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Papers

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Wildlife Protection & Human-Wildlife Coexistence Across the Lewa-Borana Landscape

Amanda Leon
Lewa Wildlife Conservancy USA
New York, New York

Manuscript Description: *Below is a brief curated update related to Lewa Wildlife Conservancy's wildlife conservation efforts in 2021 and 2022, as well as looking ahead to 2023. The conference speaker will briefly touch upon this information, provide an update on the rhino populations on the Lewa-Borana Landscape, and share insights on their conservation research working alongside Lewa's Kenyan team and partners.*

Lewa Wildlife Conservancy Overview

Lewa Wildlife Conservancy (Lewa) is a UNESCO World Heritage Site, Man & Biosphere Reserve, and IUCN Protected and Conserved Green List Area that works as a catalyst for the conservation of wildlife and its habitat across northern Kenya. Lewa does this through the protection and management of species, the initiation and support of community conservation and development programs, and engagement of local communities in conservation. The Lewa-Borana Landscape (LBL) is a 93,000-acre protected sanctuary for some of Africa's most threatened wildlife, including 15% of all Kenyan Southern White rhino and Eastern Black rhino (*Ceratotherium simum ssp. simum* and *Diceros bicornis ssp. michaeli*), as well as thriving populations of more than 400 African Savanna elephants (*Loxodonta africana)*, 11% of the global population of Grevy's zebra (*Equus grevyi)*, large-bodied carnivores like African lion (*Panthera leo)* and Spotted hyena (*Crocuta crocuta)*, and several species of ungulates, primates, more than 480 bird species, and reptiles.

Lewa's community development initiatives benefit more than 60,000 people per year, including ~8,000 students from 23 Lewa supported schools who gain access to a quality education, and 1,800 women who leverage Lewa's micro-loan program to start their own businesses, reducing gender inequalities. Additionally, more than 40,000 people have access to healthcare through Lewa's partner clinics and over 25,000 people have access to clean water via 16 local water projects. Lewa also supports locally led forestry conservation efforts and sustainable agriculture practices in surrounding communities.

Wildlife Protection Across the Lewa-Borana Landscape (LBL)

Amidst slow recovery of tourism revenue and challenges brought on by the worst drought in four decades, Lewa remains steadfast in its efforts to protect wildlife and people in northern Kenya. The Conservancy has managed full retention of 158 field rhino monitors, fence monitors, armed anti-poaching personnel, and rapid response personnel in 2021 and 2022, while providing the ongoing professional development and safety education for rangers to maintain their technical

skills. The Conservancy's technical teams upheld unified operations and management of the Joint Operations Command Center (JOCC), and security teams acted quickly and proactively to protect both wildlife and people within and around the LBL.

The security team of 118 rangers, in partnership with the Borana Conservancy's security team, achieved a zero anti-poaching record across the LBL from 2020-present date. The rhino population has exceeded 255 on the LBL, comprising 15% of all Kenyan rhinos. The Conservancy also maintained 10% black and 11% white rhino annual growth rates in 2021, significantly exceeding the national target of 5% outlined in Kenya's Black Rhino Action Plan (2017-2021). The Proportion of Illegally Killed Elephants (PIKE) in northern Kenya was recorded at a relatively low 25% in mid-2022, reflecting a 12% decrease from 2020. This was made possible in collaboration with other partners, including the Northern Rangelands Trust (NRT), Kenya Wildlife Service (KWS), and communities in the region.

EarthRanger remains a critical tool, allowing Lewa, Borana Conservancy, and 39 NRT community conservancies to aggregate significant amounts of data into a single platform and monitor a vast landscape of more than 10 million acres in real time. As a result of this data, security personnel were able to address key threats, exacerbated by the pandemic and prolonged droughts, including poaching; habitat degradation; competition for resources with livestock; reduction of water sources and restricted access to water; human-wildlife conflict (HWC); human-elephant conflict (HEC); insecurity and migration; wildlife disease; and predation of livestock that affect communities' livelihoods and food security.

EarthRanger is now transforming protected area management throughout Kenya as it has been adopted at the national level by KWS with the goal of connecting every protected area in Kenya to a centralized system. Outside of Kenya, EarthRanger is now utilized in 188 protected areas (www.earthranger.com) and counting since being developed in partnership with and piloted in Lewa in 2016.

Mitigating Human-Wildlife Conflict (HWC)

HWC mitigation remains a key priority for Lewa, and our philosophy is anchored in working with surrounding communities to help individuals see tangible value in conservation and supporting the protection and care for wildlife and their habitats. Through years of building and maintaining trust, we are witnessing an improved level of coordination and cooperation between Lewa and the local communities, which has contributed to the decreasing HWC and human-human conflict (HHC) incidents we are observing. In the past year, the newly formed HWC rapid response unit confirmed that community members will practice patience and caution when they are confident that a team will respond to a reported issue in a timely manner. In 2021, 45 HWC cases were recorded which is down from 104 cases in 2020 and 117 in 2019. However, extended dry seasons intensify competition for water and grazing land and push wildlife to look for food in nearby

community farmlands. This inevitably results in fence breakages, crop damage, loss of livestock and other property, and can antagonize relationships between communities and Lewa.

From October 2021 to May 2022, Lewa's HWC Rapid Response Unit recorded and successfully addressed 29 HWC cases (mostly caused by elephants and baboons) through timely responses, safe wildlife deterrent methods, community education and training, and data collection as supported by EarthRanger to inform proactive patrols in high-risk areas. **Overall, the Response Unit helped reduce HWC cases by 17% from the previous eight-month period.**

Lewa also recorded four cases of wildlife attacks on livestock resulting from the prolonged drought that prompted herders to search for rangelands closer to the protected areas and unfenced community conservancies where predators roam.

Human-Human Conflict (HHC) Cases

Lewa recorded a total of 12 HHC cases from October 2021 to May 2022, indicating a 40% decrease from the last eight months. While managing HHC cases remains a challenge due to devastatingly dry conditions and resulting added pressures on natural resources and livelihoods, drawing real-time monitoring data from EarthRanger allowed Lewa's team to see where animals were located, gain a bird's eye view of how humans affected wildlife movement, and actively protect important wildlife passageways within and around the Conservancy. Without the accurate, timely intel from EarthRanger, the incident rate would be undeniably higher in current conditions.

Ongoing Challenges for Wildlife Conservation in the LBL

A total of seven tusks have been recovered from 2020-present date. Five of the tusks recovered were from natural death rather than from poaching activities. There are relatively low cases of bushmeat hunting within the Conservancy (one in 2021). Those that occur are attributed to the severe drought that led to insufficient food for both people and animals. With poor harvests, communities begin to look for alternative sources of livelihood that include bushmeat hunting. Additionally, the extensive droughts weaken the majority of wildlife species such as buffalos, making them vulnerable to hunting by humans.

To this end, in May 2022, the conservation team identified specific rhinos (those more vulnerable including older, breeding rhinos and lactating mothers) and a broader subset of additional wildlife species that will be on a targeted supplementary feeding program for the next three months to provide a nucleus of animals the greatest opportunity to survive the drought until the next rains expected in October 2022.

Lewa's CEO, Mike Watson, shared *"We have had our first delivery of hay and lucern in May and the conservation and security teams will be coordinating the distribution to identified feeding*

sites across the Conservancy, in a plan designed to last 4 - 5 months, if we don't have unexpected rains between now and then.

Several partners and lodges very kindly offered to assist with establishing their own feeding sites, proximate to their locations, which will be a helpful augmentation. Hay, lucern, and other supplementary feed is already becoming short in supply and prices are rising, so this will be an expensive exercise. Any contributions are very gratefully received, as we look to assist Lewa's wildlife in this challenging period."

Prioritizing the Ecological Carrying Capacity Study for Rhino on the LBL

Lewa will be conducting a study to determine the Ecological Carrying Capacity (ECC) for Eastern Black and Southern White rhinos by assessing the browse availability percentages, food suitability scores, other herbivore populations competing in the landscape, and related ecological dynamics on the LBL. Understanding the ECC of a landscape, defined as the maximum number of species held by the ecosystem in the existing conditions, is essential for sustainable conservation and management of wildlife. KWS recommends all rhino populations in a reserve be managed at 75% of the ECC to maintain high growth rates. The implications of a habitat that is close to exhausting or surpassing its ECC include competition for ecological resources, habitat degradation, increased opportunities for disease, reduced population performance, and more. To continue achieving sustained population growth and ensuring reproductive rates are not limited by the resource capabilities of the landscape, the ECC must be determined, and the relative rhino managed appropriately. Thus, it is critical to fill this ECC survey information gap to inform rhino conservation efforts and serve as a resource for other protected areas managing rhino.

The last ECC carried out on the Lewa was in 2006 for black rhino only, and estimates set the ECC at 70 animals, meaning the landscape is likely supporting populations beyond its capabilities. Rhino roam widely on the open savanna and within neighboring forest habitats, competing with other animals for resources, and are subject to the effects of a depleted browse base. It is important to investigate and understand this thoroughly, to ensure appropriate land management interventions are implemented. **Now a top priority for conservancies in the region, this KWS sanctioned study will aid in determining the larger regional standing of Kenya's rhino populations.**

Lewa will establish the current ECC for both white and black rhino that includes additional incorporated areas that were not studied in 2006, such as Ngare Ndare Forest, which most black rhinos are currently utilizing. Results from the study will help the Lewa research and management teams understand food options accessible to rhinos and implement actions to boost browse availability, such as adding more habitat recovery zones (fenced areas rhino can access but not elephants or giraffe) and limiting the number of competing browsers and grazers. Additionally,

the study will serve as a reference point for the intended relocation of buffaloes, whose numbers have rapidly increased on the landscape, and the potential translocation of rhinos to other protected conservancies with KWS's authorization.

A keystone species, rhino are landscape architects, and provide critical ecological services that support a healthy and balanced ecosystem. On a national scale, the breeding performance success of this black rhino metapopulation is vital in their strategic conservation that extends beyond the Conservancy. Listed as Critically Endangered on the IUCN Red List of Threatened Species, 32 black rhinos have been translocated from Lewa to establish rhino sanctuaries across the country, an effective metapopulation management tool to form genetically and demographically viable populations.

Despite the increasing population of white rhinos, which are listed by IUCN as Near Threatened, the ECC has never been established. The recently launched Kenya White Rhino Conservation and Management Action Plan (2021-2025) outlines conservation strategies and interventions, including rhino sites conducting ECC studies, to ascertain and implement effective conservation plans and key biological management tools, such as translocation. Therefore, the ECC study will help Lewa accomplish a key exercise outlined by the national management plan.

Additionally, outcomes from the EEC study will aid Lewa in maintaining a population growth rate exceeding 5%; establishing new rhino conservation strongholds via translocation; building the knowledge base for Lewa's conservation teams, key partners, Kenya, and Africa on the ECC of rhinos; monitoring rangelands health and forage trends; and securing the registration of the Lewa-Borana Landscape Ecosystem Management Plan.

Looking Ahead: Integrating LoRaWAN technology with EarthRanger

As Lewa helped develop and pilot EarthRanger in 2016, the Conservancy is now pursuing another global first for innovative conservation technology based around the EarthRanger system.

To optimize security and anti-poaching measures, Lewa is fundraising for and deploying [LoRaWAN](Long Range Wide Area Network) gateways and LoRa (Long Range) sensors to bolster rhino management, law enforcement, and connectivity across the landscape. So far, the Conservancy has raised approximately USD$120,000 out of the USD$526,000 needed for this project.

Once funding is secured, Lewa will tag rhinos with LoRa-equipped sensors and install sensors on fences, vehicles, aircraft, and ranger equipment to enable real-time monitoring of wildlife and ranger movement, fence functionality, and integrity, as well as environmental changes. The

integration of LoRa in Lewa's conservation efforts will enhance wildlife security and generate accurate biological monitoring and evaluation data across the Conservancy's conservation impact programs. The LoRa sensors will be placed in strategic locations within the Conservancy that are considered vulnerable to illegal access and would be able to relay information when movement, metals, weapons, and other contraband are detected in such locations. These measures will significantly improve the effectiveness and safety of Lewa security responses and the overall safety of wildlife.

EarthRanger is the main platform for the application and deployment of LoRaWAN, and data collection templates have been revised to comply with the new data that will be captured through the roll-out of LoRaWAN. **Integrating LoRa with EarthRanger is a global first.** As Lewa pilots this integration, the Allen Institute, 51 Degrees, and others will look to integrate LoRa with EarthRanger in all global sites where EarthRanger is being used.

Table 1: Wildlife Counted in the Lewa–Borana Landscape, Feb. 2016 – Feb. 2022

SPECIES	2016	2017	2018	2019	2020	2021	2022
Beisa Oryx	179	220	178	227	307	239	247
Buffalo	1220	1391	1623	1753	2086	2153	1901
Bush buck	15	17	16	15	15	15	5
Cheetah	8	1	4	5	6	7	8
Eland	280	192	322	291	245	358	331
Elephant	416	509	250	253	727	516	425
Gerenuk	10	10	11	10	10	11	16
Gazelle, Grants	348	443	415	718	1101	1145	1135
Gazelle, Thompsons	27	4	7	10	16	16	26
Giraffe	273	251	127	167	178	172	119
Greater kudu	28	35	22	32	32	32	32
Hippo	2	2	2	2	2	2	2
Hartebeest	30	62	64	64	93	91	92
Hyena, spotted	0	0	122	133	136	134	144
Hyena, striped	-	-	-	-	-	-	14
Impala	1113	1096	1763	1817	1505	1568	1285
Jackal (Silver backed)	9	12	6	7	14	22	6
Klipsringer	8	8	8	8	8	15	15
Leopard	7	8	9	9	9	9	14
Lion	17	44	45	47	53	61	57
Ostrich	51	44	41	52	65	83	61
Rhino, black	81	82	88	101	109	117	132
Rhino, white	70	75	80	87	97	107	118
Sitatunga	0	0	0	0	0	0	0
Warthog	68	85	140	161	168	162	151
Waterbuck	136	168	152	180	167	100	158
Zebra, Burchell	1262	1236	1228	1484	1599	1561	1557
Zebra, Grevy's	299	292	308	313	331	322	310

The table above is titled "Lewa - Borana Landscape Game Count" with "Dates: 2016 - 2022".