

# Kafue National Park

A Conservation Case Study  
2018 – 2022



**CONTRIBUTORS IN ALPHABETICAL ORDER**

African Parks, Game Rangers International, KAZA Secretariat,  
Musekese Conservation, North Carolina Zoo, Panthera, The Nature Conservancy,  
Wildlife Crime Prevention, and the Zambian Carnivore Programme





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## Special Thanks To







## Executive Summary

Achieving positive wildlife outcomes from conservation programs that operate over vast landscapes is challenging. This is particularly true for Africa's vast protected area (PA) network, which includes some of the world's most iconic places, charismatic species, important biodiversity and carbon sinks. In addition, the resources required to protect these areas and their species diversity are sorely lacking.<sup>1</sup>

This case study of Kafue National Park (Kafue NP) may provide a promising template for conservation in sub-Saharan Africa's giant unfenced PAs. A team led by the Zambian statutory authority, DNPW, in partnership with six in-country conservation NGOs, over a four-year, three-month period, achieved stabilization and potential improvement in lion and leopard populations, thus suggesting resilience of the Park's biodiversity. The results were achieved using advanced conservation methods employing recently available technologies and a highly collaborative data-driven approach.

The financial cost per km<sup>2</sup> is considerably less than historically assumed for maintenance and, in some areas, an increase in species densities. This data demonstrates the productivity potential for the conservation of Africa's PAs.

**Collaboration Partners:** Zambia's Department of National Parks and Wildlife, Game Rangers International, Musekese Conservation, Panthera, Wildlife Crime Prevention, Zambian Carnivore Programme, African Parks from 2021<sup>2</sup> and the North Carolina Zoo.

**Case Study Time Period:** April 2018 – July 2022. Four years and three months.

**Annual Funding (peak year 2021):** Approximately \$4,730,748 or \$211 per km<sup>2</sup> for 22,400 km<sup>2</sup>.

**Wildlife Police Officers and related scouts:** ~240 (in 2021), or ~11 per 1,000 km<sup>2</sup>.

**Technologies Employed:** SMART and SMART Profiles; EarthRanger; GPS collars; Panthera IDS; advanced camera traps; GPS-tagged sentinel vultures; digital communication.

**Management Methods Employed:** Use of large, strategically located Intensive Protection Zones (IPZs); adaptive management; monthly site-based collaboration meetings; "Halo" approach to targeted key species protection; support to effective prosecution, engagement of Judiciary and innovative community engagement.

**Lion and leopard densities:** Across three Intensive Protection Zones (IPZs) totalling 5,500 km<sup>2</sup> and representing 25% of the Park, lion densities remained stable with no decline in the core of two IPZs, and although not statistically significant, an increase was noted in the core of one zone. Leopard densities remained stable in the core of one IPZ and, although not statistically significant, increased in the core of two.

Please refer to the extended explanations below to expand on this summary.

<sup>1</sup> Lindsey, et al 2021. Biological Conservation.

<sup>2</sup> African Parks started supporting the Park in early 2021 with significant infrastructure investments and law enforcement support as part of a Priority Support Plan and followed by a 20 year Conservation Collaboration Agreement with Government signed in June 2022.





# Kafue NP and the Greater Kafue Ecosystem

## Exceptional Biodiversity Under Threat

At 22,400 km<sup>2</sup>, Kafue NP, unfenced, is Africa’s third-largest national park and has no unauthorised residents.<sup>3</sup> The park is located at the core of an even larger unfenced system known as the greater Kafue Ecosystem (GKE), which includes nine Game Management Areas (GMAs), large communal areas designated for the sustainable utilization of natural resources (see Figure 01 source TNC).

At 66,000 km<sup>2</sup> the GKE has exceptional scenic beauty, with terrain ranging from the vast, seasonally inundated Busanga plains to seemingly endless Miombo woodlands. This infinite beauty is interspersed with flooded grassland expanses and riverine vegetation following the Kafue and Lufupa Rivers. The ecosystem is rich in natural biodiversity, including Zambia’s largest cheetah population. It hosts significant populations of lions (over 200 individuals), leopards and African wild dogs. Kafue NP also hosts the most diverse antelope fauna of any national park in Africa (21 species). The GKE is florally highly diverse, hosting examples of 16 of the country’s 24 natural habitats and stretches across three eco-regions of Zambia, offering significant climate resilience and generates important ecosystem services.

However, over the past half-century the GKE has suffered from intense poaching pressure (Overton et al., 2017) that depleted wildlife in the Park to approximately 25% of its carrying capacity and several of the GMAs to even lower levels (Lindsey et al., 2014). Particularly pronounced are the impacts of bushmeat poaching on Kafue’s herbivore communities, specifically the large herbivore species preferred by lions, and the dynamics of prey depletion in the ecosystem has an array of impacts on big cats and their competitors (Schuette et al., 2018, Goodheart et al., 2020, Vinks et al., 2020, 2021a, b).

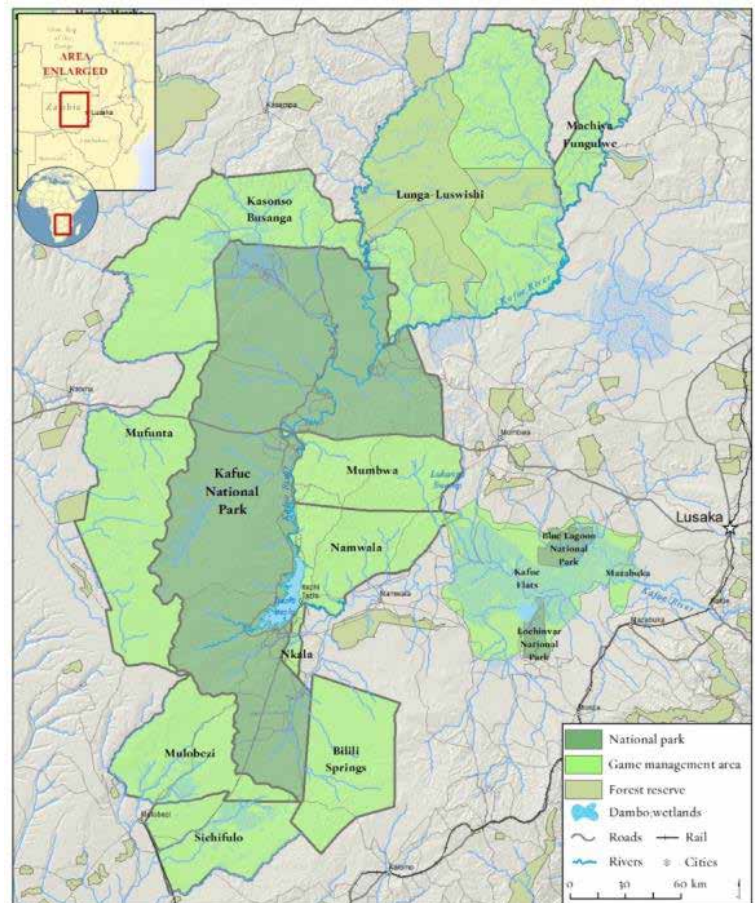


Figure 1

<sup>3</sup> Almost the size of Massachusetts, USA.

Given the strong relationship between lions, leopards and their prey availability, combined with widespread snaring, killing or maiming of carnivores (Schuette et al., 2018, ZCP and Panthera unpublished data; Midlane et al., 2014), the long-term resilience of Kafue NP's rich biodiversity, including wild cats, was under severe threat early in the last decade despite efforts of the statutory authorities and several collaborating partners. Several GMAs also suffer rapid degradation through land conversion to agriculture and settlement, permanently degrading and reducing the habitat available to carnivores and their prey (Watson et al., 2014).

Five of the six NGO partners currently invested in the GKE have been supporting DNPW in Kafue for at least a decade, and some longer. Some progress was made in the years before 2018. From 2010 to 2012 Panthera conducted a lion research program in North Kafue NP which the Zambian Carnivore Program (ZCP) continued as a long-term focal monitoring program. Starting from 2013, ZCP also conducted an early capture-recapture leopard survey in a small but important area of the Park to determine the abundance and survival rate (Vinks, 2022).

Indeed, an article in the Outdoor Journal, in November 2018 entitled, "Aerial Survey of Kafue National Park Suggests Great Progress in the Fight for Conservation" noted that,

***"Formerly plagued by poaching, it has taken a dedicated commitment, both physically and financially, with assistance from DPNW, local lodges and operators and various NGOs . . . to turn the tide and protect Kafue's wildlife."***<sup>4</sup>

However, until 2018 carnivore species densities were not systematically measured across wider Kafue NP or impact of protection activities assessed.

Recognizing the enormous ongoing challenge, in 2018 Zambia's Department of National Parks and Wildlife (DNPW) leveraged cooperation among its conservation partners; Game Rangers International (GRI), Musekese Conservation, Panthera, Wildlife Crime Prevention (WCP), ZCP, and, in 2021, African Parks, to coordinate and integrate activities across the GKE with a focus on Kafue NP. Resource commitments and funding of this collaboration grew in size. In 2018, Panthera conducted the first systemic camera trap population study in the Park, which focused on the core of Kafue NP (see below), estimating a baseline population density for lions and leopards.

From 2018 to mid-2022, this coordinated and collaborative protection approach, underpinned by technology and informed by scientifically rigorous wildlife monitoring, grew further in scale. This augmented protection, combined with measuring population outcomes for lions and leopards in the core of essential and sizable intensive protection zones (IPZs) in Zambia's Kafue NP has yielded no further declines in these key wildlife species.

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<sup>4</sup> Outdoor Journal, November 2018 <https://www.outdoorjournal.com/news/aerial-survey-kafue-national-park-suggests-great-progress-fight-conservation/>





## Lions and Leopards Serve as Umbrella and Indicator Species

When present at meaningful population sizes, lions and leopards serve as both “umbrella” and “indicator” species. However, these species are on the decline in Africa<sup>5</sup>, making their protection and growth of their population densities in Kafue NP more critical.

Due to their large space requirements and wide-ranging behaviours, lions serve as an umbrella species. Protecting lions protects an extensive range of species that make up the ecological community of their habitats (the umbrella effect).<sup>6</sup>

Indeed, dispersing male lions can travel long distances searching for uncontested territories. In one documented case, “Dynamite,” a collared male lion, walked for 37 days covering 220 km from Hwange NP in Zimbabwe to the Zambian side of the Zambezi River.<sup>7</sup> (<http://vicfallsbitsnblogs.blogspot.com/2013/02/the-livingstone-lion.html>). These wide ranges and dispersing behaviours are why lions are difficult yet essential to protect in large areas like Kafue NP (<https://www.youtube.com/watch?v=nQKyVzBu2F8>), across the comprehensive Greater Kafue Ecosystem to which it belongs, and at the broadest landscape scale, in the even more prominent and massive KAZA Transfrontier Conservation Area, within which the greater Kafue Ecosystem is nested.<sup>8</sup>

Lions and leopards reside at the top of the food chain and serve as indicator species. When their populations are resilient and plentiful, the entire ecosystems they depend on may also be resilient. Recent developments enable both these species to be counted and their density in a defined area measured accurately enough to determine trends through time. Accurate trends provide essential, objective feedback on the effectiveness of threat interventions and conservation efforts. The range use and movement patterns of lions capture the scale, seasonality and intensity of protection effort required to protect of the broader suite of wildlife species naturally occurring in savanna systems.

<sup>5</sup> African wild lions likely number less than 20,000 and occupy just 6.4% of their historic range. Wild cheetah number less than 7,100 and occupy less than 8% of their historic range. Declining leopard populations now inhabit just over a quarter of their historic range. Even in Africa’s most protected areas, wild cats continue to decline (Midlane et al. 2014), compounding these substantive reductions in numbers and ranges. In these protected areas, wild cats fall victim to illegal poaching, as both targeted and non-targeted species. In non-protected areas, the fear of wild cats killing livestock leads to persecutory killing by impoverished communities who can ill afford to lose cattle and goats to lions or leopards.

<sup>6</sup> References 1, 3, 4 in Wikipedia, “Umbrella Species”

<sup>7</sup> Loveridge, Andrew, Lion Hearted, The Life and Dearth of Cecil & the Future of Africa’s Iconic cats, pages 149 – 150.

<sup>8</sup> KAZA, or the Kavango Zambezi Transfrontier Conservation Area is the largest nature and landscape conservation area in the world, spanning the international borders of five countries in southern Africa with an area of 519,912 km<sup>2</sup>



## Large Carnivore Species Densities: Measuring Accurately

Species conservation programs in large open systems strive for populations that are viable in the long term and resilient to natural changes in the environment according to seasons and long-term climate cycles.

It is, therefore, essential to accurately measure the population status of species that are the target of conservation interventions with enough precision to measure trends over time. Fortunately, recent advances in applications of Spatially Explicit Capture-Recapture (SECR) to estimate densities of lion and leopard populations have allowed this for these two species of high conservation value. See “Restoring African lions: start with good counts”<sup>9</sup>. Kenya has conducted a countrywide lion population survey using SECR<sup>10</sup>, and other papers have showcased the ability of SECR to obtain a reliable measurement of densities of lions and leopards using various data capture techniques, including camera traps and direct observation<sup>11</sup>.

Complementing long-term intensive studies of known individuals undertaken by the *Zambian Carnivore Programme*, Panthera measured lion and leopard densities using camera traps for SECR in the core Intensive Protection Zones to continuously adaptively manage the program<sup>12</sup> and measure impact. By end of 2022, 880 camera traps were set in the core of three intensive protection zones (IPZs) in Kafue NP. By utilising the images of lions and leopards from these cameras, SECR provided the ability to estimate population densities, revealing desired outcomes from conservation interventions. This approach provided a unique opportunity to compare SECR estimates from camera trapping with long-term demographic studies for lions.

<sup>9</sup> Braczkowski, et al. *Frontiers in ecology and evolution* May 2020.

<sup>10</sup> Using search encounter (SE-SECR) a form of direct observation through photography. (Elliot & Gopaldaswamy 2017)

<sup>11</sup> Strampelli et al. 2022

<sup>12</sup> In conservative science, this is a feedback cycle called “adaptive management”



# Population Outcomes

Across three intensive protection zones in Kafue National Park, trends in population densities from 2018 -2021 following collaborative protection were consistent with population improvement and resilience for both lions and leopards.

For lions, no decline in population density occurred in the core of the northern Kafue NP intensive protection zone. In the core of the southern Kafue intensive protection zone, where in situ collaborative protection had been in place for one year, densities increased from a baseline in 2019 and then remained stable. Finally, although not statistically significant, our calculations suggest that in the core of the central Kafue intensive protection zone, lion densities increased from the baseline calculated in 2018.

Long-term demographic studies of lions and other carnivores in the Kafue by ZCP in Northern and Central Kafue NP (<https://www.zambiacarnivores.org/greater-kafue>) are consistent with the camera trap results.

Lion diet and prey base have changed significantly over the last half-century (Creel et al., 2018), corresponding with depleted herbivore populations in Kafue NP—particularly with larger prey species such as buffalo, which lions prefer (Schuette et al., 2018; Vinks et al., 2020). Subsequent demographic analyses from 2013-2019 in Northern and Central Kafue reveal small pride size and low cub recruitment (Vinks et al., 2021), supporting the notion that lions are limited by prey depletion.

SECR from ZCP’s demographic studies revealed a density of 3-4 lions/100 km<sup>2</sup> and no statistically significant pattern of change in population size between 2013 and 2021 across Northern and Central GKE. Data collected from 358 lions from 2013-2021 (ZCP in prep), did however support a significant increase in cub recruitment from 2018 to 2021 (see Vinks et al., 2021). Since lion populations respond gradually to protection and lag increases in prey populations over time, the increase in lion cub recruitment indicates that population dynamics are improving.

Leopard population densities also remained stable with no decline over the three years in the core of northern Kafue IPZ, consistent with prior estimates of leopard density in Kafue (Vinks et al., 2022). Although not statistically significant, in the core of both Central and Southern Kafue IPZs, leopard densities also increased, leopard density also increased corresponding with the results of an ex-situ demand reduction program. This program focuses on reducing the demand for leopard skins supplied to Zambia’s Western Province and parts of its Southern Province.

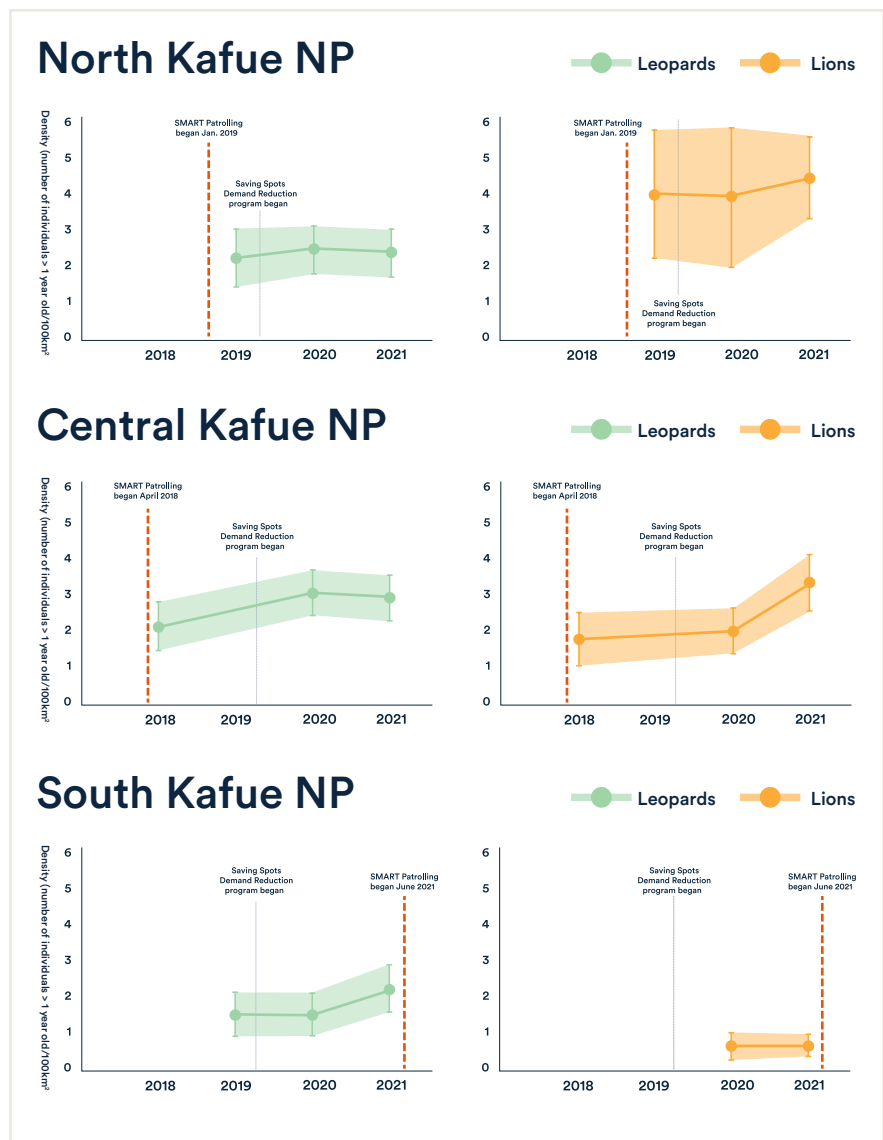


Figure 2. Population density estimates for lions and leopards (number of individuals >1 year old/100km<sup>2</sup>), in the core of three IPZs in Kafue NP from camera trapping. Bars are the standard error (Source Panthera in prep).



# Resources Expended Within Kafue NP Boundaries

What was the level funding and law-enforcement investment required to achieve these results?

The total estimated budget for Kafue National Park law enforcement and technology support in 2021 was \$4,730,748 (see Figure 03) from law enforcement partners.

| ORGANIZATION                | TOTAL FOR KNP LE OPERATIONAL ACTIVITIES ONLY |
|-----------------------------|--|
| Panthera <sup>13</sup>      | \$814,000                                    |
| All other partners combined | \$3,916,748                                  |
| Approximate Total           | \$4,730,748                                  |

Figure 3

As the park is 22,400 km<sup>2</sup>, this equates to an investment of approximately \$211 per km<sup>2</sup> per year, including funding allocated to monitoring and evaluation. Note that this peak year was roughly double the average annual investments of the prior years of the study period (2018-2020), and so provides a very conservative measure of the impact per dollar invested.

This amount also excluded threat mitigation investments made in the Park, the GMAs and beyond. The latter focusing on dismantling illegal wildlife crime networks by WCP and DNPW. If the analysis included these investments, it would need to include the GMA's km<sup>2</sup>, dramatically increasing the denominator. As such, the analysis is confined only to the Park.

Nevertheless, in 2021 the approximately \$4.73 million in Kafue NP by DNPW and the collaborative partner investments were targeted to achieve species conservation outcomes through threat mitigation and did so in a transparent, scientific and highly documented and productive way.

This investment was able to fund ~40 patrol teams (note that some of these teams patrolled both Kafue NP and surrounding GMAs), or roughly 11 patrolling officers per 1,000 km<sup>2</sup>. Each patrol had a contingent of roughly six members. This analysis of patrolling personnel per 1,000 km<sup>2</sup>, and annual funding invested km<sup>2</sup> provide valuable benchmarks for other conservation efforts in similar landscapes.

Could the Park use even more intense law enforcement coverage and information-led protection? Absolutely, because, as reported, the entire range of the Park was not protected. Moreover, when adding the surrounding GMAs (43,600 km<sup>2</sup>), the need for further protection becomes ever more evident.

In 2021, law enforcement presence and associated M&E achieved impressive coverage and increased certain indicator species densities in the core of the monitored IPZs.<sup>14</sup> At 22,400 km<sup>2</sup>, that investment equates to an incredibly efficient approximately \$211/km<sup>2</sup>, subject to the considerations above. Even if the annual investment is underestimated by 50%, this still amounts to considerably less than the \$1,000 - \$2,000 per km<sup>2</sup> conventionally assumed needed.<sup>15</sup>

What was behind this efficiency/productivity of the conservation investment? Three equal factors come into play: 1) utilization of advancing technology, 2) employment of best practices in conservation management, and 3) a high degree of coordination and collaboration.

<sup>13</sup> Total Panthera budget for the greater Kafue Ecosystem was \$1.171 million

<sup>14</sup> These three IPZs totalled 5,500 km<sup>2</sup>, or 25% of the Park

<sup>15</sup> Lindsey, et al 2021

# Productivity Driven By Utilizing Advancing Conservation Technologies

Effective collaboration and coordination was underpinned by a common and shared understanding of the goals, challenges and priorities for the landscape. Two information technological platforms, working together, strongly amplified the efficiencies and information sharing of the collaborative partnership and associated supported patrols, and collectively allowed for innovative approaches among the partners.

## THE POWER OF SMART

Lying at the heart of the collaborative protection approach, DNPW implemented the operational monitoring Spatial Monitoring and Reporting Tool (SMART) to build accountability and a shared understanding among partners of anti-poaching patrolling efforts coverage and observations. (<https://www.nczoo.org/blog/front-lines-ensuring-future-lions-southern-africa>)

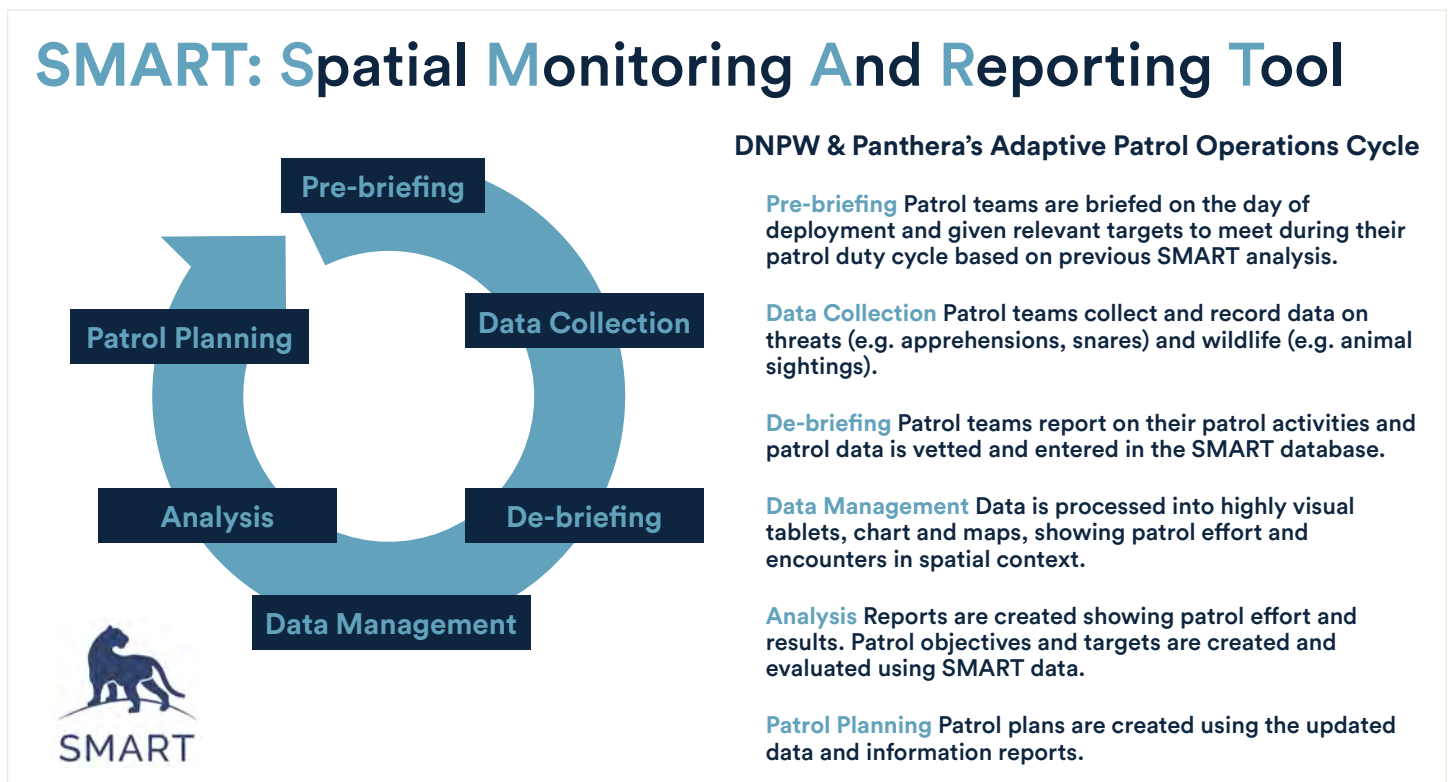


Figure 4

SMART combines standardized patrol data collection, site-based database management and decision-making, emphasizing effective patrolling and best practices for protection. The system also provides a highly intuitive visualization of patrol team routes and coverage (see SMART patrol maps in Figure 08).

Technology development and adoption for the global SMART software originated in 2011. In partnership with eight conservation organizations, the system has been adopted in over 1,200 sites worldwide, including over 350 sites in sub-Saharan Africa.

SMART enables protected area managers and community conservation groups to visually track patrol routes and sightings, empowering staff, boosting motivation, increasing efficiency and promoting credible and transparent monitoring of the effectiveness of antipoaching efforts (Lynam, Antony and Singh, Rohit and Montefiore, Alexa, 2016).

By June 2022, the collaborative SMART program collected operational data from all 49 park antipoaching patrol teams in 11 SMART hubs across the entire GKE. Monthly analysis of SMART data from all hubs crucially informed monthly coordination and planning that allowed for more effective coordination of collective patrolling capacity among all partners, forming the foundation of adaptive management and ever-increasing patrol productivity and impact.



In the peak year of 2021, 211,073 kms were patrolled by a combination of foot, helicopter, fixed-wing aircraft, boats and bicycles in Kafue NP, over 38,862 person-days. This collective effort made 322 apprehensions.

The rich database built in SMART enables robust situational analyses and collaboration to guide effective patrolling. SMART also allows impact monitoring to determine the overall impact of conservation interventions against operational goals. DNPW supports SMART as an operational tool for protected area conservation management across the country.

### EARTH RANGER

Complementing SMART, DNPW and collaborating partners implemented EarthRanger in 2021. EarthRanger is a technology platform that enables real-time monitoring of management and antipoaching assets such as vehicles, patrol teams, aerial surveillance capability, radio communications, terrain, and collared wildlife assets. EarthRanger enables targeted protection of wild cats in situ by integrating antipoaching patrols and wild cats tracked through focal monitoring, known as the Halo approach (see below).

Utilizing investigative data management, Earthranger has been a critical tool to enhance even greater collaboration among partners. It allows law enforcement and wildlife assets to be visible on one display/interface, irrespective of which organization the assets are being supported by. This allows for considerable situational awareness across the Park and a more coordinated use of resources.

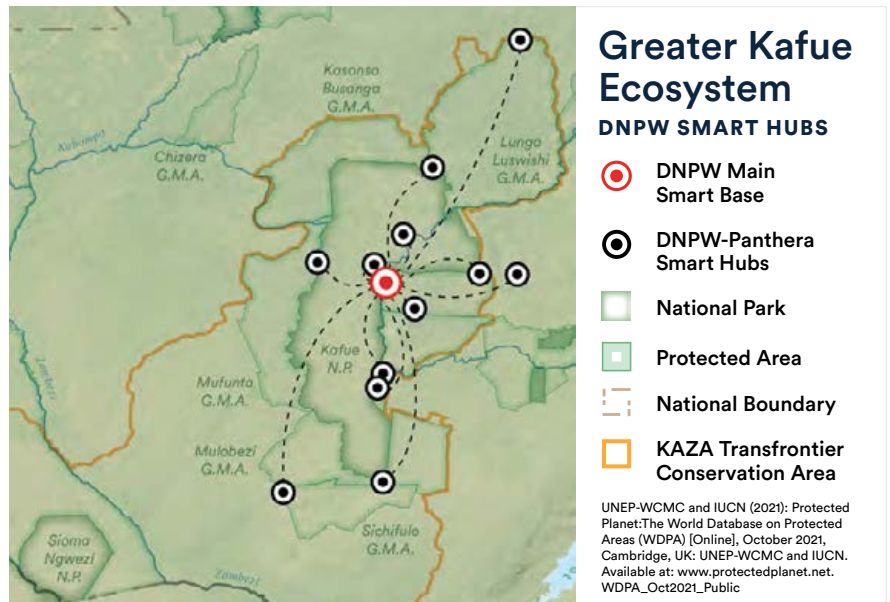


Figure 5



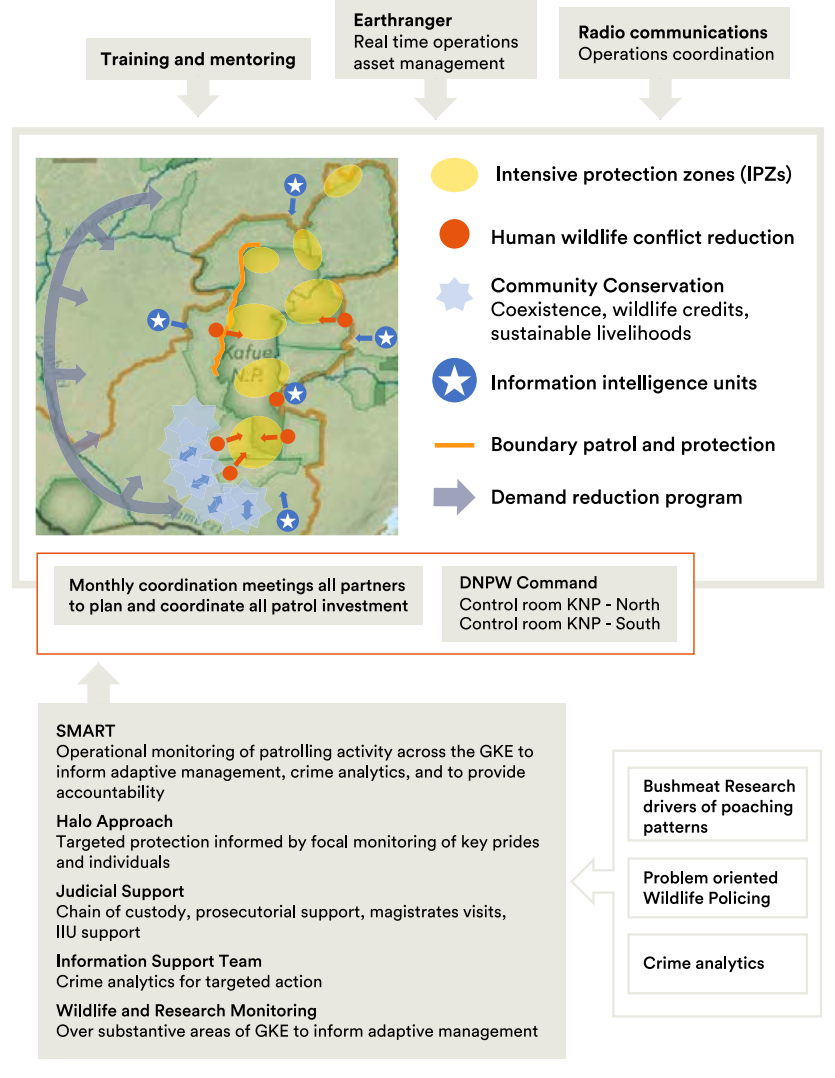
## Best Practice And Innovation To Support One Integrated Landscape

Kafue NP is spacious, unfenced and possesses poorly defined porous boundaries, allowing poachers and wildlife unlimited access in and out of the Park. Accordingly, members of the collaboration engaged in an incremental and integrated suite of complementary activities and emerging best practices in conservation management to comprehensively address the full suite of threats to wildlife across the Park, its surrounding GMAs and beyond. This approach allowed for the inclusion of non-protected areas, treating the whole as one interconnected management landscape.

Monthly operational planning meetings held in held in both the northern and southern portions of the Park<sup>16</sup> became the cornerstone for collaborative protection for patrol planning and incident management. These meetings harnessed the collective partner inputs and maximized the impact of partner support while avoiding duplication.

Key strategies coordinated through these meetings and/or fed into the integrated management approach included:

### DNPW-Cooperating Partners Collaborative Integrated Resource Protection



<sup>16</sup> Being a very large and long park, it can take 12 hours to drive from the south to the central part of the Park.

Figure 6



## INCREMENTAL INTENSIVE PROTECTION ZONES

Large Intensive Protection Zones (IPZs) were areas identified as *key habitats* for wild cats and associated prey that, with adequate protection, independently had the potential to host viable populations of lions and leopards and their prey species (<https://panthera.org/panthera-zambia>).

In 2018, Panthera supported DNPW to establish one IPZ located in central Kafue NP, spanning 2,500 km<sup>2</sup>. In two years, the number of IPZs grew to five across the Park, supported by partners, including Panthera (3 IPZs totaling 5,500 km<sup>2</sup>), Game Rangers International (1 IPZ at 3,000 km<sup>2</sup> including the shores of Lake Iteshi-Tezhi) and Musekese Conservation (1 IPZ at 2,800 km<sup>2</sup> core shown) (<https://www.musekeseconservation.com/about>). The five IPZs covered 11,300 km<sup>2</sup> or ~50% of the Park area.

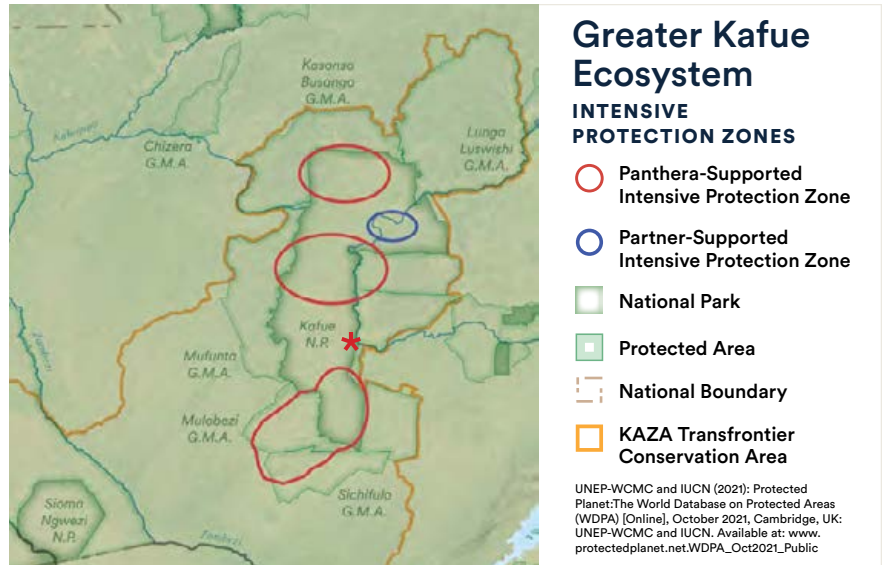


Figure 7

\*note, not drawn - the GRI IPZ in KNP covers Lake Iteshi teshi and surrounds.

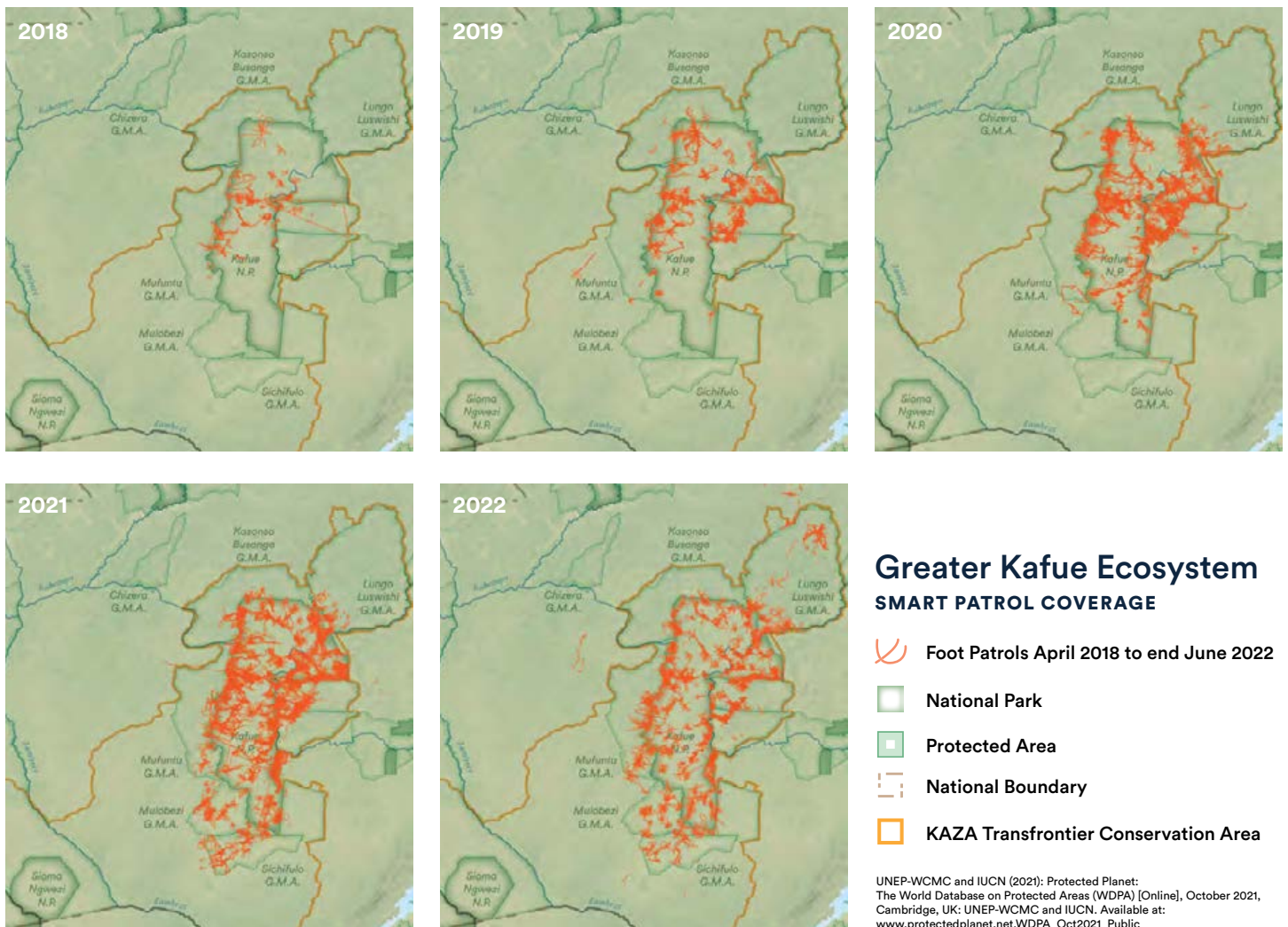


Figure 8

Each IPZ was large enough to represent the needs of considerable prey populations for viable wild cat populations *per se* but realistically small enough to secure through intensive patrolling. By the end of 2021, 19 antipoaching patrol teams (Panthera 12, MC 4, GRI 3) secured these IPZs, which also enormously benefited from targeted protection afforded by the Halo approach. Note that these patrols extended well beyond the IPZ areas, as seen by the SMART patrol route track graphics. In 2021 protection for the IPZs was also strengthened by 10 patrol teams supported by AP inside and outside the IPZs together with aerial surveillance and response capacity.

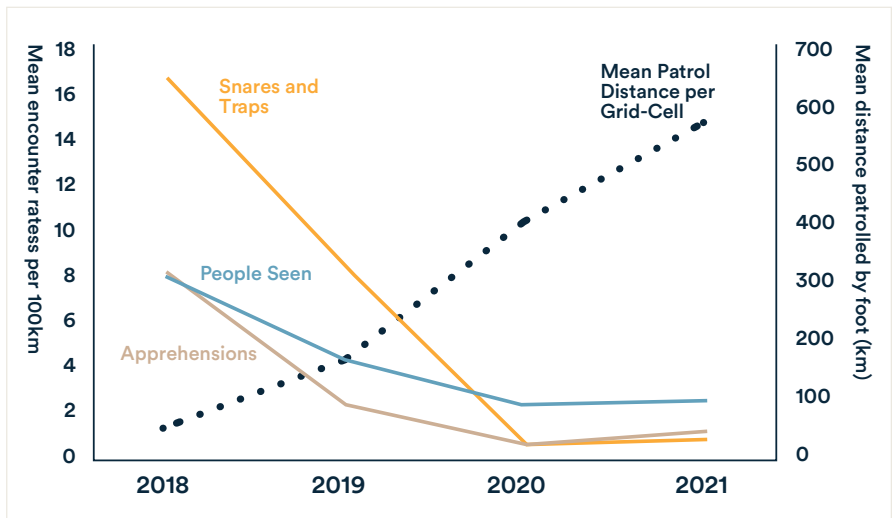


Figure 9

Over the four years, increased coverage and protection by the DNPW and wildlife across Kafue NP and surrounding GMAs resulted in a substantive decline in poaching activity (measured as encounter rate/100km patrolled by foot (Figure 09)). As the collaborative program progressed, the teams supported needed to patrol further in terms of kms to encounter a poacher or snare - the assumption was that there were fewer poachers or snares within the areas of interest. While these are not the same as the outcome metrics of indicator species population trends, they are consistent with a substantial reduction in poaching activity.

### SPECIAL ANTIPOACHING UNITS

Complementing territorial patrolling in the IPZs, Game Rangers International resourced three Special Antipoaching Units (SAPU north, south and KAZA) (<https://www.gamerangersinternational.org/single-post/how-special-anti-poaching-units-differ-to-traditional-anti-poaching-units>) to rapidly respond to poaching events and to reduce poaching hotspots. The SAPUs use intelligence-led patrolling, working with the intelligence units of DNPW to interdict poachers before they enter the park. In the four + years of collaborative protection, the Special Antipoaching Units apprehended 205 suspects.

### BOUNDARY PROTECTION

Responding to information revealing access pathways and routes into and out of the Park, and especially concerning the IPZs, Panthera supported five dedicated boundary protection teams to close off key poacher access points along the western and northeastern boundaries of the Park. These made it harder for poachers to enter the Park quickly, reducing poacher pressure on the intensive protection zones. African Parks, from early 2021, supported one team. Together, boundary protection teams apprehended 129 poachers over the four-year program.

### FOCAL PROTECTION

Focal monitoring and the Halo approach utilized collars that allow conservation programs to remotely track wildlife individuals and their movement in large landscapes through regular GPS locations uploaded to satellites and downloaded to monitoring applications, including EarthRanger. Satellite tracking collars fitted to lions, cheetahs and wild dogs by ZCP (and Panthera since 2021) in partnership with DNPW enabled remote tracking of key individuals (such as a lioness in a pride or key leader of a wild dog pack) and prides or packs of these critical species across the greater Kafue Ecosystem.

By utilizing the location coordinates provided by the collar, the collaborative partnership developed the “Halo approach,” which directed antipoaching efforts to bolster security in an





area when needed during denning, raising young or when tethered to rich prey sources such as buffalo herds during the calving season. In southern Kafue NP, the Halo approach also mobilized wildlife conflict reduction teams to sensitize communities and sweep areas for snares when key groups roamed into communal areas. Furthermore, in concert with the Halo approach, ZCP teams and their veterinarians (together with others) rapidly responded to injured and snared individuals in focally monitored groups, many times with a highly successful outcome (<https://panthera.org/blog-post/wire-snares-africas-silent-killers>).

Together, the Halo approach and rapid response afforded targeted protection to increase survival that blanket law enforcement coverage of the entire park alone may not have achieved.

## **INNOVATIVE VULTURE SENTINELS**

African vultures, operating at a landscape scale, act as early warning systems for conservation issues linked to poisoning and poaching. In particular, White-backed vultures act as an umbrella species for other scavengers (Thompson et al., 2021), as their wide-ranging and gregarious feeding puts them at risk of poisoning events. Based on their movement patterns, satellite-tagged vultures can provide helpful information about poisoning and indicators of other illegal activities such as elephant and buffalo carcasses resulting from poaching. Since October 2021, North Carolina Zoo has tagged 18 White-backed and 1 Hooded vulture in three areas within Kafue NP.

Through a novel system developed in partnership with MoveApps and EarthRanger, North Carolina Zoo has implemented a vulture-based monitoring system in Kafue NP that can inform law enforcement efforts. Analyzed information is fed into EarthRanger to support efforts to address threats to carnivores, vultures, and other wildlife within the park (<https://www.earthranger.com/news/vultures-a-lions-best-friend>). Two vulture mortalities detected two poisoning incidents highlighting threats, particularly in south Kafue and areas with settlements in the Kafue Flats. In addition, bushmeat poaching was detected via follow-ups. Further afield, tagged vultures helped detect a disease outbreak in elephants around greater Chobe, Botswana. In addition to supporting law enforcement, these data have been instrumental in confirming wildlife corridors Panthera suspected would be necessary for lion movement within KAZA TFCA but pass through various protected and unprotected lands. On-going input from the vulture sentinel system will continue to provide vital information about poisoning hotspots and the need to address this threat.

## **DNPW INTELLIGENCE AND INVESTIGATION UNITS (IIUS)**

DNPW Intelligence and Investigation Units (IIUs) were supported by WCP Zambia, an NGO partner supporting DNPW to address the illegal wildlife trade. The trafficking of illegal wildlife products such as lion, leopard skins, ivory, bushmeat and other products from Kafue NP constitutes severe and organized crime conducted by networks operating across the border in the Southern Africa region. In 2018-2022, WCP supported DNPW IIUs in four main centers associated with the greater Kafue Ecosystem: Mumbwa, Kaoma, Ngoma and Kasempa. In Mumbwa, a Rapid Deployment Team has been established to provide operational support and increase the capacity of IIUs in the GKE. In total, 23 officers were supported, trained and resourced to conduct strategic wildlife crime investigations and law enforcement operations outside the national park in proximate urban areas and transport routes. This includes targeting wild cat poaching and the illegal trade in their body parts, providing a solid deterrent for targeted and opportunistic poaching of wild cats. From 2018-2022 these units conducted 803 arrests and seized 11 lion skins and 33 leopard skins from the illegal wildlife trade.

## **JUDICIAL SUPPORT**

Antipoaching and other law enforcement efforts can only deter wildlife crime if cases are successfully prosecuted or if appropriate sentences are not applied. (Akella, A.S. and J.B. Cannon (2004)). Since 2019 WCP's legal assistant, a qualified Zambian lawyer and one of a nationwide team, has been based in Mumbwa town, close to Kafue NP's eastern boundary, where many of the wildlife crime court cases from Kafue NP are heard in the subordinate court. The legal assistant has played a supporting role in liaising between DNPW and National Prosecution Authority prosecutors to promote effective wildlife crime prosecution and appropriate sentencing, including illegal possession of lion and leopard products. Effective prosecution contributes to the certainty element of wildlife crime deterrence and ensures that the likelihood of punishment deters potential offenders.

Court cases monitored by the WCP legal assistant in Mumbwa, Kaoma, Namwala and Itezhi-Tezhi subordinate courts around Kafue NP (not restricted to GKE) ran from January 2019 to September 2022. These cases exhibited the following documented statistics in all concluded wildlife crime cases:

1. 85% conviction rate, with 78% receiving a custodial sentence
  - a. For offenses involving lion body parts 85% conviction rate, with 100% receiving a custodial sentence (average of five years);

2. For offenses involving leopard body parts 50% conviction rate, with 100% of those receiving a custodial sentence (average of 5.1 years).

The WCP legal assistant conducts a mentorship role facilitating pre-trial conferences between testifying officers and prosecutors to ensure consistency of statements, evidence preparation and good case-building where appropriate. Quarterly feedback meetings are held between DNPW, WCP and other NGO partners to ensure that progress from the court is shared back to law enforcement. DNPW wildlife crime evidence management and safe storage have been improved in partnership with the TRACE Wildlife Forensics Network to strengthen the “chain of custody” of wildlife products. A *“Rapid Reference Guide for the Investigation and Prosecution of Wildlife Crimes in Zambia”* was produced in 2018 by WCP in partnership with DNPW and the National Prosecution Authority and made available to officers and prosecutors. WCP has also supported human rights training with other NGO partners for officers throughout the park through materials produced with DNPW.

Since 2019, the WCP has facilitated collaborative field visits for members of the judiciary, prosecutors, DNPW personnel and other NGO partners to Kafue NP to help enhance the contextual awareness of the complexity of wildlife crime and its impact on the economy, environment and local communities. Between 2019 and 2022, four visits were conducted for 16 magistrates presiding over courts around Kafue NP.

### **LEOPARD POACHING**

Seizure records, patrol data from Kafue NP and interactions with local communities around Kafue suggest that the GKE and Sioma-Ngwezi NP are primary sources of leopard skins used in ceremonial attire in the region. Over the past four years, the number of leopard parts identified in seizures of illegal wildlife around GKE and into southern and western Zambia dramatically reduced. A notable decline in seizures of other spotted carnivores echoed this trend. The ‘other spotted carnivores’ include servals, genets, hyenas and cheetahs, used during traditional ceremonies as replacements for or in addition to leopard skins.

### **INFORMATION SUPPORT**

Since 2019, Panthera supported DNPW in establishing an Information Support Team (IST) in north Kafue. Panthera provided analytical support to assist with targeted responses to specific wildlife crime problems. This included providing details on crime trends and hotspots in GKE, identifying existing and emerging threats and supporting wildlife crime problem prioritization. The IST also helped identify information gaps, information gathering opportunities and potential partnership opportunities (e.g., Min. Education, Community Resource Boards (CRBs), community leaders and NGOs) to open a broader range of intervention options. Together these activities contributed to supporting coordinated wildlife protection efforts by enhancing the flow of information among key stakeholders within the landscape.

### **DEVELOPING GENETIC TOOLS FOR ANTI-TRAFFICKING**

Illegal trade in big cat skins and parts continues to increase in demand. Utilizing long-term studies of big cats in the Kafue and elsewhere in Zambia and the region, ZCP, DNPW, WCP, TRACE Wildlife Forensics Network and the University of Zambia have successfully developed genetic tools for combatting trafficking. These tools have utilized long-term genetic data to develop unique genetic identifiers for lions, leopards, and cheetahs. This technology will assist law enforcement intelligence and forensics by providing improved means of population estimation and connectivity assessments.





## Community Engagement

### COMMUNITY CONSERVATION, WILDLIFE CREDITS AND REDUCTION IN HUMAN WILDLIFE CONFLICT

Adjacent to protected area boundaries, Panthera, along with partners (DNPW, The Nature Conservancy and The World Wildlife Fund), implemented an innovative wildlife credits program in southern GKE to build community-wildlife coexistence across open, unprotected lands connecting the GKE within the massive Chobe ecosystem and the Kwando Wildlife Dispersal Area of KAZA. By 2022, this approach, combined with a targeted human-wildlife conflict reduction program, protected livestock, livelihoods and wild cats throughout the program footprint.

When lions and leopards range into neighboring communities, the potential for persecutory killing by communities is high. This is especially true when livestock deaths are believed to result from lion or leopard predation. To proactively support communities to live with lions and leopards, Panthera began a Human-Carnivore Conflict Reduction Program near southern Kafue NP, formed as part of Panthera's southern Kafue program.

Since August 2021, Panthera has supported DNPW in attending 24 Human-Carnivore Conflict Responses involving lions and leopards. Since the beginning of the program, this support has resulted in zero lions and leopards killed by communities. Panthera, with the community, proactively constructed two permanent bomas for the most targeted area by lions in the Mulobezi GMA. These have proven successful, with lions visiting the newly built bomas without livestock or lions killed or harmed.

Furthermore, Game Rangers International (GRI) implemented a Human-Carnivore Conflict Resolution and Management Program in Nkala GMA. Ten livestock farmers were empowered with zero-visibility mobile bomas, replacing inadequate, unsafe traditional bomas. Permanent communal bomas were also installed in three hotspot communities and distributed fifty solar-powered and motion-sensor lights to at-risk farmers to serve as wildlife-safe deterrents. GRI raised awareness of Human-Wildlife Conflict and provided practical advice on improving livestock security via live community radio broadcasts. Over two thousand bumper stickers promoting the Wildlife Crime and Conflict hotline number were distributed in the area. Two large banners displaying the hotline number were displayed during GRI's annual youth football tournaments, with further awareness message communicated over a loudspeaker to several thousand spectators.

GRI's Human-Wildlife Coexistence Ranger responded to every reported incident in person and collected data on the species involved, loss or damage caused, and mitigations attempted.

### DEMAND REDUCTION FOR ILLEGAL WILD CAT SKINS

This partnership program reached right into the hearts and minds of communities. Leopards and other wild cat skins are worn during traditional ceremonies as symbols of power, prestige and courage and their use stems from a deep cultural reverence for the species. In 2018 Panthera partnered with the Barotse Royal Establishment (BRE) of the Lozi People

of western Zambia to implement the “Saving Spots” project (<https://www.youtube.com/watch?v=yTwAnK9kHb0>). This project focused on reducing demand for illegal authentic wild cat skins used in traditional ceremonies while simultaneously assisting in preserving the rich cultural traditions of the Lozi People. Most of the wild cat skins, primarily leopards, are suspected to be coming from Kafue NP and associated GMAs, as well as the area around Sioma Ngwezi NP.

During the main Kuomboka ceremony, approximately 200 participants adorned in wild cat skins, primarily leopard and serval, paddle the Royal Barge from the King of the Lozi’s (known as the Litunga) wet palace to his palace on higher ground across the seasonally inundated Barotse flood plains. Through the custodianship of BRE, the Saving Spots project, provides ceremonial paddlers with highly realistic synthetic furs known as “Heritage Furs” as alternatives to authentic skins. By 2022 over 1350 Heritage Furs had been distributed to the BRE – catering to demand for at least five years. The Heritage Furs include leopard and serval skin Lipatelo skirts and Lion mane Mishukwe headpieces. Dramatically, in 2022 61-76% of paddlers were wearing the Heritage Furs exclusively during the main Kuomboka ceremony (the first since the inception of the project) and encouragingly, over 80% of Lozi paddlers interviewed (n=166) about the project had a positive opinion of the Heritage Furs with 67% no longer wanting to acquire an authentic skin (Panthera unpublished report 2022). Heritage Furs were first used in public at the Kupuwana event in Livingstone in Sept 2019. In December 2019, the BRE declared that Heritage Furs would replace authentic skins used as ceremonial regalia for all major events, potentially saving significant numbers of wild cats each year.

### **DEMAND REDUCTION FOR BUSHMEAT**

The illegal bushmeat trade has been reported as one of the biggest indirect threats to carnivore populations through prey depletion and snare injuries (Lindsey et al., 2012). Prior to the four-year period, a collaborative study was conducted by DNPW, Panthera, Game Rangers International, WCP Zambia and the Copperbelt University, which identified that the main market for illegal bushmeat from Kafue NP was the capital city, Lusaka (Overton et al., 2017). Using this evidence base, in 2018, WCP Zambia launched an illegal bushmeat demand reduction campaign, “This Is Not A Game” targeting bushmeat consumers in Lusaka and other urban centres in Zambia with both public health and conservation messaging (<https://www.facebook.com/ThisIsNotAGameZm/>). This campaign has run on TV, radio, billboards and social media from 2018-2022. In impact evaluations, the majority (60%) of campaign viewers interviewed (n=140) reported that their opinion about illegal bushmeat had changed in the past three years, and 78% of these people reported that this change was because of information they had learned through the campaign. A large proportion (69%) said they had not eaten bushmeat in the past year. The rest had eaten it between once and monthly in the past year. And 97% of individuals believed there were disadvantages associated with eating illegal bushmeat.

## **The African Parks Priority Support Plan**

In early 2021, the Government of Zambia entered into a Priority Support Plan (PSP) with African Parks for the Kafue NP. The PSP considerably raised the resourcing and capacity available to the Park management and law enforcement, including building and road maintenance, construction of a new law enforcement center for the Park and the provision of aerial support (helicopter and fixed wing aircrafts) for aerial surveillance and rapid response to real-time poaching activities. The PSP also included coverage of Wildlife Police Officer salaries, supported 10 additional patrol teams and provided uniforms and equipment for all officers operating in the Park.

In July 2022, the Government of the Republic of Zambia entered into a long-term collaborative management agreement with African Parks, where among other elements, DNPW together with African Parks will oversee the law enforcement element of threat mitigation in Kafue NP (<https://www.africanparks.org/zambian-government-makes-historic-commitment-protect-kafue-national-park>).





## Discussion and Implications

This case study, spanning 2018 through to mid-2022, demonstrates the profound impact and efficiency that can come from utilization of best practice conservation strategies underpinned by technologies to achieve encouraging outcomes for lion and leopard populations on a budget of around \$200-\$250 per km<sup>2</sup> per year. As such, in the absence of, or working hand in hand with other models for longterm protected area management, this approach could point the way for conservation of other protected areas in sub-Saharan Africa, particularly those large, unfenced areas that contain important megafauna and associated ecosystems.

Funds for sustainable conservation in Africa are exceptionally difficult to come by, either through eco-tourism, African or international governments, or philanthropy. By demonstrating breakthrough efficiency and productivity, such as in the case of Kafue, funders may be more willing to invest knowing their funds will go so much farther to save and grow African biodiversity. But they will step up only if they are confident that these advanced methods and technologies herein are employed, and positive indicator species population outcomes can conclusively be demonstrated and sustained. Funders want to make a difference, and those who supported Kafue can have the confidence and satisfaction that they have done just that. This case study has provided a future template for augmented investment and has helped lay a foundation for the future success of Kafue NP under the new management arrangements and as part of the crucially important broader GKE ecosystem.

Looking to the future of Kafue NP and the greater Kafue Ecosystem, the addition of African Parks in the form of a collaborative management agreement, signed with the Government of Zambia in June 2022, to include all law-enforcement for the Park, heralds an unprecedented and exciting new era for this system. With Kafue NP protected as the core of the system, collaborative partnerships in this case study can build on the successes achieved during the study period and expand the geographic scale of support and success even further. A critical intervention in this expansion is the enhanced conservation management in Kafue's GMAs to mitigate the rapid degradation of the key wildlife corridors and buffer zones that these areas represent, which in turn must involve ensuring the local communities in and around these areas participate in and most importantly derive financial and socio-economic benefit from conservation. Equally, these conservation measures must extend into the unprotected conservation areas linking the GKE to the region's other protected areas and as high priority to the rest of the Kavango-Zambezi Transfrontier Conservation Area (KAZA-TFCA) before these ecological links are lost forever.

Ultimately, the vision for the expanse of the 66,000 km<sup>2</sup> greater Kafue Ecosystem is for a landscape that thrives with natural biodiversity, including lions, leopards, cheetah, wild dogs, their prey, and elephants, properly measured and monitored, and economically protected from anthropogenic effects.

Attaining this vision for the greater Kafue Ecosystem would support an even larger global vision. The KAZA TFCA, of which the GKE is a part, is the largest conservation and development landscape in the world. Covering an area the size of France and encompassing 36 protected areas including three of the largest national parks in Africa, KAZA hosts 30% of the world's lion population, 25% of the world's endangered African wild dog population, and 50% of the world's African elephant population. Achieving wildlife recovery across the protected areas of this massive, unfenced wilderness complex has been aspirational but elusive.

This Kafue NP case study reinforces our firm belief that a collaborative approach can achieve a pathway forward for achieving global conservation outcomes for these species at large spatial scales.

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