Custodians of Rare and Endangered Wildflowers

Operations Manual
Introduction

CREW, the Custodians of Rare and Endangered Wildflowers, is a programme that involves volunteers from the public in the monitoring and conservation of South Africa's threatened plants. In doing so, CREW aims to capacitate a network of volunteers from a range of socio-economic backgrounds. The programme links volunteers with their local conservation agencies and particularly with local land stewardship initiatives to ensure the conservation of key sites for threatened plant species.

What this manual covers

This manual has been written for all existing and new volunteers working with the CREW programme. It outlines how the programme works and provides clear guidance on how to contribute to the programme. We would like to emphasise that CREW takes pride in being a flexible project that does not prescribe a specific approach. The information contained in this manual is therefore only to be used to guide you — never let it restrict your creative ideas.

Gibbaeum dispers Photograph: J. H. Vlok
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Disa aristata

Photograph: S. Burns
Why CREW is needed

South Africa has a significant number of the world’s plant species and is the only country that has its own plant kingdom and 3 of the world’s Biodiversity Hotspots. Of the 20 456 plant species in South Africa, 2577 (13%) are threatened with extinction and a further 2232 (11%) are consider near threatened, data deficient or rare endemics. This means that 1 in 4 of South Africa’s plants is rare or threatened. For most of these species there is no recent information about how the populations are doing in the wild. As a country we urgently need to keep track of our plants so that we know how to conserve the unique diversity that we have. CREW volunteers can contribute significantly by each focusing on a small area of the country and monitoring the plants endemic to that area.

Information collected by CREW volunteers helps prioritise which species are in need of conservation attention. CREW data is also used during the EIA process to influence development decisions and is used in fine scale conservation plans which help municipalities determine which areas should be allocated to conservation in their integrated and spatial development frameworks.

How the programme came about

CREW, the Custodians of Rare and Endangered Wildflowers programme, was started in 2003 in the Cape Floral Region (CFR). It was initiated by a small team within the then National Botanical Institute (NBI) with funding received from the C.A.P.E. programme, i.e. Cape Action for People and the Environment. The idea for CREW to work primarily with volunteers was inspired by the very successful Protea Atlas Project that had encouraged large numbers of volunteers to atlas proteas. The data collected by the Protea Atlas Project have been used extensively in conservation plans and in research projects. They have lead to the most accurate IUCN Red List assessments for this plant family. Inspiration was also derived from the fact that many of the interesting botanical finds over the past 20 years have been brought to the attention of the scientist by amateurs (people not formally trained as botanists) with a passion for searching for interesting plant species. CREW initially started working with six volunteer groups and by the end of 2006 there were 14 groups working in the CFR. In 2004 NBI became SANBI, the South African National Biodiversity Institute and was mandated by the Biodiversity Act to monitor threatened species and ecosystems. This new mandate meant that CREW’s work was well aligned with SANBI’s mandate and in 2006 SANBI, in partnership with the Botanical Society, formally adopted the CREW programme and expanded it nationally.

Who should be working with CREW

CREW will work with any individual passionate about the environment and with a particular interest in plant species. The only criteria to
join CREW is that you have to be interested in plants, that you have a basic knowledge of your local flora and that you live in an area where there are many threatened plant species.

There is no need for volunteers to have any formal botanical training. We do, however, encourage volunteers to focus on building their own knowledge of plant species. Our volunteers come from a range of socio-economic backgrounds — from school kids, university students, retired individuals to working professionals.

**How to form a CREW group**

Although our volunteers are very welcome to operate independently, we do encourage them to form groups. You can form a group by approaching other like-minded people within your community, or by advertising the project and gatherings or fieldtrips you will be holding in local newspapers. Some CREW groups hold regular evening presentations on interesting environmental and botanical topics to attract more volunteers. CREW groups can range in size from a handful of interested individuals (we have groups that consist of three people) to groups of around 20 individuals. We do not recommend that there are more than 20 people in a group as it is difficult to
manage large groups. Each group has to select a champion to act as the point of contact between the CREW support team and the volunteers in the area, as well as motivator of the group. Some groups have two champions (one to work on the logistics of group activities and the other to focus on which plants to look for).

**Structuring a CREW group: an example**

In the case where volunteer groups consist of more than about four members it is possible to divide tasks amongst group members in such a way that certain members do not become overloaded. An example of where this has worked particularly well is the Fourcade Botanical Group in St Francis Bay. Here, one group member (A) collects the plants, takes notes and gives the plants provisional names. These plants are immediately passed on to another group member (B) who labels the plants with tags, writes down the tag number and a description of the plant in his/her book so that he/she has a record of the plants as he/she will be taking them home to do the pressing together with one or two other group members. The Fourcade Botanical Group has devised its own specimen labeling system that was approved by the Compton herbarium. The group members doing the pressing (B) will use the information collected on the field data collection form as well as the information collected by group member (A) to fill in the specimen labels.

While in the field, tasks are split so that group member A is collecting the plants and then hands them to group member (B) who tags them; another group member (C) takes all the GPS points of the site and special plants found and another group member (D) is the photographer. The photographer must use the same labeling system to number and describe his/her photographs as the person tagging the plants to do the pressing (i.e. B) as it is the photographer’s duty to upload the photographs at home and email them to the plant presser (B) so that a photograph of each plant can be printed and attached to each pressed specimen. Group member (E) decides what the dominant plants are at the site (between approximately 1 and 6 species). All group members contribute to filling in ‘other species’ on the data collection form. If you are fortunate enough to have a budding taxonomist in your group you may have another group member responsible for dissecting and drawing the specimens and doing your IDs of difficult specimens.

The above information serves merely as a guide and the structure of each group may change according to the size of the group and the interests of the group members.

**The kind of activities you can do with CREW**

CREW has three specific kinds of activities on which we would like volunteer groups to focus: surveying remaining patches of natural vegetation for threatened plant populations; adopting key sites for conservation and working with landowners to conserve threatened
species. In addition, should groups be interested, they can also conduct demographic monitoring of specific threatened plant populations or work with the local youth to build awareness of threatened plant species.

1) Surveying remaining patches of natural area for threatened plant populations

Most populations of threatened plants are known only from areas close to roads where botanists have been able to see them easily. Many species are known from only one or two populations and some of these known populations have not been seen for very long periods of time. We therefore do not know whether they are still there and whether they are healthy and thriving.

To improve our knowledge of the status and distribution of threatened plant populations, groups should identify a certain area close to where they live to sample each year. This area should be divided into sites that can be visited during one fieldtrip, e.g. a single farm. Wherever possible, it is important that the whole area should be systematically sampled, so try to cover all patches of remaining habitat in your planning. Obtain a list of the threatened and rare species from your area from the CREW programme. Also obtain an identification guide with photos and descriptions of your threatened and rare species so that you know what the plants look like. Sample each site for these species using the CREW field forms.

Information collected this way improves our knowledge of exactly how many populations of threatened species still survive. All these localities of special plants are then used in the conservation plans for your area as well as in decisions on whether ploughing or development proposals should be allowed or approved. The information also helps us to report via our national Red Lists exactly how threatened each species is. In addition, survey data provide a baseline set of accurate information that can be used in the future to establish whether the distribution range of the plants is changing. This baseline data are also useful for monitoring the impact of climate change on our plant species.

2) Actively adopting key sites for conservation of threatened plants

Many sites where threatened plant populations are found are small urban or agricultural fragments. These sites are typically either privately owned or owned by local municipalities. Municipal commonages are particularly important for threatened plant conservation as they are often the only sites that have not been completely transformed for agriculture or housing. These sites are far too many for conservation agencies to manage as formal nature reserves. Some of them can contain the last known populations of a highly threatened species or even a handful of different threatened species. CREW volunteers can play a very
important role in the long-term conservation of threatened plant species by adopting one such site in their area and assisting with its management. If your group is interested in adopting a site to conserve, then liaise with the CREW support team to identify a suitable site and look at the key threats to the site. Plan regular visits to the site to help manage the threats. Examples of activities currently undertaken by CREW volunteers on sites with threatened plants, are regular clearing of invasive alien plant species, organising and overseeing managed burns, and clearing of litter. CREW groups also regularly monitor the threatened plants that occur on their adopted sites.

3) Working with landowners

Most threatened plant populations (> 90%) occur on fragments of natural veld that are part of privately owned land. One of the most effective ways to conserve threatened plant species is to build landowner awareness of the species that exist on their land. This entails the following steps:

- Always contact landowners to request permission before coming to sample on their land.
- Try wherever possible to encourage the landowner to join you for part of the fieldtrip.
If he/she is unable to join you, be sure to fill in a CREW landowner card detailing the unique plant species on their land, the special habitats where these plants are found (indicating where on the farm they occur) and some management recommendations for the species.

Wherever possible, keep regular contact with key landowners, ensuring that follow-up visits are made at least every two years. Do not fall into the trap of working only with the male landowners, also involve the females (farmers’ wives) as they often have a massive influence on the management of the land.

If you are working in KZN or the Western Cape and are within a Stewardship Priority Zone (with the help of stewardship staff of provincial conservation agencies), encourage landowners to conserve their fragments formally via the Stewardship Programme.

If a farmer commits an illegal activity such as building a new road or dam or ploughing virgin veld, do not automatically go the enforcement route. Rather hold a meeting with a number of stakeholders in the area first and determine the best way forward. Remember, CREW volunteers are part of the community and any enforcement actions will have an impact on social interaction.
It may be better to ensure that a government body such as the provincial conservation agency proceeds with enforcement activities.

4) **Demographic monitoring of certain populations on an annual basis**

For most threatened plant species, we know very little about their basic life history traits such as how long individuals live, how often they flower, what pollinates them, how often they set seed, and how successful seed recruitment is. All this information is vital to understand how different species react to the threats they face that are caused by humans. To assess how threatened a plant species is, we need this basic information. To help us obtain this information, we would like each CREW group to choose one threatened species to monitor.

With the help of your CREW support team, select one threatened plant species that you know has a population close to the area where you live. Choose a species that is easy to identify and that is easily distinguishable from other plants growing with it, even when the plants are seedlings.
Then from your CREW support team obtain a number of small numbered metal tags; each tag has a unique number on it. With the tags, label at least 250 individuals within your population. Make sure that seedlings, juvenile plants and adults are marked. For each marked plant, measure basic features such as plant height, bulb diameter, leaf length. What is measured will depend on the type of species being monitored. Your CREW support team will help you to identify the plant features that have to be measured for your species and will draw up forms for the data you have to collect.

Also lay out small 30 x 20 cm plots with 100 seeds in them to count the number of seeds that recruit. On an annual basis, go back to your population of marked individuals and re-measure the same features to see how much each individual has grown; also check whether any of your marked individuals have died. Keep checking how many of your planted seeds have survived as seedlings.

5) Conducting awareness activities with the youth in your area or communities

A range of awareness activities have been developed by the CREW programme. If you would like to start working with local schoolchildren on a regular basis, you can contact Ismail Ebrahim (ebrahim@sanbi.org) of our Cape Town office and he will provide you with some of the activities we have developed.

One activity in which we encourage all our groups to become involved in is Plant Monitoring Day described below:

Plant Monitoring Day (PMD) is an annual innovative educational exercise aimed at making students and their teachers aware of the rich diversity of plants in their local surroundings. Participants employ different sampling techniques using simple plant identification kits and monitoring equipment to identify and record core plant species at selected sites.
The sites are carefully chosen: for their value to conservation, for their proximity to local schools and for their reserve status or equivalent, the latter being an important factor to ensure their future sustainability.

At each site, students are accompanied by their teachers and CREW representatives. The age group of students can vary between grades 7 and 9. Students are provided with a monitoring kit, which includes: a plant ID booklet and instruction manual specially prepared for the site; 50 m tapes, string, pegs and flags to mark out the plot; quadrats, environmental monitoring instruments (GPS, thermometer), data collection forms and pencils. Once on site, with the help of teachers and CREW representatives, students set up the 50 x 50 m plots and then 10 x 10 m plots within these. Before starting the exercise, they take environmental measurements such as air and soil surface temperatures and record GPS readings for the site. Students are then divided into groups, with each group working in one of the smaller plots. Here they monitor dominant species in 10 randomly selected quadrats using random numbers provided in the booklet. Following this, they perform a ‘chicken parade’, which involves walking through the site in rows and systematically counting the special (rare and/or endangered) species.

After the exercise, data are entered and submitted to the CREW office. Plant Monitoring Day is conducted annually and allows for trends in threatened plant populations to be observed on a long-term basis.

Figure 6: Learners from Mamre (Western Cape) and Port Edward (KwaZulu-Natal) involved in Plant Monitoring Day

How to work with your CREW support team

CREW has four support offices: one in Cape Town (to help support all CREW groups in the Fynbos area); one in Kamieskroon (to work with groups in the Northern Succulent Karoo); one in Pietermaritzburg (to
work with groups in KZN) and an office in Pretoria (to co-ordinate CREW activities nationally and support groups based in Gauteng, Mpumalanga and Limpopo). The contact details of the CREW office staff can be found on the CREW website www.sanbi.org. The champion of each group should be in constant e-mail and telephonic contact with your support CREW office to ensure that you get the support you need from them. The following section outlines the process of conducting fieldwork as part of the CREW programme and what different activities are conducted by the CREW support team and champions as well as activities relevant to volunteers.

How to go about doing your field surveys

Pre-fieldtrip:

Permits
According to national and provincial conservation legislation, no plant may be collected without a permit. Permits have to be acquired from the provincial conservation agency for general collecting. For work done within National Parks, specific permission has to be obtained from SANPARKS. Furthermore, if fieldwork is going to be conducted on land owned by the Department of Water Affairs and Forestry (DWAF) or on land belonging to other forestry companies, permission has to be requested. The CREW support team can help to organise permits, especially the general provincial permit. However, where possible, CREW group champions should assist by contacting local officials responsible for issuing permits, e.g. DWAF forestry staff.

Draw-up a species list (according to planned targets for the year)
Before you can do fieldwork with the CREW programme, you require a list of the special species occurring in your area. This will be provided to you by your CREW support team. Special species are the endemic species restricted to your region as well as the species listed as Threatened, Near Threatened or Data Deficient on South Africa’s Red Data List of plants.

Selecting priority species
Each CREW group is supplied with a priority list of species to monitor. The list of species is extracted from the SANBI Threatened Species Programme’s Plant Conservation Assessment Database using key words to match text in the localities field, e.g. “*Darling*” or “*Mamre*”. When the list is extracted it includes all the Red list categories. The priority species are chosen from the Critically Endangered ‘presumed extinct’, Critically Endangered, Endangered, Data Deficient and Rare-critically categories. These species are the top priority target species but are not the only species that are important. Species that are listed as vulnerable, near threatened, rare or endemic should still be monitored. The list is made available to the CREW groups in Excel format and
includes species name, locality details and RDB status. Please ensure that the list in not widely distributed and remember that the information contained in the excel spreadsheet is sensitive and confidential.

Once the list has been produced, literature and pictures must sourced to assist the group with identifying the species in the field (see ‘producing an Id guide’ below)

**Producing an ID Guide**

Once you have a list of the specials for your area, you then require an ID guide to help you to recognise them. The CREW office staff will typically help to produce ID guides for you. If you are doing an ID guide on your own, then ask for their assistance with training to conduct the following steps:

Visit [http://www.kew.org/epic/he](http://www.kew.org/epic/he) (KEW herbarium’s electronic plant identification centre webpage [http://www.kew.org/epic/](http://www.kew.org/epic/)) or [http://www.ipni.org/](http://www.ipni.org/) to obtain literature references. This site includes all the literature produced for every plant species and always includes the most recent species description. Once you have the references, obtain the literature from one of the SANBI libraries (remember to photocopy the first page that reflects the author’s details as this is required for the reference list). Extract the description including diagnostic characters, flowering time, distribution and altitude for each species. As far as possible, simplify botanical terms so that they can be understood by volunteers. Where it is not possible to simplify terms, include them in a glossary at the back of the ID guide. Highlight the most distinguishing characters of the species in bold.

Scan illustrations and pictures found in the literature. Should illustrations and pictures not be found in the literature; search [http://www.aluka.org/](http://www.aluka.org/) for scans of type specimens or scan specimens at a herbarium. The Aluka website allows zooming in: to do this click the “viewer” option. Once zoomed, press “print screen” on the keyboard. Open Paint programme and paste scan. Save in JPEG format. Edit the JPEG by cropping. Note the Aluka website only has scans of type specimens; these are sometimes very old and it may not be easy to see important characters. If this is the case, rather go to a herbarium and ask permission to scan good recent specimens.

Once you have the images and the text, various programmes can be used for the layout. Thus far we have used Corel Version 5.3 or Microsoft Publisher. Whichever programme you choose, make sure it can deal with a large volume of pictures, texts and pages.
E-mailing — advertising

To conduct fieldtrips independently as a volunteer group or with the CREW staff, it is necessary to advertise the trip at least two weeks in advance. When working in potentially dangerous areas, e.g. an urban or communal area, then ensure that a minimum of three volunteers join a trip and do not do a trip if there are no men in the group.

Organising transport

When organising fieldtrips with CREW staff, use either CREW or SANBI transport, and if going in a volunteer’s vehicle, mileage costs and the feasibility thereof must be considered. When going as an independent group of volunteers on a fieldtrip requiring driving over a long distance, contact the CREW office to enquire whether mileage costs can be covered.

Arranging permission

If sampling in a reserve, state land or on private land, find out the contact details of the landowner and arrange permission the day before. Contact the co-ordinators from your local CREW support node for assistance (see CREW page on the SANBI website www.sanbi.org for details). If you cannot get hold of the landowner’s contact details beforehand, try to find the farm house and ask...
permission during the filed trip. When working in communal areas, contact the local district municipality and ask for the telephone number of the chief or headman of the village closest to where you are working. Phone and ask permission before going into communal areas.

Preparing materials
Ensure there is space in the press.
Sufficient newsprint and blotting papers.
Digging tools.
Camera.
GPS.
Charged batteries.
Zip-lock bags.
Datasheets and clipboards.
Collecting books.
Field guides.
ID guides.
Large plastic bag for bulky specimens.
Hand lens.
Mace.
Whistle.
First aid box.
Put everything into a fieldwork box.

During Fieldtrip:
Sampling techniques
Plan the trip the day before and consider the size of the area, which habitats will be present and the size of the group. If the group is smaller than 10, do not split up but spread out as much as possible while walking. When groups are large, split them up and make sure each group has a an ID guide, collecting bags, a GPS and data collecting forms. Give clear instructions at the beginning of the fieldtrip on how sampling will be conducted and how much time will be spent at each site. With a large group, ensure that everyone meets for tea and lunch. Make sure that no volunteer or CREW staff member wanders out of sight. If anyone blows a whistle, gather at that point.

Use one CREW site form per habitat. If a site has a range of habitats, ensure that different forms are filled in for different habitats.

How to complete the CREW data collection forms
CREW Site collection form: (example of form on page 18)
This form is used for recording data when surveying sites for threatened plant populations. The form is designed to record
**Data collection forms (* compulsory fields)**

**Population codes for special species:**
- R:1-9; F:10-50; C:50-100; A:100-250; D:250-500; S:500-1000; P:>1000

**Spec No = herbarium specimen number**

### Dominant species @ locality:
<table>
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<tr>
<th>Species</th>
<th>Code</th>
<th>Spec No.</th>
</tr>
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<tbody>
<tr>
<td>Protea repens</td>
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<td></td>
</tr>
<tr>
<td>Protea laurifolia</td>
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<td></td>
</tr>
<tr>
<td>Ischyrolepis capensis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thamnochortus insignius</td>
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<td></td>
</tr>
</tbody>
</table>

### Special species @ locality*

<table>
<thead>
<tr>
<th>(List co-ordinates of specials beneath the species name)</th>
<th>Code</th>
<th>Spec No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp1: Tritoniopsis flexuosa</td>
<td>F</td>
<td>CR899</td>
</tr>
<tr>
<td>34 26 32.8 19 09 43.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp2: Aspalathus rosea</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>34 26 33.4 19 09 50.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 26 36.5 19 10 12.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp3: Lachenalia sp</td>
<td>F</td>
<td>CR987</td>
</tr>
<tr>
<td>34 26 40.1 19 10 04.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp4:</td>
<td></td>
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<td>Sp6:</td>
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<td></td>
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<tr>
<td>Sp7:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sp8:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Date*
- 10/02/2005

### Collector*
- Ismail Ebrahim

### GPS Co-ordinates*
- Centre S: 34 26 30.5 E: 19 10 47.2
- Alt: 206
- Site no. 1
- Est size of site* 10 ha

### Description of locality*
Caledon Waterkloof farm. On the 316 from Caledon to Bredasdorp 500m west of TB 45 on mid slope of witklippieskop north of main farmhouse.

### Landform:
- Hilltop
- Hill slope
- Wetland/marsh
- Ridge
- Dune ridge
- Sleep
- Cliff face
- Flat
- Kloof/Ravine
- Estuary
- Floodplain
- Standing water
- Riverbank
- Plain
- Valley
- Other

### Condition of site:
- Cliff face
- Dune slack
- Variable
- Flat
- Moderate
- Beyond repair

### Soil type:
- Sand
- Silt
- Clay
- Peat
- Tertiary sands
- Other

### Soil colour:
- Black
- Brown
- Grey
- Yellow
- White
- Orange
- Red

### Geology:
- Conglomerate
- Quartzite
- Silcrete
- Ferricrete
- Loam
- Tertiary sands
- Other

### Vegetation Description:
- Sandstone Fynbos. Vegetation dominated by Proteas and Restios

### Moisture:
- Seasonally wet
- Seasonally moist
- Permanently wet
- Permanently moist

### Age of veld:
- Recently burnt
- Mature
- Young
- Senecent
- Unknown

### Landuse:
- Urban
- Conservation
- Industry
- Plantations
- Mining
- Recreational
- Stock
- Poultry
- Other

### Ownership:
- Private
- Communal
- State
- Other

---

**CREW Site collection form**
habitat information, dominant species, special species, other species and threats.

**Observer and Locality:**

**Collector:** The name of the person collecting the data is very important. Please add a name of someone that was involved in data collection. Do not only add your groups name. This is important when queries need to be followed up. You can add your group name in brackets.

**Date:** The preferred format for date is dd/mm/yyyy

**Grid Ref:** If you have the grid reference available please fill it in. The CREW localities database has a function to calculate the Grid Ref automatically. So don’t be too worried if you do not have it at hand.

**Co-ordinates:** The preferred format for co-ordinates is DMS (degrees, minutes and decimal seconds). Please go to the settings of your GPS and ensure that the map datum is set to WGS 84 and that the units/format is set to DMS. The co-ordinate for the site can be taken closest to the middle of the plot.

**Description of locality:** This is one of the most important parts of the data collection form. This information is vital for relocating populations of plants. Here are some guidelines on how to give the most accurate description of where you are in the field. It is important to mention as much detail as possible. Record the closest town, the farm name, and then triangulate your position by using landmarks visible to you. Use trig beacons, major roads, major intersections, unique landforms, etc (see example in form).

**Estimated size of site:** This information is used to give us an idea of the size of the area in which you sampling. This is particularly useful when sampling in a fragmented landscape. This will aid in estimating the viability of the site as well as threat to the species. One hectare is roughly the size of a rugby field.

**Habitat:**
The habitat details are fairly simple to complete. If you are having trouble deciding what landform you on or what the geology of the site is, please contact one of the CREW staff members to explain the terminology to you. The Vegetation description box can be used to record the vegetation type (if you know what it is) or it can contain a description of the vegetation (see example in form).

**Geology:**
Most plant species are specific to certain geological substrates. It is therefore extremely important to note as accurately as possible the geological substrate of the area in which you are working. As
geology can be complicated, the following notes are given to help you identify the basic geology of your site.

**Granite** is an igneous rock, i.e. it is crystallised from a liquid magma rather than deposited as sediment particles to form layers on the sea floor. It consists of clearly visible different kinds of crystals: sparkling flakes (mica), colourless-pink rectangles (Feldspar), and black biotite in a background of milky quartz. Common as large granite domes, which form deep in the earth as magma cooled slowly.

**Basalt** is an igneous rock. The crystals are not visible with the naked eye. Typically dark green or black in colour, basalts are not laminated. The top of the Drakensberg and Lebombo mountains were deposited as huge Basalt lava sheets.

**Dolerite** is a medium-grained (hypabyssal) basalt and forms in shallow intrusions, such as dykes, which cut across the rock strata, and sills, which push between beds of sedimentary rock. When exposed at the surface, dolerite weathers into spherical lumps.

**Quartz** is the commonest mineral, and shale with overlying quartz pebbles is often observed in the field. Quartz as an igneous material is generally the last to crystallise and does therefore not normally possess a crystal outline. Instead it fits into whatever space is left, e.g. in granite.
Silcrete appears similar to quartzite and forms when silica is dissolved and re-solidifies as cement.

Sandstone is a rock consisting of sand grains, clearly visible to the naked eye, cemented together with finer particle, but generally with a lot of space between the grains, making them porous to water. They usually occur in beds from several centimeters to metres thick. Originally formed at beaches, deserts and deltas, they usually erode to form steep mountainous terrain, as in the Cape and Drakensberg.

Shales are rocks consisting of fine grained particles, usually too fine to see with the naked eye. Usually clearly layered, with beds several millimeters thick. Formed in lagoons, lakes and floodplains, shales comprise 80% of sedimentary rock.

Limestone is pale rocks containing more than 50% calcium carbonate (Lime). It usually has crystals which are visible and may contain shell fragments. Caves, blind rivers or sinkholes might be present the area. Formed from the shells of marine mollusks or by chemical deposition, limestones are mainly coastal in occurrence. This category includes calcium-based hardpan formations, as it is not easy to tell whether limestones have formed by sedimentation or chemically.
Dolomites are similar to limestone, but typically the crystal are too small to see. Caves, blind rivers or sinkholes might be present the area. Formed by precipitation of calcium and magnesium in the sea water by ancient algae, the largest expanses of dolomites occur on the Witwatersrand. These dolomites often have thin layers of hard chert within them.


Landuse: This refers to the human use of the site or the economic activities that are taking place on the site. This information is very important for determining the threat to the site and species therefore impacting on the assessment of the conservation status of the site and special species that occur there. If the land-use is not listed please select other and record the land-use in the notes field.

Ownership: Please select type of ownership of the property. If it is a private landowner please record his contact details in the notes field. This is incredibly useful if we want to revisit the farm or engage the landowners in conservation initiatives.

Plant communities — dominants, specials and ‘other’ species: The dominant plants usually control and characterize the community. If they are removed for any reason, other species may take over as dominants and the character of the community could change completely. This change does not occur when most other species are removed, with the dominants intact, the same type of community can generally regenerate itself. Dominant plants that are showing a decrease in numbers and reproducing poorly indicate that radical changes will take place in the future. To identify dominants in your area, look for species that are common and typically scattered relatively evenly throughout the site.

‘Specials’ or Threatened plants are the endemic or threatened species for which the CREW staff will provide a list or an ID guide. ‘Specials’ may have limited numbers for various reasons, but they are all dependent on the survival of the community as a whole for their survival. ‘Specials’ generally have a lower tolerance to stress and this restricts them to specific habitat types. It is essential that we monitor these threatened plants so that we can try and prevent their further decline, since a change in their specialized habitat may lead to their eradication.
It is essential to record as many ‘other’ species as possible as without many of the interactions with these ‘others’, the threatened species could not survive. In addition, should habitat restoration at the site ever be necessary, CREW site forms can provide an easy reference for ecologists and botanists to the species that originally occurred there. If you take specimens of unidentified species please list it in the others and ensure that the corresponding collection number is recorded on the form.

**Any plant that is pressed must be highlighted on the form and the collection number of the specimen included.**

**Threats and disturbances:**

This is also vital information for the site. Please refer to the codes on the back of the site collection form for the threat codes. The first box is the threat category e.g. 1 = habitat loss/degradation. The second column is for the specific threat under that category e.g. C = livestock. The next three columns are to record whether it is past, present or future threat. You can tick the relevant box. The rating is also important for the codes refer to the back of the site collection form (see example in form).

**CREW Species collection form:** (Example of Form: page 24)

This form is used to do detailed monitoring of a single population of threatened plant species.

For instructions on how to fill in the fields: Collector; Date, Grid Ref; Locality; Habitat and Threats please refer to the information under the site form above.

**Co-ordinates:** There is space for four sets of co ordinates. These points are taken at the start, western extreme, eastern extreme and end of the population of species you are monitoring. This will help us determine the extent of the population.

**Species:** Record the name of the species you are collecting data for.

**Population information:**

No. of individuals: This is for the number of plants counted. It is preferable to count the individual plants; it gives us a better idea of the status of the population.

**Estimated no. of individuals:** If it is not possible to count the individual plants please make an estimation of the population number.

**Distribution of plants:**

Even – uniformly distributed throughout the site
Variable – varying conspicuously in density within the site
Geissorhiza malmesburiensis

Dimensions of the population*

| Corner 1* | S | 33 27 47.4 | E | 18 37 12.8 |
| Corner 2* | S | 33 27 46.9 | E | 18 37 11.5 |
| Corner 3* | S | 33 27 48.4 | E | 18 37 12.0 |
| Corner 4* | S | 33 27 49.8 | E | 18 37 13.1 |

Habitat

Landform: | Soil type: | Geology: |
--- | --- | --- |
Mountain peak | X Sand | Conglomerate |
Mountain slope | Loam | Sandstone |
Hilltop | Clay | Shale |
Hill slope | Peat | Limestone |
Cliff face | Gravel | Dolomite |
Kloof/kraal | Rocky | X Granite |
Flat/plain | Quartzite |
Riverine | Slope: | Silcrete |
X | Gentile |
Other: | Flat |
Variable | Aspect: | N |

Notes and Sketches

Good condition renosterveld. We collected 3 specimens of Geissorhiza that was very similar to G. malmesburiensis. The specimens will be sent to Compton herbarium to be correctly identified.

Threats & Disturbances*

1 Habitat loss/degradation
A Agriculture
B Plantations
C Livestock
D Abandonment
E Mining
F Timber harvesting
G Groundwater extraction
H Urbanization
I Roads/Railways
J Power lines
K Dams
L Telecommunications
M Tourism/Recreation
N Aliens
O Too frequent fires
P Too irregular fires
Q Wrong season fires

2 Aliens (affect to species)
A Competitors
B Hybridizers

Rating - Degree of impact
1 Very low
2 Low
3 Medium
4 High
5 Very high

C.R.E.W. Custodians of Rare & Endangered Wildflowers
South Africa National Biodiversity Institute (SANBI)
P/Bag X7, Claremont
7735
Ph: (021) 799 8742/51
Fax: (021) 797 6903
Email: Project Manager CFR or Project Co-ordinator
crew@sanbi.org
Clumped – confined to one or a few localized patches within the site.

**Area of extent:** Refers to the size of the area in which the species extends.

**Dist to next Population:** If you know the estimated distance to the next population of species you are monitoring then please record this information.

**Population composition:**
Adults – Mature plants that form flowers and fruits.
Juvenile – Young plants that have lost their cotyledons but have not reached maturity.
Seedling – Young plants that still have their cotyledons.
Dead individuals – Old plants that have died and are not producing new growth.

**Plant features:**
Reseeder – Plants that persist by producing new individuals from seed.
Resprouter – Plants that have the ability to regenerate vegetatively after fire and can form clones by root suckering, fragmentation of root stocks or rhizomes, or produce corms, tubers or bulbs.
Clonal spread – Plant species that form extensive clonal (derived from one seed) patches as underground stems spread and give rise to new shoots.

**Pollination:**
Record pollinator only if seen actively pollinating plants. Generalist pollinators are those that pollinate various types of plants e.g. Bees. Specialists are adapted to pollinate specific types of plants e.g. Long tongue flies pollinating long tubed flowers.

**CREW Quick Observation forms:** (Example of Form on page 26)
This form can be used to capture threatened plant population observation records. This form includes the bare essential information needed by the CREW programme to assess the status of a population. We encourage you to use this form when you come across a threatened or special species while you are busy doing a non-CREW field activity and you have limited time (e.g. hiking with a local mountain club). This form is not a substitute for the CREW Site and Species Collection forms as it doesn’t provide the detailed monitoring information we require.

**Feedback**

☐ **Receiving data from groups**
Once a data collecting form has been received by the CREW office, e-mail notification has to be sent to inform the volunteer
CREW Threatened Species Observation Form

<table>
<thead>
<tr>
<th>Collector:</th>
<th>Zikishe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>12/10/2007</td>
</tr>
<tr>
<td>GPS Co ordinates:</td>
<td>S: 32 18 23.5</td>
</tr>
<tr>
<td>Description of locality</td>
<td>Piketberg, Farm Drie pad. 5.7km north of town Piketberg on R315. Grootkop south slopes 750m east of saddle on 4X4 track</td>
</tr>
<tr>
<td>Species</td>
<td>Moraea barkeri</td>
</tr>
<tr>
<td>Population number</td>
<td>1-10</td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Threats</td>
<td>Threatened by agricultural development. Farm has been sold to sheep farmer and will start stocking sheep. Overgrazing is a potential threat.</td>
</tr>
</tbody>
</table>

of when and how many data sheets were received. This will also include any queries or errors noticed while checking the data collecting forms (see example below).

- **Landowner cards**
  Landowner cards are available from the CREW office. They are used as a tool to create awareness amongst landowners and to inform them of special plants that CREW has found on their land and of the basic management requirements of the threatened species. The landowner cards should be completed and sent to the landowner after any field trip conducted on private land.

- **Fieldtrip report**
  Fieldtrip reports are mainly to give feedback to volunteers that attended CREW C-team field trips. The purpose of this form is to inform volunteers of what areas we visited and what interesting species were found. Please see example below:
Collecting specimens

As a standard, collect three pieces of each plant if there are more than five plants; a photo is generally not sufficient for identifying plants as many diagnostic characters cannot be seen in a photo. For example, the degree of hairiness of the sepals of a plant could be what differentiates it from a sister species, and if the back of the flower is not photographed at a high enough magnification this character cannot be seen. Other plants require dissection of the ovaries to determine the species. Therefore, always collect specimens of specials or unknown interesting species. If the plant is very rare (i.e. fewer than five plants seen) and the whole plant has to be dug up for identification, first take a photo rather than dig up the plant, especially in the case of orchids and bulbs in the Iris family, for example.
How to collect good herbarium specimens

Herbarium specimens are permanent records of a plant species or population as it occurred at a given time and place. The future value and use of any specimen depends on the care with which the collector selects, collects and prepares his or her specimens. A small number of really well-preserved and well-annotated specimens are far more valuable than a large number of poor specimens.

Each specimen should:
- Be as representative as possible of the population or show as much range of the variation as possible.
- Have a collecting label carrying at least the following data:
  - Collector.
  - Date.
  - Collector number and CREW number.
  - GPS point (including altitude).
  - Locality description: District, closest town, detail of description that includes distance and cardinal direction from a landmark (refer to 1:50 000 map if possible), include name and number of farm.
  - Habitat information, including geology and availability of moisture.
  - Plant details likely to be lost on drying, e.g. flower colour.
  - Information on abundance.
- Be well prepared and well preserved.

How to keep record of your plant collection

Without careful records the plants are useless for botany and they can have no future in a formal botanical collection. Even within your lifetime the usefulness of your collection to the end-users will depend on the care with which you have documented it. Basically the record of plant collection is of importance for you as a collector and for the user, e.g. Botanists and students. The most sensible method is to assign each collection a unique number that is cross-referenced in your system to all the information about that collection, by so doing you can keep adding to your records without constraints on space. The following are the guidelines on how to keep these records avoiding any confusion and forgetfulness.

Additional information on keeping record of your collection

The simplest and most strongly recommended system consists of collector's surname, followed by one or more digits from a continuing series of numbers commencing at one, or you can use your group's name e.g. “FOT 239”
Various complicated numbering systems based on a sequence of expeditions or dates of collection may appeal to collectors, but experience has shown that such systems are often miscopied or misinterpreted.

**Collection / collectors numbers**
- Each collection must have a number, corresponding to the same number in your field-collecting book. The collection can be made up of parts of one large plant or a number of individual small plants from the same population, collected at the same time by one collector.
- A number should only be used once, e.g. if you should collect from the same plant at different times of the year each collection should have a different number and be cross-referenced to each other.
- Each number should be a unique number from a collector’s single running number sequence, which can start at one and continue unbroken.
- The number should be placed with the specimen at all times or written on the flimsy to avoid confusion, if the specimen is divided between several folders ensure each one has a number. Tie-on tags are advantageous.

**Recording data**
- Collecting books for field notes are essential, need to be sturdy to give a firm writing surface and if possible, water resistant. Pocket-sized notebooks are most convenient.
- Pencil doesn’t wash out and can be erased easily, propelling types are always sharp, but use a soft lead.
- Notes should be taken as detailed and methodically as possible in more or less the same sequence and position in your notebook.
- Locality notes should be taken in the field to avoid having relying on your memory about details. The specimen data must be taken before the plant is pressed for the same reason. Your plant may turn out to represent a collection of botanical interest, possibly a range extension or even a new species, either of these possibilities may demand that the botanist revisit the site in order to study the population in the wild.

**What to collect**
Collecting and pressing of specimens is a long process, requiring dedication and hard work, so do not go through all the stages of processing and then have your specimens returned because they are sterile.
- Sterile specimens, that is without flowers and fruits, are of limited use; collect both flowers and fruits if possible. Fruits are
often valuable aids in identification (particularly in the case of Fabaceae, Brassicaceae and Apiaceae) and so are rootstocks, especially for bulbous species. If a plant is herbaceous, collect the whole plant. If there is only one flower, collect the flower and complement the collection with sterile material.

- Lanky specimens such as grasses can be folded zigzag once or twice.

**Selected plant groups**

Collectors should know that there are specific plant parts that are essential for correct identification of certain groups. In some cases the plant part has to be cut, i.e. prepared in a special way to reveal a specific character. See Herbarium Specimen collecting manual by T. Dold & Phillipson 2003 pg58-61 for the parts or characters of different plant families that need to be collected for herbarium botanists to accurately identify specimens.

**Post-fieldtrip:**

**Pressing Specimens**

*What you need for pressing specimens*

- Press.
- Flimsies/newspaper.
- Felt paper.
- Copy of the specimen accession database.
- Access to a herbarium.
- Herbarium field labels.
- Big plastic bags for specimens that have to go into the freezer.
- Mounting boards (A4 white 160 g boards, available at most stationery stores).
- Herbarium lick-and-stick tape.
- A5 plastic sleeves.
- A5 lever arch files.

**Think preparation and preservation (please refer to the herbarium pressing guide available from the CREW office).**

- Pressing can be done immediately in the field or material can be taken along in a plastic bag (avoid black rubbish bags as they absorb too much heat). Zip-lock bags work well to keep specimens fresh.
- Delicate flowers should be put in a folded sheet of tissue paper and temporarily pressed in a notebook or field press.
Plant specimens are pressed by first arranging them in a fold of thin paper such as newsprint, taking into consideration the size of the final herbarium sheet (25 x 36 cm). Plants too large to fit the paper should be bent sharply into a V, N or W shape by bruising or pinching the stem before bending to avoid breaking it off.

Specimens should not protrude from the fold of paper and should be folded back onto it.

Specimens may be trimmed to reduce bulk and expose certain characters advantageously if sufficient material is left so that the pattern of branching, leaf arrangement, and other features are readily discernable, but be careful to avoid trimming away all the leaf tips.

When pressing large plants, make several sheets rather than one mass of material on the same sheet; in this case, number each sheet with the same number and the part number, e.g. V-Z 01 sheet 1 of 3. Arrange specimens so that upper and lower parts are visible.

Spread flowers or inflorescence to show as many surfaces or views as possible. Section some flowers longitudinally and press flat to exhibit the inner parts and thereby reducing the need for dissection of the finished specimen.

Excessively bulky and fleshy parts such as stems and fruits may be split and both parts included. Do not include more than one species in a single paper.

Collect enough material to fill the sheet, but avoid crowding or excessive overlapping.

For fragile flowers, press flowers immediately on gummed paper, to preserve colour.

Pressing succulent plants:

Succulent plants usually have a very high water content, which makes drying difficult. Some also tend to remain alive in the press; following is the technique to overcome this problem.

Press them in field immediately after collecting, then put the entire press in the freezer for 24hrs, then take it out and let the material thaw, change the paper everyday for at least 3-5 days, to avoid mouldiness, this is work intensive, but works best, don’t put them in the drying oven, where they shrivel up.

For specimens from the family Mesembryanthemaceae specimens should always have capsules. Try and collect approximately 20 capsules per specimen.

Some important tips for collecting specimens

Write your field notes at the time of collecting.

The specimen must be accompanied by a description of
the habitat and other features of the plant not shown in the specimen, including habitat, ecology and abundance.

- Process your plant specimens either in the field or at least on the same day as specimens deteriorate if left overnight.

- Give each specimen a unique collecting number. In the case of plants with separate male and female flowers, use one number if male and female flowers are collected from the same plant i.e. monoecious plants. If the male and female flowers are on separate plants, i.e. dioecious plants, use two different collecting numbers.

After a minimum of one week, specimens should be taken out of the press and prepared for sending them to a herbarium. Ensure that the specimens are properly dried before processing them.

**Processing Specimens**

Once the specimens are properly dried, they are ready to be sent to a herbarium for identification. It is recommended that volunteers send their specimens to the CREW office, after which the following steps will be followed:

i) The first step is to get collecting numbers for the specimens. The specimen details are captured in the CREW specimen accession database and a CREW collecting number is generated for the specimen. If the specimen was sent by a volunteer group that records their own collecting numbers, the CREW project assistant will ensure that the group’s collecting number is captured in the database so that it is easy to cross-check and give feedback to the groups once the specimens have been identified.

It is essential that volunteer groups keep a record of their own collecting numbers. The CREW collecting numbers will be used for herbarium identification purposes but the group’s collecting number will be noted in the CREW accession database.

ii) Once the CREW collecting number has been generated, the herbarium labels can be completed. The CREW project assistant will complete this task and add as much detail on the herbarium labels as possible. The herbarium label and the CREW collection form have similar fields and these can be copied onto the herbarium label. CREW is developing an electronic data collection form and when this is complete, we will be able to generate herbarium labels from the CREW localities database. The system will also allow one to capture the necessary data for the herbarium label in the field.

Dried specimens should be put in a freezer for at least 24 hours before being sent to a herbarium to sterilise them. After the specimens have been in the freezer, they are ready to be sent off.
Specimens returning from the herbarium

When specimens are returned from the herbarium, they have to be sorted by CREW and the specimen accession database has to be updated.

The specimen accession database is updated to capture the confirmed name of the species. The specimens are then sorted into those that have to be returned to the herbarium and those that are kept by CREW. The specimens that have to be returned, are checked and if there is enough material a piece is taken for the CREW quick guide and for the group that collected the specimen (if it was collected by one of the volunteer groups). If not enough material is available, the whole specimen is sent to the herbarium to be added to the herbarium collections. Specimens that have been returned to CREW will be split between the quick guide and the volunteer groups.

Mounting of specimens

The specimens are mounted on A5 boards (white 160 g) with herbarium lick-and-stick tape. The mounted specimens are put in an A5 plastic sleeve and filed in an A5 lever arch file. A copy of the herbarium label is attached to the back of the mounted specimen. The specimens are filed by area and in alphabetical order according to family and then genus. The specimens for the groups are returned to them with copies of the herbarium labels.

Feedback

Feedback should be given to the volunteer groups when the CREW office receives specimens from the group. This can be in the form of an email.

When the specimens are returned from the herbarium, a list of confirmed names with the corresponding collecting number of the group should be sent to the group. A specimen feedback form must be completed and sent to the relevant CREW group (see specimen feedback form below).

<table>
<thead>
<tr>
<th>Specimen Receipt Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received by:</td>
</tr>
<tr>
<td>Date received:</td>
</tr>
<tr>
<td>Specimens received:</td>
</tr>
</tbody>
</table>

Processing data collection forms

Data collected can be entered and processed in one of three ways:

i) Volunteers can receive a copy of the database as a CD and enter the data themselves.
ii) Forms should be sent to the CREW office by fax or e-mail as soon as possible after the fieldtrip so that data can be entered by CREW office staff.

iii) The excel version of the data collection form can be completed and emailed to the CREW office so that it can be captured in the CREW Localities Database. The electronic forms are designed for you to easily enter your data electronically. Use the tab keys to navigate to the relevant box where you would like to enter data or use the mouse to click in the boxes. The Electronic forms are available from the CREW offices.

### Specimen Feedback Form

<table>
<thead>
<tr>
<th>Feedback by:</th>
<th>Status codes:</th>
<th>Date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vatiswa Zikishe</td>
<td>K = return to the herbarium</td>
<td>20/12/06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R = Return to the groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S = not enough material to make positive ID</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group collection number</th>
<th>CREW collection number</th>
<th>Confirmed taxon name</th>
<th>Det</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBG 45</td>
<td>CR1156</td>
<td>Brunsvigia gregaria</td>
<td>Dee Snijman</td>
<td>K</td>
</tr>
</tbody>
</table>

**Exchanging knowledge and training**

CREW assists in building the capacity of volunteers in terms of plant identification in order to provide fundamental botanical knowledge and skills. The courses involve a presentation on the family or genus with notes providing an overview and basic key to some of the species. The theory is followed by a practical session with a dissection where possible and a walk in the field to observe species *in situ*.

Three ID courses are arranged per year and are advertised to all CREW volunteers. Generally a maximum of 25 people per course can be accommodated.
Since CREW commenced in 2003, volunteers have been given the opportunity to attend plant identification courses focussing on certain plant groups, particularly those groups containing many rare and/or endangered species.

In addition to formal plant ID courses, volunteers are encouraged to share knowledge amongst their own groups by meeting regularly to discuss their recent fieldtrips, press specimens together and share their findings and arrange informal talks. Examples are the Mpumalanga Plant Specialist group and the Friends of the Tygerberg group who arrange monthly talks where a group member is responsible for preparing a presentation on a certain genus or family.
List of useful resources

List of a few useful reference books for CREW summer rainfall regions:
Leistner, O.A. (Ed.) 2000. Seed Plants of southern Africa: Families and Genera; Strelitzia 10. National Botanical Institute, Pretoria. (useful for keying to family and genus, but with a hand lens or microscope.)

List of a few useful reference books for CREW winter rainfall regions:
Bayer, B., 1999, Haworthia revisited: a revision of the genus, Umdaus Press, South Africa
Trinder-Smith, T., 2003, The Levyns guide to the plant genera of the Southwestern Cape, Bolus Herbarium, University of Cape Town

CREW summer rainfall ID guides:
Midlands
Durban

CREW winter rainfall ID guides:
Papiesfontien
Caledon
Stillbay
Bredasdorp
Outeniqua Mountains
Swellendam
Mamre
Southern Cape Lowlands
Tulbagh
Tygerberg/Durbanville
Port Elizabeth
Stellenbosch

Botanical Society Wild Flower Guides:
Wild Flower guide No. 1 - Namaqualand
Wild Flower guide No. 2 - Outeniqua, Tsitsikamma & Eastern Little Karoo
Wild Flower Guide No. 3- Cape Peninsula.
Wild Flower Guide No. 4 - Transvaal Lowveld & Escarpment
Wild Flower Guide No. 5 - Stellenbosch to Hermanus
Wild Flower Guide No. 6 - Karoo
Wild Flower Guide No. 7 - West Coast.
Wild Flower Guide No. 8 - Southern Overberg
Wild Flower Guide No. 9 - Nieuwoudtville, Bokkeveld Plateau & Hantam
Wild Flower Guide No. 10 - Cederberg, Clanwilliam & Biedouw Valley
Wild Flower Guide No. 11 - Eastern Cape
Wild Flower Guide No. 12 - Table Mountain National Park

Interactive Keys
- Linder, H. P., 2006, African Restionaceae v.4, CD
- Vlok, F., Forshaw, N., Oliver, T., Oliver, I., 2002-2004, Genus Erica: interactive identification key v.2., CD
- Cliffortia interactive identification key. C.M. Whitehouse. Freely available from the Bolus Herbarium or CREW office.

Interesting websites to check
www.agy.kaktus.hu
www.andreeva.lapshin.org
http://www.asphodelaceae.com
www.bernard.bubendorf.free.fr/mesems.htm
http://www.bulbsociety.org/
www.davesgarden.com
www.desert-tropicals.com
http://www.disas.com/
www.fernkloof.com
http://haworthia.com
http://www.haworthia.info/en/gallery/06.html
www.kew.org
http://www.netvisual.co.za/
www.newbijou.com
http://www.orchid-society-gb.org.uk/
www.pacificbulbsociety.org
www.palkowitschia.cz
http://www.plantsafari.com/
www.plantafrica.com/
http://sciweb.nybg.org/
Plantchat is a very useful and informative plant emailing group that operates mainly in the summer rainfall regions. If you would like to receive plantchat news please email David Styles (davidstyles@vodamail.co.za) and he will add you to the list.

Plantlife is a journal for everyone concerned about the conservation of our indigenous flora, particularly amateur botanists and indigenous plant growers. It is published by the KZN Coastal branch of the Botanical Society. This is a really worthwhile, informative and beautifully produced journal. Please contact botsoc-kzn@mweb.co.za or phone 031 2015111 for subscription details.

Veld and Flora is a journal that focuses on South Africa’s unique flora and its conservation, and is distributed to all members of the Botanical Society. CREW articles are regularly featured in this journal. To join the botanical society visit www.botanicalsociety.org.za.