in the Rhodope Mountains.

"In the Rhodope Mountains GPS data and spatial analysis has aided the selection of optimum sites for the restocking of deer populations and creation of artificial nests for cinereous (black) vultures, and helped to identify which electricity pylons and power lines need to be made safe for vultures by insulation and the installation of diverters," says Jelle Harms, Rewilding Europe's Spatial Data Manager. "The same process will be used to identify power lines that harm Dalmatian pelicans close to their breeding and feeding grounds."

Future focus

Going forwards, new technologies will continue to improve rewilding efforts. The challenge will be to use technology more wisely, synergise different technologies, and get the right technologies into the hands of those than can use them most effectively.

"We are now seeing a shift towards more open source, low-cost technologies, resulting in more data being collected and more connected landscapes," says Kate Moses.

Rewilding is about restoring dynamic interactions between the biological and physical components of ecosystems, and allowing

natural processes to reshape landscapes. The approach to restore and embrace unpredictability in nature and minimise human intervention, will require an evolution in monitoring.

Fortunately, the rise of rewilding has coincided with a step change in our ability to measure and analyse different attributes of nature. The last decade has seen breathtaking advances in the power, affordability and size of computers and sensors, while the roll-out of ever faster mobile networks and developing battery technology is making it easier to gather and share data.

"Rewilding is characterised by a spirit of innovation," says Dr. Paul Jepson. "As this spirit interplays with advancing technology, we can expect new and as yet unimagined solutions to the challenges of monitoring dynamic ecosystems as they follow uncertain and self-governed pathways to recovery."

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GPS data showed a juvenile cinereous (black) vulture from the Rhodope Mountains rewilding area travelling **3200** kilometres in the spring of 2019. **2** griffon vultures tagged with GPS transmitters in the Rhodope Mountains rewilding area in 2019. This means **29** griffon vultures and **26** cinereous vultures have now been tagged as part of the ongoing LIFE Vultures project.