SITES of INTEREST for BOTANICAL CONSERVATION in the COMMUNAL LANDS of the ZAMBEZI VALLEY, ZIMBABWE

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PHASE I

Consultant's Report for
The Zambezi Society

by
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EXECUTIVE SUMMARY

In 1991 the National Herbarium published a report (Sites of Interest for Conservation in Various Communal Lands of N & W Zimbabwe) which mapped and described 90 relatively small sites of botanical interest in parts of the Zambezi Valley. In 1995 The Zambezi Society requested the Biodiversity Foundation for Africa to (a) carry out an assessment of the present status of these sites over part of the study area (the communal lands of N Binga, N Gokwe, Kariba, N Guruve, N Muzarabani and N Darwin Districts) and (b) to set priorities for their possible conservation through the appropriate District Councils. This report is the result.

Many sites were revisited in 1995/96 and conservation assessments made. In view of changes in land use, previous errors or omissions, and the availability of better quality Landsat-TM satellite imagery dating from 1992, a re-interpretation exercise was carried out and the 1991 study effectively re-done. A series of annotated 1:250,000 scale maps (Maps 1-6) were produced, and are a more authoritative determination of site extent and priority than the original National Herbarium report. Each identified site is briefly described in terms of its botanical interest, importance and any other special features (Section 4 and Table 2). Priorities for conservation were assessed as low, medium and high; the latter two categories requiring action. Sites of high priority are of major national significance and many are under a high level of threat. The report does not offer a comprehensive, representative selection of areas for botanical conservation, either as "witness stands" or to cover the range of vegetation diversity. It only describes a selection of areas of high botanical interest.

A total of 82 sites were identified within the communal lands of the Zambezi Valley, 18 of which are of high conservation priority and a further 32 of medium priority. The communal land containing most sites is Dande (36 sites) which, including Dande Safari Area (8 sites), contains over half of the total identified, although many are quite small. The vegetation type with the most identified sites is dry forest or thickets on sand (Types 5, 6, 7, 16, 17, 26, 28 - 29 sites), followed by dry forests or thickets on old alluvium (Types 27, 34 - 15 sites). Other numerically important vegetation types are gully or kloof woodlands (Types 10, 20, 31, 36 - 15 sites), woodland on recent alluvium (Types 23, 30 - 8 sites) and tall mopane woodland (Types 22, 29 - 6 sites).

The most important sites for conservation are: *Guibourtia* woodland in Manjolo (site 5a), *sidaga* grassland in Gokwe (site 11b), Tiger Bay thicket in Omay (site 17), tall mopane

woodland in Omay (site 22a), Angwa Bridge dry forest in Dande (site 26a), dry forest in Dande Safari Area (site 26f), riverine dry forests associated with the Manyame (sites 27g,h,j) and Musengezi (sites 27a,b,c) rivers in Dande and Muzarabani, alluvial woodlands in Mukumbura (site 30a) and the Gonono complex in Dande (sites 26p and 28a).

Various observations are made indicating the importance of the dry forest types, many of them on colluvium or alluvium perhaps dating from the Pleistocene pluvials. These types have high species diversity and include some species of very restricted occurrence in Zimbabwe. Prior to the widespread introduction of mechanised and cash-crop agriculture it was the recent alluvium that was favoured for settlement and cropping, thus very few extensive areas of this type remain. Those that do remain are priorities for conservation. With improved agricultural technology it is now the heavier soils (supporting dry forest on old alluvium, tall mopane woodland or *sidaga* grasslands) that are rapidly being ploughed. Those, generally small, relics remaining are mostly of high conservation priority. Other sites of high species diversity, although the species are generally less restricted in their occurrence than those of dry forests, are the gully or kloof woodlands, found in ravines or gullies where soil nutrient and moisture levels are higher.

It is suggested that botanical conservation does not require large exclusive-use conservation areas to be effective. The major, fundamental requirement is that conservation considerations must be incorporated into the formal planning process. An important prerequisite for this is that the sites of interest, as well as ecological concerns, are clearly identified and described for planners and other interested parties, and this information is readily available. Botanical information needs to become more accessible.

Eight recommendations are given concerning (a) the need for comprehensive surveys and lists of the major identified sites, (b) the necessity to extend the present study to other areas, both within communal land and the Parks and Wildlife Estate, (c) methodological techniques that could be usefully employed in future studies, and (d) the value of an historical comparison of air photos to detect rates of change.

1. INTRODUCTION

1.1 *Conservation in Zimbabwe*

Much of conservation in Zimbabwe over the last 80 years has focused on large mammals and the gazetting and State ownership of extensive "wild" areas for them. The conservation of plant species and of vegetation types, especially considering that such animal populations are dependent on the plant resource, has received surprisingly little attention. In part this is due to the less "charismatic" nature of plants, but one of the more important reasons for this situation is paucity of accessible botanical information. Information on vegetation types and their distribution, on what the rare species are, their habitat requirements and distribution, is lacking in a readily-available and usable form.

In the mid-1970s a network of mostly small Botanical Reserves was gazetted (National Parks Act 1975, Robertson 1985, Timberlake & Müller 1994), principally in the east and south of the country, but with an emphasis on exclusive State ownership and management. The network of Botanical Reserves has not been particularly successful for plant or vegetation conservation, principally owing to an almost complete lack of management or interest over the last 20 years.

Zimbabwe, as elsewhere in the world, is partially moving away from the State Control paradigm in conservation, and the "Them and Us" situation that had been created, to an approach encouraging more community involvement. There is an increasing recognition of the importance of the human factor. Indeed, it has been stated that "people management is what is required for conservation, not animal management". It is also being realised that the major threat to protected areas in many cases comes from the impoverished surrounding rural populations, trying to eke out a living against a background of an unpredictable climatic regime, frequent droughts and economic marginalisation. There is now recognition of the need to actively involve these rural communities in conservation initiatives as equal partners, and to set up mechanisms that ensure that most of the economic benefits accrue to them. The benefits of biodiversity conservation, and some of the responsibility for it, are devolving down to local communities.

The major initiative in this regard in Zimbabwe is the CAMPFIRE programme (Child 1996), which to date has focused primarily on large mammals and sport-hunting. However, CAMPFIRE was designed to eventually cover other natural resources such as wood and wood products, grazing, and non-consumptive ecotourism. Although conservation and utilization of botanical resources is unlikely to be nearly as lucrative economically as wildlife, what is nevertheless required is a clearer picture of which are the important areas for botanical conservation and what levels and types of utilization are compatible and sustainable.

1.2 *Biodiversity and conservation*

The word "biodiversity", derived from "biological diversity", has been much-used over recent years, but its meaning is not always clear. It is often defined as the sum of all types of biological diversity - at the species, population and genetic levels - as well as the diversity of ecological processes. It is important to recognise that biodiversity concerns go beyond

species richness or rarity, and must also include genetic diversity within a species, ecological or habitat diversity, and even landscape diversity.

Plants have particular value in conservation. They are the primary producers of an ecosystem, converting the sun's energy into a form (food) usable by other organisms, and also provide the substrate for these organisms. Vegetation represents an integration of all environmental factors pertaining to an area, such as rainfall, temperature, evapotranspiration, soil texture, soil depth, soil type and nutrient status, tempered by historical factors such as previous land use (Timberlake *et al.* 1993). Vegetation structure can also determine what other species occur in an area.

There is a tendency in conservation to concentrate on areas of species richness ("hotspots") or on rare and threatened species. But in order to encompass the greatest range of biodiversity within conserved areas it is necessary to concentrate on conserving a broad range of the nation's or region's vegetation types as well as areas of high diversity (Timberlake & Müller 1994). In this way the diversity of ecological processes would be protected as well as the constituent species, and normal evolutionary processes could continue to operate. All the myriad of unknown organisms, including decomposers and pollinators, would also be much more likely be conserved.

Unlike the case with larger mammals or many bird species, large areas are generally not required for plant species conservation or conservation of special vegetation types. Chirinda Forest in Chipinge offers an example of a vegetation type containing viable populations of certain tree species in an area of c. 600 ha, with the nearest other individuals from 200 to 2000 km away. Viable conservation areas for plants can be comparatively small with little danger, as far as we are aware (and certainly over the time scales at which we are now operating of 20 to 50 years), of inbreeding. Part of this is due to the long inter-generation times of many trees, but also to the fact that a small area can contain many more genetically differing individuals of plants that it can of most mammalian or bird species.

Clearly, there is now a strong need to identify areas of high botanical diversity and good examples ("benchmark sites" or "witness stands") of the range of vegetation types. Monitoring, for example due to expansion of agricultural activity, is only possible when there is a baseline against which to measure change. Also important is that biodiversity concerns should be formally incorporated into planning processes, especially into the land use planning of resettlement areas and large agricultural development projects. Although Environmental Impact Assessments are increasingly being carried out for all sorts of developments within Zimbabwe, botanical concerns are often marginalised, not least because of paucity of available information and the lack of a national framework.

1.3 *Previous studies*

A national vegetation map of Zimbabwe is available (Rattray 1962, Wild & Barbosa 1968), but only recently has the myriad of vegetation surveys and maps produced over the last 50 years been brought together (Timberlake & Nobanda 1993). No attempt has yet been made to synthesise this information or to revise the national map. The nearest we have to a national ecologically-based framework is the vegetation survey of the communal lands of the north and west (Timberlake, Nobanda & Mapaure 1993), covering around 20% of the country but most of the Zambezi basin. Using these surveys as a framework, and incorporating the considerable knowledge and experience of Tom Müller and Bob

Drummond, an overview of the vegetation and botanical diversity of the country is now becoming available. With this overview the threatened vegetation types can be identified more clearly and confidently, and areas of high biodiversity or unusual species noted. The advent of satellite imagery providing a synoptic view of large areas has also greatly assisted in this process.

A start in identifying the major areas of plant and vegetation diversity for Zimbabwe has been made (Müller & Timberlake 1992, Timberlake & Müller 1994), and the beginnings of a hierarchical framework proposed. The rainforest areas of conservation interest in the Eastern Highlands have been described by Müller (1994), and selected areas in the mid-Zambezi Valley by Timberlake & Mapaure (1992). For some of the communal lands of the Zambezi basin sites of interest have been identified by Timberlake *et al.* (1991), and this forms the basis of the present report.

2. BACKGROUND

2.1 *National Herbarium studies*

From 1988 to 1991 the National Herbarium in Harare undertook a vegetation survey of Zimbabwe's Communal Lands as part of the World Bank-funded Physical Resource Inventory of the Communal Lands project (see also Anderson *et al.* 1993). Unfortunately only half of the country, the north and west from Tsholotsho to Mt Darwin, could be covered before funds ran out. One of the outputs from the survey was a short report (Timberlake *et al.* 1991) identifying and briefly describing 90 sites considered to be of interest for plant conservation using the following four criteria: (a) rarity in Zimbabwe, (b) high plant species diversity in a comparatively limited area, (c) wide variety of habitats in a comparatively limited area, and (d) relatively undisturbed condition or a particularly good example of a more widespread vegetation type.

Although fairly widely circulated, no further action has yet resulted from this report. Staff changes and reduction in funding at the National Herbarium has prohibited further work in this area. In addition, the mandate of the Herbarium does not extend to formal conservation, only to identification and description of the flora. Two further publications (Müller & Timberlake 1992, Timberlake & Müller 1994) incorporated these findings in identifying major national areas of plant conservation interest for Zimbabwe. A recent book on areas of plant diversity over Africa (Davis, Heywood & Hamilton 1994) also peripherally mentions some of them (pp. 126, 139).

2.2 *Zambezi Society initiative*

The Zambezi Society, in conjunction with the Biodiversity Foundation for Africa, drew up a project proposal in early 1995 to revisit the areas identified in the 1991 National Herbarium report and to make initial approaches to the appropriate District Councils concerning their conservation. Conservation would be directed through the councils or traditional authority, and would be along the lines of the CAMPFIRE programme rather than formal gazetting through the Department of National Parks and Wildlife Management or the Department of Natural Resources. CIDA agreed to support this from their Regional Initiatives Fund.

The project has been divided into two phases. Phase I, covered in this report, was to revisit the described sites to record present status and any changes, and to set priorities for conservation primarily using technical (biodiversity) criteria. Phase II is to develop appropriate conservation measures in conjunction with the District Councils and communities for the priority sites. Phase I was carried out by Jonathan Timberlake (Plant Ecologist, Biodiversity Foundation for Africa) between November 1995 and April 1996.

2.3 *Terms of reference*

The following were the original Terms of Reference.

1. To inspect all sites listed by the 1991 National Herbarium survey in the communal lands in northern and western Zimbabwe, and to assess their current status and condition;

2. To develop appropriate criteria for categorisation, and categorise all sites; to determine conservation priorities based on considerations of botanical diversity; and to assess the practicality of pursuing conservation measures to cater for local social, developmental and other relevant issues;

3. to prepare a report outlining the findings of the above, for review by the Zambezi Society and the Biodiversity Foundation for Africa, for use during Phase II.

Subsequent to a meeting between the Zambezi Society and BFA on 25 October 1995, these Terms of Reference were clarified and slightly modified:

a) the communal lands to be covered are only Manjolo and Siabuwa in Binga District; Omay and Gatshe Gatshe in Kariba District; that portion of north west Gokwe lying between Chizarira National Park and Chirisa Safari Area; Dande, Muzarabani, Mukumbura, Gutsa, Chiswiti and west Masoso in the mid-Zambezi valley (northern parts of Guruve, Centenary and Mt Darwin Districts). Areas covered in the National Herbarium report which were not to be covered in this consultancy were southern Binga (Lubimbi and Busi), most of Gokwe, Sanyati, Lupane and Nkayi.

b) the evaluation of priority for conservation should be primarily based on technical considerations of botanical diversity and/or outstanding examples of vegetation.

c) if possible some indication of change in condition and/or extent since 1990 should be included, using historical air photos if available.

d) detailed species lists are not required, but there should be a clear indication of the major woody species and any botanical "specialities" of the area.

2.4 *Outputs*

It was proposed to provide three main outputs:

1. Recording sheets for each area visited, stating various relevant parameters and a basic scoring;

2. A detailed report providing an assessment of the conservation importance of each site (or group of sites) and an overview of the major areas and concerns. Where possible an indication of change since 1988-1990 will be given, based on airphotos. Recommendations will be included.

3. A map at 1:500,000 of visited and suggested sites, colour-coded to indicate priority.

The present report has slightly modified these outputs:

a) Completed recording sheets are provided, but the basic scoring system did not prove effective or practical. It has therefore been left out.

b) A detailed report is provided (Section 4), but it was not possible in the time available to carry out a comparison of historical air photos or satellite imagery. An overview of the major areas and issues (Section 5) and recommendations (Section 6) are included.

c) Colour-coded maps from the original study are provided at a scale of 1:500,000 (Maps 7-9). In addition interpretation of more recent and better quality satellite imagery allowed for the production of revised and more detailed maps at 1:250,000 scale (Maps 1-6). The detailed descriptions are based on these latter maps.

2.5 *Limitations*

It should be stressed that this study does not attempt to identify a comprehensive list of sites or areas for plant conservation. In particular, no substantive effort has been made to identify a representative selection of the vegetation types within the study area. However, larger sites of unusual vegetation types have all been identified and some would undoubtedly form part of such a representative selection.

The sites included in this study are principally those identifiable using medium-scale remote sensing, and are mappable at a scale of 1:250,000. There are, of course, many small sites which are difficult or impossible to identify and portray at this scale, for example springs and small groves of trees. These have not been covered in the present study. However, they may have high intrinsic interest for biodiversity conservation, or cultural or local; economic significance.

3. METHODOLOGY

3.1 *Original survey*

The sites described in the 1991 National Herbarium report (Timberlake *et al.* 1991) were identified in the course of vegetation mapping fieldwork for the Communal Lands Vegetation Survey (Timberlake, Nobanda & Mapaure 1993) and mapped using field notes and 1:250,000 scale false-colour Landsat-MSS satellite imagery dating from 1984 and 1985. The criteria used for inclusion were:

a) rarity of the vegetation type in Zimbabwe,
b) high plant species diversity in a comparatively limited area,
c) wide variety of habitats in a comparatively limited area, and
d) relatively pristine vegetation condition of a more widespread type.

These criteria were adhered to in the present revision.

3.2 *Revisiting of sites*

As many of the sites as possible were revisited to determine their current status and condition, and to obtain further information on species diversity, conservation potential and threat. The recording sheet used is shown in Appendix 1. In most cases a more accurate location was determined using a global positioning system (GPS). Fieldwork took place in November 1995 (Manjolo), December 1995 (Gokwe North, Omay, Siabuwa) and March 1996 (mid-Zambezi Valley). A low-level aerial survey was made over some of the priority areas around Chitsungo and Muzarabani (mid-Zambezi Valley) in March 1996. Table 2 shows the location and scores for all sites.

3.3 *Map revision*

In the course of the 1995/96 fieldwork it became apparent that (a) some sites were not as important as had at first been thought, (b) the extent of some sites had been over-estimated, and (c) various sites of interest had been missed. In view of this, and the present availability of much higher quality 1992 1:250,000 false-colour, edge-enhanced, geo-corrected Landsat-TM satellite images through the Forestry Commission/GTZ VegRis project (Table 1), re-interpretation of the whole revised study area was carried out. Information and notes collected from the field, from aerial reconnaissance, and from conversation with persons with a good knowledge of parts of the area, were drawn upon. This re-interpretation was transferred from transparent Mylar sheet to the standard 1:250,000 scale topographic maps from the Department of the Surveyor-General (see Maps 1-6). Numbering of sites was based on that used in the National Herbarium study, but with necessary additions. The two numbering systems are compatible. The section describing the sites of interest for conservation (Section 4) is based on the revised maps (Maps 1-6).

3.4 *Allocation of priorities*

Priorities for conservation were allocated based on intrinsic biological interest (species diversity, presence of unusual species or unusual vegetation type) coupled with degree of threat. Highest priority was allocated to those sites in imminent danger of complete destruction, or those of particularly unique importance.

An attempt to score the different parameters recorded at each site did not provide a good indication of priority, even when parameters were differentially weighted or when non-technical considerations such as threat level were left out. In the end the most practical solution was as indicated in the preceding paragraph.

Table 1. Landsat-TM imagery used for selection of areas of conservation interest.

Scene name	image dates
Binga SE 35-7	7 April 92, 16 April 92
Kariba/Bumi Hills SE 35-4/3	7 April 92, 16 April 92, 16 Sept 92
Mana Pools/Kanyemba SD 35-16, SD 36-13	16 April 92, 16 April 92
Mhangura SE 36-1	14 Feb 92, 16 April 92
Mt Darwin SE 36-2	29 Jan 92, 14 Feb 92

Summary maps at 1:500,000 scale are also included in the report (Maps 7-9), but these are based on the 1991 National Herbarium survey and exclude the recently identified sites. They are also not definitive in terms of boundaries.

3.5 *Survey limitations and recommendations*

During the earlier National Herbarium study, 1:80,000 scale panchromatic aerial photographs dating from 1982 were available, which greatly facilitated field orientation and the location of smaller areas. These were not available for the present revision.

This sort of work really requires air photos, and the inability to visit some of the sites in 1995/96 in many cases was primarily due to only having the rather inaccurate 1:250,000 scale topographic maps and satellite imagery for field orientation. It is strongly recommended that any future studies should utilize aerial photography in addition to Landsat imagery.

A recently available product from the Department of the Surveyor-General which may help bridge this gap is 1:100,000 scale panchromatic SPOT satellite imagery dating from 1992. Although only in black/white, the much greater resolution of SPOT imagery over Landsat, and the smaller size of each sheet, makes them very useful for fieldwork.

Some difficulties were experienced in the interpretation of false-colour Landsat imagery, for instance where a particular area on the image was under-exposed, or where shadow or burn

scars are present. This was a particular problem in accurately delimiting some of the dense woodland or thicket types, and also in clearly identifying good gully woodland.

Overall, however, it should be emphasised that the 1:250,000 scale Landsat-TM imagery available through the Forestry Commission's VegRis project greatly helped the present revision. This imagery is a great improvement on that available for the original National Herbarium study, and which was also used for the Communal Lands Vegetation Survey (Timberlake, Nobanda & Mapaure 1993). The present revision is thus more accurate as well as updated from 1984 to 1992.

4. **DESCRIPTION AND STATUS OF CONSERVATION SITES**

The sites are briefly described below in terms of their location, vegetation type and their current status. Priorities for conservation are indicated, and suggestions as to possible avenues for conservation implementation are noted. Numbering and extent are as shown in Maps 1-6, modified somewhat from the 1991 National Herbarium report and maps. Maps 7-9 only provide an assessment of previously identified sites; some boundaries have now been modified. Table 2 summarises in tabular form all sites identified with grid references and priority scoring.

Attention is drawn to Section 2.5 and the proviso that the sites described below do not represent a comprehensive list of representative areas for vegetation conservation (*sensu* Timberlake & Müller 1994).

4.1 BINGA DISTRICT

4.1.1 *Deciduous thickets on sand and hills* (Types 5 and 6).

Three sites of deciduous *Combretum* thicket on sand were identified in the 1991 report, and one was added (5d) subsequently. They are found on coarse sandy soils and consist of a dense shrub layer of *Combretum celastroides*, *C. elaeagnoides* and *Meiostemon tetrandrus*, typically with *Haplocoelum foliolosum*, *Croton longipedicellatus*, *Dalbergia martinii* and *Elachyptera (Hippocratea) parvifolia*. Trees of *Pteleopsis myrtifolia*, *Diospyros quiloensis* and *Xeroderris stuhlmannii* are found. Sites 5a (PM 040.105), 5b (PM 060.110) and 5d (PM 065.155) in N Siabuwa near Sengwa Mouth are thicket formations dominated by shrubs of *Combretum* spp. and *Meiostemon*. There are few large trees, perhaps partly a result of elephant damage and human impact, but some unusual species such as *Entandrophragma caudatum* occasionally occur. These sites are not considered a priority.

Site 5c (PL 060.990), on the top of a hill in N Siabuwa, is very difficult to access and would require air photos to locate old Tsetse Department tracks. It has not been visited. From satellite imagery it appears to be a particularly well-developed example of thicket, verging on dry forest, and would be of medium priority for conservation. The threats to it are minimal at present, although high densities of elephant could damage its structure.

One site of deciduous thicket on a sandstone hill (site 6, PL 115.695), verging at times on dry forest, is found on a hill just north of Siabuwa Business Centre. It is of an unusual kind, being found on shallow sandy soils formed from outcrops of Upper Hwange sandstone, otherwise only found in scattered localities ringing Chizarira (e.g. Lusulu, Sengwa coalfield). The main shrub species are *Combretum elaeagnoides*, *Elachyptera (Hippocratea) parvifolia* and *Meiostemon tetrandrus*, with *Combretum celastroides*, *Dalbergia martinii*, *Haplocoelum foliolosum* and *Acacia ataxacantha* common. The major trees are *Diospyros quiloensis*, *Pteleopsis anisoptera*, and *Strychnos madagascariensis*. The condition of this site is good despite an access track leading to an old military camp on top, the effects of which are still clearly visible, and some selective tree cutting along it. The hill is not suitable for cultivation

Table 2. Areas of Plant Conservation Interest in the Zambezi Valley - summary (see Maps 1-6).

Score: 1 - high
2 - medium
3 - low

Site No.	Communal Land	UTM grid ref.	Type	Biodiversity spp.rich	Biodiversity unusual	Rarity of type	Condition	Threat	Potential to conserve	Overall importance
5a	Siabuwa	PM 040.105	Deciduous thicket	3	2/3	2/3	3	3	3	3
5b	Siabuwa	PM 060.110	Deciduous thicket	2	3/2	2/3	1/2	3	1/2	3
5c+	Siabuwa	PL 060.990	Deciduous forest	?1	?1	2	1	3	1	2
5d*	Siabuwa	PM 065.155	Deciduous thicket	3	3	2/3	1/2	3	2	3
6	Siabuwa	PL 115.695	Woodland thicket on hills	1	1/2	1/2	2	3	1	2
7a	Manjolo	NL 450.410	*Guibourtia* dry forest	2	2	1	3	1	2	1
7b	Manjolo	NL 370.390	*Guibourtia* dry forest	2	2	2	3	1	3	3/2
7c*	Manjolo	NL 150.150	*Guibourtia* deciduous thicket	2/1	2/1	1/2	2/3	2	3	2/3
8	Binga	NL 380.540	Hill woodland	2	2	2	2	2	2	3
10a+	Manjolo	NL 610.380	Escarpment woodland	2	2	2	2	3	1	3
10b	Siabuwa	NL 690.425	Escarpment woodland	2	2	2	2	3	1	2
10c*+	Siabuwa	NL 740.440	Escarpment woodland	1	2	2	1	3	1	3
10d	Siabuwa	NL 920.495	Escarpment woodland	1	1	2	1	3	1	2/1
10e*+	Gokwe N	PL 280.565	Gorge woodland	1	1	2	1	3	1	2/1
11a*+	Gokwe N	PL 360.575	Grassland on clay	3	3	1	2/3	1	2	1/2
11b	Gokwe N	PL 420.470	Grassland on clay	3	3	1	2/3	1	2	1
15	Siabuwa	PL 165.973	Chaba vlei dam	2	2/3	2	2/3	1	2	3
16j+	Gokwe N	PL 450.675	Deciduous forest	1?	2?	2	1	3	1	2
17	Omay	PM 525.350	Deciduous woodland thicket	1	1	1	1/2	2	1	1/2
20a	Omay	PM 365.078	Gully/hill woodland	2	2	2	1	3	1	2
20b	Omay	PM 445.137	Footslope/kloof woodland	1	1/2	2	1	2	1	2/1
20c*	Omay	PM 425.160	Footslope/gully woodland	1	1	2/1	1	2	1	2/1
20d*	Omay	PM 457.065	Gully forest	1	1	1/2	2	2	1	2

Site No.	Communal	UTM grid	Type	Biodiversity	Rarity	Condition	Threat	Potential to	Overall

	Land	ref.		spp.rich	unusual	of type			conserve	importance
22a	Omay	PM 300.200	Mopane woodland	3	3	1	1/3	1	1/2	1
22b+	G. Gatshe	QM 050.470	Mopane woodland	2	3	1/2		2		2
23a+	Gokwe N	PL 175.340	Alluvial woodland & thicket	1	1	1/2				1/2
23b+	Omay	PL 232.975	Alluvial woodland	2	2	2/3	2	1	1/2	3
23c*+	G. Gatshe	QM 080.465	Alluvial woodland	2	2	2/3				3
23d*+	Gokwe N	PL 320.475	Alluvial woodland/thicket	1?	1?	2			2	2
26a	Dande	TT 250.250	Deciduous forest	1	1	1	1	2	1/2	1
26b	Dande	TT270.180	Deciduous forest	1/2	1	1	1	2	1/2	2
26c	Dande	TT 116.213	Deciduous forest	2	2	1/2	2	2	2/3	2
26d+	Dande	TT 200.386	Deciduous forest			2			2	3
26e+	Dande	TT 215.260	Deciduous forest	1/2?	1/2?	1/2				2
26f	Dande S.A.	TT 220.370	Deciduous forest	1	1	1	1/2	3/2	1	1
26g+	Dande S.A.	TT 180.410	Deciduous forest			2				2
26h+	Dande S.A.	TT 165.440	Deciduous forest			2				3
26i+	Dande	TT 160.470	Deciduous forest			2				3
26j+	Dande S.A.	TT 105.400	Deciduous forest			2				3
26k*+	Dande S.A.	TT 080.380	Deciduous forest			2				3
26l*+	Dande S.A.	TT 100.380	Deciduous forest			2				3
26m*+	Dande S.A.	TT 115.365	Deciduous forest			2				3
26n+	Dande	TT 175.540	Deciduous forest			2				2
26o+	Dande	TT 180.590	Deciduous forest			2				3
26p+	Dande	TT 530.290	Deciduous forest	1?	1?	1		1/2	1	1
27a	Muzarabani	TS 850.925	Alluvial forest	1	1	1	2	1/2	2/3	1
27b+	Muzarabani	TS 853.910	Alluvial forest	1/2	1	1		1	2/3	1
27c	Gutsa	TS 815.980	Alluvial forest	1/2	1	1	2	1/2	2	1
27d*+	Gutsa	TS 800.950	Alluvial thicket	1/2?	1/2?	1		1		2

Site No.	Communal Land	UTM grid ref.	Type	Biodiversity spp.rich	unusual	Rarity of type	Condition	Threat	Potential to conserve	Overall importance

27e+	Dande	TT 240.000	Alluvial thicket			1				2
27f+	Dande	TS 250.985	Alluvial thicket			1				2
27g*+	Dande	TS 310.988	Alluvial thicket			1		1		1
27h+	Dande	TT 275.040	Alluvial thicket			1				1
27i+	Dande	TT 275.065	Alluvial thicket			1				2
27j	Dande	TT 340.065	Alluvial thicket	1/2	1	1	2	2	2	1
27k*+	Dande	TS 358.970	Alluvial thicket			1				1
27l*+	Dande	TS 360.993	Alluvial thicket			1				1
27m+	Dande	TT 135.240	Alluvial thicket			1		2	2	2
28a	Dande	TT 600.220	Bushed woodland	1	2	1	1	2	1	2/1
28b+	Dande	TT 225.480	Bushed woodland	2	2/3	2	2	3	2	3
28c+	Dande	TT 230.575	Bushed woodland	2	2/3	2	2	3	2	3
29a	Muzarabani	TT 875.000	Mopane woodland	3	3	1	3	1	3	3
29b	Dande	TT 880.140	Mopane woodland	3/2	2/3	1	2	1/2	2	1
29c	Dande	TT 440.080	Mopane woodland	3	3	2	2	1/2	2/3	2/3
29d+	Dande	TS 530.150	Mopane woodland	3	3	2	2	2	2	3
30a	Mukumbura	UT 310.140	Alluvial woodland	1	2	2	1/2?	2	1	1/2
30b	Dande	UT 000.245	Riverine forest	1	2	1	2	2/3	1	2/1
30c*+	Dande	TT 240.275	Alluvial woodland			2			1/2	3
30d*+	Dande N	TT 160.670	Alluvial woodland			2		2/3	1/2	2
31*+	Siabuwa	PL 150.962	Chaba gorge	3	3	3	1	3	1	3
32	Dande N	TT 171.266	Salt pan	3	1/2	1/2	2	2	1	1/2
33a*	Dande S.A.	TT 130.320	Miombo woodland	2	1/2	2	1/2	2/3	1	2
33b*+	Dande N	TT 150.550	Miombo woodland							2
34a*+	Chewore	ST 880.040	Riverine thicket	1	1/2			3	1/2	3
34b*+	Dande	ST 930.100	Riverine thicket	1	1/2			3	1/2	3

Site No.	Communal Land	UTM grid ref.	Type	Biodiversity spp.rich	Biodiversity unusual	Rarity of type	Condition	Threat	Potential to conserve	Overall importance

35*+	Dande	TS 190.990	Sarawanda Hills	2	2	2				2
36a*+	Dande	TS 230.920	Escarpment gorge			2		1/2	2	2
36b*+	Dande	TS 350.915	Escarpment gorge			2		1/2	2	2
36c*+	Dande	TS 425.880	Escarpment gorge			2/3		2	1	2
36d*+	Gutsa	TS 710.840	Escarpment gorge			2/3		3	1	3
36e*+	Dande	TS 170.950	Gorge/woodland			1/2		1		1
37*+	Chiswiti	US 600.850	Mavuradonha Hills	1	2	2	1	3	1	3

* added since 1991 report
+ not visited

NB. For sites not visited in 1995/96 scoring is based on visits during 1988/90, or best available information.

so the level of threat is not high. Of the area identified in 1991 only a smaller portion on the middle and upper slopes is retained as being of botanical interest, with medium priority for conservation.

4.1.2 *Dry forests on sand* (Type 7).

A special effort was made to visit all sites in Manjolo of more than a few hectares that appeared to be sand caps on relatively level plateau terrain, whether they had been previously identified as possible conservation areas or not. Some of such sites are dominated by the tall slender tree *Guibourtia conjugata*, which is otherwise only found within Zimbabwe in parts of Hwange District and Gonarezhou. The often thick undergrowth in such areas comprises *Combretum celastroides* and *C. elaeagnoides*, sometimes with *Baphia massaiensis* and *Meiostemon tetrandrus*. Other trees include *Commiphora karibensis*, *Strychnos madagascariensis*, *Diospyros quiloensis*, *Pteleopsis anisoptera*, *Xeroderris stuhlmannii*, *Lannea schweinfurthii* and *Pterocarpus lucens*. Generally the soils are deep sands, probably remains of old alluvium or colluvium deposited during the Pleistocene pluvials.

The site at Mlibizi (7c, NL 150.150) is not of any particular conservation importance, although it does contain some species of comparatively restricted distribution. The site near Mabega Dam near Chief Sigalenke (7b, NL 370.390) still contains some interesting species such as *Guibourtia*, but has been heavily disturbed and much cleared for cultivation. It is not considered a priority.

The best developed site is just north of Manjolo Business Centre (7a, NL 450.410). This has been extensively cleared for cultivation over the last 15 years, but a reasonable amount still remains. This dry woodland to forest, dominated by 10-5 m high trees of *Guibourtia conjugata*, represents the major development of such dry forests in Binga District. The site is considered to be a national conservation priority as it is apparently the only viable remaining patch of this vegetation type in the country. The threat to its continued existence is great, and nearly all will be cleared, at current rates, within five years. Aerial reconnaissance is required to determine its current extent and to locate the most viable area. Information also needs to be gathered locally on (a) the value and limitations of these sandy soils for agriculture, and (b) the local use and value of *Guibourtia* wood. The site would appear to have no real potential for the development of ecotourism or consumptive utilization.

4.1.3 *Deciduous woodlands on shallow soils and escarpments* (Types 8 and 10).

The woodland covering Binga hill, from the airstrip to the Rest Camp and tarred access road (8, NL 380.540), is of lesser extent and interest than had originally been thought. The frequency of *Guibourtia conjugata*, on which this assessment had been based, is much less than had been supposed, being restricted to pockets of deeper sand on the hillslopes. The area around the hot springs has been extensively modified and has little biodiversity interest, although the springs themselves have visitor and economic potential. The seepage zone below the springs contains sedges (e.g. *Eleocharis geniculata* and *Fimbristylis ferruginea*) and herbs (e.g. *Nicolasia pedunculata* ssp. *thermalis* described from Kavira) which only occur in the neighbourhood of hot springs or salt pans. Except for the springs and immediate seepage zone the area is not of any great interest for conservation despite the rapid developments taking place.

There are various interesting sites along the Chizarira escarpment comprising "kloof" or gully woodland or forest which verge with miombo woodland on the slopes above. Some of these gullies contain unusual species, such as the palm *Phoenix reclinata*, and have not yet been fully explored botanically. The tree flora is generally rich and individual trees can reach large sizes. The major and perhaps most interesting area, from the Luizilukulu to Mucheni gorges (site 10d, NL 920.495), is virtually all inside Chizarira National Park. There is one safari lodge adjacent to the site with an access road through the National Park, but its impact was not assessed. It is of medium priority.

Additional areas where concerns of botanical conservation should feature in any local land use planning are sites 10a (NL 610.380), 10b (NL 690.425) and 10c (NL 740.440), all gullies running up into the escarpment retaining moisture for much of the year and with nutrient-rich soils, hence the tall trees. Owing to their rocky and steep nature these sites are unlikely to be used for agriculture, but excessive selective tree felling or excessively high levels of livestock grazing would damage their viability. They could be the sites for small campsites or lodges, and are close to wildlife areas. Only site 10b is of medium priority for conservation; the others are of lower priority.

Gully woodlands are of particular value as an adjunct to existing wildlife areas. The District Council is at present constructing a game fence near the base of the escarpment through some of these woodlands under the CAMPFIRE programme to protect villagers' crops from animal damage. Tourism is a feasible option without destroying the biological viability of the area, as is minor consumptive utilization (grazing and possibly selective felling).

4.1.4 *Chaba Vlei dam* (Type 15).

Chaba Vlei dam (site 15, PL 165.973) is the site of an old tsetse camp, with a small dam containing water plants surrounded by woodland including riverine species. The area is now heavily degraded by cattle grazing and tree cutting, and the area below the dam is used for irrigated agriculture. It has little value now for conservation, but with a fair amount of investment could be turned into a picturesque and well-sited Council-run rest camp.

4.1.5 *Chaba gorge* (Type 31).

Near to Chaba Vlei dam and very close to the main road, is a small gorge in the Karoo sandstone (site 31, PL 150.962) with an interesting array of widely distributed species. It is well worthy of conservation, perhaps as a small picnic or scenic site.

4.2 GOKWE NORTH DISTRICT

4.2.1 *Kloof or gully woodland* (Type 10).

North of Sengwa coalfield the Sengwa river, which here forms the boundary with Chizarira National Park, passes through a steep gorge (site 10e, PL 280.565). The site was not visited and is rather inaccessible. However, it is likely to have an interesting and fairly rich woodland flora. Owing to its inaccessibility, and the fact that half of it is already protected inside Chizarira, conservation priority is low.

4.2.2 *Sidaga grassland* (Type 11)

True, or edaphic grasslands (i.e. soil-determined, not cleared by man) are not common in Zimbabwe, which is essentially a woodland country. One of the natural grassland types is locally called "sidaga", and what is probably the best-developed and most extensive area is found east of the Sengwa coalfield in northwestern Gokwe Communal Land (sites 11a, PL 360.575; site 11b, PL 420.470). Site 11b is on a slope above the Sengwa river, stretching much of the way to Chirisa Safari Area, and the soil type is a heavy black cracking clay probably derived from Karoo mudstone. The grassland mostly comprises the perennial grasses *Ischaemum afrum*, *Dichanthium papillosum* and *Setaria incrassata*, with patches of low shrubs of mopane, *Dichrostachys cinerea*, *Dalbergia melanoxylon* and *Acacia nilotica*, and the shrublet or herb *Neorautanenia mitis*. Although very low in species diversity, the grasslands are very interesting and unusual biologically. Much (perhaps more than 50%) of this Sengwa site has now been ploughed, principally for cotton production by recent immigrants to the area. There has been a very large increase in cultivation since 1989, when only a few patches at the margin had been ploughed. Now there are homesteads and fields scattered over most of its extent. Disturbance is particularly concentrated on the higher northern section, close to the main tar road.

Protection from ploughing of a block of these grasslands, ideally on the upper slopes of site 11b, is considered a major priority. The remaining area is of medium priority. Similar grasslands are present in Busi Communal Land and Chirisa Safari Area, but the latter are less extensive and seemingly less "pure" as grasslands (i.e. they have more shrub cover).

4.2.3 *Dry forest on sand* (Type 16)

Only one very small area of this Type (site 16j, PL 450.675) is found in Gokwe District, on high ground (above 900 m) in the north close to Gomera Hill. Owing to inaccessibility and the lack of air photos for accurate location it was not visited. It is thought this site is a dry forest on a sand cap, possibly dominated by *Xylia torreana* with emergent trees of *Pteleopsis anisoptera*, *Pterocarpus lucens* and *Entandrophragma caudatum*, and as such is an unusual species-rich vegetation type of medium conservation priority. From satellite imagery it appears in very good condition, it is unlikely to have been significantly disturbed by man, and probably shows minimal elephant damage.

4.2.4 *Alluvial and floodplain woodlands* (Type 23)

The floodplain vegetation, including alluvial woodlands, along the west bank of the Busi river before its confluence with the Sengwa (site 23a, PL 175.340), appears from satellite imagery not only to be well-developed but apparently not much cultivated. It was not possible to visit it this time, but in 1989 a visit to the northern margins showed a wide range of trees typical of recent alluvium including *Acacia robusta* ssp. *clavigera*, *A. tortilis*, *A. polyacantha*, *A. nigrescens*, *A. sieberiana*, *Faidherbia albida*, mopane, *Trichilia emetica*, *Piliostigma thonningii*, *Kigelia africana*, *Lonchocarpus capassa*, *Triplochiton zambesiacus* and shrubs of *Combretum mossambicense*.

Well-developed and relatively uncultivated recent alluvium along these larger rivers of the Zambezi Valley are comparatively rare. It is unlikely that the woodlands on the west bank of the Sengwa have been heavily cultivated. They are also immediately adjacent to Chizarira National Park and probably liable to severe elephant damage to crops. Site 23a stretches upstream on the Busi into Chizarira National Park and is considered of medium priority.

A much smaller site (23d, PL 320.475), also on the west bank of the Sengwa river, was not visited. From satellite imagery it appears to be a mixture of alluvial woodland and woodland thicket associated with Uppper Hwange sandstone (similar to Type 6) dominated by shrubs of *Combretum celastroides*. It is considered of medium priority.

4.3 KARIBA DISTRICT

4.3.1 *Dry forest on sand deposits* (Type 17)

There is a very interesting and botanically diverse area on the Tiger Bay peninsula in NE Omay Communal Land opposite Tashinga (site 17, PM 525.350). The soil types are varied, ranging from old sandy colluvial to clay-rich alluvial deposits. The extent of woodland thicket is substantially less than shown in the 1991 National Herbarium report as the interesting, but more open, woodland of mopane and baobab was included under it owing to its similar appearance on satellite imagery. Change since 1989 seems minimal; the airstrip was cut before that. Refuse disposal from Tiger Bay Lodge is causing minor damage at the periphery.

The open woodland is composed of tall trees of mopane, *Lonchocarpus capassa*, *Entandrophragma caudatum*, baobab and others, and then grades northwards into a species-rich woodland thicket of *Combretum celastroides*, *C. elaeagnoides*, *Meiostemon tetrandrus*, *Schrebera trichoclada*, *Cleistochlamys kirkii*, *Lonchocarpus bussei*, *Berchemia discolor*, *Balanites maughamii* and *Entandrophragma caudatum*. The woodland thicket is generally in good condition and of medium to high priority for conservation owing to its species richness and being an unusual vegetation type.

It is hoped the Lodge could cooperate in the conservation of the area as, although it is on communal land, there is hardly any habitation there and the Lodge are managing the area in practice.

4.3.2 *Kloof or gully woodland* (Type 20)

By definition, this type of woodland, often verging on forest (i.e. closed canopy) or thicket, is very limited in extent. It is a result of increased soil moisture and soil nutrient levels derived from the surrounding rocky areas. Four sites of this type were identified in Omay from satellite imagery and fieldwork.

One site (20a, PM 365.078) is situated on a small river in the middle of the Mapangola Hills in C Omay around where the tsetse track crosses it. Large and tall trees of *Tamarindus indica*, *Acacia nigrescens*, *Afzelia quanzensis*, *Kigelia africana*, baobab, *Xanthocercis zambesiacum*, *Gyrocarpus americanum*, *Berchemia discolor*, *Terminalia* sp. and *Diospyros mespiliformis* are found, with a wide range of other woody species. The threat level is low as the site is difficult of access with no arable land nearby. Conservation priority is medium.

Two further sites are situated at the east end of the Mapangolo Hills where the Siakobvu-Bumi Hills road cuts through. Site 20b (PM 445.137) contains large mopane and *Commiphora caerulea* on rocky slopes going down into a rocky gorge with a range of other species, including many large trees and a diverse understorey. Site 20c (PM 425.160), going up a small rocky gorge in the Karoo sandstone, is exceptionally species-rich, including many species more typical of dry forest or jesse - 46 woody species were noted in just a small area.

Both sites are of medium priority, the threats being from destruction due to road building, destruction by elephant, and possibly tree cutting.

The fourth site (20d, PM 457.065) is a very small area at the base of a small cliff and spring behind Siakobvu Business Centre where the road goes down the escarpment towards Matusadona National Park. The tree flora, which is also particularly rich, includes *Ficus* spp., *Sterculia africana*, *S. quinqueloba*, *Diospyros mespiliformis*, *Triplochiton zambesiacus*, *Kigelia africana* and *Brachystegia glaucescens*. The microclimate around the spring is moist with epiphytic orchids not uncommon. There is a small house, said to be linked to CAMPFIRE, in the middle of the forest patch adjacent to the spring. The major threat is from expansion of housing and the nearby DDF camp. Priority for conservation is medium.

4.3.3 *Tall mopane woodland* (Type 22)

Tall or "cathedral" mopane woodland, which is mostly confined to deeper clay-rich alluvial soils laid down in the Pleistocene pluvial period, is of local occurrence along the Zambezi Valley. One of the few good stands noted in 1989 was to the north of the Rukovo Hills in N Omay (site 22a, PM 300.200). As with many mopane-dominant woodlands, species diversity is low. Other important tree species include *Terminalia stuhlmannii*, *T. prunioides* and baobab. The mopane is from 12 to 16 m tall.

The site has been extensively cleared over the last six years; previously there was very little cultivation. Clearing and stumping of mopane has spread from the south and east, followed by ploughing using Council tractors as cattle are still not allowed in the area. The extent of clearance can only be determined by aerial reconnaissance, but it is thought that at least 30% has been cleared since 1989, and perhaps up to 60%. At the present rate this tall mopane woodland would have been nearly all cleared in 10 years time. Conservation of a few square kilometres, preferably in the south west with less pressure from cultivation and a lower frequency of burning (which appears to be common in remnant woodland in the eastern section), is of high and urgent priority. This site is the best extensive area of tall mopane woodland known in the Zambezi Valley west of Kariba.

The other site of tall mopane woodland (site 22b, QM 050.470) is at the east end of Gatshe Gatshe Communal Land and consists of tall mopane (12-14 m high), *Combretum apiculatum*, *Commiphora mollis*, *Diospyros quiloensis*, *Acacia nigrescens* and *Triplochiton zambesiacus*. This woodland is more species-rich than that in Omay, and contains in parts various shrub species typical of jesse. The area was not revisited on the ground in 1996. Conservation priority is medium.

4.3.4 *Alluvial woodland* (Type 23)

Only one small patch of particular interest was noted in Omay (site 23b, PL 232.975) at the confluence of the Sengwa and Mawena rivers. However, it was not possible to visit it in 1996 owing to expansion of cultivation removing the track and many small gullies. The site is a small peninsular of alluvium which has been used as a tsetse camp and also by some safari operators. There is a fringe of large trees next to the river comprising *Tamarindus indica*, *Acacia robusta* ssp. *clavigera*, *Trichilia emetica*, *Berchemia discolor*, *Ficus* spp., *Lonchocarpus capassa*, *Kigelia africana* and *Faidherbia albida*, with shrubs of *Combretum mossambicense* and *Friesodielsia obovata*.

Local Tsetse Control Branch workers said the woodland is still intact, but cultivation of the surrounding alluvium has greatly expanded since 1989, and the site is under threat. It would make a good District Council campsite for safari operators or a scenic public campsite if the access track could be rebuilt, despite being some distance from the main roads. The area is considered of low priority as more substantial stands of alluvial vegetation exist elsewhere.

A small area of alluvium of varying types is found where the Gachegache and Sunde rivers flow into Lake Kariba in Gatshe Gatshe Communal Land (site 23c, QM 080.465). The dense mixed woodland includes *Triplochiton zambesiacus*, *Acacia robusta* ssp. *clavigera*, *A. nigrescens*, *A. tortilis* and *Lonchocarpus capassa*. Various fruit trees such as *Tamarindus* and *Cordyla*, much browsed by elephant are also found. Conservation priority is low.

4.4 GURUVE DISTRICT

4.4.1 *Dry forest on sand* (Type 26)

The dry layered forests found principally on old sandy colluvial/alluvial deposits, possibly dating from the Pleistocene pluvials, are quite common along the lower Angwa and tributaries up through the Dande Safari Area almost to Kanyemba. They are similar to those found in Omay, Copper Queen and Mana Pools, and are particularly species-rich with many unusual species. Some in the Angwa area have been less damaged by elephant and are probably the best examples remaining in the country.

Many patches have been identified (26a-p), but the largest two are by far the most important. One is situated on the east bank of the Angwa river near Chief Chisunga close to the Mozambique border (site 26a, TT 250.250) and the other is north of this in Dande Safari Area straddling the Mozambique border (site 26f, TT 200.380). Uranium prospecting has been taking place in both localities.

The vegetation within these large sites is quite varied, but the major type is a dry layered forest of closed-canopy *Xylia torreana* at 8-12 m with emergents of *Pteleopsis myrtifolia* and especially *Pterocarpus lucens* up to 18 m high. The shrub layer mostly comprises *Meiostemon tetrandrus* and *Monodora junodii*. Species of interest that are scattered through include *Entandrophragma caudatum*, *Excoecaria bussei*, baobab, *Strychnos decussata*, *S. potatorum*, *Berchemia discolor*, *Croton longipedicellatus*, *Cleistochlamys kirkii*, *Citropsis daweana, Neoholstia tenuifolia*, *Elachyptera (Hippocratea) parvifolia* and *Strophanthus kombe*, amongst many others. The soils are generally sandy but with some clay particles, and termitaria are not uncommon. Occasional pans are found containing aquatics such as water lilies, fringed with such species as *Diospyros mespiliformis* and *Balanites* spp.

Site 26a is very diverse and contains some other unusual vegetation types, most of them forest or closed woodland. The ecotones are particularly rich. This forest is alleged to contain Nyala (*Tragelaphus angasii*; G. Davison, Tsetse and Trypanosomiasis Control Branch, pers. comm.) and possibly Sun Squirrel (*Heliosciurus mutabilis*). Elephant often hide in such forests during the day, and when concentrated they can cause a lot of structural damage. They destroy many of the larger shallow-rooted trees and this, coupled with a high density of elephant paths, encourages dense shrub growth of *Combretum* spp. This can particularly be seen at Mana Pools where the dry layered forest has been effectively reduced by elephant to thicket. So far this has not occurred at this site, but elephant damage poses probably the biggest threat to the vegetation type.

There are proposals for a livestock fence to pass through the area, effectively forming a stock-free zone to the north. The stated plan is for this fence to run from the Mozambique border at Chikafa (Hunyani Mission) to the west of site 26a until it reaches the old game/tsetse fence around Chapoto Fly Gate. This would protect the forest from cattle incursion, especially as there are some pans contained within it that would enable wet season grazing to take place independent of distance from the kraal site. However, if these plans are modified so that the fence runs along the border to the north of the forest its conservation would be threatened. Conservation of this area is of the highest, national, priority.

The Kanyemba road passes through a small site of thicket with emergent trees (site 26c, TT 120.220). The structure of this thicket is not particularly well developed but it contains a wide range of woody species including *Xylia torreana*, *Pteleopsis myrtifolia*, *Cordia goetzei*, *Acacia ataxacantha* and some large, magnificent, emergent trees of *Lannea schweinfurthii*. Its priority for conservation, however, is low to medium.

Site 26f in Dande Safari Area lies between the Nyambenga and Kamsaza rivers and crosses the border into Mozambique. It is very similar in composition to site 26a and is the best developed *Xylia-Pterocarpus lucens* forest I have seen. It is fringed by *Combretum* thicket.In one locality there is a grove of *Schinziophyton (Ricinodendron) rautanenii* trees, a very unusual occurrence in the Valley. Although elephant activity (paths) is high, damage to forest structure is minimal so far. The area is presently conserved in Dande Safari Area, but control of elephant numbers may be necessary. Again, this site is considered to be of the highest, national, priority even though there is no immediate threat other than from elephant. Both sites are probably the best remaining examples of *Xylia* dry forest in the Zambezi Valley, most of the others having been badly damaged by elephant, or cleared for cultivation.

Site 26p (TT 530.290), straddling the Mozambique border north of Gonono inside the distinctive crescent-shaped sand ridge appears exceptionally densely vegetated, and may in fact be similar to dry forest/riverine thicket (Type 27). It was not visited, being only accessible by a lengthy walk. There was reputedly a poacher's camp on the Mozambique side. Although there appears to be no immediate threat to its conservation, other than from elephant, its conservation is also considered of the highest priority owing to the rarity of the type and its undoubted high species diversity.

Other forest sites were identified from satellite imagery but not visited on the ground. They are of lesser conservation value owing to their smaller size, but may well contain some unusual species not common in the main areas.

An extensive outcrop of fossil wood associated with the Pebbly Arkose layer of the upper Karoo sandstone is found near and in site 26b (TT 270.180). This is one of the best outcrops known in the Zambezi Valley.

4.4.2 *Dry forest/riverine thicket* (Type 27)

The outlines of this vegetation type are given under Muzarabani District (section 4.5.1). Various small patches of this type remain in Dande Communal Land associated with the Manyame and Dande rivers. Owing to intensified development in the Chitsingo-St Cecelia area over the last 8 years many of these patches have since gone or been much disturbed. The status of the described sites is based on 1992 satellite imagery and aerial reconnaissance in March 1996. Only one site (27j) was visited on the ground.

Nine sites were identified (27e-m). The one site visited (27j, TT 340.065) is adjacent to the pumphouse for the ARDA irrigation scheme. It is a dense woodland thicket in a deeply-incised, gullied area of fine-textured and gravelly alluvium close to the Manyame river, and extends round an outer bank of the river. From the air it appears relatively undisturbed. Emergent trees of *Lannea schweinfurthii*, *Kirkia acuminata*, baobab, *Euphorbia ingens* and *Commiphora karibensis* rise above a dense thicket of *Acacia ataxacantha*, *Albizia anthelmintica* and *Combretum celastroides*, among others. Species diversity is high. This is one of only four localities for the woody herb *Anisotes bracteatus*, which is otherwise only known from Chirundu, Luangwa Valley (Zambia) and, surprisingly, Mushandike.

The site is unlikely to be cleared owing to the total unsuitability for cropping from the deep gullies. As with the similar forests near Muzarabani, the belief that ancestral spirits inhabit and thus protect them should be investigated.

In the course of aerial reconnaissance, the best preserved sites appear to be 27g (TS 310.988), 27h (TT 275.040), 27j and 27k (TS 358.970). These sites are of very high conservation priority owing to their rarity in the country and the high threat they are exposed to. Areas on the west bank of the Manyame below its confluence with the Monozi river appear to be somewhat disturbed, opened-up and with many cattle tracks entering them.

It should also be noted that the forests on the west bank are recorded as having been a breeding site for the African or Angola Pitta (*Pitta angolensis*), a rare occurrence within Zimbabwe (Masterson, pers. comm.). Fossil plants have been found adjacent to site 27m (TT 135.240) along the Manyima river.

4.4.3 *Wooded bushland on sand* (Type 28)

The major development of this vegetation type is on the crescent-shaped sand ridge close to the Mozambique border north of Gonono (site 28a, TT 420.290 to TT 680.280) between the Manyame and Kadzi rivers. The ridge contains a mixture of vegetation types (see Timberlake & Cunliffe 1995), but the commonest is *Terminalia brachystemma* wooded bushland, with a dense shrub layer of *Baphia massaiensis*, *Combretum* spp. and *Acacia eriocarpa*. Trees to 6-10 m of *T. brachystemma*, *Combretum apiculatum*, *C. collinum*, *Schrebera trichoclada* and *Strychnos madagascariensis* form an open woodland above. Towards the ecotones (vegetation boundaries) large trees of *Kirkia acuminata* and *Xeroderris stuhlmannii* occur. Within this type are patches of much denser *Xylia* dry forest (Type 26).

The Gonono sand ridge is a unique feature in the mid-Zambezi Valley and is of conservation interest not only for its vegetation but also for its diversity of habitat (if the area to the north is included), as wildlife habitat, and for its geomorphology. As the area is extensive the major priority is considered to be that part of the ridge from Sundi beacon south to TT 600.225 which encompasses virtually the complete range of vegetation types. The area of shallow soils and mixed, possibly semi-alluvial, vegetation enclosed by the Gonono sand ridge to the north, should be incorporated into a larger conservation unit. The remaining part of the sand ridge is of medium priority.

Other small sites of this vegetation type are along the Kanyemba road (site 28b, TT 225.480; site 28c, TT 230.575). Although both are in good condition, with occasional patches of *Xylia* dry forest, they are considered of low priority compared to other available sites.

There are reports of plans to upgrade the road from Muzarabani to Kanyemba through Angwa Bridge, with the possibility of a more substantial crossing place to Zambia at Kanyemba. This may well increase settlement in Dande Communal Land, particularly along the roads, although it has been decided to keep the area cattle-free. If such developments take place, sites 28b and 28c, and others, may face increased threat from both cultivation and burning.

4.4.4 *Tall mopane woodland* (Type 29)

The large area of tall or "cathedral" mopane shown in the 1991 National Herbarium report south east of Mushumbi Pools is not as well-developed or extensive as was believed. This area of old, deep, clay-rich alluvium is principally associated with the Ambi river basin. A large portion of this woodland has been disturbed or cleared for cultivation and now only a much smaller area is recommended for conservation (site 29c, TT 440.080). The mopane trees are 10-14 m tall and widely spaced, with various other species more typical of alluvium - *Combretum imberbe*, *Acacia tortilis*, *A. nigrescens* and *Albizia anthelmintica* - also present. The grass layer is good. The site is extensively used for grazing and most is likely to be cleared over the next few years. It is considered of low conservation priority.

Site 29b (TT 880.140) is associated with the Musengezi river upstream of its confluence with the Masingwa. This still exists but is being rapidly encroached upon by cultivation. The site visited is perhaps the largest of a few remnant patches. It had good growth of grasses and annual herbs. A certain amount of selective wood cutting is occurring. Again, pressures on these remnants are great, and conservation, although of medium to high priority, is urgent and may not be successful. This was the best area of tall mopane woodland visited in the mid-Zambezi, although there may be others that are better.

The third site (29d, TS 530.150), associated with the Eastern Gwaze river basin, was not visited. From satellite imagery it appears to be a mixture of moderately tall mopane (perhaps 10-12 m high) with species more typical of alluvium such as *Acacia robusta* ssp. *clavigera*, *A. nigrescens* and *Combretum imberbe*. It can be considered of medium or low conservation priority, depending on how tall the mopane is.

4.4.5 *Alluvial woodlands* (Type 30)

Only two small sites if this type were identified in Dande Communal Land as most areas of recent alluvium have been much disturbed and cultivated. Neither, however, were visited.

Typically these floodplains are formed in the bends of larger rivers and often consist of coarse sandy soils. Characteristic trees are *Faidherbia albida*, *Combretum imberbe*, *Acacia tortilis*, *Ziziphus mauritiana*, *Croton megalobotrys* and *Tamarindus indica*.

Site 30c (TT 240.275) is along the Angwa river adjacent to the large area of *Xylia* dry forest (site 26a). It appears from satellite imagery to be relatively uncultivated and could be conserved in conjunction with the larger dry forest site. Conservation is considered of low to medium priority.

Site 30d (TT 160.670) extends along part of the Zambezi river at the confluence with the Mwanzamtanda near Kanyemba. The site looks particularly rich on satellite imagery and it is known that the local chief (Chief Chapoto) retains a strong influence over natural resource utilization in the area. Although some cultivation is taking place on the east bank of the

Mwanzamtanda, and an old irrigation scheme is being renovated by the DDF for the use of villagers as small gardens, the site on the west bank is much less disturbed. The site was only seen from afar, and is considered of medium conservation priority.

4.4.6 *Salt spring* (Type 32)

A small salt spring, Kauroko Salt Pan, covering less than 5 ha is situated near Chief Chapoto west of Kanyemba on the floodplain of the Mwanzamtanda river (site 32, TT 171.266). This is the only such pan identified, although others may exist elsewhere in Dande. Some of the surface is bare owing to salinity, and the sedge *Cyperus laevigatus* and grass *Sporobolus consimilis* are abundant. An extensive area of *Typha* (bulrush) is adjacent. There are few woody plants, just the occasional *Combretum imberbe* and *Hyphaene petersiana*.

Chief Chapoto controls access to the pan and extraction of salt. There are no cattle in the area. The renovation of a small irrigation scheme nearby should not pose a threat. This species-poor pan, owing to its rarity and unusual species, is considered of medium conservation priority.

4.4.7 *Low-altitude miombo woodland* (Type 33)

In Dande Safari Area the road follows a ridge of the Pebbly Arkose layer supporting an open and stunted miombo woodland (site 33a, TT 130.320). This woodland is of an unusual type, perhaps because of its low altitude and marginal rainfall. The major species are *Julbernardia globiflora*, *Brachystegia allenii*, *Pteleopsis anisoptera*, mopane, *Diplorhynchus condylocarpon* and *Monotes katangensis*. In this part of Dande and Chewore are the only localities in Zimbabwe for *M. katangensis*. *Brachystegia manga* may occur here - within Zimbabwe it is only known from the adjacent Chewore Hills.

This unusual vegetation type is of medium conservation priority. It occurs on stony non-arable soils but may be under some threat from road building. Frequent fire and elephant damage will also be detrimental.

Site 33b (TT 150.550), on the small hill called Kamota close to the Mwanzamtanda river in the southern part of Dande Communal Land extension, appears to be of a similar vegetation type. It was not visited, but may well contain a rich assemblage including some unusual species.

4.4.8 *Riverine thicket* (Type 34)

Two extensive areas of this type have been identified from satellite imagery along the Maura and Chenje rivers, tributaries of the Angwa (site 34a, ST 800.090 to ST 920.050 and site 34b, ST 830.150 to ST 950.120). The former is entirely within Chewore Safari Area and the latter is predominantly within its boundaries. Unfortunately neither was visited.

The thickets, which do not appear to be on old alluvial deposits but in more recent gullies, probably include *Acacia ataxacantha* with some emergent trees such as mopane, *Commiphora caerulea*, *Kirkia acuminata* and *Entandrophragma caudatum*. Cunliffe (1985b) describes them under Type 1.3 (dry deciduous thicket) and du Toit (1993) under Type 1.2.2 (riverine forest). Both descriptions accord well with extrapolations from other areas.

The sites should be visited to fully determine their species composition and structure, and levels of diversity. They would appear to be unusual within the mid-Zambezi Valley but are not under any threat (except perhaps from elephant). They are of low conservation priority.

Dinosaur remains have been found within site 34a (Broderick 1987).

4.4.9 *Sarawanda Hills* (Type 35)

The Sarawanda Hills area (site 35, TS 190.990) where the Manozi river leaves the escarpment close to the Manyame river, is an area of both high species and habitat diversity.The following is based on notes from G. Davison (Tsetse Control Branch) as I did not visit the area.

The hills are of shallow soils, heavily dissected, with thicket in the gullies. Adjacent to the Manozi river there is some good alluvial vegetation remaining, including large *Khaya anthotheca* trees. Elephant and buffalo are still common. In the past hunting camps have been sited here, and the area remains attractive for such ventures. Land pressures from the dense settlements of Chitsingo-St Cecelia are building up and conservation can be considered a priority.

4.4.10 *Escarpment gorges* (Type 36)

Five sites of species-rich woodland and narrow belts of associated alluvium were identified from aerial reconnaissance. Many of the gully or kloof woodlands coming down off the Mavuradonha or Zambezi escarpment are of conservation interest - the five chosen appeared to be the best.

Site 36a (TS 230.920) is where the Manyame river exits the escarpment, including Mashungayendi Pool. This would make a good campsite catering for hunting in the Dande communal land west of the Manyame, as a base for hiking into the Doma Safari Area upstream, and possibly for fishing. An adjacent site (36e, TS 170.950) is nearby on the Manozi river. There is a narrow band of alluvium and some large trees. Owing to threats this is considered of medium to high conservation priority.

Site 36b (TS 350.915) is where the Dande river leaves the escarpment. The best developed section is south of the large S-bend. Cattle tracks going into the hills are common. This site is also considered of medium to high conservation priority owing to threats from cultivation, cattle and tree cutting from the adjacent densely populated area. Both sites would make good bush campsites.

Site 36c (TS 425.880) is where an upper tributary of the Karai river leaves the escarpment. The woodland is well developed and there appears to be a grove of *Khaya anthotheca (nyasica)*. Conservation is of medium priority as the threat is less.

Further to the east, midway between Matsiwo and Muzarabani, site 36d (TS 710.840) is where an unnamed river leaves the escarpment below Matuzviadonha peak (1061 m). The site forms part of the Mavuradonha Wilderness Area (thus is actually in Muzarabani District), and good gully woodland and a spectacular waterfall were noted. As the threat level is low, with negligible easily-accessible land, and existing protection, conservation priority is low.

4.5 MUZARABANI DISTRICT

4.5.1 *Dry forest/riverine thicket* (Type 27)

This vegetation type is essentially a closed-canopy deciduous forest of what are normally woodland species with a thicket understorey, formed on heavily-dissected old, clay-rich alluvium. As a type it was previously more widespread, particularly on the upper reaches of the Musengezi and Manyame rivers below the escarpment. Now only small remnants are found, those on more level terrain having been cleared for cultivation.

Four sites have been identified in the district on the banks of the Musengezi river between Muzarabani and the Utete-Musengezi confluence (site 27a, TS 850.925; site 27b, TS 853.910; site 27c, TS 815.980; site 27d, TS 800.950). All sites appeared in reasonable condition when examined from the air in March 1996.

Only site 27a was visited on the ground. It comprises tall mopane to 14-18 m high with *Commiphora caerulea* to 14 m. Other important trees are *Gyrocarpus americanus*, *Kirkia acuminata*, *Euphorbia ingens*, *Sterculia africana*, *Lannea schweinfurthii*, *Pterocarpus lucens* and *Afzelia quanzensis*. Shrubs include *Acacia ataxacantha*, *Croton menyhartii*, *Markhamia zanzibarica*, *Neoholstia tenuifolia*, *Monodora junodii*, *Friesodielsia obovata* and *Canthium glaucum* ssp. *frangula*. The liane *Fockea multiflora* is common. The area consists of a dense network of deep gullies, probably natural, with the larger trees on the narrow interfluves. There is evidence of selective tree felling, particularly of mopane.

The two sites in Gutsa ward (27c, 27d) were visited by Cunliffe (1995a) in April 1995, who determined their extent as 50 and 30 ha respectively. Site 27c was said to be in relatively good condition.

It appears that at least some of the remnant patches are protected traditionally by "vadzimu" (ancestral spirits) which are said to inhabit them and would seek revenge on those who carry out unauthorised tree cutting. This could be a good entry point for their continued conservation.

From the air and from satellite imagery the best two patches are 27a and 27c, which in view of the very great threat of clearance are of high and national conservation priority.

4.5.2 *Tall mopane woodland* (Type 29)

Tall or "cathedral" mopane woodland (taller than 12 m), found on older and deeper, clay-rich alluvial soils, is not common in the Zambezi Valley. The soils on which it is found are also now, with the advent of draft and tractor power for ploughing and cash crops such as cotton, in demand for cultivation. The vegetation type typically has a strong dominance of tall mopane trees up to 18 m tall, with scattered individuals of other species such as *Terminalia prunioides*, *Acacia robusta* ssp. *clavigera*, *Balanites aegyptiaca*, *Ximenia americana*, *Boscia* and *Maerua* species. It is now greatly threatened by agricultural developments such as those associated with the Mid-Zambezi Development Project.

The large area of tall mopane (site 29a, TT 870.025) present north of the Muzarabani ARDA irrigation scheme in 1989 has now been virtually all cleared and stumped for cultivation, much of the wood being bought by the now-closed sawmill at Muzarabani, or burnt in the fields. There is little left to conserve. Some tall mopane in the north eastern section on the

other side of the Kadzirure river (TT 920.020), difficult of vehicle access, was noted from the air in March 1996. However, the extent of tall mopane is limited and it rapidly grades into shorter mopane woodland of lesser conservation interest. The area now has little conservation value.

Although not visited during this study, there are reports of extensive and good stands of tall mopane woodland in Chadereka ward in the northern part of Muzarabani District (C. Rogers, I. Grundy, pers. comm.). This ward has a very low population pressure and good sites for conservation should exist.

4.5.3 *Alluvial/floodplain woodlands* (Type 30)

The woodland associated with the floodplain of the Mukumbura river (site 30a, UT 010.315 to UT 410.080) crosses the extreme north of Muzarabani District from Darwin District to the point where it enters Lake Cabora Bassa. Along much of its length a 50-100 m wide swath was cleared during the 1970s by soil sterilization prior to mine-laying, killing all trees, but apparently only the section from Mukumbura south east to Mavuradonha actually contains mines. The scars of this clearing can still be clearly seen on satellite imagery and on the ground. Owing to concerns at the time regarding mines and the inaccessibility by vehicle, only the periphery of parts of the woodland were visited. Typically the trees form a canopy 10-14 m high which is quite dense, and the shrub layer is well-developed, sometimes verging on thicket. Characteristic trees are *Acacia tortilis* ssp. *spirocarpa*, *Xanthocercis zambesiaca*, *Acacia robusta* ssp. *clavigera*, *Tamarindus indica*, *Cordyla africana*, *Kigelia africana*, *Combretum imberbe*, baobab, mopane, *Lonchocarpus capassa* and, at the margins, *Ziziphus mauritiana*, *Combretum mossambicense*, *C. obovatum* and *C. elaeagnoides*. *Faidherbia albida* is common on the most recent alluvium close to the river, and *Trichilia emetica* on finer-textured soils.

There has been some expansion of cultivation into some of the floodplain woodlands, particularly near Mukumbura, and the population is now building up on the Mozambique side. Settlement has apparently been restricted in the past by the absence of water in the dry season, so new boreholes are likely to increase settlement. At present there are some people living and farming on the floodplain. In view of this increasing pressure, and given the extent of the woodlands, it is suggested that a much shorter section is selected for conservation attention. From satellite imagery and local information (G. Davison, Tsetse Control Branch) the best section is between the soil-sterilized line and the river itself, from the Musingwa-Mukumbura confluence downstream to where the Mukumbura ceases to be the border and enters Mozambique. The section of greatest importance over this 50 km length is that from the Musingwa-Mukumbura confluence (UT 400.115) to just downstream of a large ox-bow (UT 275.185). This section contains dense alluvial forest as well as the more typical open *Acacia* woodlands associated with recent alluvium.

The other site of alluvial woodland identified (site 30b, UT 005.245) is in an oxbow of the Musengezi river 6 km north of Musengezi Mission. The vegetation is dense forest with a thick shrub layer, particularly at the margins, situated on a light but clay-rich alluvium of some age (i.e. not recent). The major trees, large and mostly over-mature, are *Kigelia africana*, *Trichilia emetica*, *Cordyla africana*, *Ficus sycomorus*, *Garcinia livingstonei* and *Diospyros mespiliformis*. Smaller trees and shrubs include *Drypetes mossambicensis*, *Cordia goetzei*, *Antidesma venosum*, *Dalbergia arbutifolia*, *Oncoba spinosa*, *Phyllanthus reticulatus*, *Cleistochlamys kirkii*, *Deinbollia xanthocarpa* and *Lecaniodiscus fraxinifolius*. There appears to be little regeneration of the major trees and a fair amount of disturbance and burning in

the understorey, but no cultivation except at the margins. The forest has been called Mbuya Nehanda's forest and is apparently protected by traditional authority as a sacred forest. The best avenue for its continued conservation would probably be through these traditional authorities, but attention should be paid to the current practice of burning the understorey as this is greatly restricting regeneration and thus the forests' long-term survival.

4.6 DARWIN DISTRICT

The only two potential conservation areas identified in Darwin District are the Mavuradona Mountains and the woodland associated with the floodplain of the Mukumbura river (site 30b), which also extends into Muzarabani District. As the most important section lies in Muzarabani it is discussed there (Section 4.5.3). However, part of this high priority section also lies in Darwin District and that Council would need to be involved.

4.6.1 *Miombo woodland on hills* (Type 37).

Towering above the east end of the Zambezi escarpment within Zimbabwe are the Mavuradona Mountains, rising to an altitude of over 1500 m (site 37, US 540.840 to US 740.810). These hills are well covered in a fairly dense miombo woodland which intercepts some of the moist south-easterly airflow. They are poorly-known botanically and may well contain some unusual species dependent on a high moisture regime. The woodland on the lower slopes includes *Brachystegia allenii*, *B. glaucescens*, *Terminalia stenostachya*, *Pterocarpus rotundifolia* ssp. *polyanthus*, *Acacia amythethophylla*, *Diplorhynchus condylocarpon*, and many others. Unusual species include *Sterculia quinqueloba*.

The area suggested for conservation is large, and the only threats at present are tree cutting around the base and wildfires. It is best to try and conserve a full altitudinal sequence, perhaps at the western end. Owing to the low risk and large size of the site, conservation priority is low.

4.7 DISTRICT SUMMARIES

The most important areas for conservation are here summarised by district. Major developments or proposals that may affect conservation are outlined. Summary tables of distribution of conservation sites by District, by priority class, and by vegetation type are given in Tables 3, 4 and 5, respectively.

4.7.1 *Binga District*

The major priority here is the rapidly-disappearing *Guibourtia conjugata* dry forest (site 5a) flanking the main tar road immediately north of Manjolo Business Centre. Expanding cultivation and burning are the causes. At present rates there will be only small forest relics left within 5 years or so. This site is of national priority as the only remaining viable area of its type in the country.

The gully or kloof woodlands of the Chizarira escarpment (sites 10b,d) are also of high conservation value, but are adequately protected within Chizarira National Park and by their rugged terrain.

4.7.2 *Gokwe North District*

The major priority here is the *sidaga* grasslands on cracking clays (site 11b) between Sengwa coalfield and Chirisa Safari Area. Rapid expansion of cultivation, mostly by immigrants from outside the area, will result in virtually all the prime area being ploughed within 5 years. This, too is a national priority, the only other similar grasslands being found in Busi Communal Land, possibly subject to similar pressures.

The extensive area of alluvial woodland on the west bank of the Busi river (site 23a) is an important site, its importance depending on how much of it has been cultivated to date. It extends into Chizarira National Park.

Recent completion of the tar road from Gokwe to Sengwa coalmine has greatly increased immigration and settlement. Sengwa coal mine does not seem to be operational at present, but when it is pressures on some sites of botanical interest (particularly sites 11a,b and 23d) can be expected to increase.

4.7.3 *Kariba District*

In Omay Communal Land the major priority is the tall mopane woodland north of the Rukovo Hills (site 22a), which is rapidly being cleared and cultivated. Although cattle are not allowed in Omay at present, tractors are available from the Council for stumping and ploughing. It is not clear how much of the woodland has been cleared, but it appears to be substantial. Burning in the remnants is also a problem. Although tall mopane woodland is found scattered across the Zambezi Basin, this site appears to be one of the best remaining and shows little elephant damage.

Another area of great botanical interest, although not threatened at present, is the Tiger Bay dry forest and thickets (site 17). It is particularly rich and diverse.

Remaining sites in Omay are relatively small and on steep slopes so are unlikely to be much affected by the eventual introduction of cattle.

4.7.4 *Guruve District*

Guruve District contains more sites of botanical interest than all the other districts. Much of this is due to the extensive coverage of old alluvial and colluvial deposits with their rich and well-developed vegetation, parts of which have not been cleared.

The two major areas are the dry forests on sand (sites 26a,f) associated with the lower Angwa river. Both are of national priority. Although similar vegetation in Mana Pools National Park is more extensive, the two Angwa sites are more diverse with a much better structure owing to significantly less elephant damage. They are thought to be the best examples in the country.

The Gonono sand ridge and the varied vegetation to the north (sites 26p, 28a) going into Mozambique, is a large area of great conservation value. Conservation considerations should play a major role in any land use planning.

Small patches of dry forest/riverine thicket associated with the Manyame river (especially sites 27g,h,j) are the last remnants of a previously much more extensive type which has been

rapidly cleared for cultivation over the last 10 years. As with the patches in Muzarabani they are species-rich, differ greatly one from another, and are now restricted to land unsuitable for agriculture. Being in a densely populated area with many recent settlers, the threat of clearance and destruction is high. These sites are a major and national priority.

Only a small patch of tall mopane woodland (site 29b) now remains on the west bank of the Musengezi river adjacent to the bus route. Encroachment by cultivation is rapid and the area may be too small to conserve adequately. However, it appears to be one of the few remaining patches of pure tall mopane woodland left in these communal lands.

The Mid-Zambezi Valley Rural Development Project has been very active in Guruve District, particularly in the Chitsingo/St Cecelia area and Matsiwo, resulting in much of the woodland being cleared. Unfortunately, no attempt was made to conserve some small "witness stands" of some of this vegetation, including the species-rich dry forests on old alluvium. It is now really too late for representative "witness stands", and remnants on land unsuitable for agriculture are all that remain.

There are proposals for a cattle fence which will permanently separate the cattle-free area to the north from primarily agricultural areas to the south. The fence would run west along the Mozambique border until the Manyame river. Here it is proposed to run it south of the Angwa dry forest (site 26a) and join the old tsetse fence which goes southwards to near Mana Angwa and south of Chewore Safari Area. This alignment would help conserve some of the best dry forest (or true "jesse bush") in the country. However, if the fence is to go north of the Angwa forest and then follow the road to Mkange Bridge, conservation of one of the best areas may be compromised by cattle grazing and occasional cultivation.

There are also said to be proposals to upgrade the road from Mushumbi Pools to Kanyemba, which may also increase pressure on some of the proposed conservation sites.

Plans also exist to build a dam on the Dande river near Guruve and pipe the water down to the Manyame river below the escarpment, from where it will be used for irrigation in the Chitsingo area by ARDA and others. This could affect some of the riverine thickets in the area (sites 27k,l).

4.7.5 *Muzarabani District*

Of major and national level priority are the small but diverse remnant patches of dry forest/riverine thicket along the Musengezi river (sites 27a,b,c). Very few such patches are known elsewhere in the country and all are relics of previously larger areas. These remnants are now surrounded by increasingly intensive cultivation and are situated in an area where development is taking place rapidly. They have probably survived owing to their unsuitable terrain for cultivation and the belief that ancestral spirits reside there. Selective tree cutting (e.g. of large mopane) is a problem.

The alluvial woodland associated with the Mukumbura river (site 30a), continuing in from Darwin District, is an important site, possibly the best extensive alluvial woodland remaining in the Zambezi valley.

The large area of tall mopane woodland noted in the mid-1980s north of Muzarabani ARDA irrigation scheme has now nearly all been cleared for cultivation. It was possibly the most

extensive such area in the country. Reports of tall mopane woodland in Chadereka ward in the north should be followed up as good stands for conservation may exist.

As mentioned above, rapid development is occurring in the parts of Muzarabani closer to the escarpment, and many of the woodlands are being cleared or selectively felled. It was not long ago that a sawmill in Muzarabani was processing thousands of cubic metres of mopane timber from clearance operations. Although now closed, there have been strong moves to get another sawmill operational for commercial extraction of mopane. The amounts of mopane remaining were found to be insufficient, and the proposal seems to have been shelved.

The introduction of electricity to this part of the Zambezi Valley may reduce dependence on fuelwood in the long-run, but it will also bring more people into the area. Plans are apparently advanced to tar the road from Muzarabani to Mushumbi Pools.

4.7.6 *Darwin District*

The only priority site is the alluvial woodland along the lower Mukumbura river (site 30a), the major part of which is in Muzarabani District.

Table 3. Distribution of conservation sites by communal land.

Communal Land	No. sites
BINGA	
Manjolo	5
Siabuwa	10
KARIBA	
Omay	7
Gatshe Gatshe	2
Gokwe N	6
GURUVE	
Dande	28
Dande ext.	8
Dande S.A.	8
MUZARABANI	
Muzarabani	3
Gutsa	3
Mukumbura	1
DARWIN	
Chiswiti	1
TOTAL	82

Table 4. Allocation of conservation priorities.

Priority	No. sites
High	18
Medium	32
Low	32

Table 5. Vegetation types for conservation.

Vegetation type	No. sites
Dry forest - sand	29
Dry forest - alluvium	15
Recent alluvium	8
Gully woodland	15
Mopane woodland	6
Grassland	2
Miombo woodland	3
others	4
TOTAL	82

5. DISCUSSION

Various observations and generalisations can be drawn from this study, some of which may assist in conservation practice in the Zambezi Valley and others which should help in identifying sites elsewhere.

5.1 *Dry forests*

It is apparent that the majority of the 82 sites identified (54%) are dry deciduous forests or thickets on old colluvial or alluvial deposits (see Table 5). Broderick (1984) suggests, however, that many of the sand deposits may be remnants of a Kalahari sand sheet of Tertiary age. These dry forests or thickets are sometimes termed "jesse bush" when the shrub layer is thick, often a result of destruction of some of the large trees by elephant and the consequent increase in shrubs.

Although mostly now consisting of small relic patches, these vegetation types are thought to have been more extensive in the past but were never particularly widespread or common. They are found on what appear to be alluvial and colluvial (= gravity deposited) deposits associated with some of the larger rivers, and were probably laid down at a time of significantly higher rainfall in the Pleistocene period 10,000 or more years ago. Such deposits are not being laid down on the same scale now. The broad fans of these deposits can be seen around Manjolo, Siabuwa, Rukovo Hills, Gatshe Gatshe, and particularly in the Manyame, Musengezi and Hoya river basins and at Chiswiti. The soils derived from them are often fertile and suited to cultivation, and so most of the associated vegetation has disappeared (e.g. at Chiswiti). It was only where soils were too sandy or too clay-rich for cultivation that the vegetation remained intact.

Sandy soils support a dry layered forest with *Xylia* or *Guibourtia conjugata* and shrubs of the Combretaceae family, while the clay-rich soils support a forest of different species such as mopane and *Commiphora caerulea*. In both cases the dry forests contain species not often, or even rarely, found elsewhere in the country, and at their best have a structure similar to the better-known rainforests - a closed tree canopy at 8-12 m height, emergent trees (sometimes with buttress roots) rising to 18 or 20 m, lianes (woody climbers) climbing into the canopy, a poorly-developed herbaceous layer owing to shading, and (for forests on clay soil only) a significant number of trees with fleshy fruits attractive to birds and mammals. Species diversity within these forests (alpha-diversity) is high and, particularly in the case of forests on old alluvium, the differences in species composition between patches (gamma-diversity) is also high.

It is not clear what the total extent of these types of vegetation is within Zimbabwe, but they can be considered as perhaps the most limited (after rainforest) and also some of the most threatened. The substrata on which they are found are naturally eroding and getting smaller, in addition to any accelerated erosion due to man's activities. In many cases the vegetation is of national conservation priority, not only for its high species diversity and unusual or rare species, but also because such sites are some of the last remnants. Particular attention should be paid to any larger areas (e.g. Angwa Bridge, Dande Safari Area, Gonono) which also show a high habitat diversity (beta-diversity).

5.2 *Alluvial woodlands*

A significant proportion of sites (10%) are woodlands on recent alluvium associated with the larger rivers (Table 5). This type of vegetation is characterised by large spreading trees, some almost evergreen, often with edible fruits. The lighter soils and availability of water have made recent alluvium the major focus in the past for human settlement, and most such areas have been cleared and cultivated at a subsistence level. Very little good alluvial woodland remains in the Zambezi Valley. Of that inside present day National Parks and Safari Areas much has been cultivated in the past and is now subject to elephant damage, at times severe (e.g. Mana Pools).

Species diversity is moderately high, but it is only where alluvial woodlands are found on heavier-textured soils, verging on dry forests, that diversity significantly increases and some of the more unusual species are found. Species composition of alluvial woodlands across the Zambezi Valley does not differ greatly.

Again, this type of vegetation is of restricted national distribution, only being found along the lower-lying parts of rivers of the Zambezi and Limpopo/Save Basins. Most of the areas throughout the Zambezi Valley have been badly damaged or destroyed by cultivation. Any good stands, even if disturbed (e.g. Sengwa and Mukumbura rivers), are a conservation priority.

5.3 *Gully or kloof woodlands*

The other major group of sites identified is the gully, ravine or kloof woodlands (18% of total, Table 5). As with the alluvial woodlands, they are sites of higher nutrient and moisture status than the surrounding woodlands, often with moisture available for a longer period of the year. In gully woodlands there is a great range of microhabitats depending on aspect, soil depth, microclimate, and availability of soil moisture through the year. This gives rise to a high species diversity (alpha-diversity) as well as favouring species of restricted national distribution. Owing to the sheltered environment large trees are common. Differences between sites (gamma-diversity) are also marked as rarely are all the microhabitats present.

Zimbabwe, being a geologically diverse country with many rock outcrops, has an extensive range of gully woodlands, especially associated with the major escarpments. This type of vegetation is not particularly threatened except in areas of very high population pressure being protected by its relative inaccessibility, rugged terrain and lack of agricultural potential. Selective tree felling can be a problem, and excessive cattle/goat grazing/browsing can affect regeneration. This is not the case in the Zambezi Valley. What has proved a conservation problem is the clearance of large trees where the gully levels out and small patches of soil suitable for cultivation are found. It is these areas, at the "mouth" of the gully, which are most in need of conservation attention.

5.4 *Low diversity sites*

So far it is the sites with high species diversity, containing unusual or rare species, that have been discussed. At the other end of the scale are those areas of low woody species diversity owing to unfavourable soil conditions. Low woody species diversity can however be partially compensated for by an increase in diversity of herbaceous species. The best-known examples of this occur in the ancient fynbos-like areas of Nyanga and Chimanimani, and mineral-toxic sites associated with the Great Dyke.

Within the Zambezi Valley there are two types of low diversity sites - tall mopane woodland and the *sidaga* grasslands. Both are unique ecological complexes and both are on very heavy clay soils unsuitable for most other woody species. Tall mopane woodland (trees over 12 m high) is found on old clay-rich alluvium, possibly dating from the Pleistocene pluvials, and has very few associated woody plants. The herbaceous layer mostly comprises annuals. These areas were protected by their unsuitability for traditional agriculture, but now, with the arrival of tractor power and cotton-cropping, are much in demand. The extent of tall mopane woodland has been rapidly reduced over the last 10 years, and as a type extensive stands (rather than small relic patches) are becoming extinct. Its conservation is an urgent and national priority.

The *sidaga* grasslands are restricted to cracking-clay soils where root shearing effectively precludes woody species. Even adapted species such as mopane and *Dalbergia melanoxylon*, are restricted to shrub forms. Only a few sizeable areas of this vegetation type occur in the country (Busi, Chizarira, Gokwe North). Previously they were under no real threat being only used for grazing; the frequent burning may have in fact increased their plant diversity by allowing small herbs and bulbous plants to flourish. Ploughing and cultivation using traditional practices was very difficult. However, with the present availability of tractor and draft power, and the comparatively high prices being paid for cotton, such areas are now rapidly being ploughed. There is a distinct danger that this special vegetation type could become extinct as a functioning ecosystem in the communal lands within a few years.

5.5 *National conservation priorities*

A hierarchical framework for the identification of areas of plant conservation interest has been proposed by Timberlake & Müller (1994) whereby the first level of the hierarchy consists of areas of international significance with a high ecosystem, vegetation type, habitat and species diversity within an area of between 500 and 2500 km^2. The second level consists of areas in which specific ecosystems or vegetation types (preferably two or three together) are conserved and are usually between 5 and 100 km^2 in size. The third level includes sites of particular biological interest which protect individual threatened species, areas of particularly well-developed pristine vegetation or outliers of locally rare vegetation due to environmental anomalies, and are generally 0.1 to 5 km^2 in size. Many of the smaller sites proposed in the present report would fall into the third category, the main thrust of this study. But most of the larger sites fall under the second category - sites with representative vegetation or specific ecosystems.

In their study Timberlake & Müller (1994) identified five areas of international interest within the country, the first level of the hierarchy. Two of these are in or adjacent to those parts of the Zambezi Valley covered by the present study - Busi-Sengwa and Chewore-Angwa. The Busi-Sengwa area covers the southern parts of Chizarira National Park and Chirisa Safari Area, Sengwa Wildlife Research Area and part of Busi Communal Land. It includes alluvial woodlands along the Busi river (Type 23), riverine forest on old alluvium (Type 27) and *sidaga* grassland (Type 11). The Chewore-Angwa area covers much of NW Dande Communal Land and part of eastern Chewore Safari Area. Thus it includes many of the presently described sites in Dande.

At a national level it was felt that these two areas, a substantial proportion of which is already formally protected, covered much of the range of variation within the Zambezi Valley in a comparatively small area. What is now needed is to identify other sites of botanical conservation interest, particularly within existing Protected Areas. It should then

be determined which of these complement one another and which could be discarded, so that the best examples of each vegetation type can be conserved. Priorities at a national level can only be set when a national overview is available and all possible sites have been at least briefly described. We are coming close to that in the Zambezi Valley. Ironically, it is within the areas under formal State protection (National Parks, Safari Areas, Forest Land) that our knowledge is weakest.

5.6 *Changes in agricultural technology*

Previously there was a sort of status quo as regard the conservation situation of vegetation types. The prime agricultural areas within the Zambezi Valley, such as recent alluvium and lighter-textured well-watered soils, had been mostly cleared. The remaining areas generally had soils too heavy, too shallow, or with insufficient moisture-holding capacity (i.e. were too sandy) for cultivation. Change was slow, primarily a result of a slowly-increasing population. The presence of tsetse fly effectively precluded cattle from much of the region.

Over the last 20 years, particularly over the last decade, the Zambezi Valley has seen a great change not only in the agricultural technology available, but also in the attitudes of the people living there. Settlement of people from elsewhere in the country has taken place on a large scale, particularly in the mid-Zambezi Valley. These people bring with them not only new ideas but a strong will to achieve more than just a subsistence existence. They have little historical connection to the land and are less inclined to conserve remaining vegetation for traditional reasons. Capital investment, particularly from the State, is very high in comparison to what it was before. Tsetse fly has again been cleared across most of the Valley, and cattle numbers have greatly increased in places. The major effect of the increase in cattle on botanical conservation is not overgrazing but the ability it now gives farmers, through the use of draft oxen, to cultivate heavier soils which were previously unsuitable. The advent of subsidised tractor power has greatly speeded this process up and made soils available for cultivation that are too heavy even for oxen, in particular those supporting tall mopane woodland. Cash-crops such as cotton are now widely planted in some areas, and cultivation expands to the limits imposed by technology and land availability, rather than to the limits of each family's requirements and labour.

Ironically, it is the vegetation types that were most under threat from the expanding population and reduced fallow times in the past, such as the alluvial woodlands, that are under less threat now. Such areas do not grow cotton well and are less suited to intensive agriculture. It is those areas on heavier soils which are now being rapidly cleared - the tall mopane woodlands (Type 29) and what is left of the dry forests on old alluvium (Type 27). The dry forests on sand (Type 26), which may in the past have been slowly encroached upon, are now not desired sites (except in Manjolo where possibly the sands are heavier and other arable land is not available).

Mechanised cultivation considerably modifies the environment, and an area left fallow, once stumped and ploughed, is unlikely to return to its original state for a century. Shrubs invade and often inhibit tree seedling establishment, and the soil moisture regime changes. Tree cutting or grazing, even if heavy, is much more readily reversible, and the original vegetation (even if somewhat modified in structure) can return in 10-20 years, depending on the degree of associated soil disturbance and the generation times of the tree species involved. Many trees and shrubs will coppice, seeds and roots are still available in the soil, and the soil structure itself can remain essentially intact.

5.7 *Possible avenues for communal land conservation*

Many of the sites selected for conservation are not readily amenable to income-generating or resource-sharing activities that could form the basis of community conservation. Some sites could be used for specialised tourism (e.g. ornithological tours, plant specialists), but this is unlikely to bring much cash into the community. Maybe only two or three tours a year could be arranged in practice, and they would take in a range of sites. Most of the sites are small and so unsuitable for wilderness tourism, which is more likely to go to such places as Mavuradonha and Chizarira. Forest sites may have value as extractive reserves for traditional herbal medicines, but there would need to be some form of control to prevent over-exploitation if the site was opened up "commercially". Commercialisation of extraction may have some possibilities if plants much in demand could be identified.

In some cases (e.g. dry forests) the sites are used as wildlife refuges for elephant and buffalo hunted in the surrounding areas. Thus the botanical sites are an important adjunct to the lucrative safari hunting supported in Dande, Omay and Siabuwa. But against this it must be borne in mind that elephant cause most of the destruction in dry forests and have already reduced many forests to thickets of much lower conservation interest. Large mammal disturbance, however, may be an important ecological factor in regeneration.

Perhaps Councils could be asked to set aside some of the sites as part of their contribution to the national conservation effort. The cost is small (mostly an opportunity cost rather than a direct financial cost) because the total area, much of it non-arable, is also small. Credit should be given for any such initiatives and perhaps linked with other development projects or educational opportunities.

The use of traditional authority to enforce conservation of some of the sites is a very practicable option. Sites such as the Musengezi riverine forest (site 30b) and Musengezi thickets (sites 27a-d) are known to be protected by traditional authority on account of ancestral spirits residing there. However, such authority is generally only linked to small areas and, as in the case of site 30b, practices which are inhibiting regeneration are still going on. Forests and woodlands are living "organisms" and need to perpetuate themselves, not become fossilized or geriatric. A useful avenue of enquiry would be to determine how many of the suggested sites do in fact have some form of traditional protection or significance.

5.8 *Conservation in the planning process*

To get conservation concerns, plant as well as animal, integrated into the planning process is the crux of the matter. As long as conservation concerns are marginalised, or merely incorporated at the last minute, conservation will always be ad hoc, reactive rather than proactive, and only a matter for pressure groups or concerned individuals. The rate of development in Zimbabwe is so rapid, and the body of active organized conservationists so small, that many valuable sites have been lost through oversight or insufficient energy or time being applied. It is hoped that the new environmental legislation now under discussion will go some way towards this, but such legislation is still somewhat reactionary in nature - making sure plans jump over the requisite hurdles before being approved, rather than getting conservation concerns and principles into the planning process from the start. A major weakness here, as pointed out earlier, is the lack of accessible scientific information which can support sound economic and environmental decisions.

Conservation in Zimbabwe has tended to focus on the State gazetting and controlling exclusive-use areas. A different approach to conservation, probably because of a different history and attitude to land, was adopted in some European countries. In the UK, for instance, the National Parks are almost entirely composed of private land with normal agricultural and residential use, but subject to more stringent planning controls than elsewhere. Thus the environment and natural beauty of the area is retained. Specific areas of interest are conserved in National Nature Reserves, where the State body responsible (previously the Nature Conservancy Council, now the various National Heritage bodies) owns or leases the land. Land use and land management is strictly controlled. There is also another widespread form of conservation - Sites of Special Scientific Interest. These are generally small gazetted areas where land ownership and land use can continue as before, but with a statutory obligation to inform and consult with the Nature Conservancy in the case of proposed change. Given land pressures in present-day Zimbabwe, and the shortage of funds and expertise within government to manage land for conservation, an approach to conservation that does not alienate land from its existing owners (or users) and incorporates their existing practices and aspirations as much as is possible, is long overdue. This is, of course, the approach being adopted under the CAMPFIRE programme, which now needs to look beyond large mammals and trophy hunting. That is the challenge.

6. RECOMMENDATIONS

Survey

1. Comprehensive surveys and inventories should be carried out of plant species, vegetation types, and other taxa (e.g. birds, mammals, selected invertebrate groups) in the high priority areas. Particular priorities are the Manjolo *Guibourtia* woodland (site 5a), Gokwe *sidaga* grassland (site 11b), Tiger Bay thicket (site 17), Omay mopane woodland (site 22a), Angwa Bridge (site 26a) and Dande Safari Area (site 26f) dry forests, Manyame (sites 27g,h,j) and Musengezi (sites 27a,b,c) riverine forests, Mukumbura alluvial woodlands (site 30a) and the Gonono complex (sites 26p and 28a).

2. Detailed plant lists should be made, also focusing on herbaceous species, of all medium and high priority conservation sites.

3. A comprehensive list should be compiled of all plant species of restricted distribution or rarity within Zimbabwe that occur within the broadly-defined Zambezi Valley, including both communal and National Parks land.

4. Various sites that have been identified but not yet seen (see Table 2) should be visited for complete evaluation of conservation potential. This particularly applies to the small areas of dry forest on alluvium (Type 27) and woodlands on recent alluvium (Types 23 and 30).

5. The current study should be extended to other mid-and low-altitude areas of the Zambezi Basin, both within Zimbabwe and outside. A major priority here is to survey the land managed by DNPWLM (National Parks and Safari Areas) and the Forestry Commission. The priority communal lands are Busi and Gokwe North.

Methodology and change detection

6. Future investigations should utilize air photos and perhaps SPOT satellite imagery, as well as Landsat-TM false-colour images.

7. Future investigations should also utilize low-level reconnaissance overflights to identify areas of conservation interest and to determine current status. However, such flights must be backed up by ground-based fieldwork.

8. An historical comparison of air photos (e.g. 1982 CIDA and 1992 WWF) of the sites subject to land use changes should be carried out to determine rates of change and the type of threat.

7. REFERENCES

Anderson, I.P., Brinn, P.J., Moyo, M. & Nyamwanza, B. (1993). Physical resource inventory of the communal lands of Zimbabwe: An overview. Bulletin 60. Natural Resources Institute, UK.

Broderick, T.J. (1984). A geological interpretation across a portion of the mid-Zambezi Valley lying between the Mkanga and Hunyani rivers, Guruve District. *Annals of the Zimbabwe Geological Survey* **9**: 59-79.

Broderick, T.J. (1987). A geological interpretation of the Cabora Bassa Basin) mid-Zambezi Valley. Map GS 150, scale 1:250,000. Geological Survey, Harare.

Child, B. (1996). The practice and principles of community-based wildlife management in Zimbabwe: the CAMPFIRE programme. *Biodiversity & Conservation* **5**: 369-398.

Cunliffe, R.N. (1995a). Vegetation survey of Gutsa Ward, Gutsa Communal Land, Centenary District. Consultant's report for WWF, Harare.

Cunliffe, R.N. (1995b). Vegetation survey of Masoka Ward, Dande Communal Land, Guruve District. Consultant's report for WWF, Harare.

Davis, S.D., Heywood, V.H. & Hamilton, A.C. (1994). *Centres of Plant Diversity: A guide and Strategy for their Conservation*. Vol. 1: Europe, Africa, South West Asia and the Middle East. WWF/IUCN, UK.

Du Toit, R. (1993). Reconnaissance vegetation survey of the Chewore-Angwa-Kanyemba area of the Zambezi Valley, Zimbabwe. *Kirkia* **14**: 61-77.

Müller, T. (1994). Distribution, classification and conservation of rainforests in Eastern Zimbabwe. Consultant's report for Research and Development Division, Forestry Commission, Harare.

Müller, T. & Timberlake, J.R. (1992). Areas for plant conservation in Zimbabwe. *Zimbabwe Science News* **26**: 88-95.

Rattray, J.M. (1962). The vegetation types of Southern Rhodesia. *Kirkia* **2**: 68-93.

Timberlake, J.R., Nobanda, N., Mapaure, I. & Mabasa, L. (1991). Sites of interest for conservation in various communal lands of N. and W. Zimbabwe. Report No. 1, Communal Lands Vegetation Survey. National Herbarium, Harare. 16 pp.

Timberlake, J.R. & Mapaure, I. (1992). Vegetation and its conservation in the eastern mid-Zambezi valley, Zimbabwe. *Transactions of the Zimbabwe Scientific Association* **66**: 1-14.

Timberlake, J.R. & Nobanda, N. (1993). Vegetation survey in Zimbabwe. *Kirkia* **14**: 24-48.

Timberlake, J.R., Nobanda, N. & Mapaure, I. (1993). Vegetation survey of the communal lands - north and west Zimbabwe. *Kirkia* **14**: 171-270.

Timberlake, J.R. & Müller, T. (1994). Identifying and describing areas for vegetation conservation in Zimbabwe. *Strelitzia* **1**: 125-139. Proceedings of a Conference on the Conservation and Utilization of Southern African Botanical Diversity, Cape Town, September 1993.

Timberlake, J.R. & Cunliffe, R.N. (1995). Vegetation survey of Gonono Ward, Dande Communal Land, Guruve District. Consultant's report for WWF, Harare.

Wild, H. & Barbosa, L.A.G. (1968). Vegetation map of the Flora Zambesiaca area. M.O. Collins, Harare.

Appendix 1.

ZAMBEZI SOCIETY - AREAS FOR PLANT CONSERVATION

Communal Land: Recorder: Date: No.

Type:

Condition:

Change since 1990:

Nature of threat:

Biodiversity - species richness:

- unusual species:

1 - high/good
2 - moderate
3 - low/poor

Rarity of type:

Condition:

Potential to conserve:

Overall importance for plant conservation:

Major & interesting plant spp:

Notes:

Appendix 2. Plant species of special interest or rarity in the communal lands of the mid-Zambezi Valley.

Compiled by R.B. Drummond.

Anisotes bracteatus (Acanthaceae). Only known from Chirundu, Mashumbi Pools, Mushandike and Luangwa Valley (Zambia).

Brachystegia manga (Fabaceae-Caesalpinioideae). Within Zimbabwe only recorded from Chewore and possibly Dande Safari Area.

Combretum goetzei (Combretaceae). Known from Chewore and Tete (Mozambique); almost certainly occurs in Dande.

Combretum kirkii (Combretaceae). Within Zimbabwe only known from the Zambezi Valley below Kariba.

Gyrocarpus americanus (Hernandiaceae). Not particularly common in the Zambezi Valley; more common in Dande.

Khaya anthotheca (Meliaceae). Normally an E. Highlands forest species, but occasionally found in kloofs at the base of the escarpment in the MZV.

Monotes katangensis (Dipterocarpaceae). Only known from Dande Safari Area and areas to the north.

Multidentia exserta ssp. *robsonii* (Rubiaceae). New record for Zimbabwe, from dry forest in Kanyemba and NW Dande. Needs confirmation.

Pterocarpus lucens (Fabaceae-Faboideae). Large trees in Dande dry forests, largest seen in Zimbabwe.

Schinziophyton (Ricinodendron) rautanenii (Euphorbiaceae). Grove in Dande Safari Area. Only known occurrence in the MZV.

Xylotheca tettensis (Rubiaceae). Within Zimbabwe only recorded from Dande and Gonarezhou.

Appendix 3.

Species lists for recorded samples, mid-Zambezi Valley, March 1996.

Compiled by R.B. Drummond. Species and families arranged alphabetically, monocotyledons followed by dicotyledons. [WP = GPS waypoint]

WP 45 (Mukumbura alluvial woodland)

Araceae
Stylochiton puberulus

Commelinaceae
Commelina forskalaei

Poaceae
Aristida congesta
Brachiaria deflexa
Chloris virgata
Heteropogon contortus
Panicum maximum
Urochloa trichopus

Amaranthaceae
Celosia trigyna
Pupalia lappacea

Anacardiaceae
Sclerocarya birrea

Bombacaceae
Adansonia digitata

Burseraceae
Commiphora glandulosa
Commiphora mossambicensis

Combretaceae
Combretum elaeagnoides
Combretum imberbe
Combretum obovatum
Terminalia sericea

Convolvulaceae
Ipomoea dichroa
Jacquemontia tamnifolia

Euphorbiaceae
Flueggea virosa

Fabaceae-Caesalpiniodeae
Afzelia quanzensis
Bauhinia tomentosa
Cassia abbreviata
Chamaecrista absus
Colophospermum mopane

Fabaceae-Faboideae
Crotalaria sp.
Sesbania mossambicensis ssp. minimiflora
Xeroderris stuhlmannii

Fabaceae-Mimosoideae
Acacia nilotica
Acacia polyacantha

Rhamnaceae
Berchemia discolor
Ziziphus mucronata

Solanaceae
Solanum delagoense

Tiliaceae
Grewia subspathulata
Triumfetta pentandra

Vitaceae
Ampelocissus africana

WP 49 (Mukumbura alluvial woodland)

Commelinaceae
Commelina forskalaei
Commelina zambesica

Poaceae
Andropogon gayanus

Amaranthaceae
Celosia trigyna

Asteraceae
Blainvillea gayana

Bombaceae
Adansonia digitata

Capparaceae
Maerua prittwitzii

Combretaceae
Combretum elaeagnoides
Combretum imberbe
Combretum mossambicense

Convolvulaceae
Ipomoea dichroa

Ebenaceae
Diospyros senensis

Fabaceae-Caesalpiniodeae
Colophospermum mopane
Tamarindus indica

Fabaceae-Faboideae
Crotalaria sp.
Lonchocarpus capassa
Sesbania mossambicensis ssp. minimiflora
Sesbania rogersii
Xanthocercis zambesiaca

Fabaceae-Mimosoideae
Acacia nilotica
Acacia robusta ssp. clavigera
Acacia tortilis ssp. spirocarpa
Dichrostachys cinerea

Malvacaeae
Hibiscus sidiformis

Rhamnaceae
Ziziphus mauritiana

Tiliaceae
Grewia bicolor

Vitacaeae
Ampelocissus africana

WP 51 (Muzarabani dry forest)

Araceae
Stylochiton puberulus

Zingiberaceae
Siphonochilus kirkii

Acanthaceae
Megalochlamys hamata

Annonaceae
Friesodielsia obovata
Monodora junodii

Asclepiadaceae
Fockea multiflora

Asteraceae
Blainvillea gayana
Calostephane divaricata

Burseraceae
Commiphora caerulea

Capparaceae
Boscia angustifolia var. corymbosa
Maerua kirkii
Maerua prittwitzii

Convolvulaceae
Astripomoea lachnosperma
Ipomoea shirambensis
Jacquemontia tamnifolia

Ebenaceae
Diospyros quiloensis

Euphorbiaceae
Croton menyhartii
Euphorbia ingens
Neoholstia tenuifolia

Fabaceae-Caesalpinioideae
Afzelia quanzensis
Bauhinia tomentosa
Colophospermum mopane

Fabaceae-Faboideae
Crotalaria cylindrostachys
Pterocarpus antunesii ssp. lucens

Fabaceae-Mimosoideae
Acacia ataxacantha

Hernandiaceae
Gyrocarpus americanus

Malvaceae
Triumfetta pentandra

Rubiaceae
Canthium glaucum ssp. frangula
Gardenia resiniflua

Simbaroubaceae
Kirkia acuminata

Sterculiaceae
Sterculia africana

Tiliaceae
Grewia flavescens

Vitaceae
Cissus integrifolia
Cissus quadrangularis

WP 53 (Musengezi tall mopane woodland)

Araceae
Stylochiton puberulus

Commelinaceae
Commelina forskalaei

Poaceae
Brachiaria deflexa
Echinochloa colona
Urochloa trichopus

Acanthaceae
Duosperma crenatum
Elytraria acaulis

Asclepiadaceae
Dregea macrantha

Asteraceae
Calostephane divaricata
Vernonia sp.

Balanitaceae
Balanites aegyptiaca

Boraginaceae
Ehretia amoena

Burseraceae
Commiphora mossambicensis

Capparaceae
Boscia mossambicensis
Maerua decumbens

Combretaceae
Terminalia prunioides

Crassulaceae
Kalanchoe lanceolata

Euphorbiaceae
Euphorbia tettensis

Fabaceae-Caesalpinioideae
Colophospermum mopane

Fabaceae-Faboideae
Crotalaria sp.
Crotalaria sp
Indigofera schimperi
Sesbania mossambicensis ssp. minimiflora

Molluginaceae
Mollugo nudicaulis

Olacaceae
Ximenia americana

Polygalaceae
Polygala erioptera

Portulacaceae
Portulaca hereroensis

Tiliaceae
Corchorus olitorius

Vitaceae
Cyphostemma lovemorei

WP 58 (Angwa dry forest - ecotone)

Araceae
Stylochiton puberulus

Commelinaceae
Aneilema nicholsonii

Cyperaceae
Cyperus amabilis
Kyllinga alba

Poaceae
Aristida sp
Aristida sp
Aristida rhiniochloa
Aristida vestita
Brachiaria deflexa
Dactyloctenium giganteum
Digitaria milanjiana
Eragrostis viscosa
Hackelochloa granularis
Heteropogon melanocarpus
Leptocarydion vulpiastrum
Melinis repens
Panicum sp
Perotis patens
Pogonarthria squarrosa
Schmidtia pappophoroides

Zingeribaceae
Siphonochilus kirkii

Acanthaceae
Crabbea velutina
Duosperma crenatum
Elytraria acaulis
Justicia kirkiana

Amaranthaceae
Celosia trigyna

Anacardiaceae
Sclerocarya birrea

Annonaceae
Artabotrys brachypetalus
Cleistochlamys kirkii
Friesodielsia obovata
Monodora junodii

Apocynaceae
Holarrhena pubescens
Strophanthus kombe

Asteraceae
Bidens schimperi
Vernonia sp
Vernonia sp

Bignoniaceae
Markhamia zanzibarica

Bombaceae
Adansonia digitata

Boraginaceae
Heliotropum strigosum

Burseraceae
Commiphora mossambicensis
Commiphora ugogensis

Capparaceae
Cleome monophylla

Celastraceae
Elachyptera parvifolia
Pristimera andongensis var. volkensii

Combretaceae
Combretum apiculatum
Combretum celastroides
Combretum elaeagnoides
Combretum mossamabicense
Combretum zeyheri
Pteleopsis myrtifolia

Convolvulaceae
Evolvulus alsinoides
Ipomoea dichroa
Ipomoea leucanthemum
Ipomoea pes-tigridis
Ipomoea plebeia
Ipomoea shirambensis
Jacquemontia tamnifolia
Merremia pinnata

Cucucurbitaceae
Citrullus lanatus

Ebenaceae
Diospyros quiloensis

Erythroxylaceae
Erythroxylum zambesiacum

Euphorbiaceae
Croton gratissimus
Micrococca mercurialis
Phyllanthus pentandrus

Fabaceae-Caesalpinioideae
Afzelia quanzensis
Chamaecrista absus
Colophospermum mopane
Bauhinia tomentosa

Fabaceae-Faboideae
Abrus schimperi ssp. africanus
Baphia massaiensis
Crotalaria microcarpa
Crotalaria virgulata
Crotalaria reptans
Crotalaria cylindrostachys
Dalbergia melanoxylon
Dalbergia martinii
Indigofera astragalina
Indigofera sp
Indigofera vicioides
Lonchocarpus eriocalyx ssp. wankieensis
Microcharis sp
Pterocarpus antunesii ssp. lucens
Rothia hirsuta
Vigna unguiculata
Xeroderris stuhlmannii

Fabaceae-Mimosoideae
Acacia eriocarpa
Xylia torreana

Lamiaceae
Leucas tettensis
Pycnostachys orthodonta

Loganiaceae
Strychnos madagascariensis
Strychnos potatorum

Malvaceae
Hibiscus mastersianus
Hibiscus physaloides
Hibiscus sidiformis

Meliaceae
Entandrophragma caudatum

Moraceae
Ficus bussei

Oleaceae
Schrebera trichoclada

Pedaliaceae
Ceratotheca sesamoides

Rubiaceae
Canthium glaucum ssp. frangula
Kohautia sp
Oldenlandia herbacea
Spermacoce senensis
Tricalysia junodii var. kirkii
Vangueria infausta

Scrophulariaceae
Striga gesnerioides

Simbaroubaceae
Kirkia acuminata

Sterculiaceae
Hermannia tigreensis

Tiliaceae
Corchorus tridens
Triumfetta pentandra

Turneraceae
Tricliceras hirsutum
Tricliceras lobatum

Verbenaceae
Clerodendrum ternatum
Karomia tettensis

Vitaceae
Ampelocissus africana
Ampelocissus obtusata ssp. kirkiana

WP 58a (Angwa tall mopane woodland)

Anthericaceae
Chlorophytum sp

Aracaceae
Stylochiton puberulus

Poaceae
Aristida sp
Brachiaria deflexa
Dactyloctenium giganteum

Zingiberaceae
Siphonochilus kirkii

Acanthaceae
Duosperma crenatum
Elytraria acaulis

Annonaceae
Cleistochlamys kirkii

Asteraceae
Blainvillea gayana
Vernonia kirkii

Bignoniaceae
Markhamia zanzibarica

Bombaceae
Adansonia digitata

Burseraceae
Commiphora mossambicensis

Capparaceae
Maerua prittwitzii

Combretaceae
Combretum elaeagnoides

Convolvulaceae
Ipomoea plebeia
Ipomoea shirambensis

Ebenaceae
Diospyros quiloensis

Fabaceae-Caesalpinioideae
Colophospermum mopane
Senna absus

Fabaceae-Faboideae
Crotalaria virgulata
Dalbergia melanoxylon
Indigofera sp

Fabaceae-Mimosoideae
Acacia nigrescens
Dichrostachys cinerea

Oleaceae
Jasminium stenolobum

Polygalaceae
Polygala erioptera

Rubiaceae
Spermacoce senensis

Tiliaceae
Corchorus tridens
Grewia bicolor

Verbenaceae
Karomia tettensis

Vitaceae
Ampelocissus africana

WP 59 (Angwa dry forest on sand)

Acanthaceae
Blepharis maderaspatensis
Justicia heterocarpa

Amaranthaceae
Celosia trigyna

Anacardiaceae
Lannea schweinfurthii

Annonaceae
Cleistochlamys kirkii
Monodora junodii

Apocynaceae
Strophanthus kombe

Asteraceae
Blainvillea gayana

Balanitaceae
Balanites aegyptiaca

Celastraceae
Elachyptera parvifolia

Combretaceae

Combretum celastroides
Meiostemon tetrandrus

Convolvulaceae
Ipomoea pes-tigridis
Jacquemontia tamnifolia

Cucurbitaceae
Ctenolepis cerasiformis
Momordica kirkii

Euphorbiaceae
Croton longipedicellatus
Excoecaria bussei
Neoholstia tenuifolia

Fabaceae-Caesalpinioideae
Bauhinia tomentosa

Fabaceae-Faboideae
Pterocarpus antunesii ssp. lucens
Xeroderris stuhlmannii

Fabaceae-Mimosoideae
Acacia ataxacantha
Xylia torreana

Loganiaceae
Strychnos potatorum

Malvaceae
Hibiscus mastersianus
Hibiscus physaloides

Rhamnaceae
Berchemia discolor

Rubiaceae
Canthium glaucum ssp. frangula

Tiliaceae
Triumfetta annua
Triumfetta pentandra

Verbenaceae
Premna senensis

WP 61 (Angwa Bridge thicket)

Anacardiaceae
Lannea schweinfurthii

Bignoniaceae
Markhamia zanzibarica

Boraginaceae
Cordia goetzei

Capparaceae
Boscia angustifolia

Combretaceae
Combretum celastroides
Combretum elaeagnoides
Meiostemon tetrandrus
Pteleopsis myrtifolia

Convolvulaceae
Ipomoea plebeia
Merremia pinnata

Ebenaceae
Diospyros quiloensis

Euphorbiaceae
Croton longipedicellatus

Fabaceae-Caesalpinioideae
Colophospermum mopane

Fabaceae-Faboideae
Crotalaria cylindrostachys
Dalbergia martinii

Fabaceae-Mimosoideae
Acacia ataxacantha
Xylia torreana

Meliaceae
Entandrophragma caudatum

Rutaceae
Citropsis daweana

Simaroubaceae
Kirkia acuminata

Sterculiaceae
Sterculia africana

Tiliaceae
Corchorus olitorius

WP 62 (Dande low altitude miombo)

Apocynaceae
Diplorhynchus condylocarpon

Combretaceae
Pteleopsis anisoptera

Dipterocarpaceae
Monotes katangensis

Fabaceae-Caesalpiniodeae
Brachystegia allenii
Colophospermum mopane
Julbernardia globiflora

WP 64 (salt pan)

Arecaceae
Hyphaene petersiana

Cyperaceae
Cyperus laevigatus

Poaceae
Sporobolus consimilis

Asteraceae
Epaltes gariepina

Combretaceae
Combretum imberbe

WP 65 (Dande Combretum thicket)

Poaceae
Chloris virgata

Acanthaceae
Duosperma crenatum
Justicia kirkiana

Apocynaceae
Holarrhena pubescens

Combretaceae
Combretum apiculatum
Combretum elaeagnoides
Combretum obovatum
Combretum zeyheri
Terminalia brachystemma

Convolvulaceae
Ipomoea pes-tigridis
Jacquemontia tamnifolia

Fabaceae-Caesalpinioideae
Chamaecrista absus

Fabaceae-Faboideae
Baphia massaiensis
Crotalaria reptans
Crotalaria virgulata
Indigofera astragalina
Indigofera demissa

Malvaceae
Hibiscus mastersianus

Oleaceae
Schrebera trichoclada

Pedaliaceae
Ceratotheca sesamoides

Rubiaceae
Spermacoce senensis

Tiliaceae
Triumfetta pentandra

WP 66 (Dande dry forest on sand)

Araceae
Stylochiton puberulus

Commelinaceae
Aneilema pedunculosum

Acanthaceae
Asystasia gangetica
Blepharis maderaspatensis

Amaranthaceae
Celosia trigyna

Anacardiaceae
Sclerocarya birrea

Annonaceae
Friesodielsia obovata
Monodora junodii

Asteraceae
Vernonia anthelmintica

Bombacaceae
Adansonia digitata

Combretaceae
Meiostemon tetrandrus

Convolvulaceae
Ipomoea pes-tigridis

Cucurbitaceae
Ctenolepis cerasiformis
Momordica charantia
Momordica kirkii

Ebenaceae
Diospyros quiloensis

Euphorbiaceae
Alchornea laxiflora
Neoholstia tenuifolia
Schinziophyton (Ricinodendron) rautanenii

Fabaceae-Faboideae
Desmodium ospriostreblum
Xanthocercis zambesiaca

Fabaceae-Mimosoideae
Xylia torreana

Loganiaceae
Strychnos decussata

Malvaceae

Hibiscus physaloides
Hibiscus rhabdotospermus
Hibiscus rhabdotospermus

Moraceae
Ficus sansibarica

Rubiaceae
Canthium glaucum ssp. frangula
Multidentia exserta ssp. robsonii
Pavetta cataractarum

Rutaceae
Citropsis daweana
Zanthoxylum sp

Tiliaceae
Triumfetta pentandra

WP 69 (ARDA riverine thicket)

Commelinaceae
Aneilema nicholsonii

Acanthaceae
Anisotes bracteatus
Megalochlamys hamata

Amaranthaceae
Cyathula orthacantha

Asclepiadaceae
Calotropis procera
Fockea multiflora

Bignoniaceae
Markhamia zanzibarica

Burseraceae
Commiphora karibensis

Capparaceae
Cadaba kirkii

Combretaceae
Combretum celastroides
Terminalia prunioides

Convolvulaceae
Hewittia scandens
Ipomoea sinensis ssp. sinensis
Ipomoea tuberculata
Merremia aegyptia

Cucurbitaceae
Momordica charantia

Malvaceae
Abutilon angulatum

Moraceae
Ficus capreifolia

Salvadoraceae
Salvadora persica

Simaroubaceae
Kirkia acuminata

Vitaceae
Cyphostemma kirkianum

WP 70 (Mushumbi tall mopane woodland)

Poaceae
Panicum maximum
Urochloa trichopus

Acanthaceae
Duosperma crenatum
Duosperma quadrangulare
Justicia betonica

Amaranthaceae
Achyranthes aspera

Asteraceae
Vernonia glabra

Bignoniaceae
Markhamia zanzibarica

Combretaceae
Combretum elaeagnoides
Combretum imberbe
Combretum mossambicense

Convolvulaceae
Ipomoea dichroa
Jacquemontia tamnifolia

Fabaceae-Caesalpinioideae
Colophospermum mopane

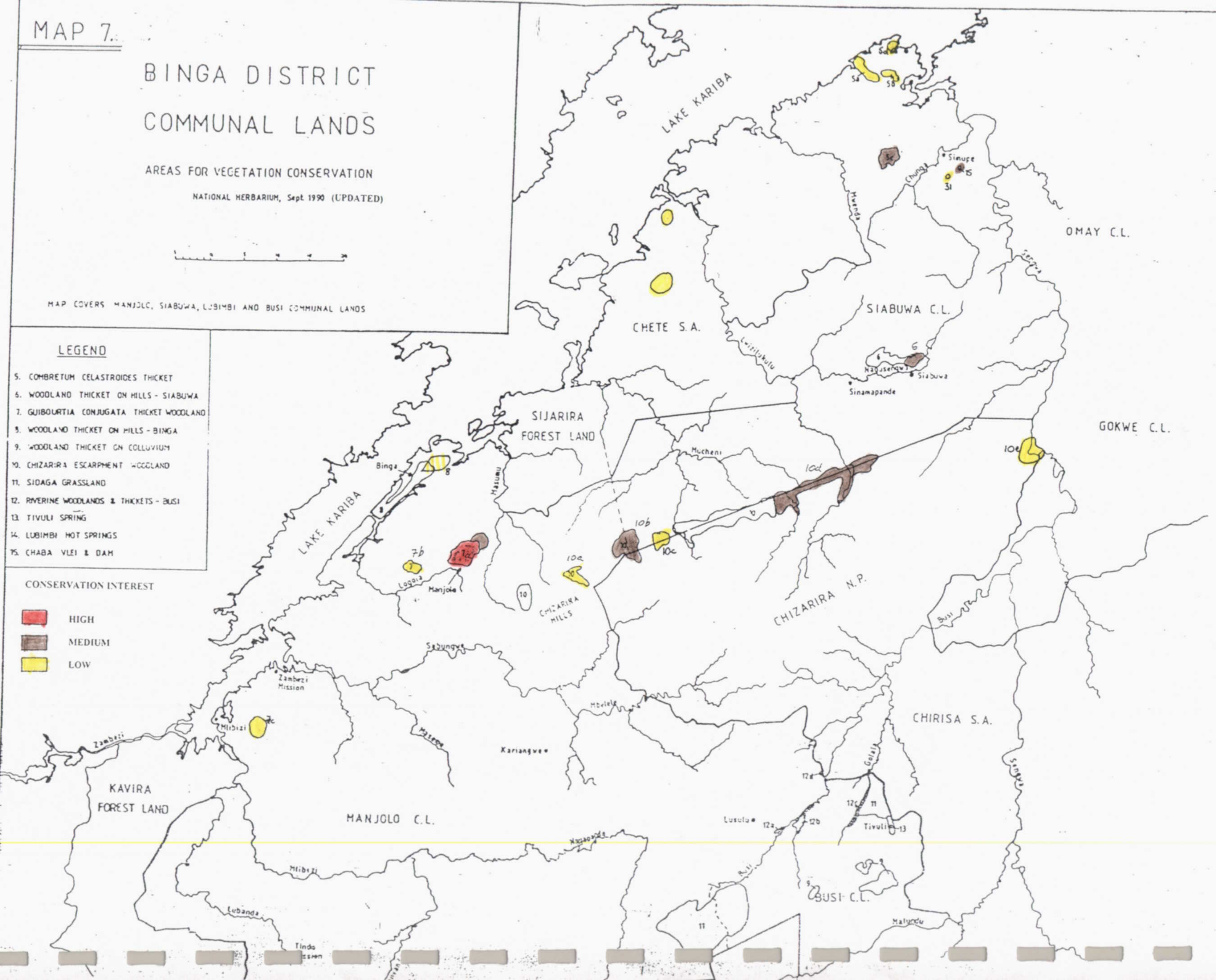
Fabaceae-Faboideae
Indigofera schimperi
Rhynchosia minima
Sesbania rogersii

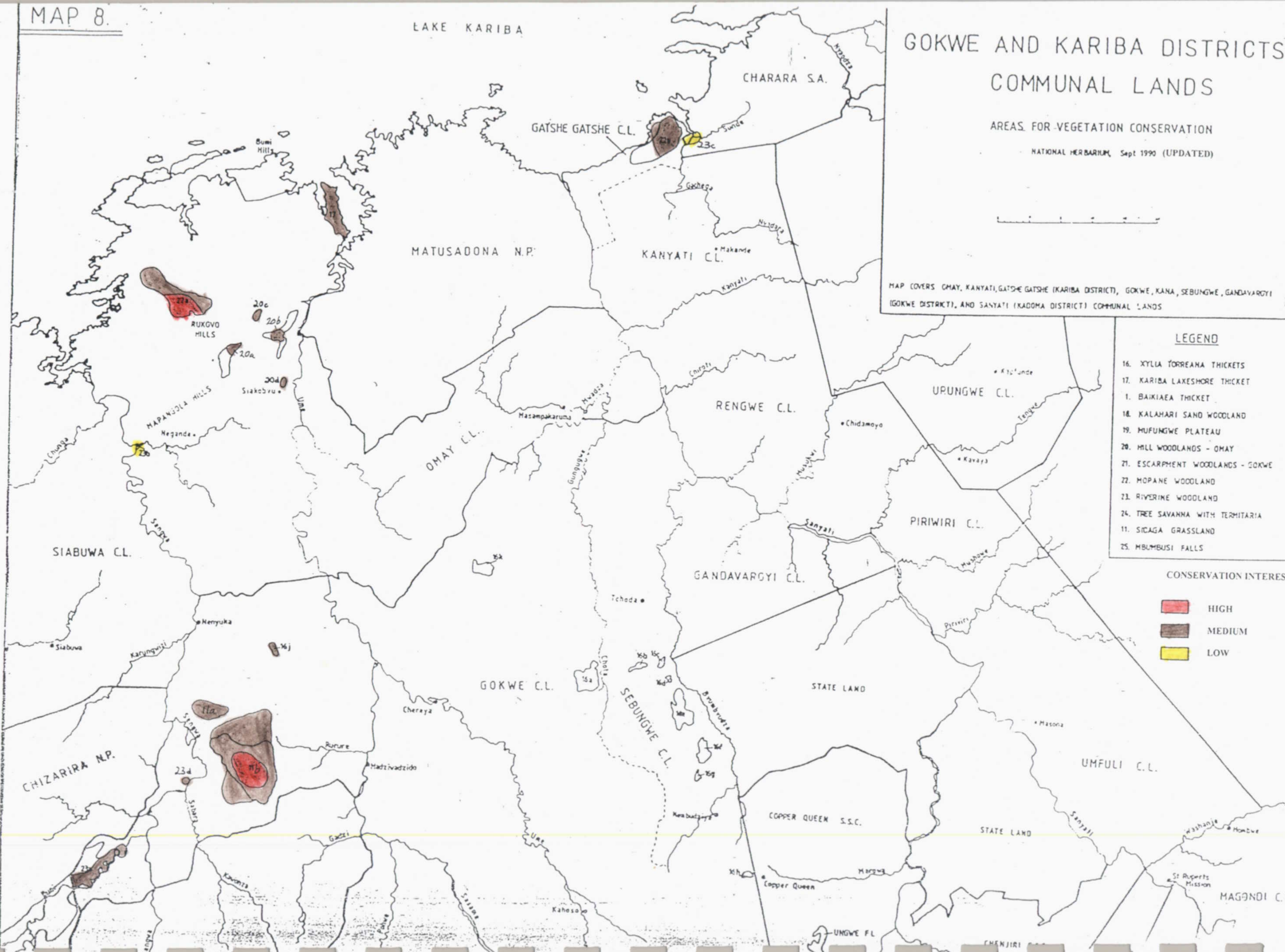
Fabaceae-Mimosoideae
Acacia nigrescens
Acacia tortilis ssp. spirocarpa
Albizia anthelmintica

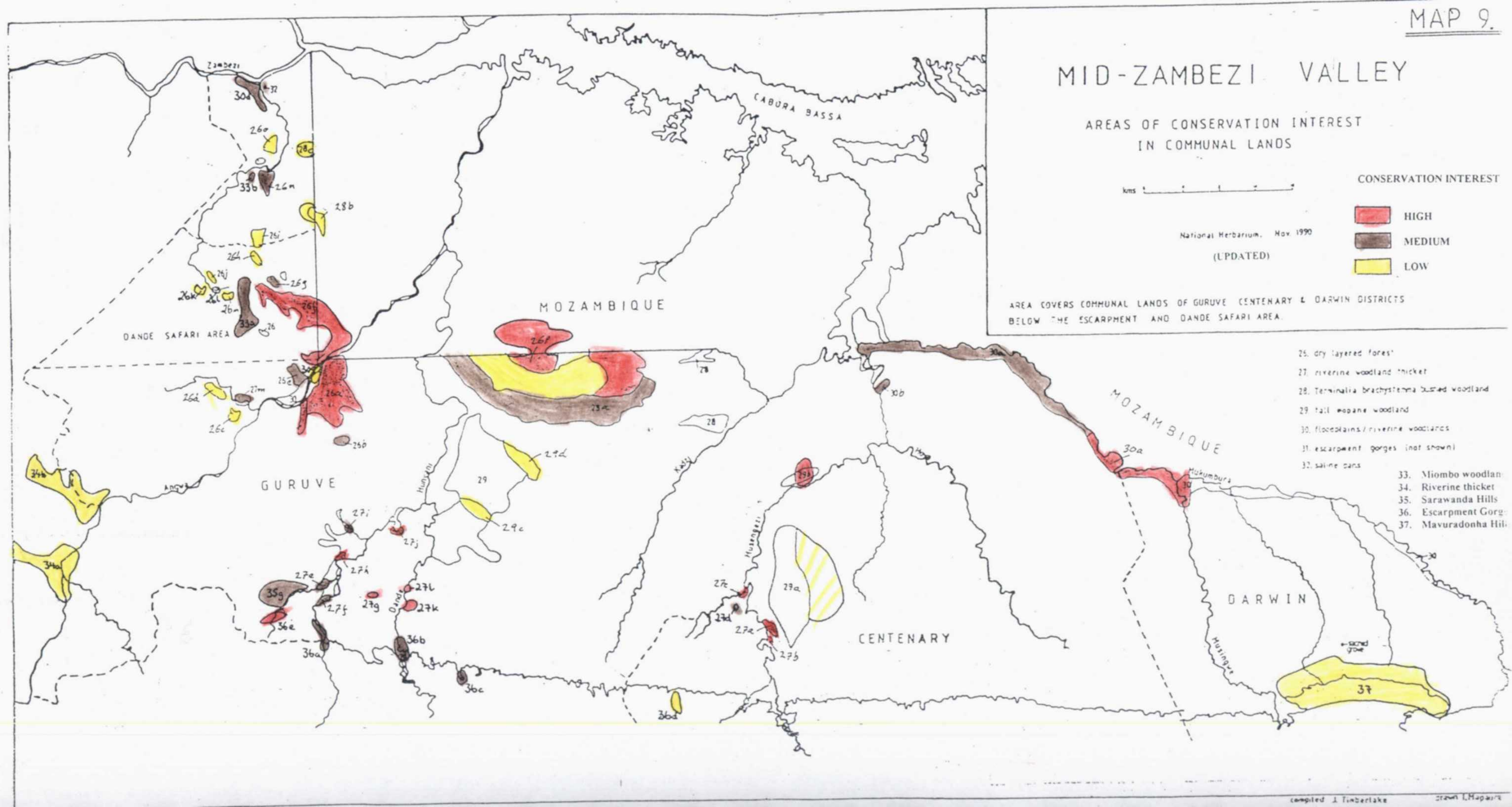
Simaroubaceae
Kirkia acuminata

Sterculiaceae
Sterculia africana

Vitaceae
Ampelocissus africana


MAP 7.
BINGA DISTRICT
COMMUNAL LANDS
AREAS FOR VEGETATION CONSERVATION
NATIONAL HERBARIUM, Sept 1990 (UPDATED)
MAP COVERS MANJOLO, SIABUWA, LUBIMBI AND BUSI COMMUNAL LANDS
LEGEND
5. COMBRETUM CELASTROIDES THICKET
6. WOODLAND THICKET ON HILLS - SIABUWA
7. GUIBOURTIA CONJUGATA THICKET WOODLAND
8. WOODLAND THICKET ON HILLS - BINGA
9. WOODLAND THICKET ON COLLUVIUM
10. CHIZARIRA ESCARPMENT WOODLAND
11. SIDAGA GRASSLAND
12. RIVERINE WOODLANDS & THICKETS - BUSI
13. TIVULI SPRING
14. LUBIMBI HOT SPRINGS
15. CHABA VLEI & DAM
CONSERVATION INTEREST
HIGH
MEDIUM
LOW
LAKE KARIBA
OMAY C.L.
SIABUWA C.L.
CHETE S.A.
GOKWE C.L.
SIJARIRA FOREST LAND
CHIZARIRA N.P.
CHIZARIRA HILLS
CHIRISA S.A.
KAVIRA FOREST LAND
MANJOLO C.L.
BUSI C.L.
Binga
Manjolo
Sinamapande
Siabuwa
Mucheni
Kariangwe
Mlibizi
Zambezi Mission
Zambezi
Tivuli
Lusulu
Sengwa
Busi
Mwenda
Masumu
Sebungwe
Mlibizi
Lubanda
Malyndu
10a
10b
10c
10d
10e
7b
7c
8
6
12a
12b
12c
12d
11
13
15


MAP 8.
GOKWE AND KARIBA DISTRICTS
COMMUNAL LANDS
AREAS FOR VEGETATION CONSERVATION
NATIONAL HERBARIUM, Sept 1990 (UPDATED)
MAP COVERS OMAY, KANYATI, GATSHE GATSHE (KARIBA DISTRICT), GOKWE, KANA, SEBUNGWE, GANDAVAROYI (GOKWE DISTRICT), AND SANYATI (KADOMA DISTRICT) COMMUNAL LANDS
LEGEND
16. XYLIA TORREANA THICKETS
17. KARIBA LAKESHORE THICKET
1. BAIKIAEA THICKET
18. KALAHARI SAND WOODLAND
19. MUFUNGWE PLATEAU
20. HILL WOODLANDS - OMAY
21. ESCARPMENT WOODLANDS - GOKWE
22. MOPANE WOODLAND
23. RIVERINE WOODLAND
24. TREE SAVANNA WITH TERMITARIA
11. SICAGA GRASSLAND
25. MBUMBUSI FALLS
CONSERVATION INTEREST
HIGH
MEDIUM
LOW
LAKE KARIBA
CHARARA S.A.
GATSHE GATSHE C.L.
MATUSADONA N.P.
KANYATI C.L.
RUKOVO HILLS
OMAY C.L.
RENGWE C.L.
URUNGWE C.L.
PIRIWIRI C.L.
GANDAVAROYI C.L.
SIABUWA C.L.
GOKWE C.L.
SEBUNGWE C.L.
STATE LAND
UMFULI C.L.
CHIZARIRA N.P.
COPPER QUEEN S.S.C.
MAGONDI C.L.


MAP 9.
MID-ZAMBEZI VALLEY
AREAS OF CONSERVATION INTEREST
IN COMMUNAL LANDS
kms
National Herbarium. Nov 1990
(UPDATED)
CONSERVATION INTEREST
HIGH
MEDIUM
LOW
AREA COVERS COMMUNAL LANDS OF GURUVE CENTENARY & DARWIN DISTRICTS
BELOW THE ESCARPMENT AND DANDE SAFARI AREA.
26. dry layered forest
27. riverine woodland thicket
28. Terminalia brachystemma bushed woodland
29. tall mopane woodland
30. floodplains / riverine woodlands
31. escarpment gorges (not shown)
32. saline pans
33. Miombo woodlan
34. Riverine thicket
35. Sarawanda Hills
36. Escarpment Gorg
37. Mavuradonha Hil
CABURA BASSA
MOZAMBIQUE
MOZAMBIQUE
Zambezi
DANDE SAFARI AREA
GURUVE
CENTENARY
DARWIN
Hunyani
Musengezi
Mukumbura
Musingwe
Angwa
compiled J. Timberlake
drawn L. Mapaura