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Edito

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Numbers and words

In late October, WWF and its partners published their exciting report on our "living planet" (*Living Planet report*). As usual, it is excellent and is filled with fascinating information.

The report also gives us some definite figures; the most shocking being the estimated percentage of reduction in vertebrate populations over the last 40 years: 58. And its ambiguous translation in vernacular by the leading French newspaper "Le Monde" a few days later: "58% of vertebrates have disappeared in 40 years."

There are two options here; either this figure is correct, or it is not. The trouble is that in either case, we are facing bad news.

If indeed 58% of mammals, birds, reptiles, fish, amphibians ... have disappeared in 40 years (which is after all only a theoretical human half-life), then the situation is dramatic. It is not merely concerning, serious, or problematic, it is truly dramatic indeed. This means that within one human lifespan, almost everything living around us will disappear. Therefore, we should not waste time in dead-ended discussions over priorities to save a given elephant or parrot or frog (our well-known congresses, conventions, workshops, symposia...); we should take to the streets, carry out a revolution, whatever is needed to ensure that this disaster is brought to an immediate stop.

But if indeed 58% of vertebrates have disappeared without, in the end, significant human suffering (because let's be clear, this is the case at present), how will we convince ourselves of the need to save what is left?

So, on the other hand, if this figure is exaggerated, what benefit does it bring to the defense of our cause? Will it help us react before the situation becomes - really – that critical? The numbers create an unprecedented shock wave but will they bring all the “decisions-makers” of the G7 or 8 or 9, the Security Council or the BRICS, the G77, small Islands States or anyone else out of their lethargy? Obviously not. Don’t we run the risk of trivializing the fall, or worse, to make it seem inevitable for us all? In the end, aren’t the implications for humans (those who do not read the IUCN Red List, that is to say, 99% of the population) invisible?

In both cases, it seems, the announcement does not serve the cause. This reminds me of the frequently heard and read statement: "the rate of species extinction is 1,000 times higher than it was previously." A declaration generally made right after explaining that the majority of disappearing species have not yet been discovered! Are we really measuring the rate of disappearance of species yet unknown? Is this serious?

Yes, biodiversity is in danger and the causes for this loss are known and clearly connected to humans and their activities. Yes, we must raise more awareness and yes, we must now take radical action. There is no need of figures for this, all we need is willingness. We have been discussing these issues since 1992...

Saturating the information space with - sometimes - questionable and - often - unverifiable information and trying to comply with the increasingly more demanding media system, places us at risk that our public will get bored without even having had an opportunity to take action.

Why? Because nobody wants to commit to a lost cause or to one that exceeds his or her capacities. And the worst would be to nip in the bud the will of those who could change everything, that is to say citizens of the world.

Download the report:
http://www.footprintnetwork.org/documents/2016_Living_Planet_Report_Lo.pdf

Papaco is also on:

Twitter = @Papaco_IUCN
(https://twitter.com/Papaco_IUCN)

And on:

Facebook = facebook /IUCNpapaco
(https://www.facebook.com/IUCNpapaco)

Please also visit the IUCN-GPAP (IUCN global PA program) webpage and read the newsletter:
https://www.iucn.org/theme/protected-areas/our-work/newsletter

OUR ONLINE TRAININGS

Our MOOC on PA management

Direction 4 of the Roadmap for African PAs

Our **MOOC** (massive open online course) on **Protected Areas management** is still online on Coursera and currently gathers more than **3 000 learners**. The course is **free** and is organized in **7 modules** that can be followed at your own pace in **3 month time**. Successful learners get a **Certificate** at the end of the course.

Register on: **www.coursera.org/learn/protected-areas**

A new session of this MOOC on PA management starts in January 2017

Our MOOC on Ecological Monitoring

Direction 4 of the Roadmap for African PAs

Our **new MOOC** on **Ecological Monitoring** will start in early **February**. It explains why and how to realize the survey of a Protected Area and how to protect its values. Strategies, methods, technics, statistics, examples from the field… and much more to learn how to develop your ecological monitoring. The course is **free** and is organized in **4 modules** that can be followed at your own pace in **2 month time**.

Pre-registration:
visit http://inform.epfl.ch/?form=MOOC_SE&formlang=en

The first session of this MOOC on ecological monitoring starts in February 2017 (the 6th)

You can also register to both MOOCs on www.papaco.org, on the page « trainings ».

Join our Group on **facebook**:
https://www.facebook.com/groups/208309996241190/

Our MOOC are developed in cooperation with the Ecole Polytechnique Fédérale de Lausanne

OUR ONSITE TRAININGS

Professional training on PA management: the 4th Master's degree is currently running in Alexandria (Egypt)
Direction 4 of the Roadmap for African PAs

Twenty students coming from **12 countries** in Africa (Burkina Faso, Benin, Centrafrique, Congo-Brazza, Gabon, RDC, Côte d'Ivoire, Guinea, Senegal, Togo), Madagascar and Haïti are gathered for their second year of **Master's degree** with the **Senghor University**, in Alexandria. This master on PA management has been set up by the Papaco and the University six years ago.

Five of the students benefit from a scholarship given by the **MAVA Foundation**.

The fourth promotion of students at Senghor University in November 2016

The thirteenth University Diploma on PA management will be organized from 27 March to 19 May in Ouagadougou (*in cooperation with IUCN-PACO*)

Direction 4 of the Roadmap for African PAs

A new session of our **8-week onsite training course** on PA management will be organized in Burkina Faso from 27 March to 19 May 2017. This training is organized by the Senghor University and Papaco, and benefits from the support of IUCN-PACO. **The course merges theory and practice** and aims at training young PA managers and their partners (NGO, private sector…) in order to improve the conditions of management and governance of PAs across Africa.

The training targets people coming from **West Africa** and will be delivered in **French**. **This edition will particularly focus on Marine PAs**. Successful students will receive a **University Diploma** delivered by the Senghor University (which is the official University of the Francophonie).

The training is funded by the **MAVA Foundation**, covering all associated costs except travels.

To candidate: online registration on
http://www.usenghor-francophonie.org/Events/3104/DU13_Ouaga.html

Deadline for inscription: 15 January 2017

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The previous (12th) promotion of the University Diploma in Ouagadougou, April 2016

JOB OFFERS

1) Deputy Project Director - Cameroon

The Deputy Project Director, responsible for anti-poaching, reports to the Project Director who he/she will assist in the implementation of project activities. He/she is particularly responsible for the implementation of project activities planned in the Chad sector of the project. In close collaboration with the project management, the conservation services and other actors in the field, he/she will participate in the planning and drafting of anti-poaching strategies and will be responsible for their implementation.

2) Logistic and infrastructure manager – Cameroon

The Logistics and Infrastructure Manager reports to the Project Director. He/she is responsible for the project's logistics and particularly for ensuring the procurement of the operational bases of the Bouba Ndjida and Sena Oura National Parks, with key responsibilities including, but not exclusive to, the following :

- Establishing and implementing procurement processes
- Ensuring controls and follow up on use of equipment and consumables
- Preparing and following up with procurement contracts for goods and services

To apply: wcscameroon@wcs.org

The Internet of Things for enhancing nature conservation: an innovative technology strategy to improve PA management effectiveness

Directions 4 to 6 of the Roadmap for African PAs

The species with which we share the planet, and the ecosystems on which we depend, are being destroyed at an unprecedented rate (see the edito of this NAPA). Despite decades of conservation effort, species and habitats are still disappearing. Reversing this decline is one of the biggest challenges of our times. We know that protected areas cover already more than 15% of the global land surface and host a significant proportion of the planet's biodiversity. Managing these areas better is a key aspect in preserving species and habitats for future generations. This is the subject of a study conducted by IUCN-Papaco with ***Smart Earth Network*** *(www.smartearthnetwork.com) and* ***Eridanis*** *(www.eridanis.com) to assess the potential of new technologies in PA management (and governance). This study has been conducted on the ground, taking the Pendjari National Park in Benin as a concrete example. It shows how a new technology revolution, the Internet of Things (IoT), has the potential to transform the management effectiveness of protected areas in Africa.*

This NAPA exposes some of the study outputs and gives a few examples as an illustration. But there are much more in the report! The study is downloadable on www.papaco.org at the 'publications' page. It's made of ***2 reports****: the first one globally exposes what kind of connected solutions can be used and the second details the specific solutions for the Pendjari NP (taken as an example of a savannah park). This study has been funded by the French Agency for Development, in the context of the IUCN/France partnership.*

FRANCE-IUCN PARTNERSHIP NATURE AND DEVELOPMENT

1) Context

Protected areas (PAs) in Africa have been facing the same challenges for centuries. These are encroachments, habitat reduction, poaching, wildlife trafficking, timber and non-timber over exploitation, invasive species, excessive numbers of tourists, lack of recognition… driven by several factors including: human population growth, poverty and natural resources dependence, land tenure insecurity, poor governance, lack of awareness, insecurity and migrations, climate change, diseases, human/wildlife conflicts…

Many solutions have been developed to address these challenges: law enforcement, fencing, patrolling, expulsion or management agreements, changes in governance models… which have, in many places, led to good results. Some PAs around the world are now properly conserved. The situation is however different in most of Africa, due to the exponential growth of the population (950 Million inhabitants today, 2.2 Billion in 2050) and of development needs. More PAs are created, covering greater surfaces whilst the means to properly manage them are not following the same trend. Biodiversity is still declining and in the short term, PAs will face issues that are more and more out of control. Most of them are threatened with becoming paper parks.

In this context, new approaches are needed to reinforce what is already being by improving efficiency or ultimately identifying new solutions, which are more appropriate and more cost-effective. The Internet of Things may well be one of them.

Internet of Things: Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing, in the Internet of Things, can be a person with a health monitor implant, an animal with a biochip transponder, an automobile that has built-in tracking sensors, a drone which is assigned a specific trajectory every day or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

IoT is not new but has recently evolved from the convergence of wireless technologies, micro-electromechanical systems, micro-services and the Internet. The convergence has helped tear down the silo walls between operational technology (OT) and information technology (IT), allowing unstructured machine-generated data to be analyzed for insights that will drive improvements. This change (some call it a revolution) is opening new possibilities for PA management and ultimately PA governance.

The IoT revolution, involving more powerful processors in small remote devices that require lower power, enabled by powerful communications and analytical systems, all at costs that are falling rapidly, is making possible a transformation in PA management effectiveness. The IoT is already making big impacts in the creation of smart cities, and improving effectiveness and efficiency of the health and energy sectors. In PAs however, awareness of the opportunity remains low, investments tend to be piecemeal, and there are important hurdles to overcome to achieve scalable, repeatable and sustainable IoT investments.

A few practical examples of IoT applicable to PAs

Using a smartphone's range of **sensors** (Accelerometer, Gyro, Video, Proximity, Compass, GPS, etc) and connectivity options (Cell, WiFi, Bluetooth, NFC, etc.), one has a well-equipped Internet of Things device in one's pocket that can automatically monitor movements, location, and workouts throughout the day. This can easily be applied to track rangers' patrols, staff vehicles or tourist activities in a protected area…

Lion Guardians have developed an open-source **wildlife tracking collar system** to safeguard the Maasai herders cattle and protect the last 2000 lions living in Southern Kenya. The system consists of a tracking collar that utilizes a GPS/GSM module to locate and track the lions and communicate their coordinates to researchers and Maasai herders via SMS.

Other tools offer an **electronic system** that notifies authorities when a fire extinguisher is blocked, missing from its designated location or when its pressure falls below safe operating levels. Alerts can be sent directly through an instant email, phone call or pager notification to proper agencies and supervisors, meaning the PA buildings and infrastructures and touristic venues are always up to date in terms of security.

Invisible Track is a **wireless device** being used in pilot programs to help combat illegal deforestation taking place in the Amazon. The battery operated devices are installed on select trees and as soon as the logged trees are in transit and able to connect to a mobile network, an alert notification with location coordinates is sent to the Brazilian Institute of Environment so they can take action.

This is a critical challenge for African PAs where there is generally no (or not enough) communications infrastructure, where technology investment tends to be disjointed, unsupported and often falls into disuse, and where the ongoing skills needed to support and maintain an IoT integrated solution are not present. The study shows how innovative technology can help us to better understand what is going on and how it can increase the capacity to identify and address threats, help build local community involvement and trust through good communication and improve the safety and experience of visitors.

2) A quick summary of Innovative Technology Applications

Here after is a summary of some of the technology applications for addressing the key challenges in African PAs (*non-exhaustive list*). This list has been built relatively to Pendjari NP challenges as identified during the field visit.

A - Automated collection of ecological data

- ***Connected Camera Traps and Security Cameras***: Network of camera traps and security cameras with wireless connectivity that can automatically upload their images centrally for processing, or in the case of security cameras, to alert patrol staff of potential illegal activity.

- ***Acoustic Sensor Networks****:* A network of acoustic sensors whose audio recordings are constantly processed to distinguish the individual audio sources and provide matches against databases of known audio signatures. In this way the calls and locations of wildlife are known but also vehicles, gunshots and chainsaws are automatically identified or flagged.

- ***Bio-tracking****:* Tracking movements of individual animals remotely using GPS trackers that can record location history for later retrieval or can relay data using embedded cellular, radio or satellite modem.

- ***Habitat Change Detection Software****:* Visibility of habitat changes can be improved by using advanced Geographic Information Systems (GIS), to change detection and prediction algorithms, and results in the increased quality and types of remote sensing data available. Applicable to the monitoring of invasive plants for instance.

- ***UAVs for Monitoring Wildlife Populations****:* Monitoring trends in wildlife populations using automated UAVs to conduct surveys on a more frequent basis (i.e. weekly, monthly, quarterly) than is possible through current methods such as manual transect surveys.

- ***UAVs for Monitoring Habitat Changes**:* Automated UAVs carrying traditional and multispectral cameras can capture high-resolution images that can then be consolidated into geo-referenced image maps. Pattern recognition and change detection software can then be used to automatically highlight changes in habitats and land usage over time.

- ***UAVs for Invasive Species Monitoring**:* Multispectral cameras capture the reflectance of plants across different wavelengths which allows individual plant species to be differentiated. Capturing multispectral images as part of automated drone surveys allows changes in the type and distribution of flora to be identified.

- ***Automated Species Identification Software**:* Image recognition software can be applied to images and videos of wildlife to automate the identification of species.

- ***Automatic Weather Stations:*** Automatic Weather Stations can report in near real time via either satellite or mobile networks, and the data can be automatically fed into a Geographical Information System (GIS) for analysis and reporting or onto visitor websites.

B - Automated surveillance of the park

- ***Anti-poaching/illegal logging sensor networks**:* A variety of connect sensors (acoustic, seismic, infrared) and cameras can be deployed to help detect potential poaching activities and illegal-logging activities. When triggered, these can send alerts via wireless networks and provide rangers with information about the location and nature of the threat.

- ***Mapping and reporting tools**:* Software that enables rangers to record poaching incidents and make effective management decisions. Data is stored on a central database which can be queried and produces maps, both of which enable intelligent allocation of resources to better combat the poaching threat.

- ***UAVs for Surveillance**:* Fixed wing UAVs with a long range (up to 100km) can be configured to automatically cover susceptible areas of the park and provide alerts to rangers of the location and nature of threats they need to respond to.

C - Security of staff and tourists

- ***Satellite Emergency Messaging Devices**:* Until VHF radio and/or LTE networks are in place satellite devices can allow SOS alerting and 2-way messaging that allow PA operations and emergency services to respond rapidly and collaborate.

D - Security of local communities

- ***Automated animal deterrents**:* Range of devices that use sound and light to prevent human-wildlife conflict. Or possibly pepper against elephants…

E - Improving the visitor experience

- ***Citizen Science Applications**:* Website and mobile apps that allow visitors to identify and submit photos of the flora and fauna they are seeing for classification and analysis. A good way to enlarge easily the park's database.

- ***Tourist-focused applications**:* Mobile apps that provide Park-specific content to improve the visitors' experience, before or during their visit.

F - Stakeholder collaboration Systems

- ***Community Collaboration Platforms**:* Web and SMS based tools to improve the collaboration and engagement of Park stakeholders.

3) A vision for Pendjari's technology-enabled enhanced management taken as an example for savannah parks

The table here after summarises the potential of a well-designed technology programme to transform the key challenges of a PA (like Pendjari NP) management.

Challenge	As-Is	To-Be
Voice and data communications	Lack of in-Park electronic communications, hampering effective co-ordination of work, causing security risks for staff and visitors, and impeding the deployment of connected devices.	Park-wide (GPS-enabled) voice and data network which allow staff and visitors to communicate and access the Internet, and IoT-enabled tools to be deployed effectively. GPS will allow geolocation capabilities, increasing security.

Monitoring, Evaluation & Program Design	Manually intensive data collection but poor evidence base for impacts evaluation, rendering confident program design difficult.	Remote sensor network supported by more powerful analytics to improve evidence base, and facilitate effective programme design.
Conservation Management	Limited resources and highly manual work processes limit effectiveness of conservation activity.	Use of technology to automate alerts and activate remedial actions reduces burden on resources, increasing capacity and ultimately effectiveness.
Collaboration and Governance	Stakeholder engagement at multiple levels creates significant administrative overhead.	Use of advanced stakeholder management and communications tools streamline work.
Visitors	Poor use of tools to help potential visitors to plan their trips and to guide them when in the PA.	Mobile apps with GPS enable visitors to plan in advance and to effectively navigate the PA and interpret what they see. And in some cases, to report species or events to the managers.
Local Communities	Local communities lose livestock and crops dues to predation and trampling. Conflicts with elephants are many.	Notifications enabled by IoT devices allow deterrent action to be taken. Including automated responses.

4) A few principles to consider in order to choose the right technology

The selection of technology and the deployment plan for this architecture needs to be guided by nine core principles:

1. All core technology should be robust, proven, simple, and, as far as possible, locally maintainable.
2. PAs lack resources today and the aim must be to increase capacity. Technology should not be used to supplant human resources, but be deployed in a way that supports and enriches current work processes, replacing low-value manual work, with higher-value work for which staff may need to be up-skilled.
3. A phased deployment should be planned which delivers value at each stage (such as ecological monitoring and poacher alerts), while building infrastructure upon which later phases can be scaled (such as connectivity, generic storage and analytics).
4. Use cases must be rigorously piloted on the ground before they are rolled out.
5. An equipment control, management, maintenance, & training strategy should be put in place from the outset.
6. All costs (capital and ongoing) must be well understood, and the budgets required to support them must be in place.
7. Digital and physical security requirements must be considered from the outset.
8. The horizon of emerging technologies should be scanned to avoid as far as possible investing in solutions that will rapidly become obsolete.
9. Where the necessary Internet access is in place, cloud-based services should be considered to reduce upfront costs and allow remote technical support.

5) A practical example from the field: connected Camera Traps for ecological monitoring

Camera traps are utilized in Pendjari NP and are used to monitor 20-30 species. There are currently a few dozen camera traps setup by the park or by other organizations (universities and NGOs) and the data is collected manually on a monthly basis by 2 staff over a period of 6 days. The photos (around 250 per camera per month) are then manually processed by a member of staff over a period of 2 weeks. Once the images have been processed, a member of staff prepares an analysis report for the park management, to inform their conservation decisions.

The current process of collecting, processing and reporting on the camera traps is time consuming, and there is quite inconsistent collaboration between the stakeholders. This reduces the

effectiveness of research and ecological monitoring. In addition currently a large proportion of traps breakdown in the field – this is not detected until the camera is visited.

The need is to reduce the effort in reporting observations of species, increase the quality and breadth of monitoring, and increase the collaboration between the stakeholders. It is also necessary to reduce the proportion of cameras that are out of operation at any one time.

Option	Description	Pros	Cons
Take no action now	Continue with manual collection and manual processing of camera traps	No additional costs.	Continued high manual effort. Less than optimal collaboration between all stakeholders. Continued high redundancy from duplicate work and non-working cameras.
Private cellular network enabled camera traps	Camera traps enabled to transmit by GSM/3G. The increased bandwidth available with 3G would allow more and higher quality images to be collected automatically.	Cellular enabled camera traps are readily available. If based on a private cellular network the ongoing costs would be small. Images are sent in near real-time, reducing the time between observation and analysis.	Would require investment and setup of private cellular network.
Drone enabled camera traps	Traditional camera traps with Wi-Fi-enabled memory cards. A Wi-Fi-enabled drone is used to periodically fly over the cameras to gather the images taken.	No cellular or satellite network would be required to collect the data from the camera traps. This would reduce data costs.	Technology not proven. Would require significant levels of drone operations to cover all of the cameras.
Radio network enable camera traps	Camera traps with radio transmitters.	Could piggy back on network of radio based voice communications.	Bandwidth for sending the images maybe insufficient. Cameras with radio compatible transmitters do not exist – would have to be added on.

The recommended solution in this case is to replace the existing camera traps with a scalable network of cellular connected camera traps that wirelessly transfer the images taken to a shared cloud platform that streamlines, and where possible automates, the image processing and reporting.

The solution consists of the following elements:

1. Acquisition

Cellular enabled camera traps operate in a similar way to a traditional camera traps, taking photos during day or night when triggered by infrared motion. However once a photo is taken, instead of waiting to be collected manually, the photo is transferred by a near real-time data transfer using a cellular connection to a server in the cloud.

To be able to stay operational without maintenance for long periods each camera would be connected to a solar panel unit. As the images are transmitted as they are captured, damaged or misdirected cameras can be quickly identified and resolved.

An example of a professional grade cellular camera trap that is reliable and has a quick trigger time is: **PC900C HyperFire Cellular Professional Covert Camera Trap (Reconyx)** http://www.reconyx.com/product/PC900C-Cellular-HyperFire-Professional-Covert-IR

2. Processing

The raw images then need to be processed to discard empty images and classify the wildlife

species that are captured. It is proposed that images captured are automatically imported into a shared platform where the images can be collaboratively classified. This image classification can be conducted by PNP researchers and also supported by a citizen science crowdsourcing platform like Zooniverse (www.zooniverse.org) and MammalWeb (https://www.mammalweb.org).

As the cellular cameras send the photos received on a near real-time basis the number of images to process each day is relatively low (on average about 8 photos per camera per day in PNP). Hence it is feasible for local researchers to process them each day as they are received.

3. Reporting

To maximize the value of the classified images for decision-making it is proposed that the shared platform would include or be integrated with an analytics platform to provide automated reporting. As the images are classified the park management and stakeholders would have the ability to review the latest sightings, and trends from any computer, tablet or phone that has an Internet connection.

By connecting all camera traps in the park to a single shared platform, individual researchers and stakeholders will gain access to wider data sets and with reduced manual effort to collect and process data.

Anticipated Outcomes

- Reduce the delay between when wildlife is observed by the cameras and is reported.
- Reduce the manual effort required for camera data collection and retrieval.
- An increase in the number of species that are able to be identified.
- An increase in the sharing of camera trap imagery between stakeholders.
- Problems with the cameras can be identified immediately.
- Provides a scalable platform for adding additional cameras.
- Potential increased engagement with wider citizen population through a citizen science platform.

Critical Success Factors

- Camera traps are deployed correctly (in correct and secure locations, with right settings, etc) so that they do not require unscheduled visits.
- The creation of an effective collaboration between organisations who need to use camera traps.
- The communications capability must be able to upload images at a sustainable cost.

6) Another example from the field: acoustic sensor networks

There is a need for large-scale and long-term ecological monitoring in order to establish effective conservation strategies. Surveys of mammals are infrequent and for many species non-existent. This severely hampers the reliability of estimates of population numbers and trends. There is also a need for real-time monitoring of several threats, namely logging, poaching and habitat encroachment by farmers.

Many species communicate acoustically and can be identified by their species-specific calls. A network of acoustic sensors can be deployed and animal call data remotely collected. The sound file analysis can be automated for efficient identification of species present.

The same technology can detect the sound signatures of several human activities, such as gunshots, chainsaws and vehicle movement. Identification of human threats could produce real-time alerts to be communicated to the rangers and park staff for decisive and rapid responses.

Option	Description	Pros	Cons
Take no action	Continue with no established acoustic sensor network.	No further investment required.	Not collecting potentially huge data resource on species and threats. No large-scale and continuous remote sensing capabilities.

Microphone array + data manually collected	Install microphone arrays across the park and manually collect SD cards on a regular basis.	Easy to deploy. Requires no existing communication infrastructure. Relatively inexpensive. Long battery life relative to cameras. Less visible than camera traps – less prone to vandalism.	Requires retrieval of data which could be time-consuming. No real-time alerts so not effective for detection and response to threats.
Microphone array + data transmitted via wireless network	Install microphone arrays that are connected to a wireless network.	Enable real-time monitoring. Can also be used to detect threats (e.g. gunshots, chain saw sounds) and send alerts.	More expensive. Requires existing wireless infrastructure.
Automated classification of species	Use of software that enables automatic species identification from sound files.	Faster processing of data. Can be applied to any species (mammal, insect, bird).	Requires pre-configuration with sample sound files. Error rates can vary depending on habitat type and background noise.
Manual classification of species	Manual processing of sound data and human-based identification of species.	Cheap. Requires no pre-programming. Requires no specialist software.	Extremely time-consuming. Requires high level of expertise. High error rate. Delayed identification meaning no real-time monitoring.

There are several fully integrated and supported acoustic sensor devices and analytical software packages on the market. Microphone devices with supported accompanying analytics are recommended to ensure the data is processed correctly and can be translated into useful information for management decisions.

The recommended solution is to use the Automated Remote Biodiversity Monitoring Network (ARBIMON) acoustic sensors and analytical software solutions.

The sensors are relatively inexpensive, long-lasting and can be joined to an existing wireless network. They are powered by solar (and has an accompanying solar panel on each device). They have already been tested in a range of environments and for a number of different species.

The analytical software package is flexible and can be configured to suit any chosen sample species. The cloud-computing platform includes an intuitive interface for using species-specific identification using algorithms. The package allows the easy set-up of the species-specific identification algorithms that are used to automatically identify species from their calls.

Anticipated Outcomes:

- Remote monitoring of a variety of species can be achieved.
- Automation of analysis will generate useful information from large volumes of data quickly.
- Threats can be detected in real-time for quick responses.

Critical Success Factors

- The microphones and analytics software must be calibrated correctly.
- Existing wireless networks must be in place to facilitate transmission of acoustic data.

- Analytics software must have adequately low error rates for accurate assessments.

You already use technologies in your park? Or you wish to engage? Contact us!

More on www.papaco.org

Peace-Park Foundation is looking for a Joint Operations Manager - Malawi/Zambia TFCA (3-year fixed-term contract)

The Joint Operations Manager will provide technical assistance and operational support to all aspects of park management, including law enforcement, infrastructure development and maintenance, tourism development, research, education and extension and cross-border operations within the Malawi-Zambia, guided by the Integrated Management and Development Framework (IMDF). The successful candidate will work in close collaboration with Department of National Parks and Wildlife (DNPW) Malawi and Zambia as well as the International Coordinator (IC) and Project Implementation Unit (PIU) of the TFCA.

Requirements: • Vast experience in all aspects of park management with a strong bias in law enforcement • An excellent command of English • Physically fit • Prepared to operate in a remote environment and travel extensively within the Nyika National Park, Vwaza Marsh Game Reserve and Chama Community Conservancy • 4X4 driving skills • A valid SADC driver's licence • A diploma or higher qualification in a discipline-related to park and wildlife management • A minimum of 10 years' working experience in park and wildlife management with a strong bias in law enforcement • A minimum of 3 years' working experience in wildlife law enforcement training, which should include design and delivery of training modules • A minimum of 3 years' experience in a position of leadership in wildlife law enforcement including the review, design, planning and implementation of law enforcement protocols (applying strategic methods and intelligence information gathering • Computer literacy, with familiarity of main software such as Word and Excel and possibly GIS • A basic understanding of the TFCA concept.

As Joint Operations Manager, the focus area for the Operational Manager will be the Nyika National Park (Malawi and Zambia), Vwaza Marsh Reserve and Chama Community Conservancy.

Specific functions will include providing support in: • Planning, implementation, monitoring, evaluation and reporting of law enforcement operations at national and cross-border levels • Development of protocols, standard operating procedures and structures to facilitate cross-border joint operations for law enforcement based on the recommendations of the policy harmonisation report • Capacity building and training of staff for law enforcement, monitoring, control of alien invasive plants and maintenance programmes • Setting up and implementing monitoring programmes with regard to vegetation condition assessments, alien plant distribution, wildlife census, etc • Setting up an eradication programme for alien invasive plants, eg bracken fern • Developing and testing partnership models for resource management and utilisation within the TFCA • Infrastructure development and maintenance and formulation of a programme for buildings and road maintenance • Preparation of terms of reference for assignments to be outsourced.

PPF will employ the candidate on behalf of the Malawi and Zambia Governments and interested candidates should submit a covering letter detailing your interest in and suitability for the position, as well as Curriculum Vitae in English, with contact details of three references by 5 December 2016 to Lee-Anne Robertson, e-mail: lrobertson@ppf.org.za and Humphrey Nzima, the International Coordinator at e-mail: nzima.he@gmail.com / nzimatfca@wildlifemw.net Please include the reference "Joint Operations Manager" in the subject line.

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