PROCEEDINGS

Protecting Threatened Wildlife in Africa with Technology and Training

A forum hosted by the Richardson Center for Global Engagement, World Wildlife Fund and African Parks

October 31, 2013
The National Press Club - 529 14th St NW Ste 1300
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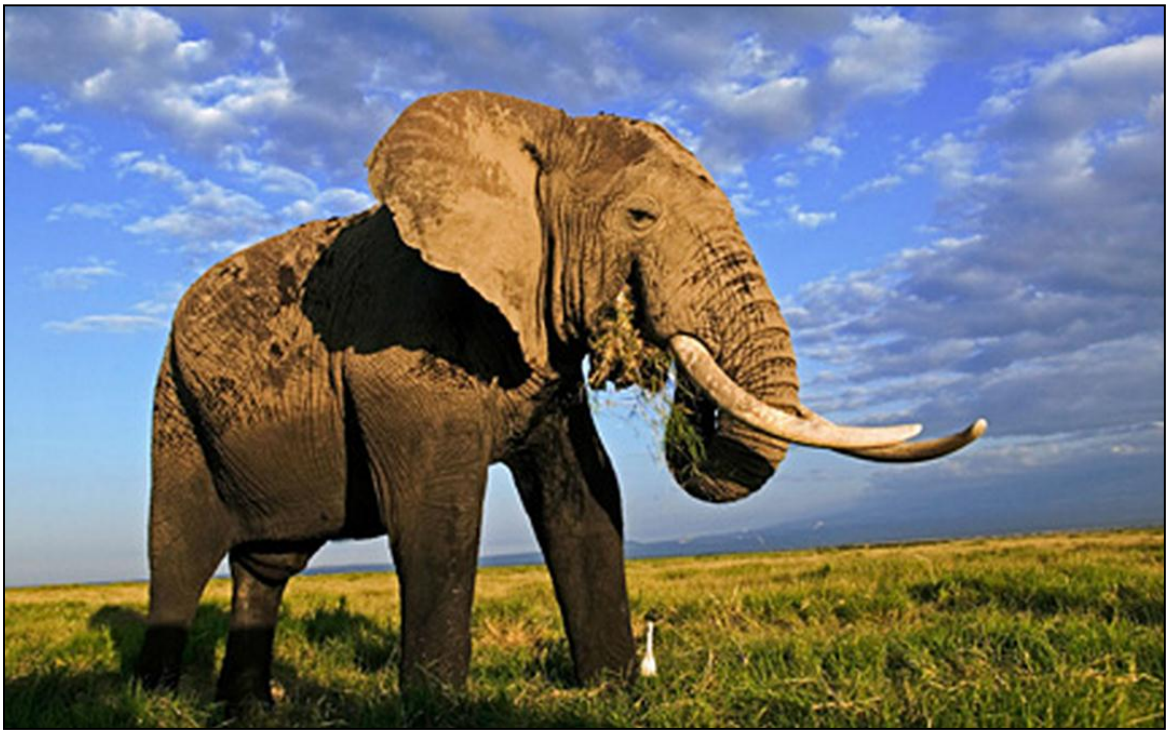

"We know that reaching and protecting the most remote locations is no easy task. It takes applying the most advanced, real-time surveillance technology. It takes trained and committed rangers and guards. It takes an infrastructure that sustains the effort over the long haul. And it takes international cooperation and strategic planning. This partnership and new resources will help us get there."

Governor Bill Richardson, President, Richardson Center for Global Engagement

Protecting Threatened Wildlife in Africa with Technology and Training

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These proceedings present topics raised on October 31, 2013 in the forum, *Protecting Threatened Wildlife in Africa with Technology and Training*. Financial support for this event was provided by The Richardson Center for Global Engagement and a Google Global Impact Award to WWF.

Forum Steering Group: The Richardson Center for Global Engagement - Governor Bill Richardson, Mickey Bergman, Clifford Karchmer; WWF - Crawford Allan, Rachel Kramer, Charles Huang; African Parks - Leon Lamprecht, Nicole Mollo. Forum Communications & Media: Navigator Communications - Sean Walsh, Becky Fleischauer; WWF - Sarah Fogel, Jenna Bonello. Forum Logistics: The Richardson Center for Global Engagement - Tara Shallal; WWF - Gia Parmer.

For WWF, please refer questions to the proceedings editor, Rachel Kramer: rachel.kramer@wwfus.org. For The Richardson Center on Global Engagement, refer questions to Mickey Bergman: Mickey@RichardsonDiplomacy.org; for African Parks, refer questions to Nicole Mollo: nicolem@african-parks.org.

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The Richardson Center for Global Engagement is a non-profit corporation established by former New Mexico Governor Bill Richardson to promote international peace and dialogue by addressing specific conflicts and unresolved problems facing the world. http://www.richardsondiplomacy.org/

World Wildlife Fund (WWF) is one of the world's leading conservation organizations, working in 100 countries for over half a century. With the support of almost 5 million members worldwide, WWF is dedicated to delivering science-based solutions to preserve the diversity and abundance of life on Earth, halt the degradation of the environment and combat climate change. Visit http://www.worldwildlife.org/ to learn more and follow our news conversations on Twitter @WWFNews.

African Parks is a non-profit organization that takes on direct responsibility for the rehabilitation and long-term management of national parks, in partnership with governments and local communities. African Parks currently manages seven parks in six countries – Chad, Congo, DRC, Malawi, Rwanda and Zambia – with a combined area of 4.1 million hectares. http://www.african-parks.org/

THE Richardson CENTER

Protecting Threatened Wildlife in Africa with Technology and Training

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FOREWORD

WORLD WILDLIFE FUND
Exploring Scalable Technologies

"Africa is facing a crisis of poaching at an unprecedented scale. The role of innovations will be critically important. In the spirit of exploration, we're seeking to identify new technologies, resources and partnerships that can be applied. "

Crawford Allan, Senior Director, WWF/TRAFFIC

Illegal wildlife trade is a global security issue with destabilizing effects on communities, governments, economies and wildlife. The poaching crisis in Africa has reached unprecedented levels, with more than 30,000 African elephants slaughtered last year alone. In just ten years, 62% of Africa's forest elephants have been lost. The most recent analysis by the Elephant Trade Information System (ETIS) shows illegal trade in elephant ivory to be at its highest level in two decades.

While long-term policy and demand reduction efforts are essential to addressing this crisis, there is an urgent need to support the capacity of rangers, law enforcement and wildlife managers to protect wildlife populations under threat of poaching. Emerging efforts to enhance wildlife protection capabilities include piloting advanced technologies to provide real time situational awareness for boots on the ground to detect and deter poaching incidents.

In December 2012, Google awarded the World Wildlife Fund (WWF) a $5 million Global Impact Award to create an umbrella of technology to protect wildlife. WWF's Wildlife Crime Technology Project aims to provide governments battling wildlife crime with the vital advantage of a new integrated network of

technologies to help reduce poaching and minimize risks to staff in the field. This project is researching and piloting a combination of affordable animal tracking systems, scalable aerial and ground-based surveillance systems, and intelligence-fed patrolling. Over the next three years, WWF will work with host-country governments to implement this system across four sites in Africa and Asia that are home to elephants, rhinos and tigers.

Expected successes in experimental sites will require evaluation and customization so that technologies that work in one setting can be employed in other environments with a reasonable expectation of performance. Since many state-of-the-art technologies with potential for conservation applications have been generated in the military, enforcement, and security arenas, general questions of scalability and affordability arise.

In an effort to provide useful feedback on technology options to the conservation community, WWF teamed up with the Richardson Center for Global Engagement and African Parks for a one-day informal review of promising technologies and possibilities for their wider implementation. In order to share information of maximum utility, experts from research and development, government, law enforcement and the non-profit and private sectors were invited to discuss their specific experience with emerging technologies and trainings, and to explore whether these present alternative, scalable, and affordable applications for protecting endangered wildlife.

Key questions discussed over the course of the day included:

(1) What are the major technologies that have worked in poaching environments that could benefit from wider implementation or further exploration?
(2) What are the financial, situational, and other considerations that can limit the impact of prominent technologies, and what can be done to reduce costs, adapt or customize these technologies and further their application?
(3) Are there federal or other research and development efforts underway to improve the accuracy of situational awareness technologies or to develop new ones that could be deployed in a conservation capacity?
(4) How can government, NGO, and other domestic and international entities further engage to enable technology to combat poaching?
(5) What are the major ivory trafficking routes and strategies? What opportunities exist to apply and/or adapt relevant technologies for the detection and interception of illicit shipments at strategic points in transit or for controlled deliveries?

In his keynote address, *Protecting Africa's Elephants: Current Threats and Responses,* Dr. Richard Carroll, Vice President for Africa Programs at WWF provided an overview of the current poaching crisis and evolving solutions. *Session 1: The Search for Cost Effective and Scalable Technologies* was initiated by a

presentation by Dr. Eric Dinerstein, Vice President and Lead Scientist at WWF, on *Harnessing Emerging Technologies to Address the Poaching Crisis and Improve Wildlife Monitoring.* Transitioning from the ground to the skies, Michael O'Shea of the National Institute of Justice then presented on parameters and resources for *Navigating to Safe and Low-Cost Law Enforcement Aviation.* A presentation by Dr. Tom Snitch of UMD followed, offering lessons learned from piloting small Unmanned Aerial Vehicles (UAVs) guided by algorithms for intelligence-fed enforcement in South Africa, *Leveling the Playing Field: Employing High Technology to Combat Poachers.* Transitioning from technology solutions for intelligence-fed enforcement at the source of poaching, to transit and market dimensions, Lisa Brown of the University of Washington offered fascinating insights on the findings of Dr. Sam Wasser's lab, *Using Forensic Science to Combat the Illegal Ivory Trade*.

Further exploration of *Cost Effective and Scalable Technologies* continued in *Session 2* with a presentation on *DigitalGlobe's Anti-Poaching Role* by DJ Mallmann, and a closer look at *Aerostats and Tethered Antennae* by Anthony Bocchichio. Finally, a review of *U.S. Export Controls: Regulatory Considerations in Wildlife Protection* was provided by Kimberly Strosnider, Esq. of Covington & Burling LLP, in which practical considerations associated with the export of select technologies were discussed.

AFRICAN PARKS
Piloting Innovative Capacity-Building and Training Programs

"We still have a long way to go, but efforts like the Poacher Amnesty Program and collaboration around technology are important steps in the right direction."

Leon Lamprecht, Park Manager, Odzala-Kokoua National Park, African Parks
Represented by Nicole Mollo of African Parks

The scale of the demise of elephant populations in Africa due to unprecedented poaching and illegal hunting levels has led to the tragic loss of an estimated 800,000 elephants over the past 40 years, with numbers dropping by 62% between 2002 and 2011 due to increased poaching pressure.

At 13,000 km² in size, Odzala-Kokoua National Park is the Republic of Congo's largest protected area and plays a vital role in the conservation of forest elephants, as well as western lowland gorillas. An estimated 9,600 forest elephants still reside in Odzala-Kokoua National Park in Republic of Congo, according to the results of a wildlife census commissioned by African Parks in 2012. While higher than expected, this healthy number is believed to be a result of what is termed a compression, with elephants fleeing the highly poached areas outside the park, and from the neighboring country of Gabon, and moving into the safety of the centre of Odzala.

Since taking over management of Odzala in 2010 under the auspices of the Odzala-Kokoua Foundation, African Parks has implemented an effective multi-pronged plan to address threats and challenges. This includes an increase in anti-poaching and intelligence gathering capabilities and initiatives, and a ground-breaking poacher-to-protector amnesty and training program for former poachers.
The Poacher-to-Protector program was launched at the end of last year by Odzala's Park Manager Leon Lamprecht, beginning with a word-of-mouth recruitment drive via existing para-military eco-guards and with official notification letters to the chiefs of villages that surround the park. The selection of recruits began in August. Fifty-six former poachers applied for the program, 28 applicants were accepted and have been trained as fully-fledged eco-guards while a further 15 who also successfully completed the rigorous course have been employed as eco-monitors. (Eco monitors perform research and monitoring functions; eco-guards implement para-military law enforcement tactics.) The intensive three-week course was designed and run by a former French Special Military Forces commander.

It was a condition of application that the poachers provide written statements detailing their activities and crimes, and hand in their illegal weapons. A total of 56 illegal firearms were handed in.

Five of the applicants confessed to previously working with a major regional ivory kingpin, called Ngondjo Ghislian, better known by his nick-name "Pepito", and their statements were admitted to the court in the Congo where he was tried. "Pepito" was convicted in July and is currently serving a five-year prison sentence.

On 15 October a group of Odzala eco-guards, also former poachers, again played a pivotal role in identifying and arresting a Chinese illegal ivory trader whom they had previously supplied with ivory. The trader and his driver, also a Chinese national, are both employees of the China Road and Bridge Corporation in the Congo. The trader was found to be in possession of three pieces of ivory, one the length of an adult arm, which had been hidden at a nearby town.

During the course of his arrest the trader tried unsuccessfully to bribe a member of Odzala's anti-poaching unit. The two men were transported to the police station in the town of Ouesso the following day to make their official statements. The men appeared in court on 16 October and were charged but released without bail or without being required to surrender their passports. The case is currently before the national prosecutor.

Odzala Parks manager Leon Lamprecht and his elite anti- poaching unit at Odzala are planning a second amnesty drive, coupled with a standard recruitment drive for training eco-guards, in February 2014. A permanent training facility is to be set up at Odzala, also during 2014, with the support of funding from the Richardson Foundation. This funding will be used for infrastructure and equipment including obstacle courses for training, uniforms, shoes, backpacks, camping equipment and weapons.

For the war on poaching to succeed, collaborative efforts will be required on multiple fronts, as outlined in this forum. At Odzala our "boots on the ground" tactics will continue to focus not only on our ground

breaking amnesty program but also on weeding out corruption, advanced para-military training and equipment, strategic patrolling, and our targeting of ivory poaching and trading kingpins.

THE RICHARDSON CENTER FOR GLOBAL ENGAGEMENT

Advancing Asset Forfeiture Systems

"My center is committing funds to establish a new permanent training facility to expand the promising poacher to protector initiative, cutting off key supply chains from the Congo region to end this illegal trade and tip the scales towards wildlife conservation. We are proud to create an international legal framework to relay assets seized from poachers to support wildlife conservation. To ensure the efforts are sustained for the long haul I will meet with African leaders and heads of state to use diplomatic channels to protect African elephants and other wildlife."

Bill Richardson – Former Governor, State of New Mexico; President,
Richardson Center for Global Engagement

Prosecution of poaching and trafficking as a 'wildlife crime' can play a significant role in financing conservation and capacity building programs by enabling the seizure of criminal assets to support enforcement and monitoring operations.

Federal and State asset forfeiture laws in the United States and international treaties allow seized assets, including cash and bank accounts generated from drug trafficking, money laundering and other illegal activities, to be forfeited. Funds raised are often invested back into enforcement operations, especially those of agencies participating in the investigation that led to the seizure.

Establishing elephant poaching as a “wildlife crime” in source and destination countries will allow a similar opportunity for wildlife conservation. The Richardson Center is developing an Asset Forfeiture and Money Laundering legislative action resource for countries to adopt to combat wildlife crimes.

Led by Governor Richardson, this pioneering law reform effort aims to empower African heads of state and their wildlife conservation agencies to enact model forfeiture laws and enforce them through advanced education for law enforcement and legal personnel at a planned law reform and investigative training institute.

In addition, the Richardson Center also announced its plan to establish the first-of-its-kind, permanent ranger training school in the Republic of Congo, in collaboration with African Parks, based on a successful "poacher-to-protector" amnesty program, and create an international legal framework to dedicate funds raised from the forfeiture of seized assets to support anti-poaching efforts.

KEYNOTE ADDRESS

Protecting Africa's Elephants: Current Threats and Responses

"The poaching numbers are staggering, representing a true ecological disaster. Seeing it in black and white is startling, but seeing poached elephants on the ground with tusks hacked out with an axe makes one become a vigilante."

Dr. Richard W. Carroll, Vice President, Africa/Madagascar Program, WWF

Globally, the estimated value of the illegal wildlife trade is between $8 and $10 billion a year, more than twice the estimated value of the illegal commerce in small arms, diamonds, gemstones and gold, combined. Adding the trade in illegal fish and timber, the wildlife trade would be the fourth largest transnational crime in the world, just behind drugs, counterfeiting, and human trafficking.

With tiger bone, rhino horn and elephant ivory now worth more than their weight in gold (a single rhino horn may have a street value of roughly $450,000) the trade in animal parts has eclipsed blood diamonds as a source of conflict, especially in Africa where wildlife crime has become a major source of funding for insurgencies and rebel movements.

Rhino poaching has increased 5,000% between 2007 and 2012. Over 700 rhinos have been killed so far this year in South Africa. That amounts to 2 rhinos per day.

In Africa, 30,000 elephants were killed in 2012. That amounts to 82 elephants per day—1 elephant killed every 20 minutes. Over 100 elephants were poisoned with cyanide in a single poaching incident in Zimbabwe this September. More large-scale elephant ivory seizures took place in 2011 than in any other year in the last two decades. A record 27 tons of illegal ivory were seized by customs officials—a ten-fold increase over the previous year.

I worked in Northern Central African Republic (CAR) in the late 70's. Sudanese horsemen made their annual dry season trek south across the Bahr Aouk into CAR with huge herds of cattle, fires set ahead to stimulate a green flush of grass. The herds were left with herd boys while the horsemen went off carrying huge spears, running down and gutting elephants. With spear alone, they killed 10% of the herd in one dry season.

These horsemen became the Janjaweed, terrorizing Darfur. Their spears were replaced by automatic weapons. Herd's fell. 85% of the elephants died in the hot savanna sun. During the early 80's, the western black rhino went extinct.

The Janjaweed now have to travel far to find killing fields. They freely cross borders destabilizing communities and countries. They killed 400 elephants in northern Cameroon in 2012, and many more in Chad's Zakouma National Park.

The Lord's Resistance Army (LRA), hiding between northern DRC and CAR, support their terrorism with ivory. Al Shabab has also been connected to fueling its fight with ivory. According to Defense Secretaries Panetta and Hagel in the NY Times, Al Shabab also receives operating funds from ivory sales.

Poaching of elephants for ivory is an issue of sovereignty and national security, with criminal elements linked to insurgency and warfare. In DRC, trend data show only a handful of remnant populations of elephants that number more than 500 individuals, with an overall population of no more than 20,000 and declining rapidly, down from an estimated 100,000 as recently as 50 years ago.

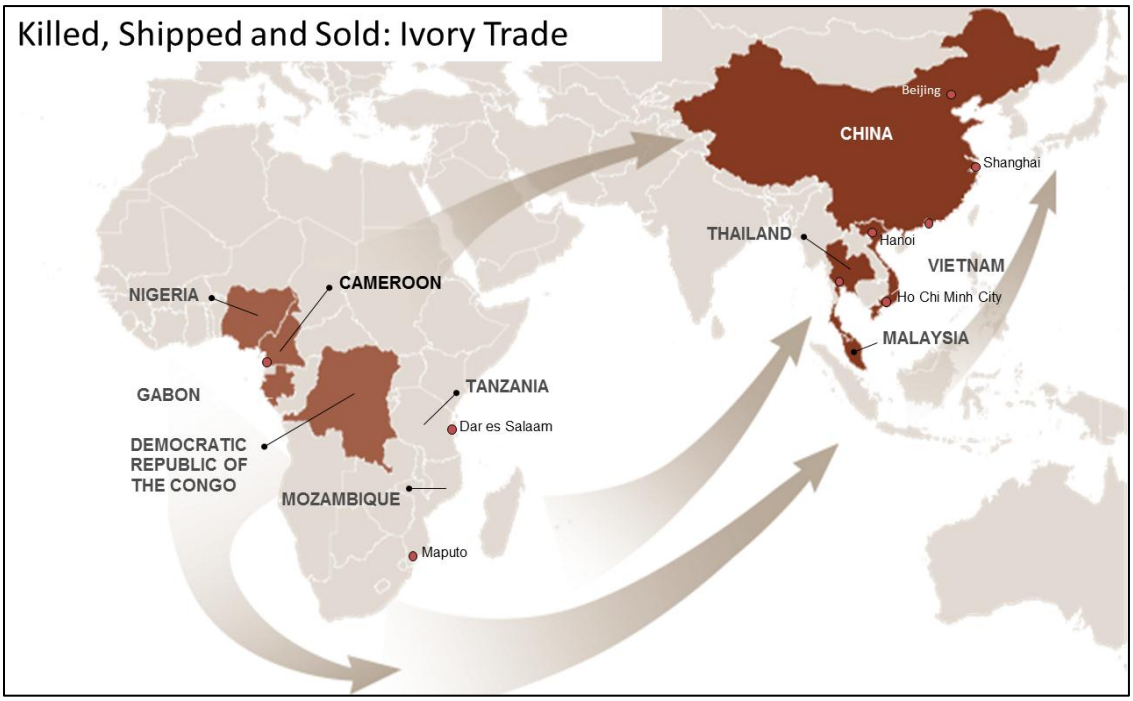
In DRC, both the military and militias are implicated in this slaughter, with arms and ammunitions readily available. In Kinshasa, carved ivory still can be bought for $300/kg.

Elephant poaching is organized crime. The demand for ivory is driven mostly by demand in Asia. Over 1 million Chinese business people and workers now live in Africa, and China is a major market for ivory. The trade is being carried out by organized smuggling gangs. Most ivory from Central Africa is shipped via ports in Kenya or Tanzania. Containers filled with hidden ivory are sent on a wild goose chase to foil detection, place of origin and destination. Although we hear of seizures, potentially only a small proportion of all illegal shipments are detected.

Poaching is devastating local populations in parts of the elephant's range-largely Central Africa. In some areas surveyed, the number of dead elephants outnumbers the number of living elephants. But Africa is

a big place. While forest elephants in central Africa are being hammered, the majority of elephants occur in stable and growing populations in Southern Africa. Botswana has around 150,000 elephants, with limited poaching. Namibia also has well managed wildlife populations.

Can the demand, mainly in Asia (China, Thailand and Vietnam) be stopped? Almost 2 million signatures on a petition delivered to the Prime Minister of Thailand at the latest CITES Conference of the Parties (COP) secured a commitment to ban ivory imports to that country. In China, the recent success of awareness campaigns against shark finning has reportedly reduced consumption by 50-70%. Chinese celebrities like Yao Ming, a basketball star, are urging people not to buy products from endangered species. Perhaps there is a chance for ivory. Can we stop the killing?



After the massacre in the north, Cameroon deployed 600 elite troops permanently stationed to protect the northern parks. Gabon and Kenya also deployed hundreds of new rangers to protect wildlife.

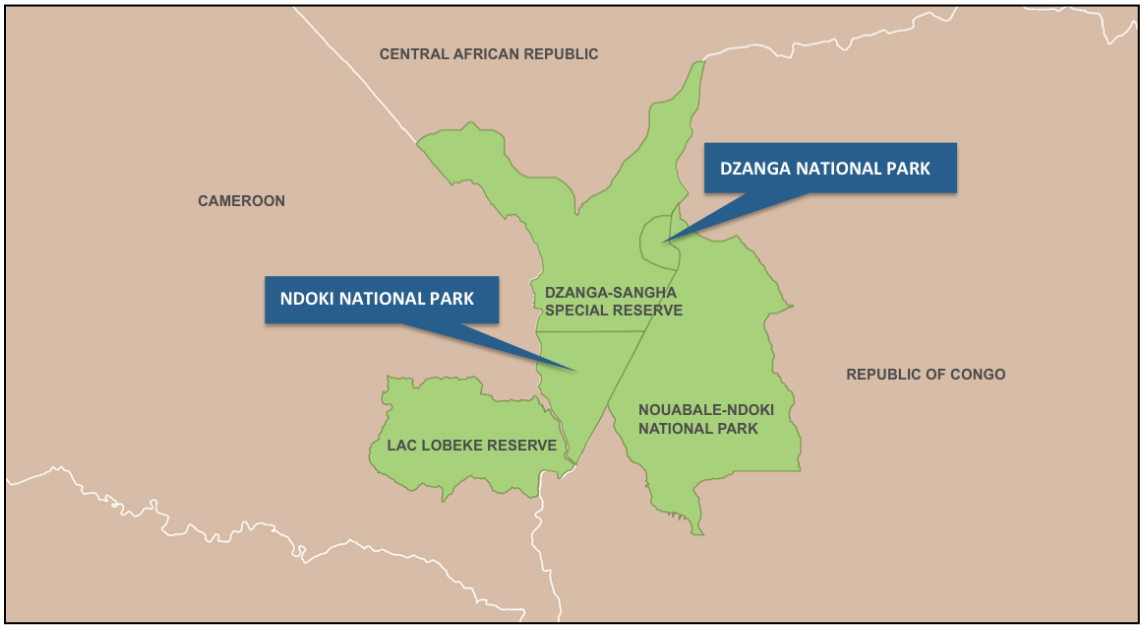
In the Dzanga-Sangha Protected Area Network in CAR, good management and dedicated rangers prevented elephant and gorilla poaching for 3 years. It can be done. The rangers are the real heroes of the fight to stop the killing and hundreds of them have been killed in the line of duty. I spent 15 years

creating and developing DS and have witnessed the dedication of rangers protecting their natural heritage.

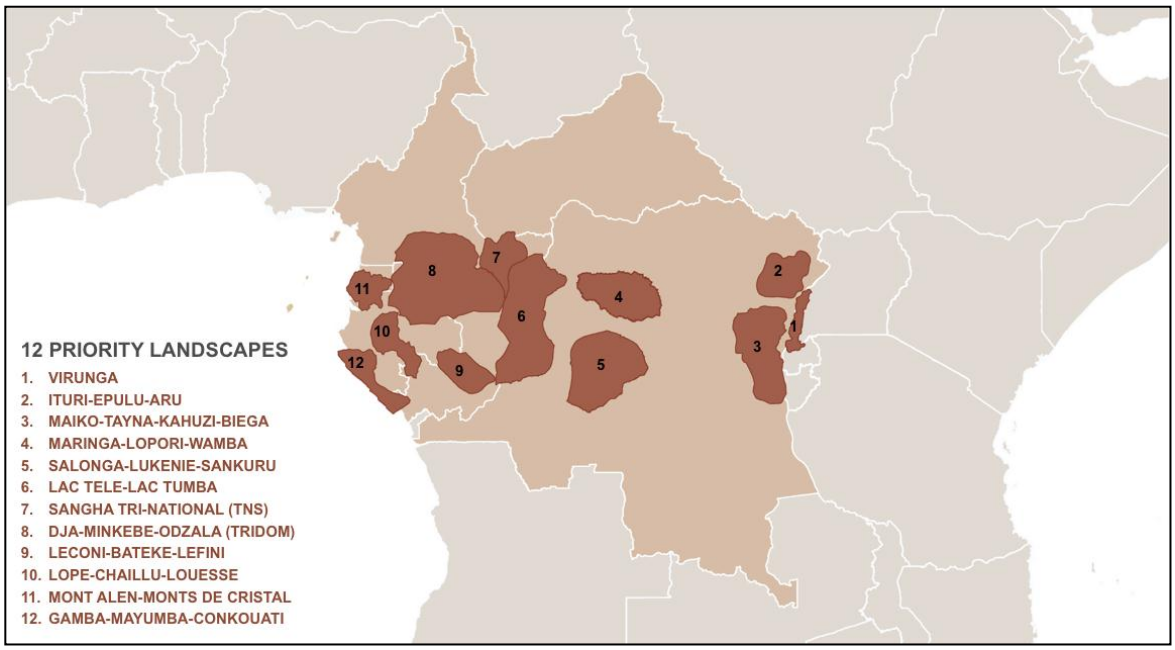
The same horsemen, responsible for the raid in Northern Cameroon, twice tried to enter Dzanga-Sangha, and were repelled. Only after the coup, and ensuing chaos, was there a poaching incident in this Protected Area, in which 26 elephants were killed, likely by these same Sudanese, now associated with the rebel faction, Seleka, which took over CAR. We have since mobilized the new government at the central level and have gotten good support from the Seleka that remained to help protect the park. No further incidents have occurred.

The fact that no single elephant was killed in Dzanga-Sangha from 2010 until the coup, is a testament to the success of many years of investment in protected area management and effective law enforcement.

Dzanga-Sangha is the core of the Sangha Trinational Landscape, designated as a UNESCO World heritage site, composed of the contiguous protected areas in Cameroon, CAR and Congo. There is a tri-national brigade which is an anti-poaching force under unified command, tasked with protecting this large landscape. This brigade recognizes that neither elephants nor poachers carry passports or recognize national boundaries and move freely across the landscape. This is bearing good results. One anti-poaching operation in southeast Cameroon netted 90 poaching suspects, of which 52 were tried and convicted.

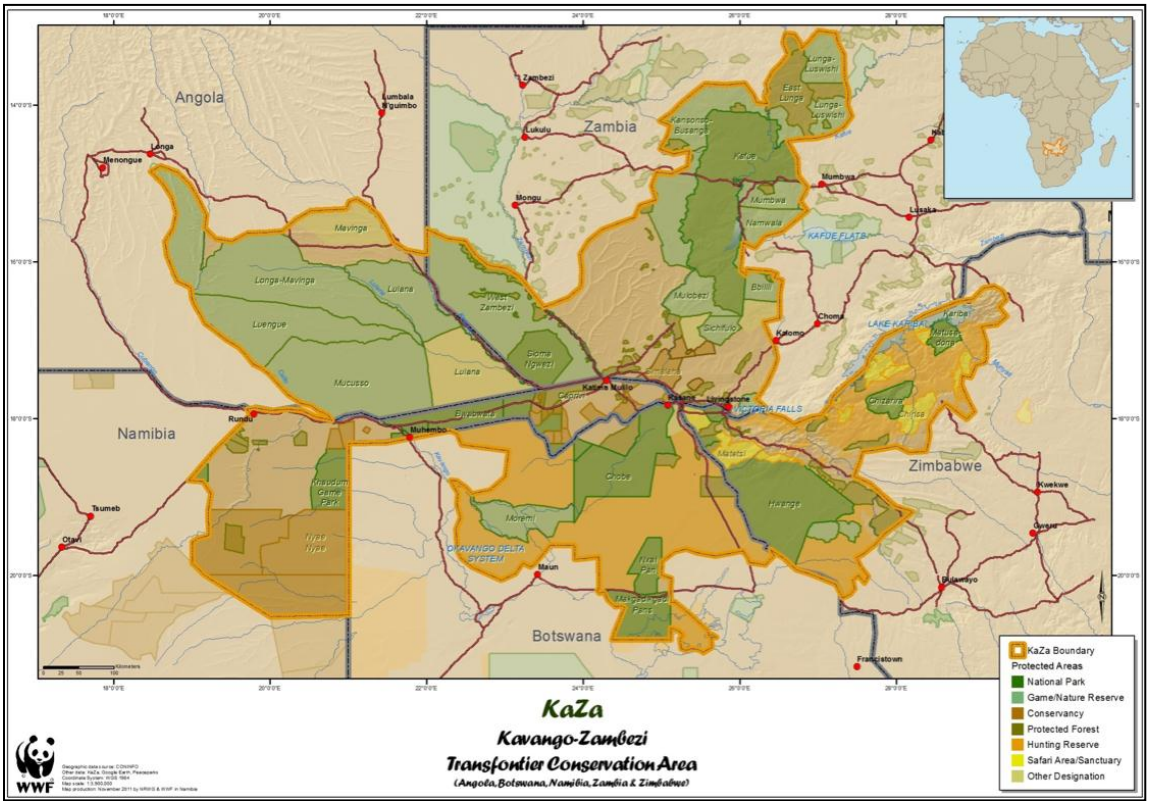


Through USAID and USFWS support, we have created 11 similar conservation landscapes in the Congo Basin, from the Mountains of the Moon, to the Gulf of Guinea, covering close to 40% of the Congo Basin Forests.



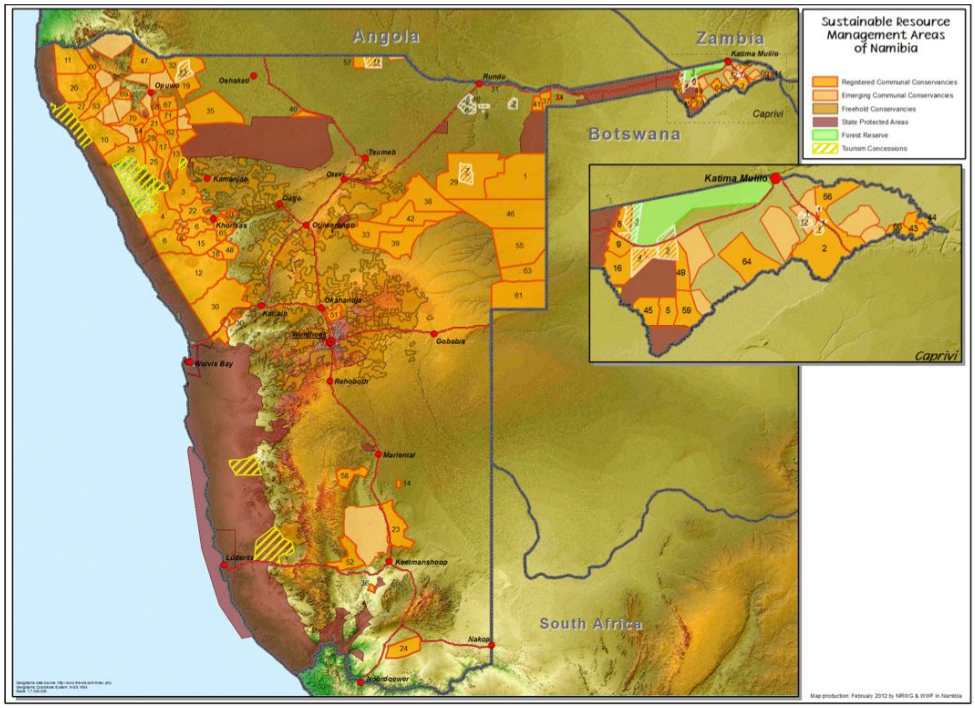
We are implementing a similar approach in the Ruvuma landscape spanning the border of Tanzania and Mozambique, and are supporting the largest transfrontier conservation area in the world; the 440,000 km sq Kavongo Zambizi, spanning Botswana, Namibia, Zambia, Zimbabwe and Angola. These two landscapes are home to over 50% of the Africa's elephants.

The goal of this huge landscape is to recreate corridors to allow the elephants the freedom to roam, expanding from overly concentrated populations in Botswana to areas emptied by conflict in Angola. The governments of these 5 countries have signed a treaty to create KAZA to break down the barriers between countries so that elephants can expand their range instead of being culled and tourists can circulate through the many parks with one visa for KAZA. WWF is extending our successful national Community-Based Natural Resource Management (CBNRM) program in Namibia into KAZA.



In Namibia, 79 conservancies have provided the communities the means to manage local lands and wildlife for their benefit. The conservancies engage more than 1 in 8 Namibians in conservation, who now manage some 30 million acres, more than 15% of the country.

By extending this program through KAZA, local people will benefit and thrive on their natural heritage. Wise sustainable use programs have resulted in very little poaching on Namibia's conservancies as people own their wildlife resources. Over 45% of Namibia is designated for wildlife management and Namibia has the largest free ranging population of black rhinos in Africa.



An overall failure of conservation and enforcement in Africa has been within the judiciary sector. Too often poachers are released without charges as a result of corruption or incompetence. We have identified an urgent need to strengthen the rule of law at all levels, from evidence collection at the scene of the crime all the way through to conviction and sentencing, with media coverage and public awareness playing a key role in shining daylight on these cases to maximize the likelihood of convictions.

Wildlife crime is too often treated as a petty crime or a nuisance rather than a serious crime on par with extortion, money laundering, tax evasion or trafficking of other illicit items. In reality, it is often linked with all of these serious crimes. Wildlife crime is a low-risk, high-gain enterprise and we are trying to change this equation.

The poaching crisis is beginning to be addressed at the highest political levels. This year President Obama pledged $10 million to help stop the killing. The Clinton Global Initiative also announced $80 million to stop the killing, trade and demand and to double the ranger force in key areas of Africa.

Heads of State from African Countries are taking stands, making wildlife crime a serious crime, increasing penalties and urging Asian countries to halt imports. The COMIFAC (Commission of Forest of Central Africa) has adopted a regional anti-poaching pact pledging zero tolerance for poaching and increased penalties for wildlife crimes to eliminate the internal and external ivory trade. The Economic Community of Central Africa is dedicating part of the upcoming HOS summit in Paris to combating

wildlife crime in the region. Botswana is hosting an important elephant range state summit in early December.

President Bongo of Gabon shared the stage with the Clintons this year and at the last two UN General assemblies, and has made pledges committing his country to treat wildlife crime as a serious offense, reinforcing protection and the judiciary, and urging other countries to do the same. Two years ago, President Bongo burned the entire Gabonese stock of ivory to show the world and his country that poaching will no longer be tolerated. Now that our own government is back in business following the shutdown, our own ivory crush has been rescheduled. We need leaders, and they are emerging. Now we need real action to stop the illegal slaughter.

WWF has always worked to protect flagship species. This year, we've redoubled our efforts and launched a global Illegal Wildlife Trade campaign, focusing on rhinos, elephants and tigers. We want to change the equation from low risk high gain to the opposite. You may have seen our posters around town.

WWF wants to leave our children a living planet. We need to work together to continue to foster solid field conservation efforts, improved technologies for law enforcement and provide an improved livelihood for local people. We will continue to work from pygmy paths to parliament halls to keep life in business.

We need to stop the killing. Stop the trafficking. Stop the demand. And we need to support sound, sustainable management, combining engaged communities, reinforced protection, improved intelligence and cutting-edge criminal deterrence, detection and investigation technologies. I hope that collaborations such as this with The Richardson Center for Global Engagement, will move us forward.

SESSION 1: THE SEARCH FOR COST-EFFECTIVE AND SCALABLE TECHNOLOGIES

Harnessing Emerging Technologies to Address the Poaching Crisis and to Improve Wildlife Monitoring

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"How can we enable technological innovations to achieve real-time or near real time monitoring capacity, and how can we work as an inter-disciplinary team of experts to bring this together? Much of what conservationists want to do already exists, but is in the hands of the military. In national parks, directors who have limited budgets have to weigh the purchase of a UAV versus vehicles or other necessary equipment."

Dr. Eric Dinerstein, Lead Scientist, Vice President for Conservation Science, WWF

SUMMARY

Wildlife monitoring is a critical part of the whole effort to address the poaching crisis. The drive to identify scalable technologies for conservation applications is founded on several key assumptions. These include: knowing the movements of high-value wildlife species (in real-time or near real-time) is essential if we are going to protect them, and technologies available today are often too expensive, unreliable, and/or inefficient to be seen as value-added. Another assumption is that unless new technologies can be invented or improved upon that drop cost while increasing functionality, they will

not be widely adopted. Setting a five-year technology goal, paired with a policy goal of establishing an anti-poaching summit attended by world leaders, will be an important start.

Today, even well guarded populations in some parts of the world are being poached. Park rangers are at increasing risk to lethal violence because poachers are more heavily armed than they are. The question is what technologies can be available to protect them.

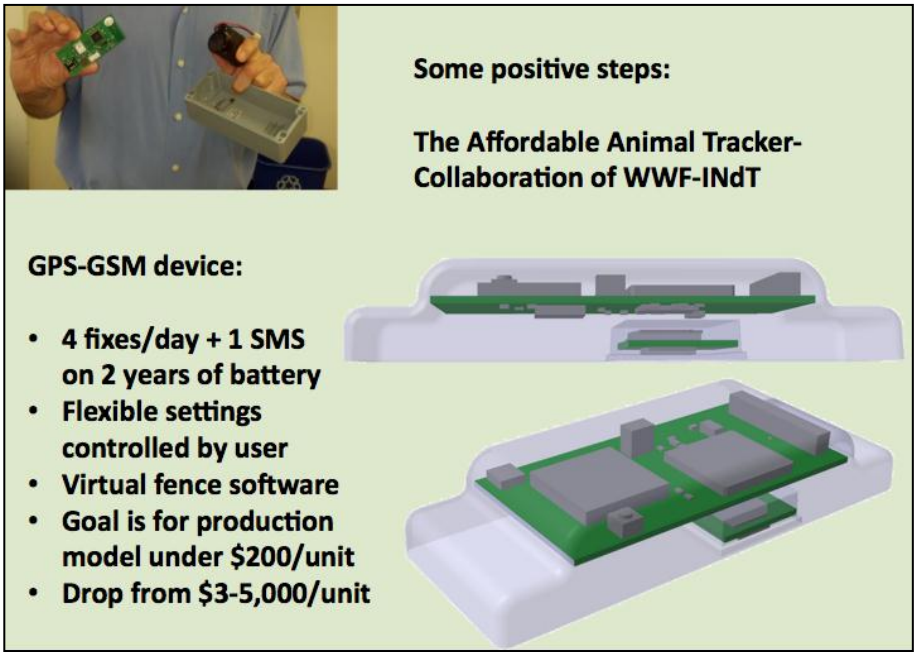
Many of the same technologies in use today have existed for the last 40 years because they are inexpensive, easily available, and perform under challenging conditions. For example, VHF systems originally developed for radio collaring tigers are still in use for a wide range of species, despite their limitations for tracking movements across great areas.

In the 90s we began experimenting with infrared camera traps and satellite tracking technologies. This offered scientists the first ever way of using statistical techniques to know how many tigers there were, where they were, and how they were moving. Understanding where species are dispersed lent important insights into to their biology.

Camera traps then helped us estimate the population of species we previously were not aware existed in certain habitats. Four years ago, WWF came up with the idea of a Global Tiger Summit hosted by Vladimir Putin, and pledged to double the number of wild tigers within 12 years. In its own right, Nepal committed to doubling the number of tigers in its own country. Already, that population has gone from 150 to 199; well on its way to doubling before the set goal of 2020. This success was achieved without any new technologies, so clearly other factors are at play that contribute to observed species population recoveries. Understanding these factors is essential to grounding us so that we can discover how technological contributions can enhance the process. It is clear that the role of governments supported by NGOs is critical.

With armies in National Parks in Nepal, for example, enforcement is capable. The question is how technology fits in to add value. A number of systems are merely too expensive to be applied. We need prices to drop by an order of magnitude.

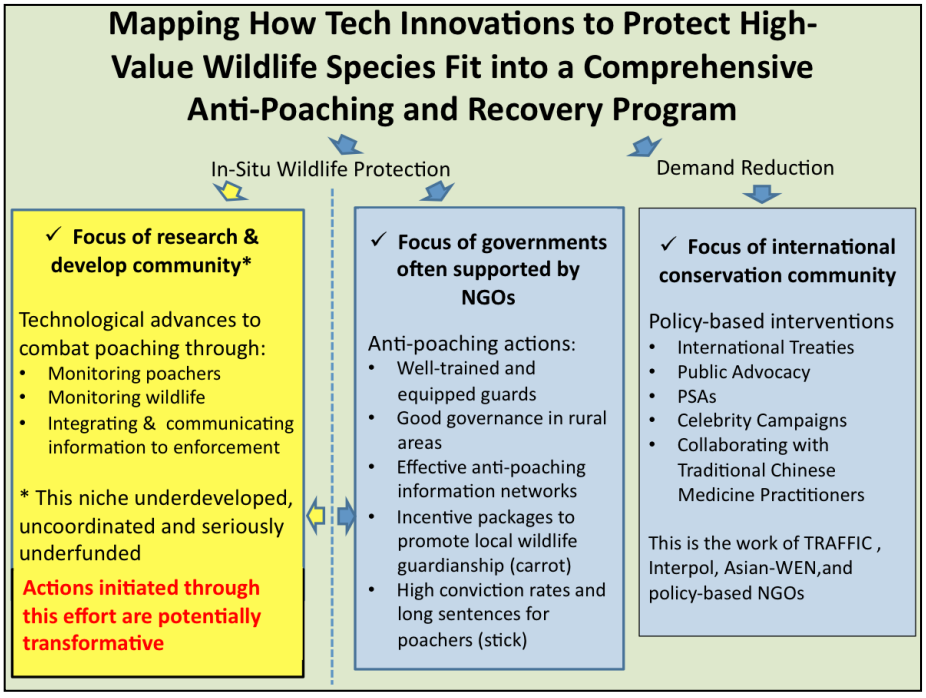
At WWF we have been working on a GPS-GSM based wildlife monitoring device with Nokia that is affordable. Typically priced at $3,000-$5,000, our device is manufactured at $300 and hopes to eventually bring costs down to $200 per unit. We're not alone at driving affordable systems forward. Microsoft Technology for Nature has a similar device.



One of the systems we plan to implement now involves elephants and rhinos in Nepal, where cell phone technology will be attached to individuals, pick up GPS coordinates and send those back to wildlife monitors managing their populations. In places where there is not a cell network, UHF will be lighter and cheaper to build. Unmanned Aerial Vehicles (UAVs), helikites and other aerial monitoring devices can also be critical to protecting high-value species.

In Asia, a huge challenge besides poaching is human-elephant conflict. To mitigate this conflict, we are exploring the possibility of using IR waves that trigger an elephant vocalization detector and emit sounds that frighten elephants away from human-occupied areas.

In many cases the greatest challenges to overcome are not technological, they are political. There are constraints associated with all systems. Through cooperation, firm commitment, and innovative problem solving, these can be overcome.



Navigating to Safe and Low-Cost Law Enforcement Aviation

"Listening to the expressed needs of the wildlife conservation community, I'm thinking, we have technologies that can do that. For instance, radio repeaters can cross-apply to Africa from natural disasters and man-made disaster applications."

Michael O'Shea, Senior Law Enforcement Program Manager, Operations Technology Division, Office of Science and Technology, National Institute of Justice

SUMMARY

The National Institute of Justice (NIJ) is the research and development agency of the U.S. Department of Justice and is the only Federal agency solely dedicated to researching crime control and justice issues. NIJ provides knowledge and tools to meet the challenges of crime and justice, particularly at the State and local levels. NIJ's principal authorities are derived from the Omnibus Crime Control and Safe Streets Act of 1968, as amended (42 USC §3721-3722) and the Homeland Security Act of 2002 (OST).

The mission of the NIJ Office of Science and Technology is to serve as a national focal point for work on criminal justice technology, using research to inform coordination of federal policy, equipment performance standards and testing, and technology assistance. Policy challenges currently being addressed by NIJ include the fact that modern technology was never envisioned by the writers of federal statutes such as The Federal Aviation Act of 1958 (as amended) (49 USC) and The Telecommunications Act of 1934 (as amended) (47 USC), which introduce challenges for State and local law enforcement use of unmanned aircraft systems, through the wall surveillance radars, cognitive radios and other technologies.

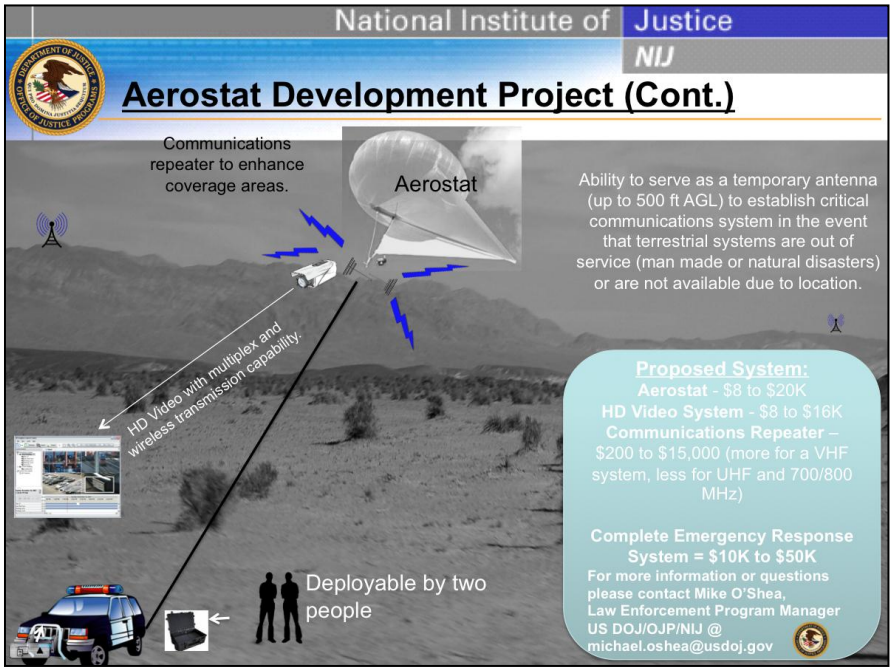
We're the consumer report for public safety when it comes to technology applications. Justnet Tech Beat comes out quarterly and offers a way to reach out and get in touch if you have questions.

Our Aviation Technology program was established to evaluate the efficacy, affordability and frequency of utilization of various aviation assets for smaller and predominately rural law enforcement agencies across the United States. Funding will provide support for the Aviation Technology Technical Working Group (TWG) to identify public safety requirements and report on recommendations and priorities. Partners include Federal, State and local law enforcement, National Law Enforcement Associations, other federal agencies and interested parties. Chief TWG priorities are to:

- Test and evaluate aircraft (light sport) for law enforcement purposes (emphasis on safety and cost effectiveness)
- Test and evaluate technologies to enhance the mission of law enforcement aircraft (emphasis on safety and cost effectiveness)
- Test and Evaluate Unmanned Aircraft Systems to include vertical take off and landing (VTOL), fixed wing and aerostats (emphasis on safety and cost effectiveness)
- Perform aviation demonstrations of the above listed technologies for State and local law enforcement officials.
- Work on developing best practices in safety for an aviation unit.

An additional priority is to research alternative energy sources for law enforcement aviation technologies.

One recent project has involved aerostat development. Working in conjunction with public safety and vendors, we hope to develop a low cost vehicle trunk or light truck deployable tethered balloon that can deploy a geo-stabilized camera and/or radio antenna to provide "look down capability" at critical incidents. We are also helping develop instant radio towers where structure towers are lost due to man-made or natural disasters.



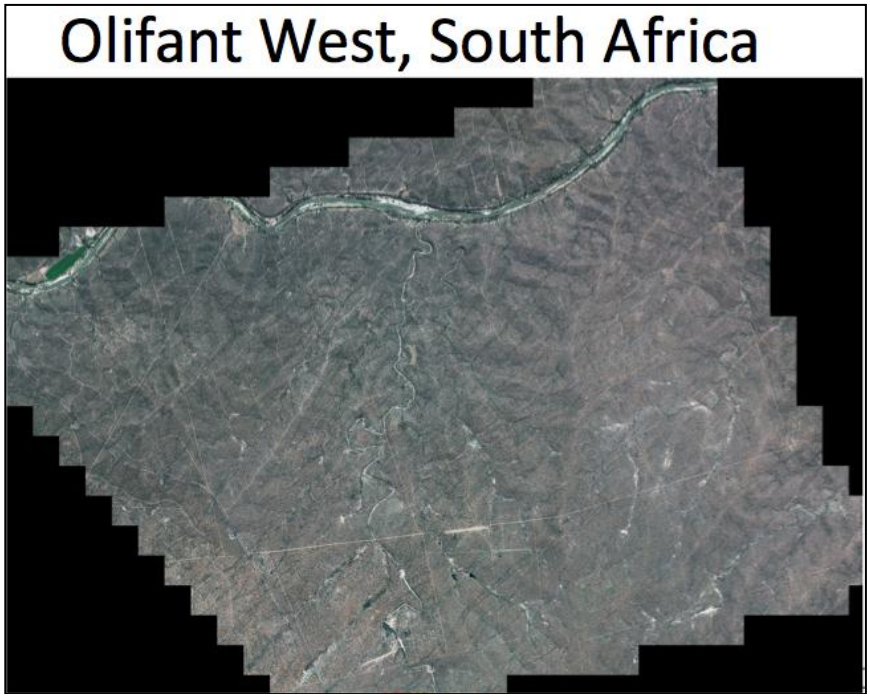
Leveling the Playing Field:
Employing High Technology to Combat Poachers

"One thing we create from this model is a strategic deployment plan for rangers. If we see poachers from miles away the odds of getting enforcement there in time to intercept is close to zero. If we see them from the air, it's a different story."

Dr. Thomas Snitch – Distinguished Senior Professor,
Institute for Advanced Computer Studies, University of Maryland

SUMMARY

Leading a research group of 12 senior PhDs and post-docs, we started off developing methodologies using geospatial techniques to distinguish where terrorists plant IEDs in downtown Baghdad. Three years ago we took this into the poaching arena. In May-June of 2013, we flew the Falcon UAV in South Africa a total of 11 flights, including 5 at night, at Olifant West.



The Falcon UAV has a bungee or hand launch and parachute recovery. In our test flights we used both IR and EO cameras. Main challenges included heavy winds at 35 kts each night. We found both animals and humans were easy to spot at night, even down to wild dogs and guinea fowl.

In considering how to employ appropriate advanced technologies to combat poaching, important issues to consider include whether the equipment is exportable (controlled under the ITAR vs. the EAR), importable (NSA vs. CAA), affordable, easy to maintain, and simple to operate in the field. The Falcon UAV is currently in use with police in the United States, has a range of + 10 kms, speed 45 knots, operates at up to 500 meters altitude, has a wingspan of 2.4 m and length of 1.3m, and training requires 1 day, plus test flights. The unit flown at Olifant West has a combined EO/IR gimbal that is two-axis steerable, battery rechargeable in vehicle, autopilot enabled, rally to home lost link, live video feed to control laptop in vehicle, a total weight of 8-12 kgs and is controlled under the EAR, meaning securing an export license under the ITAR was not an issue.

Lessons learned from this mission include that Africa is too expansive to randomly launch UAVs, so efforts must be intelligence-based and targeted. Night flights present a greater challenge than day flights, and mathematical modeling is essential to narrow areas to be monitored. Predictive analysis and heuristic modeling can tell when and where to fly, with models that are adaptive and learn from each flight. A maximum of no more than 10-12 kms can be covered using these UAVs, with parachute landings key to avoiding damage. It is important to remember that UAVs are only a tool, and not a silver bullet.

Having been given access to a range of data from Kruger, the next step will be starting to model the Park. At this stage, a model of Balule Reserve has been completed. We plan to fly in Kruger National Park and two reserves in Natal in early 2014, as well as begin modeling in Tanzania and Kenya in January 2014.

Using Forensic Science to Combat the Illegal Ivory Trade

"CITES estimates each elephant has roughly 1.8 tusks at 3.7 kg per tusk. The 46.5 tons of ivory seized globally in 2011 translates to 70,000 elephants at a 10% seizure rate or 35,000 elephants at a 20% seizure rate. With this many elephants being killed, there is a very real possibility that they could be extinct within the next 10-20 years if we do not do something. In our DNA assignment of ivory seizures we see the same populations keep popping up over and over again. Hotspots infer hundreds of elephants poached repeatedly over a series of time. Only a limited number of remaining elephant populations can provide this. Determining origin of recent large seizures should thus be highly predictive of future hotspots, and get patrols to the right place at the right time."

Lisa Brown, PhD Candidate, Department of Biostatistics and Center for Conservation Biology, University of Washington and Dr. Sam Wasser, Director of Conservation Biology Department at University of Washington

SUMMARY

Elaborate networks are used by syndicates to transfer ivory shipments to market. As obstacles are presented, evidence shows that different routes are adopted, enabling criminals to poach and directly trade ivory for arms and funds.

In 2011, 46.5 tons of ivory were seized globally. Forensic scientists use DNA from those seizures to track the trade. In our lab we have analyzed only a small percentage of seizures to date. The world needs to choke the trade at its source, but we really know very little about primary source countries.

At the latest COP, CITES delegates recognized this need, and deemed origin assignment a priority. CITES Decision 16.83 urges countries to promptly submit ivory subsamples from all large seizures, made between the present and past two years, for origin assignment by an appropriate forensic laboratory. CITES also tasked the UN Office on Drugs and Crime (UNODC) to cooperate for investigations. UNODC asked our Center to lead these DNA-based analyses. Our collaborators now include UNODC, INTERPOL, World Bank, CITES Secretariat and World Customs Organization.

Our assignment method starts with a reference panel with each dot representing a location where samples were sourced. Forest and savannah elephant populations have been separated for 3 million years, and are as genetically different as the lion and the tiger. First we genotype elephant samples from known locations using 16 genetic markers. Then we create a reference map of estimated allele frequencies using smoothing that is continuous across Africa. Populations close together are more genetically similar than populations that are far apart. To assign ivory samples we compare observed allele references in ivory samples to the reference map to determine origin. Because forest and savanna elephant populations are genetically distinct, we use forest elephant reference samples to assign forest elephant ivory and savanna elephant reference samples to assign savanna ivory.

Assignment Methods

Two-step process:

1. **Build Reference Map**
   (i) Genotype elephant samples from *known* locations using 16 genetic markers
   (ii) Create a reference map of estimated allele frequencies using smoothing that is continuous across Africa
2. **Assign Ivory**
   (i) Genotype ivory of *unknown* location of origin
   (ii) Compare observed allele frequencies to reference map

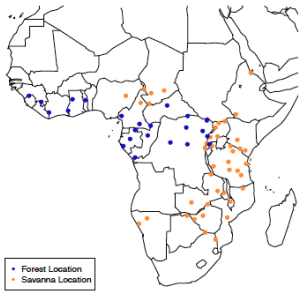


Figure: Reference Panel contains over 1300 samples from 65 locations across Africa

Only a small part of the tusk (taken from the base) is needed. Samples are pulverized and can then be genotyped. The cost of this method is roughly $120 per sample (around 200 samples per seizure). We then look at the distance between the assigned location of origin and true location of origin. The median is selected instead of the mean, as this is less sensitive to outliers.

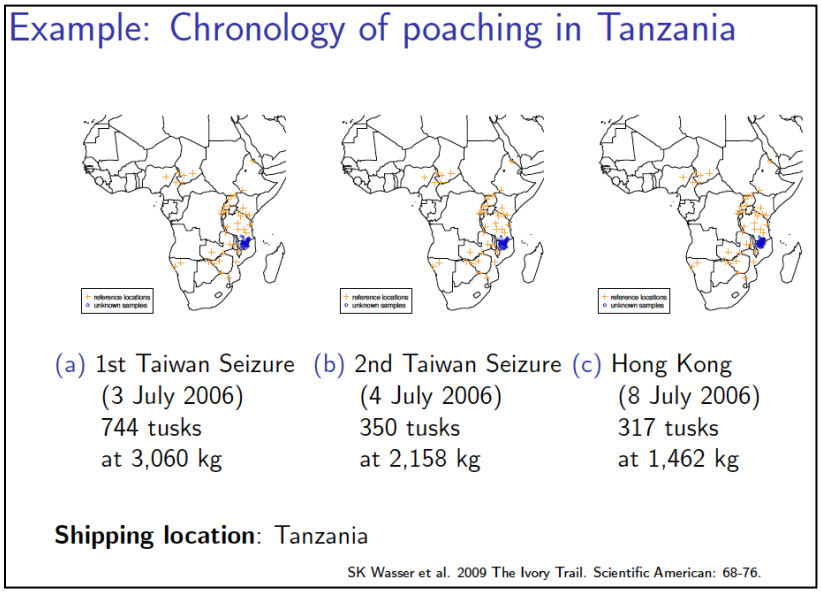
How accurate are assignments?

We carried out several cross validation analyses on the reference samples.

Distance (in km) between assigned and actual location of samples

	25th percentile	Median	75th percentile
Savanna			
Overall	155	258	423
N. savanna	105	269	399
E. savanna	186	278	451
S. savanna	124	221	398
Forest			
Overall	140	272	432
W. forest	80	139	240
C. forest	171	294	449

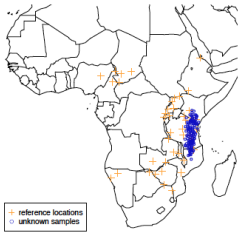
An accuracy can be achieved from the point of origin than is generally smaller than the distance between protected areas, allowing us to tell the difference between source populations and transit ivory. Our analyses of ivory samples submitted to our lab to-date show that more poaching is occurring in Tanzania than in any other country.



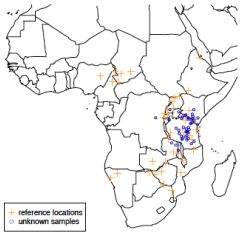
Our lab analyzed two shipments caught en route to Taiwan, and another caught in Hong Kong in 2006. These three seizures were assigned to the same source location in southern Tanzania: the Selous Reserve. These elephants were poached in Tanzania and the ivory was shipped out of Tanzanian ports. A Wasser et al 2009 paper in Scientific American drew attention to this problem. Tanzania shortly thereafter petitioned for a one-off sale of its stockpiled ivory, and was denied by CITES.

The most recent seizure to come to our lab was caught en-route to Sri Lanka in May 2012. Southern Tanzania and Ruaha National Park were identified as sources (at least two enforcement agents/rangers were recently killed by poachers in the latter location). Although this ivory was sourced from Tanzania, the ivory had been shipped through Uganda and then out from Kenya. The only reason syndicates would do this is if they were trying to conceal their source. We believe that the attention our work placed on poaching in Tanzania, led to their attempts to filter ivory through other areas. Yet, our continued monitoring was able to detect these changes. If we work together we should be able to target the major poaching hotspots across Africa and more efficiently direct law enforcement to these areas.

Example: Chronology of poaching in Tanzania



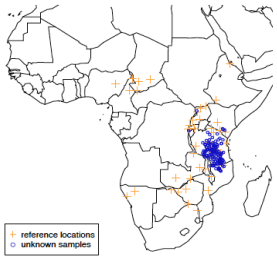
(d) Avocado Seizure
(22 Aug 2010)
317 tusks at 1,462kg



(e) Pili Seizure
(5 May 2011)
115 tusks at 1,304 kg

Shipping location: Kenya

Example: Chronology of poaching in Tanzania



(f) Sri Lanka Seizure
(May 2012)
at 359 pieces

Shipping location: Uganda to Kenya

SESSION 2: THE SEARCH FOR COST-EFFECTIVE AND SCALABLE TECHNOLOGIES

DigitalGlobe's Anti-Poaching Role

"The challenge is not in the tech, it is in the collaboration. We need to have a large toolbox to have a range of options and select the appropriate tools for the task. Not only should we be agnostic about which technological platforms to use for the job, we need to be constantly adaptive to respond to the changing behavior of poachers."

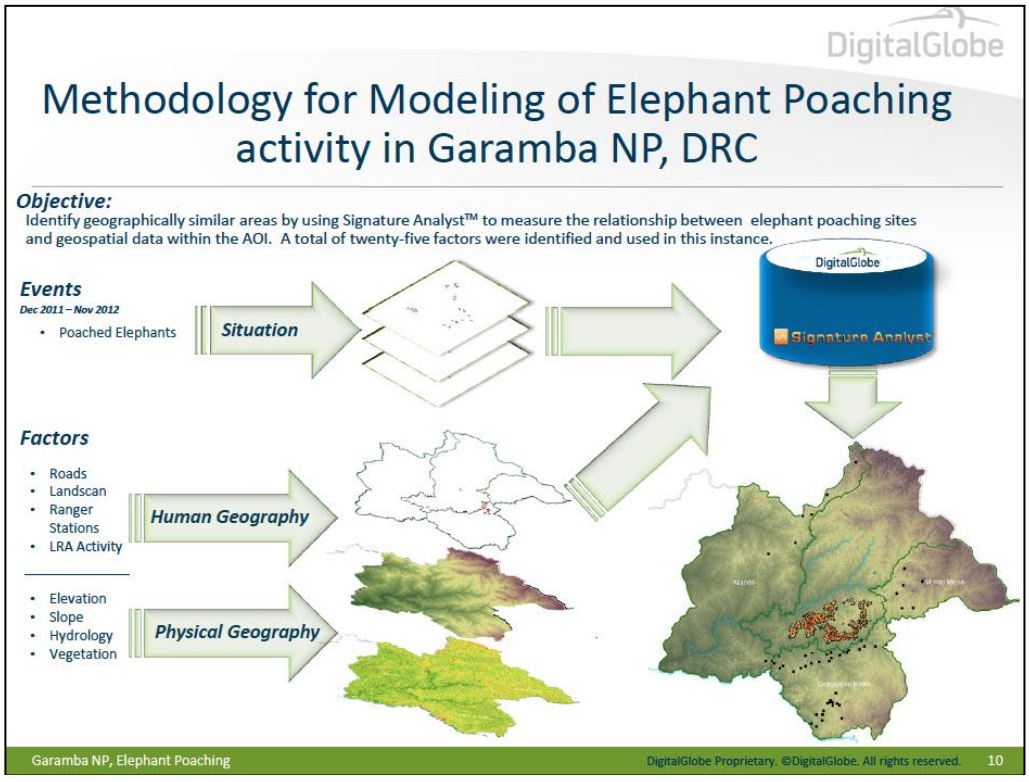
D. J. Mallmann, Senior Imagery Analyst, Digital Globe
and Jonathan Hutson, Independent Advocate

SUMMARY

DigitalGlobe performed a poaching analysis within Garamba National Park in the Dec 2011- Nov 2012 period. DigitalGlobe's aerial imagery ranges from 1 m resolution to 45 cm resolution. It allows analysts to look at vegetation to distinguish between healthy versus degraded areas. This is particularly useful in savanna regions to understand how herds might move based on vegetation patterns. Our system is able to go off track rather than merely follow strip coverage. If looking for a higher degree of granularity on a herd, we can do that with regularity, capturing any spot on the earth, if it is cloud free, over the course of a single day.

Strips of Garamba National Park (2,400 square km each) were captured in a single pass. Using this imagery it is possible to conduct herd counts for an entire park over a given period of time. Collar data can then be merged to distinguish between herds that have already been counted. It is possible to distinguish between an elephant, a buffalo and a giraffe in these satellite images. We also have an analytical assessment team that has put together data to look at where elephants were, where terrain was, and match up with reported incidents of poaching to make predictions/modeling as to where those attacks could next take place and where to send patrolling units to help mitigate effects. Accurate models require information available from Park Service. Key point: we can start tomorrow, and we don't have to ask anyone to take pictures over their parks. We are seeking a good partnership.

The methodology developed for the Garamba National Park poaching analysis aimed to identify geographically similar areas by using Signature Analyst to measure the relationship between elephant poaching sites and geospatial data within the AOI. Twenty-five factors were identified and used for this identification, including human geography (roads, ranger stations, LRA activity, landscan) and physical geography (elevation, slope, hydrology and vegetation).

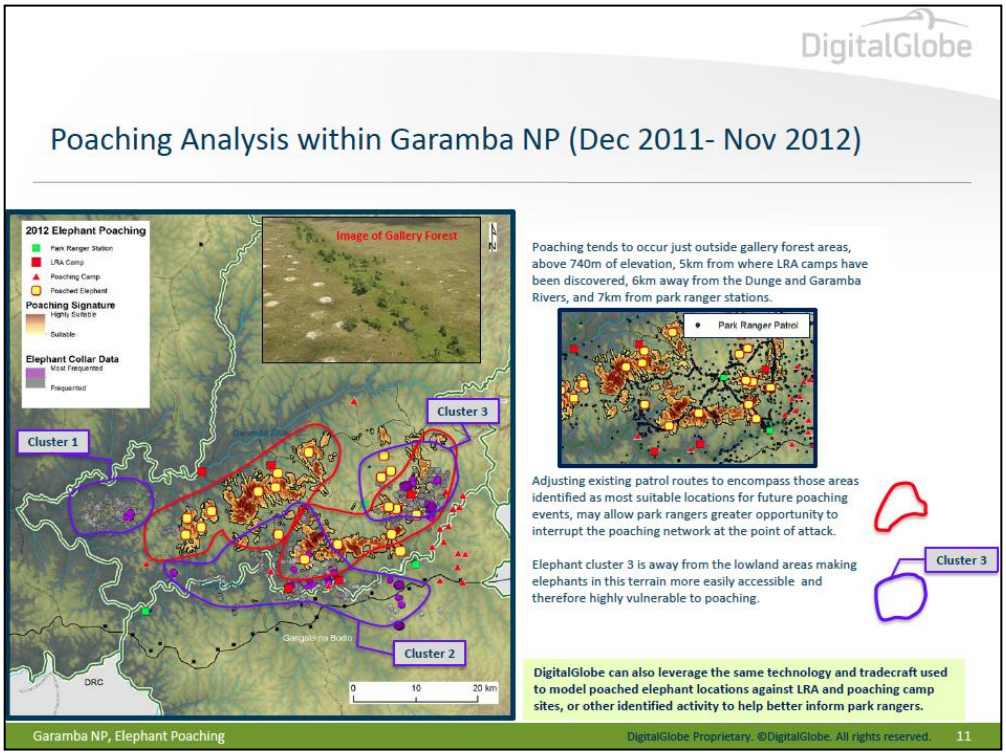


The analysis found that poaching tends to occur just outside gallery forest areas, above 740m of elevation, 5km from where LRA camps have been discovered, 6km away from the Dunge and Garamba

Rivers, and 7km from park ranger stations. Adjusting existing patrol routes to encompass those areas identified as the most suitable locations for future poaching events may allow park rangers greater opportunity to interrupt the poaching network at the point of attack.

Mapping shows that elephant cluster 3 is away from the lowland areas making elephants in this terrain more easily accessible and therefore highly vulnerable to poaching.

DigitalGlobe can also leverage the same technology and tradecraft used to model poached elephant locations against LRA and poaching campsites, or other identified activity to help better inform park rangers.



Current gaps for this landscape include robust land classifications and a Normalized Difference Vegetation Index (NDVI), updated patrol route information from Garamba National Park Rangers, seasonal rainfall and weather pattern information, additional elephant collar data and elephant subject matter expertise.

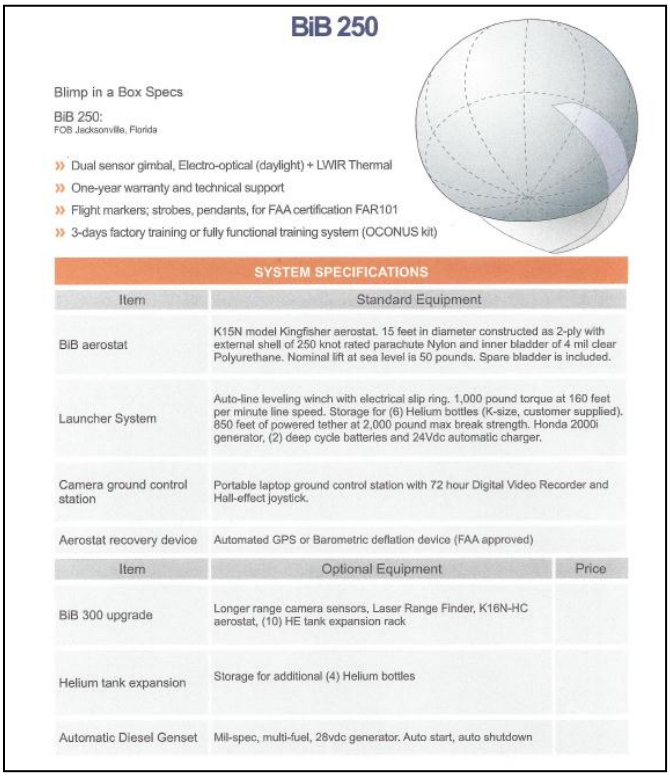
Aerostats and Tethered Antennae

Anthony Bocchichio – Former Chief of Technical Operations, Drug Enforcement Administration (ret.)

SUMMARY

The "blimp in a box" aerostat is an example of a self-contained static surveillance device. The balloon can be launched in 10 minutes and can operate for 7 days at a time. The camera is a day/night thermal imaging sensor that is near all-weather permanent and simple to operate. A vehicle can drive with a gyro-stabilized camera on the aerostat trailing behind it. The camera enables 3km human detection and 5km vehicle detection and is highly stable, contained in a pressurized system 2 miles or 1,000 ft high. The balloon itself is made of nylon and will not deflate even when hit with rounds.

Capable of carrying different equipment with a payload up to 50 lbs, the device is easy to handle with two people. The box including launcher weighs 1,000 lbs.



BiB 250

Blimp in a Box Specs

BiB 250:
FOB Jacksonville, Florida

- Dual sensor gimbal, Electro-optical (daylight) + LWIR Thermal
- One-year warranty and technical support
- Flight markers; strobes, pendants, for FAA certification FAR101
- 3-days factory training or fully functional training system (OCONUS kit)

SYSTEM SPECIFICATIONS

Item	Standard Equipment
BiB aerostat	K15N model Kingfisher aerostat. 15 feet in diameter constructed as 2-ply with external shell of 250 knot rated parachute Nylon and inner bladder of 4 mil clear Polyurethane. Nominal lift at sea level is 50 pounds. Spare bladder is included.
Launcher System	Auto-line leveling winch with electrical slip ring. 1,000 pound torque at 160 feet per minute line speed. Storage for (6) Helium bottles (K-size, customer supplied). 850 feet of powered tether at 2,000 pound max break strength. Honda 2000i generator, (2) deep cycle batteries and 24Vdc automatic charger.
Camera ground control station	Portable laptop ground control station with 72 hour Digital Video Recorder and Hall-effect joystick.
Aerostat recovery device	Automated GPS or Barometric deflation device (FAA approved)

Item	Optional Equipment	Price
BiB 300 upgrade	Longer range camera sensors, Laser Range Finder, K16N-HC aerostat, (10) HE tank expansion rack	
Helium tank expansion	Storage for additional (4) Helium bottles	
Automatic Diesel Genset	Mil-spec, multi-fuel, 28vdc generator. Auto start, auto shutdown	

DISCUSSION: PRACTICAL CONSIDERATIONS FOR PROMISING TECHNOLOGIES

U.S. Export Controls: Regulatory Considerations in Wildlife Protection

"Not only can UAVs be controlled, but also night vision equipment, cameras, computers, sensors, software and other items. Think about what you are exporting and where it's going. You may need 60 days or more for the regulator to evaluate the intended use and license."

Kimberly A. Strosnider, Esq., Partner, Covington & Burling LLP

SUMMARY

Export controls are restrictions on the transfer of sensitive technologies (such as commodities, software, and technology) to particular countries and their nationals due to, for example, national security, foreign policy, or nonproliferation concerns; to identified persons or entities subject to particular restrictions; and/or for end-uses that raise policy/security concerns. Key U.S. regulatory programs to be familiar with are the Department of State International Traffic in Arms Regulations (ITAR) and the Department of Commerce Export Administration Regulations (EAR). Violations can result in substantial penalties, including incarceration, fines, and loss of export privileges.

ITAR: Scope of Items Regulated

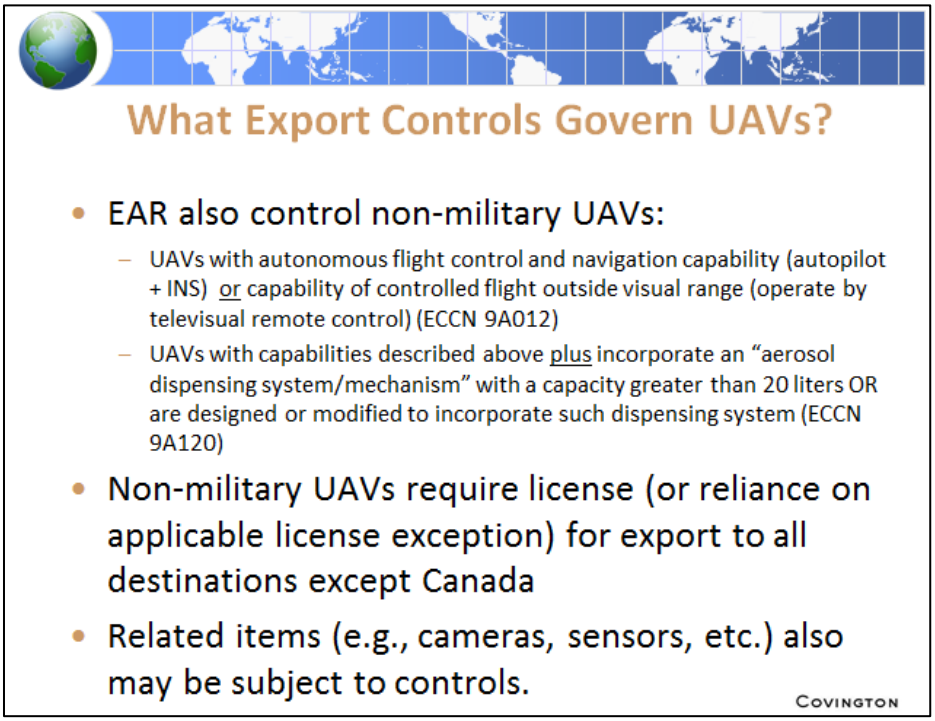
- The ITAR regulate:
  - Exports and retransfers of listed defense articles (including technical data) and defense services;
  - Temporary imports of listed defense articles;
  - Brokering of listed defense articles/services; and
  - Manufacturing of listed defense articles (registration and related requirements).

COVINGTON

EAR: Scope of Items Regulated

- Items on the CCL may require a license for export/reexport: depends principally on controls on the item and destination.
- Items not on the CCL generally do not require licensing.
- However, certain prohibitions apply to all items subject to the EAR, even non-sensitive items ("EAR99" items):
  - Exports to U.S.-embargoed countries (Cuba, Syria, Sudan, Iran, North Korea);
  - Activities supporting missile proliferation or proliferation of chemical, biological, or nuclear weapons;
  - Exports to individuals or entities on various Commerce Department restricted-parties lists (Denied Persons, Unverified, or Entity Lists); and
  - Exporting an item with knowledge or reason to know an EAR violation has occurred.

COVINGTON



New technologies can aid in wildlife protection but also may raise national security or other considerations. Conservationists need to integrate export control considerations into their analyses, obtaining licensing where needed or using license exceptions. Being mindful of considerable regulatory requirements when ITAR items are involved such as registration, brokering, etc. is essential.

A key take away is remembering that controls extend to software and technology, not just hardware. End use of items and end users are relevant considerations, even for low-level items. Key questions to ask are: will the item be used in proliferation activities, and are any restricted persons involved?

ADDITIONAL BRAINSTORMING

"All of the technologies we are talking about are only as good as the hands that hold them. Very basic training for rangers is essential. Reliability, tenacity, maintaining composure under severe stress, these qualities are essential."

Comment: Bill Clark, INTERPOL Environmental Crime Program

Field Challenge	Integrative Technology Approaches
Real time awareness of traffic/travel of poachers or armed or other problematic groups, and capacity for rapid enforcement response.	- Remote sensing, UAV cameras, aerostat detection systems, algorithms and other methods. - Anti-sniper technology can be applied as long as there is a patch of skin exposed for identification – for instance NOAA hopes to be able to identify whales from skin analysis as an animal surfaces. - What is essential is the connection between identification of threats and responsiveness on the ground. Effective response is a question of command and control. The challenge will be to integrate with existing intelligence systems so that Park Rangers can call on police to engage. In Central African field sites we need these technologies but if we don't have the motivated enforcement, logistics and capacity on the ground then success will be low.
Near real-time or post-event awareness of poachers, activity, or intruders.	- Video recognition or detection by computer systems. - Any aerial asset is great but without a targeted approach you're fighting a defensive war. What we need is perimeter defense. Sensors that are low cost and IR. This equipment is pennies on the dollar, basic technologies that are out there today. UAVs don't do any good in the absence of perimeter defenses. The advantage they afford is an eye in the sky. If a sensor goes off you at least have an indication of where priority areas are for detection. There is no reason not to apply these same military principles to conservation. - Managing expectations and enabling continuation of efforts in situations of crisis is key. It is important to have not just long-term sustainable solutions but strategies to maintain systems during periods of crisis.
Real-time and near-real time awareness of poaching incidents via surrogate indicators.	- Acoustic detection of gunshots.
Post-event detection of poaching.	- Detection of carcasses (spectral signature, chemical signature, other).
Real time awareness of changes in the welfare of target elephant populations.	- GPS monitoring; UAV/cameras, aerial surveys, RS solutions, tracking solutions deployed by military or law enforcement.
Limitations of robust	- Portable antennae (tethers), movable signal repeaters, solar and portable power

technologies that are compromised by rural/forest environments (such as signal degradation).	generators. Also cost effective wireless communications systems: closed circuit, portable cell/3g/4g towers, cell phone relayers, UHF networks, other wireless or RF technology.
Real time awareness of illicit trafficking and interception opportunities.	- GPS container tracking devices, geo-fencing software. - Civilian, military, or law enforcement technologies and techniques used to intercept communications, perform surveillance and intelligence gathering, and track goods, vehicles or people. - Air vent suction sampling from shipping containers with sniffer dogs trained to detect ivory, rhino horn and other illicit goods. This approach reduces need to formally inspect containers, and is better for the welfare of the sniffer dogs. - Through the State Partnership Program each of the 50 United States has a partner country with exchanges funded by the U.S. Department of State. Seven countries in Africa are currently participating, including Nigeria, South Africa, Botswana, Ghana, Liberia. The Department of State and DOD coordinate to support these exchanges, for example, North Carolina's National Guard is currently paired for military-to-military exchange with Botswana. Within those seems there may be funds in foreign operations accounts that can leverage funds for technologies. Collaborations with NGOs, industry and academia should be explored.
Real time flagging and impediment of illicit ivory sales via online marketplaces.	- Analytical software, online marketplace compliance.
Evidence-gathering and analysis to distinguish age/origin of detected ivory for prosecution of traffickers.	- DNA sampling, other technology for age-distinction.

ANNEX: FORUM PARTICIPANTS

LAST	FIRST	TITLE	AFFILIATION
Allan	Crawford	Senior Director	TRAFFIC/WWF
Augustyn	Joseph	Executive Vice President, Security and Intelligence	Jefferson Waterman International
Bagley	Michael	President	Jellyfish Operations
Berendt	Scott	Senior Program Design Officer	African Wildlife Foundation
Bocchichio	Anthony	Former Chief Technical Operations	Drug Enforcement Administration (ret.)
Brown	Lisa	PhD Candidate, Department of Biostatistics Department of Biostatistics	University of Washington
Carlson	Sara		USAID
Carroll	Richard	Vice President, Africa/ Madagascar Program	WWF
Casellas	Gilbert	Chairman	OMNITRU
Clark	Bill	Environmental Security Sub-Directorate	INTERPOL
Coffey	John "JC"	Vice President - Unmanned Systems Division	TriVector Services Inc.
Cory	Stuart	National Program Manager	NOAA Office of Law Enforcement/ INTERPOL Liason
Croft	Ameliah	Bureau of African Affairs, Economic Policy	U.S. Department of State
Deckard	Margo	Senior Advisor	NexGen Space
Dinerstein	Eric	Vice President and Chief Scientist, Conservation Science Program	WWF
Dornburg	Jed	International Relations Officer - Southern Africa - Botswana and Malawi	U.S. Department of State
Ford	Edward	Managing Across Boundaries	The Stimson Center
Garrigan	Kathleen	Marketing & Communications Officer	African Wildlife Foundation
Gavin	Michelle	US Ambassador to Botswana	U.S. Department of State
Glabe	Scott L.	Associate	Covington & Burling LLP
Gregory	Megan	Senior Associate	Jefferson Waterman International
Gregory	Nathan	AAAS Science and Technology Policy Fellow/ Biodiversity Advisor	USAID
Grespin	Whitney	Director, Government Relations	Precision
Hinton	Melanie	Senior Communications Manager	Association for Unmanned Vehicle Systems International
Ho	Iris	Wildlife Campaigns Manager	Humane Society International

Holland	Keri	Special Assistant	U.S. Department of State
Hsiao	H. Timothy	Innovation and Acceleration Advisor	USAID
Huang	Charles	GIS Analyst	WWF
Hutson	Jonathan	Human Rights Advocate	
Jameson	Lloyd	Fellow	U.S. Chamber of Commerce
Karchmer	Clifford	Advisor	(Consultant to) Richardson Center for Global Engagement
Kramer	Rachel	Program Officer	TRAFFIC/WWF
LaFontaine	Peter	Campaign Officer	International Fund for Animal Welfare
Mallmann	D.J.	Senior Imagery Analyst	DigitalGlobe
Medina	Monica	Principal Deputy Undersecretary for Oceans and Atmosphere	NOAA
Mollo	Nicole	Director	African Parks Foundation of America
Morrison	Rosalyn	Legislative Assistant	AWI
Mutu	Kamweti	Program Officer	Africa Biodiversity Collaborative Group
Olesker	Alexander	Research Associate	Defense Group Inc
O'Shea	Michael	Senior Law Enforcement Program Manager, Operations Technology Division	National Institute of Justice, USDOJ
Quirk	Bruce K.	UAS Liaison	U.S. Geological Survey
Resch	Tim	Bureau for Africa Environmental Advisor	USAID
Richardson	Bill	President	The Richardson Center for Global Engagement
Shelton	Todd	VP, US Government Relations	WWF
Siex	Kristin	WCS Representative	Wildlife Conservation Society
Snitch	Thomas	Senior Professor	University of Maryland
Strosnider	Kimberly	Partner	Covington & Burling LLP
Tischler	Shoshanah	Analyst	U.S. Department of the Treasury

Wyman	Sam	Vice Chairman and Chief Operating Officer	Jefferson Waterman International
Zagaris	Bruce	Consultant	The Richardson Center for Global Engagement
Ziemian	Jocelyn		BCI