WHERE ARE WE GOING? FINE SCALE SYSTEMATIC CONSERVATION PLANS AND THEIR CONTRIBUTION TO ENVIRONMENTAL ASSESSMENT

Ralston, Samatha
Cape Nature Scientific Services: Land Use Advisory Unit
Private Bag X5014
Stellenbosch 7599
Tel: 021 866 8017
Email: landuse@capenature.co.za

Villiers, Charl de
Charl de Villiers Environmental Consulting cc
Email: skua@mweb.co.za

Manuel, Jeff
South African National Biodiversity Institute
Email: manuelj@sanbi.org

Pence, Genevieve
Conservation Planning Consultant
Email:genpence@gmail.com

te Roller, Kerry
Co-ordinator: CapeNature Fine-scale Biodiversity Planning Project
Email: teroller@sanbi.org

ABSTRACT

Until recently systematic conservation planning has added limited value to environmental assessment. Early conservation plans were broad-scale and intended to inform proactive conservation action rather than land-use planning and regulation. However, significant progress has been made with mapping techniques. Fine-scale conservation plans, applicable at a cadastral level, now offer coverage for much of the Western Cape. These 'Critical Biodiversity Area (CBA) maps' represent the biodiversity sector's primary spatial informant for forward planning and land-use regulation in the province.

This paper draws on recent experience in the Western Cape to demonstrate the benefits and challenges of CBA maps for environmental assessment and decision-making. The maps serve as an accurate, early indication of potential biodiversity-related issues at the level of individual properties, as well as more strategically. They also support the contextualisation and assessment of potential impacts on ecosystem-scale processes, and decisions about spatial adaptation to the effects of climate change. The CBA mapping method can also be used to quantify cumulative impacts on biodiversity. CBA maps hold great relevance for Spatial Development Frameworks, Environmental Management Frameworks, LandCare area-wide planning and for guiding integrated environmental authorisations.

As the biodiversity sector's primary informant, these products can assist in reducing uncertainty about the biodiversity implications of proposed projects and land-use decisions. They also offer an unprecedented degree of predictability and consistency that will facilitate more efficient and defensible decision-making around biodiversity and its implications for sustainable development.

Key words: Fine-scale biodiversity planning, Critical Biodiversity Areas, environmental assessment, biodiversity mainstreaming

---

INTRODUCTION

Prediction of off-site and cumulative impacts has been long-recognised as an Achilles heel of environmental assessment (EA), and particularly so with respect to biodiversity. The biggest single issue that affects the effectiveness of environmental impact assessment (EIA) negatively in South Africa is that it is mostly executed at the level of projects, without taking sufficient account of the broader context within which the application occurs (Mosakong Management 2008). This observation applies in equal measure the treatment of biodiversity in EIA as evidenced in the following observation by the Department of Environmental Affairs and Tourism (DEAT 2009):

> "A major shortcoming (in EIA)... is that biodiversity considerations are usually inadequately reflected in the EIA process, especially with respect to how the local site specific issues impact on the broader/regional biodiversity context."

The problems arise from EIA's reactive, site-specific focus, its lack of reference to a broader, strategic planning perspective, and ensuing failure to contextualise potential impacts in terms of their cumulative effects on biodiversity, ecological goods and services and the functional integrity of affected ecosystems (Krattiger et al., 1994; Le Maitre et al., 1997; Thérivel et al.; 2004; Brownlie et al., 2005; Treweek et al., 2005; Brownlie et al., 2006a). In practice, this means that substantial resources are invested in mitigation and attempts at controlling impacts at the end of planning, rather than addressing them timeously and further 'upstream' at a regional or sectoral level (Brownlie et al., 2005).

Besides failure to assess cumulative, "big picture" impacts on threatened ecosystems (DEAT, 2006), it is at the level of individual projects, in the context of decisions around the planning and implementation of EA procedures, where many of the origins of inadequate biodiversity reporting and assessment are to be found (Treweek, 1996; De Villiers et al., 2004; Brownlie et al., 2006b). Problems of practice with respect to biodiversity reporting in EA include:

- A narrow focus on impacts on local biodiversity pattern rather than ecological processes or their spatial surrogates;
- A failure to co-ordinate specialist investigations and encourage integrated biodiversity reporting; and
- Addressing potential biodiversity-related impacts reactively rather than proactively through positive planning (De Villiers et al., 2004).

The contextual biodiversity challenges to EA and development planning in the Western Cape cannot be under-estimated. The borders of the province closely coincide with the Cape Floristic Region (CFR), a global biodiversity hotspot (Mittermeier et al. 2005) owing to threats to its unique biodiversity, as well as the Fynbos Biome – which accounts for 66% of the country's Critically Endangered ecosystems (Driver et al., 2005). Because nature reserves and national parks are generally located in topographically rugged terrain or other areas that are otherwise unsuitable for agriculture and other intensive land uses, the biodiversity of the developed lowlands and coast is severely under-represented by statutory protected areas. It is largely due to this bias that about 42% of the landscape outside protected areas needs some form of conservation management to meet biodiversity targets for the CFR (Cowling et al. 2003).

For conservation agencies, this has meant a major shift in focus towards conserving highly irreplaceable habitat and ecosystems in lowland settings that are largely in private ownership. Land-use planning and EA are now also confronted with the challenge of how to balance conservation imperatives with those of socio-economic development amid ever-decreasing opportunities for achieving this reconciliation. The National Biodiversity Framework (DEAT, 2007) defines the test for planners and EA practitioners as needing to determine "*where* and *how* development takes place", and not pursuing choices in which the one is eclipsed by the other.

Systematic Biodiversity Planning, and particularly its refinement as 1:10 000, fine-scale maps of 'Critical Biodiversity Areas' and other important biodiversity features, can dramatically assist EA with fulfilling its central, if neglected, role as a safeguard to a globally threatened biodiversity (IAIA, 2005; Slootweg et al., 2006).

These fine-scale maps, known as Critical Biodiversity Areas (CBA) Maps are intended to be the biodiversity sector's primary spatial informant to be used in both proactive and reactive land-use planning and -management processes. This paper draws on recent experience in the Western Cape in order to highlight the benefits and challenges of using fine-scale Critical Biodiversity Area maps to inform Environmental Assessment processes.

SYSTEMATIC BIODIVERSITY PLANNING

What is Systematic Biodiversity Planning?

Given that the current location and area set aside in formal conservation areas in the Western Cape is not sufficient to ensure that a representative sample of biodiversity pattern and process is protected and able to persist, it important that conservation efforts outside of protected areas are strategically located and prioritised. Biodiversity conservation is just one of many competing land uses and there are limited resources available for conservation initiatives. Resources need to be used as efficiently and effectively as possible and that where possible, conflict with competing land uses should be avoided or reduced.

Systematic Biodiversity Planning is a structured, step-wise method of identifying conservation priorities. It helps direct and focus conservation action by spatially identifying the most efficient conservation network required to meet prescribed conservation thresholds (also referred to as targets). It is based on the following principles:

1. *Representivity* - a Biodiversity Plan should identify the areas needed to conserve a representative sample of all biodiversity pattern (for example species, communities, ecosystems, etc.);
2. *Persistence* - a Biodiversity Plan should identify areas needed to maintain ecological and evolutionary processes (these allow biodiversity to persist in the long term);
3. *Biodiversity thresholds* - Biodiversity Plans are threshold-driven, thresholds indicate that point at which an ecosystem pattern or process begins to break-down. The threshold represents the minimum amount of feature which should be earmarked for conservation though the systematic Biodiversity Plan. Thresholds can be set for any biodiversity feature including biodiversity pattern or ecological processes.
4. *Efficiency and conflict avoidance* - a systematic Biodiversity Plan should be designed to identify priority areas in a spatially efficient manner (i.e. identify the smallest possible area where conservation thresholds can be met), where possible conflict with other land uses should be avoided or minimised (DEAT 2007).

Margules and Pressey (2000) describe Systematic Biodiversity Planning as a process with six stages, starting with measuring and mapping biodiversity and ending with implementing conservation on the ground and managing and monitoring reserves (see box 1).

<u>Box 1: The Six Stages in Systematic Biodiversity Planning</u>
(adapted from Margules and Pressey, 2000)

Stage 1: Gather biodiversity information for the region; if necessary measure and map biodiversity.

Stage 2: Set conservation goals for the planning domain, including quantitative targets for biodiversity features and design objectives.

Stage 3: Review existing conservation areas; to what extent to these contribute towards meeting the targets?

Stage 4: Select new reserves or areas requiring conservation action.

Stage 5: Implement conservation actions, including identifying priority interventions.

Stage 6: Manage and monitor conservation areas.

A Brief History of Biodiversity Plans in Western Cape

Although biodiversity assessments and conservation planning has a long history in South Africa, interactions with Australian conservation planners in the 1990's led to the adoption of *systematic* conservation planning as the preferred South African approach. Lessons learned from the implementation of early plans in South Africa over the last decade has enabled subsequent biodiversity planning projects to draw on and become to more specific in their application.

In 2000, the C.A.P.E. programme produced a spatial plan which identified priority areas for conservation *action* in the Cape Floristic Region at a broad-scale (1: 250 000). This spatial plan was coupled to a programme of activities for implementation over the following 20 years to effect the conservation and sustainable use of the Cape Floristic Region.

This was followed by the conservation planning process for the Succulent Karoo biome , the SKEP programme (2003). This plan sought to identify areas with the highest concentration of biodiversity, as well as areas of greatest vulnerability and opportunities for sustainable land-use and development. Like SKEP, the systematic conservation plan for the Sub Tropical Thicket, the STEP programme (also 2003), was at a broad-scale plan (1:250 000). The STEP programme, however, had a strategic objective to support the integration of mapped biodiversity priorities into provincial and municipal planning processes (Knight et al, 2003) and recognised that enabling this required mapping outputs to move beyond only prioritising conservation action (for conservation agencies.).

The Cape Lowlands Renosterveld Conservation Plan (2003) refined the planning for Renosterveld priorities highlighted in the 2000 C.A.P.E plan and also aimed to inform provincial planning frameworks. To this end the plan was produced at a finer scale (1:50 000) and included biodiversity pattern and ecological processes that were relevant for land use planning and management. It provided specific land-use recommendations and contained a simple decision protocol to support its use in this regard.

In 2005, the Putting Biodiversity Plans to Work (PBPTW) programme used the Renosterveld plan outputs and developed it into priority maps and land-use guidelines for municipal areas. Additionally, it refined the Renosterveld outputs based on South Africa's first National Spatial Biodiversity Assessment (NSBA), undertaken in 2004.

PBPTW laid the foundations for a dialogue between the conservation agencies, conservationists, municipal officials and provincial officials on the implementation of systematic biodiversity planning in land-use planning and management. PBPTW also provided valuable lessons regarding the type of biodiversity information required to support land-use planning and decision-making, as well as recommendations to improve implementation approaches (Job & Driver, 2006).

These lessons were taken up in the CAPE Fine-Scale Biodiversity Planning (FSP) Project and the integration of biodiversity into land-use planning and decision-making projects which followed. FSP project, which started in 2005, produced maps of critical biodiversity areas (CBA maps) for 9 local municipalities in the Cape Floristic Region, using a systematic biodiversity planning process. Maps were produced at a fine-scale (1:10 000) (i.e. relevant at a cadastral level) and will be accompanied by an interpretative handbook (the Biodiversity Sector Plan). Thus the project intends to support both land-use planning and decision making, including Integrated Development Plans (IDPs), Spatial Development Frameworks (SDFs), and environmental assessments.

This evolution in planning approaches is reflected in the shift in language from systematic *conservation* plans to systematic *biodiversity* plans: whereas early conservation plans were primarily developed to guide conservation action, the latest generation of fine-scale biodiversity plans are intended to guide land-use planning and management of biodiversity, and the outputs of the planning process have changed in order to better meet this objective.

Developing Fine-Scale Systematic Biodiversity Plans in the Western Cape

The project defined Critical Biodiversity Areas as "*those areas - terrestrial … and aquatic … - which must be safeguarded in their natural state as they are critical for conserving biodiversity and maintaining ecosystem functioning"*. Critical Biodiversity Areas include areas required to meet national biodiversity thresholds, areas required to ensure the persistence species and ecosystems, (including for the delivery of ecosystem services) and/or important biodiversity features and localities of rare species (te Roller and Vromans, 2009).

In addition to the CBAs, other biodiversity priorities, termed Ecological Support Areas (ESA), were also identified and highlighted on the CBA Maps. ESAs are "support zones which must be safeguarded as they are needed to prevent degradation of CBAs and formal protected areas" (te Roller and Vromans, 2009).

Data Inputs:

Biodiversity Pattern

The first step of the process of developing the biodiversity plan was to identify and map biodiversity features (biodiversity pattern). The terrestrial component of the assessment used the existing national map of vegetation types as a coarse-scale surrogate for biodiversity pattern. The boundaries of the vegetation types were adjusted by experts to increase the accuracy of the map and where appropriate new vegetation types were described. Species, however, may not be distributed evenly throughout a vegetation type, and conservation thresholds indicate how much of the habitat must be conserved, but not where. In order to address this, known localities of rare and localized species and special features (where this information was available at an appropriate scale) were used to supplement broad pattern data (Pence, 2008).

Wetlands were manually mapped at a scale of 1:10 000 and the condition, size, location and presence of fish or amphibian species in each assessed. Based on this information, wetlands were ranked relative to others of a similar type (Pence, 2008).

Ecological Process

Areas important for sustaining biodiversity processes were also mapped and used in the design of the CBA maps. These include:

- *Coastal corridors:* which support unique habitats maintained by coast-specific processes and climatic conditions,
- *Significant wetland clusters:* that serve as potentially ecological viable stepping stones for species associated with wetlands
- *Wetland and river buffers*: required to protect these aquatic environments from pollution and degradation,
- *Priority sub-catchments:* which were identified in the river analysis as needed for meeting aquatic pattern and process targets,
- *Edaphic interfaces:* “hard” interfaces (where contrasting soils types meet) are thought to drive plant diversification, while soft interfaces (where similar types of parent material meet) support species movement,
- *Upland-lowland gradients:* which are associated with the diversification of plants, facilitate seasonal movements of fauna and may allow the adjustment of species range in response to climate change,
- *Regional corridors:* which link bioregions and follow macroclimatic gradients,
- *Fine-scale corridors* necessary to secure linkages between and within different ecosystems, vegetation types and ecological communities (Pence, 2008).

Ecosystem Status

A significant part of project devoted to attaining accurate and fine scale landcover data (at a scale of between 1:10 000 and 1:50 000). This information was necessary to calculate how much of each biodiversity feature was remaining (in a natural state) and to ensure that the final map product was relevant at a cadastral level (i.e. the level at which land use decisions are taken) (Pence 2008).

An important step in systematic Biodiversity Planning is to assess to what degree the existing protected areas contribute towards meeting conservation thresholds (Margules and Pressey, 2000). Only statutory or similarly secure protected areas were treated as contributing to meeting thresholds for biodiversity features (Pence, 2008).

Ecosystem status, how much of a vegetation (ecosystem) type is left relative to thresholds (irrespective of protection), was calculated using defined South African National Biodiversity Institute's (SANBI) thresholds (which relate to a target estimated as the area required for 75% of species in a vegetation type to be represented). The calculations, however, were based on the fine-scale vegetation and landcover maps and as a result may differ from the published National Spatial Biodiversity Assessment (Pence, 2008).

The status categories and thresholds used were:

- Critically Endangered (CR) - less than the biodiversity target remains;
- Endangered (EN) - less than the biodiversity target plus 15% original area of the vegetation type remains;
- Vulnerable (VU) - less than 60% of the original area of the vegetation type remains;
- Least Threatened (LT) - more than 60% remaining.

Importantly, the geographic focus of the FSP project was on Critically Endangered and Endangered lowland ecosystems not well represented in the current protected area network and which lacked previous fine-scale biodiversity planning attention.

Analysis

The planning units (areas of analysis and final CBA selection) were based on landform and land-use, using satellite imagery and eCognition software, and were assessed with Marxan and Conservation Land-Use Zoning (CLUZ) software. A feature of Marxan is that it incorporates costs into the analysis; this allowed the incorporation of discounts to drive the preferential selection of more natural and intact terrestrial and wetland areas as well as planning units located within priority catchments. The conservation thresholds used for biodiversity features (e.g. vegetation types, species and process areas) were based on national thresholds, guidelines, or regulations. For the aquatic component, sub-catchments were used as planning units and targets were set for features such as river types and habitat for endangered fish. Freshwater and terrestrial priorities were integrated through a set of design criteria, for example, by preferentially selecting areas for meeting terrestrial thresholds in priority sub-catchments (Pence, 2008).

In many areas, such as those containing critically endangered habitats, there are no options as to where conservation should take place as these features are already below threshold (i.e., the ecosystems have been developed for human utilization to the point where species are being lost). However, where options exist and ecological processes are likely to remain intact, design objectives were set. For example, corridors linking uplands and lowlands, traversing macroclimatic gradients, following south-facing slopes, buffering rivers or linking protected areas were identified. Many of these design objectives relate directly to the ability of biodiversity to respond to climate change, e.g. to allow species to shift to more suitable climates but maintain similar soil or other abioitc conditions (Pence, 2008).

Output

CBA maps were made available for stakeholder review and where necessary amendments were made. The following categories were identified:

- Formal protected areas
- Terrestrial CBAs - areas required to meet terrestrial biodiversity pattern and process thresholds,
- Aquatic CBAs and their buffers – rivers, wetlands and estuaries required to meet thresholds,
- Critical Ecological Support Areas and their buffers – aquatic features supporting CBAs aquatic and falling with priority sub-catchments,
- Other Ecological Support Areas and their buffers - all wetlands and rivers not identified above, but all of which are water resources protected under the National Water Act (36 of 1998) and the Conservation of Agricultural Resources Act (43 of 1983), and have listed activities associated with them in terms of EIA regulations (Pence, 2008).

Each CBA category was assigned a desired management objective, for example the objective for both terrestrial and aquatic CBAs and CBA buffers is to “maintain natural land and rehabilitate degraded portions to a natural or near-natural state and manage for no further degradation”. The desired management objective of Ecological Support Areas is to maintain ecological processes as a minimum (te Roller and Vromans 2009).

The CBA maps will be accompanied by a matrix table which indicates which type of landuse activities should be encouraged, restricted or discouraged within each of the CBA map categories. This matrix table is driven by the desired management objective of the CBA category and are aligned with the draft Western Cape Provincial Spatial Development Framework (WCPSDF): Rural and Land Use Planning and Management Guidelines (in prep.).

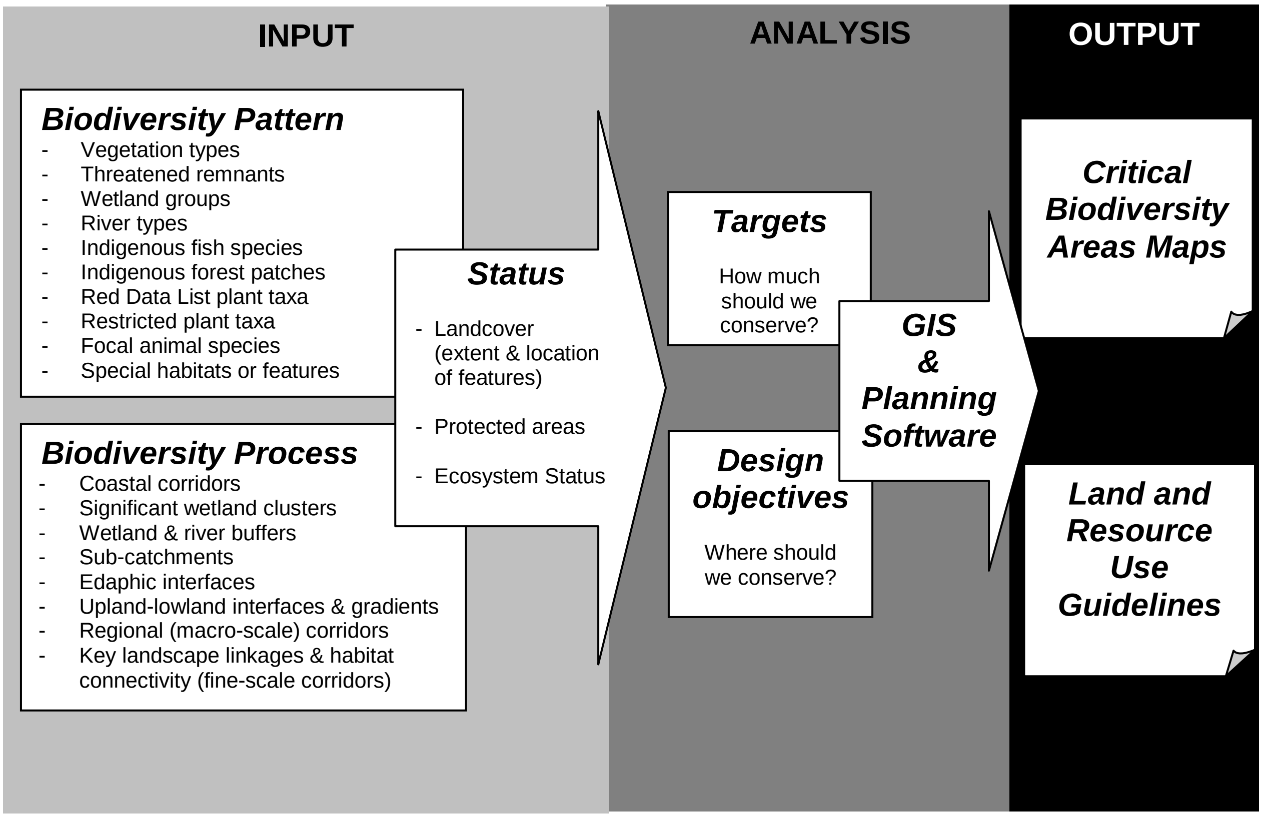

Figure 1: The process of developing the CBA Maps for the C.A.P.E Fine-Scale Biodiversity Planning Project.

SYSTEMATIC BIODIVERSITY PLANNING AND EA – AN EVOLVING RELATIONSHIP

It is common cause that systematic biodiversity planning, at least in its earlier manifestations in South Africa, was not designed to inform environmental assessments (EA), and EA was given, at best, fleeting recognition as a 'mainstreaming' device. These earlier biodiversity plans were broad-scale, intended to inform proactive conservation action rather than land-use planning and regulation. More recent systematic biodiversity plans recognise specific areas of important biodiversity on a fine scale and are intended to be used in both proactive conservation (e.g. protected area expansion, Stewardship, alien clearing) as well as decision making (EIAs, LUPO, cultivation permits, water licenses, etc).

It cannot be said that early biodiversity plans added no value to EA. An argument has increasingly been made that proactive use of even broad-scale products by government and Environmental Assessment Practitioners (EAPs) could introduce significant improvements to the quality of project planning and impact assessment while helping to stem biodiversity loss in off-reserve contexts (De Villiers, 2003; Brownlie et al., 2005; De Villiers and Hill, 2008).

In terms of this point of view, the chief benefits of Biodiversity Plans for EA included presenting a readily-accessible 'red-flagging' system, providing a strategic overview of a project's biodiversity context, and supporting ecosystem-scale assessment and evaluation of potential impacts.

The new generation plans have built on these benefits and begin to address some of recurrent issues highlighted above. They are immensely useful for site or project-specific EA in that they graphically depict, at a practical and reliable scale, the value of an area in relation to broader, strategic-level biodiversity conservation imperatives. They support the contextualisation and assessment of proposed developments in terms of potential degradation and disruption of ecosystem-scale processes and include consideration of adaptation to climate change. The plans include input on diverse biodiversity features, including botanical, faunal and aquatic, promoting integration of specialist approaches. Furthermore, they can be used to quantify cumulative impacts on biodiversity and they offer far more certainty in areas that historically have faced low levels of threat.

Fine-scale conservation plans should supplant ecosystem status (Driver et al., 2005) as the ‘trigger’ for an appropriate planning response (De Villiers et al., 2005) for individual development, i.e. by:

- Indicating the potential significance of biodiversity as a factor in decision making;
- Suggesting the degree of effort that may be needed to find a suitable alternative to avoid significant loss of biodiversity or ecosystem function in a particular area; and
- Highlighting from the outset the potential need to appoint a biodiversity specialist during project planning and design.

POTENTIAL CHALLENGES TO THE OPTIMAL USE OF SYSTEMATIC BIODIVERSITY PLANNING IN EA?

Concerns with the CBA Maps:

The implementation phase of the FSP project is still in the very early stages. Draft maps where available to commenting authorities, specialists and consultants since 2007 and much of the feedback here is based on the experience of the commenting authorities and feedback at introductory workshops. The reception and uptake of these products has been mixed, with some users eager to get hold of the maps, while others have been more sceptical about their usefulness. Some of the issues and concerns raised have been outlined in Table 1.

Issue	Response	Recommendations
Degraded areas are included as CBAs. This has led some people to question the validity of the products. In some cases the recommendations can be quite different from the predicted outcome of an assessment in the absence of the plan.	Degraded areas may be included as a CBA as a result of the following: 1. *Errors in the landcover or subsequent changes since the area was mapped.* Despite substantial effort to achieve accurate landcover, errors may have occurred. Since the landscape is changing rapidly, this information may also be out of date. It is necessary to groundtruth the products to check for such errors. 2. *Degraded areas were purposely selected as they are required to meet biodiversity pattern targets* (i.e. there is nowhere else targets can be met). A cost surface was used to in the analysis to preferentially select areas in good condition, but in some cases degraded areas could have been selected if they represented a more efficient layout, or represent the only place that targets can be met (for example in endangered or critically endangered habitats). A biodiversity specialist should assess the site in the context of the plans and pay specialist attention to the rehabilitation potential of the site. 3. *Degraded areas were deliberately selected as they are required for ecological process targets or connectivity.* This a significant contribution the products make to impact assessment as especially regional scale ecological corridors have previously not always been identified or consistently recognised by specialists, especially if a significant portion of the corridor is degraded. The EIA (biodiversity specialist) should assess any proposed development bearing in mind the need to maintain ecological processes.	Although the CBA maps represent the best available information, they do need to be ground-truthed and do not replace the need for a specialist assessment. It is important that users are taught how to interrogate the information provided in order to understand why an area was selected, as this directly influences the desirability of certain land-uses. Additional information such as landcover and reasons for selection must be referred to. It would be useful if key ecological corridors could be clearly identified. In future, consideration should be given to displaying degraded CBAs differently as this may help improve understanding and perceived credibility of the products. The plans must be regularly updated to take into account new information, such as errors or changes in the land cover. Ideally a mechanism should be put in place to capture and record this information.

	4. The planning units (areas available to selection) contain both pristine or degraded vegetation Ecognition software was used to identify planning units. A balance had to be achieved between indentifying meaningful planning units and a manageable number of units for analysis. As a result some planning units contained both pristine and degraded vegetation. A specialist should assess the site with regards to various areas within its contribution to biodiversity pattern and/or process targets.	

CBA's are identified in areas not previously recognised as priorities and this can change the predicted outcome of an assessment.	This is precisely the value that CBA maps bring to EIA processes. Previously, particularly on least threatened and vulnerable vegetation types, it was difficult to decide if a particular site was the ideal place in which conservation targets could be met. Similarly there was often uncertainly and inconsistency regarding where ecological corridors should be located. It was therefore difficult to predict the outcome of an impact assessment in such areas and more often than not these would be lost. If this approach continues, it may result a fragmented and threatened ecosystem that is difficult and expensive (land hungry) to protect. CBA maps should be used to inform an assessment of cumulative impacts. The CBA maps have identified the most efficient network of conservation areas required to meet conservation targets, including least threatened habitats and thus will introduce a level of certainly in decision-making in these areas. However, this proactive identification of conservation priorities does require a substantial mind-shift for many practitioners and specialists who have traditionally viewed the loss of least threatened areas as being of low significance.	The uptake of CBA maps does require a mind-shift from protecting what is already threatened, to also considering what may be threatened in the future. Specialists and EAPs must be educated regarding the principles of Biodiversity Planning to enable them to understand why areas are selected as conservation priorities and assess what the significance of the loss a CBA might be. Users should be encouraged to refer to the maps as early on in a process as possible in order to proactively indentify any potential red flags.
Introducing CBA's mid EIA process New products must be introduced at some time and some consultants expressed frustration with the new information being introduced at a late stage in EIA processes.	The CBA maps represent the best available information and thus should be used to inform an EIA regardless of the stage of assessment.	CBA's should be considered regardless of the stage they were introduced in an EIA. However, careful consideration must be given to the timing of information sharing and training when planning a systematic biodiversity planning project.

CBA's conflict with other intended land uses and do not take into account social and economic issues.	The CBA maps represent the biodiversity sectors' input into land use decisions; they do not claim to integrate social and economic needs. Unfortunately, most other sectors have not advanced to a stage where their priorities are identified spatially and thus these could not be incorporated into the analysis. Where possible (i.e. where there where different areas available to meet thresholds or targets), urban areas were avoided as a means to reduce potential conflicts. Through identifying the most efficient layout (smallest area) of CBA possible, potential conflicts with other landuses should also be minimised.	Other sectors, for example, mining, agriculture, tourism, should be encouraged to engage in similar spatial planning exercises to allow better integration and proactively identify and/or avoid possible conflicting land requirements.
CBA products appear to be 'cast in stone' and offer no room for negotiation.	CBA maps do represent the best and most efficient layout possible. They intentionally do not offer options as this offers no protection to ecosystems and adds no certainty with regards to decision-making. Due to the threatened nature of most habitats in the Western Cape, there is often little room to negotiate if biodiversity pattern and process targets are to be met. In some instances options or alternative layouts may exist. However, the implications of the loss of a CBA/change a CBA map should be interrogated by a conservation planner to ensure that the impacts are fully understood.	It is important that a conservation planner is available to advise decision-makers regarding the implications of loosing a CBA. CBA maps will also require regular updating to respond to any losses of CBAs.
Related products and guidelines do not use CBA terminology	Efforts have been made to align new policies with CBA terminology and recommendations; however older policies will need to be updated.	Future systematic biodiversity planning projects should include a component to promote the updating of relevant polices and guidelines.

The national level and FSP ecosystem statuses differ and this can be confusing.	There are different measures of ecosystem status including in terms of the NSBA 2004 (an update of which will soon be released) and the Biodiversity Act (Act 10 of 2004) threatened ecosystems. These do differ from the status used in the FSP. This is because the vegetation maps and landcover on which the assessment was based differ. We suggest for the purposes of assessment, the most precautionary (most threatened status) should be used. However, it should be noted that the ecosystem status should no longer be the primary informant in impact assessment, but rather an areas designation in terms of the CBA maps.	Ecosystem status should no longer be the primary informant in impact assessment, but rather an areas designation in terms of the CBA maps. In future, care should be taken when using terminology relevant to other products. I.e. FSP ecosystem status should be prefaced with local.
The FSP products are vague about what should happen in 'other natural areas'.	Based on the information currently available these areas were not indentified as areas required to meet biodiversity pattern and process targets/thresholds. These areas will include habitats that are currently extensive enough that some loss can be tolerated. However, as with all assessments, a precautionary approach should be applied and new information may come to light that may change the conservation value of the area (for example, previously unknown populations of rare species may be identified). For this reason, these areas do need to be assessed by a specialist.. Project planning should always seek to keep special habitats intact, and always aim to retain the functional integrity of affected areas The CBA maps relate only to measurable biodiversity targets. Naturally, there is a whole suite of other issues that should be considered when contemplating the future of these areas.	EIA's in other natural areas should include a specialist assessment to confirm that there are no previously unidentified features of conservation value. A mechanism should be put in place to capture new information on biodiversity that arised from EIA processes. This should feed into future updates of CBA maps. Development in other natural areas should follow the principles of sustainable development.

The value of biodiversity is only defined by scientific targets, not social and aesthetic values. There are many other potentially significant conservation-related concerns such as visual integrity, cultural significance or use values	The CBA maps are based on measurable and scientifically defensible targets and do not claim to account for more localised values placed on biodiversity which are hard to quantify. Some of the targeted special features (unique local landforms or habitats) do, however, correspond to sites of cultural or aesthetic significance.	Impact assessments should consider both measurable and scientifically defensible targets and local conservation values, visual impacts etc. Other sectors are encouraged to spatially identify their priorities
The Biodiversity Planning process is a "black box"; it is difficult to interrogate why an area was identified as a priority.	Systematic biodiversity planning can be extremely technical and often an area would have been selected for several reasons. However, an effort has been made to include reasons for selection in the GIS layers and users are encouraged to interrogate information as much as possible.	It is important that it is communicated that the CBA maps (images) are just the primary output. A large amount of supporting information is available and users will be taught how to interrogate this.

One of the major challenges has been the difficulty in interpreting the products, most specifically where the selected units do not make intuitive sense. This highlights the importance of interpretive guidelines and training of users. It is therefore vital that the conservation planner is available, especially in the early phases of implementation, to answer technical questions and help interrogate the plans. Without adequate understanding of the products it is unlikely that there will be wholesale buy-in and uptake.

Care should be taken to manage expectations. It should not be purported that CBA maps will provide 100% certainly on a site specific/EIA level, or that they will replace the need for specialist assessments or groundtruthing. However, they do provide a good indication of the likely outcome of assessments..

One of the greatest inhibitions to EIA's role as a vehicle for off-reserve conservation stems from the absence of clearly-stated criteria for decision-making, including explicit limits to the loss of biodiversity (e.g. statutory prohibitions on habitat loss beyond set thresholds).. The CBA Maps and their accompanying land use guidelines offer a simple framework on which to base such limits, however it remains to be seen the extent to which the authorities accept these.

A final challenge is to ensure that the biodiversity plans are keep up to date to and remain relevant. The real measure of the effectiveness of EIA that is aligned with biodiversity priorities is the extent to which EIA proactively succeeds in avoiding biodiversity loss and securing long-term conservation gains in critical biodiversity areas. However, common to most 'mainstreaming' initiatives in South Africa (Pierce et al. 2005; Reyers et al. 2007), there is no comprehensive monitoring programme for tracking biodiversity losses or gains arising from environmental authorisations in the Western Cape.

Fine-Scale Biodiversity Plans: Presaging a post-EIA era?

Besides making major strides towards resolving the contextual 'blind spots' of EA, and flagging the potential for cumulative impacts at a landscape, ecosystem-wide scale, fine-scale biodiversity plans can potentially make an important contribution to a more streamlined, and predictable, environmental authorisation process.

There is a call for the reintroduction of screening into the South African EA system, which currently does not provide for a mechanism whereby the level and intensity of EA can be voluntarily selected through a proactive process of screening project impacts in terms of contextual environmental factors. Fine-scale Critical Biodiversity Areas Maps are highly suitable for fulfilling the type of EA 'triage' envisioned in The World Bank (1993), IAIA (2005) and Convention on Biodiversity (Slootweg et al., 2006) guidelines on EA screening.

Environmental Management Frameworks (EMFs) that are drafted in terms of Chapter 8 of the National Environmental Management Act (NEMA) EIA regulations in effect fulfill the role of screening maps in terms of which application procedures can be determined by environmental attributes that, ideally, would also include areas identified as crucial for conservation by fine-scale biodiversity planning. The broad objective of EMFs is to steer development towards less sensitive areas, by means of notionally streamlined procedures, while requiring more rigorous assessment where the environmental costs of development may be high.

CONCLUSION

Despite some remaining challenges to ensuring that biodiversity conservation is effectively mainstreamed in EA, the biodiversity sector has progressed far since the early days of impact assessment and spatial identification of priorities. Fine-scale CBA maps will assist in dispelling uncertainty about the biodiversity implications of land-use decisions. They offer an unprecedented degree of predictability and consistency that will facilitate more efficient and defensible decision-making around biodiversity and its implications for sustainable development.

The uptake of the products will require the full co-operation of all affected parties and decision-makers, including EA practitioners. The biodiversity sector is leading the way with regards to spatially identifying priorities relevant at both a site specific and regional scale, and other sectors (for example agriculture, mining, water, tourism, heritage, etc.) are encouraged to both follow suit (i.e. develop and share their own priorities maps) and to use the CBA maps to help inform their planning and decisions.

REFERENCES

Brownlie S, De Villiers C, Driver A, Job N, Von Hase A and Maze K (2005) Systematic Conservation Planning in the Cape Floristic Region and Succulent Karoo, South Africa: Enabling Sound Spatial Planning and Improved Environmental Assessment. *Journal of Environmental Assessment Policy and Management*, vol 7 no 2, 201-228.

Brownlie S, Manuel J and de Villiers C (2006b) *Review of the effectiveness of the Botanical Society's input to environmental impact assessments in the Western Cape, South Africa.* Botanical Society of South Africa, Kirstenbosch, Cape Town. Funded by IAIA's Capacity Building in Biodiversity and Impact Assessment project, Fargo, N.D. USA.

Brownlie S, Walmsley B and Tarr P (2006a) *Situation Assessment on the Integration of Biodiversity Issues in Impact Assessment and Decision Making in Southern Africa.* Southern African Institute of Environmental Assessment and IAIA-CBBIA. Windhoek and Fargo ND.

Cape Action for People and the Environment (CAPE) (2008) Call for expressions of interest: Investigating the implementation of alternative environmental management tools to streamline environmental decision-making in production landscapes. Notice published in the *SundayTimes,* 27-09-2008.

Cowling RM, Pressey RL, Rouget M and Lombard AT (2003) *A conservation plan for a global biodiversity hotspot – the Cape Floristic Region, South Africa.* Biological Conservation 112, 191-216

Cowling RM and Pressey RL (2003) Introduction to systematic conservation planning in the Cape Floristic Region. *Biological Conservation* **112**, 1-13.

De Villiers C, Brownlie S, Driver A, Laidler D and Love V (2004) Developing guidelines for incorporation of biodiversity considerations in environmental assessment: The experience of the Fynbos Forum. In *IAIAsa 2004 National Conference Proceedings,* 17-20 October 2004, Champagne Sports Resort, Drakensberg, KwaZulu-Natal.

De Villiers CC (2003) Integrating strategic conservation planning with environmental impact assessment in the Western Cape: A report card. In *IAIAsa 2003 National Conference Proceedings*, September 1-3, Wilderness.

De Villiers CC and Hill RC (2008) Environmental Management Frameworks as an alternative to farm-level EIA in a global biodiversity hotspot: A proposal from the Cape Floristic Region, South Africa. *Journal of Environmental Assessment Policy and Management* 10(4), pp 333-360.

De Villiers CC, Brownlie S, Clark B, Day EG, Driver A, Euston-Brown DIW, Helme NA, Holmes PM, Job N, Rebelo AB (2005) *Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape*. Fynbos Forum and Botanical Society of South Africa, Kirstenbosch.

Department of Environmental Affairs and Tourism (DEAT) (2007) *National Biodiversity Framework*. Government Notice 801 of 2007, Department of Environmental Affairs and Tourism, Pretoria.

Department of Environmental Affairs and Tourism (DEAT) (2007). *Guideline regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans.* Notice 1112 of 2007. Published in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Government Printer, Cape Town.

Department of Environmental Affairs and Tourism (DEAT) (2009) *South Africa's Fourth National Report to the Convention on Biodiversity*. DEAT, Pretoria.

Driver A, Maze K, Rouget M Lombard AT, Nel J, Turpie JK, Cowling RM, Desmet P, Goodman P, Harris J, Jonas Z, Reyers B, Sink K and Strauss T (2005) National Spatial Biodiversity Assessment 2004: Priorities for biodiversity conservation in South Africa. *Strelitzia* **17**. South African National Biodiversity Institute, Pretoria.

International Association for Impact Assessment (2005) Biodiversity in impact assessment. *IAIA Special Publication Series* **3**, Fargo, Narth Dakota.

Job N & Driver A. (2006) CEPF Final Project Completion Report for Putting Biodiversity Plans to Work. Report submitted to CEPF by Botanical Society of South Africa.

Knight, A.T., Boshoff, A.F., Cowling, R.M. and Wilson, S.L. 2003. Keeping People on the Land in Living Landscapes: A Co-operative Strategy for Conserving Landscapes and Enhancing Livelihoods in the Subtropical Thicket Biome. Terrestrial Ecology Research Unit, Report No.46, University of Port Elizabeth, South Africa.

Krattiger AF, McNeely JA, Lesser WH, Miller KR, St Hill Y and Senanayake R (eds) (1994) Editor's Introduction – Section 6: Biodiversity and Environmental Impact Assessment in Krattiger *et al*. (eds) *Widening Perspectives on Biodiversity,* IUCN-The World Conservation Union and The International Academy of the Environment, Geneva, Switzerland, pp 315-318.

Le Maitre DC, Euston Brown DIW and CM Gelderblom (1997) *Are the potential impacts on biodiversity adequately assessed in southern African environmental impact assessments?* Paper presented at IAIAsa conference, South Africa, September 1997.

Mosakong Management cc (2008) *Review of the effectiveness and efficiencyof the environmental impact assessment (EIA) system in South Africa*. Unpubl. draft report, Department of Environmental Affairs and Tourism, Pretoria.

Margules,C. R. and. Pressey, R. L (2000) Systematic conservation planning Nature **405**, 243-253

Mittermeier RA, Gil PR, Hoffman M, Pilgrim J, Brooks T, Mittermeier CG, Lamoreux J and GAB da Fonseca (2005) *Hotspots revisited: Earth's biologically richest and most endangered terrestrial ecoregions*. CEMEX, Agrupación Serra Madre, S.C., Mexico.

Pence, G. Q.K. (2008) C.A.P.E. Fine-Scale Systematic Conservation Planning Assessment: Technical Report. Produced for CapeNature as part of the GEF-funded C.A.P.E. Fine-Scale Biodiversity Planning Project. Cape Town, South Africa

Pierce SM, Cowling RM, Knight AT, Lombard AT, Rouget M and Wolf T (2005) Systematic conservation planning products for land-use planning: Interpretation for implementation. *Biological Conservation* **125**, 441-458.

Reyers B, Rouget M, Jonas Z, Cowling RM, Driver A, Maze K and Desmet P (2007) Developing products for conservation decision-making: lessons from a spatial biodiversity assessment for South Africa. *Diversity and Distributions,* 1-11.

Slootweg R and Kolhoff R (2003) A generic approach to integrate biodiversity considerations in screening and scoping for EIA. *Environmental Impact Assessment Review* **23**, 657-681.

Te Roller, K.S. and Vromans, D.C., 2009. The Biodiversity Sector Plan for the Hessequa and Mossel Bay Municipalities*. Supporting land-use planning and decision making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development.* Produced by CapeNature as part of the C.A.P.E. Fine-scale Biodiversity Planning Project. Kirstenbosch

Treweek J, Therivel R, Thompson S and Slater M (2005) Principles for the use of strategic environmental assessment as a tool for promoting the conservation and sustainable use of biodiversity. *Journal of Environmental Assessment Policy and Management*, vol 7, no 2, pp 173-199.