GEOGRAPHIC INFORMATION SYSTEMS

South African National Parks

PROUDLY SOUTH AFRICAN

http://www.sanparks.org/parks/kruger/ conservation/scientific/gis/

KRUGER NATIONAL PARK

GEOGRAPHIC INFORMATION SYSTEMS

Geographic Information Systems (GIS) are computer systems designed for storing, manipulating, analyzing, and displaying data in a geographic context. As such, GIS invariably stores digital representations of data that would traditionally have been drawn on a map. GIS typically stores data in separate layers e.g. one for rivers, one for rest camps and so on. This lends itself to the production of "Smart Maps", which can be processed & analysed separately or in combination to explore spatial relationships between features (e.g. water availability and species distribution).

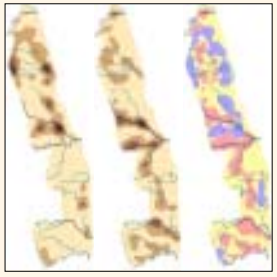
The GIS Lab at Skukuza exists mainly to serve the Kruger National Park's (KNP) Scientific Services Division. It aims to provide access to specialized GIS & Remote Sensing (RS) software, hardware, data & literature as well as our in-house expertise to resident & visiting scientists. Our objectives include:

1. Providing data capture & pre-processing facilities (hardware and software).
2. Serving an online spatial data catalogue.
3. Building a good quality & well catalogued spatial database.
4. Providing a facility with good hardware & cutting-edge GIS/RS software for our own staff & for researchers.
5. Supporting spatial analyses.
6. Offering training courses in GIS & RS.
7. Generating GIS awareness.

Please visit us at:
http://www.sanparks.org/parks/kruger/conservation/scientific/gis/

Animal Distribution

The value of any GIS lies in the analysis of data, which enables us to visualise spatial relationships. Using a GIS we area able to do just that with annual aerial elephant survey data. These data, which includes population numbers and structure, are used to investigate the dry-season distribution & density of elephants in the KNP. Spatial & density dependant analysis of elephant numbers was conducted using data collected over a period of 20 years (1985-2004) at the park wide scale. The figures below indicate the naturally occurring high & low density areas which were identified for KNP elephants.



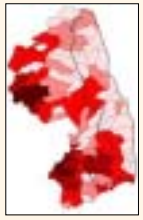
The figures above indicate the "hotspots" for both bull and elephant herd groups. The third figure in the series indicates the difference in distribution and density patterns between the groups i.e. The yellow areas have equal densities of both bull and herd groups, while the blue areas indicate higher densities of bull groups and similarly the pink areas higher density of herd groups. This information will later form part of the development of a KNP Elephant Management Policy.

Invasive Species

Invasive alien species are regarded as the second greatest threat to global biodiversity by scientists worldwide (IUCN, 1997), second only to habitat degradation and fragmentation.

Since the KNP is a conservation area, it is not subjected to fragmentation or degradation. It therefore stands to reason that the number one threat facing KNP biodiversity conservation is that of Invasive Alien Species.

All protected areas are becoming increasingly isolated, with river corridors forming one of the most important links to the surrounding landscape. Unfortunately these corridors are also conduits for invasion of alien species. KNP is no exception, facing increasing pressure from alien species in neighboring watersheds.

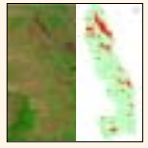


Using GIS, an assessment of the risk of spread (in the figure above, darker colours represent a higher level of threat) assists managers in identifying areas requiring proactive intervention. The spatial arrangement of KNP invasive species is of primary concern to managers in order to locate possible foci of propagules. GIS analysis interrogates species distribution and abundance patterns, providing the means to assess areas of concern.

Fire Decision Support

Traditionally fire mapping in the KNP was done using rangers' reports in conjunction with topographic maps to establish fire boundaries. However, the availability of space borne sensors such as MODIS (Moderate-Resolution Imaging Spectroradio-meter) has offered more reliable alternatives for the mapping of these fire scars.

The NASA Goddard Space Flight Centre (**GSFC**), in collaboration with the University of Maryland (**http://rapidfire.sci.gsfc.nasa.gov**) provides real time image subsets of MODIS for the KNP twice a day. The images are classified into areas which have burnt and those which have not by using fire scar co-ordinates (obtained from field rangers) & active fire locations (detected by the WebFire Mapper) to "train" the classification. Image classification commences at the onset of the fire season in June. The process is repeated every month until November in order to capture the temporal changes in fire scars.



KNP is therefore, able to map fire scars at least once every month during the fire season - something that in the past has never been considered due to resources constraints. This information is therefore invaluable to KNP managers for the calculation of fire frequency and percentage area burnt. Read more from ***http://www.sanparks.org/parks/kruger/conservation/scientific/gis/remotesensing.php***

CyberTracker

*To promote the development of a worldwide environmental monitoring network (**http://www.Cybertracker.org**).*

The CyberTracker (CT) System was developed for application in conservation by Louis Liebenberg, as a user-friendly interface for handheld computers (PDA's). The system allows literate as well as non-literate field workers to record customised observations with latitude (lat) and longitude (long) co-ordinates.

Field rangers, from each of the 22 sections in the KNP, are deployed with CT units on a daily basis to patrol selected areas (± 220 rangers & 110 units covering almost 2 million hectares). The following lat/long observations are recorded using the customised, icon-based interface with English and Shangaan descriptions:

- Daily field ranger patrol
- Species Distribution
- Location of important spoor
- Available Surface Water
- Location of Diseased/Injured animals & associated causes
- Location & cause of game deaths
- Location of all Poaching activities
- Fence Line Breakages & repairs
- Elephant utilization of trees
- Distribution of Invasive Species
- Fire Mapping
- Collaborative research projects

This system has proven to be an indispensable tool for field data collection in the Kruger National Park. The research stemming from these data is fed into the KNP's adaptive management program. We encourage our visitors to view CT species distribution as downloadable sightings maps & GPS waypoints from our website **http://www.sanparks.org/parks/kruger/sightings**

Data Management

Good Information Management (IM) practices are essential if KNP science is to be a success in the longer term.

Scientific services strives to stimulate awareness of the value of scientific data & information. KNP data are therefore managed to ensure correct preservation & promote sharing, analysis & use.

In addition to current datasets, we have a wealth of historical datasets, some of which date back to the 1950's. In order for us to preserve these as well as the current data we are developing a metadata (data about data) system, according to developed ecological standards, using a program called Morpho (**http://ecoinformatics.org**). This program enables one to upload both the dataset as well as the description of the dataset that can then be searched via a normal text search engine through the internet.

Staff can browse our large archive of publications, articles and reports related to research conducted in the Park through our intranet **http://intranet/blog/?cat=1**. A large database of photographic material, collected over the years, can also be accessed by staff from ***http://intranet/consevation/savannah/gislab/slides/historical_slides.php***

Sandra Mac Fadyen