

Kajiado Rangelands Carbon Project

Biodiversity findings from 2023 to 2025

About the project

Savanna grassland ecosystems, such as the tropical savannas of Kajiado County are high in biodiversity and play a significant role in capturing and sequestering carbon, through extensive root systems and soil.

In 2023, CarbonSolve launched the Kajiado Rangeland Carbon Project (KRCP), working directly with local pastoral communities to develop rotational grazing plans and monitor livestock movements and vegetative response.

Baseline biodiversity surveys to support the KRCP were conducted successfully from 2023-2025 and will continue as communities join. To date, surveys have taken place across 11 Maasai communities and 2 adjacent reference areas including Amboseli National Park (Figure 1).

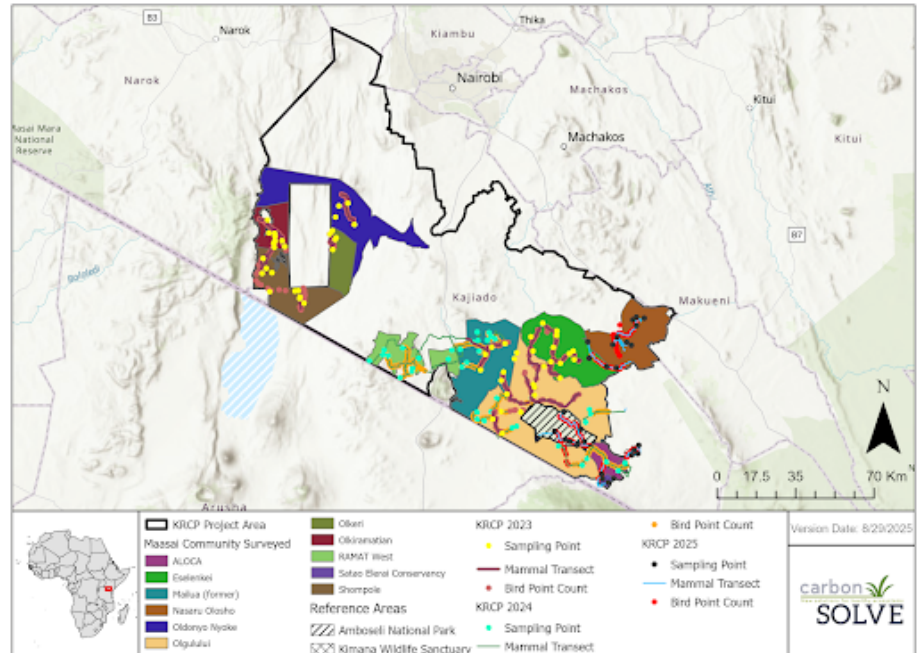


Figure 1. Study area for the Kajiado Rangelands Carbon Project including the boundaries of both the 11 communities and 2 reference areas included in the first three years of the project, 2023-2025.

Biodiversity survey design

Over the next forty years of the KRCP, we aim to monitor changes in soil carbon storage and biodiversity as a result of altered grazing pressure while controlling for key environmental factors that influence carbon storage (e.g., precipitation, soil texture).

To maximize data collection and efficiently deploy monitoring equipment, the team split into two groups: one collected vegetation, ground cover, mammal, and invertebrate data, while the other collected bird data (Figure 2).

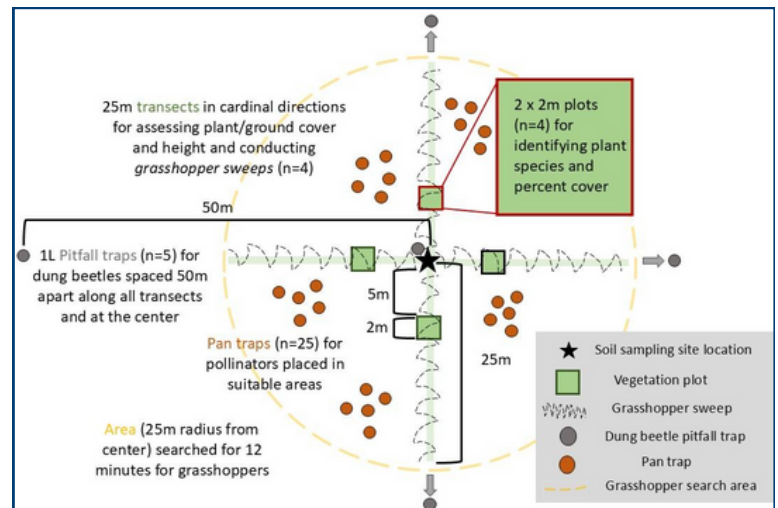


Figure 2. Vegetation sampling methodologies at each site including a) 25m transects for assessing ground cover and collecting grasshoppers radiating out in cardinal directions from the center of the site, b) 2 x 2m plots for assessing plant species, and c) pitfall traps for dung beetles. The black star represents the GPS location of prior soil sampling and where basic information about the site is collected.



Plant communities and grazing

Analysis of species-level data from the 2x2 m plots improves our understanding of the plant community composition and structure. In total, 369 species of plant were identified across 97 randomly stratified soil-sampling sites.

A majority of soil sites sampled across all 13 communities showed some level of recent grazing of grass and/or browsing of woody vegetation (Figure 4). All communities had multiple sites with evidence of at least moderate if not heavy grazing of grasses.



Equipment deployed at sites. From left to right; autonomous recording unit (top) and camera trap (bottom), pan trap, pitfall trap baited with cow dung.

Invertebrate sampling

Dung beetles were sampled using pitfall traps with 5 traps per sample site. Larger dung beetles (2.0 - 3.0 cm) were more common in the eastern communities (Eselenkei, Mailua, Olgulului) than the west.

Dung beetle biomass per trap-hour varied by size class among communities, with higher biomass in the smallest and largest categories in Nasaru Olosho, and RAMAT West, while Amboseli National Park, Nasaru Olosho, and Olgulululi had the highest biomass in the > 200mm category (Figure 5).

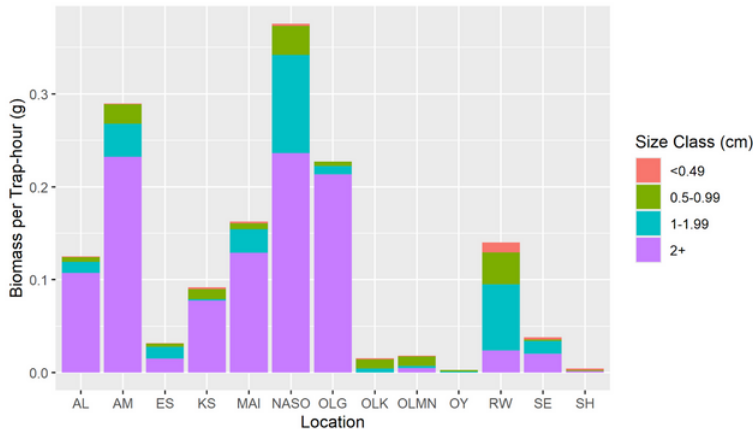


Figure 5. Indicator used for comparison of number of individual dung beetles per trap hour for each Maasai community within the Kajiado Rangeland Carbon Project area collected during 2023-2025.

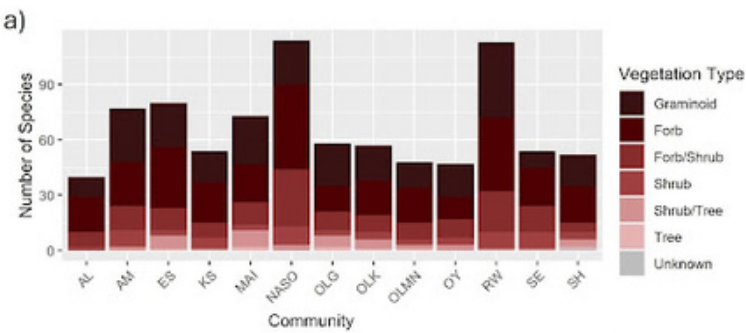


Figure 3. indicator showing the number of plant species and overall species richness by type detected in 2x2 m plots (n=560 plots from 140 soil sampling sites) by community sampled in the Kajiado Rangeland Carbon Project area during 2023-2025.

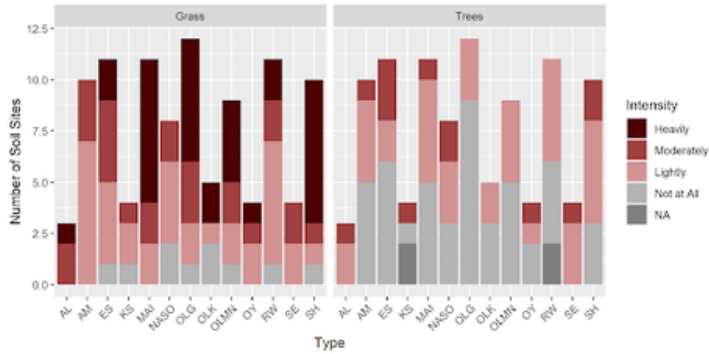
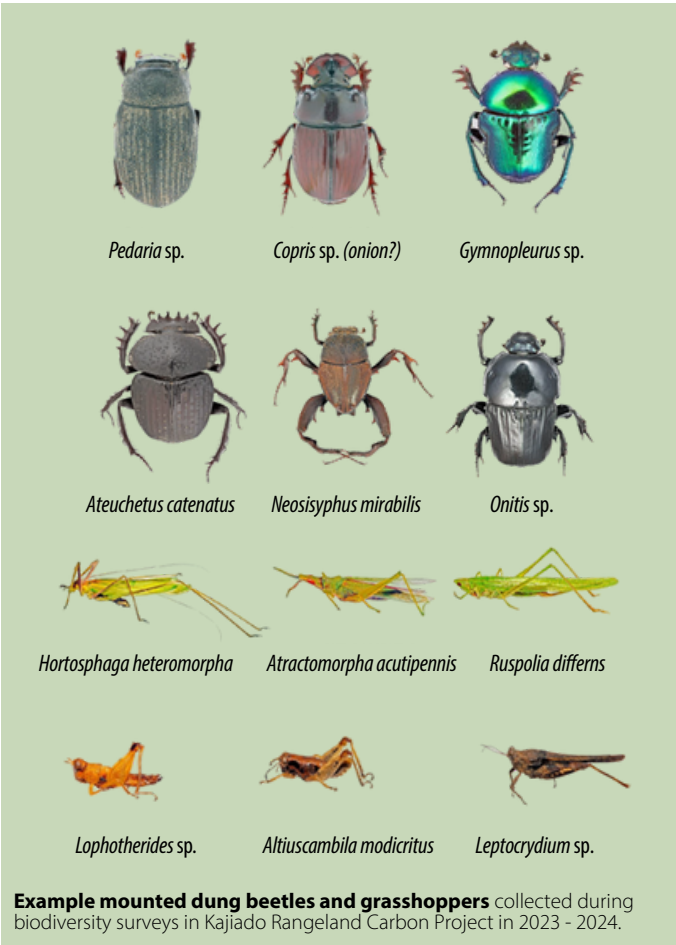


Figure 4. indicators establishing baseline site characteristics for soil sites sampled for biodiversity monitoring (n=97) for the Kajiado Rangeland Carbon Project area during 2023-2025 including intensity levels of grazing of grass and browsing of shrubs and trees.



Example mounted dung beetles and grasshoppers collected during biodiversity surveys in Kajiado Rangeland Carbon Project in 2023 - 2024.

Birds as trigger species

Bird species were detected during point counts and by using acoustic recording data. A combination of 436 point counts and 185 acoustic recordings resulted in 255 species of bird being detected from 64 families.

Survey effort ranged from 10 surveys in Olkeri to 138 in Olgulululi. Community totals spanned 66–192 species and 30–58 families. Per survey richness ranged from 6–34 species (mean 21.15), and Shannon diversity from 0.62–3.32 (mean 2.65) (Figure 6).

The data collected is used to determine trigger species across the KRCP, which are threatened species that provide exception benefits to biodiversity if the project takes measures to enhance populations.



Secretarybirds (*Sagittarius serpentarius*) are a large bird of prey found open savannas and a valuable trigger species for the project. Listed as Endangered on the IUCN Red List, the population is declining due to habitat loss.

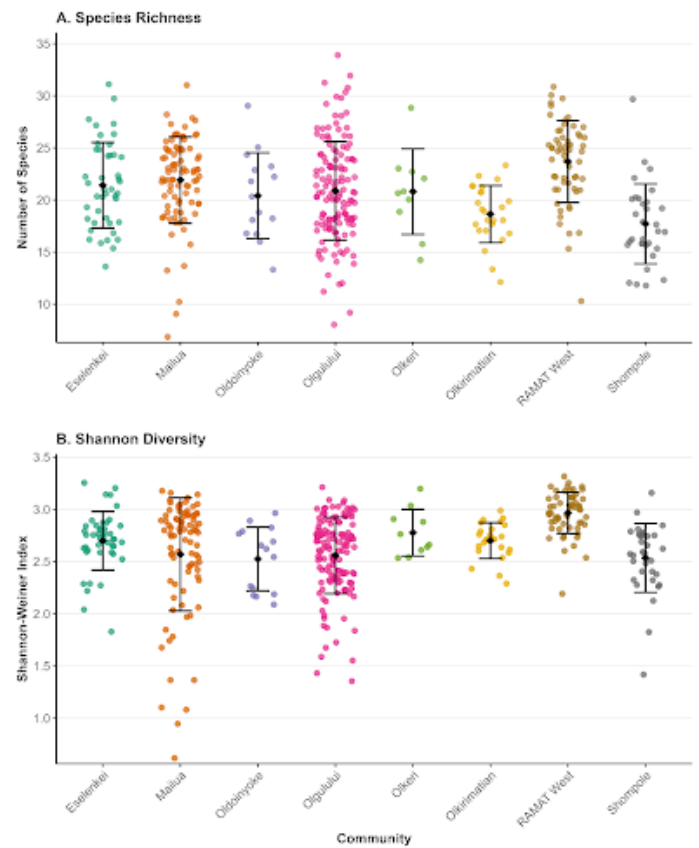


Figure 6. Indicators of species richness (top) and Shannon-Weiner diversity (bottom) of bird species observed during point count surveys by community in the KRCP baseline biodiversity monitoring area (Kajiado County, 2023–2024). Colored points represent individual surveys at different transect locations; black points represent the mean with error bars showing variability ($\pm$ SD).

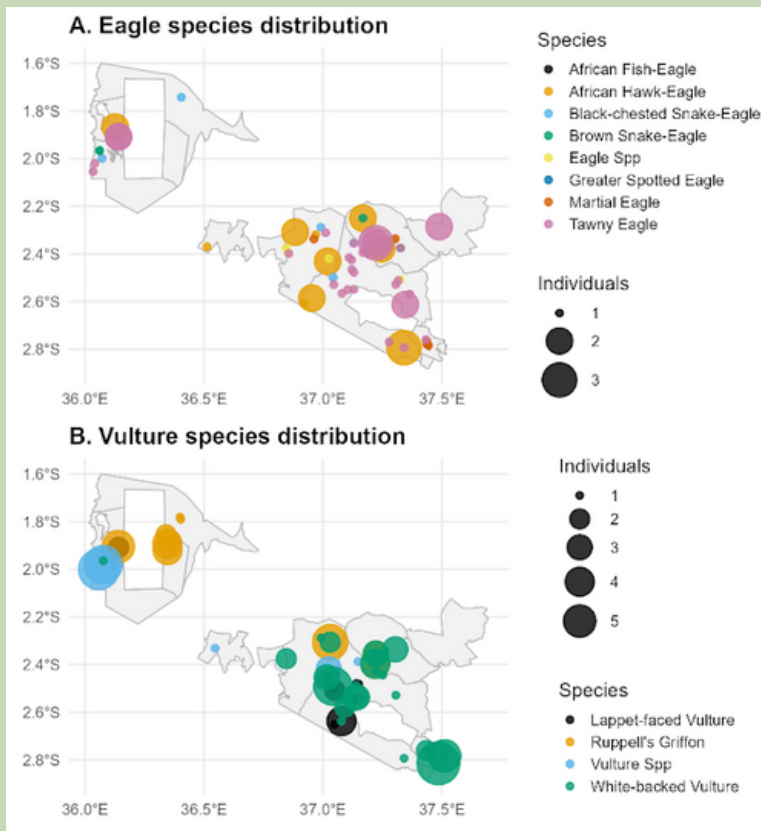


Figure 7. Summary of raptor abundance and distribution during KRCP baseline monitoring (2023–2025). (A) Spatial distribution of eagle species from opportunistic observations, with point size proportional to individuals detected. (B) Spatial distribution of vulture species from opportunistic observations, with point size proportional to individuals detected.

Raptor observations

Raptors were detected during point count surveys, systematic transects, and opportunistic observations.

Since the 2023 baseline survey, across methods, 632 individuals representing 29 raptor species were detected, including **seven IUCN Red Listed species**: White-backed Vulture, Tawny Eagle, Secretarybird, Martial Eagle, Rüppell's Griffon, Lappet-faced Vulture, and Bateleur.

Tawny Eagle was widespread (detections in seven communities), while Martial Eagle was scarce (detections in four communities).



White-backed vultures (*Gyps africanus*) is a highly sociable scavenger that feeds on carcasses. These birds face threats from poisoning, both accidental and incidental which has led to significant population declines and being listed as Endangered on the IUCN Red List.

Mammal detections

26 species of terrestrial mammal were observed via 604 km of driving transects and 200 nights of camera trap deployments, and 20 species of bat were identified via ARUs.

Species of conservation concern observed within the KRCP area included four mammals; African Lion, Masai Giraffe, African Savanna Elephant, Harrison's Large-eared Giant Mastiff Bat. The Masai Giraffe and African Savanna Elephant were identified as valuable indicators of change over the long-term project period.

Wild mammal abundance and diversity is heavily influenced by domestic animal grazing intensity. As the project continues, mammal species richness and abundance is expected to increase as rangeland health increases.

Bat presence

For bats, survey effort varied across communities and the data from 2025 is yet to be analyzed. Species richness for bats across sites ranged from 1-18 species, with a mean of 9.65 (Figure 9).



Figure 8. indicators of the total number of individual wild mammals by species and year combining standardized driving transect survey data with data from camera traps placed at soil sites and basecamps within the project area. The size of points represents the sum of all individuals observed (uncorrected for effort).



Harrison's Large-eared Giant Mastiff Bat (*Otomops harrisoni*) has a major colony within the project area that roosts within the Suswa Caves, and are threatened by habitat degradation and cave tourism.

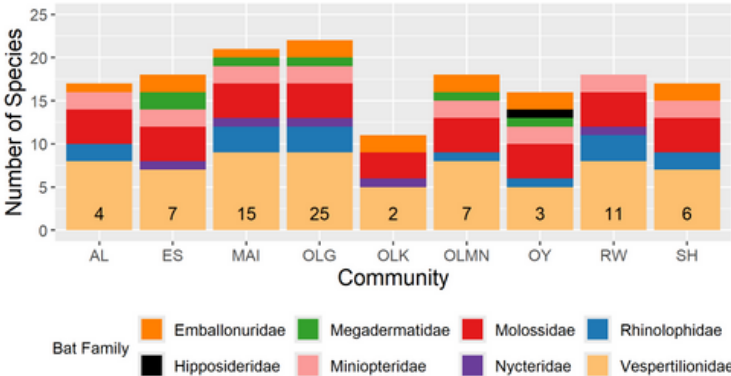


Figure 9. Bat diversity by community detected via ARU surveys for the Kajiado Rangelands Carbon Project in 2023 and 2024. Note that Mailua and Olgulului were sampled in both years. The total number of sites sampled across both years are noted in black.

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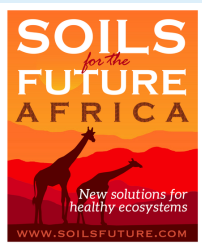
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Credits—Figures: BRI - Ed Jenkins, Dustin Meatterey. Photography: p. 1 Header: Allison Foster, Bottom: Amboseli landscape by Ken Archer, Vegetation by Allison Foster, Dung Beetle by ranplett/Getty Images, Vitelline Masked-weaver by Ed Jenkins, African Savanna Elephant by Ed Jenkins. p. 2 Equipment by Ed Jenkins and invertebrates by Tanzania Wildlife Research Institute. p. 3 Secretarybirds by Ken Archer. White-backed Vultures by Ken Archer. p. 4 Bats by Beranrd Risky Agwanda.