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AMBOSELI MONITORING OUTLOOK

Current conditions and outlook for livestock and wildlife in Amboseli

By David Western and Victor N. Mose

In this issue: Range conditions in Amboseli and conservation software tools corner.

We anticipated a severe dry season in June 2021 when the long rains were paltry across the Amboseli region and severe in northern and eastern Kenya. It was soon apparent from our ground monitoring that Amboseli faced severe grazing shortages in the eastern portion of the ecosystem. By January the extreme pasture shortages had spread well to the east towards the Chyulu Hills. (Figure 1). Anticipating a severe drought in early 2022, the Amboseli Conservation Program commissioned the Department of Resource Surveys and Remote Sensing (DRSRS), and the Flight Training Centre at Wilson Nairobi, to conduct an aerial count of the Amboseli ecosystem in January 2022.

By late December it was apparent that Amboseli had been invaded by a huge influx of cattle from Tanzania, Matapatu, the Rift Valley and other places to the west and south where the rains had failed. The influx quickly reduced the sparse forage around Amboseli and moved east towards the Chyulu Hills where the rains were moderately good. By mid-January cattle were emaciated, most especially those from Tanzania, and the weaker animals were dying. We planned our count to capture the extent of the invasion and issue a forecast of heavy anticipated livestock deaths and plunging market prices.

In what follows we report the findings on the extent of the cattle invasion, the numbers and distribution of livestock and wildlife. Based on the counts, other monitoring data and unseasonal rains in January and February 2022, we project the outlook for the next half year.

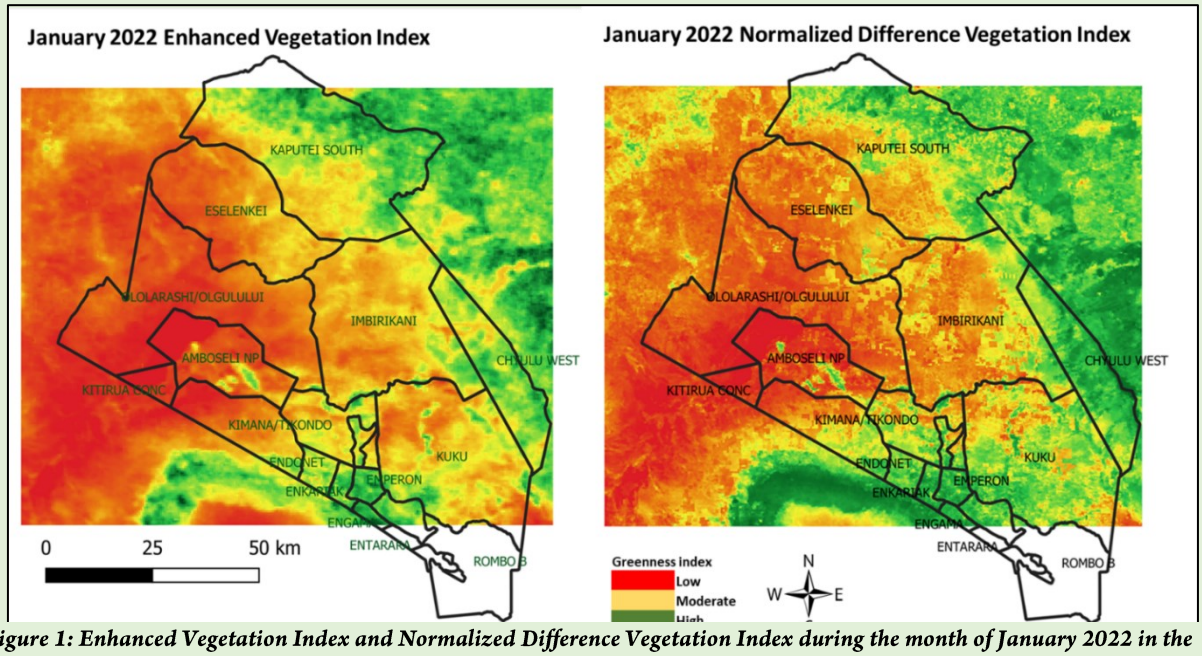


Figure 1: Enhanced Vegetation Index and Normalized Difference Vegetation Index during the month of January 2022 in the Amboseli ecosystem. The red shade indicates poor (dry) pasture conditions based on the proxy indices.

Species	May-2018		February-2020		January 2022	
	Estimate	se	Estimate	se	Estimate	se
Burchell's zebra	15,902	4,542	17,239	2,832	20,466	3,595
Wildebeest	8,361	3,629	8,094	3,089	8,700	2,967
Kongoni	196	137	695	384	89	87
Thomson's gazelle	624	395	89	87	36	24
Grant's gazelle	10,839	2,037	12,515	1,882	10,732	2,082
Impala	1,908	609	464	301	250	162
Oryx	464	392	89	85		
Eland	4,368	3,443	4,154	2,743	2,692	1,411
Buffalo	428	310	1,355	733	1,711	1,608
Elephant	767	286	1,533	686	2,139	840
Giraffe	6,667	1,120	6,828	1,156	5,562	1,598
Cattle	107,358	14,110	143,601	13,061	283,849	41,036
Sheep & goats	184,907	23,872	249,478	34,881	296,810	34,328
Ostrich	1,266	401	1,052	312	428	148
Donkey	998	568	856	397	2,603	1860
Gerenuk	18	17			18	18
Warthog	107	75	303	165	89	84
Lesser Kudu	18	18	36	34		
Camel	1,729	1,041	981	637	285	198
Hippo	36	34				

Table 1: Species population numbers and standard deviations for the January 2022 aerial count of the Amboseli ecosystem and surrounding regions. Numbers for the year 2018 and 2020 are given for comparisons.

The aerial count

The sample count covered 7800 km^2 of Eastern Kajiado (Figure 2) between 24th January to 28th January, 2022. We used the same procedures and covered the same areas as ACP counts since 1974. The results of the January count are given in Table 1, followed by the distribution maps for each species and a breakdown of numbers by group ranch (Figure 3 & Table 2). The counts and standard errors for each species are given with counts for 2018 and 2020 to track the changes in populations.

Comments on the aerial count

Livestock

The count of cattle numbers and distributions captures the enormous influx into the Amboseli region. Previous counts over the last four decades rarely exceeded the 143,000 recorded in 2020 when cattle numbers reached a peak after the 2009 drought. The 284,000 recorded in January shows over 140,000 cattle had moved into the Amboseli region, by far the biggest influx ever recorded and double the peak numbers.

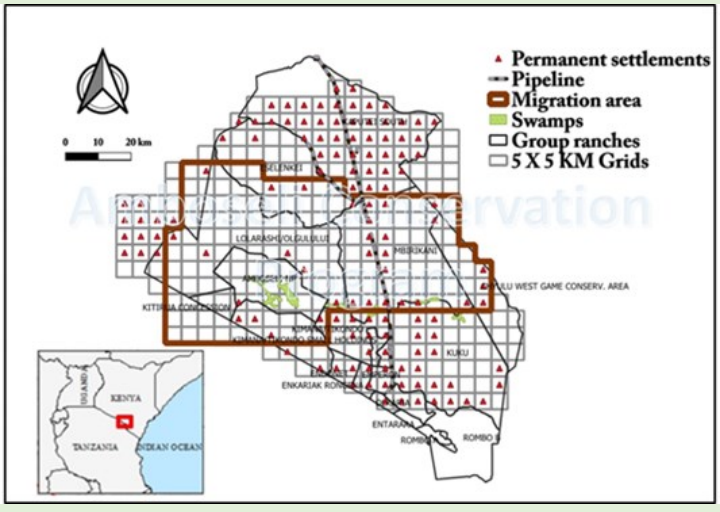


Figure 2: Amboseli National Park is surrounded by Maasai group ranches where the aerial survey was conducted.

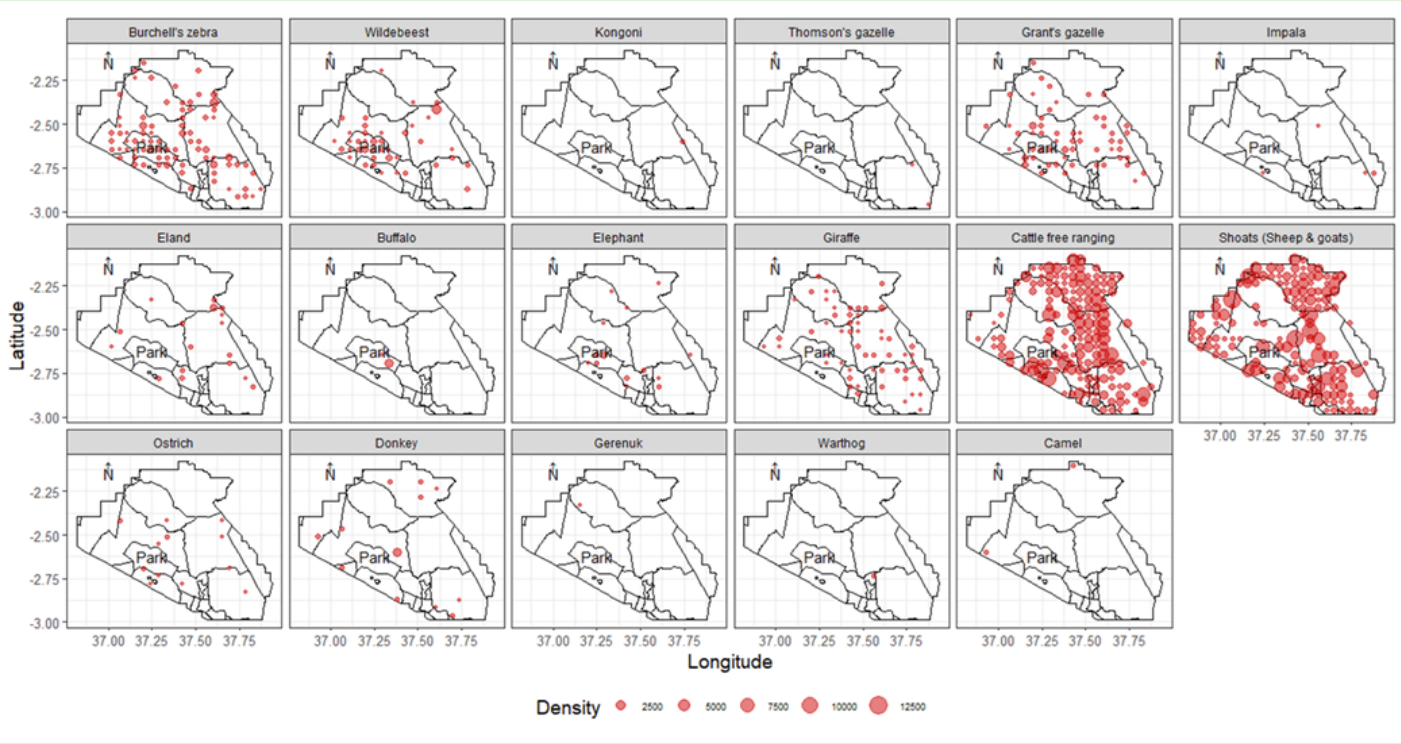


Figure 3: Distribution of each species tallied on the January 2022 count overlaid on a map showing Amboseli National Park and the surrounding group ranches.

The distribution maps show most of the inflowing cattle to have moved through Amboseli due to the dry conditions and onto the group ranches receiving better rains to the east . Imbirikani with 61,000 had by far the highest influx in the Amboseli ecosystem. Kaputei, lying, north of the Amboseli ecosystem also had a large influx totaling 67,000 due to favorable rains (Table 2).

A satellite image of pasture conditions in December 2021 given above shows the influx of cattle from the south and east. They are moving across the dried conditions (red) and around Amboseli to the better pastures (orange and green) and to the group ranches to the east (Figure 4 & 5).

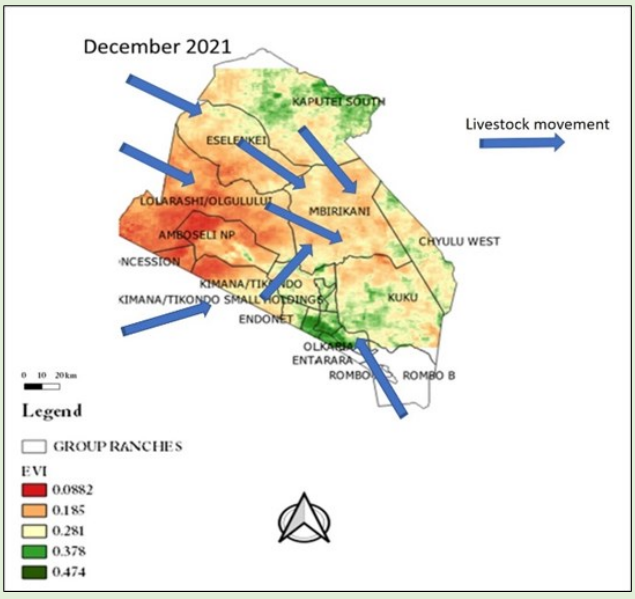


Figure 4: Livestock movement tracking pasture in the Amboseli ecosystem during the aerial survey in January 2022.

Figure 5: Cattle influx into the Amboseli ecosystem in a photo taken during the survey in January 2022.

Group ranch / Species	Amboseli Park	Olgulului Ololarashi	Imbirikani	Eselenkei	Kaputei South	Kimana	Kuku	Chyulu West
Burchell's zebra	1,646	5,454	2,432	2,360	2,698	608	4,452	108
Wildebeest	2,165	2,487	2,590	180	90	108	841	0
Kongoni	0	0	0	0	0	0	0	90
Thomson's gazelle	0	0	0	0	0	0	36	0
Grant's gazelle	484	4,721	2,003	396	322	359	590	805
Impala	0	0	18	0	0	0	0	197
Eland	0	108	180	126	1501	519	198	0
Buffalo	1,715	0	0	0	0	0	0	0
Elephant	1,215	18	0	72	18	536	233	36
Giraffe	36	556	717	1381	841	429	681	466
Cattle	2,287	42,851	61,346	37,331	67,659	11,558	33,008	3,020
Sheep & goats	0	69,137	35,377	36,884	62,176	14,182	38,206	3,376
Ostrich	0	288	54	18	0	18	36	0
Donkey	0	2,163	0	0	270	0	90	0
Gerenuk	0	0	0	18	0	0	0	0
Warthog	0	0	0	0	0	90	0	0
Camel	0	108	0	0	179	0	0	0

Table 2: Selected Group Ranch populations estimates for January 2022.

Sheep and goat numbers reached 250,000 in 2020 and grew 296,000 in 2022, reflecting the continuing increase of small stock as cattle numbers have steadily declined over the decades due to a shrinking range and pasture decline.

The added impact of the cattle influx into the Amboseli region can be shown by the increase in animal production shown in Figure 6. Total production of livestock and wildlife increased by over a third, putting enormous pressure on the grasslands during a period of extreme plant stress.

The unseasonal rains which fell in January and February have moderated the outlook for livestock in Amboseli over the next few months.

We were expecting a large loss of cattle due to the depleted pastures in December and the emaciated state of cattle. The three large hurricanes in the Madagascar Straights in January and February dumped unseasonal rains in the Amboseli region sufficient for herders from Tanzania and the west to begin returning their herds and relieving pressure on the grasslands.

The outlook for livestock over the next two months has therefore improved temporarily, but the economic impact of the drought conditions over the last six months will persist for months to come.

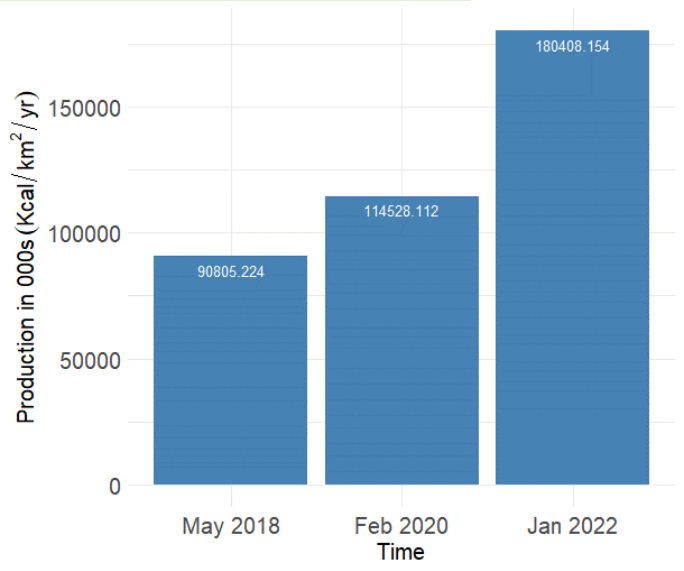


Figure 6: Total herbivore production in the Amboseli ecosystem for May 2018, February 2020 and January 2022. The influx of cattle into the ecosystem and rise in zebra numbers increased the total production as seen in January 2022.

The cumulative income loss from plunging milk yields since January 2021 is enormous: even with good long rains, milk yields will remain depressed for months to come (Figure 7 & 8). The same outlook applies to livestock sale prices. The rock-bottom prices during the 2009 drought when over two thirds of livestock died rebounded quickly due to the lack of animals for sale (Figure 9).

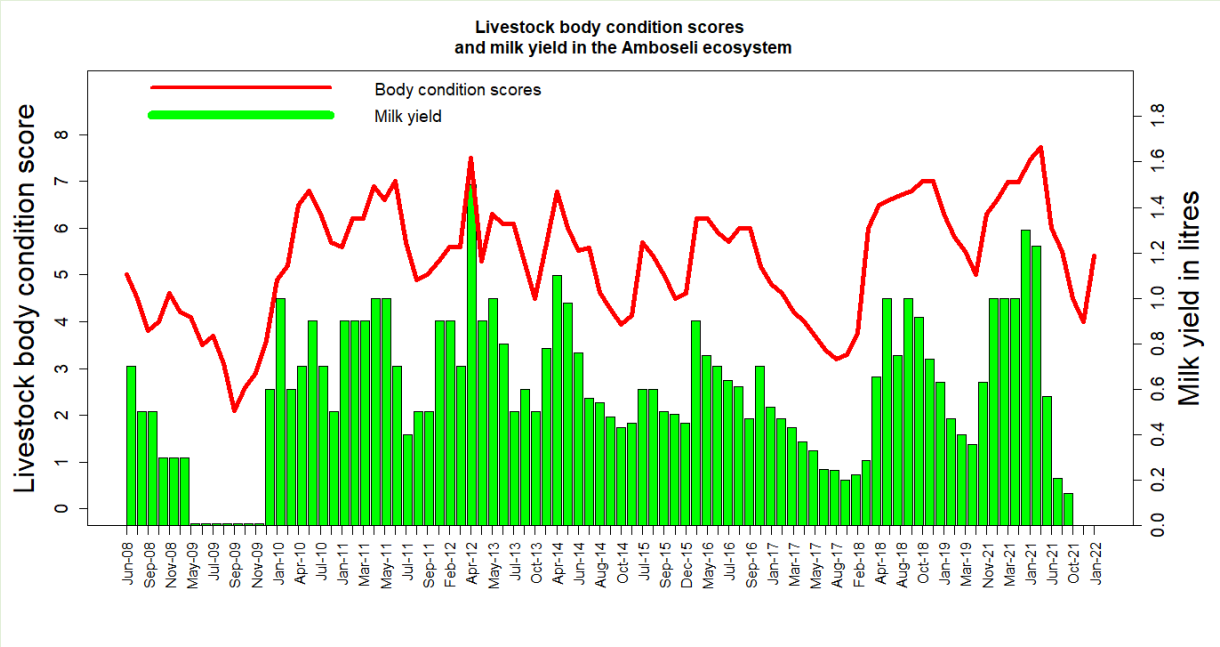


Figure 7: Livestock body condition scores and milk yield in the Amboseli ecosystem. Milk yield has reduced significantly in the recent months.

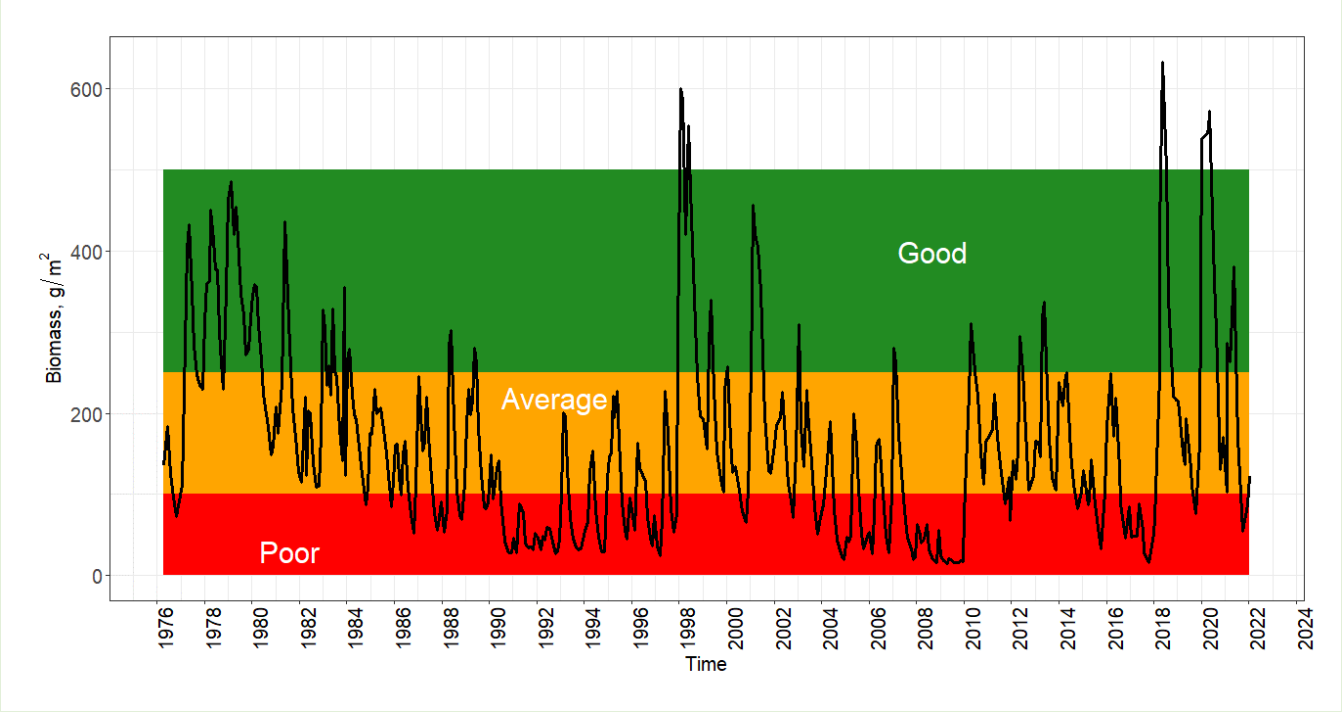


Figure 8: The depressed state of the rangelands in Amboseli due to prolonged high stocking rates and heavy persistent grazing pressure is reducing plant recovery and reducing pasture yields despite the extremely heavy rains in Amboseli in 2018 and 2020 which matched record El Niño fall in 1998. Green indicates above average pasture production, orange average and red years of extreme shortfall.

With few animals to spare, the cumulative loss of income from cattle sales persisted for several years until herds recovered. Livestock sale prices illustrated below show prices falling from 2014 onwards, and only recovering due to the exceptional rains of 2018 and 2020. Prices began to fall steeply again in 2021 and will likely stay depressed well into 2022 due to the poor condition of livestock and surfeit of animals for sale.

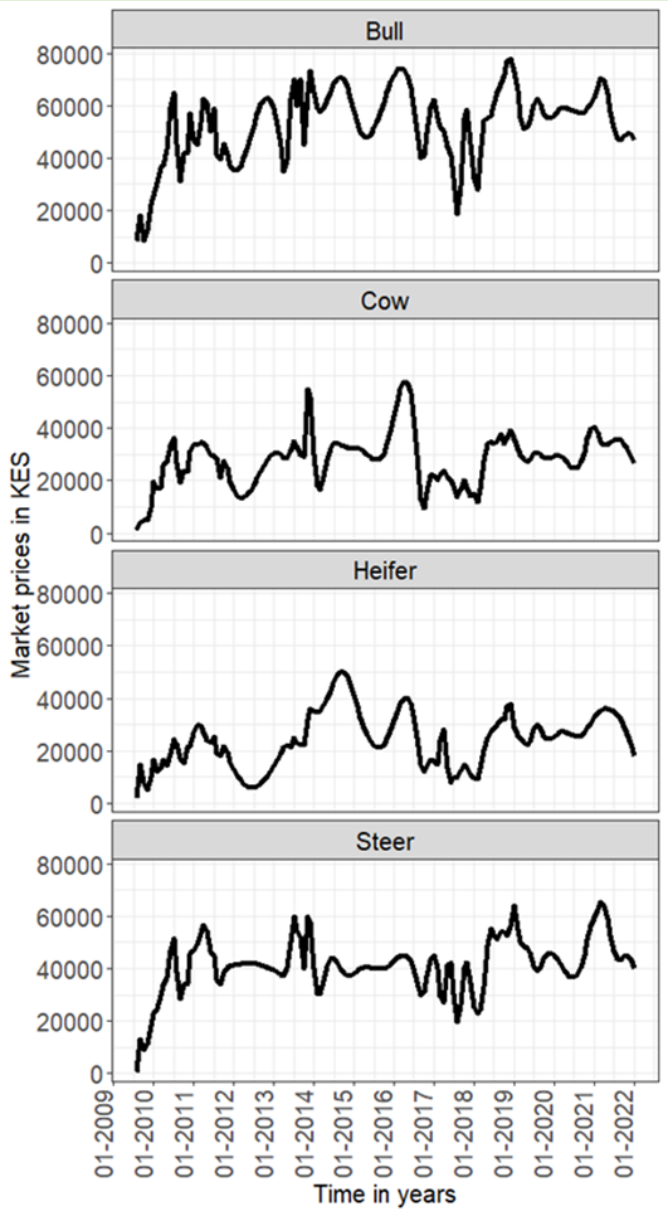


Figure 9: Average livestock market prices in eastern Kajiado showing a steady recovery after the 2009 drought and fluctuations with subsequent dry periods.

Wildlife

Contrary to the livestock figures, wildlife numbers have been holding their own or increasing in the Amboseli ecosystem. Of the most abundant species, zebra numbers have increased from 16,000 to over 20,000 since 2018, wildebeest marginally from 8,000 to nearly 9,000, elephants have topped 2,000, and Grant's gazelle are holding their own at around 10,000 and giraffe at around 6,000.

Counts of impala and bushlands species are clearly on the low side, which we attribute to the dry conditions decreasing the visibility for small animals and herds. We shall be comparing the aerial counts for smaller, more discrete species with ground counts we did of the Amboseli area in the same week.

As we reported for earlier counts, we attribute the increase in wildlife in recent years to the expansion of the Amboseli swamps due to extensive flooding. We shall be posting an update on the Amboseli ground counts shortly.

Traffic light assessment system

ACP is using a traffic light assessment system (Figure 10) to project the livestock outlook based on rainfall and Enhanced Vegetation Index (EVI) as background indicators, but more precisely on the range conditions we measure on the ground—biomass of vegetation, greenness and grazing pressure, and at homesteads the animal body condition and market prices of livestock.

Figure 10: Early warning signals based on ACP's traffic light assessment system. The signals for October were dire in the event of the short rains faltering. The outlook improved marginally with the short rains.

The traffic lights were signaling red and amber for all indicators, meaning severe times ahead if the short rains were poor. The marginal improvements in December were set back by an influx of 140,000 cattle into the Amboseli region. The unseasonal rains in January and February have relived the pressure on the rangelands temporarily. Based on ACP's long-term pasture monitoring program (Figure 8), the outlook for livestock in the Amboseli region is deeply worrying.

Despite exceptional rains in 2018 and 2020, the persistently high livestock populations and grazing pressure due to permanent settlement, will see continuing poor body condition of livestock poor milk yields and weak sale prices. ACP is aiming to model the loss of livestock income due to pasture depletion.

Software and tools corner

The adoption of opensource technology raises the challenge of technical skills needed to customize software to fit organizations' data needs. The Amboseli Conservation Program (ACP) has over the years developed opensource technologies for application to various conservation research needs.

The software tools, which integrate digital data collection, entry, processing, mapping and now report generation, can be easily adapted to processing species population at any scale (Figure 11). Looking ahead, ACP will expand the training on these tools through the Conservation Knowledge Hub (CKH).

The Amboseli monitoring portal, a one-stop protocol and software programs platform for ecological monitoring, was launched online in January 2022.

See https://amboselimonitoring.org/

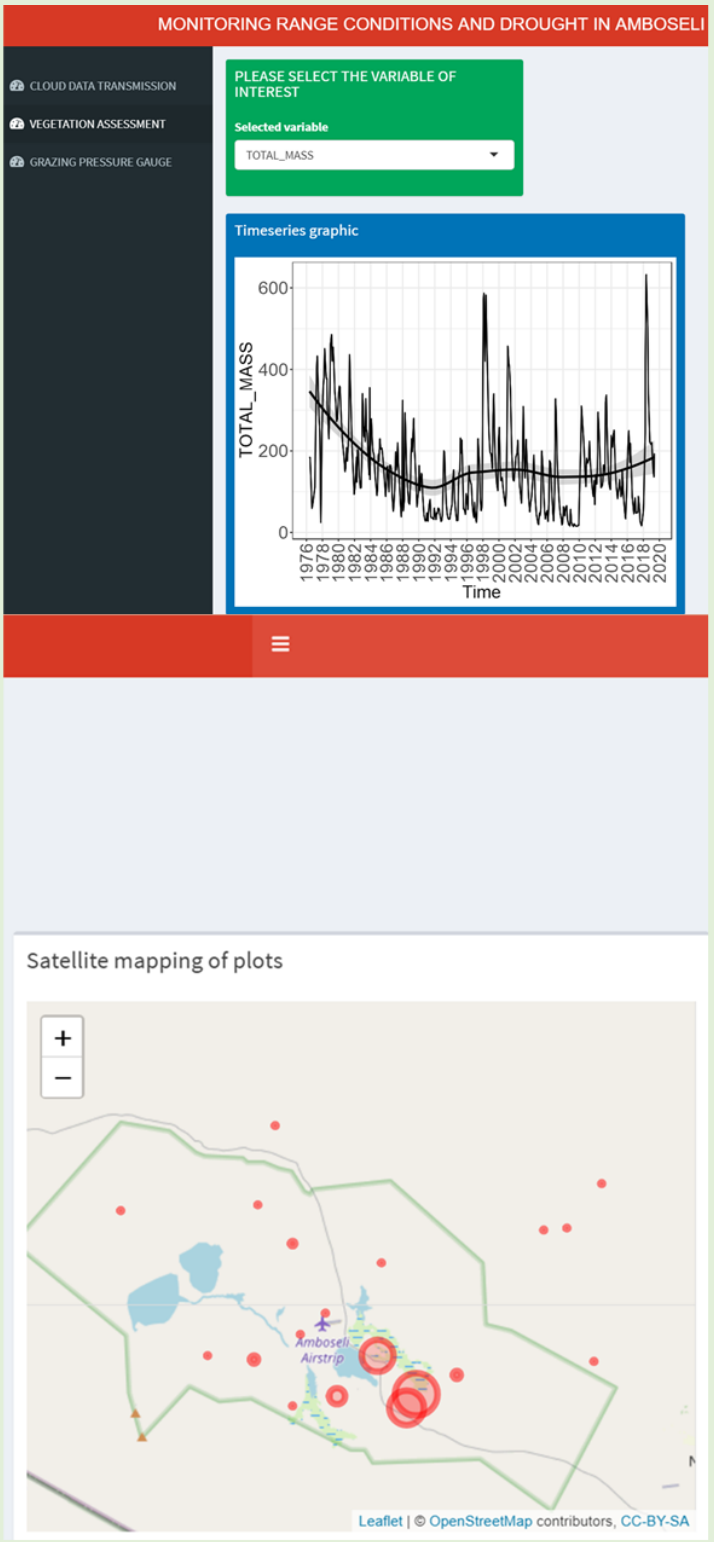
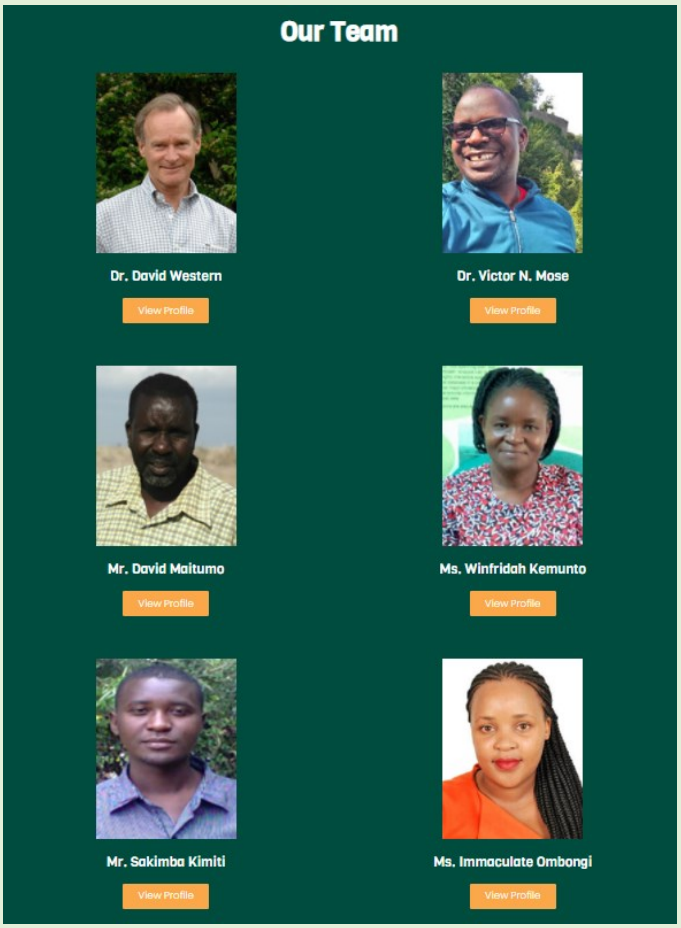


Figure 11: Screenshot of the R Shiny App used by ACP that integrates data transmission via cloud, analysis, mapping and reporting.



Amboseli Monitoring Outlook

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