Wild harvested wild resources in two Cape Town Nature Reserves - Mapping Exercise 2012

Sustainable Livelihoods Foundation- Final Project Report

1.0 Overview

The biodiversity mapping project, undertaken by the Sustainable Livelihoods Foundation piloted process of GPS recording of the localities of some of the most commonly harvested and economically utilised species found within protected areas of Cape Town. In collaboration with the City of Cape Town, GIS tools were employed to convert these GPS recordings into visually accessible formats for local protected area management purposes. Existing law enforcement data was collected in conjunction with these GPS coordinates and further habitat information of harvested species was gathered to build a more nuanced and thorough understanding around the processes of illicit harvesting. With the data collected, this biodiversity mapping project supports local preparation towards the rapidly growing environmental threat and management challenge that illicit harvesting of wild resources poses to conservation efforts within Cape Town.

The objective of this report is to provide an outline of the problem that illicit harvesting poses to Cape Town's nature reserves, focusing in particular on Rondevlei and Tygerberg nature reserves; to explain the methodology utilised to collect data for this study; to illustrate the findings and to provide a discussion of these results.

2.0 Background

Cape Town is located within an area of world class biodiversity and unique conservation value. This is as a result of both the inland aquatic and terrestrial ecosystems and the diverse coastal and marine habitats created by the warm waters of False Bay and the colder waters of the Atlantic Ocean. Importantly, the City of Cape Town is located within the Cape Floristic Kingdom, which is one of only six floral kingdoms in the world. Although, the Cape Floristic Kingdom is the smallest of the world's floral kingdoms, it is one of the richest, with a high proportion of endemic and endangered species. As such, the Cape Floristic Kingdom is commonly referred to and known as a "global biodiversity hotspot", placing considerable responsibility on the City of Cape Town, the Provincial Government and National Government to ensure the adequate conservation thereof.

The City of Cape Town itself administers 22 conservation areas within its boundaries, yet city officials claim that only five are currently managed to appropriate standards. This is largely due to a lack of capacity and resources, particularly within the Cape Town lowlands area, which had been severely neglected under Apartheid planning. Many of the problems surrounding these conservation areas pertain to issues around the security of the nature reserves and threats posed by the growing illicit harvest and trade of biodiversity products for informal markets.

The anthropogenic extraction of biodiversity products from within these reserves is conducted by culturally and financially motivated individuals, serving a cultural market representative of 80% of the South African population (Mander *et al*, 2007). Mander (1998) and Shackleton (2005) have established that there is a strong reliance amongst most South African's on biodiversity resources for medicinal and cultural reasons, household items, income generation (Shackleton & Shackleton, 2004), fuel wood (Twine et al, 2003), foods (Clark et al, 2002; Shackleton, 2002; UNDP, 2006) and veterinary medicines (Dold & Cocks, 2001). There is a strong history of wild harvesting from South African landscapes, especially in communally owned lands, such as former South African homelands formalized by the Apartheid regime; and in coastal zones.

There is a particularly high reliance on these biodiversity resources of the urban poor. For the urban poor, entering into the informal biodiversity industry (of harvesting, processing or trading) as a livelihood activity fulfils an existing cultural and economic demand. It also allows the urban poor to make use of traditional knowledge and rural linkages in an urban economy that has otherwise very high barriers to entry.

3.0 Problem

Such extraction of biodiversity resources within the City of Cape Town's nature reserves however is simply not sustainable. A compendium produced by Petersen et al (2012), illustrates that 448 biological species are wild harvested within the City, of which 250 are indigenous plant species. Nearly 70% of these harvested flora species are either killed or reproductively harmed in the process. Within the exponentially expanding City of Cape Town (which is experiencing growth of 97,000 residents per year (City of Cape Town 2010))

local public open space and protected areas are being increasingly inundated by hundreds of illegal cultural and cash driven resource harvesters. With such growth within the City, the rates of extraction are inevitably exceeding the rates in which these harvested species are able to reproduce, thus threatening their survival.

Moreover with formal unemployment above 25% and an influx of traditional rural migrants to the City, who share local cultural preferences for wild medicines, anthropogenic pressures from harvesting in conservation areas will substantially increase at detriment to natural capital, resulting in biodiversity loss. Within this context of growing urbanisation and poverty, the reliance on local biodiversity to support livelihoods will remain prominent, potentially growing in severity as a conservation threat.

Of the various anthropogenic uses of locally wild harvested resources within the City's boundaries, 51% of the species harvested are utilised for medicinal purposes. Owing to the obvious significance of such a market, the species harvested for the traditional medicine industry formed the focus for this project. The species harvested for this traditional medicine industry are either sold by informal retailers as individual plant parts, or in a variety of plant component blends and prescribed mixes. Petersen *et al*. (pending) note that Cape Town supports a cash economy of traditional medicines worth US$ 14.5 million/year. This market comprises of 4,600 Rastafarian/ Sangoma traditional healers, which is x6 the number of western doctors, shedding some light on the magnitude and importance of this industry within Cape Town. It has been estimated by Petersen *et al*. (2012) that these traditional healers harvest (commonly illegally) around 219 tonnes/ year of plants. The greater CFR contributes a further 279 tonnes / year of plants, which collectively generates 45% of the volume of local trade, worth $6.7 million. Again, these healers operate in the unregulated, informal (cash) economy of the poor, whereby up to 50% of black households make use of traditional healers and 64% regularly use wild herbs. The demand for such wild harvested medicines dispensed by traditional healers is culturally embedded and intergenerational.

Numerous contemporary harvesting 'hot-spots' for these medicinal plants have emerged within the City's nature reserves. Within the 300 ha Tygerberg nature reserves for example,

more than 10,000 bulbs of *Tulbaghia capensis* (wild garlic) have been confiscated by law enforcement officials from illegal harvesters within a period of eight months (Glanville 2010).

In response to the increasingly identified threats to habitats within Cape Town's nature reserves, the City of Cape Town has carried out security audits[1] of the Biodiversity Management Branch of the City of Cape Town. From the 2010 audits carried out, Tygerberg and Rondevlei nature reserves were found to have the highest threat levels and were therefore natural choices of research priority (selected by the City of Cape Town), becoming the focus for this study. Tygerberg was found to have particularly high levels of trespassing and poaching owing to lack of security coverage, whereas Rondevlei's threat level was attributed to high local rates of violent crime.

4.0 Tygerberg Nature Reserve

Tygerberg Nature Reserve was proclaimed a Local Authority Nature Reserve in 1974 by the Bellville Municipality. The reserve is currently just over 300 ha in extent, forming part of the Elsies river catchment area. It is a refuge to a great diversity of birds, mammals, reptiles, amphibians and invertebrates, all associated with this vegetation type. The Nature Reserve conserves one of the last and largest remnants of Critically Endangered Swartland Shale Renosterveld.

The reserve is home to 562 plant species, of which 23 are red data threatened species, eight are endemic to Cape Town and three are endemic to Tygerberg itself. The diversity of species found here is vast, with some 24 different mammal species, 137 bird species, 22 reptile species, seven frog species, as well as numerous different butterflies. The diversity of

[1] The 2010 audits established that the location of the various reserves with their own unique social contexts were the primary determinants of the level of threat of each reserve. The findings of each audit, including responses received from public interest groups were used to determine the threat level of each reserve. The threat levels were based on a combination of factors which could potentially affect security of the reserve and its staff and visitors. The threat levels low, medium, and high reflect the safety threat to visitors, staff, and infrastructure. Further to which the threat level provided an indication to respective intervention priorities in terms of staffing, infrastructure and equipment.

mammal species are a significant indication that ecological corridors are still available through and around the Tygerberg Nature Reserve and that these areas can cater for the needs of species with large home ranges, such as the *Mellivora capensis* (Honey Badger).

The anti-poaching measures currently in place include two bush rangers, community liaison, SAPS and City Law enforcement support. The bush rangers undergo police checks and three months of rigorous training on environmental and law enforcement issues. In order to monitor plant/ animal life and the movements of poachers daily patrols are carried out by the bush rangers and observation points are set up. These rangers have proven to be highly successful in targeting a prominent local illicit activity of wild medicine poaching, confiscating approximately 15,000 bulbs of *Tulbaghia capensis* (wild garlic- a locally traded medicinal plant) from poachers in last two years.

Fifty eight arrests of poachers and twenty one court cases have proceeded in the last two years based on the poaching of *Tulbaghia* (amongst other items). Five of these court cases were concluded in the reserves favour. One community service was agreed upon for an under aged boy found guilty of poaching. The bush rangers have full records of these poachers and any serial offenders in their office.

4.1 Rondevlei Nature Reserve

Rondevlei Nature Reserve was established in 1952 as the Rondevlei wild bird sanctuary in cooperation with the Cape Divisional Council (now Cape Metropolitan Council). Despite the fact that the surroundings of the vlei were at that time semi-rural, ornithologists and other bird lovers had been concerned about the rapid decline in the numbers of birds associated with the vleis of the area. Despite its age, fencing and incorporation of much of the reserve only took place in 1995, once urban development had largely surrounded the protected area.

The Rondevlei Nature Reserve is at present 290 hectares in extent, covering approximately 2.2 square kilometres of mostly permanent wetland and consisting of a single large brackish lagoon. There is a permanent wetland with Cape Flats sand fynbos to the north, and seasonal wetlands and Cape Flats dune strandveld in the south. The nature reserve is among

the most important wetlands for birds in South Africa despite being situated directly alongside the heavily polluted waterways.

Rondevlei is inhabited by 230 bird species, a variety of small mammals and reptiles like caracal, porcupine, Cape fox, grysbuck, steenbuck and mongoose, as well as a hippopotamus population which was re-introduced in 1981. Importantly, Rondevlei is home to 3 endemic and 9 endangered plant species, including the Cape Flats cone bush (*Leucadendron levisanus*), the Rondevlei spiderhead (*Serruria aemula foeniculaceae*) and the Cape Flats erica (*Erica verticillata*), which was locally wiped out due to excessive harvesting for cut flowers in the 1940s and 50s. Rondevlei also boasts unusual and threatened ecosystems like strandveld, Sand Plains Fynbos and indigenous Coastal Fynbos vegetation.

Rondevlei Nature Reserve is entirely surrounded by working class suburbs of high unemployment (>60%). There is considerable local crime in these suburbs, some of which overflows into the protected area, whereby litter, illegal weapons and dead bodies may be dumped and reserve infrastructure stolen.

Rondevlei is now managed as part of False Bay Ecology Park, as shown below:

Figure 1.0

Security is largely undertaken by reserve staff, as there are no dedicated officials for security management.

5.0 Methodology

In order for this project to gain the necessary support, involvement and interest to make it feasible, synergies were established with the CoCT Nature Conservation Department, and Biodiversity Management Branch. Liaison with the CoCT's biodiversity management and environmental services departments took place, whereby agreements with stakeholders regarding issues on data knowledge, security and access were formalised at a focus group meeting in December 2011. City conservation stakeholders played a critical role in helping to refine the methodology of this project, for example on such matters of timing of fieldwork. Current biological and management knowledge with respect to fire regimes were taken into account. The importance of conducting the surveys and species census after the fire management process was emphasised.

Primary and secondary data was obtained through an exploration of existing literature on Cape Town's nature reserves and qualitative interviews with reserve staff. From this data, background reports on each of the nominated reserves: Rondevlei and Tygerberg were put together, documenting some of the key security and resource extraction issues for each of the sites.

5.1 Project Team

The team involved in the project included:

Leif Petersen: SLF Director and project leader and manager.

Professor Eugene Moll: The technical advisor and field support. Eugene is an ecologist based at the University of the Western Cape.

Leonard Macmillan: The project officer, who was conducting and coordinating the fieldwork during the project and acting as a liaison at the reserve level.

Nicola Freeman: Technical assistant. Nicola is a Postgraduate geographer, who is interning with SLF.

5.2 Tygerberg Nature Reserve (April and May 2012)

There was a delay in the data collection owing to fire management procedures; however this presented an important opportunity in the case of Tygerberg Nature Reserve for measuring locally extracted *Tulbaghia capensis*; which as a bulbous species is a prolific resprouter immediately after a fire. Thus, it was found to be considerably easier to locate and record in post fire conditions, as there was very scarce other vegetation that had regrown. See Figure 1. 1.

Figure 1.1

A prolific re-sprouter: Tulbaghia capensis (wild garlic)

Whilst the majority of the areas surveyed were burnt sites, owing to the distinct measurement advantages that these sites offered various un-burnt sites were also mapped as well. It was found that irrespective of whether the site had been recently burnt or not, the *Tulbaghia capensis* tended to inhabit steep slopes and ridges.

Two strategies were employed for geo-referencing the garlic plants. Firstly circular plots were generated using a stick as a central point and attached string to mark a radius of 2m of the area to be measured. See Figure 1.2. Within this area, each individual garlic plant was counted. The sites chosen for this type of measurement were chosen on the basis that they were particularly dense areas of garlic vegetation. Such micro level measurements were carried out and the site was waypointed on the GPS device. This kind of measurement

opens up potential for researchers to return to these sites and make comparisons of the densities of garlic plants over a few years and after the next burn. This will thus allow further research to make assertions on the potential rates of harvesting of these plants.

Figure 1.2

Prof Moll counts Tulbaghia individuals within a 2m radius circular plot

The second strategy employed was cluster level measurements, which were carried out over a much larger area of 100m x 10m transects. A transect of 10m wide and 100m long was measured using the path as a starting point and proceeding down the slope in a Westerly direction. See Figure 1.3. In order to reduce the bias of human selection when sampling the sites, the first site was chosen because it was at the edge of where the burn area started. From this site, the subsequent site was located 10 m along the path. This ensured that the researchers were not simply selecting sites due to higher densities of garlic plants and the data was therefore more representative for the reserve as a whole. The researchers measured the garlic plants 100m down the slope, taking measurements within 10m blocks, which were labelled 1.1, 1.2 - 1.10 accordingly.

Figure 1.3

Tygerberg's burnt site and path which signalled the start of the transects.

In order to be more time efficient, the measurement taken within these transects were carried out at a cluster level. To differentiate between the different clusters, the width of a foot was used as a separator, i.e. if the garlic plants were less than a foot width apart then they were counted as being part of the same cluster. See Figure 1.4. A maximum of three categories were decided upon in which to identify roughly how many garlic plants were in each cluster, as opposed to having lots of different values that would present problems with visually representing the data at a later stage. The categories were set as follows:

< 5 garlic plants = 1

5- 20 garlic plants = 2

> 20 garlic plants = 3

So for example, if a cluster was counted that had 12 plants, it would be categorised as two. Results were tabulated by several researchers as insurance for the data collected. A waypoint on the GPS was taken at the beginning of this transect, in the middle of the 10m diameter across (i.e. at 5m across at 1.0 for the 1st plot of land covered) and at the end (i.e. at the 100m mark, 1.10), again in the middle of the diameter of this plot.

Figure 1.4

A foot's width was used to differentiate between different clusters of *Tulbaghia*

This wider scale transect measurement was carried out to achieve more of a general impression of the density and distribution of *Tulbaghia* within the recently burnt sites. The methodology process was documented using video technology, so it may be reproduced in the future. See Figure 1.5.

Figure 1.5

Leonard McMillan demonstrates the use of video to help facilitate replication of methodology in other reserves

Over the course of the field research local rangers guided the researchers through a poacher's entry point to a different site within Tygerberg Nature Reserve, through a residential development called Baronetsy Estate. The fence demarcating the boundary of the reserve had been vandalised as can be seen on Figure 1.6 and makeshift pathways were evident as illustrated on Figure 1.7, which had been generated from sustained poacher movement and activity. Similarly to the recently burnt sites observed on day 1, much of the *Tulbaghia* was situated on a ridge, with the main population found midway down the slope. The soil in this habitat consisted of a clay like substance. There were many signs of excavation at this site (see Figure 1.8), but frequently garlic plants were found hidden under a bush or rocks, suggesting that these garlic plants may not have been seen by poachers. As the researchers moved upslope, the vegetation became less dense and there were more signs of excavation. These less densely vegetated areas were clearly more accessible, owing to their proximity to the path and were therefore more frequently poached. It was also observed that the areas closer to where poachers were most likely to be entering the reserve were more heavily excavated.

The Baronetsy Estate had a very dense population of vegetation, greatly hindering the same kinds of mapping strategies as employed on the burnt sites. See Figure 1.9. Owing to such difficult terrain, it wasn't feasible to carry out the larger scale transects, so a few circular plot measurements were taken to get an impression of the density of bulbs within these areas. There was much evidence within this site of poachers, including various tools for extraction of plants such as spades, pick axes etc, an eroding path, bottles and signs of where fires had been lit. See Figure 2.0.

Figure 1.6

An illicit site of entry to Tygerberg Nature Reserve.

Figure 1.7

Makeshift pathways forming from repeated poacher movements

Figure 1.8

Signs of excavation of Tulbaghia

Figure 1.9

Dense vegetation in Site 2 of Tygerberg Nature Reserve

Figure 2.0

Tools left behind by poachers

5.3 Rondevlei (False Bay Ecology Park) May and June 2012

Before commencing field work in Rondevlei Nature Reserve the researchers consulted with the conservation area manager of the Southern region of Cape Town and previous manager of Rondevlei Nature Reserve, Dalton Gibbs to find out what were the most commonly harvested species within Rondevlei Nature Reserve. The following species were identified as:

- *Euphorbia caput-medusa*
- *Brunsvigia* spp.
- *Haemanthus coccinea*
- *Dianthus albans*
- *Kedrostis nana.*

The more frequently targeted areas of the Reserve by poachers were in the southern side of the Reserve. The southern boundaries of the reserve ran alongside an informal settlement, indicating that this area was therefore a more accessible point for poachers. See Figure 2.1. This assertion was confirmed by the damage to the fences, which opened up areas of access. See Figure 2.2. The southern side also provided a more favourable environment for the types of species identified for us by Gibbs, which were more likely to establish themselves on the slopes of sand dunes, as opposed to the wetter reeds and marshlands.

Figure 2.1

Rondevlei Nature Reserve in close proximity to an informal settlement

Figure 2.2

Damaged fences on the southern boundary of Rondevlei Nature Reserve

The southern side therefore provided a natural starting point in which to begin mapping the species outlined by Gibbs. Once the researchers had covered the southern boundary, representative areas of different habitat environments were identified as other sites in which to investigate. Given the large size and at times difficult terrain of the park, it was impossible with the resources available to survey the entire Reserve. See Figure 2.3 representative sample sites were chosen, to clarify which environments the selected species grew best in and therefore which areas would be more susceptible to poaching. Some of the different environment types within the Reserve included sand dunes, marsh land, Reeds,

grass land, bogs, bush land etc. GPS waypoints were taken from an area within each environment and the circular plot measurement strategy was employed to determine the densities of the selected species within these areas.

Figure 2.3

Rondevlei Nature Reserve as viewed from the southern shore

Within Rondevlei Nature Reserve the *Haemanthus* species were found to be in abundance, so counts were not taken, but sites where they were located were waypointed on the GPS. There were two types of *Haemanthus* species observed, including *H. coccinea* (see Figure 2.4) and *H. pubescens (*see Figure 2.5). They frequently occurred in colonies together. The types of environments that these species resided in most predominantly were in the drier sand dune areas, where the *Haemanthus* was often found sheltering under neighbouring vegetation (see Figure 2.6). Although the *Haemanthus* were not in flower, they are vibrant bulbous plants and therefore still easy to identify.

Figure 2.4

Haemanthus coccinea

Figure 2.5

Haemanthus pubescens

Figure 2.6

***Prof Moll looking at Haemanthus* species commonly found hidden under bushes**

Within Rondevlei Nature Reserve, there were a number of obstacles to the research process. Some of the more commonly harvested plants identified by Gibbs were not seen to be present within the research site due to seasonality and previous extraction by harvesters, so therefore were not identifiable at the time of the field research. Given the tools at our disposal it was not possible to conduct a sub soil level analysis which would give fuller knowledge of the local species mix. As such, *Dianthus* spp., and *Kedrostis nana* were not located in this exercise. Although the *Brunsvigia* was not in flower, it was still possible to identify evidence of where this species had been.

Under the guidance of the head ranger of False Bay Ecology Park, Assef Khan, the researchers were directed to the sites in Pelican Heights, where there had been excavations of *Euphorbia caput-medusae* species and *Brunsvigia*. See Figure 2.7.

Figure 2.7

Leonard McMillan traverses the Pelican Heights section of the reserve

The *Euphorbia caput-medusae* species tended to reside on the steep sides of the sand dunes (See Figure 2.8). There were only very few of this species identified, so a count was not taken, but all growing sites were waypointed. When the researchers traversed across the dune valley, evidence sites of where the *Brunsvigia* plants were waypointed.

Figure 2.8

Euphorbia caput-medusae in Pelican Heights

6.0 Results

Tygerberg Nature Reserve

Measurement tool 1: 100m x 10m Transects

Transect 1

Start of transect (at edge of burnt site): Waypoint 3465 (356B): 1.1

End of transect: Waypoint 3573 (357B): 1.10

		Cluster<5	Cluster 5-20	Cluster>20
	Category	**1**	**2**	**3**
Waypoint 356B/3465	1.1	5	2	0
	1.2	17	16	9
	1.3	7	14	9
	1.4	3	4	0
	1.5	3	8	2
	1.6	2	4	3
	1.7	0	0	0
	1.8	0	0	0
	1.9	0	0	0
Waypoint 357B/3573	1.1	0	0	0

Transect 2

Situated 10m across the path from the 1st transect.

Start of transect: Waypoint: 3585 (358B): 2.1

End of transect: Waypoint 3592 (359B): 2.10

No wild Garlic was found within this transect

Transect 3

Start of transect: Waypoint: 3625 (362B): 3.1

No wild Garlic was found within this transect, so the end of transect waypoint did not need to be taken.

Transect 4

Start of transect: Waypoint 3634 (363B): 4.1

No wild Garlic was found.

Transect 5

Start of transect: Waypoint: 3645 (364B): 5.1

4 clusters found.

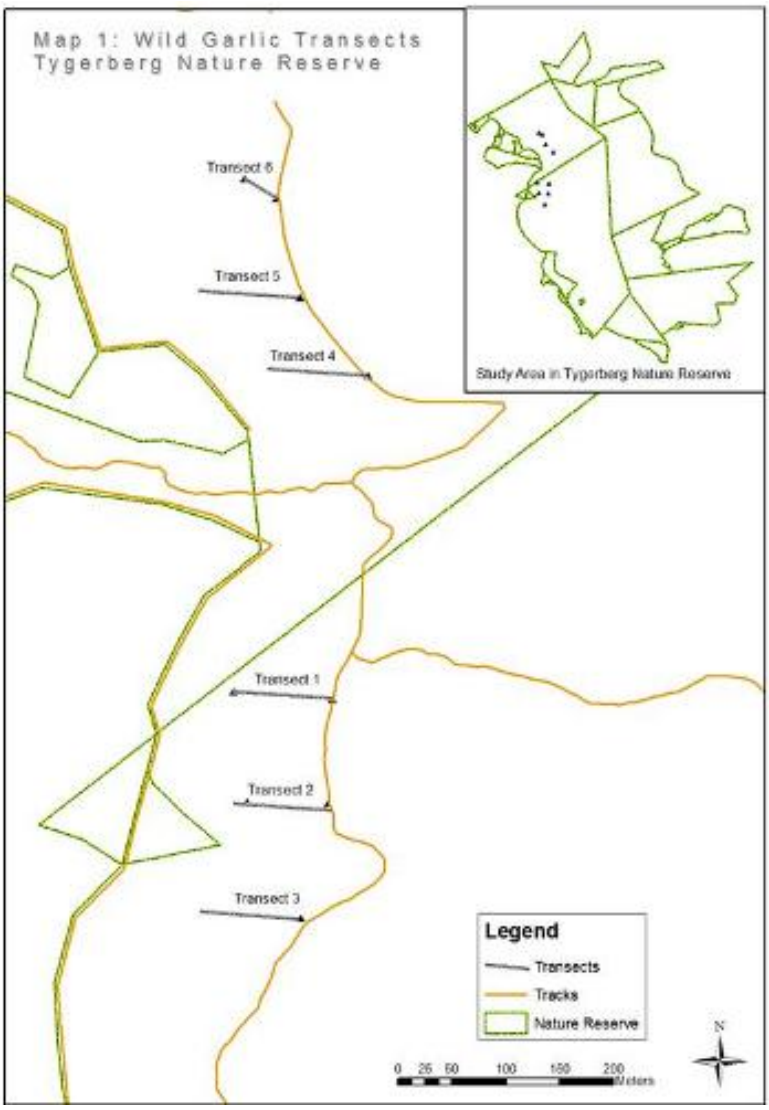
Transect 6

Start of transect: Waypoint: 3654 (365B): 6.1

End of transect: Waypoint: 3664 (366B): 6.10

		Cluster<5	Cluster 5-20	Cluster>20
	Category	**1**	**2**	**3**
Waypoint 3654 (365B)	6.1	9	12	0
	6.2	64	12	0
	6.3	40	8	1
	6.4	45	6	2
	6.5	33	3	1
	6.6	28	9	3
	6.7	0	0	0
	6.8	0	0	0
	6.9	0	0	0
Waypoint 3664 (366B)	6.1	0	0	0

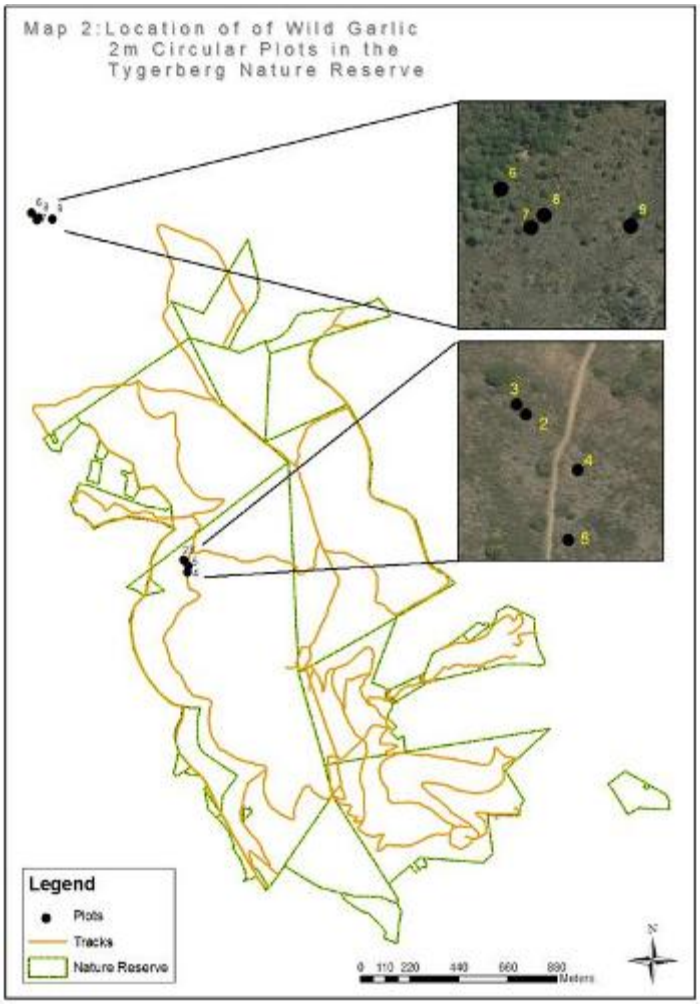
End of path/ burnt site: Waypoint: 3674 (367B)



Measurement tool 2: Circular plots

Waypoint on GPS	Plot No.	No. of individual garlic plants
3535-353B	Plot 1	125
3544-354B	Plot 2	116
3554-355B	Plot 3	293
3603-306B	Plot 4	28
3615-361B	Plot 5	58

		No. of cluster of garlic plants		
		Cluster<5	Cluster 5-20	Cluster>20
		1	**2**	**3**
3695- 369B	Plot 6	7	5	3
3704- 370B	Plot 7	11	7	1
3715- 371B	Plot 8	14	7	0
3734- 373B	Plot 9	18	4	0



Rondevlei Nature Reserve

(CoCT developed maps not included due to data sensitivity for locally resident *plant populations*)

Measurement tool 2: Circular plots

The *Haemanthus* species were found in colonies at the following waypoints:

WAYPOINT	SPECIES
3755	375B HAEMANTHUS
3764	376B HAEMANTHUS
3774	377B HAEMANTHUS
3784	378B HAEMANTHUS
3795	379B HAEMANTHUS
3805	380B HAEMANTHUS
3814	381B HAEMANTHUS
3823	382B HAEMANTHUS
3832	383B HAEMANTHUS
3842	384B HAEMANTHUS
3853	385B HAEMANTHUS

Within each waypointed colony specific individual plants counts for juvenile *Haemanthus* spp. were made and documented. These data were presented to CoCT.

Pelican Heights

Measurement tool 2: Circular plots

Various circular plots were located and recorded to establish population levels and reproduction of *Euphorbia*, *Kedrostis* and *Brunsvigia* spp.

The *Euphorbia caput medusa* species were found at the following waypoints:

Waypoint: 3873 (387B)

Waypoint: 3882 (388B)

The *Kedrostis* species was found at the following waypoint:

Waypoint: 3893 (389B)

The *Brunsvigia* species was found at the following waypoint:

Waypoint: 3903 (390B)