

Sustainable Rangeland Management

2024 PROGRAM BRIEF



Overview

People, livestock, and wildlife share about 92% of the suitable wildlife habitat in northern Tanzania. Community rangelands comprise a significant portion of this habitat and are critical to the preservation of community food security and livelihoods. Wildlife depends on the landscape connectivity ensured by open pastures, while agricultural expansion and dense human settlements threaten that connectivity. Further, healthy pastures support a rich source of prey species for big cats, including impala, wildebeest, zebra, and African buffalo. Thus, healthy pastures and the sustainable use of natural resources are imperative for both wildlife and pastoralist communities.

African People & Wildlife (APW) implements its Sustainable Rangeland Initiative based on the 2021 guidelines for acquiring, developing, and managing rangelands in Tanzania provided Ministry of Livestock and Fisheries, which were created with help from APW. Tanzania has a total of 94 million hectares of land. Out of that, 50 million hectares can be used as grazing areas and approximately 35% of these areas are in drylands that have average rainfall. According to the national land use framework plan of 2013 – 2033, rangelands total 9,829,700 acres, almost 10.3% of the country's area. In addition, 2015 statistics show that the area used as rangelands is approximately 9.3 million hectares.

Rangelands areas are declining in number, and their qualities have been depreciating due to a number of reasons, including population increase of both livestock and people. During independence, the population was 9 million with 8 million head of livestock. According to the 2022 census, the population has rapidly expanded to approximately 63.59 million and 33.9 million head of livestock. The need for land is high. Other challenges include climate change, an increase of bare lands, overgrazing, gully erosion, and an increase of invasive species, among others.

African People & Wildlife helps communities manage their rangelands sustainably and ethically by building capacity, improving the use of technology, and reinvigorating traditional pasture monitoring and management practices. By using a data-driven approach to rangeland management, APW's Sustainable Rangelands Initiative prolongs the viability of pasture ecosystems, securing necessary nutrition for livestock and a variety of wildlife.

APW's Sustainable Rangelands Initiative began in 2016 with three villages and has expanded to more than sixty villages in 2024. In addition to community-based rangeland dialogues with the village grazing committees on ecologically sound management practices, APW supports two volunteer rangeland monitors in each participating village to conduct monthly monitoring of village pastures. This information, presented in feedback meetings in the respective villages, supports informed decision-making and rangeland management activities as determined by the appropriate village government committee and informs where to intervene with projects to improve rangeland health.

Data collected during routine monthly monitoring inform decision-making on land allocation for grazing during different seasons and in the long term. Further support of village grazing committees on drought scenario planning and inter-village cooperation increases community resilience to the effects of climate change. Participating communities also have the opportunity to apply for small project funding and technical support from APW to implement community-level initiatives to improve clean water access, remove invasive species from pastures, and increase livestock health and productivity.

Implementation

To ensure quality and consistency in all villages participating in the Sustainable Rangelands Initiative, APW streamlined its approach to engaging with new communities with structured yet flexible procedure.

PHASE ONE

In Phase 1 of engagement with a new community, APW conducts preparatory activities, including a series of introductory meetings and a pastoral livelihoods and management dialogue. This phase of engagement assists in understanding the existing governance structures and rangeland management practices of the village. In accordance with APW's community-driven approach, the team makes an active effort to understand the political, economic, ecological, and cultural factors that influence each new community's management of its natural resources before we begin.

PHASE TWO

In Phase 2 of the Sustainable Rangelands Initiative for new villages, the team works with the village government and grazing committee to do a participatory mapping exercise to identify grazing areas and assess the initial condition of critical pastures. The APW team uses Google Earth Pro software to display the land use plan of the village and determine the appropriate number of monitoring plots based on the total area allocated for grazing. APW generally recommends one plot per one km² of critical pasture.

The APW team and grazing committee representatives then visit each critical pasture. The APW team leads a participatory site assessment via community mapping during which grazing committee representatives walk transects through the pasture to identify easily accessible plots of high grazing importance. For each selected plot, the APW team generates a plot ID and conducts a baseline condition assessment through a mobile data collection form. Assessment questions included ecological metrics such as grass height and soil type, as well as social metrics such as cultural importance of the plot, accessibility, and proximity to human settlements.

The APW team then asks the grazing committee representatives to provide a field name for the plot in the local language to ensure future relevance of monitoring data for the community. The team ensures that there are no duplicated names so that rangeland monitors can easily distinguish between plots. Phase 2 concludes with a site-selection process, aimed at confirming plots for the village that best represent the ecological pasture diversity and grazing importance of the village rangelands. The APW Geographic Information System (GIS) team formalizes the site selection by overlaying selected plots on the village land use plan or map of grazing resources.

PHASE THREE

Phase 3 of the Sustainable Rangelands Initiative begins with the village grazing committees selecting two community rangeland monitors for each village, who then begin their initial training with APW's Rangeland Management Team. The training of new community rangeland monitors includes conducting proper monitoring protocols, learning more about rangeland ecology, and methods of communicating the monitoring findings. The new monitors then conduct pilot monitoring of the selected plots in their village to determine if any of the plots need to be adjusted.

Understanding Local Structures to Facilitate Local Solutions

APW strives to ensure that all of our programs support community-driven efforts to protect and preserve natural resources. Thus, a deep understanding of the institutional and governance aspects of community natural resource management is critical. Before beginning work with any new village, APW conducts several introductory meetings. In addition to helping assess community interest in our Sustainable Rangelands Initiative, the meetings provide APW with necessary context and background information about the existing rangeland management structure.

Key points of inquiry during these introductory meetings include an overview of the existing governance structures, the various decision processes at play, and the likelihood of political buy-in from leadership. A needs assessment is often conducted to determine challenges in pasture management, strengths in existing governance, and past problems that have since been resolved and how this was achieved. The APW team identifies community champions, assesses the readiness of the community to engage in data-driven rangeland management, and rates the enthusiasm of the community members and pastoralists.

After introductory meetings, APW engages in stakeholder mapping exercises to understand the existing governance structures in each village and map the decision process. The latter exercise requires APW to clarify which individuals, groups, or institutions make decisions about natural resource management and how those decisions are enforced. These analyses inform APW's planning for feedback meetings to ensure that monitoring data are presented to the right people at the right time. APW also works closely with each village grazing committee to refine its rangeland management plan or to assist in developing one. APW follows the existing government and traditional village structures. In case such structures do not already exist, the team helps facilitate their formation, building capacity to manage rangelands.

DEVELOPING EFFECTIVE PROGRAMMING

Over eight years of working with communities on rangeland management, APW has learned several lessons for effective programming.

First, it is necessary to have a thorough understanding of existing governance structures before engaging in monitoring efforts. APW seeks to recognize how different governance structures function and which decisions are made by which governing bodies. For instance, in the Ngorongoro Conservation Area, traditional leaders make pasture management decisions through the *Ilaigwanak* structure, while the village government often focuses more on political decision-making. Personnel overlap between the *Ilaigwanak* and the village government is common. As is customary in this region, pastoralists have tremendous respect for the traditional leadership and their decisions. Abiding by decisions made by the *Ilaigwanak* is deeply rooted in the local culture and way of life.

Thus, APW makes an effort to understand this structure and work within it to influence pasture management by advising the leadership on the use of routine monitoring data. Conducting stakeholder analyses is key in contextualizing natural resource management efforts. APW seeks to clarify the decision-making process in a village grazing committee before making any effort to effect change. APW works within these existing governance structures as often as possible to maintain positive relationships with community leadership.

Second, APW recognizes that traditional practices are often more feasible, accepted, and relevant to community leadership than new approaches to rangeland management. The team spends significant

time during the preparatory phases learning about indigenous methods of pasture management and biophysical interventions. For instance, many pastoralist communities traditionally implement zoning practices through rotational grazing or livestock species control. Since these practices are already a way of life for the pastoralists in these communities, they are accepted and implemented more successfully. By strengthening these practices with modern, user-friendly technology, APW maintains support from village leadership while introducing innovative methods for data collection, analysis, and feedback. This builds ownership and trust in the communities, leading to long-term success.

Third, since 2016, APW has learned the importance of working not just with village-level committees but also with larger ward-level governments. Many villages in northern Tanzania share rangeland or have adjacent pastures. Thus, it is necessary to work with neighboring villages to ensure continuity in management and connectivity of ecological benefits. Since adjacent villages may compete for high-quality rangeland, cooperative management of neighboring grazing areas is imperative. As villages are added to the program, gaps in ward-level management are filled by APW and other partners, moving one step closer to ensuring connectivity in a landscape shared by people, livestock, and wildlife.

Lastly, APW recognizes the efforts of different stakeholders in rangeland management. Since 2020, APW has been conducting harmonization meetings that bring together different stakeholders from the village level, wards, divisions, districts, regions, different ministries, parastatal institutions, NGOs among other stakeholders to discuss and streamline different agendas in regards to rangeland management in their different areas of work and also influence policy.



Biophysical Interventions

APW recommends and facilitates community-led biophysical interventions to improve rangeland health and restore degraded land. The following interventions have been employed by communities with APW support or are in APW's suite of potential biophysical interventions to recommend under appropriate conditions.

INVASIVE SPECIES CONTROL

Invasive species are a growing threat for the northern Tanzania rangelands, so APW recommends and facilitates community invasive species removal. Conducted both by hand-pulling and by using root extraction equipment such as weed wrenches, invasive species removal is aimed at limiting the expansion of species that damage pasture ecosystems. Using data collected during monthly monitoring, communities identify problem species, monitor their spread, and recommend removal efforts when necessary. To date, 14 communities have implemented invasive species removal initiatives with APW financial and technical support, improving the quality of over 7,000 acres of critical rangelands.



WATER MANAGEMENT

Communities in APW's Sustainable Rangelands Initiative have employed various water management interventions, including watershed protection from soil erosion, pollution, and overuse; dam restoration; and cattle watering via troughs. Ground and surface water monitoring, watershed protection, and dam restoration provide communities with important access to water in pre-designated sites, often in times of drought. Further, building troughs helps to maintain clean natural water resources by limiting livestock access to rivers and streams, and instead watering cattle through separate structures. APW does not recommend the development of new watering points, as this can stimulate overgrazing, drawing livestock into areas during the wrong season or without strong management.

PASTURE REST

As the most common intervention recommended by APW and employed by pilot communities in the Sustainable Rangelands Initiative, pasture rest entails setting aside areas of pasture for natural regrowth. This intervention does not require assisted restoration techniques, but rather requires enforcement to ensure compliance with pasture restrictions. Restricting grazing access to certain

pastures allows for biomass regrowth, naturally resupplying pasture resources for livestock and wildlife and mitigating the harmful impacts of soil erosion, gullies, overgrazing, and soil compaction.

PASTURE ALLOCATION THROUGH ZONING

Zoning is another commonly employed intervention by communities participating in APW's Sustainable Rangelands Initiative. This practice entails allocating certain pastures for grazing during specific times of the year, based on collected data and historical management practices. The land allocations are determined from traditional herd rotation practices and include dry and rainy season pastures, multi-season pastures, and areas designated for emergencies. This practice allows degraded pastures to regrow rotationally throughout the year.

LIVESTOCK SPECIES CONTROL

Similar to pasture allocation through zoning, livestock species control designates certain pastures for specific types of livestock. This intervention entails restricting areas of rangeland to browsers, primarily goats. As browsers, goats can prevent bush encroachment where grass resources are limited. Further, pastures with prevalent forbs may be set aside for goats, whereas pastures composed primarily of grasses may be set aside for cattle and other grazers. Herd dynamics are also considered under this intervention and includes restricting the total number of livestock grazing in some pastures or limiting areas to specific age classes (for example, calves).

FIRE MANAGEMENT

Communities in APW's Sustainable Rangelands Initiative have employed various forms of fire management to improve rangeland health. Prescribed burns are discussed as a restoration technique in APW's rangeland management training and are used to stimulate the germination of certain desirable grass species in degraded pastures. Further, wildfire management is employed to prevent extensive burns, bush encroachment, the spread of some invasive species, and to control wildlife expansion into critical, healthy pastures. For example, Loibor Siret Village has intentionally suppressed burns via fire lines or stamping to preserve grasses during the dry season.

APW has empowered several communities in the Simanjiro, Ngorongoro, and Babati districts to employ the biophysical interventions listed above. Through this experience, APW has learned several key lessons in using biophysical interventions to promote rangeland health. First, the team has found that all interventions employed on community rangelands must be led by community members. Their support and direct action are critical for any intervention to succeed, particularly when considering the biophysical factors of their rangelands. Thus, while APW recommends interventions and facilitates their employment, it does not directly implement biophysical activities in the rangelands.

APW has also found that reinvigorating traditional practices such as pasture rest and zoning is critical to maintaining positive relationships with communities and ensuring that interventions are culturally appropriate and understood by the community. The pastoral communities with which APW works have generations of knowledge on rangeland ecology and grazing and pasture management. Thus, implementing their traditional practices with modern technology retains cultural relevance while simplifying and improving implementation accuracy and efficiency.

Monitoring Rangeland Health

In each village, two community rangeland monitors conduct monthly monitoring of the selected plots using the Survey123 mobile app. In addition to a phone to use for data entry, GPS, and photographs, the monitors are equipped with:

- 100-meter tape measure
- 1-meter ruler
- 1-meter x 1-meter quadrat
- Multi-language field guide for invasive species identification

At each plot, monitors answer the following macro-plot questions:

- *Has the plot been burned?*
- *Has the plot been grazed?*
- *What is the main color of the grass in the plot?*
- *Does the plot contain litter?*
- *Does the plot contain invasive species? If so, which species?*
- *On a scale of 1 to 5, with 1 being very good and 5 being very poor, how do you rate the overall quality of this pasture?*

The monitors then photograph and GeoPoint the plots. Next, the monitors walk a 100-meter transect due north from the GeoPoint. Every 5 meters, the monitors drop a 1-meter ruler perpendicular to the transect, with five evenly spaced points marked on the ruler. They then answer the following micro-plot questions to determine sample metrics:

- *How many points are touching basal vegetation?*
- *How many points are touching bare ground?*

The monitors then place a 1-meter x 1-meter quadrat on the north side of the ruler and answer:

- *Which, if any, of the following invasive species are present within the quadrat?*

Lastly, the monitors place the ruler vertically at the center of the sample and measure the grass height in centimeters. The monitors then walk to the next sample, 5 meters along the transect.

All data are recorded via mobile phone or tablet and sent to APW's ArcGIS Online account for analysis. Raw data are analyzed at APW's Nolooho Environmental Center. Simple percentages are used to report bare ground versus basal vegetation at each plot, and grass height is averaged for all 20 samples in a plot. Macro-plot data and photographs are reported as raw data for each plot.

Every quarter or more frequently upon request, in collaboration with the community rangeland monitors, APW hosts a rangeland feedback meeting in each village. The village grazing committees are presented with the analyzed data for each plot in their village. APW rangeland officers and community rangeland monitors then discuss recommendations for biophysical interventions with the committee. These recommendations often include zoning changes or amendments to the village's rangeland management plan. Decisions are made by the grazing committee with APW providing data-driven counsel.

Select Community-Led Rangeland Restoration Initiatives

1. APW began working with the village of Esere in Ngorongoro District in 2018. As one of the pilot villages in Ngorongoro, Esere has taken many steps since 2020 to improve its rangeland condition. Specifically, Esere has used the data collected during monthly monitoring to inform its decisions made at monthly feedback meetings. In 2019, Esere's monitors noticed that several monitoring plots — Oldonyo Kite, Endonyo Sapok, and Naibatat — demonstrated a higher-than-expected percentage of bare ground. Thus, they decided to rest these critical pastures until further notice. Moreover, the village leadership decided to schedule the livestock movements for the rest of 2020 based on the grass height and basal vegetation data collected over the last six months. Recognizing that some plots retain high grass reserves, Esere has planned to move livestock from the Ilasiti pasture to the Endepesi pasture, and then to the Euwasi Engati pasture. This will ensure that grass reserves are maintained throughout the rest of the dry season so that all three plots are not grazed simultaneously.
2. In 2020 and 2021, four communities that participate in the Sustainable Rangelands Initiative implemented rangeland restoration and improvement projects informed by the results of their pasture quality monitoring. Mungere, Esilalei, Loibor Siret, Baraka villages conducted invasive species removal projects to combat proliferating invasive species in several plots they monitored monthly. In total, the two villages uprooted *Dichrostachys cinerea* from over 570 acres of critical rangeland shared between livestock and wildlife.
3. In 2022, APW worked with the seven villages in Longido District that use the shared Lelek grazing area to implement an invasive species removal project. This rangeland enhancement project began with a meeting with the District focal person and other key personnel to discuss the issue of invasive species and sign a payment contract for the community members that would perform the removal. A baseline survey was then performed to assess the quality of the pasture at six points. Members from all seven villages that use the Lelek grazing land participated in the exercise and each community member was paid 60,000 Tanzania shillings per acre. In total, *Ipomoea hildebrandtii* was uprooted from 1,099 acres of pasture. Community members have since pooled together a portion of their income from the project to begin construction on a new school for local youth.
4. In 2023, APW supported four villages with invasive and problematic species removal on 1,355 acres of communal pasture plagued by bush encroachment. To combat soil erosion, the activity filled 40 gullies, totaling 5.6 kilometers. Less than a year later, native plants are rebounding, aiding in gully stabilization and providing critical food sources for domestic and wild animals. In addition, APW assisted two Tarangire-Manyara region villages with 1,522 acres of pasture rehabilitation work in Fall 2023. Monthly monitoring data showed an aggressive, unpalatable shrub was taking over native grasses that support wildlife and livestock. APW will closely monitor the treated areas to ensure sustained impact as well as support local grazing committees with responsive management plans.
5. APW launched a rangeland monitoring program in Greater Mkomazi in 2023. Eight monitors were recruited and trained to evaluate monthly monitoring plots, collecting data on vegetation cover and invasive species to provide valuable insights into effective management practices that benefit livestock and wildlife.

Key Takeaways

APW has compiled and summarized the following major take-aways that should inform future work to succeed with improving rangeland health:

- Healthy pastures and sustainable use of natural resources are imperative for both pastoralist communities and wildlife, making rangeland management a priority for community-based conservation organizations in northern Tanzania.
- Data-driven decision-making is critical to ensure that biophysical interventions are timely, relevant, and appropriate to the local context.
- Rangeland management must take place at the ward level to maintain continuity in management and connectivity in ecological benefits between neighboring villages and adjacent pastures.
- Feedback must be provided to the right people at the right time in order to maintain positive relationships with local leadership and ensure that decision-makers have the information necessary to enforce management decisions.
- Reinvigorating traditional practices with modern technology is necessary for maintaining a community-driven conservation ethic while ensuring scientific rigor in monitoring.
- Traditional practices such as land allocation through zoning and rotational grazing are effective in reducing the harmful effects of overgrazing and drought.



Helpful References

Bailey, D. W., Mosley, J. C., Estell, R. E., Cibils, A. F., Horney, M., Hendrickson, J., ... Burritt, E. A. (2019). Synthesis Paper: Targeted livestock grazing: prescription for healthy rangelands. *Rangeland Ecology & Management*.

Ganskopp, D. C., & Bohnert, D. W. (2009). Landscape nutritional patterns and cattle distribution in rangeland pastures. *Applied Animal Behaviour Science* 116, 110–119.

Holechek, J. L., Cibils, A. F., Bengaly, K., & Kinyamario, J. I. (2017). Human population growth, African pastoralism, and rangelands: a perspective. *Rangeland Ecology & Management* 70, 273–280.

Holechek, J., & Valdez, R. (2018). Wildlife conservation on the rangelands of eastern and southern Africa: Past, Present, and Future. *Rangeland Ecology & Management* 71, 245–258.

Ministry of Livestock and Fisheries (2022). National guidelines for acquiring, development and managing rangelands in Tanzania.

Oba, G., Kaitira, L. (2006). Herder knowledge of landscape assessments in arid rangelands in northern Tanzania. *Journal of Arid Environments* 66, 168–186.

Quinn, C. H., Huby, M., Kiwasila, H., & Lovett, J. C. (2007). Design principles and common pool resource management: an institutional approach to evaluating community management in semi-arid Tanzania. *Journal of Environmental Management* 84, 100–113.

Russell, S., Tyrrell, P., & Western, D. (2018). Seasonal interactions of pastoralists and wildlife in relation to pasture in an African savanna ecosystem. *Journal of Arid Environments* 154, 70–81.

Sircely, J., Conant, R. T., & Boone, R. B. (2019). Simulating rangeland ecosystems with G-range: model description and evaluation at global and site scales. *Rangeland Ecology & Management* 72, 846–857.

Stasiewicz, A.M., & Paveglio, T. B. (2018). Wildfire management across rangeland ownerships: factors influencing rangeland fire protection association establishment and functioning. *Rangeland Ecology & Management* 71, 727–736.

Tuffa, S., Hoag, D., & Treydte, A. C. (2017). Clipping and irrigation enhance grass biomass and nutrients: implications for rangeland management. *Acta Oecologica* 81, 32–39.

Wilmer, H., Derner, J. D., Fernández-Giménez, M. E., Briske, D. D., Augustine, D. J., Porensky, L. M. (2018). Collaborative adaptive rangeland management fosters management-science partnerships. *Rangeland Ecology & Management* 71, 646–657.

PATH TO SUSTAINABLE RANGELAND MANAGEMENT



Collected data is uploaded to APW's ArcGIS Online portal for analysis. Recommendations for interventions are discussed with the grazing committee at rangeland feedback meetings.

Figure 1: Sustainable Rangelands Initiative approach to implementation