SECTION 10: PRIORITISING SITES FOR CONSERVATION

Summit of Rwenzori Mountain.. A.J..Plumptre, WCS

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10.1 SUMMARY

A prioritisation of the sites in the Albertine Rift is made based on species richness, endemism and numbers of IUCN threatened species. Equal weighting is given to each of five taxa (mammals, birds, reptiles, amphibians and plants). Sites are classified into those that have high, medium and low species numbers for total species richness, and endemic and threatened species. Eight sites rank highly for both criteria and are considered the most important sites for conservation in the Albertine Rift. These are: Virunga, Kahuzi Biega, Semliki, Kibale, Bwindi Impenetrable National Parks, Itombwe Massif, Nyungwe Forest and Lake Tanganyika. Large areas of contiguous habitat are important for the long-term conservation of species in the Rift. Landscapes of contiguous protected areas or sites are described and the suggestion made that collaboration occurs between institutions or between countries to manage these as contiguous units. The Virunga Landscape which encompasses the Virunga National Park and contiguous protected areas is incredibly rich in total species, endemic and threatened species. This region may be one of the most diverse on the planet. These landscapes are important to maintain biological, geological and evolutionary processes that occur at large scale and these are discussed.

La prioritisation des sites du Rift Albertin est plus basée sur la richesse d'espèces, l'endémisme et le nombre d'espèces menacées de l'UICN. La même considération est attribuée à chacun des cinq taxa (les mammifères, les oiseaux, les reptiles, les amphibiens et les plantes). Les sites sont classifiés suivant qu'ils ont un nombre élevé, moyen et bas suivant la richesse en espèces et des espèces endémiques et menacées. Huit sites se classent premiers considérant les deux critères et sont considérés les plus importants pour la conservation dans le Rift Albertin. Ceux-ci sont: Les Parcs Nationaux de Virunga, Kahuzi Biega, Semuliki, Kibale, Bwindi Impenetrable, le Massif d'Itombwe, la Forêt de Nyungwe et le Lac Tanganyika. Les larges aires d'habitats contigus sont importantes pour la conservation à long terme des espèces du Rift. Les paysages des aires ou sites protégés contigus sont décrits et la suggestion a fait que la collaboration soit effective entre les

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institutions ou entre les pays pour gérer ces sites comme des unités contiguës. Le Paysage de Virunga qui entoure le Parc National des Virunga et les aires protégées contiguës est incroyablement riche pour toutes les espèces, les espèces endémiques et menacées. Cette région peut être l'une des plus diversifiées sur la planète. Ces paysages sont importants pour maintenir les processus biologiques, géologiques et évolutionnistes qui se produisent à grande échelle et ceux-ci sont présentés.

10.2 INTRODUCTION

The availability of funds for conservation in Africa is limited. Ideally all the sites described in this report should receive high levels of financial support given the species richness and endemism of the Albertine Rift. However reality dictates that certain sites should be given priority over others. How should priorities be set for these sites? Here I use the biodiversity data presented in the previous chapters to look at priority sites within the Rift initially and to select an initial set of high priority sites. I then look at other factors that should be considered when setting priorities, such as size of site, integrated landscapes and biological and evolutionary processes. Rather than rank all sites for priority I produce a list of high, medium and lower priority sites.

Ranking using species data requires subjective decisions to be made. The data lists are incomplete, only five taxa can be used in this study of the rift because the species data are not collated or available for other taxa and it makes the assumption that these taxa are acting as good surrogates for other taxa. If total numbers of species are used to rank sites then plants will dominate the rankings because of the larger number of species. The general public may wish to rank sites on their mammal and bird fauna because these are the two taxa that are most popular and which attract most attention. Alternatively it might be better to prioritise sites on species that have economic value and can attract tourists or provide livelihood to local communities. Weightings could be made for certain species or certain taxa to incorporate these ideas. Here I have decided to weight taxa equally so that a high number of species of mammals at a site receives the same rank as a high number of plants irrespective of the actual number of species.

10.3 RANKING USING SPECIES DATA

10.3.1 Species richness

Total species richness is potentially useful for prioritising sites because as a measure it will incorporate the diversity of habitats and hence capture the diversity of other taxa that may be highly specific to certain habitats (eg. certain insect groups). However, it also is very strongly influenced by the area of a site and the effort that has been put into surveys at the site. Here I only use data from sites that have had a reasonable survey effort (greater than 5 on the scoring system described in section 1.4.1).

Table 10.1 indicates ranking of sites for each of the five taxa based on species richness and calculates a mean rank across all taxa and then ranking these values. Taking a mean rank rather than a computing a total score is necessary to avoid the problems that occur when sites do not have good data and hence are not ranked at all.

Table 10.1 The rankings of species richness for the five taxa for which data are available for the Albertine Rift and for sites that have been relatively intensively sampled. The rank scores of the mean ranking across all taxa are given. Ranking is from 1 for the highest number to the maximum number of sites for which data were compiled.

Site	Mammals		Birds	Reptiles	Amphib.	Plants		Mean rank	
	All	Large				Tree	All	All	Large /tree
Murchison Falls NP	5	5	4	12	16	16		11	12
Bugungu WR		24							31
Karuma WR		14			14			21	20
Budongo FR	8	14	11	5	6	1	6	5	6
Bugoma FR		21	22			10		30	23
Kagombe FR	21	25	31			14		35	29
Kitechura FR	20	29	33		15	19		31	32
Ibambaro FR		31							38
Matiri FR	22	31	32		18	20		32	36
Itwara FR	19	28	24		12	9		26	26
Lendu plateau			14					19	18
Semliki WR		11	7	11	19			15	15
Semliki NP	9	14	6	4	11	6		6	9
Rwenzori Mountains NP	6	17	20	8	7	15	11	13	17
Kibale NP	4	4	13	3	3	5	12	4	2
Kasyoha-Kitomi FR	17	21	15		7	3	8	14	14
Kalinzu-Maramagambo	14	19	9		9	2	9	12	10
Kyambura WR		18	5		20			17	19
Queen Elizabeth NP	7	3	2	8	21	7	7	10	8
Bwindi Impenetrable NP	3	8	10	8	3	4	2	3	5
Mafuga FR		31	30	13		21		29	30
Echuya FR	18	29	29		16	17	14	27	28
Virunga NP	1	1	1	1	1	8	1	1	1
West of Lake Edward		25	8					8	22
Nyungwe NP	9	10	17	6	5	11	5	9	10
Kahuzi Biega NP	2	2	12	2	2	13	4	2	4
Idjwi island			28					36	37
Kibira NP	12	13	23					24	24
Bururi FR	23	23	26					33	33
Lac Ruzizi NP			25					34	35
Itombwe Massif	11	5	3	7	9			6	3
Gombe Stream NP		19	18			18	13	22	25
Mahale Mountains NP	15	7	19			12	3	15	16
Mt Kabobo			21					28	27
Mbizi FR		25	27			22	10	25	34
Marungu Massif			16		12			20	20
Sumbu NP	13	8						18	7
Mweru-Wantipa NP	16	11						23	13

10.3.2 Endemic species

Prioritising by the number of endemic species will focus on those species that are specific to the Albertine Rift (Table 10.2). Focusing on these species will weight the prioritisation for upper and lower montane forest species because most of the endemic species fall in this category.

Table 10.2 The rankings of numbers of endemic species for the six taxa for which data are available for the Albertine Rift and for sites that have been relatively intensively sampled. The rank scores of the mean ranking across all taxa are given. Rankings as in table 10.1.

Site	Mammals	Birds	Reptiles	Amphib.	Butterfly	Plants	Mean rank
Murchison Falls NP	19	21	11	18		22	30
Bugungu WR	19						34
Karuma WR	19			18			31
Budongo FR	19	21	10	12	18	11	22
Bugoma FR	19	21			12	15	25
Kagombe FR	19	21			12	19	29
Kitechura FR	19	21		18		20	37
Ibambaro FR	19						34
Matiri FR	12	21		12		20	23
Itwara FR	19	21		12		15	25
Lendu plateau		14			16		20
Semliki WR	19	21	11	18			28
Semliki NP	12	13	11	12	9	15	15
Rwenzori Mountains NP	3	7	2	7	5	5	5
Kibale NP	8	16	8	8	10	13	11
Kasyoha-Kitomi FR	11	17		9		6	12
Kalinzu-Maramagambo FR	12	15		10	16	8	17
Kyambura WR	19	21		18			36
Queen Elizabeth NP	19	21	11	12		12	20
Bwindi Impenetrable NP	2	6	6	6	1	4	4
Mafuga FR	10	12	9		5	15	10
Echuya FR	7	10		10	5	9	8
Virunga NP	1	3	1	1	2	1	1
West of Lake Edward	19	5			12		15
Nyungwe NP	5	4	3	4	2	3	2
Kahuzi Biega NP	4	2	4	5	4	2	2
Idjwi island		17					27
Kibira NP	6	7					6
Bururi FR	12	11					14
Lac Ruzizi NP		20					38
Itombwe Massif	9	1	7	2	18		7
Gombe Stream NP	12	21			12	14	19
Mahale Mountains NP	12	17			8	7	13
Mt Kabobo		9					9
Mbizi FR	12	21			11	10	18
Marungu Massif		21		12			24
Sumbu NP	19				18		31
Mweru-Wantipa NP	19				18		31

Prioritising by total species richness ensures that all the generalist species and those that are migrant are included whereas a focus on the endemic species helps exclude the species of lower conservation concern. However many endemic species are locally abundant and are not of great conservation concern either.

10.3.3 IUCN threatened species

When it comes to focusing on scarce conservation resources it may be better to prioritise by IUCN threatened species (critical, endangered and vulnerable). Table 10.3 uses the number of threatened species to rank the sites.

Table 10.3 The rankings of IUCN threatened species (CR, EN, VU) for the five taxa for which data are available for the Albertine Rift and which have been relatively intensively sampled. The rank scores of the mean ranking across all taxa are given.

Site	Mammals	Birds	Reptiles	Amphib.	Plants	Mean rank
Murchison Falls NP	12	6	1	14	13	13
Bugungu WR	25					37
Karuma WR	15			14		25
Budongo FR	12	21	2	10	1	13
Bugoma FR	15	21			5	21
Kagombe FR	19	27			13	30
Kitechura FR	25	27		14	21	34
Ibambaro FR	31					38
Matiri FR	31	27		14	17	35
Itwara FR	31	27		14	9	31
Lendu plateau		12				16
Semliki WR	15	14	1	14		15
Semliki NP	12	5	2	14	4	8
Rwenzori Mountains NP	3	12	2	10	13	9
Kibale NP	5	14	2	7	5	7
Kasyoha-Kitomi FR	19	21		8	3	17
Kalinzu-Maramagambo FR	19	21		8	5	18
Kyambura WR	19	10		14		24
Queen Elizabeth NP	9	6	2	10	13	9
Bwindi Impenetrable NP	5	10	2	4	1	4
Mafuga FR	25	27	2		17	26
Echuya FR	25	19		10	19	27
Virunga NP	2	2	2	2	8	2
West of Lake Edward	25	2				20
Nyungwe NP	19	6	2	5	12	11
Kahuzi Biega NP	1	2	2	6	10	3
Idjwi island		21				33
Kibira NP	5	6				6
Bururi FR	25	14				29
Lac Ruzizi NP		14				22
Itombwe Massif	3	1	2	1		1
Gombe Stream NP	15	19			21	28
Mahale Mountains NP	9	21			10	19
Mt Kabobo		14				22
Mbizi FR	24	27			19	36
Marungu Massif		27		14		32
Sumbu NP	9					12
Mweru-Wantipa NP	5					5

Ranking by the number of threatened species will focus on those species of greatest conservation concern but to rank sites within the Albertine Rift it is probably preferable to focus on both the endemic and threatened species and hence capture both groups.

10.3.4 IUCN threatened species and endemic species

A final prioritisation was made combining the number of threatened species with the endemic species. The complementarity analyses in the previous chapters focussed on selecting sites for their endemic or threatened species although they included all

IUCN-listed species. Here I focus on the threatened species only and the endemic species (Table 10.4).

Table 10.4 The rankings of endemic and IUCN threatened species (CR, EN, VU) for the five taxa for which data are available for the Albertine Rift. The rank scores of the mean ranking across all taxa are given. Rankings as in table 10.1.

Site	Mammals	Birds	Reptiles	Amphib.	Plants	Mean rank
Murchison Falls NP	16	22	9	17	20	22
Bugungu WR	30					37
Karuma WR	20			17		25
Budongo FR	12	22	9	14	8	14
Bugoma FR	20	22			15	26
Kagombe FR	25	30			19	35
Kitechura FR	27	30		24	22	36
Ibambaro FR						
Matiri FR	20	27		17	21	29
Itwara FR	30	30		17	16	34
Lendu plateau		14				15
Semliki WR	19	27	9	17		24
Semliki NP	10	13	9	14	14	12
Rwenzori Mountains NP	4	7	4	8	5	6
Kibale NP	7	16	7	6	12	9
Kasyoha-Kitomi FR	9	22		10	6	11
Kalinzu-Maramagambo FR	14	16		12	9	13
Kyambura WR	25	16		24		30
Queen Elizabeth NP	12	15	13	17	13	15
Bwindi Impenetrable NP	2	6	5	5	4	5
Mafuga FR	20	12	8		18	19
Echuya FR	10	10		12	10	10
Virunga NP	1	3	1	1	1	1
West of Lake Edward	30	4				23
Nyungwe NP	5	4	2	2	3	3
Kahuzi Biega NP	2	2	2	4	2	2
Idjwi island		20				28
Kibira NP	6	7				7
Bururi FR	27	11				26
Lac Ruzizi NP		22				32
Itombwe Massif	7	1	6	2		4
Gombe Stream NP	20	30			17	33
Mahale Mountains NP	16	20			7	18
Mt Kabobo		9				8
Mbizi FR	27	27			11	30
Marungu Massif		16		14		20
Sumbu NP	16					21
Mweru-Wantipa NP	14					15

This ranking is probably the most useful for conservation purposes because it combines both the threatened status of species with some of the specialisations and habitat selectivity that are exhibited by the endemic species.

10.4 TESTING SURROGACY

It is possible with these data to test how well one taxa predicts species richness or endemism in another taxa and therefore how well these taxa might be acting as surrogates for total biodiversity. Pearson correlations were made between the numbers of species, numbers of endemic species, numbers of threatened species and numbers of endemic+threatened species for all sites where scores for survey effort exceeded the value of five (Tables 10.5 and 10.6).

Table 10.5 Pearson correlation coefficients and 'p-values' for comparisons between the different taxa for total species richness and total number of endemic species. ** = p<0.01; ***= p<0.001

	Endemic species				
Species richness	Mammals	Birds	Reptiles	Amphibians	Plants
Mammals		0.742 ***	0.932 ***	0.798 ***	0.816 ***
Birds	0.762 ***		0.838 ***	0.909 ***	0.856 ***
Reptiles	0.810 **	0.497 p=0.08		0.866 ***	0.856 ***
Amphibians	0.773 ***	0.402 p=0.08	0.930 ***		0.969 ***
Plants	0.730 **	0.702 **	0.696 **	0.825 **	

Table 10.6 Pearson correlation coefficients and 'p-values' for comparisons between the different taxa for number of threatened species and number of threatened and endemic species. ** = p<0.01; ***= p<0.001

	Threatened and endemic species				
Threatened species	Mammals	Birds	Reptiles	Amphibians	Plants
Mammals		0.718 ***	0.906 ***	0.779 ***	0.860 ***
Birds	0.636 ***		0.832 ***	0.812 ***	0.870 ***
Reptiles	-0.28 ns	-0.15 ns		0.919 ***	0.885 ***
Amphibians	0.651 **	0.710 ***	-0.425 ns		0.966 ***
Plants	0.332 ns	0.240 ns	-0.282 ns	0.339 ns	

In general these results show that one taxa is a pretty good predictor of another taxa whether you look at species richness or endemism. Endemic species richness and threatened and endemic species are predicted well by other taxa and all predictions across sites were significant at P<0.001. Species richness was on the whole a reasonable predictor although birds did not predict reptile and amphibian richness very well. Threatened species numbers were not well predicted by other taxa. In particular the plants and the reptiles were not predicted by the other taxa. This may

be partly due to the fact that reptiles have not been classified under IUCN red list criteria very thoroughly and this is currently under review. The same is also true for plant species and most threatened species are those with economic importance. Plants listings are also being reviewed at present.

These results will be strongly affected by the size of a site, particularly for species richness but also for endemic and threatened species (Howard *et al.* 1998). The larger a site the more species it will have and hence the likelihood is increased of it having endemic and threatened species. However, area is not the only factor determining species richness and endemism and some sites that rank highly are actually fairly small (eg. Bwindi Impenetrable National Park – 325 km^2; Semliki National Park – 225 km^2; and Echuya Forest Reserve – 34 km^2). In this study we are interested in identifying those sites that are important for conservation. We are less interested in looking at the relative biological richness of sites when controlled for area but are more interested in the total species richness, and number of endemic and threatened species. Large sites will have more of these but at the same time large sites tend to conserve species more effectively than small sites (Soulé, 1987).

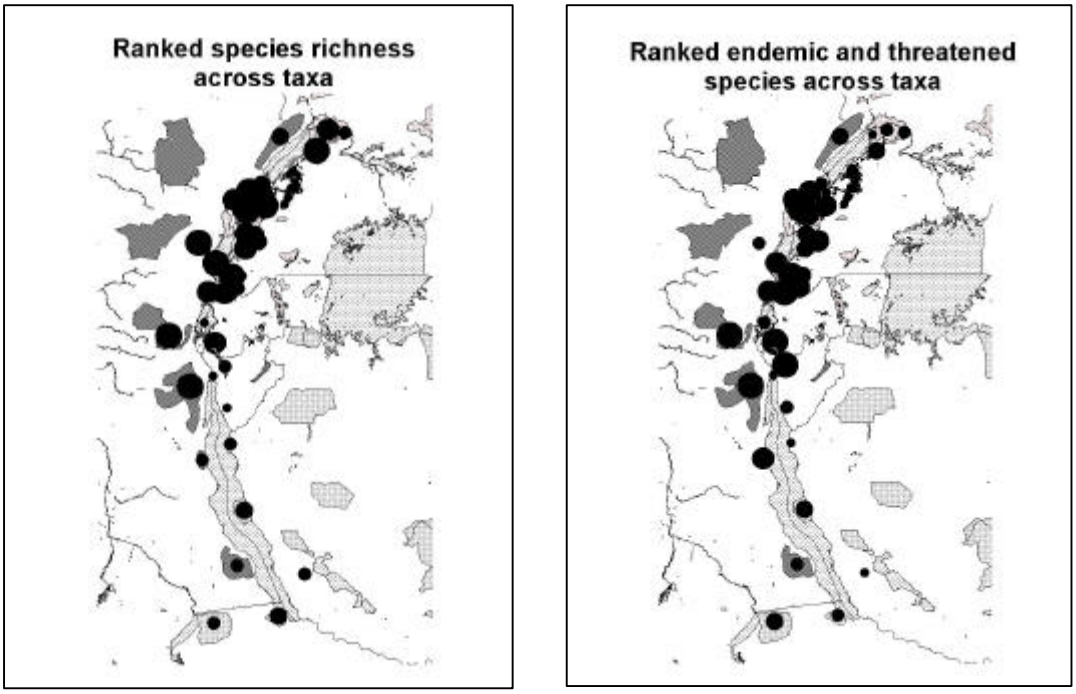

Figure 10.1 Ranked scores for sites based on a) the mean rank value for species richness and b) the mean rank value for the number of endemic and threatened species. The larger the circle the larger the number of species.

10.5 Important sites in the Albertine rift

Rather than ranking sites in sequential order it makes more sense to group sites into categories of high, medium and low rank. This is because the data for many sites are not complete, some mean ranking scores are based upon one taxon rather than a combination of several and the effort made in sampling sites still varies widely despite only selecting sites that have been reasonably well surveyed. Figure 10.1 shows the relative mean rankings across the five taxa (mammals, birds, reptiles, amphibians and plants) in five classes of rank (circles of varying radius) for species richness and endemic with threatened species. This figure gives some idea of which sites are more important. It also includes the five sub-sectors of the Virunga National Park so that these can be compared with other sites.

These two maps indicate that sites in the central portion of the Albertine Rift including the Virunga, Queen Elizabeth, Rwenzori, Bwindi Impenetrable and Semliki National Parks and the Nyungwe Forest, Kibira, Kahuzi-Biega National Parks and Itombwe Massif form two important regions within the Rift for conservation. Budongo Forest Reserve and Murchison Falls National Park rank highly for species richness. It is possible sites further down the Rift in Tanzania and south-eastern DRC would rank more highly with increased survey effort.

Comparing the rankings of species richness and the ranking of endemic and threatened species allows an analysis of relative importance for these two criteria. I grouped the sites into high (rank scores 0-12), medium (rank scores 13-24) and low (rank scores 25-38) scoring sites for both criteria and plotted the results in a two-way table (Table 10.7). The lakes were added to to this classification based on the richness and endemism of the fish fauna. It was not possible to include them in the ranking method above because the taxa being surveyed were very different and it was not possible to compare the lakes with the terrestrial habitats. However, given their high species richness and endemism they should be included in this summary.

Table 10.7 Relative rankings of sites for 'species richness' and 'endemic and threatened' species. Scores are obtained from table 10.1 (species richness) and table 10.4(endemic and threatened species). High=1-12; medium=13-24; low=25+.

	Endemic and threatened species		
Species richness	**High**	**Medium**	**Low**
High	Virunga NP Itombwe Massif Kahuzi Biega NP Semliki NP Kibale NP Bwindi Impenetrable NP Nyungwe FR Lake Tanganyika	Murchison Falls NP Budongo FR Kalinzu-Maramagambo Queen Elizabeth NP W. Lake Edward	
Medium	Rwenzori Mts NP Kasyoha-Kitomi FR Kibira NP Lakes Edward and George	Lendu plateau Semliki WR Mahale Mts NP Marungu Massif Sumbu NP Mweru-Wantipa NP	Karuma WR Kyambura WR Lake Albert
Low	Echuya FR Mt Kabobo	Bugoma FR Mafuga FR Lake Kivu	Kagombe FR Kitechura FR Matiri FR Itwara FR Idjwi Island Bururi FR Lac Ruzizi NP Gombe Stream NP Mbizi FR

Those sites that score highly in table 10.1 and table 10.4 are considered to be the most important sites because they rank highly on both species richness and number of endemic and threatened species. There are eight of these. The next important sites are those that rank highly for endemic and threatened species and medium for total species richness as species richness should receive a lower weighting than the numbers of endemic and threatened species. There are four of these. Sites that are high in endemic and threatened species but low in species richness can be grouped with those that have medium endemic
and threatened species but high species richness. There are seven of these. On the whole this classification seems to make sense intuitively and from what is known about these sites.

10.6 Landscape Conservation

10.6.1 Contiguous sites

Many of the protected areas or sites in the Albertine Rift are contiguous with other protected areas/sites or are still connected to these sites by relatively natural habitat. As such they form larger 'landscapes' whose species richness and number of endemic species will be larger than consideration of single sites. As a general rule the larger the conservation area, the better it is for the long-term conservation of its species and habitats. Many of these landscapes cross international boundaries or else connect sites that are managed by different institutions such as the forest reserves and national parks in Uganda. If these landscapes are to persist it is important that they are managed as one contiguous unit rather than independent sites because the connectivity between them could easily be lost if this is not taken into consideration.

Where do these landscapes occur? The largest and most critical of the landscapes includes the Virunga National Park in DRC, with the Parc National des Volcans in Rwanda, and Semliki, Rwenzori, Queen Elizabeth, and Kibale National Parks and Kasyoha-Kitomi and Kalinzu-Maramagambo Forest Reserves and Kyambura Wildlife Reserve (Figure 10.2). This 'Virunga landscape' covers about 12,860 km^2 and includes a wide variety of habitats and altitudes, ranging from 600-5,100 metres above sea level. It is also incredibly rich in species and endemic and threatened species (Table 10.8). There is nowhere else in Africa that can claim species numbers anything close to those found here and detailed studies of sites in the neotropics have fewer numbers than these (Gentry, 1990).

Other possible landscapes that could be managed as contiguous units include (Figure 10.3):

1. Nyungwe-Kabira forests: these two areas are contiguous across the Burundi-Rwanda border
2. Murchison Falls National park – Budongo-Bugoma-Kagombe-Itwara Forest Reserves- Semliki/Toro Wildlife Reserve: these sites link Murchison Falls to Semliki Wildlife Reserve through a corridor of forests reserves, grasslands and private forests. This landscape may be important for the gene flow in chimpanzee communities.
3. Kahuzi-Biega National Park – Tayna Community Reserve – Itombwe Massif: although not linked by protected areas there is still a fair amount of natural habitat between these sites and it may be possible to maintain linkages. It is also important to maintain the linkage between the upland and lowland sectors of Kahuzi Biega National Park.

4. Mahale Mountains – Ufipa plateau: much wild land still exists to the east of Mahale Mountains National Park and down towards Ufipa Plateau. It may be possible to protect parts of this region to enlarge the park.

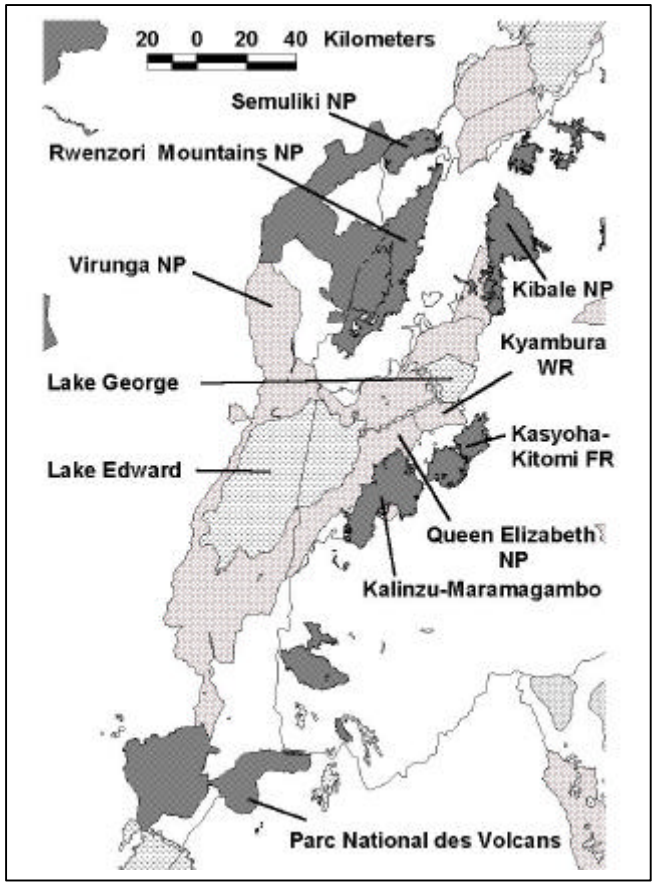

Figure 10.2 The various protected areas that form the Virunga landscape. Forested areas are shown in dark grey, savanna woodland in light grey and lakes stippled.

Table 10.8 Species richness and numbers of endemic and threatened species for the Virunga landscape.

Taxon	Species richness	Endemic species	Threatened species
Mammals	278	30	22
Birds	871	31	16
Reptiles	134	12	1
Amphibians	84	21	10
Fish	81	56	?
Plants	3,180	246	27

Other landscapes could include the catchment areas for the lakes and the need to manage the land uses to limit the pollution and sedimentation of the lakes.

10.6.2 Landscape Processes

It is important to manage these protected areas as landscapes because there are several biological, geological and evolutionary processes that occur at large scales and which need to be managed as such. Some examples of these processes include:

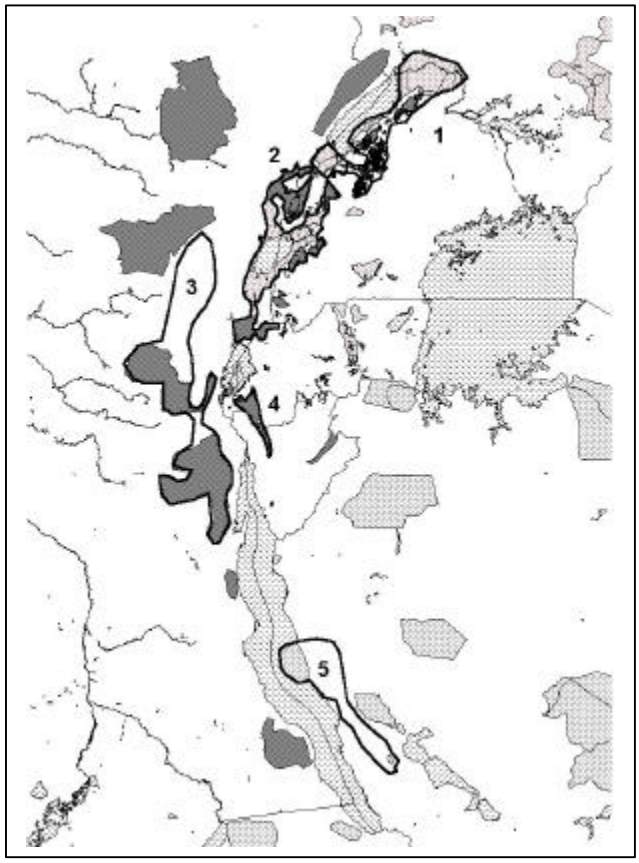

Figure 10.3 Landscape areas of the Albertine rift: 1=Murchison-Semliki corridor; 2=Virunga landscape; 3= Itombwe-Kahuzi Biega-Tayna landscape; 4=Nyungwe-Kibira landscape; 5=Mahale-Ufipa landscape.

1. *Climate change.* It is very probable that climate change is going to change habitats and species compositions of these sites within the Rift. Protecting a contiguous range of altitudes will ensure that species can migrate to sites that are still suitable as the climate changes.
2. *Evolutionary changes*. The mountains and lakes of the Rift have been important sites of evolutionary change. Ensuring a diverse, contiguous set of habitats will ensure that this process can continue.
3. *Migration of large mammals*. Certain species such as elephants and large ungulates are known to undergo migratory movements as a result of drought or variation in food availability. It is important to ensure the ability to migrate out of areas where food is scarce if these species are to survive as functional populations.
4. *Migration of birds*. The Rift is an important stopping point for migratory birds during their annual migration from Europe. Maintaining the sites where they stop and ensuring that disturbance is minimized will be necessary if these species are to survive.

5. *Natural fire regime*. Fire is an important component of the savannas and woodlands. Fire destroys the habitat and food supply, however, and there is a need for large contiguous areas of so that animals can find food in unburnt areas.
6. *Watershed function of forests*. Forests encourage rainfall and also soak it up releasing it slowly to the streams that feed local communities. Where forest has been cut from hillsides in the Rift streams have dried up (eg. Gishwati Forest in Rwanda, M. Schilling Pers. Comm..) and local people have suffered as a result. Enough forest needs to be maintained to ensure the constant supply of water to communities.
7. *Volcanic succession*. The active volcanoes in the southern Virunga National Park create a succession of highly specialized vegetation and its associated fauna, which can live on volcanic lava and degrade it over centuries to soil. Maintaining sufficient area to ensure these species survive is important, as the eruptions of the volcanoes have been regular and they are steadily destroying much of this habitat with recent lava flows.
8. *Interdependence of species*. Certain species require the presence of others to ensure their survival. For instance many woodpeckers create holes in trees that become nesting sites for other birds. Similarly many tree species require elephants or large primates to disperse their seeds and are declining at sites where these dispersers have become extinct (eg. Elephants in Budongo Forest Reserve).

Other examples can no doubt be thought of. Many of these processes will be lost if contiguous protected areas are not managed as a whole rather than as individual units. This necessarily requires close collaboration between institutions in the same country or between countries. Developing mechanisms for inter-institutional collaboration should be a priority in this region.

10.7 FUNDING CONSERVATION IN THE ALBERTINE RIFT

Given the importance of this region for global and national conservation there is a need to identify and lobby for significant funding. Given the high species richness of sites in the Albertine Rift it is possible to argue that you can protect more for less funding than elsewhere in Africa and hence get 'more bang for your buck'. However, there are constraints to funding conservation in this region:

1. The countries in the Albertine Rift are some of the poorest in the world and quite rightly governments are focussing on poverty alleviation as a priority. However, in some countries this is at the expense of conservation when these protected areas, their wildlife and natural scenery have the potential to create wealth through tourism. Civil wars in the region have severely hampered efforts to encourage tourism and consequently donors are beginning to move away from supporting it. The fact that insecurity has stifled tourism though, does not negate its economic potential in future and hence there is a need to maintain the investments that have taken place such that tourism can take off more easily. The gradual degradation of sites over time, particularly with the loss of large mammals will make it harder to attract tourists and hence it will require longer periods of recovery before tourism can earn as much as it potentially could do so with well stocked parks.

2. The boundary between DRC and Uganda, Rwanda, Burundi and Tanzania is also a boundary between two funding zones for most bilateral and multilateral donors. Yet it is the contiguity between sites that straddle this border that needs to be

maintained. Donors should review their policies about supporting conservation activities in this region so that it can include joint activities between DRC and these other countries.

3. Many of the important sites for conservation in this region have not been included under the Congo Basin Initiative, which is due to provide major support for conservation in the Congo Basin. Yet these sites are the most species rich of any in the Congo Basin. They have been omitted partly because of the civil war and the fact these sites are controlled by different groups. Yet it has been possible to channel funding to sites in DRC through the NGOs with the blessing of the government in Kinshasa as shown by the initiative of the UN Fund through UNESCO. This fund is supporting staff salaries and basic operating costs in the World Heritage Sites in DRC.

4. The high human population density puts great pressures on the protected areas in the Albertine Rift for land. There is a need to develop mechanisms that promote a positive behaviour towards conservation amongst local communities that live near the protected areas. One of the more successful methods that have been tried in the region is the Bwindi and Mgahinga Conservation Trust Fund that helps local community projects such as the construction of schools and clinics, and more recently provides loans for business enterprise development. This fund effectively is paying people not to destroy the parks while at the same time helping them develop alternative ways of making an income. This fund has received favourable reviews in many analyses and yet it has not been replicated elsewhere in the Rift. In part this is because donors seem to want to fund 'new ideas' rather than replicate successful ideas.

5. There is poor valuation of the benefits of protected areas to local communities and to the nation in each country. The value of watersheds in providing clean and disease free water and firewood, building poles and other non-timber forest products to people is rarely valued when assessing whether to alter its land use. There is increasing pressure in some countries in the Rift to encourage investment and business at the expense of natural habitats and their provision of goods to local communities.

There is a need to develop innovative ways of funding these protected areas over the long term. In some countries in the world water is taxed to business to help fund the protection of watersheds. This would be possible in the Rift as many people and businesses rely on the water that flows from the mountains, provided the taxes could be collected in a transparent manner. Another method would be an environmental tax on oil if it were found in the Rift to support a trust fund for protected areas. Given the importance of this region for conservation the global community should be made aware of it and encouraged to support conservation activities as a result.

10.8 Conclusions

The Albertine Rift has been shown in this report to be a region of incredible biodiversity. The numbers of species found here are greater than anywhere else on the African continent and rival some of the most diverse areas outside Africa. Using species to prioritise sites in the Rift has created a list of the most important sites for conservation in the Rift. However, it must be remembered that the comparisons are relative and that even sites that have ranked low for species richness and the number

of endemic and threatened species are richer than many sites in the world. We would not argue therefore that they be neglected as a result. Managing the landscapes that occur in the Rift would be a more sensible conservation strategy although it will require more resources, because it will maintain the connectivity and landscape processes that still occur in the Rift. Conservation in this region has been neglected recently because of civil conflict and there is a need to move it onto the agenda of many bilateral and multilateral donors.