Kirkia (2021) **19**(2): 180-190

FOREST LOSS IN EASTERN ZIMBABWE OVER 50 YEARS

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SUMMARY

While loss of tropical moist forest has been a significant issue across Africa and elsewhere, there have been particular concerns in Zimbabwe on deforestation and habitat loss over the last 20 years owing to the fast-track land reform programme. Data from a comprehensive historic forest survey across Zimbabwe's Eastern Highlands provided an opportunity to determine rates of moist forest loss over an approximately 50-year period from 1970. In addition, patterns of loss across geographical areas and land use categories could be determined, as well as which forest types were most affected and at which altitudes. The original forest survey, based in airphotos and 203 georeferenced 0.25 ha plots, suggested that total forest cover in the 1970s was 10,635 ha, distributed across thirteen areas.

Using Google Earth imagery (most dating from 2019), a loss of 18 plots (8.9% of total) was noted over the period from the mid-1970s, plus damage and/or possible disturbance to a further 22 plots, giving a total loss/damage of 19.7%. State protected areas (national parks, botanic reserves, State forest land) showed almost no loss and little damage (9.2%), showing the effectiveness of state conservation even in a period of rapid economic and political change, while private farmland not subject to resettlement showed only a 5.7% loss. In contrast, private farmland subject to rapid resettlement since 2000 showed an 88% loss.

Of the twelve forest types described by Müller, those at higher altitudes were little impacted, probably as such areas are not suited to agriculture. Montane and Sub-montane zones (1350-2100 m altitude) showed around 19% loss, while medium altitude forest (type 11) showed a 10.2% loss and lowland forest (Type 12) a 34.2% loss.

The most significant losses over the last 50 years have been to low-altitude moist forest and those patches on what was previously private land that have been resettled in the last 20 years.

KEY WORDS: moist forest − forest loss − forest types − land use − Zimbabwe

INTRODUCTION

There has been much concern in recent years over the loss of moist tropical forest − or rainforest − across the globe, in particular as it affects loss of biodiversity, loss of stored carbon, a reduced ability to sequester carbon from the atmosphere, and its impacts on important ecosystem services such as water supplies (viz "water towers" in Kenya; Kenya Water Towers Agency 2020). These concerns have resulted in numerous publications aimed at raising the international profile of forests (e.g. FAO 2018, Global Forest Watch 2020). Specifically for Africa these include Sayer, Harcourt & Collins (1992) and Mittermeier *et al.* (2002, 2004), along with various initiatives to focus conservation action, such as CEPF's Eastern Afromontane Ecosystem Assessment (CEPF 2012). In Zimbabwe similar specific concerns over forest loss have also been raised, particularly since 2000 with the advent of the fast-track Land Reform Programme and the loss of many environmental controls.

The moist forests across south-central Africa are generally very patchy in occurrence and rarely larger in extent than a few square kilometres, although there are larger areas on the windward slopes of the Nyanga Mountains in eastern Zimbabwe and the foothills of the Chimanimani Mountains in western Mozambique. Most forests here form part of the Afromontane phytochorion (White 1983), although low-altitude forests have many links to White's Zanzibar-Inhambane regional mosaic. In this part of tropical Africa moist forest is at its limits as regards climatic suitability owing to the relatively low rainfall and, in particular, the long dry season (Sayer *et al.* 1992: 258−261, Müller 1999). It is only at higher, cooler altitudes or in favourable sites with additional available moisture during the dry season − such as from runoff or regular low cloud and mist linked to the south-east trade winds − that moist forest can sustain itself.

By Independence in 1980, much of Zimbabwe's moist forest was protected inside national parks and botanic reserves, administered by the Department of National Parks and Wildlife Management (now the Zimbabwe Parks and Wildlife Management Authority), or on gazetted forest land administered by the parastatal Zimbabwe Forestry Commission. However, a small but significant proportion lay on privately-owned commercial farmland outside the protected area network where the main uses were plantation forestry and arable farming, or in small private conservation areas, especially in the Bvumba area (Timberlake *et al.* 2020). During the recent land reform programme (1999−2008), many privately-farmed properties were taken over for resettlement and the new settlers often cleared large areas for smallholder cropping. At Independence, only a small amount of moist forest lay on communal land, that is land allocated by local chiefs or authorities and used primarily for subsistence agriculture and with no formal, legislated, conservation protection.

Forest Survey in Zimbabwe

There had been surprisingly little written about moist forest in Eastern Zimbabwe, with the exception of Chirinda Forest (Timberlake & Shaw 1994), which may in part have been due to its comparative inaccessibility in many places and the rugged terrain. Although both Malawi and Zimbabwe have reasonable levels of information on their forest types (e.g. Dowsett-Lemaire 1989, 1990, Müller 2006), what is generally missing is a detailed account of both distribution and extent.

A major study covering the classification and distribution of all moist forest patches in Zimbabwe was carried out by the second author (Tom Müller) in the 1970s. Over the period from August 1975 to November 1977, 176 plots, each 50 × 50 m, were recorded from across most of the forest area, with a further 28 plots recorded in lesser detail up to 1983. The main forest areas are shown in Figure 1. For the 176 earlier plots, all tree species present with a diameter at breast height (dbh) above 8 cm were noted, along with species present in the sapling, shrub and seedling layers. A grid reference, altitude and slope were also recorded, with notes on vegetation structure, soil parameters and general ecology. At the time all 203 plots were marked on c. 1:25,000 scale panchromatic air photos, most of which date from 1968, 1972 or 1975 (Timberlake 1994, although exact dates are not marked on the photos). Field data were later summarised on summary sheets, all of which have now been transferred to Excel spreadsheets. Interpretation of the same 1970s airphotos was later used to compile 1:50,000 scale detailed maps of the total extent of forest across Eastern Zimbabwe (maps in Müller 2006).

These data were analysed and outline results presented in 1994 as a consultancy report for the Zimbabwe Forestry Commission. This was later published to make it more widely available (Müller 2006). In this report, 12 main forest types were identified and described in terms of their species composition, structure (height, etc.) and distribution (Müller 1999, 2006), shown in Table 1. Summary results show that − at that time − there was around 10,635 ha of moist forest across Zimbabwe's Eastern Highlands, ranging from the Nyanga area in the north to Chirinda Forest in the south (Fig. 1). Given that

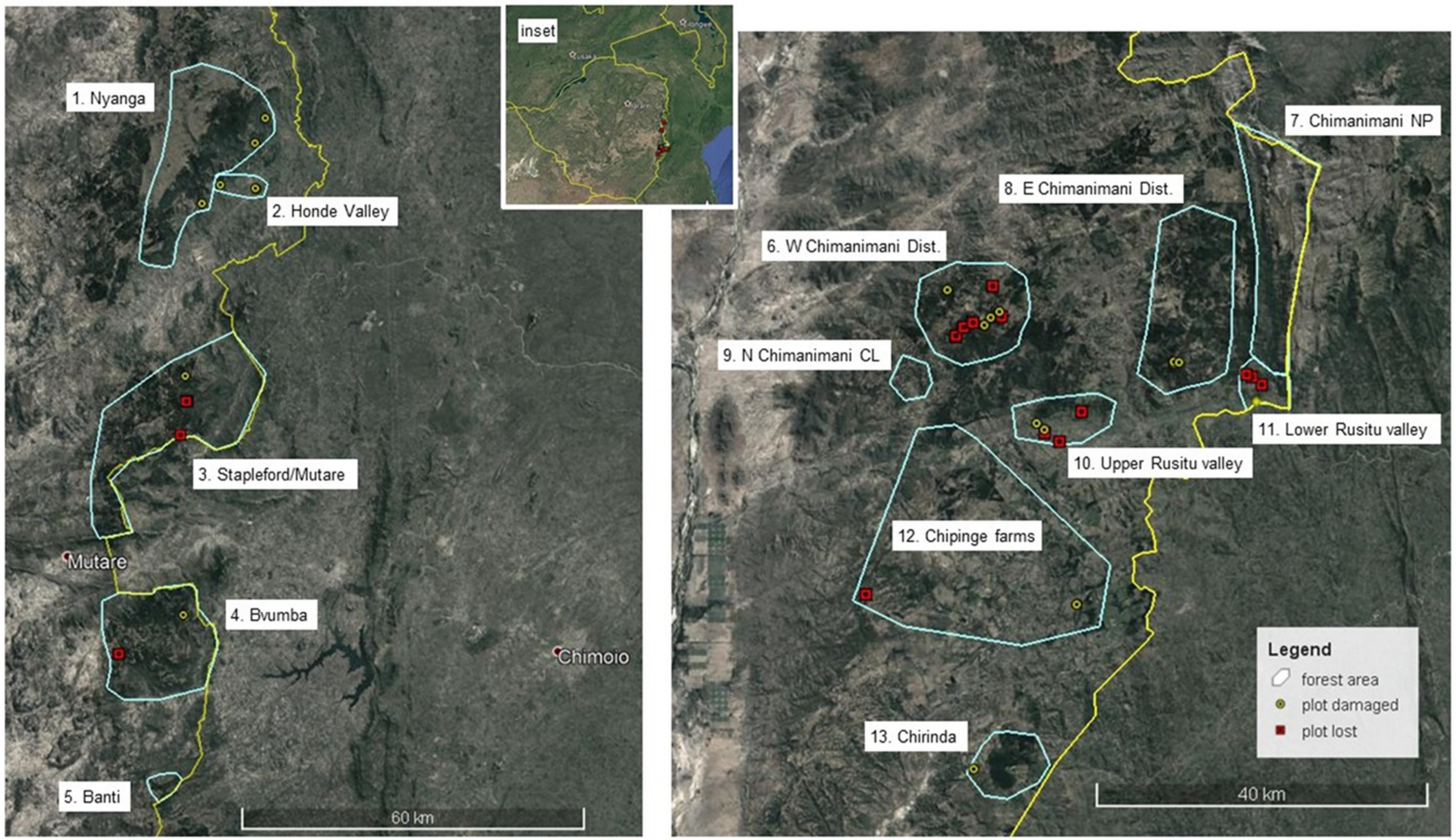

Figure 1. Location of forest plots and losses, Eastern Zimbabwe (north and south sheets).

most forest plots recorded were on steeply sloping land, this equates to around 113 km^2 of forested land surface[1].

The present paper compares this historic information on the distribution of moist forests across the highlands of Eastern Zimbabwe with current Google Earth imagery to determine (a) what the extent of forest loss has been over the last 40 to 50 years, (b) in which areas that loss has occurred, (c) on which land use types this has occurred, and (d) which forest types have been most affected.

Table 1. Forest types in E Zimbabwe (after Müller 1999).

Forest type	zone	altitude (m)	area (ha)	# plots
1. *Syzygium masukuense* montane forest	Upper Montane (≈1650-2100 m)	1580-2100	655	12
2. *Afrocrania volkensii* montane forest		1740-2100	375	8
3. *Widdringtonia nodiflora* forest		1700-2100	40	0
4. *Ilex mitis - Schefflera umbellifera - Maesa lanceolata* montane forest		1700-2100	695	16
5. *Syzygium guineense* subsp. *afromontanum* montane forest		1500-1900	2420	27
6. Regenerating montane forest		1600-1850	1935	13
7. Mixed sub-montane forest	Sub-Montane (≈1350-1650 m)	1350-1750	2130	25
8. *Craibia brevicaudata* forest		1400-1700	35	4
9. *Albizia*-dominated regenerating forest		1200-1600	380	5
10. *Albizia schimperiana* forest		1200-1600	110	6
11. Medium altitude forest	Medium altitude (≈850-1350 m)	850-1400	1370	49
12. Lowland forest	Low altitude (≈350-850 m)	350-850	490	39
TOTAL			**10,635**	**204**

Note: One plot could not be fully located so was excluded from later plot-level analyses.

METHODS

Using the original marked aerial photographs, or the position as marked on 1:50,000 scale maps at the time (UTM grid references on individual recording sheets sometimes proved insufficiently accurate), the 203 forest plots were located on current Google Earth imagery and place-markers made (although one plot was not locatable). For most plots the 1960-70s black/white airphotos clearly showed good forest cover at these points. It was then noted from recent Google imagery whether the original forest patch was still intact or whether it had been cleared, and if still intact whether it appeared to have been significantly disturbed (i.e. with an apparently lower smooth canopy differing from that

[1] Average recorded slope is 20° (ranging from 0 to 46°, with many plots being c.30°). Using a cosine correction factor of 1.0639, the mapped area of 10,635 ha equals a total surface extent of 11,313.8 ha.

of the main forest area) or was very close (< 50 m) to an area of disturbance. The general location and apparent land use were also noted. Satellite imagery used dates mostly from May to October 2019 (although in a few places the latest available imagery was from 2016), giving an estimated time period between original air photo and present imagery of between 41 and 51 years; in the majority of cases this period is thought to be 44–51 years. Given that this was a desk-study, there was no recent field checking of any of these plots to verify status or condition.

An Excel sheet was made of the 203 plots with an indication of the general forest area, forest type (following Müller 2006), and whether it had been lost or possibly damaged. These data were then assessed to provide total levels of loss and/or damage by area, land use, forest type, and altitude. The study has assumed that damaged patches are probably "lost" from a biodiversity and conservation perspective.

RESULTS

Findings from the condition assessment status of the 203 forest plots were grouped into 13 geographic/land use categories to assist in interpretation and presentation (Fig. 1 and Table 2). It was apparent that forest loss and/or damage was not equally spread north to south or across land use types.

The number of plots actually lost to clearance over almost 50 years was 18 (Table 2), or 8.9% of those recorded, although this rose to 19.7% (40 plots out of 203) once damaged plots were included. This loss was mostly concentrated in areas that were previously commercial farmland, in areas that have been subject to heavy resettlement pressures over the last 20 years, and in areas of destructive gold panning along the lower Chisengu River in the lower Rusitu Valley.

Table 2. Loss of recorded forest plots by geographical area, E Zimbabwe, 1970-2019.

Area (N to S)	land use	# plots recorded	# plots lost	# plots damaged	% loss+ damage
1. Nyanga	national park, private, commercial estates	59	0	3	5.1
2. Honde Valley	communal	5	0	3	60.0
3. Stapleford/Mutare	state/private forestry	16	3	1	25.0
4. Bvumba	national park, private	37	2	1	8.1
5. Banti	state forestry, private	9	0	0	0.0
6. W Chimanimani Dist.	resettlement	12	6	6	100.0
7. Chimanimani NP	national park	3	0	0	0.0
8. E Chimanimani Dist.	state/private forestry	9	0	3	33.3
9. N Chipinge CL	communal land	2	0	0	0.0
10. Upper Rusitu valley	resettlement	8	3	2	62.5
11. Lower Rusitu valley	national park, communal land, resettlement	23	3	1	17.4
12. Chipinge farms	commercial farms, resettlement	6	1	1	33.3
13. Chirinda	state forestry, communal land	14	0	1	7.1
TOTALS		**203**	**18**	**22**	**19.7**

Geographic Distribution and Land Use Categories

As expected, losses over the last 50 years in protected areas such as National Parks, Botanic Reserves and on Forest Land were much lower than in farmed areas (Table 3). In fact, out of 131 plots under State protection, only two were lost to clearance (on Stapleford Forest Land). Of particular note is the continued existence of all 59 forest plots originally recorded in the Nyanga area (Table 2), with just three plots showing signs of damage (one on and one adjacent to communal land, and one adjacent to a commercial tea plantation), and damage to just one of the plots in the Chirinda area (the only plot that was not formally protected). Plots in other formally protected areas, such as Chimanimani National Park and on Forest Land in the Banti and Chimanimani areas, also show no forest loss and only minor damage, but three plots inside Botanic Reserves in the low-altitude Honde and Rusitu valleys show evidence of being damaged. In contrast, parts of western Chimanimani District around Gwendingwe, previously commercial farmland with plantations but resettled under the Fast-Track Land Reform programme in recent years, suffered very large losses (6 out of 12 recorded plots plus 5 significantly damaged). Another area of significant loss was in the Upper Rusitu Valley in Chipinge District, part of which has been commercially farmed for many years and has recently been subject to resettlement, while significant damage occurred to remaining forest patches in the heavily-populated communal lands of the Honde Valley below the Nyanga massif. In the Lower Rusitu valley, three plots were lost, but these were on private land that has now been resettled along with much illegal gold panning along streams.

Table 3. Forest plot loss by land use category, E Zimbabwe, 1970-2019.

Land use category	# plots	# plots lost	# plots damaged	% lost or damaged
Botanic Reserve	14	0	3	21.4
National Park	75	0	2	2.7
State Forest Land	42	2	5	16.7
Private plantation	6	1	1	33.3
Private farmland/nature reserve	35	0	2	5.7
Resettlement area	25	15	7	88.0
Communal land	6	0	2	33.3
TOTALS	**203**	**18**	**22**	**19.7**

Forest Cover Loss

The above results relate to changes in forest cover based on located plots. In addition, it was possible to estimate the actual extent of forest loss. Using the 1: 50,000 scale maps in Müller (2006), estimates were made of forest loss (Table 4) which showed a somewhat different picture from that determined from plots alone given in Table 2. Loss of forest extent across the Eastern Highlands as a whole is estimated at only 360 ha, or 3.4% of the total extent of 10,635 ha. However, there is an additional area of 430 ha of assumed forest damage, giving a total extent of loss and damage of 790 ha, or 7.4% of all forest cover. Mostly this can be ascribed to the lack of damage to the extensive mouist forets blocks on Mt Nyangani, by far the largest extent in eastern Zimbabwe.

Comparing maps of forest extent in Müller (2006) with current Google Earth imagery, all of the West Chimanimani area (area 6 in Table 4) has been lost or damaged, along with most of the very limited forest patches in the Pungwe–Honde and Upper Rusitu valleys (areas 2 and 10, respectively) and on the commercial Chipinge farms and plantations (area 12). Of particular concern, a significant extent of low- and medium-altitude forest along the lower Chisengu River before it joins the Haroni River on the edge of Chimanimani National Park has been denuded, an area of intense illegal artisanal gold panning. From Google Earth imagery the great majority of this is actual loss (170 ha or 40%), not damage or degradation.

Table 4. Estimated loss of forest extent by geographical area, E Zimbabwe, 1970-2019.

Area (N to S)	estimated forest extent (ha)	forest loss (ha)	forest damage (ha)	forest loss + damage (% of area)
1. Nyanga	6520	0	70	1.1
2. Honde Valley	85	0	60	70.6
3. Stapleford/Mutare	280	20	10	10.7
4. Bvumba	975	10	15	2.6
5. Banti	605	0	0	0.0
6. W Chimanimani Dist.	290	80	210	100.0
7. Chimanimani NP	260	0	0	0.0
8. E Chimanimani Dist.	225	0	15	6.7
9. N Chipinge CL	40	20	10	75.0
10. Upper Rusitu valley	35	10	23	94.3
11. Lower Rusitu valley	425	170	5	41.2
12. Chipinge farms	80	50	10	75.0
13. Chirinda	815	0	2	0.3
TOTALS	**10,635**	**360**	**430**	**7.4**

Forest Types and Altitude

As can be seen in Table 5, forest loss was also not evenly spread across Müller's 12 forest types. Some types have been disproportionally more affected, especially those at lower altitude where land is more suited to agriculture. The high-altitude Type 1 (*Syzygium masukuense* forest) has seen no loss as all areas sampled lie inside Nyanga National Park. However, the other high montane forest type (Type 2, *Afrocrania* forest) was badly affected (75% loss or damaged) as most of the plots recorded were in the western part of Chimanimani District, an area of rapid land use change.

Other forest types showing significant levels of loss and/or damage were types 10 (sub-montane *Albizia* regenerating forest, 33%) and 12 (low-altitude forest, 34%). Losses in all other types were between 8 and 25%, with much of this being damage rather than complete loss.

Table 5. Estimated loss of forest plots by forest type (Müller 1999), E Zimbabwe, 1970-2019.

Type	forest zone	# plots recorded	# plots lost	# plots damaged	% lost or damaged
1	montane zone	12	0	0	0.0
2		8	1	5	75.0
4		16	2	1	18.8
5		27	1	3	14.8
6		13	2	1	23.1
7	sub-montane zone	25	2	0	8.0
8		4	1	0	25.0
9		5	0	1	20.0
10		6	2	0	33.3
11	medium altitude zone	49	2	3	10.2
12	lowland zone	38	5	8	34.2
TOTAL		**203**	**18**	**22**	**19.7**

As forest types are closely linked to altitude and generally defined by it (Müller 2006), the differences in loss/damage over altitude were expected to show a similar pattern. When all 203 plots were arranged solely by altitude, not type (data not presented here), it was noted that the Montane Forest Zone (above 1650 m, mainly types 1 to 6) had 4 destroyed and 8 damaged plots out of a total of 64 (18.8% loss/damage), the Sub-montane Forest Zone (1350−1650 m, mainly types 7 to 10) contained 7 destroyed plots and only 2 damaged out of 50 (18.0%), the Medium-altitude Forest Zone (850−1350 m, mostly type 11) contained 3 destroyed and 5 damaged out of 53 (15.1%), while the Lowland Forest Zone (350−850 m, all type 12) contained 4 destroyed and 7 damaged plots out of 36 (30.6%). This indicates that the most significant impacts have been at lower altitudes, a continuation of the historical situation as described by Müller (1999, 2006).

DISCUSSION

The main drivers of indigenous moist forest loss across Eastern Zimbabwe over the last 50 years would appear to be uncontrolled clearance following resettlement under the fast-track land reform programme of the early 2000s and, more recently, the rapid expansion of small-scale and illegal artisanal gold mining along rivers in the southern Chimanimani area. Forest destruction in the latter case may have more to do with cutting for firewood or construction timber and the resulting devastating effects of the recent Cyclone Idai (March 2019) rather than the actual direct impacts of mining itself. Other factors leading to losses, albeit of lesser impact, are the slow inexorable spread of subsistence agriculture inside communal lands and the expansion of commercial plantations or disturbance such as firebreaks and roads associated with them.

On the positive side, what is also very apparent is that formally protected areas in Eastern Zimbabwe, such as national parks administered by the Zimbabwe Parks and Wildlife Management Authority and Forest Land managed by the parastatal Zimbabwe Forestry Commission, most of which were gazetted in the 1950s or 1960s, have been very effective in maintaining moist forest cover. There has been hardly any encroachment or damage to forests in these areas over the last 50 years, probably owing to patrolling and effective management. But it also needs to be recognised that many such areas were selected at the time for protection as they had limited arable soils or limited possibilities of alternative land use. Many forest patches on what are now commercial Forest Land − such as Tarka, Glencoe and Chisengu in Chimanimani District − may have been wholly or partly cleared before the baseline date of 1970 used here.

The two main national parks containing moist forest are Nyanga National Park in the north (Clark *et al.* 2017), an area that was significantly expanded in the mid-1970s as a result of Müller's initial study (it was extended by 136 km^2 in the 1970s to include important areas of moist forest), and the Chimanimani National Park in the south, particularly the Makurupini section in the far south. The main Forest Lands with moist forest are Stapleford, Banti, Mudima, Glencoe and, especially, Chirinda (Timberlake & Shaw 1994). Only Banti and Chirinda were gazetted for conservation purposes and have been managed since the 1950s on a non-commercial, non-plantation basis.

There are also a number of Botanic Reserves that are very significant for moist forest − Pungwe Bridge, Rumbisi Hill, Bunga Forest, Vumba Botanic Garden, Haroni Forest and Rusitu Forest. Botanic Reserves are small gazetted areas managed by the Parks and Wildlife Authority for conservation of their vegetation. Although the Pungwe Bridge and Rumbisi Hill reserves are situated in heavily-settled and fertile communal land in the Honde Valley, from satellite imagery they appear to have remained relatively intact as regards canopy cover, although they show abrupt boundaries to cultivated areas and there has been some encroachment (Timberlake 1994). However, it may well be the case that there has been significant disturbance under the canopy and invasion of alien species, inhibiting future regeneration. A similar situation is seen with the Rusitu Botanic Reserve in Ngorima communal land in the fertile and heavily settled Rusitu Valley (Timberlake 1994). The nearby Haroni Reserve lies adjacent to the Makurupini Forest in Chimanimani National Park.

Conservation and protection are not only the preserve of the State. Patches of moist forest are actively protected on some commercially-farmed or privately-owned land, particularly in the Bvumba area where most forest is on privately-owned land (Timberlake *et al.* 2020). The privately-owned Nyazengu area at Nyanga contained extensive moist forest, but became part of the National Parks estate in the 1990s (Müller 1999), and there are some important small forest patches on commercial farmland at Waterfall/Moodies Rest, Rosslyn and Ratelshoek in Chipinge District and on Belmont near Chimanimani town.

The role of traditional conservation also needs to be recognised. It is possible that Pungwe Bridge Botanic Reserve was a significant site traditionally before it was gazetted by the State, and Rumbisi Hill Botanic Reserve was a chief's burial ground. Much further south in Mutema communal land some patches of forest remain on the margins of a large gully and appear to have been traditionally protected from clearance, possibly for collection of special plants, while in the Upper Rusitu Valley there are a few scattered forest patches of one or two hectares each, now heavily disturbed, that were known to be traditional burial sites. Here, occasional large remnant trees of *Milicia excelsa* could be found (T. Müller, pers. comm.) in the 1970s. However, such traditionally-protected sites are often characterised by clearance of undergrowth and, although the mature tree cover remains intact, have a limited ability to regenerate and are not of great value for biodiversity conservation.

We need to recognise, however, that there was probably very significant loss of moist forest during the colonial period from the 1890s, especially at medium and low altitudes under 1400 m (Sayer *et al.* 1992: 259, Müller 1999). Most would have been situated in areas where the topography becomes less steep and hence more suited to agriculture. From verbal accounts, losses became very marked in the 1950s, an era of rapid expansion of commercial agriculture for dairy and plantation crops such as tea, coffee, pine and wattle (e.g. Sinclair 1971, Mullin 1994). It is probably at this time that many moist forest patches in Chipinge District were lost, and maybe also those on the lower eastern slopes of Mt Nyangani. Müller (1999) estimates that in the Chimanimani and Chipinge districts of southeast Zimbabwe, medium altitude forest may have originally covered up to 120 km^2, plus maybe around 70−100 km^2 in the Bvumba and Nyanga areas further north. Since the early 1900s, this extent has been reduced to less than 10 km^2, representing a loss of up to 200 km^2, almost double the total extent of all moist forest now remaining in eastern Zimbabwe.

There are some important caveats to these findings, however. The most significant concerns how reliable analysis of Google Earth imagery can be in determining damage to and the viability of remaining moist forest, unless backed up with field checking. In the current study, no forests were visited on the ground. As has been noted elsewhere in Zimbabwe (J. Timberlake, pers. obs.), the tree canopy of a forest patch can appear relatively intact, but on the ground the regeneration and/or sapling layers have been cleared, even burnt or trampled, or sometimes become so thick with shade-tolerant secondary species or invasives that, in practice, the patch is not able to regenerate. It is, in effect, a 'fossil'. Hard edges to forest patches and cultivation on their margins can also lead to an increase of invasive species. The probability of this significantly distorting our results was reduced in the current study by categorising all forest plots that were close to recently cleared or obviously disturbed areas as 'disturbed', even if the canopy appeared more-or-less intact. What would now be most useful is a survey of many of the remaining forests to see if they are in reasonable ecological health and able to regenerate, even where the canopy remains.

CONCLUSIONS

In conclusion, the extent of moist forest across eastern Zimbabwe probably halved from perhaps 220 km^2 in the 1890s, before the arrival of the first settlers, to what was seen in the early 1960s. This was due mostly to clearance by colonists for agriculture as well as clearance in the so-called Tribal Trust Lands, such as in the Pungwe-Honde and Rusitu valleys, where native populations displaced by colonial settlement went (Mullin 1994, Hughes 2001). Clearance for commercial agriculture was particularly widespread in the 1950s after the Second World War, with a big increase in commercial enterprises and plantations for dairy, tea, coffee, pine and wattle.

By the mid-1970s, the extent of moist forest of all types across eastern Zimbabwe was 106.35 km^2, but since then losses appear to have been surprisingly low at around 3.6 km^2 (7.4 km^2 including 'damaged' areas). However, these figures are based on satellite imagery from which it is not easy to detect significant damage as long as the canopy remains substantially intact, and have not been field-checked. Much of this 'success' of comparatively low levels of loss can be attributed to the fact that large areas are under formal State protection by the Zimbabwe Parks and Wildlife Management Authority in national parks or as Forest Land under the Zimbabwe Forestry Commission, and also to the fact that the largest extent of remaining moist forest is at higher altitudes in places unsuited to agriculture for both topographic and climatic reasons. This has undoubtedly helped maintain their extent in the face of the rapid land resettlement schemes and economic problems in the country over the last 20 years, during which period wildlife and other natural resources elsewhere have been much reduced.

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Accepted April 2020