Paper prepared for the workshop on Transboundary Protected Areas in the Governance Stream of the 5th World Parks Congress, Durban, South Africa, 12-13 September 2003.

Evaluating Transboundary Protected Areas: Achieving Biodiversity Targets

Belinda Reyers
Dept of Zoology, University of Stellenbosch,
Pvt Bag X1, Stellenbosch, 7602, South Africa.
breyers@sun.ac.za

1. Introduction

The idea of transboundary natural resource management (TBNRM) has recently gained much attention within political as well as scientific arenas. TBNRM is defined as "*any process of collaboration across boundaries that increases the effectiveness of attaining natural resource management or biodiversity conservation goal(s).*" (van der Linde *et al*. 2001). This study focuses mostly on formally protected areas of TBPAs which go back as far as 1925 when the Albert National Park was established by the Belgian colonial regime between the then Ruanda-Urundi and the Congo (Wilkie *et al.* 2001).

Today several examples exist of fully functional TBPAs where there are high levels of cooperation and management of protected areas across a boundary (Zbizc 2001). Many protected areas of the world exist along international borders as military buffer zones or due to inaccessibility of the area to other forms of land use. Zbicz and Green (1997) identified 415 such protected areas in 98 countries forming 136 cases where national protected areas abut on an international boundary. There are another 85 cases identified where a protected area exists on one side of a border and a proposed or non qualifying protected area lies on the other. The high number of potential TBPAs as well as their much advertised benefits has resulted in much interest and investment by governments and NGOs alike.

The supposed benefits of TBPAs are large and wide spread, but despite the fact that several TBPAs have been established for quite some time, very little work has been done assessing the environmental, economic, social or political impacts these areas are having. The few studies that have been done on the effects of TBPAs appear to illustrate that the potential benefits are not being realized. Work by Zbicz (2001), Wolmer (2003); and Fakir (2000) illustrate that the benefits of political cooperation, improvement of local livelihoods and socio-economic benefits are not necessarily a reality yet. Critique by Katerere *et al*. (2001) add to these concerns and highlights the fact that the management of natural resources across boundaries might not hold the political and economic benefits it is purported to. Most of the studies thus far have focused on the socio-economic and political benefits of TBNRM. Even less work has been done on assessing the biodiversity conservation benefits of these transboundary protected areas.

The biodiversity benefits of TBPAs are supposedly many and include larger areas for low density species, linkages within and between ecosystems for the migration of animals, better

representation of species and habitat diversity as well as rare and endangered biodiversity (Hanks 2000, Basnet 2003, Hanks 2003, Rainer *et al.* 2003). In addition Hanks (2000) argues that these protected areas will address threats facing biodiversity, particularly mammalian diversity in southern Africa, including habitat loss, civil unrest, poor management, fragmentation, a lack of national commitment and overhunting. However, almost no research has been done on whether these benefits are actually being realized in existing TBPAs. Are TBPAs contributing to the conservation of regional biodiversity or are they merely political instruments for the promotion of regional peace and economic growth? As Wolmer (2003) points out no one has yet answered whether these large transboundary parks are necessary, do animals migrate across the national boundary, and is the TBPA's biodiversity more threatened or unique than diversity found elsewhere?

Assessing these potential benefits to biodiversity is a complex task and would require data on the distribution and state of species and habitats before and after the establishment of the TBPA. In reality very little baseline information has been collected before the establishment of the TBPAs and few monitoring programs exist in established TBPAs to provide data useful for assessing the biodiversity impact of TBPAs. It would therefore be difficult to assess the benefits to biodiversity e.g. population numbers of low density species, migratory routes and dispersal of species, or even recovery of threatened species. However some of these potential benefits can be measured using broad scale species and vegetation data in an effort to test the assertion that TBPAs represent more biodiversity and more endangered biodiversity than areas elsewhere.

This study therefore aims to assess the effectiveness of TBPAs in best representing regional biodiversity. This aim reflects work that took place in the 1980s and 1990s when conservation biologists began to question whether the *ad hoc* allocation of land to conservation in the past effectively and efficiently conserved regional biodiversity (Freitag 1998, Pressey 1994, Pressey *et al.* 1993, 1994; Rodrigues *et al.* 1999). We are now extending this question from the local and national scales it was originally asked to the regional scale when we question the effectiveness of TBPAs in the representation of regional biodiversity.

In addition many of the benefits listed above are actually benefits linked to protected areas whether or not they span international boundaries. For example the role TBPAs can play in alleviating threats like habitat loss and over-hunting is actually the role all protected areas can play and not limited to protected areas that straddle borders. The study therefore also aims to assess the contribution that TBPAs make towards conserving regional biodiversity and to determine if this contribution is actually a benefit of going across borders.

2. Methods

2.1 Study area and data

The assessment is based on a study of TBPAs in southern Africa. This region has a well known history of TBPA implementation. With the establishment of the Kgalagadi Transfrontier Conservation Area between South Africa and Botswana in 1999 the notion of TBPAs, or more commonly Peace Parks, increased in popularity, government support and donor funding. Since then there have been several proposals for the establishment of more TBPAs, some of which are well advanced in their development. Existing and proposed TBPAs between South Africa and the neighboring countries of Namibia, Botswana, Zimbabwe and Lesotho were studied

(Figure 1). These TBPAs include the |Ai-|Ais/Richtersveld between South Africa and Namibia, the existing Kgalagadi between South Africa and Botswana, the Limpopo/Shashe between South Africa, Botswana and Zimbabwe, the Great Limpopo between South Africa, Zimbabwe and Mozambique and the Maloti-Drakensberg between South Africa and Lesotho. The assessment excluded the portion of the Greater Limpopo TBPA within Mozambique due to a lack of spatial data for that country.

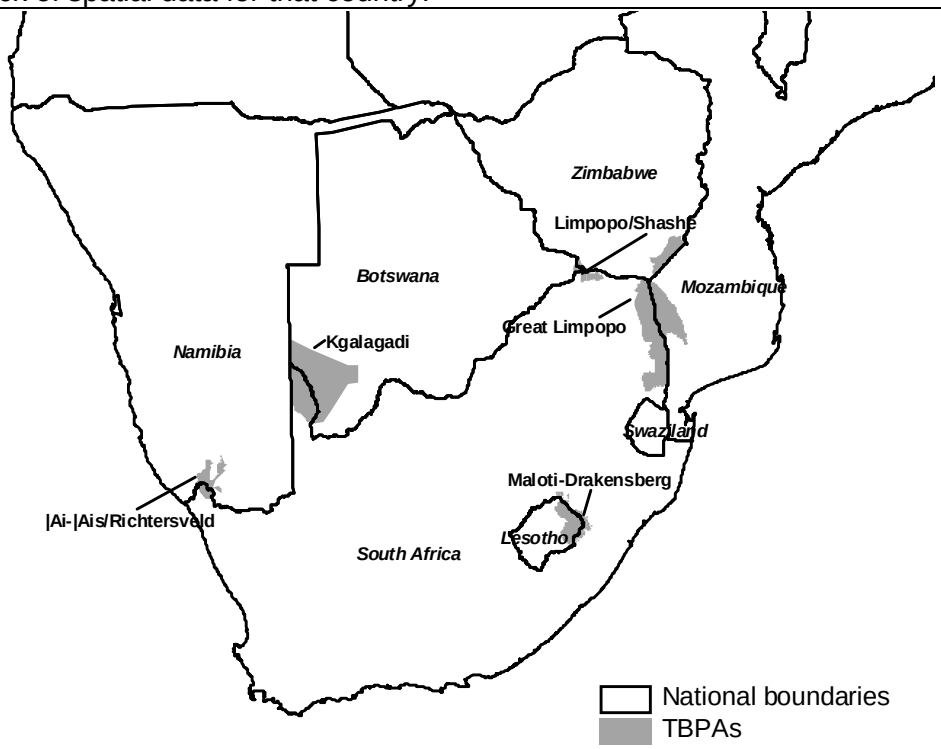

Figure 1: Study area of southern Africa illustrating potential and existing TBPAs, names of which are in italics.

Biodiversity data employed included Whites (1983) vegetation map of Africa (Figure 2a). These are broad scale vegetation units which aggregate into vegetation zones. Information on avian distribution was collated from the South African Bird Atlas Project (Figure 2b) (Harrison 1992, Harrison *et al.* 1997). This atlas recorded the presence/absence of 852 avian species in the Southern African sub-region (South Africa, Lesotho, Swaziland, Namibia, Botswana, Zimbabwe) from 1980 – 1992. These data were collected at the quarter degree grid square except in Botswana where the data were collated at the half degree grid square.

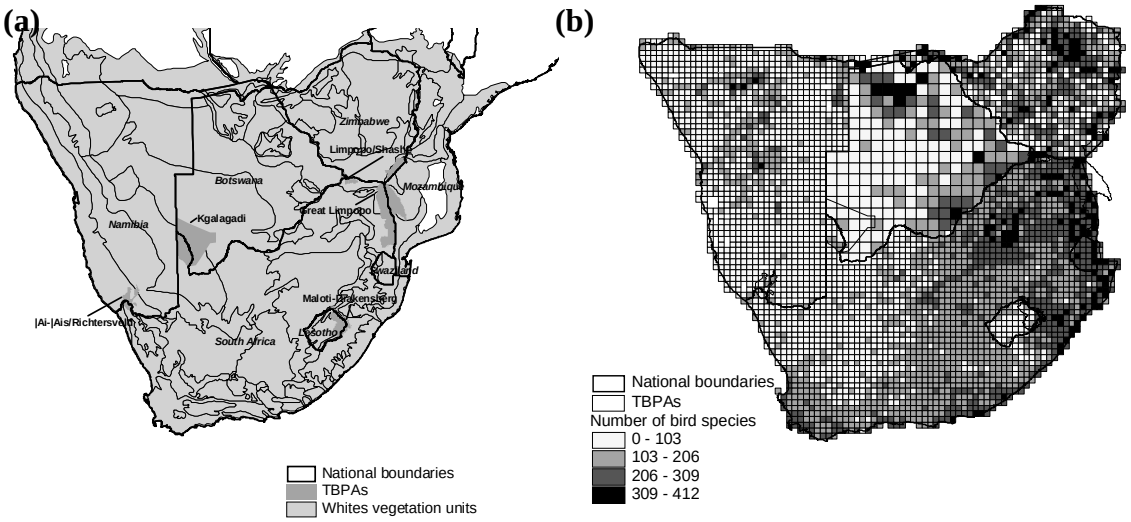

Figure 2: Biodiversity data used in the assessment of TBPAs. Figure 2a illustrates the vegetation units as defined by White (1983), Figure 2b illustrates the species richness per quarter (or in the case of Botswana, half) degree grid cell.

The boundaries of the TBPA's were extracted from WCMC global database on protected areas (http://sea.unep-wcmc.org/wdbpa) and were refined according to the Peace Park's database on TBPA's (www.peaceparks.org).

2.2 Geographic Information Systems Analysis

All analyses were performed in a Geographic Information System (GIS) using the software ArcView 3.3 (ESRI, 1998). Analyses were performed in an Albers Equal Area projection based on the WGS 84 datum. The borders of the study area of South Africa, Namibia, Botswana, Zimbabwe and Lesotho were overlaid in a GIS operation on the vegetation map in order to calculate the number of vegetation types and their respective areas in the study region. Similarly the number of species falling in the 3966 grid cells in the study area was totaled in order to determine the number of species in the region

The boundaries of the TBPAs were overlaid on the vegetation types in order to calculate the number and percentage area of the region's vegetation types represented in TBPAs. For the species assessment, birds in grid squares which overlapped more than 50% with the TPBAs were assumed to fall within the TBPAs and therefore be protected within the TBPA. The analyses aimed to calculate the number and area of vegetation types, as well as the number of bird species found within each TBPA as a percentage of the regions' total.

In addition to the assessment of the role played by these Southern African TBPAs in the protection of regional biodiversity, this study also aimed to test whether these benefits were really a benefit of going across borders. This analysis was done from a South African perspective, in other words an assessment was made of the proportion of the species and vegetation protected in the South African portion of the TBPA. Following this assessment, an evaluation was done on the new species and vegetation captured in the portions of the TBPA falling outside of South Africa. This illustrated the increase in species and vegetation represented when the protected areas extended across the South African border. This enabled

us to assess whether the land, resource and infrastructure costs of extending protected areas across national boundaries results in real biodiversity benefits measured as an increase in species and habitats protected.

2.3 Results and Discussion

The study area contains 86 vegetation units as defined by White (1983) and 851 bird species as collated by the Southern African Bird Atlas Project. Sixteen (19%) of the 86 vegetation types within the Southern African region were found to fall within the TBPAs assessed. The TBPAs were found to protect on average 17% of the area of these 16 vegetation types with values ranging from 0.1 to 78% of the total extent of the vegetation type. These results illustrate the bias in representation by the TBPAs which only protect the vegetation types found along the national boundaries of the countries while excluding the vegetation of the interior. Although the TBPAs appear to represent these 16 vegetation types well above the 10% IUCN recommended protection level, there is still a skew in representation with some of the 16 vegetation types under-protected while others are overrepresented.

The bird assessment found that the TBPAs represent 636 (74%) of the 851 birds in the study region. This appears to be a promising result and supports the role of TBPAs in protecting biodiversity. Very little is known about the remaining 26% of the birds not captured by these TBPAs. As if often the case these might well be the endangered and endemic species most in need of protection but often not captured by protected areas (Dobson *et al.* 1997). More work needs to be done on assessing which birds are excluded by TBPAs.

The next step of the assessment aimed to evaluate what proportion of the vegetation and birds captured by the TBPAs were gained as a result of going across borders, and what proportion would have been represented in the part of the TBPA falling in South Africa alone. Figure 3 illustrates the percentage of regional bird species represented in the South African portion of the TBPA and then shows the increase in percentage as the new birds represented in the TBPA across the border in neighbouring countries are included in the assessment. It would therefore appear that the gains in bird species are minimal, ranging from 0.3 to 16% with an average increase of 7.1%, when South African protected areas are extended into neighbouring countries. Figure 4 illustrates the numbers of new vegetation types and the increase in area of vegetation types represented when South Africa's protected areas are extended across its borders. These results show more support for the idea of extending protected areas across borders, as several new vegetation types are captured in the Kgalagadi and Great Limpopo, and the extent of the vegetation types already represented increases when the protected area crosses the national border. This increase varies between 0.3 and 1768% with an average of 203% for vegetation types found on both sides of the South African border. When one compares these gains in species and vegetation against the increase in land area of the TBPA (Figure 5) as it crosses the boundary, then the costs of land appear to outweigh the benefits to biodiversity representation. Land area increases range from 25.7 to 268.3% and average 110.7% increases.

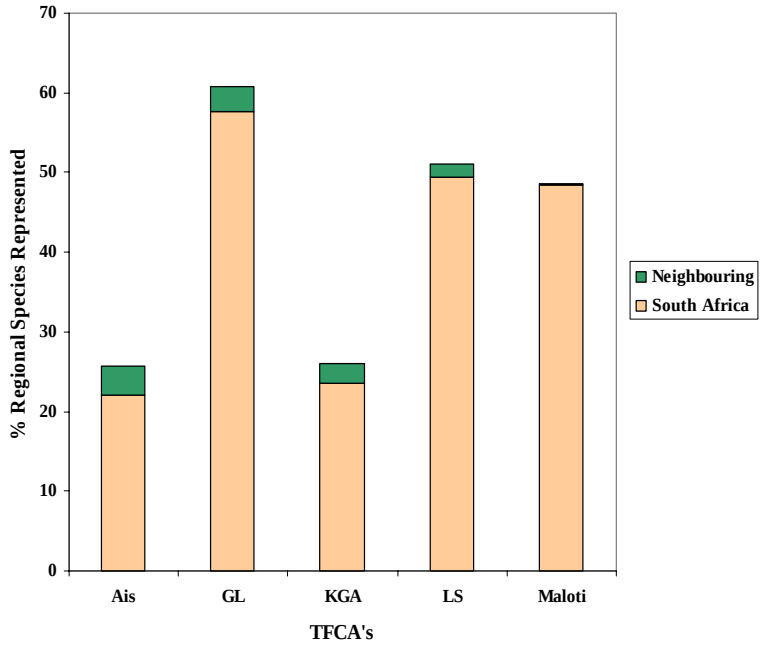

Figure 3: The proportion of southern African bird species represented in the TBPA falling within South Africa in orange and the increase in proportion of bird species as the TBPA extends across the border of South Africa into neighbouring countries in green.
Ais = |Ai-|Ais/Richtersveld, GL = Great Limpopo, KGA = Kgalagadi, LS = Limpopo/Shashe and Maloti = Maloti-Drakensberg

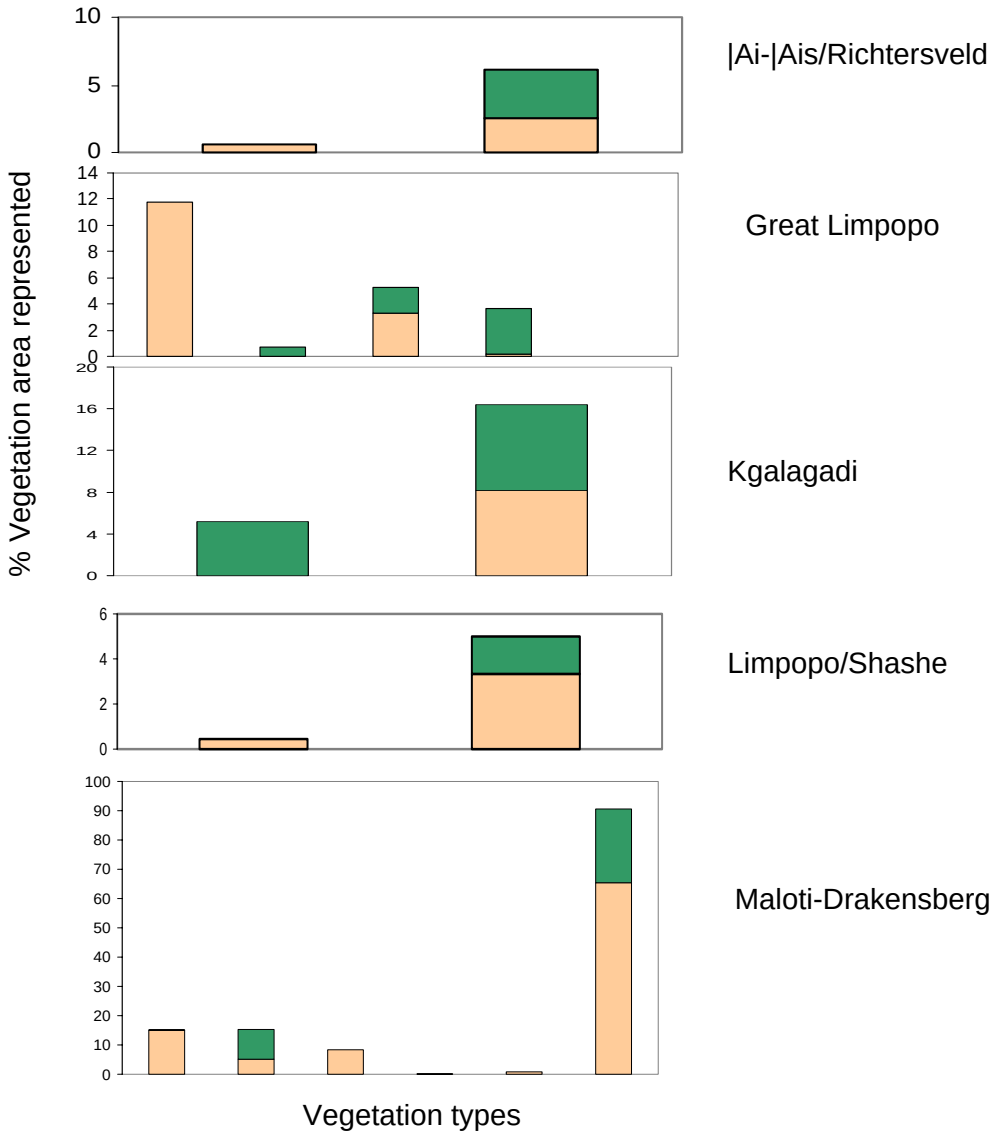

Figure 4: The proportion of southern African vegetation types represented in the TBPA falling within South Africa in orange and the increase in proportion of vegetation types as the TBPA extends across the border of South Africa into neighbouring countries in green. Vegetation only in orange implies that the vegetation does not fall outside of South Africa in the TBPA, and vegetation in green is vegetation that only occurs in the TBPA outside of South Africa.

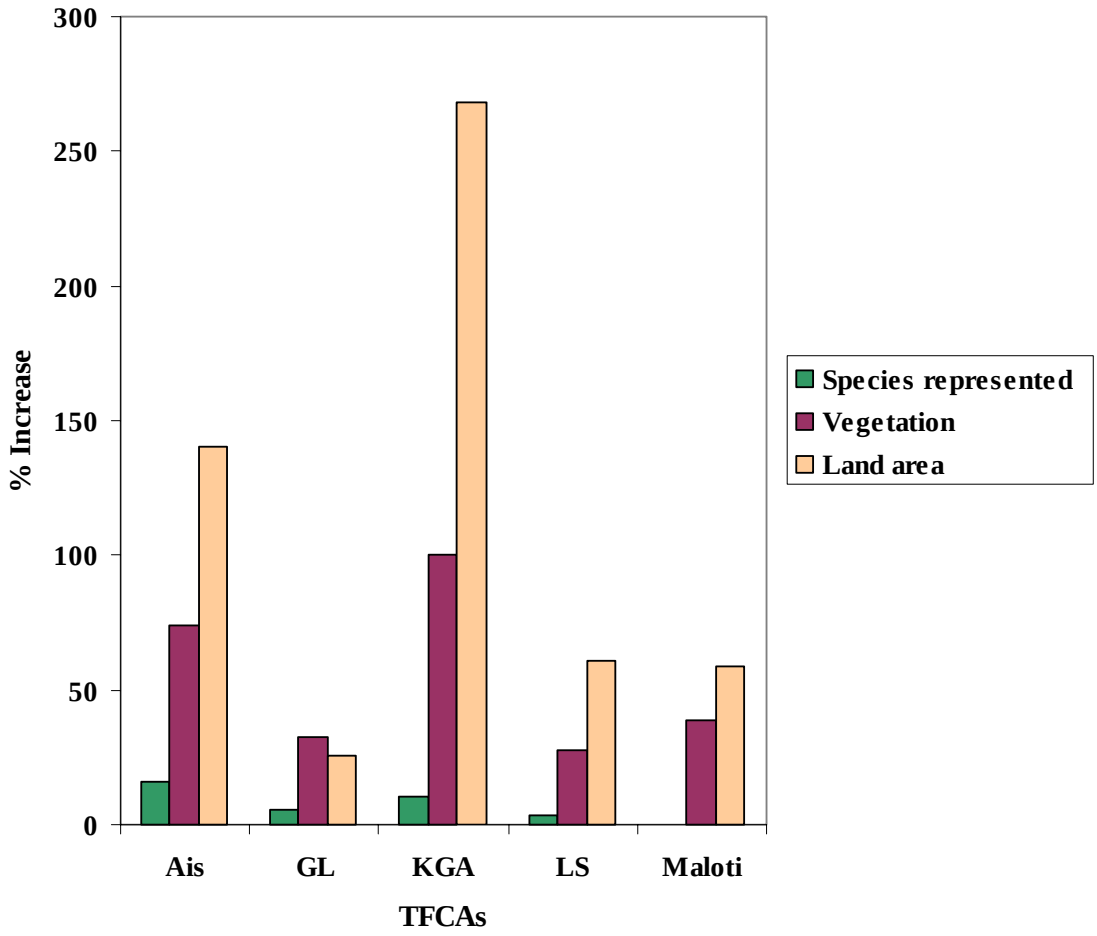

Figure 5: Increase in land area, species represented and vegetation area as the TBPA extends over the border from South Africa. This figure represents the increase in species and vegetation in the TBPA not found on the South African side. Names of TBPAs are the same as those given in Figure 3.

3. Conclusions

In summary although many bird species are captured by the TBPAs, these bird species are mostly captured within the South African portion of the TBPA as evidenced by the minimal increase in bird species representation when expanding the TBPA outside of South Africa. Although vegetation area increases are large when the TBPA extends out of South Africa, the proportion of regional vegetation types contained in the TBPAs is very small and reflects a significant bias towards vegetation types on the border. The land area requirements of TBPAs are significant and extending the TBPA across the border causes large increases in land area under protection.

Although these analyses are very preliminary and require more work to be able to report on the biodiversity contribution of TBPAs, they do provide a first step towards assessing the biodiversity conservation role of TBPAs. The biodiversity data available cannot be used to

assess the total role of TBPAs in conservation such as the provision of larger habitats for low density species and the availability of migration corridors. However the data on species and vegetation distribution do raise questions about the role of TBPAs in protecting a greater sample of biodiversity and point out that the gains in terms of species and vegetation are not great.
Using land area as an indication of costs is also not adequate, as this land area in southern Africa is usually already set aside for conservation and little costs exist in obtaining the land. However, land area can act as a useful proxy for other costs such as infrastructure and staffing which may not already exist on the ground. There are costs associated with the establishment of TBPAs, and although land acquisition may not be one of these costs in South Africa, it does highlight the huge demands that TBPAs will place on conservation agencies.

A simple cost benefit assessment of the data in this study does seem to question the small benefits obtained at large costs. However, TBPAs are often not established with conservation as their primary objective and thus maybe their minimal conservation benefits are not problematic. However there is one potential problem that could arise if this current path of TBPA establishment is followed without the necessary planning. This problem is that TBPAs could actually undermine the objectives of regional biodiversity conservation and could in effect amount to *ad hoc* land allocation. This was a problem highlighted in the 1980s conservation biology literature as conservation biologists became aware that nations were allocating land to conservation based on political, social and economic priorities. This allocation resulted in very biased protected area networks in most countries of the world. Thus although the countries were protecting large areas of land up to the 10% IUCN recommendation of protected area coverage, they were not capturing their national biodiversity resources within this network.

This problem of the historic inefficient allocation of land to conservation is now being corrected through a variety of conservation planning techniques and frameworks allowing conservation biologists and planners to identify the gaps in existing protected area networks and fill them with new protected areas. It would now seem that the agenda driving TBPAs might be mimicking this historic allocation of land to conservation, as political and economic agendas drive TBPAs and conservation is most often a secondary side effect. However as nations continue to allocate land and resources to TBPA establishment driven by primary criteria other than biodiversity considerations there will continue to be a limited increase in biodiversity representation and thus reduced conservation land use efficiency.

The one danger is that as nations add land to their conservation networks they near the 10% target set by the IUCN and can then potentially stop expanding conservation areas. However, if this 10% land area was chosen based on political and economic and not biodiversity criteria, then the resultant land will not contain a representative sample of the region's biodiversity and thus not adequately conserve the country's biodiversity.

There are many techniques and tools available to incorporate biodiversity data into planning for conservation and other forms of land use. Unless these techniques are included in the development of TBPAs we might find ourselves with large swathes of land under conservation while many species and habitats fall outside in the human dominated matrix without any form of protection against the pressures that threatened their persistence.

References

Basnet, K. 2003. Transboundary Biodiversity Conservation Initiative: an Example from Nepal. *Journal of Sustainable Forestry* 17: 199-220

Dobson, A. P., Rodriguez, J.P., Roberts, W.M. & Wilcove, D.S. 1997. Geographic distribution of endangered species in the United States. *Science* 275:550-553.

ESRI. (1998). *Arc and Grid Command References*. Environmental Systems Research Institute, Redlands, California.

Fakir, S. 2000. *Transfrontier Conservation areas: a new dawn for eco-tourism, or a new form of conservation expansionism*. Policy think tank series ; No 2. IUCN, Pretoria, South Africa.

Freitag, S., Nicholls, A.O. & van Jaarsveld, A.S. 1998. Dealing with established reserve networks and incomplete distribution data sets in conservation planning. *South African Journal of Science* 94:79-86.

Hanks, J. 2000. The role of Transfrontier Conservation Areas in southern Africa in the conservation of mammalian biodiversity. In *Priorities for the Conservation of Mammalian Diversity: has the Panda had its day.* Eds (Entwhistle, A. and Dunstone, N). pp 239-256. Cambridge University Press, United Kingdom.

Hanks, J. 2003. Transfrontier Conservation Areas (TFCAs) in Southern Africa: their Role in Conserving Biodiversity, Socioeconomic Development and Promoting a Culture of Peace. *Journal of Sustainable Forestry* 17: 121-142

Harrison, J.A. (1992). The South African Bird Atlas Project: Five years of growth. *South African Journal of Science* 88, 410-413.

Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (1997). *The Atlas of Southern African Birds*, Vols. 1 & 2. BirdLife South Africa, Johannesburg.

Katerere, Y., Hill, R. and Moyo, S. 2000. A critque of Transboundary Natural Resource Management in Southern Africa. The IUCN ROSA Series on Trasnboundary Natural Resources Management - Paper 1.

Pressey, R. L. 1994. Ad hoc reservations: forward or backward steps in developing representative reserve systems. *Conservation Biology* 8:662-668.

Pressey, R. L., Humphries, C.J., Margules, C.R, Vane-Wright, R.I. & Williams, P.H. 1993. Beyond opportunism: key principles for systematic reserve selection. *Trends in Ecology and Evolution* 8:124-128.

Pressey, R. L. Tully, S.L. 1994. The cost of ad hoc reservation: a case study in western New South Wales. *Australian Journal of Ecology* 19:375-384.

Rainer, H., Asuma, S., Gray, M. & Kalpers, J. 2003. Regional Conservation in the Virunga-Bwindi Region: The Impact of Transfrontier Collaboration through the experiences of the International Gorilla Conservation Programme. *Journal of Sustainable Forestry* 17: 183-198

Rodrigues, A. S. L., Tratt, R., Wheeler, B.D. & Gaston, K.J. 1999. The performance of existing networks of conservation areas in representing biodiversity. *Proceedings of the Royal Society London, B* 266:1453-1460.

van der Linde, H., Oglethorpe, J., Sandwith, T., Snelson, D. and Tessema Y. 2001. *Beyond Boundaries: transboundary Natural Resource Management in Sub-Saharan Africa.* Biodiversity Support Program, Washington, D.C., U.S.A.

White, F. 1983. *The Vegetation of Africa*, UNESCO, LaChaux-de-fonds, Switzerland

Wilkie, D.S., Hakizumwami, N. Gami, and Difara, B. 2001. *Beyond boundaries*: *regional Overview of Transboundary Natural Resource Management in Central Africa*. Biodiversity Support Program, Washington, D.C., U.S.A.

Wolmer, W. 2003. Transboundary conservation: the politics of ecological integrity in the Great Limpopo Transfrontier Park. *Journal of Southern African Studies.* 29: 261-278.

Zbicz, D. C. 2001. Crossing international boundaries in park management—a survey of transboundary cooperation. *Proceedings of the 11th Conference on Research and Resource Management in Parks and on Public Lands,* Ed. D. Harmon Michigan: The George Wright Society

Zbicz, D. C. and. Green, M. J. B. 1997. Status of the world's transfrontier protected areas. *Parks* 7:3, 5-10.