COLE BURTON

Eyes ON THE *Wild*

Remote wildlife cameras are becoming essential conservation research tools. With the right expertise, they will help Canada—and the world—meet our essential biodiversity targets

By Niki Wilson

ONE OF COLE BURTON'S FAVOURITE REMOTE WILDLIFE camera images is a leopard bathed in perfect light as its gaze penetrates the lens. "Sometimes you get images that just take your breath away," he says. In another favourite, far from that West African locale, a lone wolf was captured on a camera southwest of Fort McMurray, Alberta, in a spot where Burton stood only minutes later, unaware of its fleeting presence. "Cameras let you into this world that you wouldn't normally be a part of," he says.

Burton, a conservation biologist at the University of British Columbia, uses remote cameras as part of his research on wildlife in West Africa and in Canada. Each time he slides the memory card from a remote camera into his computer, there

is the chance an animal will reveal something of itself. “It gives us a connection to species that are rare and elusive,” he says.

Burton is one of many researchers using wildlife cameras to pinpoint where animals are, what habitats they use and how many are in the area. It’s information foundational to our understanding of biodiversity — the variety of life we find both locally and across the globe. He’s particularly interested in how to best conserve, manage and restore this biodiversity in a world rapidly changing due to climate change and human incursions, and he’s not alone.

As a signatory to the 1992 Convention on Biological Diversity and subsequent strategic plans, the Canadian government has committed to several internationally established biodiversity targets. Whether or not Canada will make its looming 2020 targets is uncertain, but many scientists agree that a nationally coordinated, standardized network of monitoring tools is needed to assess and track progress. Given their ubiquity and ever-increasing presence on the landscape, remote wildlife cameras might have an important role to play in this network and, more broadly, in the successful conservation of biodiversity.

The use of remote wildlife cameras — called “camera traps” by biologists — has increased dramatically over the past 10 to 15 years as the technology has evolved. Across the planet, tens of thousands of these cameras are now deployed. The engaging quality of their images and videos, along with technical advances and a reduction in cost, has helped fuel their popularity. Though these cameras are generally limited to capturing medium to large ground-dwelling animals, many of the animals “trapped” play important ecological roles.

Remote cameras are often combined with other technologies like genetic identification using hair snags, or GPS-equipped collars that relay locations to satellites. They are now being used in thousands of studies, measuring everything from how well highway crossing structures work for wildlife, to how logging tropical forests affects the diversity of species that live there. Monitoring species diversity is a key advantage of remote-camera technology.

“Even if our project is driven by the conservation of one species — say, caribou [in North America], or Andean bears in Peru — we can try to use the cameras to get information on multiple species and how they are interacting in a system,” says Burton. For example, along with colleague Jason Fisher, a wildlife ecologist at the University of Victoria and senior research scientist at InnoTech Alberta (formerly the Alberta Research Council), Burton recently used camera-trap data to determine the changing composition of wildlife communities over a three-year span around Alberta’s oilsands. The cameras revealed that as the density of human infrastructure increased, some animals (coyotes, for instance) also increased in number, while others like caribou and fishers decreased.

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ACROSS CANADA, ANIMALS SAY CHEESE FOR RESEARCHERS

With dozens of sites already up and shooting across the country — and more on the way — the Canadian remote camera system is beginning to show results

MORE PRIMARY RESEARCH, LIKE THE KIND CARRIED OUT WITH CAMERA TRAPS, IS NEEDED TO FILL IN DATA GAPS ACROSS THE GLOBE

This kind of dynamic information about biodiversity is critical to assessing and tracking Canada’s progress on goals outlined in the Convention on Biological Diversity’s strategic plan. For example, Strategic Goal B aims to “reduce the direct pressures on biodiversity and promote sustainable use,” and data collected in work like Fisher and Burton’s oilsands study identifies specific pressures related to that kind of human development. But there are challenges in sharing this data to potentially understand regional, provincial and national trends.

At the field level, historically one problem has been that camera-trap studies lacked consistency in how and where the data was collected. In 2015, Burton and a team of colleagues reviewed 266 studies that used camera surveys and reported a number of methodological details that could skew study conclusions. The team concluded their review with a call for greater transparency in study design and assumptions, and for careful consideration of ecological processes that affect what data is collected through the cameras. For example, detection rates of some species do not simply translate to an estimate of how many animals are in the area: whether or not an animal is “trapped” by a camera is affected by many factors, like home range size, travel routes and interactions with other species. “If we’re going to start putting cameras out all over the place, we should be thinking about how to maximize the information we’re getting out of them,” says Burton, adding that consistent recording of data has been another challenge experienced throughout the scientific community. The ubiquity of cameras has also raised privacy issues in areas where people share the landscape with wildlife being studied. Dedicated communication about camera locations and careful handling of data files has become paramount to ensure the public is on board.

These research hurdles are not insurmountable and finding ways to overcome them is worth it considering the gains the technology provides. The bigger challenge lies in figuring out how we can take results from research scientists like Burton and scale them up to a multi-user, multi-ecosystem level where biodiversity can be assessed and tracked across the country.

Organizations like the Group on Earth Observations Biodiversity Observation Network (GEO BON) are working on solutions to address this question. The network comprises more than 400 members from 45 countries,

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REMOTE CAMERA IMAGES, LIKE THIS BEAR ON A "RUB TREE," CAN PLAY A CRUCIAL ROLE IN CAPTURING THE PUBLIC'S ATTENTION

including scientists, managers and others active in biodiversity studies. Together, they are creating a framework of "essential biodiversity variables" combining data from camera traps and other research that allows countries and international organizations to compare "apples to apples" to get a sense of national and global trends. Network co-chair Mike Gill says that with these frameworks in place, "Camera traps are a huge opportunity to use emerging technology to better cover the Earth in a more efficient and interoperable manner." More primary research — like the kind carried out with camera traps — is needed to fill in data gaps across the globe, Gill argues.

Burton concurs. Even though the number of cameras in use is growing rapidly, remote camera studies aren't necessarily being done consistently across diverse regions and biomes in Canada. "You get pockets where certain species have been studied and other pockets where nothing has been done," says Burton.

Filling these gaps will take time. Until then, remote cameras can help meet biodiversity targets in another, very tangible if non-scientific way: the images and video they capture can play a crucial role in capturing the public's attention, engagement and imagination. Remote camera footage has brought us "pole-dancing" grizzly bears slithering up and down "rub trees" on which they leave their scent. We've had surprising insight into the diverse behaviour of wolverines approaching rotting beaver bait. Some take their time to wander around and gently have a nibble, while others run in and mount a smash and grab operation. We've also witnessed the thrill of the chase — a series of snaps in which a deer appears momentarily, eyes bulging, followed by the three wolves hunting it down. Many of these moments have circulated on social media with hundreds of thousands of views.

In a paper published last year with several colleagues, including Burton, Government of Alberta wildlife biologist Robin Steenweg argues that, in this way, remote cameras are helping meet the first strategic goal of the Convention on Biological Diversity targets: "address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society." "Public buy-in is key," he says, adding that the cameras not only give glimpses into the world of wildlife from around the country and the globe, but that people are often surprised to learn that their landscape is a shared one.

"A lot of wildlife cameras are on trails," says Steenweg. "You don't have to spend much time looking at camera-trap photos to see an animal on the trail, and the next photo is a bunch of people walking by, and then another animal [after them]. The time between can be seconds or minutes." People are often oblivious to the animals around them. One of his favourite examples is a series of photos in which a grizzly bear is visible just off the trail. A whole pack train of horses and riders come by while the bear watches. Once

WITH BIODIVERSITY IN DECLINE AND TECHNOLOGY CONTINUING TO EVOLVE, CONSERVATIONISTS NEED TO USE EVERY TOOL AVAILABLE

the horses and riders have passed, the grizzly bear moves on. “That kind of typifies most common interactions with humans and wildlife,” he says. “Humans have no idea the wildlife is there, and the wildlife don’t care.” The photos, then, allow for the public to understand that sharing nature harmoniously with wildlife is not only possible — in some places it’s already happening.

Public engagement comes from more than viewing the photos too. Some citizen scientists actively participate in wildlife studies, helping to set up cameras, change batteries or classify images. Zoologist Roland Kays, a professor at North Carolina State University, leads the eMammal project, a data management system and archive for camera-trap research projects. In a 2016 study, he reported that through the process of participating in eMammal projects, volunteer knowledge of wildlife was increased, and volunteers became advocates for mammal conservation through sharing what they’d learned. When asked if this kind of awareness about conservation and biodiversity helps create political will that helps push governments to meet biodiversity targets, Kays says, “It definitely does.”

Volunteer participation has not only helped build biodiversity awareness but has led to some important discoveries. Kays’ citizen science work has led to a better understanding of which animals use backyard habitat in North Carolina, and how coyotes help keep feral cats out of protected areas in six eastern U.S. states. Camera-trap work by volunteers also helps to identify the ecological impacts of humans and dogs in protected areas.

While Kays suggests there will always be a need for professional researchers to do remote camera research, he believes the role of citizen scientists will continue to grow and be an important component of future research projects, especially as it becomes easier to participate. For example, he points to the development of automatic species identification through artificial intelligence that will save a lot of time and make it “more fun and less work.”

In fact, Kays will be incorporating this kind of artificial intelligence into Wildlife Insights, a new wildlife-monitoring platform he is co-developing that is a “stepped up” version of the camera-trap data management system in eMammal. The goal of Wildlife Insights is to help connect data providers with decision-makers in a way that makes the data highly accessible and easy to visualize. The team hopes that, among other things, the platform will allow wildlife data collection in places where it is needed most and will reveal how large-scale analyses of wildlife data can help monitor the health of wildlife populations from local to global scales.

It’s an ambitious, big data project, one that could provide a critical benchmark for informing progress on whether or not nations are meeting their biodiversity targets. Data sharing at such a scale might seem an overwhelming task, but with the world’s biodiversity in decline as technology continues to evolve, scientists need all the tools they can get in their conservation toolboxes. Knowledge from camera traps, weaving together a network of information-gathering on a grand scale, is providing an increasingly clear picture.

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