ACTION FOR CHEETAHS IN KENYA

Year End Report 2014

Cheetah Conservation and Human Impact in Kenya

Action for Cheetahs in Kenya (ACK) *is a project under* ***Carnivores, Livelihoods and Landscapes (CaLL)*** *working with local and international partners to promote the conservation of cheetahs through research, awareness and community participation in Kenya.*

Carnivores Livelihoods and Landscapes

cheetah CONSERVATION FUND

KENYA WILDLIFE SERVICE

University of Nairobi

WELLS FARGO

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ABBREVIATIONS

ACK - Action for Cheetahs in Kenya
CCF - Cheetah Conservation Fund
KWS - Kenya Wildlife Service
LEDS - Lion and Elephant Deterrent System
PNG - Predator/NiteGuard (deterrent light system)
UofN - University of Nairobi

FIGURES AND TABLES

Photos: *Student projects from Masters to Secondary schools assist ACK in data collection and analysis while building local and international capacity. Our staff learn skills in data collection, camera trapping, driving and computers to build our internal capacity as well. Volunteers assist with field work and fund raising. We are grateful to each of the individuals and organizations that assist ACK*

1.0 EXECUTIVE SUMMARY

Action for Cheetahs in Kenya is the only project that is focused on the national status of cheetahs in Kenya. ACK field bases in Salama and Samburu form the core of our research and provide models that assist in understanding the threats to cheetah populations throughout Kenya. At the field bases we test solutions to identified threats for implementation on a range wide scale. 2014 was a new transition for our programmes. We bid farewell to our long term Senior Scientist, Cosmas Wambua in March and wish him luck in his new position as a lecturer at South-eastern University and pursuit of his PhD in Ecosystem Services and Landscape Ecology.

Last year, 2014, was a new transition for our programmes. The timing for this transition was ideal because we have come to an end on several of the long term monitoring projects in the Salama research base. We discontinued game counts and conflict data collection to conduct analysis of the seven years of data and evaluate the effectiveness of conservation efforts in a rapidly changing landscape. Field Officers continue patrols and focus on implementation of conflict mitigation through our "Build-a-Better Boma" campaign and through testing deterrent lights at shamba (land holder plots usually used for agriculture). We extended our research into the Athi-Kapiti ecosystem since 2012. In 2014, Noreen Mutoro completed her thesis study on faecal analysis of cheetah preferred prey and she has been hired by ACK to complete several pending publications. Noreen is also launching into the next step in her career through acceptance into a PhD programme through which she will head the second national cheetah survey.

ACK received authorization to open a permanent field base in Meibae where we have now formalized our relationship with the Meibae Community Conservancy. We have conducted two years of targeted analysis of cheetah status in the region and will increase our presence in Samburu through hiring additional cheetah field officers, increasing our community and education programmes, and assisting the Conservancy rangers with field equipment.

ACK Director, May Wykstra, is the committee secretary for the formation of a new community wildlife conservancy in Wajir South. There is political will, KWS support and a need for increased conservation efforts in this area. Community meetings were put on hold following security issues in the region, but will be revisited in 2015. The 2007 national survey showed a strong presence of cheetahs in this region. The game count conducted in the area is one of the few conservation studies that have been conducted in this region, and it is the only documented count that can be used for predator and prey distribution.

We provided data collection sheets to the Galana conservation group where a new camp and conservation area was set aside in early 2014. Ranger training will continue through 2015 with links through Wells Fargo Security, our partner in faecal detection dog training.

In June, ACK welcomed our new Senior Scientist, Sarah Omusula. She was greeted with a stack of data from both field sites and over 100,000 photos from the deterrent light pilot study. Before I left for the fall fundraising tour, we decided that Sarah would focus August - October on data entry before we launched into new studies. In November, we conducted training with field staff from both locations and in December we hired two additional field officers for the Samburu/Meibae study site. We initiated the second National Cheetah Survey with a meeting of all registered cheetah projects at KWS. At the meeting we identified our scope and targets for the survey and began the process of prioritization of regions for pilot and initial focus in the first phase of the research. Genetic evaluation on a range wide level will be a primary focus thus ACK linked with the Wells Fargo Canine Unit to hire Susan Kuria as head dog trainer to continue the process of faecal detection dog work.

We are very excited that we will soon have field base access in four community areas (Salama, Samburu, Wajir and Galana). Associates in the Masai Mara, Meru and Tsavo regions will partner with us in the national survey as we launch pilot tests in 2015-2016. Please join us in celebrating our accomplishments in this annual report.

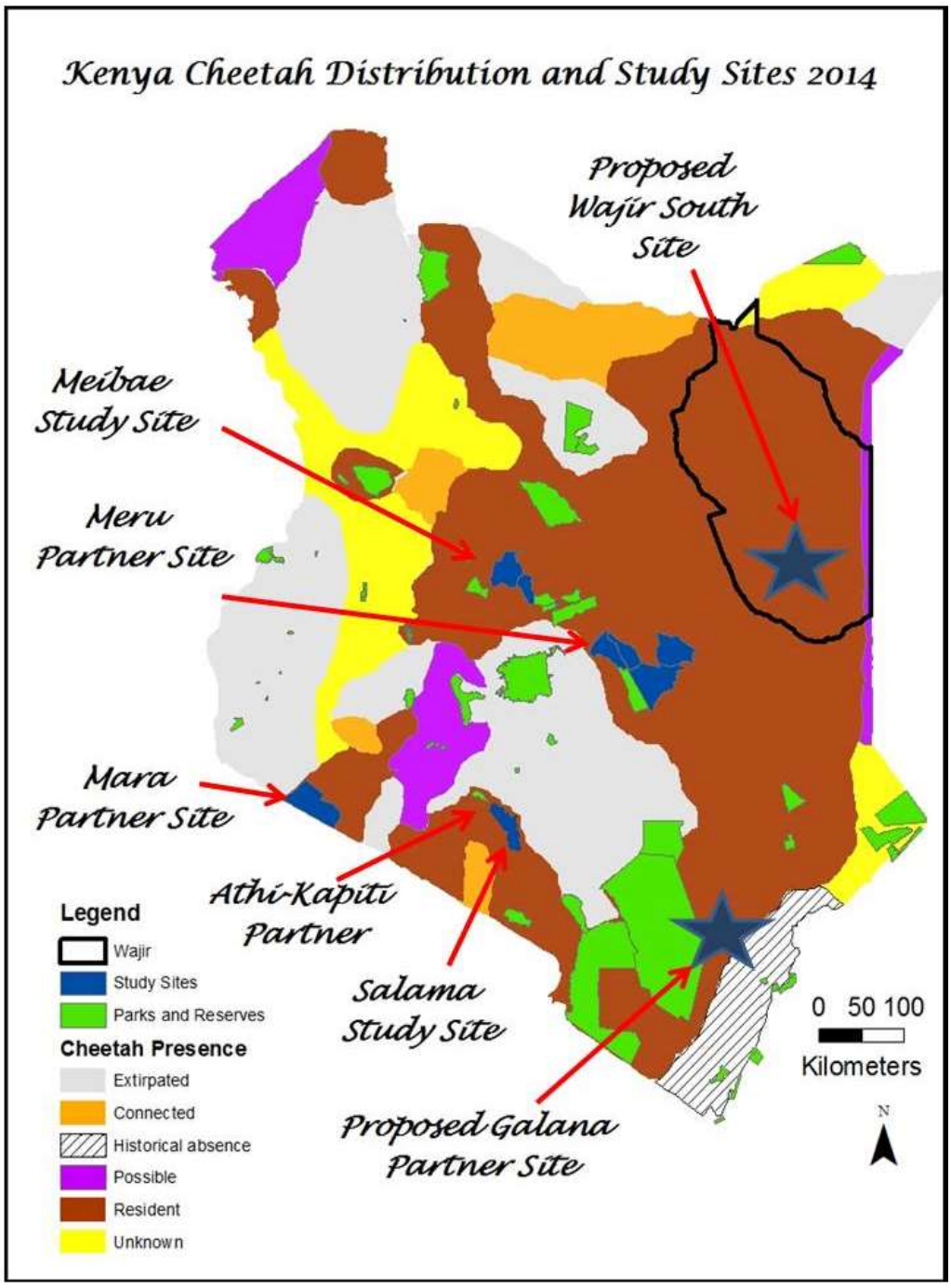


Figure 1: Locations: ACK has two formal field sites in the Makueni and Samburu Districts respectively. ACK extended the Salama study site to include the Athi-Kapiti region working in collaboration with researchers and land owners in the region. *The Mara-Meru Cheetah Project has two study site locations that work in collaboration with ACK on faecal analysis and cheetah presence mapping.* New Projects in Wajir and Galana will assure an extended coverage of cheetahs in community rangelands.

2.0 2014 ACCOMPLISHMENTS (SUMMARY)

2.1 RESEARCH (SUMMARY)

- Three cheetah field officers collected data on cheetah and wildlife movements in the Salama field site (500 km^2).
  - Field Officers completed 597 predator monitoring patrols recording five cheetahs in the area. Spotted hyena and jackal are still the most predominant predator recorded. The most frequent game sightings included dikdik, reedbuck, Thompson's gazelle, zebra and wildebeest.
  - Conflict reports from 2005-2013 were compared showing a decline from 20 to only one cheetah conflict. Total conflicts from 2007 - 2013 declined from 53 to ten. Our focus in 2014 was in conflict mitigation through seminars, participation in community events and education programmes. Over 2000 households were provided with information and assistance on boma improvements.
  - Boma monitoring and deterrent lights were set up and tested for effectiveness against crop raiding as the greatest human-wildlife conflict in the Salama area is now the crop loss. In the first phase of the study we evaluated the perceived vs actual predator visitation using camera traps. Perception of crop raiding species was quite accurate while perception of predator visitation was significantly higher than actual visitation.
  - Seven predator mortalities and 11 game species were documented due to road accidents in Salama and Athi-Kapiti areas. No cheetahs and fewer hyenas were killed in 2014 than in previous years. Thirty domestic animals (dogs, cats, cattle and goats) were recorded primarily along the Malili section of the highway. Highway monitoring and mapping provided information on vegetation, settlement, fencing, water points and intersections to identify correlations in problem areas.
  - Nine snares were found and removed by ACK staff in 2014.
- ACK continues to work in the Athi-Kapiti Study Extension area.
  - Two hundred and eighty-seven scats were collected by ACK staff in 2012-2014. Analysis could only positively identify 27 scats as belonging to cheetah.
  - Twenty-one prey species were found in the cheetah scats and were consistent with previously identified preferred cheetah prey.
  - Game density and abundance was achieved through driving transects in the Athi-Kapiti region to compare prey availability with prey selection.
  - Within the Samburu and Buffalo Springs Reserves we relied on reports from naturalists, rangers and project partners to monitor cheetah presence. Cheetah sightings decreased to nine adults and seven cubs from the 14 adults recorded in previous years.
- Three Cheetah Field Officers collected patrol and walking transect counts within a 600km^2 portion of the Meibae Conservancy.
  - Field officers completed 512 patrol surveys. Jackal and spotted hyena are the most frequently recorded predators. Cheetahs were seen on only five occasions but tracks were recorded on 22 occasions. We estimate the adult population to be nine and twelve cubs were born in the area in 2014. Dikdik, gerenuk and Grevy's zebra were the most common recorded prey. Elephants were also frequently recorded and on occasion forced the scouts to abandon their route.
  - Field officers completed 72 walking transects. Game numbers in 2013 and 2014 were very similar. We compared changes in game sightings to cattle leaving the area due to drought and found that there is no significant change in game with or without cattle.
  - To assist in conflict mitigation we conducted thirty random interviews in the community to test perception vs actual predator visitation. We found that people's perception of the frequency of visitation is correct. Half of livestock killed by predators in the past year were attributed to night time losses. Larger frequencies of daytime losses were related to high numbers killed by wild dogs on four occasions.

- After installing two types of predator deterrent lights we found that the bright flashing Lion and Elephant Deterrent System had the strongest effect in reducing predator visitation by 99%.

- National Survey
  - The first stakeholder meeting was held to set priorities in data collection and areas of focus for a survey to begin in 2016.
  - And agreement was signed with Wells Fargo Security to fund and assist with training of a fecal detection dog and trainer for the survey.

2.2 COMMUNITY (SUMMARY)

- In Salama Natural Resource Planning using the Conservation Measures Partnership and Miradi software enables the community to identify targets and create management plans that are feasible. ACK staff are trained in conducting the seminars and assisting the community to develop the plan.
- In Samburu ACK works in the Meibae Community Conservancy. We collaborate with rangers and the Northern Rangeland Trust to create strong community conservation ethics.
- ACK assisted KWS in an informational booth at the Machakos Agricultural Show reaching over 4,000 people with information about predators and improved bomas.
- ACK participated in a tree planting and showed a conservation video at the Ndalani Primary School. We hosted 17 students from Kalamazoo Christian High School in an exchange programme where the students learned about field research and where they worked with the Kima Kiu Secondary School on a clean water project.
- Wajir South Member of Parliament is working with ACK, KWS, County administration and the local community to develop a community conservation area.
- The Galana Ranch, located on the east of Tsavo East National Park, is developing a community conservation area. Ranger data collection forms have been given to the staff who are already trained in the use of GPS. ACK will be conducting conflict training with the rangers in 2015.

2.3 CAPACITY BUILDING (SUMMARY)

- ACK bid farewell to our long term Senior Scientist, Cosmas Wambua and welcomes Sarah Omusula to the Senior Scientist position.
- Two student from the University of Nairobi, Yale University completed thesis and internship project respectively. Several volunteers joined ACK for two weeks or more to learn about ACK's projects. Many students and volunteers continue to work with ACK to improve our programmes after they spend time with us.

3.0 Project Monitoring and Results

3.1 Salama Research

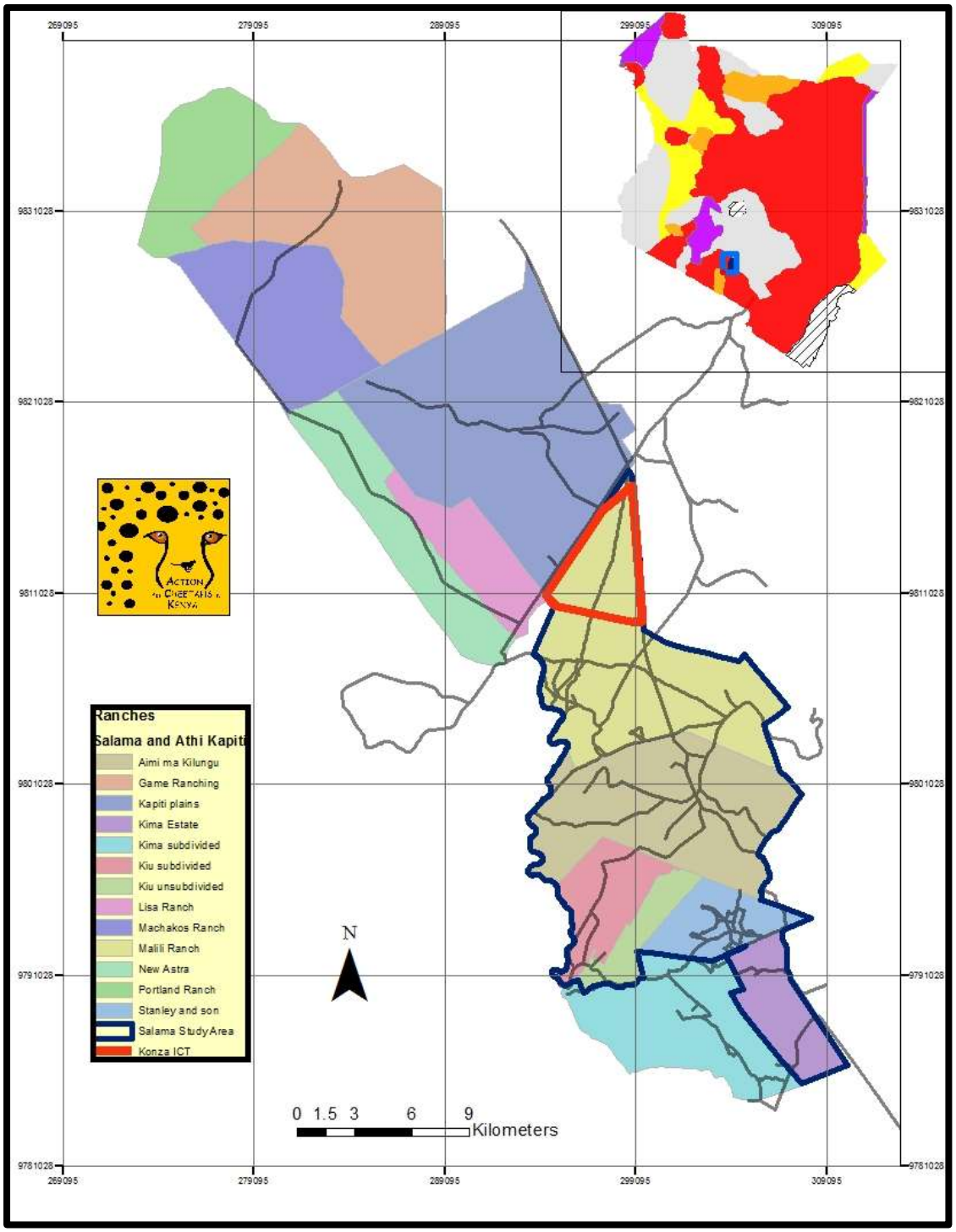


Figure 2: Salama and Athi-Kapiti study sites Extending studies from the Salama to the Athi-Kapiti region enables ACK to monitor shifts in cheetah range from the recent fragmented landscape of Salama to the commercial ranches of the Athi-Kapiti region. Game and predator densities in the Athi-Kapiti ranches provide wildlife friendly mixed farming community.

3.1.0 Salama Wildlife Monitoring

In early 2014, research staff took some time to evaluate collected data and data forms from previous years. The field officers cut back the frequency of patrols in January - March while new forms were being developed. Field officers put their effort into discussions with the community about natural resource planning to prepare for stakeholder meetings. Once the patrols resumed there were sightings and tracks of cheetahs on several occasions in June through August. A mother with two sub-adults and a single cheetah were tracked on the Stanley Ranch and in the Ngaamba community. Bat eared fox, caracal, hyena, jackal and leopard tracks were sighted with hyena and jackal being the most frequent. A single wild dog was sighted and tracked by the field officers in May. In the past (2005-2012) a pack of seven and a pack of three wild dogs were present between Ulu town, Ulu conservancy and Stanley Ranch, these packs were not recorded in 2013 or 2014.

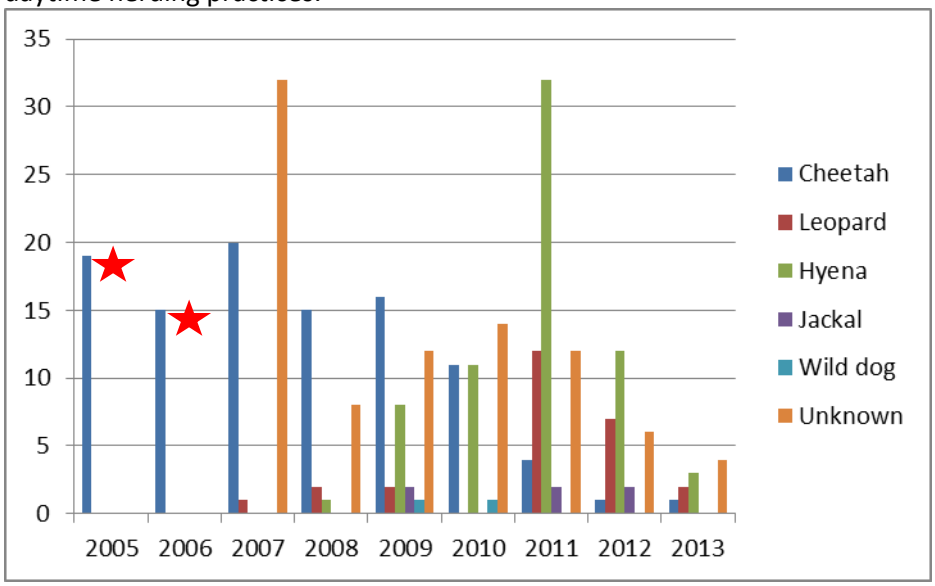
We conducted driving and walking transect game counts between 2009 and 2013, but we did not conduct transects in 2014. Walking patrols use different routes and times, but still provide prey sightings for distribution purposes only. Game species recorded between June and December included frequent dikdik and reedbuck sightings in the Kima, Stanley, Aimi and Ulu conservancy areas. Thompson's gazelle, wildebeest and zebra were most frequently recorded in the Malili area. Honey badger tracks were seen on several occasions in all area. Other species reported and whose tracks are often seen during crop conflict monitoring are impala, wild pig, warthog, duiker, bushbuck, baboon, vervet, guinea fowl, yellow-necked spurfowl, eland, buffalo, Grants gazelle, hare and spring hare. Game species have become very shy and are rarely seen on daytime patrols, but tracks and sounds are still seen/heard providing evidence that these species are still prevalent in the area.

Photos: *Hartebeest and hyena are among wildlife recorded during game count transects. These photos are from the Malili subdivision in Salama and from Machakos Ranching respectively.*

3.1.1 Salama Conflict Mitigation

Cheetah conflict was documented between 2005 and 2007, but after realizing that many suspected cheetah conflicts were actually caused by other predators, Field Officers began conducting conflict interviews on all reported conflicts in mid-2007. At each conflict investigation Field Officers share information about loss prevention leading to material development in 2013. Posters and "Build a Better Boma" presentations assisted the community in identifying the correct predator and implementing loss prevention specific to their conflict. With increased settlement reaching a peak threshold at which carnivores are no longer secure, the frequency of livestock losses decreased in

2013, and in 2014 we documented only our mitigation efforts and discontinued conflict investigations. The majority of livestock losses between 2011 and 2013 occurred at the homestead or in the boma (livestock coral) with hyena being the most frequent conflict species (Figure 3). Thus our mitigation efforts focus on night time losses, with continued discussions about adequate daytime herding practices.



Year	Cheetah	Leopard	Hyena	Jackal	Wild dog	Unknown	TOTAL
2005	19						19
2006	15						15
2007	20	1				32	53
2008	15	2	1			8	26
2009	16	2	8	2	1	12	41
2010	11		11		1	14	37
2011	4	12	32	2		12	62
2012	1	7	12	2		6	28
2013	1	2	3			4	10

Figure 3: Predator Conflict Confirmation*: Predators verified to have caused livestock loss since 2005 (Note: only verified cheetah losses were investigated in 2005-2006 -other losses were not recorded ★). Cheetah depredation went from nearly 20 to only one.*

Many of the new settlers in the area plant crops - primarily maze and beans. The crop raiding species also most frequently invade the shamba (property on which crops are planted). We investigated 25 shambas that reported frequent threats by predators and loss of crops. Interestingly, even though we did not receive reports of livestock loss from these people in 2013, eighteen of the interviewees responded that they had indeed incurred livestock loss to predators in the past year. Three of the interviewees believed the responsible predator was a cheetah, two of which believed the cheetah came to the boma at night (Figure 4). Despite seven years of intense community work in the area, and near extirpation of cheetahs, people still perceive the cheetah as a great threat to livestock in the boma.

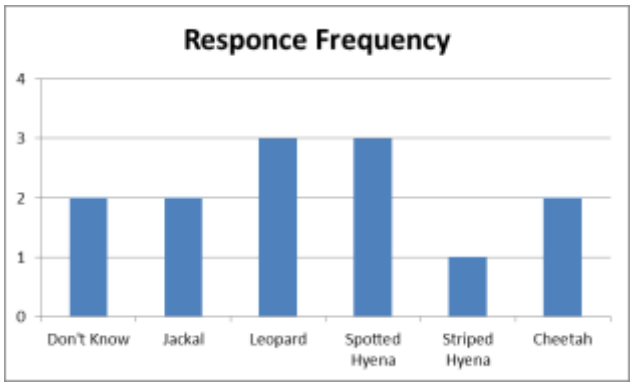


Figure 4: Reported Livestock Loss in Past Year: Predators believed to have caused livestock loss inside boma in past year. Ten respondents had livestock losses in the boma, but one stated both cheetah and spotted hyena and another stated jackal, cheetah and striped hyena. None of these conflicts were previously reported to ACK or verified by Field Officers.

We asked each interviewee the frequency at which they believed predators visit their boma. Following the interviews we conducted one month of boma monitoring around six of the bomas that perceived the most frequent visitation by predators. Figure 5 shows the frequency of perceived visitation. During the month of monitoring there were light rains, the season during which the respondents claim that the seasonal visitations should increase.

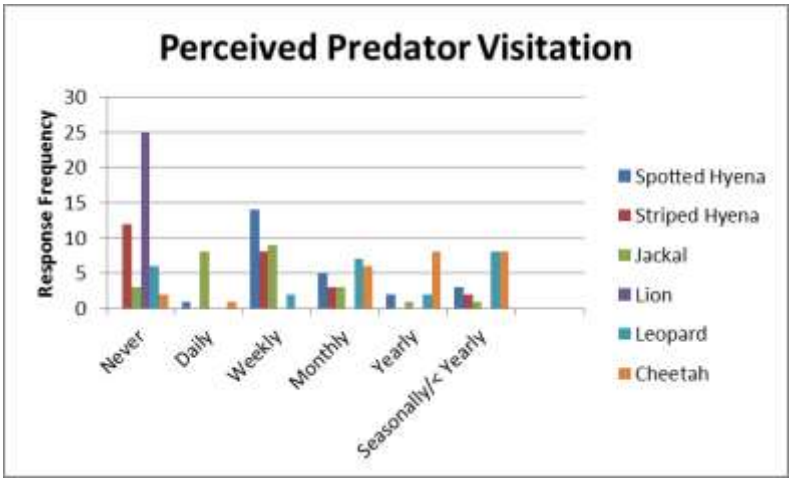


Figure 5: Perception of Predator Visitation to Salama Bomas: Predators believed to visit 25 livestock bomas throughout the previous year. Caracal, serval and honey badger were also mention as other predators visiting from weekly to yearly and sometimes taking goat kids or chickens.
Photo: Spotted hyena

With the data received in the interviews we selected six shambas at which we conducted one month of monitoring to confirm species and frequency of actual visitation. After the month of monitoring we then set up camera traps and continued monitoring at the two most frequently confirmed potential conflict sites. The Field Officer believed that visitation should be evident (rains did not affect the tracking around the boma). Foot monitoring confirmed predators that passed within 30 meters of the livestock boma (Figure 6). Only two jackals and one leopard were tracked to have come to less than 15 meters, but during the monitoring no livestock were attacked. Field officers felt that each of the bomas being monitored had adequate enclosures to prevent future attacks. Crop raiding occurred at least weekly during the monitoring time.

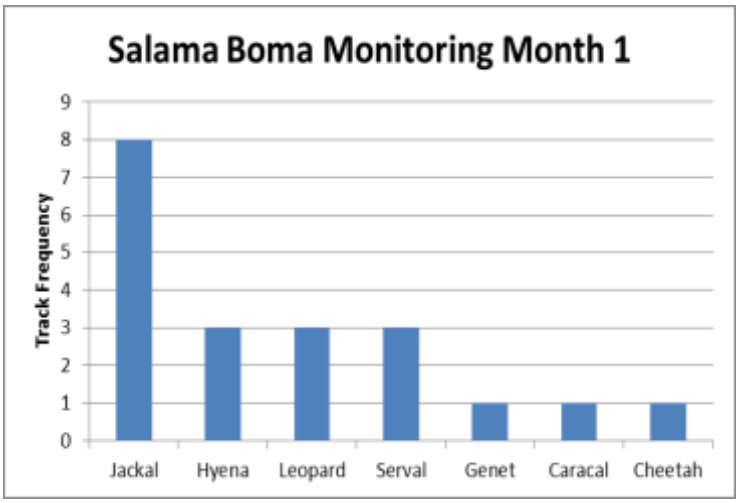


Figure 6: Actual Predator Visitation to Salama Bomas: Predator visitation at six bomas selected for one month monitoring. Jackal were the most frequent predator found to visit livestock.

Photo: Silver-backed jackal

For the past several years, ACK Field Officers have been advising community members on methods of protecting their stock from predators. During the interviews we asked what protective measures the farmers implemented to protect their stock. Strong/predator proof fences were listed by thirteen of the interviewees as the primary protection against losses. Of the 13 people who listed fencing/good bomas as the primary prevention, only four had night time losses in the previous year. Three of the respondents reported keeping their goats in a secure building at night, but stated that the buildings were built after the livestock loss occurred to jackal. Nineteen respondents reportedly keep dogs as a primary alert to predators. ACK Officers provide information about the effectiveness of healthy and well-fed dogs, they alert people to area vaccination details and give advice of a well-balanced dog diet. Healthy and well-fed dogs are more likely to bark and will less often chase game for food. People stated field loss preventions as hiring good herders, and assuring stock is returned to the boma before dusk. In all investigations conducted by ACK officers in previous years, the most common herder behavior associated with the loss was a lack of presence with the herd in mid-afternoon or early evening.

Historically, cattle ranching was not only the greatest income generator in this region but this area ranked high in national productivity prior to corruption in the management of these share-holder ranches. Grasses in the area are best suited to rotational cattle grazing, but most of the settlers in the area keep more goats and sheep than cattle due to the small plot sizes. After land subdivision, the residents of this area were encouraged by local administration to plant crops as a sustainable income despite low rains and poor soil quality (See Salama Natural Resource Planning section). Crop raiding was listed as the highest impact on the livelihoods of the people, and thus our focus in the deterrent lighting shifted from predator loss prevention to crop protection. However, during the study, even farmers who protected their crops with good fencing and diligent daytime security had low yield in due to the drought. During this study, extreme drought not only caused low yield, but also resulted in any crop raiding being seen as the greatest threat to the livelihoods in the area. Nearly all (n=23) of the respondents suffer from crop raiding. Nine respondents had both day and night raids, eleven had night raids only, and only one had daytime raids only (by dikdik). The game species most frequently seen in the crops were dikdik, but those causing the most damage included baboon, vervet monkey, wild pig, eland, kongoni and zebra (Figure 7).

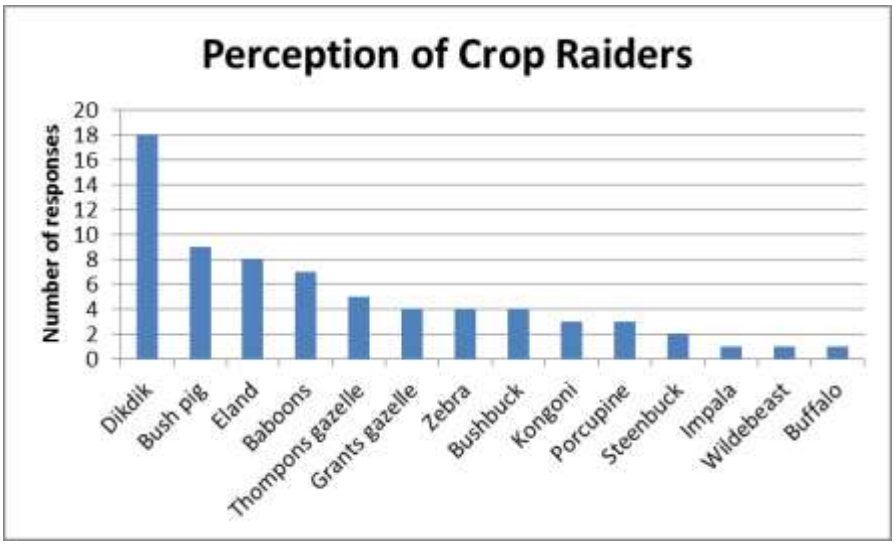


Figure 7: Perception of Crop Raiding on Salama Shambas
Crop raiding perception shows dikdik to be the most common species entering the shamba (crop field), however bush pig, eland and baboon were listed to cause the most extensive damage. Guinea fowl and other birds were listed as raiding the shamba immediately after planting of the seeds.

Photo: Kirk's dikdik

Boma monitoring in the first month confirmed the species mentioned by the respondent plus a several other species that were not mentioned as entering the shamba (Figure 8). It was immediately noted that most of the people interviewed had partial or poorly maintained perimeter fencing. Although we stressed to them that the deterrent lighting was not a replacement to well-maintained fences, none of the people in the study were financially or physically committed to adequate fence improvements. We proceeded with the deterrent lighting in order to show them that the lights could possibly reduce their frequency of invasion, but remained adamant that this would not be a long term solution unless fence improvements could be done to support the lights.

Photos: *Crop loss is most devastating when compounded by drought and inadequate fencing. Although dikdik and baboon were ranked the most frequent crop raiding species in the interviews, it was vervet monkey and zebra that were most frequently captured on camera traps.*

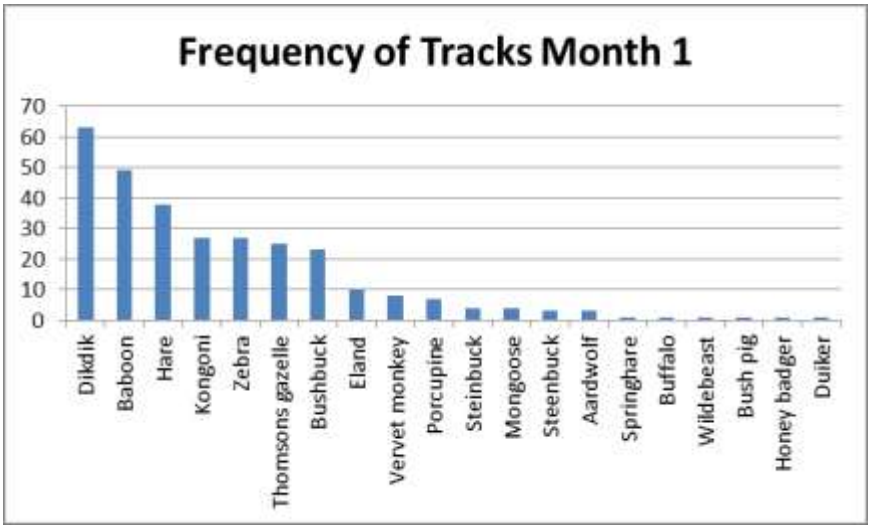
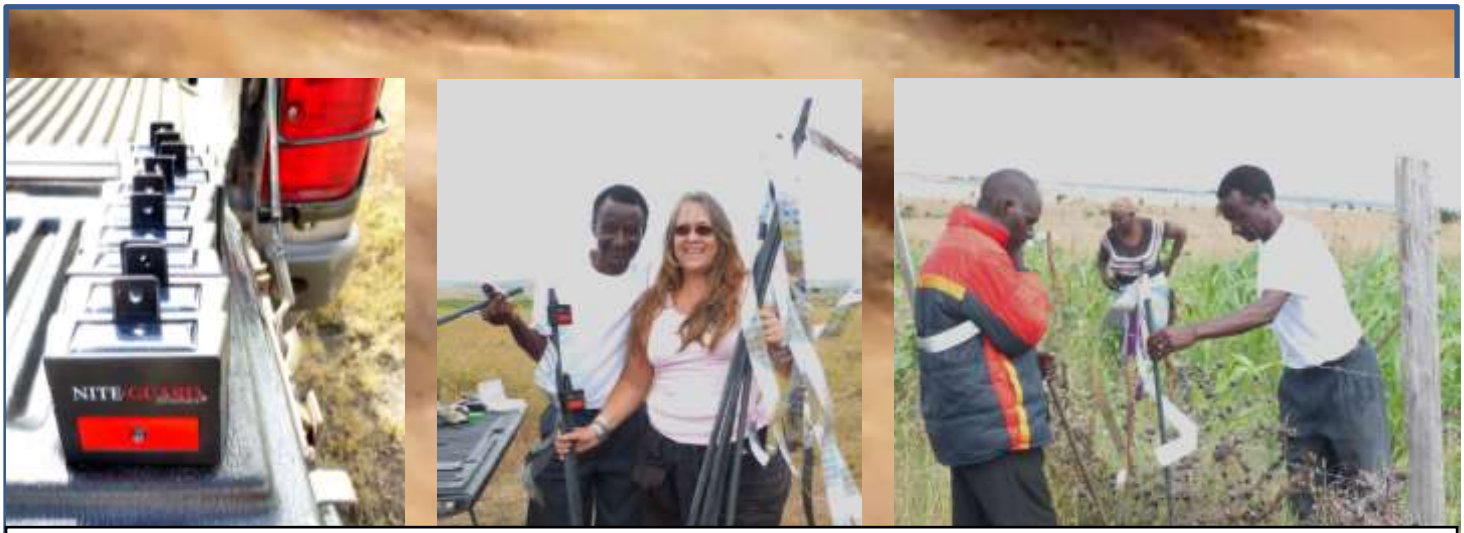


Figure 8: Perception of Crop Raider Visitation along Perimeter of Salama Shambas: Although these species were tracked along the outside of the shamba, not all actually entered through the perimeter.

One shamba that we had chosen to receive lights was invaded by bush pig, baboon, vervet and buffalo prior to installation of lights. The owner of the property believed that we were not assisting

in damage prevention and asked us to discontinue the study on her property. During the third month of the test, drought caused crop failure in all of our study shambas. The monitoring was discontinued in April. After the next planting season in July, we installed Predator/NiteGuard (PNG) system. The PNG system was completely ineffective against the zebra, wildebeest, and hartebeest. The Lion Elephant Deterrent Systems (LEDS) was placed on the selected shamba. We selected a different shamba to receive the PNG system. Following the installation of the lights we knew that the PNG system would turn on each night automatically, but the LEDS system required the owner to bring the battery from the solar panel charger to the fence to turn on the system. Our monitoring at both systems showed a great decrease (80% less invasion) in game passing through the fence, but visitation of game to 15 and 30 meters of the fence was only slightly decreased (10%). Raids that did occur with the lights installed incurred a large loss to the farmer in even a single night. We used reflective plastic tape on 10m poles around the shamba with the PNG system to reduce baboon and vervet intrusions. The owner of the shamba with PNG was extremely proactive in fence improvement and he moved the lights and the reflective tape every two weeks. He reduced his loss to all crop raiding by 100% at night and by 90% during the day, but expressed that the preventative measures are very labor intensive. His profit from the protected crops more than paid for the extra labor, but if he did not have the funds to pay the extra labor he would not have had such a good yield. We installed a second PNG system at the first selected site as well. Wild pigs, Eland and buffalo still visited the shamba through gaps in the fence. This shamba owner was making fence repairs and there was a large amount of personnel activity through the day. Reduced daytime raids could not be attributed to the light or reflective tape, thus the owner chose not to keep the system.



Photos: *Testing the Nite Guard system and reflective deterrent tape. Although this system reduced the losses during the night in the beginning, the animals quickly habituated to the lights and walked past without hesitation within the first month. The tape did not hold up to the evening winds and became litter in the shamba.*

Both of the final farmers testing the deterrent systems agreed to purchase the systems at a subsidized rate. However by the end of the year, the farmer with the LEDS lights was experiencing battery and connection problems in addition to more broken fences. The LEDS test site was in the Malili area where zebra, wildebeest and kongoni are resident. Neighbors and KWS regularly chase zebra from other plots and the LEDS test site owner claims that the chased zebra run into his fence so frequently that repairs are not possible. We recommended that he increase the number of droppers and other visual barriers around his shamba to make his fence easier for frightened animals to see, however at the end of the year no further improvements were made. ACK and the LEDS project manager (Michael Mbithi) made plans to visit and consult with the farmer prior to the next planting season.

Additional light testing in the Samburu study site occurred simultaneously and the results will be discussed in section 3.4.2. The LEDS lights proved most effective in night time raids, but on large shambas is cost prohibitive, high maintenance and subject to theft. The PNG system is easier to install and maintain, however is easier to steal and also requires regular movement of the lights to remain effective. For improved day-time deterrent the reflective tape is also needed, and must also be moved regularly. In both cases it is important that the farmer continue fence maintenance in addition to the light maintenance. No one solution will remain effective without diligence. Using this pilot study we accepted a student to conduct additional testing in Samburu in 2015.

3.1.2 Salama Wildlife Mortality

ACK field officers record animal mortality with particular focus along the Mombasa Highway. They also look for snares and other mortalities during their field patrols. Out of the nine snares removed, six were removed from the Konza ICT fence and three were in the Stanley and Kima ranches. Near the Ulu Conservancy (north western side of study area) rangers from Ulu conduct regular patrols and removed additional snares that were not documented by ACK staff. Poaching in the Malili area is conducted using motorcycles or vehicles chasing game in the evenings and early mornings either into the ICT fence, or just chasing them to exhaustion and cutting their back legs. ACK staff works with KWS to create a network of informants in the Malili area, but as more settlement occurs it has become the norm for KWS to chase game away from the area. Thus the general public also feels that chasing game should not be reported as it appears to be encouraged.

Date	Location	Latitude	Longitude	Species
1-Mar-14	Kautandini	301653	9802652	Serval
4-Apr-14	Kautandini	302372	9799882	Hare
20-Apr-14	Aiimi	306913	9794068	Genet
28-Apr-14	Salama	306913	9794068	Serval
2-May-14	Kautandini	301546	9802678	Hare
2-May-14	Salama	306859	9794258	Porcupine
20-May-14	Mombasa road	306404	9793257	White tailed mongoose
23-May-14	Kautandini	300623	9804590	Hare
19-Jun-14	Corner Mbaya	301116	9803190	White tailed mongoose
26-Jun-14	Ndovoi	302161	9800600	Spotted hyena
28-Jun-14	Malili	300366	9805206	Bat-eared fox
2-Jul-14	Mombasa road	305829	9797096	African Civet
15-Jul-14	Mombasa road	299928	9806498	Duiker
15-Jul-14	Mombasa road	300636	9804825	Hare
17-Jul-14	Mombasa road	296190	9810040	Hare
23-Jul-14	Kona mbaya Aiimi	304199	9798423	White tailed mongoose
23-Jul-14	Kona mbaya Aiimi	304383	9798003	White tailed mongoose
20-Dec-14	Aiimi	300191	9808396	Serval

Table 1: Salama Mortality Recorded mortality was primarily along the Mombasa Highway.

Photos: *Top: African Civet Bottom: Although it could be confirmed that the porcupine was hit by vehicle, the field officer found the quills and feet in a sack, abandoned by the offender when the ACK officer approached. Two other porcupine poaching incidents were reported.*

In recorded wildlife mortalities, the majority of the incidences were caused by vehicle collision on Mombasa Highway. Compared to 2013, not as many hyena (n=1) or serval n=2) were hit by vehicles. Hare (n=5) and white-tailed mongoose were most frequently reported mortalities. (Table 1)

Other mortalities included two buffalo that were shot by KWS when they moved from the Ulu Conservancy into the community in the Aimi area. People tried to chase the buffalo using motorcycles, thus by the time KWS arrived the animals were extremely agitated and dangerous. Motorcycle drivers assisted KWS in hopes of getting game meat when the buffalo were shot by KWS. After one person was knocked from his motorcycle and a buffalo charged a vehicle, the decision was made to kill the animals. Had the community been calmed rather than allowed to assist in chasing the buffalo, it is likely that the buffalo would have gone to Stanley Ranch or returned to the Conservancy on its own. One other buffalo remained after the incidence and returned to the Conservancy. A puff adder was killed by an eagle, and two kongoni died in the ICT area from drought. One kongoni and one wildebeest was found poached and other signs of poached animals were recorded but could not be identified (stomach and blood only remained). Reports of high wildebeest, zebra and kongoni poaching around the settled plots in Malili and along the ICT fence were passed on the KWS. Two poachers were arrested by KWS with game meat including impala, Thompson's gazelle and kongoni. ACK also reported to the Machakos Warden that there were increased reports of porcupine being poached for the black-magic practices and on two occasions our scouts found skinned carcasses of porcupine missing feet and quills. Currently all KWS activity for the Makueni District is conducted from the Machakos outpost. It is expected in 2015 that KWS will open a new office in the Makueni District and hoped that this will increase capacity and education activities in the Salama region.

For domestic species our main focus has been in highway mortality. Along the Mombasa Highway dogs were most frequently hit by vehicles. Field Officers recorded 25 domestic dogs, three domestic cats, one goat and one cow hit by vehicle. Cattle and goats are often herded through drainage coverts running under the highway to avoid the heavy traffic.

It was noted that several cattle brought into the area by the Maasai died of drought. Traditionally, the Maasai would have brought their cattle into the Malili plains only during severe drought. The area would be generally avoided as it was where wildebeest give birth in February and harbors Malignant Catarrhal Fever (often deadly disease that is spread through wildebeest placenta). Due to the 5000 acre fenced Konza ICT the cattle could not be grazed within the fence and many herders trekked their cattle into the area from remote locations to find no water or grazing area available to them. Hundreds of cattle carcasses were around the ICT center and along the Konza road.

We collected information along the entire length (36km) of the Salama study area to correlate highway mortality with vegetation (50 m from road), water (500 m from road), fences (50 m from road) and permanent settlement (500m from the road) to evaluate if any of these factors could be influencing the locations of mortality. There were 61 permanent homesteads between 60 and 500 meters from the road (average 200m). Two large permanent villages (Salama and Malili) and one smaller market center contain stores, restaurants, kiosks and lodges. There were three permanent lodging facilities and five churches. Additional water kiosks (n=5) and temporary homes (n= 3) were set up near the road. A permanent district headquarters is made up of resident accommodation and several office buildings. A temporary camp was built inside of the Malili ICT fence. There is rarely more than one km between some sort of permanent building except along the 4km stretch of the Stanley Ranch.

There were 17 water points along the highway ranging from lugga (temporary streams) to dams within 500 meters of the road. Water accessibility from the dams ranges from the day of the rain only to dams that hold water for a few months after the rains. Only three of the dams typically

provide water throughout most of the year. The vegetation was classified for 50 meters from the road as the canopy and ground cover. The majority of the distance there is a secondary road running along both sides of the highway with limited access to vehicle. There were 72 secondary roads branching off of the highway to schools, homes and settlements. A student will conduct a more detailed study and run the statistical evaluation of these factors as a part of his project in 2015.

Photos: *Mombasa Highway is a source of high mortality for wildlife and livestock. To better understand the corridors we mapped surrounding environment and conducted traffic counts at different times of the day.*

3.1.3. Elephants in Salama

After nearly ten years of absence from this area, we were visited by elephants in December 2014. A group of three elephants came into the Kima area near the boundary of Stanley Ranch on 6 December. Reports began coming to the scouts at 3AM and by first light the entire ACK field team arrived at the report site. At first visit there were several community members with spears and poison arrows prepared to try to scare the elephants away. KWS was called as soon as we had confirmation of the sighting, but they were unable to attend the sight because other elephants were in the neighboring area of Emali and had killed a person. ACK field officers worked with local administration to control the crowd throughout the day. As darkness approached the three elephants had remained calm and were still grazing in the Kangi area of the Kima Estate. Through the night the elephants moved across the railway tracks and into the Masailand in the direction of Amboseli. The most impressive action of the community was the response of people in Salama town when some people came into a pub and asked if people would assist in tracking the elephants to kill them. The members of the community escorted the poachers back to the bus station saying, "*No elephants will die in our area!*" Ten days later a bull elephant with large tusks came into the area. Again the ACK team worked with local administration until KWS officers arrived late in the afternoon. At both elephant encounters as many as 300 people gathered to see an elephant, many for the first time in their life. At no point in the second encounter did the people express a desire to kill the elephant, but they did fear that herders were at risk if the elephant stayed in the grazing area. KWS used smoke bombs to direct the elephant southeast towards the Masailand where people are more accustomed to living with elephants. For the past two years rain has failed and the entire region suffers from drought. We believe the elephants came into the area in search of water and forage as the trees in the area still had leaves. ACK rewarded members of the community who informed us of the elephant movements and who assisted with crowd control by giving out 30 shirts from *Hands Off Our Elephants* and *Ivory Belongs to Elephants* campaigns. Thank you to Wildlife Direct and Elephant Neighbors Centre for donations and reduced rates on the shirts and to Maggie and Alan Binks for contributing to the t-shirt purchase.

***Photos**: Elephant in bushland area between settlement, and crowds of people gathering to see the elephants. T-shirts were given to people who assisted with crowd control to allow the elephants time to move out of the settlement area.*

In 2014, construction of the Standard Gauge Railway (SGR) began between Nairobi and Mombasa. This railway line is to accommodate high speed railway transport of passengers and commercial goods. The railway is being constructed through contract with the Chinese Government. Culverts and overhead bridges were planned by the engineering and planning, however locations of the passageways for wildlife and livestock are not in locations of predator safe passageways. In the areas of giraffe, the bridges are not high enough for giraffe to pass through. In areas of elephant crossings, the passages are not frequent enough and we believe the issues with elephants reaching Salama are due in part to the inability of the elephants to cross back through to Kajiado. Plans are underway for meetings with administration, KWS and concerned land owners and conservation groups from the area.

3.2 Athi-Kapiti Study Extension

In March, the completion of the Masters thesis project by Noreen Mutoro marked the end of our first detailed work in the Athi-Kapiti area. Out of 287 scats collected only 27 scats could be positively identified as cheetah from the hair found in the samples. Cheetah scats were collected from the Salama and Athi-Kapiti study areas between June 2012 and March 2014 (Figure 9). A detection dog was trained on two occasions but issues of arthritis (Floris 2012) and a field accident (Mara 2013) prevented us from using the dogs for scat collection. Per recommendation we have re-evaluated our training programme and with funding from Wells Fargo Security have hired a designated dog trainer (Susan Kuria) who will complete her veterinary degree from the University of Nairobi in May 2015. Susan will complete handler training and will supervise conservation detection programmes in scat and illegal wildlife trade.

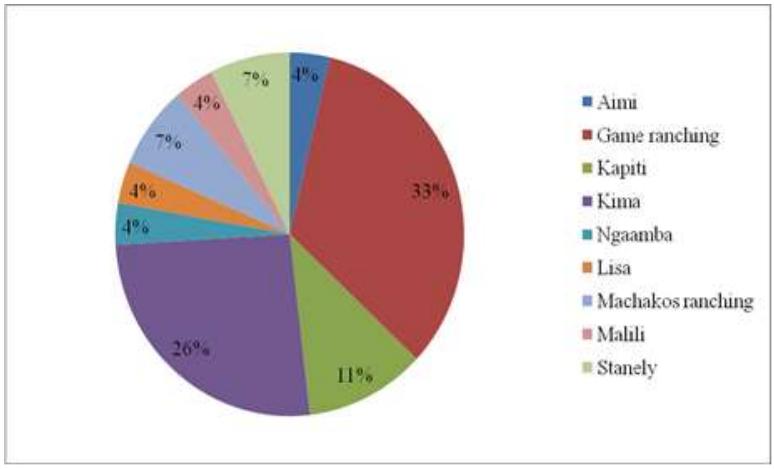


Figure 9: Scat Collection by Ranches in Salama and Athi-Kapiti Percentage of cheetah scat collected in farms within the study from 2012-2014

A total of 106 prey items (21 species) were identified in the analyzed scats of the cheetah. Preliminary results from Noreen's work show that cheetah diet contained 21 prey species ranging in size. Selection was dominated by Grant's gazelle (26%) cape hare (22%), and bushbuck (19%) dominated the prey selection. Goat also made up 19% of the cheetah diet. The rest (44%) of the cheetah diet (53%) was derived from 17 other animal species (Table 2). The wild ungulate prey was significantly higher compared to the domestic prey in the hairs that could be identified.

Game counts and vegetation surveys were also a part of this study. Game count classified potential prey abundance to estimate biomass of prey available for cheetah consumptions. Using the known preferred prey and the vegetation across the study area, Noreen modelled the habitat available to cheetahs. The vegetation survey included ground cover and woody vegetation classification (based on height and canopy cover). Using the locations of cheetah scat and verified cheetah sightings during the fecal collection period, Noreen measured the habitat confirmed to be used by cheetahs. While it is not possible to classify non-use areas she can confirm the known use area habitats. Noreen is working on the publication that will further discuss the relationship between prey abundance and cheetah prey selection.

Prey type		Frequency of occurrence	
		Actual	%
Grant's gazelle	*Gazella granti*	7	25.9
Cape hare	*Lepus capensis*	6	22.2
Goat	*Capra hircus*	5	18.5
Bushbuck	*Tragelaphus scriptus*	5	18.5
Spring hare	*Pedetes surdaster*	3	11.1
Sheep	*Ovis aries*	3	11.1
Zebra	*Equus burchellii*	3	11.1
Giraffe	*Giraffa camelopardalis*	2	7.4
Kongoni	*Alcephalus busephalus*	2	7.4
Wildebeest	*Connochaetes taurinus*	2	7.4
Baboon	*Papio anubis*	2	7.4
Impala	*Aepyceros melampus*	2	7.4
Rock hyrax	*Procavia capensis*	2	7.4
Cow	*Bos taurus*	1	3.7
Common duiker	*Sylvicapra grimmia*	1	3.7
Thompson gazelle	*Gazella thomsoni*	1	3.7
Warthog	*Phacochoerus africanus*	1	3.7
Vervet monkey	*Cercopithecus aethiops*	1	3.7
Steenbok	*Raphicerus campestris*	1	3.7
Lesser kudu	*Tragelaphus imberbis*	1	3.7
Giant rat	*Crycetomis emini*	1	3.7

Table 2: Frequency of Prey in Cheetah Scat Prey found in cheetah scat collected from 2012-2014

Photos: *Top: cheetah and lion scat on Kapiti Estate. Center: Noreen Mutoro and Sarah Omusula conducting vegetation survey. Bottom Noreen and Violo Ronoh setting hair samples for analysis*

3.3 Konza Information and Technology Center (ICT) Development (Malili Ranch)

The ICT area is still being developed on 5000 acres of the Malili Ranch. After the dedication and bore hole drilling in late 2013, more roads and entries have been cut. Although in smaller numbers, wildlife such as wildebeest, kongoni, zebra and ostrich can more easily find entry and exit points. When giraffe enter the perimeter of the ICT, KWS organize to chase them out to prevent poaching opportunities. As earlier stated, poaching and chasing of wildlife in the area is a threat to the stability of the Konza area wildlife and is increasing conflicts in the surrounding areas. Between the subdivision and the Konza ICT the area available for wildlife and pastoral use has now been decreased by more than 50%.

Development of areas surrounding the ICT are impacted by the lack of remaining traditional grazing areas. In the past Maasai herders would bring cattle to rent the grasses of the Malili Ranch. With

subdivision, the only remaining grassland is inside the ICT and on the neighbouring commercial ranches like New Astra, Lisa and Kapiti Estate. Large herds of cattle came into the area in September and October, but were mostly turned away by the new settlers. To prevent political conflict the Athi-Kapiti ranches rented out grazing area to some of the herds, but many people displaced by the ICT set up temporary boma along the ICT fence line and illegally took their cattle into the ICT and other ranches at night. On one occasion in November, we counted over 45 cattle carcasses along the road that died of starvation and dehydration. Many more died within the ICT fence and inside the grazing areas. Additional Somali cattle were brought down from the north and suffered similar fates. Once the rains began in the majority of the cattle were moved to the fresh grasses.

3.4 Samburu Study Area

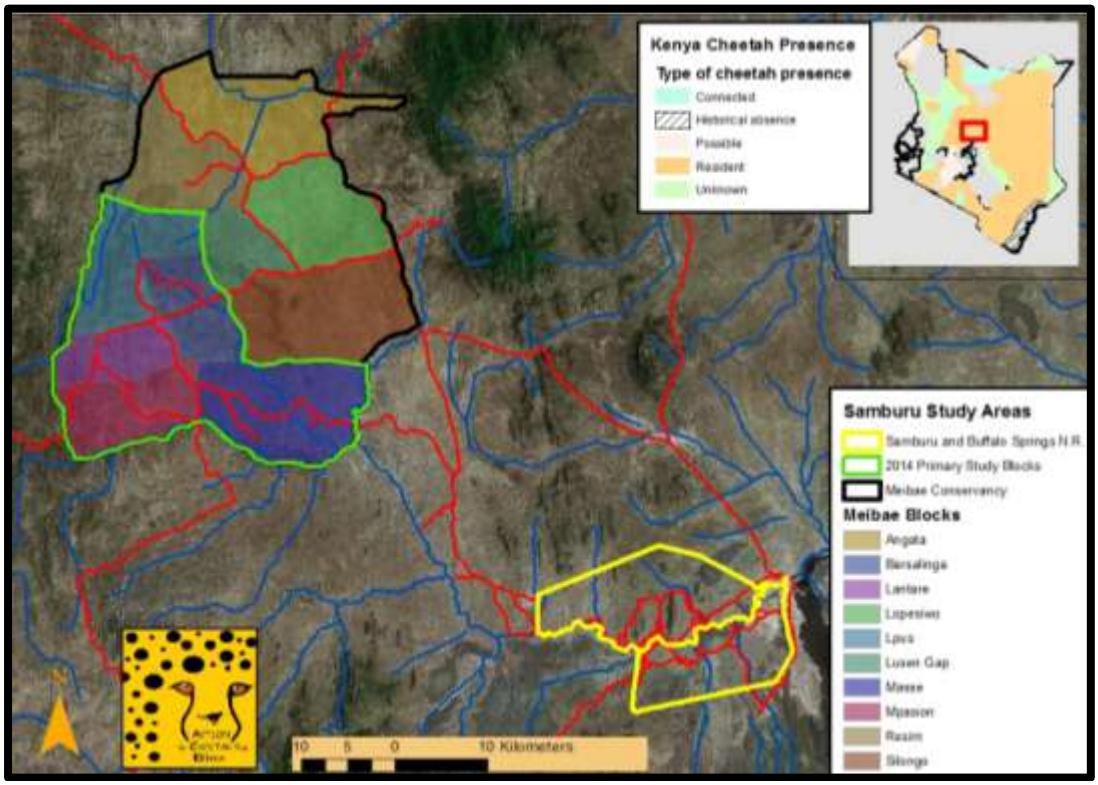


Figure 10: Salama and Athi-Kapiti study sites Extending studies from the Salama to the Athi-Kapiti region enables ACK to monitor shifts in cheetah range from the recent fragmented landscape of Salama to the commercial ranches of the Athi-Kapiti region. Game and predator densities in the Athi-Kapiti ranches provide wildlife friendly mixed farming community.

3.4.0 Samburu and Buffalo Springs Reserves

ACK has worked in the Samburu region since 2009. The Samburu and adjacent Isiolo counties potentially hold more than 1/3 of Kenya's cheetahs according to our 2004-7 National Cheetah Survey. In 2009-10 we worked in the Samburu and Buffalo Springs National Reserves (NR) to test radio collar technology. It was determined that GSM technology and advancements in small batteries with long term capacity will be adequate in this region to achieve long term cheetah movement information (see 2009-2011 ACK Annual Reports). In 2010, we moved our efforts into the West Gate and Meibae Conservancies where frequent cheetah sightings were being reported to the Northern Rangelands Trust. We continue to receive cheetah sighting reports and to visit the Reserves to confirm cheetah presence, but we chose to focus our long term monitoring efforts in the Meibae Conservancy due to high cheetah reports, high conflict reports and the lack of any other carnivore work in this area. The Ewaso Lions Project (ELP) collects cheetah and lion sighting information in Samburu, Buffalo, and Shaba NR and in the West Gate Conservancy. ELP shares the cheetah reports with ACK. Additionally, ACK visits the Samburu NR several times per year to

document cheetah sightings and verify ID's. In 2014, there were eight cheetah cubs born in Samburu and Buffalo NR. The mother cheetah that was collared and produced two cubs in 2011 has moved between the two Reserves and raised two more cubs to near adulthood in 2014. Two single male cheetahs frequent the Koitigor and Larsons area of the reserve and a coalition of two males are regularly seen around the Sopa Lodge area. An additional 3-4 females (ID's not yet confirmed) with 6 cubs total have been reported in Buffalo Springs NR. ELP reports frequent tracks of cheetahs with only one confirmed photo of two males. We know that a female from Meibae moved into Westgate with five cubs in Dec 2013 and is suspected to still be moving between Westgate and Meibae with at least three sub-adult cubs through 2014.

***Photos**: Natanywe was radio collared in 2010. The collar was removed in 2012 when her cubs were about one year of age. This year she raised two new cubs to adulthood. Mom and growing cubs were seen repeatedly through the end of the year.*

3.4.1 Meibae Conservancy Wildlife Monitoring

Three Field Officers conducted patrols and transects in the southern section of the conservancy. Patrols provide us with a distribution map of wildlife by documenting predators, prey and other significant species (elephants and Grevy's zebra). The jackal is the most frequently sighted species while a large number of hyena tracks (both striped and spotted) are found throughout the area (Table 3). One Lion came into the Remot region of the conservancy but returned to the West Gate Conservancy after only a brief visit.

Wildlife are recorded as they are seen by the Field Officer. Wildlife patrols are conducted at random locations through the blocks within the area each scout is expected to cover. This information can tell us the distribution of species, but does not provide density or abundance. The patrols assist us in interacting with the community and with assuring that our formal transects are set in the right locations. The most frequently seen species are those that are often referred to as preferred cheetah prey (Figure 10). The frequency at which the prey species are seen during foot patrols indicates an adequate prey base to support cheetahs and the other predators in the area.

Predators				
Species	Sighting	Track	Total Count	Average per sighting
Aardwolf		1	1	1.0
Bat eared fox	1		3	3.0
Caracal	2	1	4	1.3
Cheetah	5	22	27	1.4
Hyena	16	167	191	1.0
Jackal	118	13	243	1.9
Leopard	2	15	17	1.0
Lion	0	1	1	1.0
Wild dog	5	2	92	13.1

Table 3: Predator sightings and tracks in the Meibae Conservancy. While jackal are the most frequently sighted specie, hyena tracks are the most common.

Photo: *Like this sighting in the Barsalinga area, most cheetahs are seen individually in the Meibae region.*

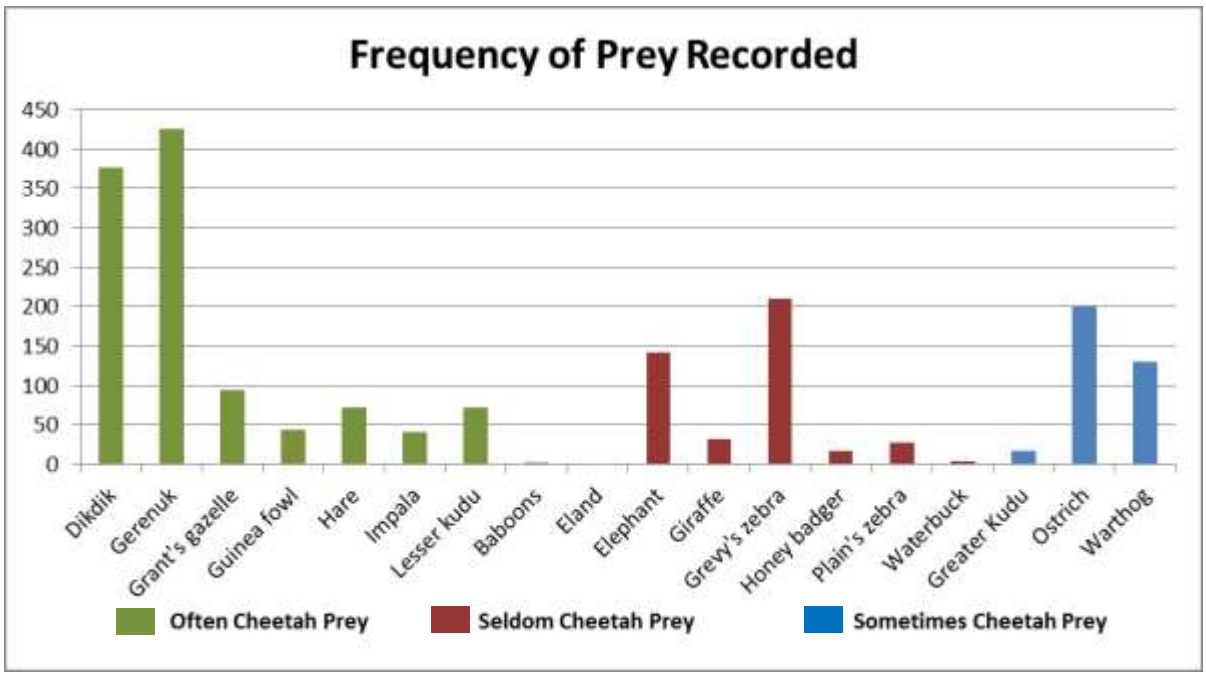


Figure 11: Prey species recorded on foot patrols in the Meibae Conservancy. Dikdik and gerenuk remain the most common recorded prey species. Elephant and Grevy's zebra are also frequently found in all areas of the conservancy.

Each scout conducted four monthly transects using the same trails from April 2013 - July 2014. Transects are 5km in length and 400m in width to provide a sample of the areas where wildlife is most abundant, where settlement is most abundant, along a main road and in game corridor areas. This sample provides us with the density and abundance changes over time and can be correlated to seasonal movements of livestock. Preliminary results show that the there was little difference in the sightings in 2013 compared to 2014 (Figure 12).

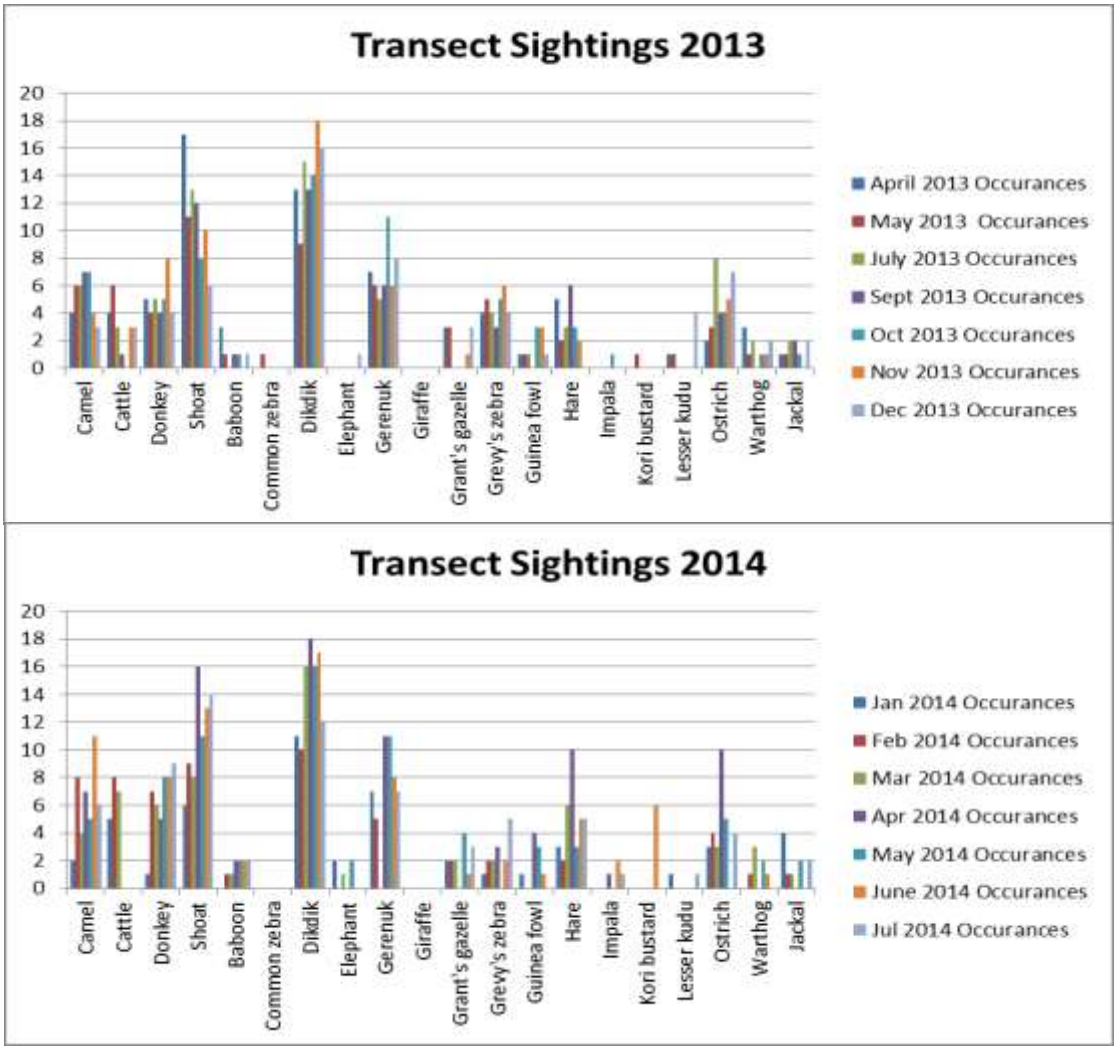
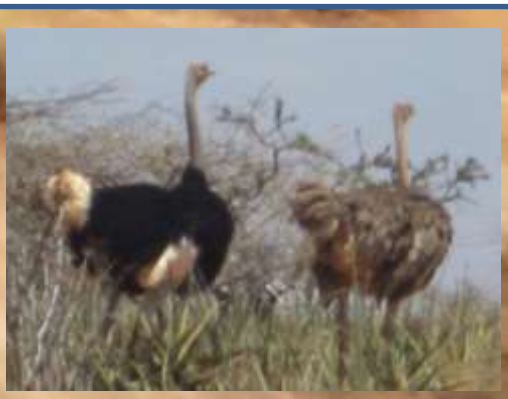
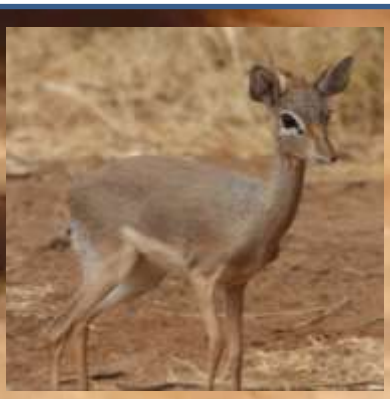


Figure 12: 2013-14 Walking Transect comparisons in the Meibae Conservancy. Transects conducted in 2013-2014 over two dry and two rainy seasons. Despite severe drought causing cattle to be moved out of the area, wildlife sightings remained fairly stable.

We were interested in the potential changes of wildlife numbers in times when cattle moved away from the area. Although we expected that wildlife sightings would increase when disturbances caused by cattle grazing were removed we saw a very small correlation in the departure of the cattle to increased wildlife sightings (Figure 13).





***Photos**: Regularly sighted species during Meibae transects include ostrich, jackal and dikdik. Changes in wildlife sightings have more correlation with rain cycles than with the presence of cattle.*

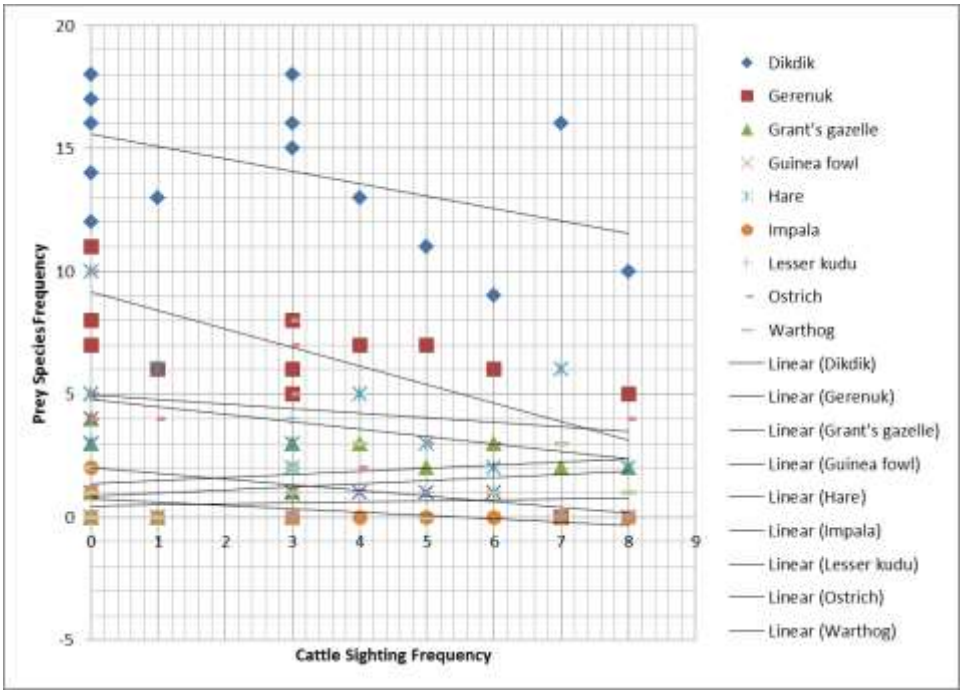


Figure 13: Game changes with Cattle Migration. A scatter plot with cattle compared to preferred cheetah prey appears to show a decline in most species; however the R^2 values in this correlation are not significant
(R^2 values: Dikdik = 0.2442, Gerenuk = 0.5333, Grant's gazelle = 0.0699, Gunea fowl = 0.245, Hare = 0.1185, Impala = 0.3774, Lesser kudu = 0.0107, Ostrich = 0.042 , Warthog = 0.1211).

3.4.2 Meibae Conservancy Conflict Mitigation

Field Officers began investigating predator HWC in 2014 using forms developed in Salama. The Samburu community has a high tolerance for livestock loss to predators as a part of their culture, thus have not been in the practice of reporting losses unless they are severe. ACK Field Officers are now well known and trusted in the community, thus we felt we could begin the conflict mitigation process without becoming bogged down in the County issues of compensation. Our investigations include verification of the predator, investigation of the carcass and interviewing the owner/herder about details of the loss. It has still been quite challenging to initiate this kind of a programme at the same time as the County Compensation programmes are implemented without being seen as the same programme.

In March, we conducted 30 interviews at manyattas in the Lpus, Masse and Lekiji regions. All of the respondents have lost livestock to predators. Seventy-three percent of the losses occurred at night, mostly to spotted hyena. Three people suspected leopard, two suspected cheetah three said jackals were responsible for night time livestock losses. Cheetah, wild dog, leopard and jackal were identified as daytime predators on livestock. Wild dog attacks were less frequent, but when they do attack a herd they result in 12 - 40 head of livestock being killed. Our mitigation at this time is to prevent the night time losses as night losses have the greatest impact to the people. We are also working with Savanna Tracking to test systems that will most impact losses using lights, sounds and early detection methods.

In the 30 interviews, 198 livestock were reported to be killed and 90 were injured in night time attacks in the previous one year. We evaluated the frequency that the manyatta owner believed they were visited by predators (Figure 14) as a criteria for selection the six bomas to be monitored for a three month study. Additional criteria were based on the frequency of visitation by multiple predators, the stability of the boma (if the owner was likely to move in the next three months even if rains arrived we did not choose them for monitoring), and the willingness of the respondents to participate in several months of evaluation and light deterrent testing. We conducted one month of foot patrols at six manyattas to verify frequency of visitation. From the foot patrol data we found strong accuracy in the suspicions of visitation represented in the interview.

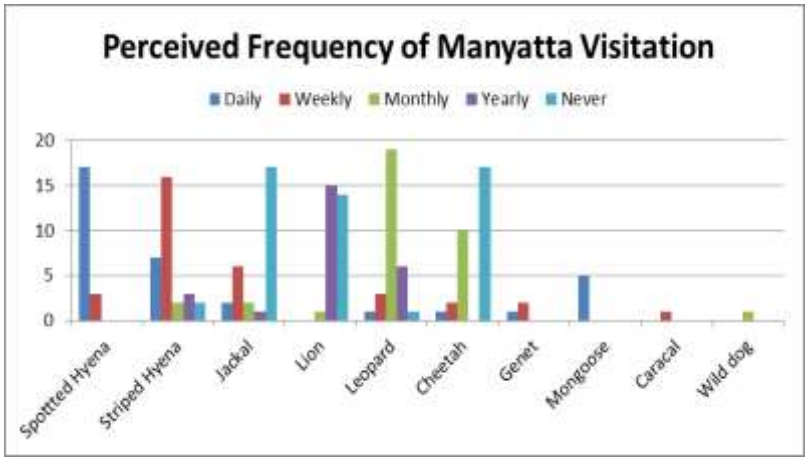


Figure 14: Perceived Predator Visitation. Frequency that the thirty respondents believe predators visit the manyatta (even if they had no losses in the past year).

***Photo*:** Two hyena and a jackal visiting a manyatta before the deterrent lights were set up. The perception of the frequency of predator visitation was very accurate.

We then set up camera traps at two manyatta to assess the ID of individuals and the amount of time each species spent at the manyatta. Jackal, mongoose and stripped hyena appeared most frequently but seemed to be eating insects, dung and food waste tossed over the fence. Spotted hyena and leopard spent time investigating the manyatta wall, following donkey and camels that were left outside at night and entering the boma (leopard on camera as it jumped a 5 foot by 3 foot fence and took a goat away). In month three we had planned to place two types of lights - Lion Elephant Deterrent System (LEDS) and NiteGuard. However, due to severe drought the manyatta where the NiteGuard were to be placed shifted their livestock. We continued to monitor the LEDS finding that there was one occasion where a hyena came within 30 meters of the fence, but never approached within a distance where they could attack livestock in the boma.

During the drought most wildlife moved away from the Conservancy along with the herds of cattle, camel, goat and sheep. To further investigate the deterrent lights we accepted a proposal for a Masters student from Antioch University, Adrianna Casillas, to conduct a more in depth project using our pilot study as a base. We continued to discuss long term effectiveness of the deterrent systems with Dr Henrik Rasmussen of Savanna Tracking. To prevent habituation to a lighting system, we hope to continue testing of collar triggers on problem animals to turn on the systems combined with motion sensors and sound alerts. Sound alert tests are being conducted with other carnivore species in various countries for both night and daytime conflict mitigation. Our manayatta and boma testing in Salama and Samburu will continue to test for effective models

3.5 National Survey

In 2004, ACK initiated the first national cheetah survey in collaboration with CCF, KWS, East African Wild Life Society and local partners (Samburu and Isiolo County council, Save the Elephants, Elephant Watch Camp). From the survey we were able to identify areas of cheetah presence and to estimate cheetah numbers through a rapid survey that included field sightings and tracks, reported sightings (resident interviews), and reported conflicts (KWS occurrence records). We interviewed residents throughout the entire cheetah range to determine perceptions of cheetah status. Data from the survey was analyzed by two masters students in 2010-2011 to identify key features in cheetah distribution (publications pending). Faecal studies in 2012-2013 provide ground work for cheetah prey analysis on a national level.

In May 2014, ACK organized a strategic planning meeting with cheetah experts working in Kenya and East Africa. We discussed methods and results from the previous survey and identified goals for the next survey. Although we need to pilot the method in known and accessible areas, we will prioritize areas of least knowledge for the first formal surveys. Additionally, there is far more ongoing studies in Kenya now than there was ten years ago. Thus, field partners will be able to collect more detailed knowledge, provide more historical data, and to assist with access and accommodation for survey staff where additional data collection is required during the survey. In addition to faecal analysis for diet and genetics some goals for other cheetah projects include reproductive hormones and disease. Stress hormone analysis over different land use categories can be feasible where secure projects are established, but may not be feasible on a range-wide scale due to the additional knowledge required. It is hoped that with the launch of the forensic laboratory at KWS we will soon be able to process glucocorticoid within Kenya, and could increase our capacity to conduct all work for the national survey within Kenya.

Objectives of the strategy meeting were determined to be the following:

1. To evaluate the distribution of cheetahs based on range categories established in the Regional and National action plan.
    a. Identify corridors and categorize based on resistance levels (roads, barriers, settlements etc.)
    b. Occupancy/presence/niche categorization - likelihoods and probabilities
    c. Categorize prey availability
    d. Categorize biotic and abiotic influences
2. To determine genetic variation, physiological status, and diet of cheetahs across Kenya
    a. Fecal collection (detection dog)
    b. Genetics
    c. Prey Base
    d. Disease/parasite

(Note: consideration of these aspects will depend on value/feasibility/funding)

    e. Stress
    f. Reproductive hormone
3. To identify and classify threats to cheetahs throughout their range.

(Note: much of this information will come from interviews, and satellite imagery, but will also include information from outside sources - ministry, KWS, ILRI etc.)

    a. Threats/Adaptations
    b. Human-Wildlife Conflict - (most often predator/fecal analysis) KWS data
    c. Impact of land use change (satellite imagery/ remote sensing)
    - Livestock
    - Settlement
    - Vegetation cover/changes
    - Impact of climate change
4. To evaluate community perception of cheetahs and distribute materials to encourage positive perceptions/tolerance towards predators.
    a. Perceptions
    b. Awareness/education material distribution

5 - To work with partners and stakeholders to develop protocols and methods for long-term cheetah conservation efforts

    a. Work with ongoing projects to test methods for long-term range wide databases
    b. Work with KWS to formalize cheetah handling and relocation protocols (capture (when is the cheetah in a location that is a risk to its survival/population and in need of capture?), immobilization, release, translocation (where and how - introductions to new area/monitoring/collaring)

Cheetah fecal analysis for genetics and prey selection will require more consistent capacity for sample collection. Wells Fargo Security is supporting the detection dog programme through

providing salaries for the dog trainers, housing and care for the dogs and transport to field locations. KK Security, Working dogs for Conservation and the Canine units from Ol Pejeta Conservancy will be partners in dog procurement and training. Ms. Susan Kuria has been selected as the detection dog training coordinator. Susan will complete her veterinary university courses in early 2015 and will become the full time trainer and veterinary officer in charge of detection dog programmes at Wells Fargo Canine unit. She will assist with field work and train additional dog handlers.

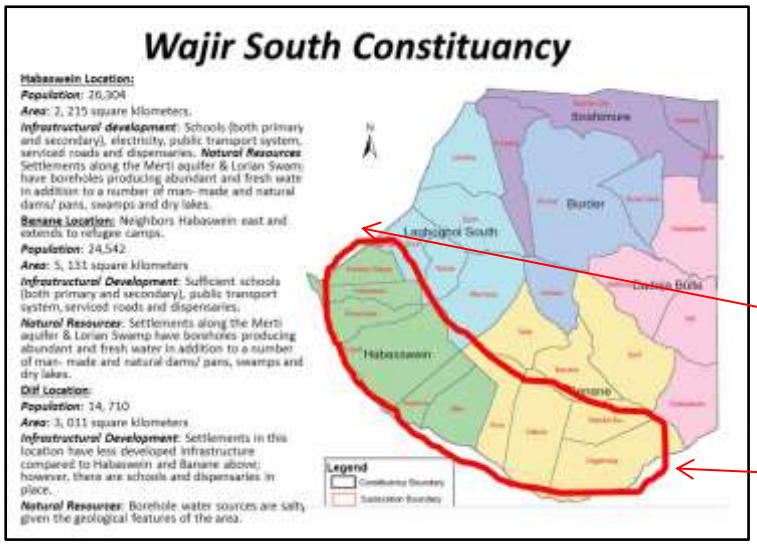
Noreen was accepted by Dr. Gertrud Schaab of Karlsruhe University of Applied Sciences in Germany and a Professor of Geometrics for PhD research. ACK Director, Mary Wykstra met with Dr Schaab and Noreen several times in 2014 to initiate the affiliation and to determine a timeline for Noreen to apply for University acceptance, funding and to begin work in modelling pilot projects. After completing her MSc thesis, Noreen was hired by ACK to complete pending publications in 2015 while laying the ground work for her PhD. Noreen will work with other students in 2015 to test models and assumptions that will further develop her thesis proposal using fecal genetics, fecal prey and rapid survey occupancy testing. The study will be piloted in collaboration with other students for use on a range-wide scale.

3.6 New Projects

3.6.0 Wajir

Interest in the Wajir area began during the 2006 - 2007 national survey field work in that area. Data from Wajir had reported “many cheetahs” but few interviewees could provide numbers or sighting proof. We found tracks and many residents talking about the “large number” of cheetahs causing conflict in the pastoral communities. In 2013, several cheetahs were removed from the area by local community members who caught them and took them to the police station as livestock thieves. KWS moved the cheetahs to other areas of Kenya. Translocation without proper introductions and monitoring means that these cheetahs would not likely have survived, and an alternative solution to the conflicts must be resolved. In late 2013, Mary initiated discussions with the Wajir South Member of Parliament (MP), Honourable Abdullahi Dirirye who was interested in community conservancy development. With a grant from the Disney Worldwide Conservation Fund and support from KWS, we initiated meetings to determine stakeholders and steps needed to implement community conservation and conservancy development in the region. Unfortunately for Kenya and the Wajir area, in 2014 security and political issues slowed the process. After three meetings we determined the area most fit for the conservancy based on land use, wildlife resources and potential tourism would be the south western section between Habeswein and Buder in the Loian swampland.

The next step in the planning process is to meet with and receive support from the county government (Governor’s office) in order to begin community meetings with stakeholders and familiarization trips for key stakeholders. The Northern Rangelands Trust has guidelines for conservancy development and KWS requests need to be submitted to the Director General. Once the exact area and size of the conservancy is determined the community will set the Memorandum of Understanding for the conservancy development.



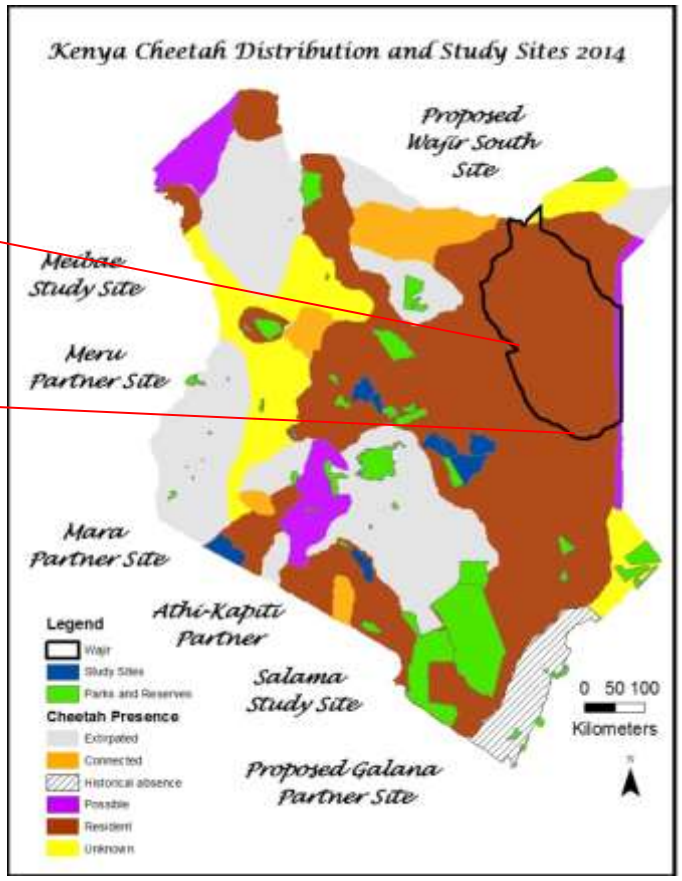


Figure 15: *Area of Wajir County being considered for conservancy.*
Photo: *KWS and administrative representatives with ACK Director at Conservancy planning meeting held at KWS Headquarters in Nairobi.*

3.6.2.Galana Ranch

The Galana Ranch is the largest ranch in Kenya. Ranch Offices are accessed by crossing the Galana River east of Tsavo East's Sala gate. The Ranch has scattered villages over 1.2 million acres. It shares its western boundary with the eastern side of Tsavo East, thus allowing a dispersal area for the wildlife. The CEO of Wells Fargo Security, Gai Cullins, is a shareholder in development of tourism and conservancy status in Galana. ACK shared the data forms used in patrols and conflict investigation to initiate data collection by community rangers in the Galana region. ACK will conduct a field training session with the rangers in 2015 and will assist the ranch in data analysis.

4.0 Community and Education

4.1 Salama - Natural Resource Planning

The dynamics of the Salama study area changed dramatically after subdivision and subsequent Konza ICT development. The people of the area expected that land ownership would benefit individuals and environmental impact assessments were conducted prior to the land division. Predication in the environmental impact assessments presented issues of land degradation, human wildlife conflict and loss of natural resource access including water and plant (grazing and traditional use species). In 2013, ACK initiated a natural resource management planning committee of stakeholders in various roles from community to government administration. Through support from

EcoSys Action (Hong Kong) we launched the planning meetings into the community level using a system called “Conservation Measures Partnership” and a program called “Miradi” (Figure 16). In the first session we clarified to the community representatives (90 members) that they could agree on the definition of a natural resource and a human resource. We then created a mission and targets for natural resource management. In subsequent meetings we identified the threats that depleted or threatened the targets. In the first meeting in 2015 we will develop solutions and results chains to minimize threats and/or re-establish key resources that can sustain a balance between the natural environment and human livelihoods.

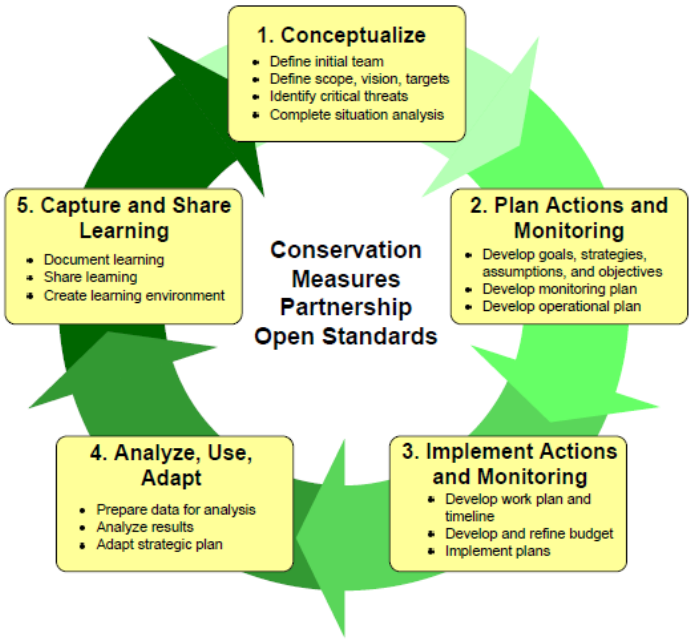


Figure 16: CMP Open Standards Project Management Cycle **(CMP, 2007, p. 4)**

1. Conceptualize what will be achieved in the context of the location.
2. Plan both **Actions** and **Monitoring.**
3. Implement both **Actions** and **Monitoring.**
4. Analyze data to evaluate the effectiveness of your activities. Use results to **adapt** the project to maximize impact.
5. Capture and Share results with key external and internal audiences to promote **Learning.**

Our ***SCOPE*** is the southeastern section of the Mukaa district: including Ngaamba, Salama, Kiu, Kima, Kima-Kiu, Ulu, Ulu Conservancy, Stanley Ranch and Malili areas. (Makueni County).

Our ***VISION*** is a Mukaa ecosystem in which landholder management practices are integrated with the maintenance of a clean and healthy environment that encourages economic growth alongside awareness and conservation of our water, land, trees and wildlife.

There are two areas in this region with different ***TARGETS***:
Natural resources:
Salama/Aimi Area: Dams, A*cacia melifera,* Star grass, Cheetah, Python, Dikdik,
Malili/UluConservancy Area: Dams, *Acacia gerrardii,* Star grass, Cheetah/hyena, Python, zebra,

Enterprise (both areas): Livestock, Crops, Sand

Identifying threats gives the stakeholders the chance to better understand what is directly and indirectly affecting the target. The Miradi programme allows us to create a visual map of the threats and to clarify the solutions that can potentially reduce the threats and increase the sustainability of each target (figure 15).

In 2015, the meetings will address strategies and actions to improve the status each of the targets. Goals for community programmes and level of outside involvement will be determined through creation of results chains. Programmes for improved sustainability in land use practices will be put in place by the end of 2015.

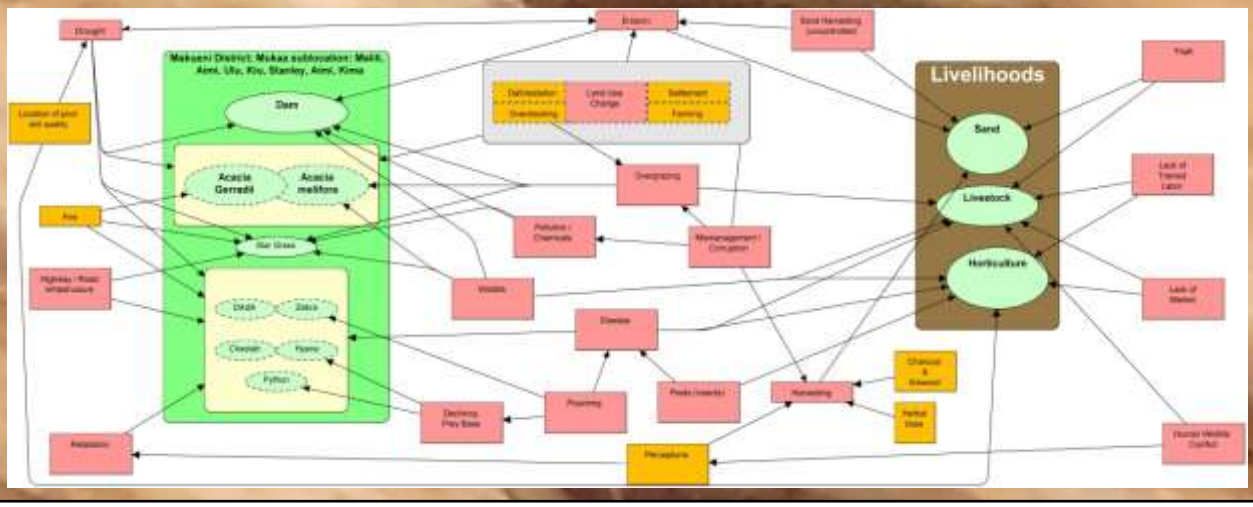


***Figure 15**: Target and Threat map in the Salama area. The map provides a clear visual of threats (pink) and their relationship to the Natural and Livelihood targets established by the community.*
***Photos**: Through group discussions and, break-out sessions the 75 representatives of government, local stakeholders and community members agreed on the targets for sustainable natural resource management.*



4.2 Samburu - Meibae Community Conservancy

In 2014 we finalized an MOU with the Conservancy allowing plans for five years of research and community development. ACK will build a field research camp near the Conservancy Headquarters from which research staff will be based. Each additional researcher attached to ACK and every volunteer and visitor will pay a conservancy fee based on the status of their relationship to ACK. We paid 100,000 in conservancy and camping fees to the conservancy in 2014. Additionally shirts donated by Utah's Hogle Zoo were given to all Conservancy rangers. Plans for additional cameras and ranger training have been made for early 2015. Using computer and phone application for photo submission we will work in collaboration with local partners including the Conservancy, Save the Elephant, Grevy's Zebra Trust and Ewaso Lions Project to develop a secure photo database that can easily be shared with Meibae Conservancy partners.

***Photos**: The MOU was signed in presence of the Meibae Community Conservancy Chairman and County representation. ACK participates in the annual general meeting of the community to share our findings and discuss issues of predator conservation.*

4.3 Machakos Agricultural Show

In June, ACK and KWS set up a booth at the annual Agricultural Fair in Machakos. ACK focused on our Spot the Difference and Build a Better Boma campaigns. The show reaches an audience in excess of 5,000 adults and 10,000 children from the surrounding communities. We strongly believe that our affiliation with KWS provides great benefits to both the organizations and the communities and are proud to be a part of this week-long event. We hope to improve our display and continue to support KWS in their education and awareness programmes through joining them at these events and through joint community baraza (public meetings).

***Photos**: The Machakos Agricultural Show reaches thousands of farmers with information about livestock, agriculture and alternative income. ACK presents information about predators and conflict mitigation at a booth shared with KWS.*

4.4 Salama - School programmes

In February, some friends of Mary's visited on holiday and joined in a tree planting and building dedication at the Ndalanai Primary School. Environmental caretaking is important to the school. We tried to show a wildlife video after the tree planting, but had equipment failure. Plans were made to show the video later in the year, but due to teacher strikes and other circumstances the rescheduling was moved to 2015.

In July, students and teachers from the Kalamazoo Christian High School (KCHS) worked with ACK and with the Kima-Kiu Secondary School (KKSS). The continued focus on clean water and health that began in 2012. Kalamazoo students participated in research in the mornings and spent afternoons building water filtration systems at the Kima-Kiu Secondary School. The visit ended in a traditional football (soccer) match between Kenya and American students and teachers. The bonds and influences that the KCHS trip are not limited to the students, and each visit with KCHS strengthens the affiliation with ACK and the local schools.

***Photos**: Tree planting programmes help students understand environmental caretaking. The Kalamazoo Christian and Kima-Kiu Secondary project also looks at the environment through access to clean water. The Kalamazoo group will return with new students in 2016.*

5.0 Capacity Building

5.1 Staff Capacity Building

In March we said farewell Cosmas Wambua. Cosmas began as a research assistant under Cheetah Conservation Fund in 2002. He was integral in the development of research and community programmes in the Nakuru and Machakos field sites, he assisted with study design on the first national cheetah survey and implemented field research in Nakuru, Salama and Samburu field sites. He was a friend to all of the staff and his presence in the project is missed. We are proud of his accomplishments in completing GIS training, his Master's thesis, and Conservation Biology training while he worked with us. In 2009, Cosmas was appointed Senior Scientist after ACK became independent from CCF. Best of luck to him in his pursuit of higher education and lecture positions in the Kenyan academic world.

Sarah Omusula was hired as the Senior Scientist to continue with staff field supervision, data entry and analysis and programme development. Sarah holds a BSc from University of Eldoret and has experience in field research through internships with KWS, Earthwatch and employment in the forestry field. Sarah aspires to complete her Masters degree, to increase her skills in statistical analysis and GIS in the coming years. Sarah loves being in the field and her passion for Kenya nature is contagious.

In November, our two field teams visited each other's sites for training and to get to know each other better. We reviewed the forms and conducted field work in both sites to assure our staff is collecting consistent and comparable data. ACK supported four staff members in computer training, and one staff member in driver training. Additional staff requests for motorcycle and driver training are being considered for 2015. We hope to support Chris Lentaam in training at the Kenya Wildlife Service Training Institute in the near future.

5.2 Students and Volunteers

As earlier mentioned, Noreen Mutoro completed her Masters field and laboratory work in early 2014 and wrote her thesis during the remainder of the year. Ms Viola Ruto, who worked with us in 2013, was hired as her lab assistant to complete the fecal hair analysis. The first draft of Noreen's thesis was submitted in October 2014 and revisions continued until the end of the year. Noreen worded with Frank Odida as a GIS consultant, with the National Museums of Kenya for vegetation and statistics consultation. Noreen will be employed by ACK in 2015 to complete publications pending from ACK activities since 2001. During the process of completing these publications Noreen will also work with students working in range wide fecal analysis and occupancy models.

Regina Bakely (Cheetah Zoo Keeper - National Zoo), and Matthew Curran (Volunteer - National Zoo) worked for two weeks with ACK in January. They assisted with game counts and fecal searches in Athi-Kapiti, and assisted with data collection and entry for the pilot deterrent light programme in Salama. Both Regina and Matthew are interested in continuing to assist ACK through fundraising and business plan development. Mary spent some time with them in Washington DC during the fall fundraising trip in September 2014. Suze Billmann worked with ACK in Salama and Samburu in May 2014. Suze works with conservation programmes throughout Africa and is an experienced traveler. Through her work in the Netherlands, Suze works with Mediamens in web development and maintenance. Suze saw the need to improve ACK's web and social media and offered not only her own personal assistance, but also contacted Mediamens directors who agreed to host the ACK web site. At the end of 2014, the draft of the new site was submitted and the launch of the site will occur in early 2015. Jeff Foy volunteered with ACK visiting the Salama and Samburu field sites. As a professor in the US, Jeff is very strong in statistical analysis and offered to continue working with ACK to complete publications. Jeff worked on analysis of education data to give us the framework for

funding applications in community education. Both Suze and Jeff continue to assist ACK from their home areas.



***Photos**: Above (left to right): Volunteer Matthew Curran with Masters student Noreen Mutoro. Jimmy Muli and Sarah Omusula with Intern Hasita Bhammar and Volunteer Jeffrey Foy. Volunteer Suze Billmann with Mary Wykstra. Below: Jameson Weston with field officers from the Salama and Samburu study areas, Hasita, Sarah and volunteer Kristy Becha with Mary Wykstra.*


Ankit Patel was a contender for the Senior Scientist position and worked with ACK in February and March. Ankit assisted with data entry, field officer photo labelling and camera trapping during the pilot deterrent light testing. Ankit accepted a position with the Lion Guardian project near Amboseli, but his contribution to ACK was valued in the short time he was with us.

Hasita Bhammer joined ACK from May through July as an intern from Yale University School of Forestry and Environmental Management. Hasita was most interested in the administration and programme development in community conservation. Hasita spend her time in the Salama field site and assisted in getting us caught up in data entry and photo processing after the transition and three months without a senior scientist during the gap of Cosmas' departure and Sarah's arrival. Hasita also provided assistance in planning and taking minutes at the Salama Natural Resource Planning meetings.

Peter Barber continues to work with ACK by assisting with operations at each of the ACK field sites. Peter is also an editor for grants and reports. Anne Walton has assisted ACK in transporting items donated in the US and has provided encouragement and financial donations for programmes. Mirriam Westervelt completed her PHD thesis work in the Loita area, but while staying at the ACK Nairobi office, she also provided additional advice in community natural resource planning and research implementation. Barbara Berney, Miriam Westervelt Elena Chelysheva and Susanne Garrison stayed at the Nairobi house contributing to rent. Elena continues to develop the Mara-

Meru Cheetah Project through which collaborative work is developed. Susanne runs the Wana Duma Children's Project (WDCP) in Gilgil working with students where ACK first started working in Kenya. WDCP provides financial assistance to more than 60 orphan and underprivileged children and families in the name of the cheetah and environmental caretaking.

In the US, Erica Hermsen continues to volunteer her time to assist with volunteer and student communication, with fundraising and with promotion of ACK through reports, grants and web site content. Erica also assisted with planning of the annual fall fundraising trip and accompanied Mary on the California programmes. Holly Koppleberger also volunteers with ACK to assist with the COOL Craft project. Holly maintains the inventory and fills orders that come between Mary's US tours. Holly attended two conferences and four presentations to assist with craft promotion. Phyllis Davis and Brenda Tuttle also joined in the fund raising travels to assist with craft set up and sales. Jameson Weston of Utah's Hogle Zoo visited the ACK project in November. Jay is also interested in working with ACK to develop the community Craft project, COOL Crafts. This year Fauna Tomlinson also assisted at one of the fund raising events. Fauna has also become an important person in assisting ACK with deterrent lights including the NiteGuard, Predator Guard and Fox Light systems. Cindy Wheeler designed the first ACK web site and had stepped off the ACK team in 2013 to pursue her web-design work in the US. Thank you Cindy for your continued support as we hand over the web management to Suze and the Mediamens team.

***Photos**: ACK Director Mary Wykstra spent August through October in the US visiting supporting institutions. Thank you to the staff at Cat Haven (top left) , the Columbus Zoo (top right), Safari West (bottom left), Cleveland MetroParks Zoo (bottom center) and Binder Park Zoo (bottom right). A special thanks to Erica Hermsen, Brenda Tuttle(center right) and all of the other volunteers mentioned in the above text.*

6.0 PLANNED ACTIVITIES –2015

Goal 1: **Identify factors affecting cheetah livestock predation and mitigate conflict.**

a. Prey Distribution and Abundance:

Distribution of prey was sampled using monthly transect game counts (2007-2014). Prey abundance will be calculated with DISTANCE software to evaluate trends and compare to past publications. On-going studies in the Salama, Athi Kapiti and Samburu areas will continue to monitor trends. Publication submission on Salama area should be completed in 2015.

b. Human Settlement Pattern:

Using maps of human settlement, vegetation, permanent and seasonal water sources combined with camera trap surveys we identify key cheetah passageways and determine the sustainable management requirements to maintain the corridors. Human settlement and areas of human use (severe-high, medium, and moderate) are analyzed using GIS buffers and compared to past studies and publications for the focal areas of Salama and Samburu. This model will be used in the national cheetah survey.

c. *Evaluate Livestock Depredation and effectiveness of mitigation:*

Prey selection determined through faecal hair analysis provides insights into the adaptations of the cheetah to human settlement as well as the level of domestic stock consumed by the cheetahs. A scat-detection dog programme is being used to collect samples. Genetic testing will provide information about the frequency that individual cheetahs kill livestock.

Since 2013, we have been testing different commercially produced light deterrent systems that use different LED lights in a series of rechargeable flashing lights and camera traps to determine if the raiding animal is a single individual or a member of a group. Once a system that has the highest mitigation effect is identified we will test trigger systems fitted on tracking collars on problem animals. Together with Savanna Tracking LTD we are developing the collar trigger that will turn on the lights and trigger an audible alarm when a problem animal approaches the area.

ACK scouts conduct interviews and patrols to verify evidence and circumstances of livestock depredation. To evaluate the effectiveness of our communication and materials in preventing livestock loss we are revisiting all homesteads receiving advice by ACK Field officers. Mitigation efforts include herder training, boma reinforcement, deterrent lighting, and livestock health improvements. Each location will be scored on the implementation of changes that prevented future livestock losses.

Goal 2) **To understand cheetah health and habitat selection**

a. *Monitor cheetah presence and movements through observation:*

Using satellite imagery and ground verifications we identify the key elements that promote cheetah coexistence with changing land use. Vegetation transects provide the habitat information to use remote sensing to understand key characteristics essential for cheetah survival on a range-wide scale.

b. *Determine habitat use of cheetahs in relation to vegetation and prey*:

Fecal genetics will be processed in the KWS laboratory through isolation and magnification of the marker containing the genetic code in collaboration with the Cheetah Conservation Fund and with KWS partners (National Museums of Kenya, Smithsonian Conservation Biology Institute, Mara-Meru Cheetah Project, Mara Cheetah Project). Disease and parasite analysis will also be conducted in the KWS facilities, Stress hormone and other indicators of disease will be done in collaboration with projects in smaller areas.

Cheetah movement data is overlaid into data from human settlement, prey monitoring, and conflict maps. Prey hair is isolated and identified using method documented by Marker et al. (2003) and

Keogh (1983) respectively and tested by Mutoro (2014). Genetic mapping will provide an understanding of key genetic corridors and will assist in control of illegal cheetah trade by identifying region of confiscated cubs or cheetah parts.

Goal 3**: Mitigate natural resource competition**
a. Conduct community programs to disseminate findings, promote conservation awareness, and improve livestock management techniques (public meetings called baraza).
Community meetings (baraza) are held monthly to discuss information about carnivore conservation. KWS and local administration attend the meetings. ACK awards community members with "Conservation Hero" certificates. ACK participates in KWS events and meetings.

b. Conduct community seminars using Miradi Conservation Management Planning system.
Using the system of target, threat and activity planning meetings with community members we assure active participation in natural resource management. The developed plans include participation on an administration level to assure the resource allocations can be achieved by the community.

Goal 4: **Influence public and administrative changes to positively affect cheetah conservation and management protocols.**
a. Raise environmental awareness through partnerships with communities and schools:
Education programmes instil a conservation ethic and reduce misconceptions about cheetahs.
Activities: School programmes include video, puppet and poster presentations showing that targeted presentations even with low technology are highly effective in children's retention of the conservation message. A student resource booklet increases the effectiveness of information sharing from students to their family.

b. *Establish cheetah conservation protocol and the policy in collaboration with KWS and local stakeholders*:
ACK staff provides quarterly updates to KWS and we present our research findings at an annual Carnivore Action Forum meeting. We submit updates to the National and Regional Wild Dog and Cheetah Strategic Plans to assist in the framework of cheetah conservation. Printed materials and digital submissions through our web site create awareness of activities and findings.
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7.0 STAFF QUALIFICATIONS

PI. Mary Wykstra, MEM, ACK Director

Since 2001, Mary has managed ACK, leading research and community development activities and acting as liaison to ACK partners. She holds a Master's of Environmental Management (2011) from Yale University, focusing on range-wide cheetah management planning and population dynamics. Mary's authorization is through the Kenya Ministry of Science and Technology in affiliation with the Kenya Wildlife Service (KWS) and Cheetah Conservation Fund (CCF).

Sarah M. Omusula, BSc., ACK Research Scientist

Sarah began working with ACK in June 2014. She studied wildlife management at the Kenya Wildlife Service Institute in Naivasha in 2008, and completed undergraduate studies in Wildlife Management in 2013 from the University of Eldoret. She has experience in wildlife monitoring through Earhtwatch International and the Soysambu Conservancy Research Facility. Sarah is responsible for managing the ACK data base and coordinates staff and student data collection, data analysis and report writing.

Erica Hermsen, MSc. – ACK Outreach and Volunteer Coordinator

Erica conducted research for her Master's thesis with ACK in 2012. After completing her field work, she continued to assist ACK through communication with volunteers and student affiliates. Erica is volunteering her time to assist ACK in website management, outreach and fundraising. To support Conservation Erica has launched an adventure service company - check out her programme Miradi Wild.

Lumumba Mutiso – Community Field Officer, Salama

Lumumba coordinates ACK community activities and field data collection in the Salama area. Lumumba is a small-scale farmer who was born and raised in the Kiu/Salama area. In 2008 Lumumba attended training courses in Namibia in Integrated Livestock and Wildlife Management and in Cheetah Conservation Biology.

Chris Simon Lentaam, ACK Community Field Officer, Samburu

Lentaam coordinates ACK activities in the Samburu region. He completed his secondary education at Marsabit Boys School in northern Kenya through a bursary from the Northern Rangelands Trust. He volunteered as a part-time ranger and radio operator for the Meibae Conservancy and participated in training for community work and ranger operations. Chris is interested in pursuing a career in conservation and business. He participated in Human-Wildlife Conflict mitigation training in 2012.

Pius Wamunyu, Jimmy Muli– Community Cheetah Scouts and Field Assistants (Salama)

Souhl Lemuntere and Moses Kinosi – Community Cheetah Scouts and Field Assistants (Meibae)

Ken Ochieng– Housekeeping Nairobi

8.0 BUDGET

Income: 2014 financial supporters include private donations, Cheetah Conservation Fund, Utah Zoological Society (Utah's Hogle Zoo), Cleveland Zoological Society (Cleveland Metroparks Zoo), St. Louis Zoo Field Conservation and Research Grants, AAZK Bowling for Rhinos, Disney Worldwide Conservation Fund, Fresno Chaffee Zoo, Columbus Zoo, Oregon Zoo, Birmingham Zoo, Baton Rouge Zoo, Project Survival - Cat Haven, Animal Ark, Binder Park Zoo, Eco-Sys Action, Safari West and Classic Escapes Safari. Additional income is received from craft sales, speaking stipends, volunteer fees and rent sharing. Total Income in 2014 was $122,000.

Current affiliated organizations include the Kenya Wildlife Service, University of Nairobi, African Wildlife Foundation, Cheetah Conservation Fund, Mara-Meru Cheetah Project, Ewaso Lions Project, Smithsonian Conservation Biology Institute and Northern Rangelands Trust.

9.0 GOVERNANCE

ACKis governed by a registered company limited by guarantee - Carnivores, Livelihoods and Landscapes (CaLL). Each researcher working with ACK is affiliated with the Kenya Wildlife Service (KWS) and Cheetah Conservation Fund (CCF). The objectives and direction of research and community programmes for ACK are guided by a board of directors, and research methods are approved by a scientific advisory board. ACK research assistants and field officers are employed by CaLL to conduct duties in accordance with the objectives of CaLL and to achieve results through monitored reports and newsletters.

Board of Directors:
Prof William Ogara, University of Nairobi (Chairman)
Mordecai Ogada, PhD, Laikipia Wildlife Forum (Treasurer)
Mary Wykstra, MEM, ACK(Secretary)
Erica Hermsen, MSc, Miradi Wild, LLC and CB&I Environmental, Inc.
Peter Barber, Independent consultant

Scientific Advisors:
Prof. Nick Oguge, University of Nairobi
Samuel Andanje, PhD, Kenya Wildlife Service
Laurie Marker, D. Phil, Cheetah Conservation Fund
Anne Schmidt-Küntzel, PhD, Cheetah Conservation Fund
Adrienne Crosier, PhD, Smithsonian Conservation Biology Institute
Darcy Ogada, PhD, Nature Kenya and the Peregrine Fund, Museums of Kenya

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