Plant conservation

Restoration Conservation at Kirstenbosch

Invaluable plant restoration work in the highly threatened ecosystems on the Cape lowlands

by **Anthony Hitchcock**, SANBI, Kirstenbosch National Botanical Gardens

Plant conservation should be recognized as an outstanding global priority in biodiversity conservation. This was the message that came out of the XVI International Botanical Congress in 1999. Three years later the Global Strategy for Plant Conservation was developed and adopted by the Conference of the Parties to the Convention on Biological Diversity. Target 8 of the Global Strategy for Plant Conservation focuses on *ex situ* conservation. (That is, growing plants in a protected place out of their natural habitat). It states that, by 2010 there should be 'sixty percent of threatened plants in accessible *ex situ* collections, preferably in the country of origin, and ten percent of them included in recovery and restoration programmes.'

In order to achieve this goal in the Cape, the Threatened Plants Programme at Kirstenbosch was developed and huge progress has been made in recent years with the help of our partners.

**Conservation at Kirstenbosch**

Kirstenbosch National Botanical Garden is one of eight botanical gardens that form part of the South African National Biodiversity Institute (SANBI). The gardens are situated throughout South Africa with each being responsible for its own area of jurisdiction. The Karoo Desert Botanical Garden, for example, grows xerophytic plants from the winter rainfall Karoo region extending from the Western Cape to the Northern Cape. (See article on page 34.) Kirstenbosch is unique in that it collects...
and displays plants from all over South Africa and should therefore by definition collect, grow and restore threatened species from the whole country. As there are over 20 500 higher plants in South Africa of which well over 2 000 species are listed as threatened, this would be an onerous and possibly unattainable task.

Over the last few decades Kirstenbosch has attempted to build up collections of threatened plant species within its target plant groups, which include the Proteaceae, Zamiaceae, Ericaceae, Rutaceae, Restionaceae and Geraniaceae families, and some broad groups such as trees, shrubs, medicinal plants, herbaceous perennials, geophytes and xerophytic plants. Our success in conserving threatened plants has been limited mainly to those groups that are long-lasting such as cycads, bulbs and trees. The majority of fynbos species are, however, short-lived, can be difficult to grow and pose other problems such as a susceptibility to various pathogens such as phytopthora.

We therefore asked ourselves the following questions when reviewing our conservation efforts:

• How do we effectively conserve so many threatened plant species?
• How do we preserve a good representation of the gene pool of each threatened species in ex situ collections?
• Where should we focus our efforts?
• For how long can we keep these plants in effective ex situ conservation?
• How do we accommodate these ever increasing ex situ collections?
• Do we have enough staff and resources?
• How do we get the conservation message through to policy and decision makers, the public and scholars?

Focussing our conservation efforts

Clearly there is a need to plan our conservation efforts to focus on certain key areas if we are to be effective. The first exercise involved looking at the conservation status of the flora in South Africa.

Kirstenbosch Garden is situated in the middle of the Cape Floristic Region, which is one of the world’s richest regions in biological diversity. It is estimated to have about 9 000 species of vascular plants of which about 69% are endemic. It is also in the part of the country with the most threatened ecosystems. The Western Cape lowlands near Cape Town and immediately to the east have been assessed as the most threatened ecosystems in South Africa. A comparison between lowland habitats and mountainous or higher areas clearly shows that the Cape lowlands are the most threatened and therefore in most need of our conservation attention.

To illustrate this a comparison was made* between the Cape Peninsula mountain chain and the ‘Acid Sand Plain Fynbos’ on the Cape lowlands. At the time of publication of the South African National Spatial Biodiversity Assessment in 2004, approximately 94% of the Cape Peninsula mountain habitat still existed and of this 90% was protected whereas only 19% of Acid Sand Plain Fynbos remained of which none is protected.

Research done by Mathieu Rouget and his team in Geographical Information Systems (GIS), and the Conservation Biology Unit (including the Protea Atlas Project and the Threatened Species Project) has been most useful in helping us develop a new Integrated Threatened Plant Strategy for Kirstenbosch Gardens. The new strategy still embraces the conservation targets set by the Global Strategy for Plant Conservation (GSP) but places emphasis on the areas of greatest conservation need. The basic conservation strategy is:

• To target threatened habitats for conservation efforts such as the lowland areas near Cape Town
• To target threatened species within these habitats.
• To prioritise in situ conservation by implementing restoration where possible.
• To increase our ability to be effective by working together with researchers at Kirstenbosch and local universities, Cape Nature Conservation, Millennium Seed Bank and South African National Parks.
• To practise ex situ conservation at Kirstenbosch Gardens in combination and collaboration with the Millennium Seed Bank Project.

In this way we focus on the areas of immediate need in threatened habitats, and at the same time expand our ability
The Rondevlei pilot project

The Rondevlei pilot project was initiated some years ago between Mr Dalton Gibbs, Conservation Officer for the City of Cape Town, and Kirstenbosch Gardens. This project involves the restoration of one of our ‘flagship’ conservation species, *Erica verticillata*, to the Rondevlei Nature Reserve. *Erica verticillata* is extinct in the wild, and was last collected in the wild in 1908.

Rondevlei is a nature reserve situated within the southern suburbs of Cape Town and consists of lakes, wetlands, ‘Acid Sand Plain Fynbos’ and coastal dune vegetation. Early herbarium records indicate that *Erica verticillata* grew in seasonally moist acidic soils in the area and was once harvested as a cut-flower. The aim was to re-plant ericas grown from seed of *Erica verticillata* plants growing in Kirstenbosch into this area, but first the area needed to be cleared of invasive *Acacia* species. The presence of nitrogen fixing acacias enriches the normally nutrient poor soils, which is thought to have inhibited the initial restoration process. Plants grew much better in areas where acacias had not invaded or where the annual grasses were first allowed to grow and use up some of the nitrogen. Harvesting and removal of large quantities of this grass by the local hippopotami also appears to have helped lower the nitrogen levels.

The ericas were planted in a transect ranging from wet to dry soils about ten years ago. Only one of the first planting of about twenty plants survived. This plant grew well in the damp soils between the wet and dry areas. The second planting was done after the area was left for about two years. The ericas were planted in the moist zone that had proved suitable and have since thrived in the area. They flower freely every summer and attract a range of pollinators including sunbirds.

The successful restoration at Rondevlei, and encouragement from the Millennium Seed Bank Project which supports the implementation of restoration programmes as part of its initiative, inspired us to pursue further projects in the lowlands.

The Kenilworth Restoration Project

Kenilworth Racecourse was established in 1882 and the central area has been more or less preserved since then. We chose it as a worthwhile conservation and restoration project in line with our conservation strategy as the high concentration of threatened species and the rarity of the habitat type give the natural area of Kenilworth Racecourse a very high conservation priority. This natural remnant comprises by far the best example of sand plain fynbos remaining in either the Cape Peninsula or the Cape Flats. This vegetation type has been virtually eliminated by urban and agricultural development and by alien invasive vegetation. A separate study has shown that the nine natural seasonal wetlands on the centre of the racecourse are among those of the highest quality in the south-western Cape. The main reason for this phenomenon is probably linked to the low level of disturbance and lack of inflow of waterborne pollution into the Kenilworth Racecourse wetlands. The water originates largely from natural seepage points in the centre of the racecourse.

The natural area is about 42 ha in size and contains about 271 plant species of which at least nineteen are listed in the Red Data Book. In addition to its floral richness, Kenilworth is home to several mammals, birds (one red listed), reptiles, amphibians (three red listed) and aquatic invertebrates. It used to contain two species listed as 'Extinct in the Wild' namely, *Erica verticillata* and *Erica turgida*, which are fortunately preserved in the *ex situ* collections at Kirstenbosch. *Erica verticillata* is recorded in the herbarium as growing in the Kenilworth area and well-known fynbos botanist Elsie Esterhuizen collected *Erica turgida* from the racecourse for Kirstenbosch in 1970.

The company Gold Circle owns the racecourse and the natural area in the centre, and a management agreement was established between them and CapeNature to preserve this natural remnant. This land unfortunately has no conservation status at the moment, but CapeNature would like to establish it as a contractual reserve. This is very important because the natural area at the racecourse is a threatened habitat of international conservation value.

Collaboration is the recipe for success in restoration projects. The Kenilworth project involves close collaboration between the South African National Biodiversity Institute (SANBI), the Millennium Seed Bank Project and CapeNature. Within SANBI, researchers in conservation biology, systematics and molecular systematics are working together with Kirstenbosch horticulturists. The Millennium Seed Bank Project has banked seed from the conservation area and provides much needed funding and hands-on support for the restoration work. CapeNature is the
Memoranda of Understanding

Our experience when working with other organizations or departments is that there is the potential for misunderstandings and confusion given different priorities and staff systems. For this reason we recommend formalizing collaborative projects through Memoranda of Understanding (MOU) that provide a framework within which the parties operate. In this way both parties define their roles and commitments. If problems or disputes arise, the MOU is the basis on which the parties fall back to resolve the issues. We have MOUs with the Millennium Seed Bank Project that cover the collaborative operating arrangement between SANBI and the Royal Botanic Gardens at Kew. In addition there is an internal MOU between Kirstenbosch Gardens and our partners in the Research section, the Custodians of Rare and Endangered Wildlife (CREW). This MOU includes agreement to work together on conservation matters of mutual interest, but also serves as an undertaking by both parties to protect sensitive information such as localities of threatened plants.

We also have a MOU with CapeNature that covers our working relationship regarding our collaborative restoration projects. This is important as both parties commit time, money and resources to these projects. One of the most positive aspects of collaboration between these parties is the seed harvesting and cleaning training given by Millennium Seed Bank Cape staff to CapeNature staff. Once trained they assist us in collecting seed in designated project areas such as at Kenilworth.

Kenilworth Restoration Planning

The restoration of the natural areas at Kenilworth Racecourse has involved a planned, properly co-ordinated series of activities. The basis for the restoration is a management plan that was drawn up by Dr Clive McDowell that highlighted the need for proper land management. The area has been protected from natural events such as fire for over 100 years and as fynbos is a fire-adapted vegetation, with long term exclusion of fire there has developed senescent vegetation, resultant lack of recruitment and disappearance of some short-lived species. There have also been other detrimental influences such as dumping and a proliferation of alien invasive plants.

With the need to burn established we had to make some important decisions and do some planning. We also had to take into account the fact that Kenilworth Racecourse is within a city urban environment, it is on privately owned land and has horse quarantine stables within the area. We had to decide how much of the area to burn at one time and how to rescue as much fauna as possible prior to burning. We had to undertake the removal of invasive plants prior to burning, and record the threatened species prior to burning in the Kenilworth Threatened Species Atlas. We also had to decide which Erica verticillata and E. turgida clones to use in restoration, and to draw up a post burn monitoring plan.

An ecologist from the University of Cape Town was brought in to do a burn assessment. He gave advice on which section to burn and the best time to do this. Plans were drawn up between CapeNature and Kirstenbosch managers to complete invasive plant removal. Seed was collected by Millennium Seed Bank staff for banking and a portion kept for restoration of damaged areas. The CapeNature manager, Chrizette Kleinhans, prepared plans for burn permits, press releases and traffic and crowd control and permission from the landowner.

The burn was set for February 2004, but was postponed as there was an outbreak of horse flu and the racehorses could not be moved out of the quarantine stable, which is adjacent to the burn area. The late summer window period for burning fynbos passed so plans were put on hold until early 2005. The burn eventually took place at the end of March 2005.
Restoration goes ahead

We decided to leave the burnt area to recruit naturally with the minimum of human interference save for restoring the two 'Extinct in the Wild' ericas. These were planted in two areas in late May and early June 2005 after good, soaking, early winter rains. Suitable sites were chosen with the help of Dalton Gibbs who had successfully restored them to Rondevlei Nature Reserve.

One batch was planted in the unburned area where the ground is moist, and a second batch of Erica verticillata was planted in seasonally wet areas in the burnt site. Erica turgida was planted on higher ground where it is drier and better drained.

Plants of one clone of Erica turgida (which stemmed from the original collection from Kenilworth Racecourse in 1970) and plants from two clones of Erica verticillata (being the same two clones that were restored to Rondevlei Nature Reserve and that produce viable seed) were planted. The other three clones in our *ex situ* collections do not produce seed. The Erica verticillata clones were validated by Erica systematist, Dr Ted Oliver, and by our molecular biologists prior to being used in restoration.

The post-burn monitoring includes random plot sampling to assess plant diversity on Kenilworth Racecourse. The Kenilworth Threatened Species Atlas work continues in order to compare the status of the threatened plants prior to burning with that after the burn. We hope that the burn will stimulate the revitalization of the flora as a whole and that we will see an improvement in the condition and number of the threatened species. Monitoring also includes the alien invasive flora, which will be eradicated.

**Challenges**

The projects highlighted in this article are progressing well, but are not without daunting challenges. The most immediate challenge is habitat loss and fragmentation. The city of Cape Town is growing very fast and there is an ever-increasing need for land for housing and resources. Cooperation from landowners with natural vegetation on their property is not always forthcoming. There is little or no incentive to preserve natural habitats and a property owner can get substantial financial reward by selling property for development. The local community could play a significant role in lobbying to protect natural areas, but there is a great deal of indifference and lack of knowledge of the conservation value of our flora.

Our habitats are disappearing faster than we can preserve any part of them. Many Cape lowlands plant species will be lost in the next fifty years at current rates of development and land alteration. Incentives need to be created to encourage landowners to preserve portions of their land where natural vegetation occurs. Nature Conservation authorities are doing their best to preserve the remaining natural areas within their capacity and limited budgets. However, while we are attempting to conserve as much of what remains of our natural habitats, the ever-increasing threat of climate change might have the final say!

The South African National Biodiversity Institute can make a significant contribution to conservation in South Africa through its research in geographical information, vegetation mapping, conservation biology and climate change as their findings are important in influencing government policy in land development planning. This is most important because plants are best preserved in their natural habitats. Botanical Gardens can also make a contribution to conservation by placing greater emphasis on collaborative habitat restoration projects. *Ex situ* threatened plants collections management at Kirstenbosch, particularly with the short-lived and disease prone fynbos flora, cannot effectively conserve most species. These collections are 'genetic bottlenecks' and should be seen as preservation rather than conservation. *Ex situ* genetically representative collections cannot be effectively conserved in living collections in botanic gardens and the best alternative to restoration is long term preservation in properly managed seed banks. Living collections displayed in botanic gardens are very useful as an educational tool to create awareness amongst the public and scholars provided they are accompanied by effective interpretation.

*A more comprehensive list of references is available from the editor at vogel@kingsley.co.za.*

---

**Plant conservation in a nutshell**

Seed stored in seed banks is the only effective means of conserving genetic collections of threatened species in *ex situ* collections as seed banks allow for long-term preservation of the increasing numbers of threatened plant species. Effective conservation requires collaboration between conservation organizations, as we do not have enough staff and resources to be effective on our own.

The conservation message can be passed on to the public and schools by using 'flagship threatened species' such as has been done at Rondevlei Nature Reserve and Kenilworth Racecourse.

We need to focus our efforts on *in-situ* conservation and therefore habitat conservation as our first priority.

---

Kirstenbosch horticulturists, Trevor Adams and Anthony Hitchcock celebrate with Dalton Gibbs, Conservation Officer for the City of Cape Town, after restoring *Erica verticillata* to Kenilworth Race Course.