

# Using GIS in biodiversity conservation across South Africa

by BGIS Project Team, SANBI

The South African National Biodiversity Institute (SANBI) promotes easy and open access to biodiversity information. Through its Biodiversity GIS website it provides free access to biodiversity plans, maps and tools to support research, planning and decision-making.

**S**ANBI believes that biodiversity information must be made readily accessible if informed land-use decisions are to be made. SANBI is the governmental organisation mandated to manage the country's biodiversity. Along with managing the biodiversity is the challenge of managing all the information generated by SANBI and many of its partner organisations. Whilst managing the information is important, it is equally important to share this information with all stakeholders.

The Biodiversity GIS (BGIS) unit has as its primary objective the provision of easy access to this spatial biodiversity planning information thereby facilitating its use in biodiversity planning and decision-making across the landscape.

When BGIS was established it was recognised that the internet would be a cost-effective way to distribute this planning information as widely as possible to those people who should incorporate biodiversity information in their decision making, both in the public and private sectors e.g. provincial and local government planners and decision makers and EIA practitioners. This would also ensure that all parties are using the same set of reliable information when a decision is made about a development.

South Africa is the world's third most biodiverse country and contains 10% of the plant species on earth ([www.biodiversityhotspots.org](http://www.biodiversityhotspots.org)). Much of this diversity is contained within three internationally recognised biodiversity "hot spots", namely the Succulent Karoo and Cape Floristic Region hot spots in the Western and Eastern Cape and the Maputoland-Pondoland-Albany hot spot in the Eastern Cape and KwaZulu-Natal. Apart from these areas of international



Fig. 1: SANBI's web portal for their online mapping system.

concern there are also areas of national biodiversity importance such as the central grasslands and the eastern escarpment. These areas contain most of the country's 225 listed endangered ecosystems which cover 9,5% of its surface area. These ecosystems fall in areas of dense population and are increasingly under pressure from activities such as mining, agriculture, forestry, urban sprawl and the spread of invasive species which put their last remaining patches and the associated biodiversity under threat of extinction.

It is clear that the present protected area network is not sufficient to adequately conserve this biodiversity and most of the remaining natural areas fall on privately owned land. If South Africa is to meet its international commitments to conserving its wealth of biodiversity, land use decisions must be made taking biodiversity into account as an informant. Over the last

decade several initiatives have taken place to map where the biodiversity occurs in the landscape. These maps are called biodiversity conservation plans and have been done at a regional level in the Western Cape under the auspices of CAPE (Cape Action for People and the Environment) and province wide by several provincial authorities. These plans show which areas cannot afford any further habitat loss as it will lead to a concomitant loss of biodiversity for the region.

It is against this backdrop that an online mapping system with an accompanying web-portal (<http://bgis.sanbi.org>) was developed (see Fig. 1). This is a better way to make the spatial information more readily available because desktop GIS hardware and software is expensive and GIS skills are often limited in the government at local level.

All the spatial information which

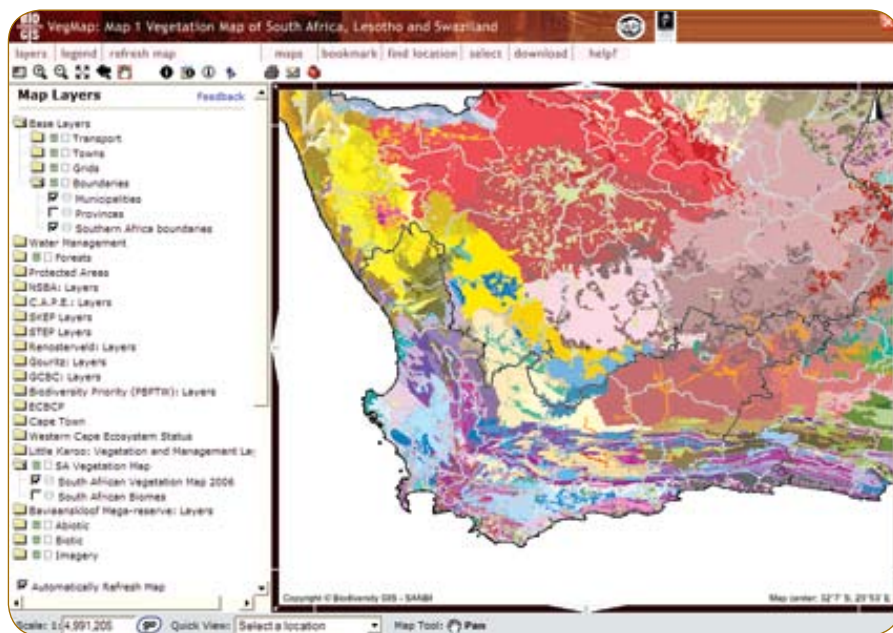


Fig. 2: The latest Vegetation Map of South Africa. (L Mucina and M.C Rutherford, 2006.)



Fig. 3: The training courses on how to use the BGIS web portal and its online mapping system.

is viewable within the BGIS online mapping system is always accompanied by any documentation from the project which produced it, including all reports and metadata. This way the user can not only interrogate the spatial information but get further background as to how it was produced. Should the user wish to use a desktop GIS, the spatial information is always also available for download as well as on DVD which is updated every six months with the latest information from the web-portal.

Success with the online mapping system was achieved by the early adoption of front end software by Moximedia – Internet Mapping Framework (IMF). Written in JSP, IMF runs on an ArcIMS backend which renders a jpeg image of the spatial layers being viewed. With its wide range of tools, IMF enables the users to interact with the spatial information either at a basic or an advanced level.

At a basic level it is very easy for a user to learn how to turn GIS layers on and off, examine the map legend, zoom in, out and pan the map, query map layer features and print or email the map as a pdf file. At an advanced level the users can select map layer features, upload their own shape files or GPS waypoints, add mark-ups to the map such as text, points, lines or polygons, extract a portion of a map layer or their mark-ups to a shape file and save their work either locally or to the server. In the latter case they can share their work securely with a colleague by sending them an email containing a link to their work which will open the system exactly as they saved it.

Spatial biodiversity information available on the BGIS portal and online mapping system includes large scale information for bioregional projects such as CAPE and SKEP (Succulent Karoo Ecosystem Programme). Biodiversity planning information is available at a regional level e.g. STEP (the Subtropical Thicket Ecosystem Project), the Greater Cederberg Biodiversity Corridor, the Cape Lowlands Renosterveld and various Western Cape Municipalities or at province level e.g. Eastern Cape and Mpumalanga. Plans for all nine provinces will be incorporated as soon as they become available. The fine scale biodiversity conservation plans that have been completed by CapeNature for CAPE that cover several

municipalities in the Western Cape are also now available online. Other spatial biodiversity informants that are important for decision making and planning are included such as the latest vegetation map of South Africa (see Fig. 2), the National Spatial Biodiversity Assessment, wetlands, indigenous forest patches and protected areas. The system includes spatial information which may be used for orientation purposes such as municipal boundaries, roads, rivers and towns.

It became evident as more spatial information was included in the BGIS web portal that it would be a challenge for a user to know which information was available for a particular municipality and what information was the most pertinent for land use decision making. BGIS has provided two tools to help users find the most relevant spatial information. By constructing a backend database and linking map layers with the municipalities they cover, it was possible to create a municipal biodiversity plan index where a user can obtain a list of all spatial information available for a particular municipality? But which information is the most pertinent particularly in the Western Cape where there has been a plethora of biodiversity planning projects covering various municipalities.

A land use decision support system was devised by modifying the IMF installation. It is conceived as an easy three step process; finding an area of interest, selecting a cadastral unit within the area of interest and analysing the cadastral unit. The analysis step extracts any information from the attribute tables of a pre-selected set of layers for the municipality in which the cadastral unit lies and which intersect with the cadastre. Only those layers which contain the most pertinent information are used in the analysis. In this way a user can quickly obtain information on any potential biodiversity "red flags" which may be important when making a development decision on a cadastral unit. This is not in any sense an impact assessment but simply highlights potential biodiversity issues as a first step towards an impact assessment.

It is evident, however, that supplying these tools only on the internet is not sufficient if biodiversity information is going to be mainstreamed into

governmental planning and decision making processes. The regular training courses (see Figs. 3 and 4) held on how to use the BGIS web portal and its online mapping system have been well supported and it is clear that there is a need for spatial biodiversity information and basic GIS skills in the work place in various sectors.

In the Western Cape, CAPE has not only emphasised the need for making spatial biodiversity conservation planning information readily available but also the importance of taking it further to ensure its use. The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) in partnership with SANBI through the BGIS unit has been actively engaged in providing training to local authorities, the private sector and civil society.

Firstly, this training covered the interpretation and application biodiversity conservation plans in local planning and decision making. Secondly, it was clear that there is a great need for the development



*Fig. 4: Participants on one of SANBI's training courses on how to use the BGIS web portal.*

of basic GIS skills at a local level so that the relevant spatial information can be obtained using GIS and the biodiversity conservation plans can be successfully implemented. The training thus also included workshops for the development of basic GIS skills using the BGIS online mapping

system as a model system. Plans are in the pipeline at SANBI to role out this type of training nationally so that biodiversity conservation plans can be more successfully implemented across the country.

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