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The State of Protected Areas and Conservation of Ethiopia's Iconic Large Mammals: Implications for the Post-2020 Global Biodiversity Framework

Simeneh Admasu, Paul Scholte and Lakew Berhanu

ABSTRACT

Despite the creation of several iconic protected areas (PAs) over the past decades, the charismatic megafauna of Ethiopia has continued to decline. Here, we identify the factors that are driving spatial and biological changes in PAs. The findings show that some iconic PAs were down-sized while others remained unchanged, but almost all PAs significantly lost their ability to support iconic species, putting the survival of large mammals at risk. Human population growth, limited livelihoods, a lack of political commitment, insufficient funding, and climate change are all underlying threats to national PAs. The unrestricted use of natural resources, habitat degradation, the rapid spread of invasive species, illegal wildlife trade, disease, pollution, human–wildlife conflict, and roadkill are proximate factors that significantly impact upon PAs. As a result, it is of critical importance to change the management paradigm of the existing but largely degraded PA system. The authors, therefore, recommend that rather than focussing only on expanding protected and conserved areas ('quantity'), management efficiency ('quality') should instead be prioritized to halt the dramatic loss of large mammals in Ethiopia.

1. Introduction

Establishing protected areas (PAs) is one of the most prominent and effective conservation techniques applied by states. However, it requires meaningful political and economic ambition to meet the high conservation objectives for which PAs are designated.¹ Ethiopia has a long history of conservation that started 500 years ago when Emperor Zera Yacob (1434–1468) brought seedlings of junipers from the woodland

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¹M Hocking, S Stolton and N Dudley, *Evaluating Effectiveness: A Framework for Assessing the Management of Protected Areas* (Gland/Cambridge, IUCN, 2000).

land of Wof-Washa to the Wechecha Mountain.² However, ‘modern’ wildlife conservation in Ethiopia started at some point during the regime of Emperor Menelik II (1889–1913). Notable national conservation efforts include the creation of iconic PAs in the 1960s and 1970s. Despite this, wildlife conservation efforts have largely proved to have been unsuccessful in Ethiopia. Several such initiatives theoretically exist in legislation but provide little actual conservation on the ground.³ Ethiopian PAs have generally lost their resilience and are no longer immune from human-induced threats.⁴ Due to the absence of effective collaboration with relevant local governments and communities, PAs have faced severe destruction of their respective infrastructures and extensive poaching of charismatic animals.⁵

Despite a fourfold increase in the global network of terrestrial PAs since the 1970s,⁶ the relative abundance of wildlife populations has decreased by 69% between 1970 and 2018.⁷ The post-2020 Global Biodiversity Framework (GBF) required that 30% of the world’s land surface be protected or conserved,⁸ but this may be challenging due to the considerable economic costs that this will entail.⁹ Furthermore, expanding an already-underfunded PA system could lead to a greater volume of ‘paper parks’ that fail to institute meaningful conservation or enforcement activities, to halt degradation or to effectively implement regulations and management plans and meet conservation targets.¹⁰ These challenges are particularly resonant in Ethiopia with circa 17% of its territory under some form of legal protection and

²R Pankhurst, ‘Some Notes on Deforestation and Afforestation in Ethiopia Prior to World War I’ (1989) 12 *Walia* 10.

³M Jacobs and C Schloeder, *Impacts of Conflict on Biodiversity and Protected Areas in Ethiopia* (Washington DC, World Wildlife Fund, 2001).

⁴M Tesema, A Asefa and Y Dellelegn *National Biodiversity Threat Assessment: Ranking Major Threats Impacting Ethiopia’s Biodiversity* (Addis Ababa, IUCN, 2022).

⁵Jacobs and Schloeder (n3).

⁶M Pacifici, M Di Marco and JEM Watson, ‘Protected Areas Are Now the Last Strongholds for Many Imperiled Mammal Species’ (2020) 13 *Conservation Letters* e12748.

⁷REA Almond et al, *Living Planet Report 2022—Building A Nature-Positive Society* (Gland, WWF, 2022).

⁸Secretariat of the Convention on Biological Diversity, Zero Draft of Post-2020 Biodiversity Framework (Montréal, CBD, 2020).

⁹A Waldron et al, *Protecting 30% of the Planet for Nature: Costs, Benefits and Economic Implications* (Cambridge, Campaign for Nature, 2020).

¹⁰E Di Minin and T Toivonen, ‘Global Protected Area Expansion: Creating More than Paper Parks’ (2015) 65 *Bioscience* 637.

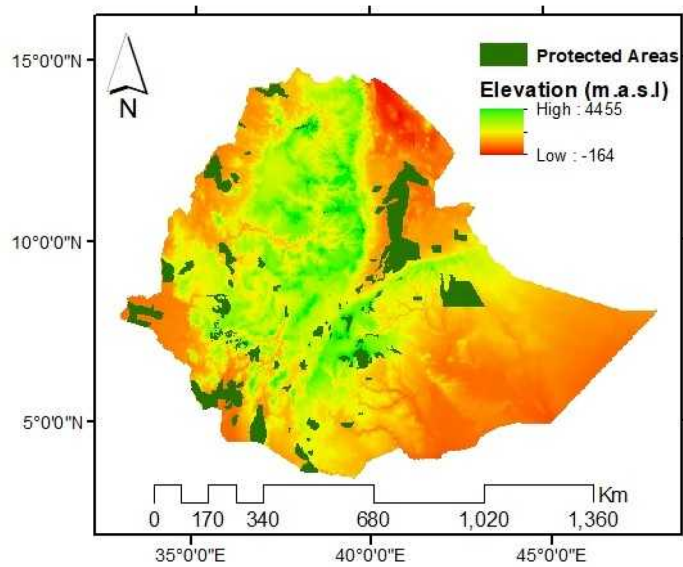


Figure 1. PA network in Ethiopia.

conservation¹¹ (see Figure 1), and a population of over 110 million people, of which 37.4 million are aged between 10 and 24 years.¹²

Ethiopia faces multiple wildlife conservation challenges.¹³ Some of the impacts facing PAs have become irreversible due to continuous encroachment.¹⁴ Several pioneer PAs have largely lost ecologically crucial habitats, while the wildlife population is declining, and the survival of threatened species is extremely low.¹⁵ Social considerations are critical to the successful implementation of the GBF.¹⁶ Similarly, stakeholder collaborations, especially with the local community and through creating economic opportunities, are vital elements to improving the management

¹¹UNEP-WCMC and IUCN, *Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM)* (Cambridge, UNEP-WCMC and IUCN, 2023).

¹²TW Admassu, YT Wolde and M Kaba, 'Ethiopia Has a Long Way to go Meeting Adolescent and Youth Sexual Reproductive Health Needs' (2022) 19 *Reproductive Health* (Supplement 1) 130.

¹³ME Tesema, *A Report on Assessment of Threat Status in Five Selected Wildlife Protected Areas of Ethiopia* (Addis Ababa, Ethiopian Wildlife Conservation Authority, 2019).

¹⁴AD Vreugdenhil et al, *Gap Analysis of the Protected Areas System of Ethiopia* (Shepherdstown, World Institute for Conservation and Environment, 2012).

¹⁵Tesema (n4).

¹⁶C Sandbrook et al, 'Social Considerations are Crucial to Success in Implementing the 30×30 Global Conservation Target' (2023) 7 *Nature Ecology & Evolution* 784.

effectiveness of Ethiopia's PA systems.¹⁷ Therefore, the overall aim of this article is to demonstrate how the current system of PAs in Ethiopia is not working by showing that (1) the extent of PAs has increased, but despite this increase in land area, (2) large mammal populations have declined dramatically, due to an array of factors and threats, and (3) the quantity of PAs has increased while the quality of them has decreased. Accordingly, this article aims to provide progressive PAs management recommendations to halt the further decline of Ethiopia's biodiversity resources.

In assessing the state of PAs, this study examined the 13 pioneer PAs created in the late 1960s and 1970s and does not consider the PAs created more recently, many of which are at the regional state level. Specifically, this study aimed to answer four key questions: (1) What is the state of Ethiopia's PAs in terms of spatial coverage? (2) What is the status of Ethiopia's large mammal populations inside protected areas? (3) What are the key drivers of change, and the major threats to Ethiopia's PAs? (4) What type of management intervention is needed to improve the quality/effectiveness of PA management?

2. Methods

A systematic review of both the grey literature and peer-reviewed literature was performed to assess the State of Protected Areas and Conservation of Ethiopia's iconic large mammals and the implications for the Post-2020 Global Biodiversity Framework. Systematic scholarly engines such as Google Scholar, Web of Science, Science Direct, and Scopus were used to retrieve articles of interest. The method consisted of three stages: (i) the generation of keywords, (ii) a systematic search, and (iii) the extraction of data. We searched published research articles and unpublished reports on the issues around Ethiopia's protected areas, and wildlife, particularly focusing on large mammals, conservation threats, and management effectiveness between June 2021 and April 2023.

Keywords specific to protected areas, wildlife, large mammals, biodiversity, conservation, and management effectiveness were selected, accompanied by appropriate terms such as protected area downgrading, downsizing, and degazettement, Global Biodiversity Framework, costs, benefits, and economic implications, human–wildlife conflict, sustainable development of the protected area system, land use and land cover changes, the

¹⁷A Simeneh et al, 'The Application of a Refined SWOT-AHP-Based Planning and Management Approach for the Conservation of Ethiopia's Protected Area Systems' (2021) 1 *International Journal of Zoological and Entomological Letters* 13.

Table 1. Developed Criteria for the Analysis of the Selected Papers

Question	Possible entries
Does the paper focus on protected areas?	Protected area systems, Ethiopia's protected areas
Does the paper focus on wildlife, large mammals?	Large mammals, elephants, giraffe, oryx, lion
Does the paper focus on the global biodiversity framework?	Post 2030-Global Biodiversity Framework
Are protected area downgrading, downsizing, and degazettement assessed?	Protected areas expansion, downgrading, downsizing, and degazettement assessed
Does the paper assess the economic value of PAs?	Cost and benefits analysis of protected areas, ecosystem service valuation in protected areas
Does the paper assess the underlying and proximate drives of changes?	Challenges of protected areas
Is the sustainable development of the protected area system assessed?	Sustainable Development Goals, protected areas
Are the changes in land use covered in the paper?	Land use changes, invasive species, crop, and settlement expansions in protected areas

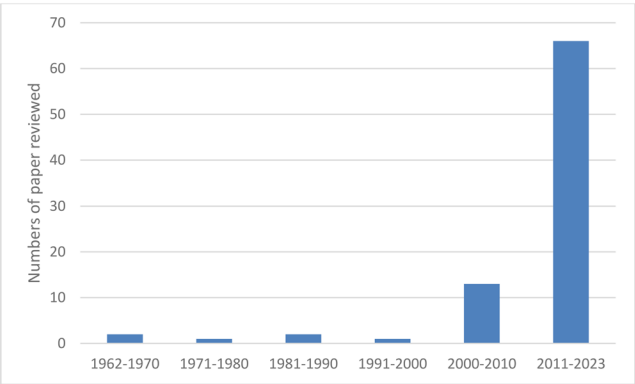


Figure 2. Numbers of papers reviewed between 1962 and 2023.

management cost of protected areas, and invasive species. Data from the reviewed papers were extracted into a database, with parameters covering (i) the extent of the PAs, (ii) trends in large mammal populations, (iii) drivers of change, and (iv) major threats to the PAs of Ethiopia. The papers were analyzed using developed assessment criteria using questions as presented in [Table 1](#).

3. Results and Discussion

We reviewed a total of 85 papers covering a 62-year period (1961–2023), yet with an important increase occurring since 2011 ([Figure 2](#)). The reviewed papers covered a wide thematic scope ranging from large mammals, conservation threats, global biodiversity frameworks, and others ([Figure 3](#)). The reviewed papers have vividly shown that the state of protected areas and the occurrence of large mammals is declining across the period. The main findings of the review are presented in the following sections.

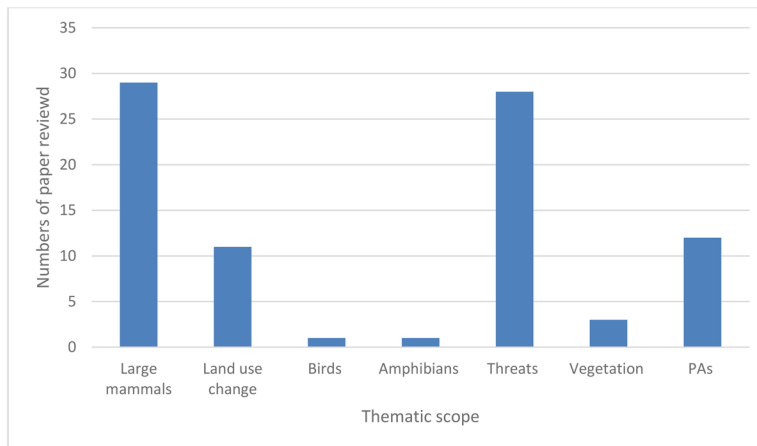


Figure 3. Categories of papers reviewed between 1962 and 2023.

3.1. The Extent of PAs

Since their creation, individual PAs have been extended, downsized, and left unchanged. In general, a total of 561 km² (1.75%) has been added to the PA network (Table 2). The mean ($\pm$ SD) extent of the PAs was 2476 km² ($\pm$ 57) when they were initially created; however, it has since increased to 2519.5 km² ($\pm$ 618.5). Some of the PAs have been dramatically downsized, while a few have remained unchanged. The Senkelle Swayne's Hartebeest Sanctuary (SSHS), Alledighe Wildlife Reserve (AWR), Awash National Park (ANP), Bale Mountains National Park (BMNP), and Gambella National Park (GNP) have been reduced by 73%, 40%, 21%, 15%, and 13.6% respectively. However, the dimensions of Simien Mountains National Park (SMNP), Omo National Park (ONP), and Borena National Park (BNP) have extended by 32.9%, 26%, and 49% respectively. The preliminary extent of the SMNP changed to 179 km². It increased to the west in 2003 and to the east in 2007, bringing the entire area to 412 km². The boundaries of the park have been set following extensive consultations with local communities in each area. The new sectors have all been depopulated and uncultivated, and boundaries have been negotiated and agreed upon with local communities. The extension areas contain some of the optimal habitats for *Walia ibex* and Ethiopian wolf and will help to conserve these two critically endangered endemic species, as well as other wildlife. Therefore, the extension may notably contribute to the increase of endemic mammals within the park.

The GNP has moved closer to the area's southwestern edge to form a transboundary conservation corridor with South Sudan's Boma National Park. However, the park's area has been reduced to 4,372 km² due to the loss of important habitat caused by mechanized agricultural projects. The ONP was expanded to form a transboundary conservation corridor with neighboring areas to facilitate large mammal migration. Furthermore,

significant land has been added to the west of the ONP for conservation to compensate for the land taken by the Kuraz Sugar Development Project (KSDP) in the park's eastern grassland. However, further extension is required to connect the ONP and GNP because a recent study discovered the first ever white-eared kob in the ONP,¹⁸ which may have important implications for migratory connectivity in this area. BNP, like the ONP and GNP, has expanded to facilitate transboundary conservation with Marsabit National Park in Kenya, with the goal of ensuring the long-term conservation and management of biodiversity and other associated natural, economic, scientific, and social values.¹⁹

In 2015, the ANP boundary was redrawn to exclude land that had been converted to agriculture or settlement. Similarly, the BMNP and AWR must be reduced in size due to increasing anthropogenic pressure, primarily agricultural expansion, and urbanization.²⁰ Before 1940, the present-day Senkelle Plain become utilized by pastoralists,²¹ and it emerged under the control of landholders who brought mechanized farming to the area during the Haile Selassie regime. Thus, the current size of the sanctuary of 54 km² was the result of its downsizing from 200 km² in 1972.

Table 2. Initial and Current Size of PAs of EWCA²²

Name of PA (abbreviation)	Year established	Initial size (km ²)	Current size (km ²)	Change (km ²)
Awash (ANP)	1958	756	598	-158
Simien Mountains (SMNP)	1959	179	412	233
Bale Mountains (BMNP)	1962	2471	2100	-371
Abijata Shala lakes (ASLNP)	1963	887	887	0
Omo (ONP)	1959	4068	5122	1054
Nech Sar (NNP)	1966	514	514	0
Yangudi-Rassa (YRNP)	1969	4731	4731	0
Gambela (GNP)	1966	5061	4372	-689
Babile Elephant Sanctuary (BES)	1970	6982	6982	0
Alledighe (AWR)	1973	1832	1099	-733
Senkelle Swayne's Hartebeest (SSHS)	1972	54	54	0
Mago (MNP)		2162	2162	0
Borena (BNP)		2496	3721	1225
Total		32,193	32,754	561

¹⁸T Asfaw et al, 'First Record of White-eared Kob (*Kobus kob leucotis*) in Omo National Park, Ethiopia (Artiodactyla, Bovidae)' (2022) 10 *Biodiversity Data Journal* e94114.

¹⁹R Moreaux et al, *Analysis of Potential of Further UNESCO-Biosphere Reserves in Ethiopia* (Greifswald, Michael Succow Foundation for the Protection of Nature, 2015).

²⁰W Kassaye and A Mekonnen, *Survey Report on Alledighe Wildlife Reserve Boundary Assessments and Socioeconomic Data Collection for the Purpose of Re-demarcation* (Addis Ababa, Ethiopian Wildlife Conservation Authority, 2013).

²¹K Tewodros, *Human–Wildlife Conflict and Population Status of Swayne's Hartebeest (Alcelaphus Buselaphus Swaynei) in Senkele Swayne's Hartebeest Sanctuary*. MSc thesis, Addis Ababa University, Addis Ababa.

²²Information drawn from UNEP-WCMC and IUCN (n11).

3.2. Large Mammal Populations

A large decline in large mammal populations has been observed throughout East Africa, because of habitat loss and unrestricted overexploitation of biodiversity resources.²³ The effects in Ethiopia seem to be especially acute, with many large mammal populations within the study PAs at stake (Table 3). For example, the black rhinoceros has been extinct from Ethiopia in general and from the ONP in particular. Some iconic species, including the African wild ass, Swayne's hartebeest, and Grevy's zebra, have been regionally extinct from Awash National Park,²⁴ and the African wild ass²⁵ and Swayne's hartebeest²⁶ have also become extinct from AWR and NNP, respectively. The population of African elephants in Ethiopia has dramatically declined, with 90% lost since the late 1970s. Thus, the current population was estimated at between 1631 and 2121.²⁷ The largest population estimated in GNP is 550 individuals, followed by way of the Omo (411 individuals), BES (250 individuals), and Mago (80 individuals).²⁸

Table 3. Summary of Large Mammal Population Status²⁹

Species	Population status	Remark
Black rhinoceros	Extinction	No record since the 1990s
African elephants	90% of the population lost since the 1970s	Occurs in a few ranges but the existence of a viable population is doubtful
Giraffe	Below 200 individuals	Occurs only in southwestern ranges but the existence of a viable population is doubtful
Lion	Below 1100 animals	Disappeared from their most historical ranges
African wild ass	Local extinction, declining by over 90% since the 1970s	Disappeared from historical ranges including ANP, Yangudirassa, and the Somali landscape
Swayne's hartebeest (endemic)	Local extinction, increasing in two remaining PAs	Disappeared from historical ranges including ANP but increasing population in SSHS and Maze National Park
Grevy's zebra	Local extinction, 94% of the population lost	Disappeared from historical ranges including ANP
Beisa oryx	Dramatically declining, current population not exceeding 4000 animals	No viable population inside the Yangudirassa, Omo, and Borena national parks
Walia ibex (endemic)	Increasing population	Over 900 animals
Ethiopian wolf (endemic)	Populations fluctuate because of diseases	450 animals

²³N Diplock et al, 'Large Mammal Declines and the Incipient Loss of Mammal–Bird Mutualisms in an African Savanna Ecosystem' (2018) 13 *PLoS ONE* e0202536.

²⁴A Tadesse, *Sustaining the Alledoghi Grassland of Ethiopia: Influences of Pastoralism and Vegetation Change*, PhD thesis 2009, Utah State University; T Chernet, *A Resource Base and Climate Change Risk Maps for Awash National Park* (Addis Ababa, PHE-Ethiopia Consortium, 2015).

²⁵UNEP/CMS, *Conservation Road Map for the African Wild Ass Equus africanus 2017–2027* (Bonn, CMS, 2017).

²⁶S Shibre et al, 'Human Pressure Threaten Swayne Hartebeest to Point of Local Extinction from the Savannah Plains of Nech Sar National Park, South Rift Valley, Ethiopia' (2020) 8 *Journal of Biodiversity and Endangered Species* 1.

²⁷K Laurenson, *Ethiopian Elephant Action Plan 2015–2020* (Addis Ababa, Ethiopian Wildlife Conservation Authority, 2015).

²⁸Ibid.

²⁹Status and remarks are drawn from the literature cited above.

In addition, the regionally managed national park Chebera-Churchura, not considered further here, may harbor an estimated 400 elephants.³⁰

Similarly, Ethiopia's giraffe population has been in dramatic decline, with its historical range heavily eroded.³¹ Giraffes used to be common on the southern border of the country, and their total number was estimated between 1000 and 2000 individuals in 1971.³² The current population, however, has declined to less than 200 animals.³³ Like the giraffe population, lions had been quite common in a number of localities of Ethiopia; however, presently, the lion population is limited to a few landscapes only, with less than 1100 animals.³⁴

The total population of Beisa oryx in Ethiopia was estimated at between 4000 and 5000 individuals, with a steadily declining population over the past four decades.³⁵ For instance, inside the ANP, wherein it constitutes the park's flagship species, the Beisa oryx has been abundant in numerous localities, with a total population estimated at 4020 in 1969.³⁶ However, numbers have declined alarmingly,³⁷ and the current population of the species was estimated below 200 individuals, with the species on the verge of extinction.³⁸ Currently, the biggest population of Beisa oryx occurred in the AWR, where a population of below 2000 individuals has been estimated.³⁹ There are no longer viable populations of Beisa oryx inside the Yangudirasa, Omo, and Borena National Parks. Similarly, Grevy's zebra has declined from an estimated 1900 in 1980 to 577 in 1992,⁴⁰ and to

³⁰M Tessema et al, 'Trend, Challenges and Opportunities of Illegal Wildlife Trafficking and Trade Activities within and through Ethiopia' (2021) 44 *SINET: Ethiopian Journal of Science* 47.

³¹M Tefera, 'Wildlife in Ethiopia: Endemic Large Mammals' (2011) 6 *World Journal of Zoology* 108.

³²Al Dagg and JB Foster, *The Giraffe: Its Biology, Behavior, and Ecology* (Malabar, Krieger Publishing Company, 1982).

³³AJ Marais, S Fennessy and J Fennessy, *A Rapid Assessment of the Giraffe Conservation Status in Ethiopia* (Windhoek, Giraffe Conservation Foundation, 2013).

³⁴G Yirga et al, 'Lion (*Panthera leo*) Ecology and Survival in Protected Areas of Ethiopia' (2021) 101 *Mammalian Biology* 379.

³⁵T Woodfine and G Parker, 'Emerging Evidence of Beisa Oryx Decline in Parts of Northern Kenya' (2011) 29 *Gnusletter* 21.

³⁶IJM Robertson, *Awash National Park. A Working Plan* (Addis Ababa, EWCO, 1970).

³⁷C Enawgaw, *Population Status and Distribution of Artiodactyls in Awash National Park with Special Reference to Beisa oryx (Oryx beisa beisa)*, MSc thesis, 2004, Addis Ababa University.

³⁸Personal communication (on file with the corresponding author).

³⁹A Simeneh, B Afework and A Addisu, 'Population Size and Structure of Beisa oryx and Its Habitat Overlap with Sympatric Species in Alledoghi Wildlife Reserve, NE, Ethiopia' (2016) 15 *Ethiopian Journal of Biological Sciences* 37.

⁴⁰M Rowen and J Ginsberg, 'Grevy's Zebra (*Equus grevyi* Oustalet)' in P Duncan (ed), *Zebras, Asses and Horses. An Action Plan for the Conservation of Wild Equids* (Gland, IUCN, 1992) 10–12.

106 in 2003,⁴¹ meaning that 94% of the population has been lost in 23 years.⁴² Likewise, the African wild ass population was estimated at 860 individuals in the 1970s.⁴³ In Ethiopia, there has been a severe population decline of over 90% since the 1970s, with only about 110 individuals now thought to survive.⁴⁴ The species has been extirpated from its historical ranges in the Yangudirassa and the Somali landscape.⁴⁵

Unlike for most large mammals, the populations of endemic and endangered species (including Walia ibex, Ethiopian wolf, and Swayne's hartebeest) have increased inside the SMNP, BMNP, and SSSH. The population of Walia ibex was on the verge of extinction in the early 1990s, with an estimated total population of 150 individuals; however, the current population reached more than 957 animals in the SMNP due to strong community-based conservation interventions and increased benefits from tourism in the park.⁴⁶ The Ethiopian wolf population has been fluctuating over the years in both SMNP and BMNP. The population seems strong, and has been growing slightly over the years: for instance, inside the SMNP it has increased from 60 individuals in the late 1990s to about 90–100 individuals in 2016,⁴⁷ and further, within the BMNP the population was expected to reach about 136 in 2016.⁴⁸ The overall number of wolves is estimated at about 450 adults or subadults across Ethiopia.⁴⁹ The Ethiopian Wolf Conservation Programme (EWCP) has been the sole initiative focusing on a single species since 1995, with the goal of ensuring viable and ecologically functioning Ethiopian wolf populations and habitats, as well as continuous monitoring of the species. Because of this regular research and monitoring of the species, adequate information can be

⁴¹SD Williams, APW Nelson and F Kebede, *Grevy's Zebra Survey: Ethiopia 2003. Interim Report* (Oxford, Wildlife Conservation Research Unit, 2003).

⁴²See <https://www.iucnredlist.org/species/7950/89624491>.

⁴³H Klingel, *Status Survey of the Somali Wild Ass in the Danakil Region Ethiopia* (Gland, World Wildlife Fund, 1971).

⁴⁴F Kebede *Ecology and Community Based Conservation of the Grevy's zebra (Equus grevyi) and the African Wild Ass (Equus africanus) in the Afar region, Ethiopia*, PhD thesis, 2013, Addis Ababa University; see also UNEP/CMS (n25).

⁴⁵F Kebede et al, *Distribution and Population Status of the African Wild Ass (Equus africanus) in Ethiopia* (St Louis, St Louis Zoo, 2007).

⁴⁶D Ejigu, A Bekele and L Powell, 'Walia Ibex Have Increased in Number and Shifted their Habitat Range Within Simien Mountains National Park, Ethiopia' (2017) 10 *Journal of Mountain Ecology* 10.

⁴⁷Simien Mountain National Park, *A General Management Plan (2020–2029) for the Simien Mountain National Park. Debark, Ethiopia* (Addis Ababa, SMNP, 2020).

⁴⁸Z Demissie, 'Population Status towards Ethiopian Wolf (*Canis simensis*) in Bale Mountains National Park, South Easter, Ethiopia' (2021) 9 *Global Scientific Journal* 1472.

⁴⁹Ethiopian Wolf Conservation Programme, *EWCP Annual Report* (Addis Ababa, EWCP, 2022).

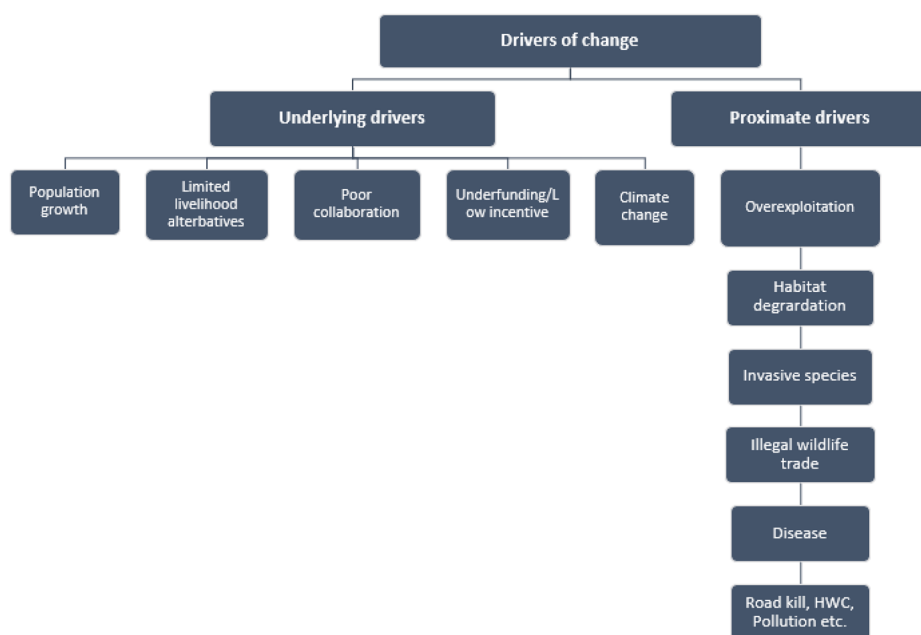


Figure 4. Overview of drivers of change that threaten wildlife conservation in Ethiopia.

obtained and rapid evidence-based solutions to emerging conservation threats can be provided. Similar to the ibexes and wolves, Swayne's hartebeest has shown an increase, from 120 individuals in 1992 to 1528 individuals in 2020.⁵⁰ The introduction of the indigenous 'Oromo Gadda System' in 1993 has changed the practices of the illegal killing of the endemic Swayne's hartebeest, making the community the custodians of conservation for the species.⁵¹

3.3. Drivers of Change

The driving factors of change can be divided into two categories underlying and proximate drivers⁵² (Figure 4). The underlying drivers do not directly cause change but rather act indirectly to contribute to it, though proximate drivers do.⁵³ Human population growth is the most significant

⁵⁰M Tamrat et al, 'Swayne's Hartebeest in Ethiopia: Population Estimate, Genetic Variability, and Competition with Livestock' (2021) 56 *Oryx* 336.

⁵¹A Asefa, G Mengesha and R Almaw, 'Indigenous Institutions and Wildlife Conservation: The Case of the Oromo Gadda System Protecting Swayne's Hartebeest in Ethiopia' (2019) 1 *Conservation Science and Practice* e113.

⁵²P Scholte, 'Towards Understanding Large Mammal Population Declines in Africa's Protected Areas: A West-Central African Perspective' (2011) 4 *Tropical Conservation Science* 1.

⁵³Ibid.

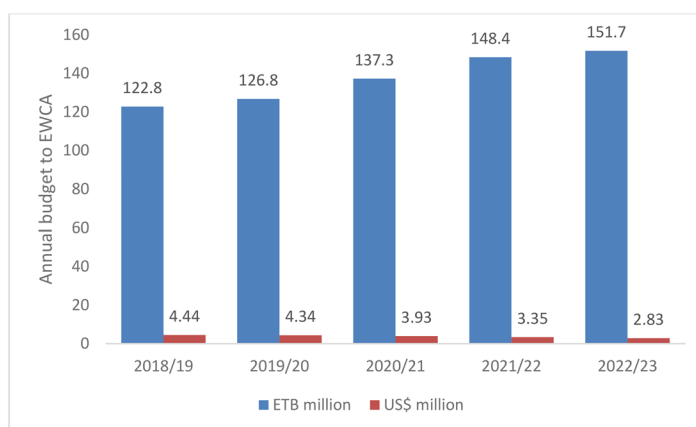


Figure 5. Budget allocated to EWCA between 2018/2019 and 2022/2023 (ETB vs US\$).

underlying factor influencing PAs in Ethiopia, but underfunding is the major factor undermining Ethiopia's PAs.⁵⁴ Indeed, the budget allocation to EWCA—although increasing in ETB—has decreased in terms of purchasing power, from US\$4.44 million in 2018 to US\$2.92 million in 2022, a 34.23% decrease in the annual budget between 2018/2019 and 2022/2023 (Figure 5).

Human settlement inside PAs has become a major threat to many of the PAs; as a result, critical habitats have been reduced.⁵⁵ Climate change has resulted in changes to ecosystem structures and functions, as well as changes in migration patterns and ecological range shifts.⁵⁶ Poor collaboration with relevant actors, including local governments and communities, has harmed PA management, as the government's lack of political commitment has resulted in the creation of poorly designed development projects inside PAs, including agriculture development projects inside the ONP and GNP. Even though communities within

⁵⁴A Simeneh et al, 'Underfunding, The Challenge of Federally Managed Protected Areas of Ethiopia' (2020) 4 *Advances in Environmental Studies* 307.

⁵⁵See further M Wondie et al, 'Spatial and Temporal Land Cover Changes in the Simen Mountains National Park, a World Heritage Site in Northwestern Ethiopia' (2011) 3 *Remote Sensing* 752; S Belay, A Amsalu and E Abebe, 'Land Use and Land Cover Changes in Awash National Park, Ethiopia: Impact of Decentralization on the Use and Management of Resources' (2014) 4 *Open Journal of Ecology* 950; SN Hailemariam, T Soromessa and D Teketay, 'Land Use and Land Cover Change in the Bale Mountain Eco-Region of Ethiopia during 1985 to 2015' (2016) 5 *Land* 41; B Tesfaw Hailu and S Girma, 'Spatio Temporal Lake Level Change of Lake Abijata, Ethiopia: A Remote Sensing Approach' (2019) 6 *Environmental Analysis & Ecology Studies* 592; DW Sintayehu and M Kassaw, 'Impact of Land Cover Changes on Elephant Conservation in Babile Elephant Sanctuary, Ethiopia' (2019) 3 *International Journal of Biodiversity* 65; F Temesgen, B Warkineh and A Hailemicael, 'Seasonal Land Use Land Cover Change and the Drivers in Kafta-Sheraro National Park, Tigray, Ethiopia' (2022) 8 *Heliyon* e12298.

⁵⁶DW Sintayehu, 'Impact of Climate Change on Biodiversity and Associated Key Ecosystem Services in Africa: A Systematic Review' (2018) 4 *Ecosystem Health and Sustainability* 225.

and adjacent to PAs tend to have higher incomes than those living outside,⁵⁷ local communities adjacent to PAs also have a high reliance on natural resources due to a lack of alternative livelihoods.⁵⁸ As a result, the current unsustainable use patterns jeopardize biodiversity conservation.⁵⁹

The primary aggravating factors include the continuation of natural habitat degradation that is particularly related to extensive cultivation and the high demand for grazing land in and around PAs. This has resulted in poor level of management effectiveness of PAs.⁶⁰ A dramatic replacement of natural vegetation with grazing land, farmlands, and settlements has been observed in almost all PAs. The growing population and increasing socioeconomic necessities in the country have created a strain on land use. Land use changes have converted natural areas into farmlands and settlements at the expense of natural vegetation, with dramatic modifications to land use arising in a number of the PA systems of Ethiopia, including the BMNP,⁶¹ ANP,⁶² SMNP,⁶³ NNP,⁶⁴ and AWR.⁶⁵ Similarly, cropland expansion is a persistent and intractable global conservation challenge that will have an impact on the post-2020 global biodiversity framework's goals.⁶⁶

Invasive species like mesquite, water hyacinth, and shrub verbena pose a threat to considerable parts of terrestrial and wetland ecosystems,⁶⁷ including PAs. For example, several PAs have been affected by invasive

⁵⁷T Estifanos et al, 'The Impact of Protected Areas on the Rural Households' Incomes in Ethiopia' (2020) 91 *Land Use Policy* 104349.

⁵⁸W Mengist, 'Challenges of Protected Area Management and Conservation Strategies in Ethiopia: A Review Paper' (2020) 4 *Advances in Environmental Studies* 277.

⁵⁹UNDP-GEF, *Sustainable Development of the Protected Area System of Ethiopia (SDPASE)* (Washington DC, United Nations Development Program, 2008).

⁶⁰FW Duckworth, *An Assessment of Ethiopia's Wildlife Situation* (Addis Ababa, Ethiopian Reporter, 2002); Simeneh (n54).

⁶¹Hailemariam, Soromessa and Teketay (n55).

⁶²Belay, Amsalu and Abebe (n55).

⁶³Wondie (n55).

⁶⁴A Fetene et al, 'Detecting Trends in Land Use and Land Cover Change of Nech Sar National Park, Ethiopia' (2016) 57 *Environmental Management* 137.

⁶⁵A Simeneh 'Impact of Land Use Land Cover Changes on Ecosystem Services in the Alledighe Wildlife Reserve, Ethiopia: Implication for Rangeland Ecosystem Management' (under review; on file with the author).

⁶⁶Z Meng et al, 'Post-2020 Biodiversity Framework Challenged by Cropland Expansion in Protected Areas' (2023) 6 *Nature Sustainability* 758.

⁶⁷W Shiferaw, S Demissew and T Bekele, 'Invasive Alien Plant Species in Ethiopia: Ecological Impacts on Biodiversity: A Review Paper' (2018) 3 *International Journal of Molecular Biology: Open Access* 171.

species that have harmed native species and habitats.⁶⁸ The illegal wildlife trade threatens many of Ethiopia's iconic species, including the African elephant, lion, cheetah, leopard, and Grevy's zebra.⁶⁹ The pollution of soil and water caused by nearby industries and agricultural practices significantly impacts Ethiopia's diverse land and water life, habitats, and ecosystem services.⁷⁰ Due to emerging infectious diseases and novel pathogens, the disease is also causing catastrophic losses in iconic species.⁷¹ The Ethiopian wolf is especially vulnerable to rabies and canine distemper virus outbreaks caused by the transmission of viruses from domestic dogs.⁷² Human–wildlife conflict (HWC) is also a serious issue that affects both local communities and the surrounding PAs.

3.4. Major Threats in Some Key PAs of Ethiopia

Almost all of Ethiopia's PAs are heavily impacted by numerous factors, although the conservation challenges and their degree of influence vary amongst individual PAs. For instance, the ASNP has had issues with incursions and encroachment from neighboring communities. Now there are thousands of human residents inside the park together with hundreds of thousands of livestock.⁷³ The park has been largely destroyed due to charcoal manufacture, agricultural land enlargement, and grazing. The two lakes (Abijata and Shalla) previously covered nearly half of the park; however, this has now changed dramatically, and the water level of Abijata has been reduced by 33.56% (66.6 km²), from 198.4 km² in 1972 to 131.8 km² in 2017.⁷⁴

The situation in ONP is different, as the central regions of the park had been handed over to sugar cane projects totaling 106,000 ha and a 125 km canal has been constructed cutting right through the national park, endangering its wildlife.⁷⁵ At some other stage, the park is envisaged to

⁶⁸Tadesse (n24); S Tesfaye, *Impact of Prosopis juliflora on Plant Biodiversity at Alledoghi Wildlife Reserve and Surrounding Local Community, Ethiopia*, MSc thesis, 2015, Addis Ababa University.

⁶⁹Tessema (n29).

⁷⁰SB Wassie, 'Natural Resource Degradation Tendencies in Ethiopia: A Review' (2020) 9 *Environmental Systems Research* 33; K Asnake, H Worku and M Argaw, 'Assessing the Impact of Watershed Land Use on Kebena River Water Quality in Addis Ababa, Ethiopia' (2021) *Environmental Systems Research* 3.

⁷¹See further <https://www.cdc.gov/onehealth/what-we-do/zoontic-disease-prioritization/completed-workshops.html>.

⁷²DA Randall et al, 'Rabies in Endangered Ethiopian Wolves' (2004) 10 *Emerging Infectious Diseases* 2214.

⁷³Wetland International Ethiopia, *Biodiversity and Socio-Economic Assessment of Abijata Shalla National Park* (Addis Ababa, Wetland International Ethiopia, 2020).

⁷⁴Tesfaw Hailu and Girma (n55).

⁷⁵Omo National Park, *General Management Plan (2021–2030)* (Addis Ababa, Omo National Park, 2021).

behave as a resettlement region for thousands of households.⁷⁶ The ANP faces several anthropogenic threats, the most significant of which is increased livestock incursions into the national park by local tribes,⁷⁷ leading to the degradation of ecologically significant habitat and to the deterioration of grazing land for wild animals within the PAs.⁷⁸

Despite being the predominant tourism destination for both domestic and international tourists, NNP is one of the most threatened PAs in Ethiopia.⁷⁹ The park management has been challenged by a combination of complicated socioeconomic, political, and administrative problems,⁸⁰ which have been daunting for the conservation of its biodiversity resources. Thus, appropriate conservation intervention to reverse the degradation of NNP is needed to secure its remaining biodiversity resources.⁸¹

Although BES is harboring the last remaining easternmost population of African elephants in the Horn of Africa and possesses globally valued biodiversity assets, the wealthy and ecologically representative ecosystems of BES have been under extreme threat from the growth of various anthropogenic influences. For example, between 2006 and 2017 the BES has seen intense illegal human encroachment, and a wide range of illegal houses has expanded into the elephant's range.⁸² The ever-growing degradation of natural ecosystems has resulted in the loss and fragmentation of natural habitats, the decline in populations of key species, and the accelerated prevalence of human--wildlife conflict. Additionally, the BES has seen a rapid land cover change over the last four decades.⁸³

GNP has seen dramatic land use changes over the past three decades,⁸⁴ where farmland has extended at the expense of grassland habitat. Land, inclusive of migratory routes, has been converted to agriculture and

⁷⁶Ibid.

⁷⁷See A Schubert, *A Situational and SWOT Analysis of the Awash and Nech Sar National Parks* (Addis Ababa, GLZ Ethiopia, 2015), and B Zerga, 'Awash National Park: It's Degradation Status and Protection Measures' (2015) 2 *Palgo Journal of Agriculture* 57.

⁷⁸Zerga, *ibid.*

⁷⁹Schubert (n55).

⁸⁰Ibid.

⁸¹F Aramde et al 'Study of Changes in Habitat Type Distribution and Habitat Structure of Nech Sar National Park, Ethiopia' (2014) 4 *Ecology* 1.

⁸²E Neil and E Greengrass, 'Illegal Settlement in the Babile Elephant Sanctuary is Threatening the Resident Elephant Population' (2021) 56 *Oryx* 457.

⁸³Sintayehu and Kassaw (n55).

⁸⁴AW Degife, F Zabel and W Mauser, 'Assessing Land Use and Land Cover Changes and Agricultural Farmland Expansions in Gambella Region, Ethiopia, using Landsat 5 and Sentinel 2a Multispectral Data' (2018) 4 *Heliyon* e00919.

settlements using agricultural development and villagization projects. As a result, the second biggest mammalian migration in Africa, wherein nearly one million white-eared kob move between Gambela, Ethiopia, and Boma, South Sudan, is under threat.⁸⁵

4. Conclusions and Recommendations

Since numerous studies used habitat and species-specific survey techniques to estimate populations of large mammals in each PA, there is a lack of long-term and comprehensive data by which to measure iconic wildlife populations in each PA. This has created inaccuracies in describing the population trends of large mammals inside Ethiopia's PAs. Despite these limitations, we can conclude that the PA system management in Ethiopia is insufficient, and it is doubtful whether it will achieve the desired results. Ethiopia's PAs are losing their ability to harbor iconic wild animals at an alarming rate. Their establishment and management have been exclusionary, with little participation from local people, and traditional conservation practices have largely gone unnoticed. As a result, this study recommends changing the management paradigm of existing, but largely degraded, PA systems and identifying mechanisms to accelerate the implementation of the post-2020 GBF through the formation of a strong coalition of stakeholders that could support National Biodiversity Strategies and Action Plans (NBSAPs), with the goal of halting and reversing biodiversity loss through transformational change in PAs and at large.

Although meeting the GBF target by 2030 will necessitate extreme dedication and financial support, Ethiopia has enormous potential. Despite the limited data concerning biodiversity resources in southwestern and southeastern Ethiopia, there is scope for additional PAs—including the Gura-Ferda Forest, which is located within the Eastern Afromontane Biodiversity Zone and in the larger Somali region of eastern Ethiopia—to be established. Moreover, in addition to the creation of additional PAs, the government should pay considerable attention to improving the management efficiency (i.e., the 'quality') of existing PAs, as opposed to simply creating additional protected and conserved areas ('quantity') to meet the post-2020 GBF expectations.

Disclosure statement

No potential conflict of interest was reported by the author(s).

⁸⁵A Kasahun, *Analyzing the Effect of Armed Conflict, Agriculture, and Fire on the Movement and Migratory Behavior of White-Eared Kob and Roan Antelope in the Boma-Gambella Landscape of Ethiopia and South Sudan*, MSc thesis, 2018, Addis Ababa University.