CHANGES IN DISTRIBUTION OF INDIGENOUS FOREST IN TABLE MOUNTAIN NATIONAL PARK FROM 1880 – 2012

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This thesis is submitted as an academic requirement for the fulfillment of an MSc in the Department of Biological Sciences
University of Cape Town

October 2013

Declaration

I know the meaning of plagiarism and declare that all of the work in the document, save for that which is properly acknowledged, is my own.

This work has not previously been submitted in whole, or in part, for the award of any degree. It is my own work, each significant contribution or quotation in this dissertation from the works of other people have been attributed, cited and referenced.

Yours Sincerely,

…………………………………………

Abstract

South Africa's indigenous forest only covers 0.56% of the country's total land area (Low & Rebelo, 1996). Its highly fragmented distribution and historically extensive exploitation has led it to be perceived as one of the South Africa's most vulnerable vegetation types. Despite this, forest remains one of South Africa's most under-researched ecosystems and the country has few dedicated forest ecologists.

This research examines changes in distribution of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest in Table Mountain National Park. Forest – Fynbos spatial ecotonal change and forest patch count was mapped from 1944 to 2008 using aerial photographs in ArcGIS 10. A full survey of species composition was undertaken and this dataset was used to produce an objective classification of the Cape Peninsula forests. Ground-based repeat photography was used to determine land cover change from 1880 to present with finer scale resolution. An analysis using transition matrices projects future land cover changes to 2050.

A total of 174 forest patches were identified in Table Mountain National Park. Total indigenous forest cover has increased by 65.3% from 1944 to 2008. This increase was predominantly visible within the Peninsula's Western Cape Afrotemperate Forest and the highest expansion rates were recorded in Orange Kloof and Blinkwater Ravine on Table Mountain. Only 13 of the forest patches surveyed decreased in cover after 1944. Most of these patches were areas of Western Cape Milkwood Forest located in proximity to expanding coastal development. This trend was also reflected in the repeat photography dataset. There has also been an increase in vegetation biomass recorded at all sites. Further research is required to determine whether these changes have caused a decrease in fynbos species diversity.

Non-parametric statistical analysis showed no correlation of forest change with variation in aspect, temperature, precipitation, geology, soils or fire frequency post 1975. These findings indicate that forest patches are influenced by localised ecological factors and suggests a dominant role for other drivers. Historical evidence indicates the key driver of forest expansion is vegetation recovery from past high fire frequency alongside the influence of current fire suppression policies. Increases in CO_2 may also be a contributory factor although localised variation in extent of forest expansion suggests that this is not the strongest driver of change. These results hold significance for the future ecological management of Table Mountain National Park in the face of changing climate.

Keywords: *Aerial Photography; Cape Peninsula; Climate Change; Land Cover Change; Repeat Photography; Table Mountain National Park; Temporal dynamics; Western Cape Afrotemperate Forest; Western Cape Milkwood Forest;*

Acknowledgements

There are a number of people to whom I would like to extend my thanks, without which completion of this research project would not have been possible.

Firstly, special thanks go to Professor Timm Hoffman for his role as both academic supervisor and mentor and for encouraging me to take the life-changing leap of moving to South Africa to pursue postgraduate study in Botany. Thanks also goes to him for unending patience, kindness and generosity as I negotiated my way through the rewarding but challenging journey that is a research Masters degree.

Thanks go to both the Plant Conservation Unit and Cameron Trust for contribution of funding. I would also like to thank other colleagues of both the Plant Conservation Unit and Department of Botany for their collaboration, advice, guidance and assistance. Particular mention should go to Associate Professor Lindsey Gilson and Dr. Rick Rohde for their academic input and to Anthea Stain and Sandy Smuts for impeccably organising our lives at UCT with the utmost kindness.

I would also like to extend special thanks to Stuart Hall, Eduard Smit, Darin Taitz, Ellen Fedele, Charmaine Lacock and Jane and Sebastian Wyngaard for their sterling field assistance. With pleasure and without complaint they accompanied me in all conditions from pouring rain to sweltering heat to the most obscure corners of Table Mountain National Park despite loose rocks, steep cliffs, electric fences, impenetrable fynbos, blister bush and closely-encountered venomous snakes.

Special thanks also go to Doug Euston-Brown for generous access to his Cape Peninsula forest GIS dataset. I would also like to thank SANParks for permission to work in Table Mountain National Park. Thanks goes to Zishan Abrahim at the Cape Research Centre for aerial photographs and GIS data, Natalie Kunz and Katya Mauff for statistical consultancy and all the staff at General Surveys and Mapping in Mowbray. Thanks also go to Tom Slingsby and Nick Lindenberg for GIS data and assistance with all my GIS queries, always answered with patience and a dry sense of humour.

Last but by no means least, special thanks go to my friends and family. Thanks to family and in particular my parents for their constant love, support and faith in all my endeavours, no matter the distance or challenge. Many thanks too to my friends, both in Cape Town and around the globe.

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Chapter 1: Introduction

1.1. Background & Rationale

The world's forests are major reservoirs of terrestrial biodiversity and provide vital ecosystem services (Venter & Venter, 2009). It is estimated that forests are home to two-thirds of the world's terrestrial species and cover nearly 30% of the earth's surface (The World Bank, 2008: pp. 1). In present debates on climate change, the world's forests are considered an integral part of climate mitigation owing to their carbon storage capacity. These discussions are increasing the focus upon the importance of effective forest conservation (Thompson et al. 2009). Indigenous forest covers approximately 0.56% of the land surface of South Africa (Low & Rebelo, 1996). This estimate varies according to the mapping criteria (for example minimum forest patch size) and method (satellite or aerial photographs) used (Mucina & Rutherford, 2006). It has a highly fragmented distribution, extending in an archipelago of patches from the Cape Peninsula at the south-western most point of the African continent to Limpopo in the north (Lawes et al. 2004a). South Africa's forests are among the most species-rich temperate forests worldwide (Lawes et al. 2004a). Forest species diversity increases across the country in a south-west to north-easterly gradient (Geldenhuys, 1992).

The Southern Afrotemperate Forest of the Western Cape Province is therefore relatively species-poor in comparison to the more extensive forests further north-east (Mucina & Rutherford, 2004). In consequence these forests are often seen as the poor neighbour of the highly biodiverse fynbos of the Cape Floristic Region (CFR) and can be at times neglected in research and conservation planning. The forests of Table Mountain National Park hold only 33 tree species (Pauw & Johnson, 1999: pp. 115). Despite this they are of high conservation importance (Alston & Richardson, 2006) and are home to several endemic species including two species of moss (Von Maltitz et al, 2003) numerous arthropods (Pauw & Johnson, 1999: pp. 140) and the critically endangered Table Mountain Ghost Frog (Pauw & Johnson, 1999: pp.145).

At present, the current spatial extent of the Western Cape Afrotemperate Forests has not been comprehensively mapped (Von Maltitz et al. 2003). In 2008 Euston-Brown was commissioned by SANParks to map the current distribution of the Cape Peninsula forests (Euston-Brown et al. 2008). However, there weren't sufficient resources available for all 212 of the TMNP forest patches recorded in the survey to be fully ground-truthed. A comprehensive assessment of the current spatial extent and distribution of the Cape Peninsula forests is long overdue. This is crucial for effective monitoring and future conservation management (Von Maltitz et al. 2003).

There is also currently a paucity of data available on forest distribution dynamics in TMNP. It is therefore not known whether the Peninsula forests are undergoing change or stasis. Recent research by Forsyth and Van Wilgen (2008) revealed that fire frequency in TMNP has increased since the availability of comprehensive fire records in 1975. These findings hold significance in the face of changing climate whereby fire frequencies in the CFR are projected to increase in response to future warming and increasing aridity (Midgley et al. 2001; Hannah et al. 2005; Bomhard et al. 2005). This has highlighted concern that the Peninsula's forests may decrease in spatial extent in response to decreasing fire intervals. However, further quantitative data on forest distribution dynamics is required to elucidate whether this will be the case. Similar trends have been predicted in response to global change drivers in other Mediterranean-climate forests in southern Europe (Morales et al. 2007).

There is also the likelihood of negative impact on forest owing to predicted decreases in rainfall. In South Africa areas of potential forest distribution are strongly governed by moisture availability. In the winter rainfall zone, forests only occur in areas that receive more than 525 mm/yr precipitation (Von Maltitz et al. 2003).

In contrast, several authors have recently expressed concern that Western Cape Afrotemperate Forest species are invading Peninsula Granite Fynbos and Peninsula Shale Fynbos on the Cape Peninsula in response to a long term absence of fire in some areas owing to expanding urban development (Mucina & Rutherford, 2006; Rebelo et al. 2010; Van Wilgen et al. 2012). Peninsula Granite Fynbos is a highly diverse vegetation type which is endemic to the Cape Peninsula. It is classified as an endangered vegetation type and 56% has already been transformed by urbanisation, vineyards and pine plantations (Mucina & Rutherford, 2006). Transformation and degradation owing to colonisation by Afrotemperate forest taxa further reduces the conserved area of this vegetation type and would represent a considerable threat to Cape Peninsula biodiversity (Mucina & Rutherford, 2006).

In 1993, Luger and Moll used aerial photographs to investigate changes in Western Cape Afrotemperate Forest distribution from 1933 to 1993 in Orange Kloof on Table Mountain. They discovered that the forest had doubled in extent since 1933 and long term fire exclusion was cited as the main reason for the observed changes (Luger & Moll, 1993). It is not known whether these trends are replicated elsewhere on the Peninsula. More research is urgently required to determine the temporal dynamics of Cape Peninsula forest distribution. This is vital to inform future forest and fynbos management in TMNP.

1.2. Project Aim

To investigate indigenous forest distribution change within Table Mountain National Park from 1880 to the present using historical aerial photographs and ground-based repeat photography.

1.3. Specific Objectives

This study has the following specific objectives:

- To map the contemporary and historic distribution and spatial area of all indigenous forest within Table Mountain National Park.
- To produce an objective classification of the forests of the Cape Peninsula
- To examine temporal dynamics of the forest-fynbos ecotone from 1880 to present
- To analyse the influence of ecological and abiotic drivers associated with forest distribution change.

1.4. Research Questions

This project addresses the following key research questions:

- What is the current spatial extent of indigenous forest in TMNP?
- How has forest distribution changed on the Cape Peninsula from 1880 to present?
- What are the key environmental drivers of forest – fynbos ecotonal change in TMNP?

1.5. Thesis Structure

The first chapter of the thesis provides the background and rationale, introduces the aim and objectives and poses key research questions for the project. Chapter 2 presents a detailed literature review encompassing an environmental history of South African indigenous forest, determinants of forest distribution and associated drivers of change. Chapter 3 offers a detailed synthesis of the study site including location and regional context, regional topography and hydrology, geology and soils, regional climate, fire history, regional biodiversity and key vegetation types.

Chapter 4 presents a classification of the Cape Peninsula forests and analyses the aerial photograph dataset. This component of the project examines changes in distribution of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest from 1944 to 2008. It includes non-parametric statistical analysis of potential associated drivers of forest distribution change. Chapter 5 examines land cover change on the Cape Peninsula using ground-based repeat photography. Use of this technique expands the temporal viewpoint back to 1882 and presents a finer scale analysis of vegetation change. An analysis using transition matrices projects future land cover changes to 2050. Chapter 6 presents the synthesis and research conclusions, reflects upon the project aims and objectives and details directions for future research. To conclude the thesis, all references used are presented. All repeat photographs with associated metadata are presented in Appendix I and Appendix II details all woody taxa from the forests of the Cape Peninsula.

Chapter 2: Literature Review

2.1. Indigenous forests of South Africa

The indigenous forests of South Africa are among the most species-rich temperate forests in the world (Lawes et al. 2004a). They have a naturally highly fragmented distribution (Everard et al. 1995; Rivers-Moore et al. 2003) covering only 0.56% of the country (Rutherford & Westfall, 1986). South Africa's forests extend in a scattered archipelago of patches from the Cape Peninsula at its south-western most extent through the southern and eastern parts of the country to Limpopo in the far north-east (Von Maltitz et al. 2003). Indigenous forest extends as far inland as the Great Escarpment (Granger, 1984) and as far north-west as Oorlogskloof near Nieuwoudtville in Namaqualand (Von Maltitz et al. 2003). The most extensive forests in the country are found on the southern coast along the Garden Route around Knysna and Tsitsikamma (Midgley et al. 2003).

At present, most forest patches in South Africa are managed as conservation areas (Mucina & Rutherford, 2006). The National Forest Act (Act No 84 of 1998) requires that the South African Government protects all natural forests on private, communal and state land (Von Maltitz et al. 2003). In cases where forest areas are isolated from fire by urban development expansion at the forest margin has occurred (Mucina & Rutherford, 2006). However, some forest areas (particularly in the vicinity of poor developing rural communities) are impacted by wood harvesting for fuel and building materials and extensive bark harvesting for medicinal use (Alston & Richardson, 2006; Euston-Brown et al. 2008; Mucina & Rutherford, 2006). Poor management practices can also be a problem (Corrigan et al. 2010).

Variation in climate, altitude, latitude and topography has resulted in a diversity of forest types across South Africa (Von Maltitz et al. 2003). Forest can be found from the hot Kwa-Zulu Natal coastal plain to the frost and snow prone valleys of the Drakensberg Mountains (Von Maltitz et al. 2003). The National Vegetation Map of South Africa (Mucina & Rutherford, 2006) recognises twelve different forest groups: Southern Afrotemperate Forest, Northern Afrotemperate Forest, Southern Mistbelt Forest, Northern Mistbelt Forest, Scarp Forest, Southern Coastal Forest, Northern Coastal Forest, Sand Forest, Ironwood Dry Forest, Lowveld Riverine Forest, Swamp Forest and Mangrove Forest. These forest groups are subdivided into a total of 26 different forest types (Mucina & Rutherford, 2006). Forest species diversity increases in a south-west to north-easterly gradient across South Africa (Geldenhuys, 1992). This trend is thought to reflect plant migration patterns or significant climatic filtering (extinctions associated with Pleistocene climate changes) at high latitudes (Geldenhuys, 1992; Von Maltitz et al. 2003; Midgley el al. 2003).

In the Cape Floristic Region where this research is based, forest is predominantly an intrazonal vegetation type which occurs as fragmented patches within fynbos (Mucina & Rutherford, 2006). There are very few species in common between the two vegetation types (Campbell & Moll, 1977; Hylander & Hedderson, 2007). These patches vary but a significant proportion are less than 1 ha in size. Research has shown that despite their diminutive size, these smaller forest patches still support the full suite of ecological processes necessary for ecosystem integrity. It is thought that this is because the organisms present in these forests evolved under fragmented conditions (Kotze & Lawes, 2007).

Despite this, many smaller forest patches have been excluded from the Mucina and Rutherford (2006) South African National Vegetation Map owing to the mapping scale being too coarse for their inclusion (Euston-Brown et al. 2008). In consequence, there are some areas where forests remain very poorly mapped (Von Maltitz et al. 2003; Euston-Brown et al. 2008). This is particularly the case in the Western Cape where there are hundreds of small forest patches scattered through the more remote reaches of the Cape Fold Mountains (Von Maltitz et al. 2003). Mapping with accuracy from aerial photographs is challenging owing to the likelihood of mistaking stands of alien vegetation for indigenous forest. Knowledge of the distribution and extent of South Africa's forests is still far from comprehensive and it is important to know this baseline information to monitor any future changes or degradation (Von Maltitz et al. 2003). This is particularly relevant in the face of changing climate and its associated projected increases in aridity (Hannah et al. 2005).

2.2. The Cape Peninsula Forests: An Introduction

The indigenous forests of the Cape Peninsula form the south-western most tip of the Afromontane Archipelago, which extends from Kenya and Ethiopia in the north southwards across the African continent (White, 1978; Grimshaw, 2001). In comparison to the surrounding fynbos, the Peninsula forests are relatively species poor and are home to only 33 tree species (Moll & Scott, 1981; Pauw & Johnson, 1999: pp. 115). Indigenous forest only covers 3% of total land area on the Cape Peninsula (Cowling et al. 1996; Alston & Richardson, 2006).

In common with the rest of the country, the Peninsula forests have a highly fragmented distribution (Euston-Brown, 1991). A total of 93% of Cape Peninsula forest patches are less than 10 ha in size and 45.7% are less than 0.5 ha in size (Euston-Brown, 1992). The recent work of Euston-Brown et al. (2008) initiated the process of mapping forest distribution and found a total of 212 patches covering a total area of 1776 ha. However, resources available weren't sufficient to ground-truth all forest patches described in the study and so more work is needed to complete the mapping process with greater accuracy. A total of 75% of the Cape Peninsula's indigenous forest cover is found on Table Mountain (Euston-Brown, 1992). The most extensive areas of forest on the Peninsula are found in Orange Kloof on the Back Table and on the lower eastern slopes of the mountain at Newlands and Kirstenbosch (McKenzie et al. 1977).

The South African National Vegetation Map recognises two different types of forest on the Peninsula: Western Cape Afrotemperate Forest and Western Cape Milkwood Forest (Mucina & Rutherford, 2006). Western Cape Afrotemperate Forest forms the majority of forest cover and it is most commonly found growing inland in sheltered fire refugia with high moisture availability such as rocky boulder screes and mountain kloofs (Campbell & Moll, 1977; McKenzie et al. 1977; Von Maltitz et al. 2003). Common taxa in this forest type on the Peninsula include *Podocarpus latifolius*, *Rapanea melanophloeos*, *Ocotea bullata*, *Cassine peragua*, *Kiggelaria africana*, *Ilex mitis* and *Cunonia capensis*. The latter species is a palaeoendemic with a highly limited distribution in the Cape. Its nearest relatives in the same genera are found in New Caledonia (Von Maltitz et al. 2003). The Cape Peninsula's Western Cape Afrotemperate Forests are also home to several endemic species which are listed in section 1.1.

Western Cape Afrotemperate Forest is predominantly found at mesic sites on the southern and eastern slopes of Table Mountain (Campbell & Moll, 1977) but there are scattered patches found further south along the Cape Peninsula including on the lower slopes of Noordhoek Peak, in the Kalk Bay Mountains and Baviaanskloof above Simonstown (Euston-Brown et al. 2008). The southernmost patch of Western Cape Afrotemperate Forest on the Peninsula is found at Bordjiesdrif in the Cape of Good Hope Section of TMNP (Fraser & McMahon, 1994: pp. 82).

Western Cape Milkwood Forest has much lower species diversity than the Peninsula's Western Cape Afrotemperate Forest and is found in scattered patches along the coastline growing on deep sand dunes where groundwater seeps are present (Mucina & Rutherford, 2006). This forest type is often classified as coastal thicket when it attains a canopy height of less than four metres (Cowling et al. 1996). On the Peninsula Western Cape Milkwood Forest is dominated by *Sideroxylon inerme* (White Milkwood) which is a tree of subtropical provenance (Von Maltitz et al. 2003). Other species commonly present in this forest type (which are usually found on the seaward side of the forest patch) include *Cassine maritima*, *Euclea racemosa*, *Olea exasperata* and *Maurocenia frangula* (Pauw & Johnson, 1999: pp. 116). The latter tree species has a highly limited distribution and only occurs on the Cape Peninsula and northwards to Melkbostrand on the West Coast (Coates-Palgrave, 2003).

2.3. Historical Distribution of Forest on the Cape Peninsula

There has been considerable debate in the forest biome literature about extent of historic exploitation of trees by early colonists after the arrival at the Cape of Van Riebeeck in 1652. Available historical evidence on past forest distribution on the Peninsula prior to 1800 is patchy in nature and highly contradictory (McKenzie et al. 1977; Joubert, 1991). The available evidence is limited only to written historical accounts prior to the invention of photography in the early 19th century. It is extremely challenging to deduce only from these sources exactly how extensive the Peninsula forests were at the time of Jan Van Riebeeck's arrival at the Cape in 1652. It was widely believed by earlier authors that the contemporary scattered fragments of forest on the Cape Peninsula are remnants from previously far more extensive areas of cover (Spilhaus, 1950; Von Breitenbach, 1974; McKenzie et al. 1977; Campbell & Moll, 1977; Masson & Moll, 1987).

It was deduced from written historical documents that there was once a swathe of forest that extended all the way from Orange Kloof on the southern slopes of Table Mountain which ran south-west following the course of the Hout Bay River right down to the shores of Hout Bay itself (Spilhaus, 1950). Newlands Forest was also thought to be considerably more extensive prior to exploitation for timber (Spilhaus, 1950). It has been suggested that this forest was cleared in the first 50 years after arrival of the first European settlers in 1652 (Sim, 1907; Jackson, 1980). The evidence to support this theory certainly seems compelling and it is easy to understand how it has been so widely perpetuated in the historic and scientific literature.

Van Riebeeck originally arrived at the Cape to establish a victualling station for the ships of the Dutch East India Company (Appel, 1966). At the time of his arrival he had been given instructions to provide the ships with both fresh produce and firewood (Steytler & Nieuwmeyer, 1985). Two months after his arrival in June 1652, Van Riebeeck reported the discovery of substantial forests on and around Table Mountain (Appel, 1966). This timber would have been a highly desirable commodity owing to the needs of the ship's galleys for firewood. A fleet of twenty ships would have required 1,000 wagonloads of wood (Steytler & Nieuwmeyer, 1985).

However, Van Riebeeck concluded initially that it would be so difficult to cut and fetch the wood that it would be cheaper to import it from Holland (Spilhaus, 1950). Unfortunately for him the paucity of ships making the journey to the Cape meant that the demand for wood could not be met in this manner (Spilhaus, 1950). He then sent a party of men down to Hout Bay where they found fine timber about 5,000 yards from the beach (Spilhaus, 1950). It is likely that this refers to the forests of Orange Kloof. However, the problem of transporting the harvested timber arose again because the way to Hout Bay from Cape Town was described as being hilly, mountainous and swampy (Spilhaus, 1950). A few months later in September, Van Riebeeck found more easily accessible forest in the vicinity of

Newlands. The next piece of historical evidence of early exploitation of the Peninsula forests dates from 1653 and is an illustration of sawyers battling with a two wheeled cart drawn by oxen transporting harvested timber (Spilhaus, 1950).

In 1657 a freeman sawyer, Leendert Cornelisz was granted a concession to cut timber in the forests around what is now Kirstenbosch and riparian forests along the Liesbeeck River were being cut for firewood (Steytler & Nieuwmeyer, 1985). Timber harvesting was by then so widespread that the settlers had to start exploiting forest elsewhere on the Peninsula to meet the demand (Spilhaus, 1950). In 1662 a locally built ship was sent to Hout Bay to collect firewood which Van Riebeeck called "the finest forest in the world" (Steytler & Nieuwmeyer, 1985). In 1687 Simon Van Der Stel inspected what is now Simons Bay and reported the presence of adequate timber to supply the settlement for many years and opened the area for harvesting (Spilhaus, 1950).

A few years later Commissioner Jansen Van Reede was heard to lament the overexploitation of forest at Hout Bay and expressed dismay at the greed and lack of foresight of those responsible (Steytler & Nieuwmeyer, 1985). In 1699 Adriaan van der Stel stated that the Peninsula forests contained no more usable timber (Steytler & Nieuwmeyer, 1985). In 1772, Thunberg wrote: "There are no forests in the vicinity of the town, except a few small ones high up in the clefts of the mountain" (Quoted in Campbell & Moll, 1977). Sim (1907) also talks about extensive destruction of indigenous forest lands by fire.

However, the point was raised by McKenzie et al. (1977) that detailed scientific information with sufficient temporal depth is not available and it is therefore impossible to tell exactly how extensive the Peninsula forests were in the past. Available descriptions of the early vegetation of the Cape are very sketchy and limited to vague accounts written by sailors while en route to the West Indies from Europe (Joubert, 1991). In 1785 Sparrman commented that these descriptions weren't often reliable because after months at sea they tended to overpraise the 'greenery' of the Cape (Joubert, 1991).

The perception that most of the Peninsula forests were remnant fragments that escaped from past exploitation by inaccessibility is perpetuated by the naturally fragmented distribution of this vegetation type and its tendency to occur in fire refugia such as high mountain kloofs and rugged scree slopes. It was widely assumed that forest was present only in small fragments on scree slopes and in inaccessible kloofs because those were the areas that the early settlers couldn't get to for harvesting timber (Steytler & Nieuwmeyer, 1985). This was prior to the currently accepted understanding that forest is situated in these habitats as a refuge from fire which in association with local topography and prevailing fire-bearing wind direction delimits its distribution (Geldenhuys, 1994; Geldenhuys, 2000; Manders, 1990).

A considerable number of seminal forest ecology papers were written in the 1970s and early 1980s (McKenzie et al. 1977; Campbell & Moll, 1977) prior to the development of a comprehensive understanding of both forest distribution and fynbos fire ecology. One of the key misconceptions that contributed to the hypothesis of the Peninsula being covered in forest until arrival of the first Dutch colonists at the Cape was the belief that fynbos was a successional stage to forest and that thousands of years of destructive burning had eliminated the tree component from the fynbos (McKenzie et al. 1977). It wasn't until the work of the Fynbos Biome Project and particularly of Manders et al. (1992) that it was fully understood and accepted that fynbos and forest were two different ecosystems with different disturbance regimes and that the former was not a degraded form of the latter.

We will never know the extent to which Van Riebeeck's 'tall tales' of extensive swathes of forest on the Cape Peninsula in the 1600s were true. Current knowledge of forest and fynbos ecology suggests that some earlier authors may have misinterpreted and exaggerated the historical evidence to reach the wrong conclusions. The truth of the original baseline state prior to colonisation lies in most likelihood somewhere between Sim's (1907) perception of destruction of extensive forests and a Cape Peninsula that naturally has numerous small fragmented patches of forest which remain so to this day.

2.4. Determinants of Forest Distribution

There has been a considerably body of South African forest literature dedicated to the task of finding out where forests grow and why. Conflicting opinions abound with regard to the relative influence of different abiotic factors in driving forest distribution patterns. More recent research has concluded that both potential forest distribution and actual forest cover are influenced by a variety of factors and that no one driver is dominant (Midgley et al. 2003; Corrigan et al. 2010; O'Connor, 2010) Literature on this topic will be reviewed and areas for further research highlighted.

Moisture availability has often been cited as a key determinant of forest distribution (Masson & Moll, 1987). Most forest patches on the Cape Peninsula are found where there is a mean annual rainfall of greater than 650 mm/yr (Manders, 1990; Trinder-Smith, 2006). Indigenous forest occurs in both winter and summer rainfall parts of South Africa (Granger, 1984). However, there are thought to be different climatic thresholds which determine its potential distribution in each rainfall area (Van Daalen, 1981). Rutherford and Westfall (1986) suggest that potential forest habitat is characterised by a lower limit in annual rainfall of 725 mm in summer rainfall areas and 525 mm in winter rainfall areas. However, some areas which are outside these lower limits can support forest owing to additional moisture from mist and fog (Midgley et al. 2003). Forest patches are also commonly found in association with seeps and in the riparian zone of streams and rivers (Manders et al. 1992).

There is unfortunately little data available on the influence of temperature on potential Afrotemperate forest distribution, particularly with regard to cold and frost tolerance of different forest taxa. By extension, it is not known where climatically-defined upper altitudinal limits for South Africa's forests lie (Midgley et al. 2003). There is also conflicting information about the influence of geology and associated soils on potential forest distribution. Initially it was thought that forest predominantly occurs on granite and shale-derived soils with higher clay content owing to their greater depth and higher levels of fertility (McKenzie et al. 1977; Campbell & Moll, 1977; Masson & Moll, 1987; Trinder-Smith, 2006). The currently accepted view is now that forest distribution is not delimited by geology and forest is found growing on soils derived from a variety of lithologies (Von Breitenbach, 1974). However, geology does influence forest patch species composition and structure (Mucina & Rutherford, 2006).

One of the most important determinants of forest distribution is presence or absence of fire (Granger, 1984; Schmidt & Vlok, 2002; Midgley et al. 2003). Forest is most often found in areas where fire is excluded, often in natural fire refugia created by landscape topography (Granger, 1984). This may include narrow-sided mountain kloofs, refugia between groups of rocks or deeply weathered cracks in the rock such as Tranquillity Cracks on Table Mountain or boulder screes (Von Maltitz et al. 2003). The role of fire in determining the forest ecotonal boundary is discussed in more detail in section 3.5.

Research by Geldenhuys (1994) in the Southern Cape forests has shown that prevailing wind direction during dry weather and landscape topography interact to determine fire pattern in the landscape, which in turn has been found to influence forest distribution in this region (Geldenhuys, 1994). In the

Southern Cape during autumn and winter, hot and desiccating bergwinds are common. Local topography strongly influences the direction and strength of bergwinds with prevailing wind direction changes occurring due to mountain ridges and winds being channelled down valleys (Geldenhuys, 1994). In areas that are most exposed to bergwinds, fires burn more frequently (Geldenhuys, 1994). This research also found that forests on the coastal platform more commonly persist in bergwind shadow areas (Geldenhuys, 1994).

On the Cape Peninsula forest distribution is thought to be influenced in a similar way by hot, dry summer south-easterly winds (Geldenhuys, 2000). Forest is widespread on the Peninsula but is thought to survive long term predominantly in fire-bearing wind shadow areas occurring due to topographic heterogeneity in the landscape (Geldenhuys, 2000). At the smaller scale these wind shadow areas may be created by shallow valleys or in rocky areas (Geldenhuys, 2000). During a major fire event in June 1999, the fire was observed to burn around or jump across the Spes Bona Forest and Amazon Forest at Silvermine (Geldenhuys, 2000). At a much larger scale, most of the larger forest patches on the Peninsula, including Orange Kloof, Newlands and Kirstenbosch forests, occur in the most wind sheltered areas, with urban development (particularly the M3 freeway) contributing further to creating fire shadow areas where forest can expand into the surrounding fynbos unchecked by regular fires (Geldenhuys, 2000).

2.5. Drivers and Processes of Forest Ecotonal Change

Climate is one of the strongest determinants of potential forest distribution, particularly at the macroscale, but it is fire that is the most important driver of forest temporal ecotonal change (Midgley et al. 2003). Fire is referred to by Bond (2003) as ‘a generalist herbivore’. In keeping with this metaphor, forest vegetation is not one of the main constituents of its diet owing to low flammability (Van Wilgen et al. 1990). Forest will rarely burn and only under exceptional circumstances after prolonged periods of drought or if fire is driven into a forest patch by strong bergwinds during periods of high temperature (Geldenhuys, 1994).

However, in the CFR forest is surrounding by fire prone and fire dependent fynbos which burns at regular intervals (Van Wilgen, 2012). Fire (the generalist herbivore) will instead nibble at the edges of the forest patch and act as an important determinant of the forest-fynbos ecotone (Manders, 1990; Midgley et al. 2003). Frequency and intensity of fire governs whether forest patches expand or contract in size over time (Manders et al. 1992; Luger & Moll, 1993). Frequent and intense fires will erode the forest edge while infrequent and cool fires cause the forest patch to expand and new forest to develop if the surrounding conditions are favourable (Schmidt & Vlok, 2002). If fire is excluded from the forest margins for a significant length of time, forest can invade the adjacent biome (Van Daalen, 1981; Luger & Moll, 1993; Midgley et al. 2003).

There are numerous forest species that are also components of adjacent fire-prone fynbos, including species of *Diospyros*, *Euclea*, *Maytenus*, *Olea* and *Rhus*. After long term absence of fire, these trees and shrubs become taller, expand vegetatively and eventually suppress senescent fire-dependent vegetation in the vicinity (Manders et al. 1992; Midgley et al. 2003). After long term fire exclusion the forest-fynbos ecotone will become far less well-defined (Schmidt & Vlok, 2002). There are numerous forest taxa that have fleshy fruits (such as *Cassine peragua*) that form an important component of the diet of birds and fruit-eating bats. Both act as important vectors of seed distribution for afrotemperate forest species (Masson & Moll, 1987; Manders & Richardson, 1992; Pauw & Johnson, 1999: pp. 130).

Large shrubs in the vicinity of forest patches (which become more common in fynbos vegetation after long term absence of fire) act as perches for birds as they deposit digested fruit and seeds underneath (Midgley et al. 2003). Initially this creates a mosaic of fynbos with forest taxa scattered throughout the vegetation (Euston-Brown et al. 2008). With time, groups of seedlings of forest trees establish around well-used 'perch shrubs' which initiates a nucleation process (Manders & Richardson, 1992). In fire shadow areas this process eventually allows new forest patches to form within the adjacent fynbos (Van Wilgen et al. 1990; Manders & Richardson, 1992; Midgley et al. 2003).

Chapter 3: Study Site

3.1. Table Mountain National Park

The material reviewed and presented in this chapter provides a broad-based contextual background to the study site. Firstly the study site of Table Mountain National Park is presented within its geographical context in section 3.1.1. This leads into a review of the literature encompassing the key ecological parameters controlling forest distribution and drivers of forest ecotonal change on the Cape Peninsula. This includes regional topography and hydrology, geology and soils, regional climate and fire history. To conclude the chapter introductory reviews of the Cape Peninsula’s regional biodiversity and main vegetation types are also presented.

3.1.1. Location and Regional Context

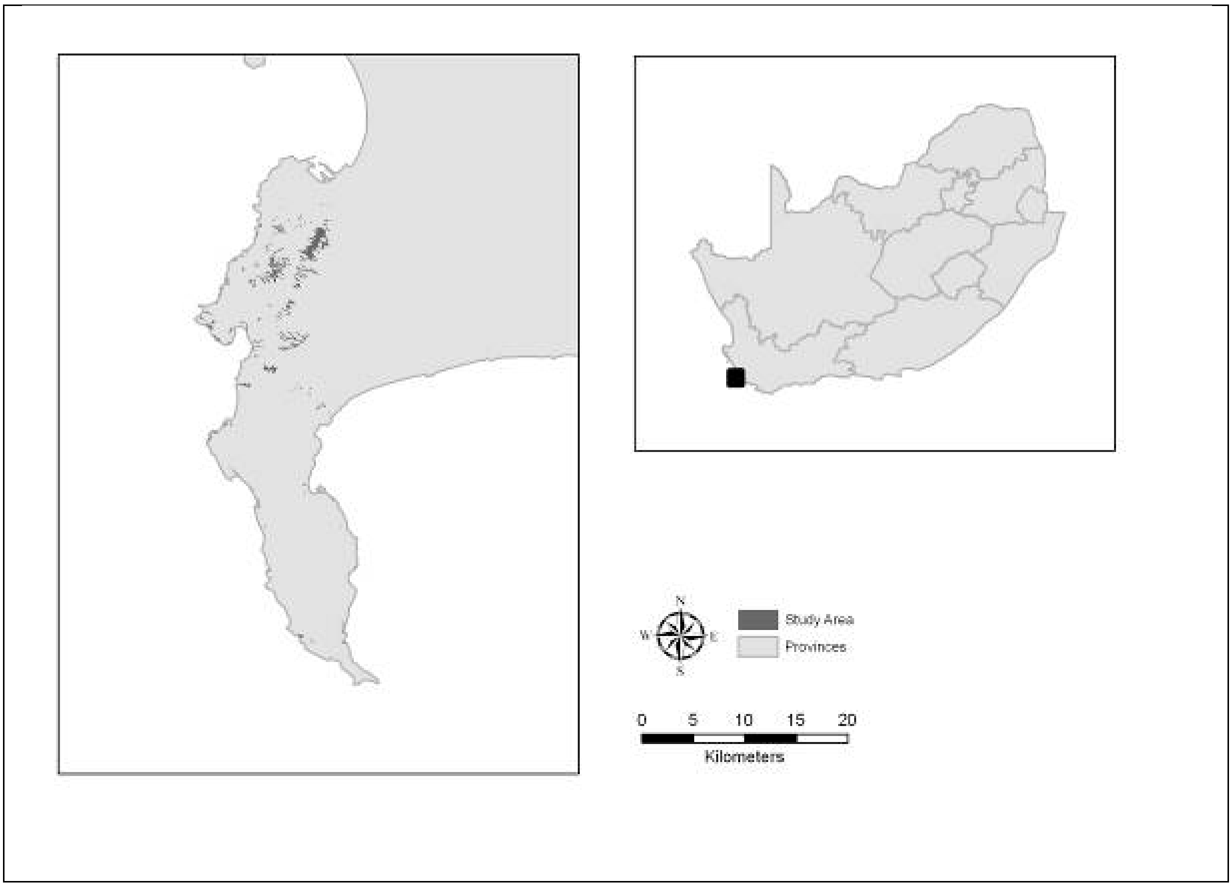

Figure 3.1: Location of Table Mountain National Park (Cape Peninsula) within the context of South Africa. Shaded areas show distribution of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest on the Cape Peninsula.

The area encompassed by this study is Table Mountain National Park (TMNP) on the Cape Peninsula in South Africa. The Cape Peninsula is a rugged and mountainous area of 470 km^2 in size at the south-western tip of the African continent (Cowling et al. 1996). The Peninsula Mountain Chain of TMNP lies within the City of Cape Town, which is one of the largest urban areas in South Africa (Anderson & O’Farrell, 2012). At present, 17% of the City of Cape Town area is formally conserved within TMNP (Rebelo et al. 2010).

3.1.2. Regional Topography and Hydrology

The Cape Peninsula is characterised physiographically by extreme topographic heterogeneity (Cowling et al. 1996). The landscape is dominated by the Peninsula Mountain Chain, which extends 50 km from Table Mountain in the north to Cape Point at the southernmost tip (Trinder-Smith, 2006). The highest point is Maclear’s Beacon on Table Mountain (1,086m asl.) above the sheer scarp face of the Front Table (Theron, 1984). Southwards of Table Mountain, the high peak of Constantiaberg (928m) rises above the Silvermine section of Table Mountain National Park (Cowling et al. 1996). Here the less rugged Kalk Bay Mountains are characterised by their extensive cave networks and *Podocarpus*-dominated Afrotemperate forest (Euston-Brown et al. 2008). On the southern Peninsula in the Cape of Good Hope section of TMNP the landscape encompasses the low sandstone plateau (c. 150m asl.) of the Smitswinkelvlakte with areas of Quaternary sand dunes.

The rivers, streams and wetlands of the Cape Peninsula play a pivotal role in structuring ecological communities. Most drainage channels begin at source in the seeps of the Peninsula’s high mountain plateaus (Brown & Mangoba, 2009). Orographic precipitation and cloud provide a regular source of water which is absorbed by the waterlogged and nutrient-poor peats which characterise this habitat (Pauw & Johnson, 1999: pp. 134). Where seeps occur in conjunction with topographic fire refugia, small patches of Western Cape Afrotemperate Forest (Mucina & Rutherford, 2006) are often found. Most streams on the Cape Peninsula are seasonal with exception of those that drain the forested eastern and southern slopes of Table Mountain where rainfall is higher (Pauw & Johnson, 1999: pp. 134). Streams with sandstone catchments have brown polyphenol-stained acidic water. Their ecological communities are therefore pH sensitive and levels of faunal endemism are high (Pauw & Johnson, 1999: pp. 136).

3.1.3. Geology and Soils

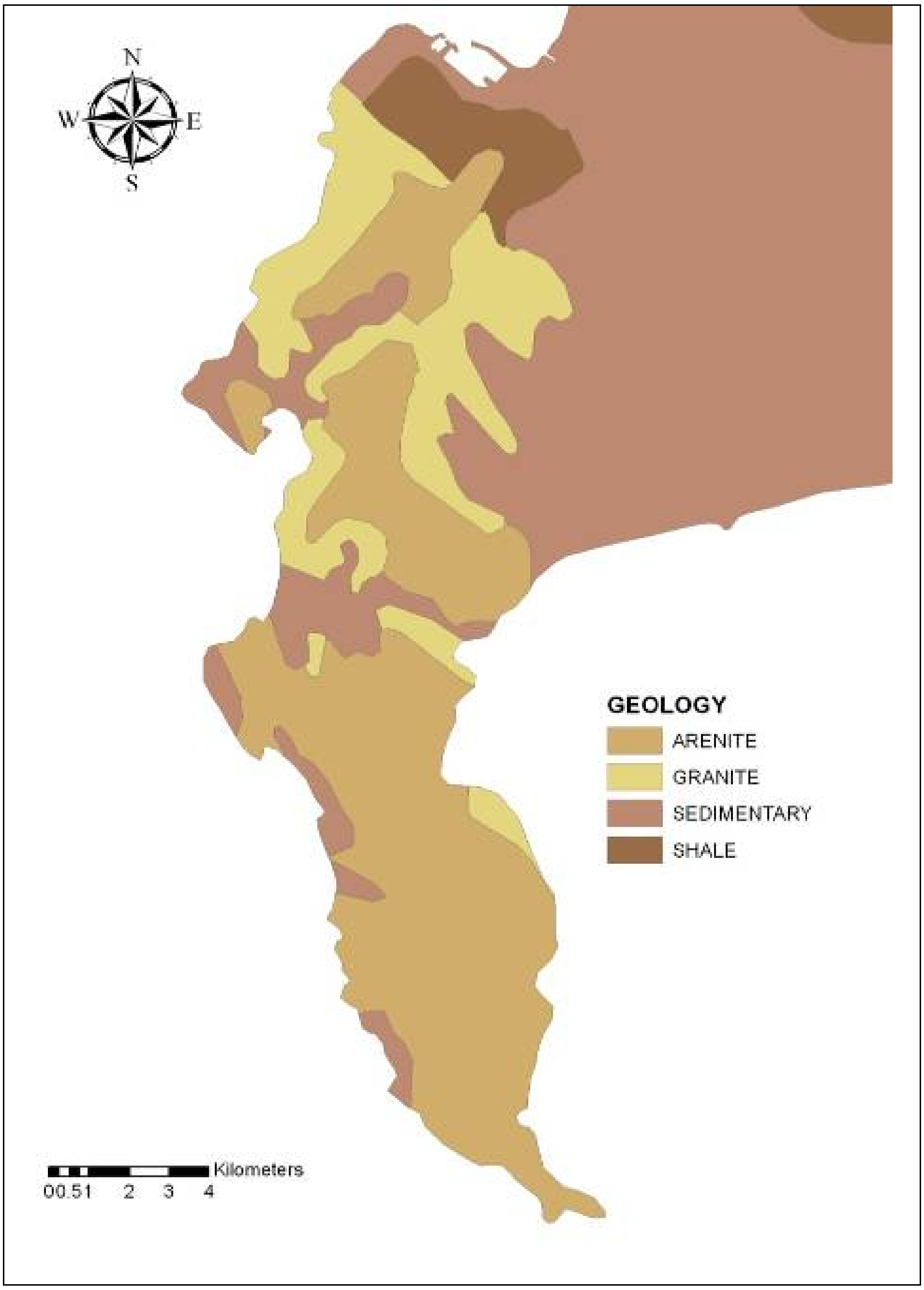

Figure 3.2: Geological map of the Cape Peninsula (after Theron, 1984).

The oldest rocks exposed on the Cape Peninsula are the Malmesbury Group (Theron, 1984). This formation consists of alternating grey phyllite shale and siltstone and massively bedded medium to fine-grained quartzitic greywacke (Theron, 1984). This geology is predominantly exposed along the Cape Peninsula coastline, on the lower slopes of Devil's Peak and on Signal Hill (Pauw & Johnson, 1999: pp. 30). The 500 mya Cape Granite Suite consists of two major plutons: The Cape Peninsula Pluton and the Kuilsriver – Helderberg Pluton (Theron, 1984). The contact point with the Malmesbury Group country rock is most clearly visible at Three Anchor Bay in Seapoint (Compton, 2004).

Following the emplacement of the Cape Granite Suite, there is a 30-40 million year unconformity prior to the deposition of the overlying quartzitic sandstones of the Cape Supergroup between 510 and 340 million years ago (Cowling et al, 1996). The oldest rocks of this group are the Graafwater Formation, which outcrop most notably on the lower front face of Table Mountain and on Devil's Peak (Theron, 1984). It consists of interbedded red to purple siltstones, sandstones and shales (Deacon, 1983). The transition to the medium to coarse-grained quartzitic sandstones of the Peninsula Formation may represent a change to a large, rapidly flowing braided river system (Theron, 1983).

Outcrops of the younger Pakhuis Formation are limited to a small area between Platteklip Gorge and Maclear's Beacon on Table Mountain (Compton, 2004). These deposits are thought to be early Ordovician in age (Theron, 1984). It consists of a yellow-brown, massively weathering gritty sandstone (Theron, 1984). It contains erratics which display faceting and striations which indicate deposition at the snout of a melting glacier (Compton, 2004). At the time of deposition the Cape Basin was at the margin of an extensive Gondwana ice sheet. This was centred in central Africa and there were at least two major ice advances during this period (Deacon, 1983).

The most common soils on the Cape Peninsula are grey, leached and nutrient impoverished acidic sands derived from the Peninsula Formation quartzitic sandstones (Cowling et al.1996). They are predominantly well-drained; however there are extensive areas of impeded drainage on the upper plateaux of Table Mountain (Cowling et al.1996). In areas greater than 600 m in altitude where winter rainfall is high, sands of very high acidity can be found that contain high levels of organic matter (Cowling et al.1996).

The soils of the Cape Peninsula on Cape Granite Suite substrate are very different in character. They are heavier, orange and red in colour as well as being less acidic and more nutrient rich (Cowling et al.1996). The orange colour is most pronounced when there is a high quantity of reworked ferricrete present in the soil profile (Cowling et al.1996). Loams are the most common soils on the Malmesbury Group geology where there is no Quaternary sand overburden. This is most notable on Signal Hill, Tygerberg Hill and Bottlaryberg Hill (Compton, 2004). These soils commonly contain small nodules of ferricrete, fragments of vein quartz as well as a variable proportion of sand grains (Theron, 1984).

Along Cape Town's larger river courses soils become a more sandy loam graduating to the more typical Cape Peninsula grey acidic sands with distance from the river channel (Theron, 1984). However, in Rietvlei and on the lower course of the Diep River brown calcareous clay soils predominate (Theron, 1984). More peat-rich black clay soils can be found bordering the Hout Bay River as well as the upper parts of the Keyser and Diep Rivers in the Wynberg – Constantia area. These deposits can be up to several metres in depth (Theron, 1984).

3.1.4. Regional Climate

According to the Koppen classification, the Cape Peninsula experiences a Mediterranean type climate (Joubert, 1991). It lies within the winter rainfall zone of South Africa (Cowling et al.1996) and receives 70% of its annual precipitation between May and September (Trinder-Smith, 2006). At this time of year low pressure cells move eastwards off the south Atlantic in association with rain-bearing frontal systems (Pauw & Johnson, 1999: pp. 34). These occur with a frequency of at least one per week during the winter months (July-August) (Cowling et al.1996). Initial signs of an incoming cold front include the presence of high cirrus clouds in the upper atmosphere and strong north-westerly winds (Pauw & Johnson, 1999: pp. 34). Sometimes berg winds from the interior can also occur which can cause rapid increases in temperature. On a winter morning in 1985 the temperature rose from 3°C to 27°C in only five minutes (Pauw & Johnson, 1999: pp. 35).

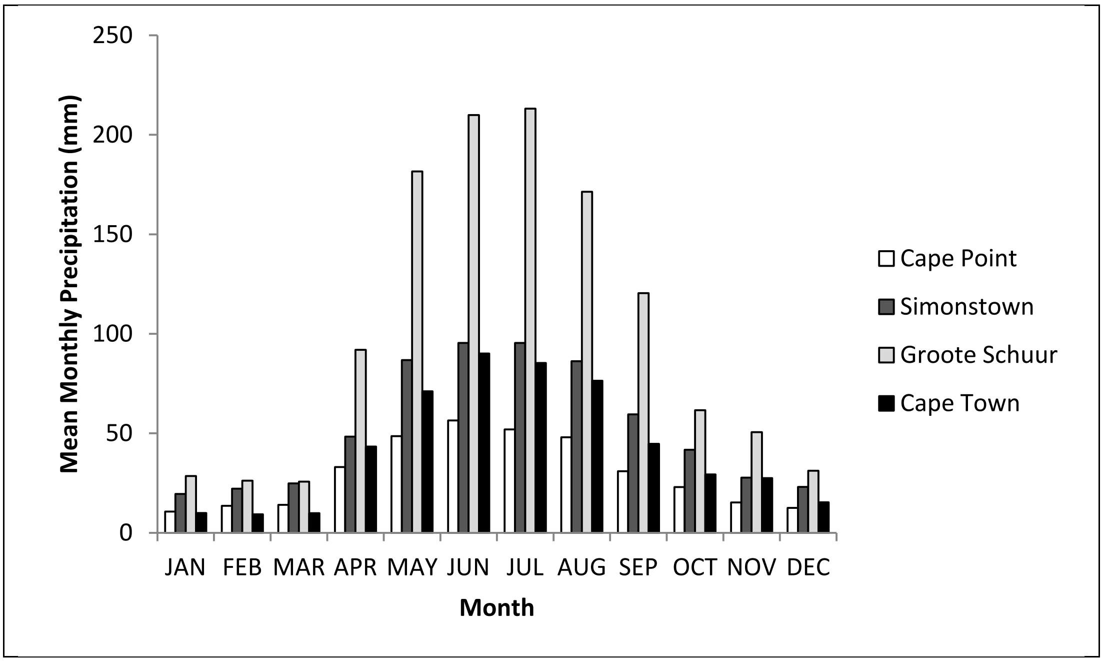

Figure 3.3: Mean monthly precipitation rates throughout Table Mountain National Park (Data sourced from the South African Weather Service).

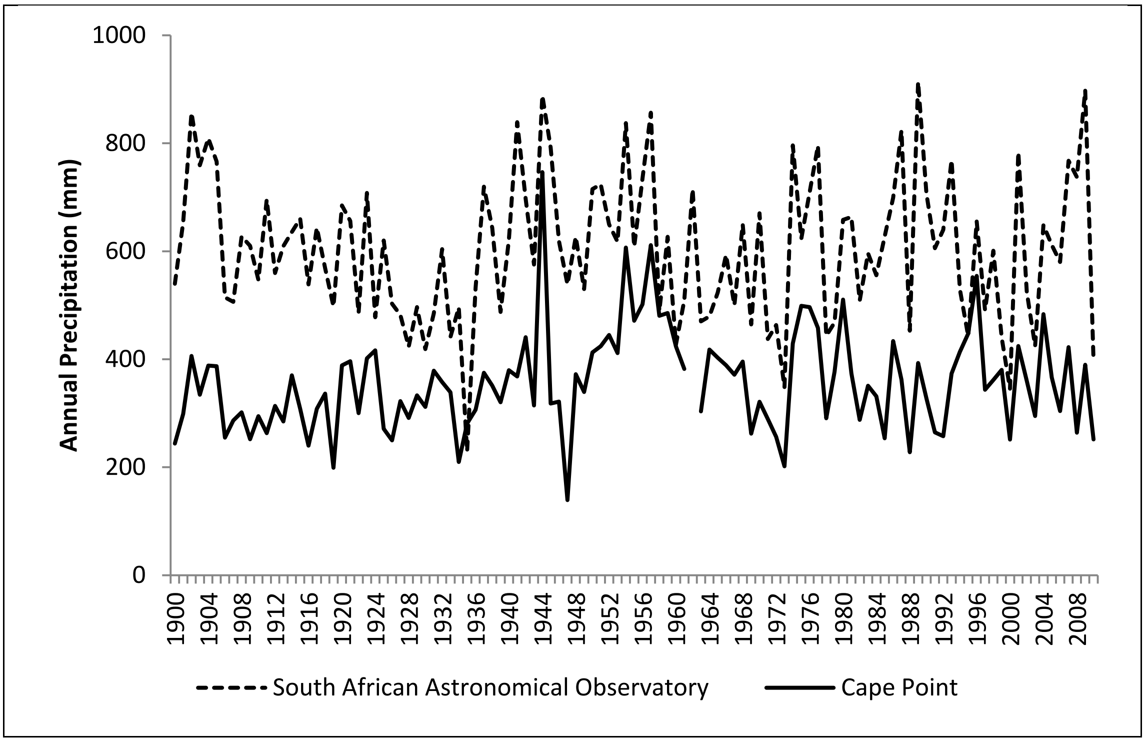

Figure 3.4: Annual precipitation rates for the Cape Peninsula from the South African Astronomical Observatory and Cape Point, Table Mountain National Park from 1900 – 2010 (Data sourced from the South African Weather Service).

The Cape Peninsula has exceptionally steep gradients in precipitation which are caused by the high topographic heterogeneity of the area (Trinder-Smith, 2006). This diversity in precipitation levels can be seen above in Figure 3.3 with much higher rainfall (particularly during the winter months) recorded at Groote Schuur on the eastern side of Table Mountain. This is because Table Mountain is not high enough to stop north-westerly winds from passing over the mountain. Moist air rises upwards to the plateau prior to condensing and then falling as orographic rain on the other side (Pauw & Johnson, 1999: pp. 32).

The highest rainfall figures are recorded on the summit of the Front Table of Table Mountain at Maclear's Beacon, where mean annual rainfall is in excess of 2,000mm/yr^{-1} (Trinder-Smith, 2006). The summit plateau also receives additional moisture from the cloud base of the "tablecloth", which is most common in summer with associated prevailing south-easterly wind. Fog precipitation in one year was estimated by the weather bureau to be an additional 3,294mm (Pauw & Johnson, 1999: pp. 32). This year-round high moisture availability on the summit plateau supports moisture-loving species such as *Disa longicornis*, *Disa uniflora* and *Anemone tenuifolia* (Pauw & Johnson, 1999: pp. pp. 134).

During the summer months a high pressure cell situated off the coast of South Africa prevents cold frontal systems from passing over the Cape (Pauw & Johnson, 1999: pp. 34). Despite this, up to 25% of the Peninsula's rain falls during the summer months in association with post-frontal conditions when ridging high pressure cells advect moisture from the south and south-east (Cowling et al.1996). The driest months of the year are December to March (Figure 3.4).

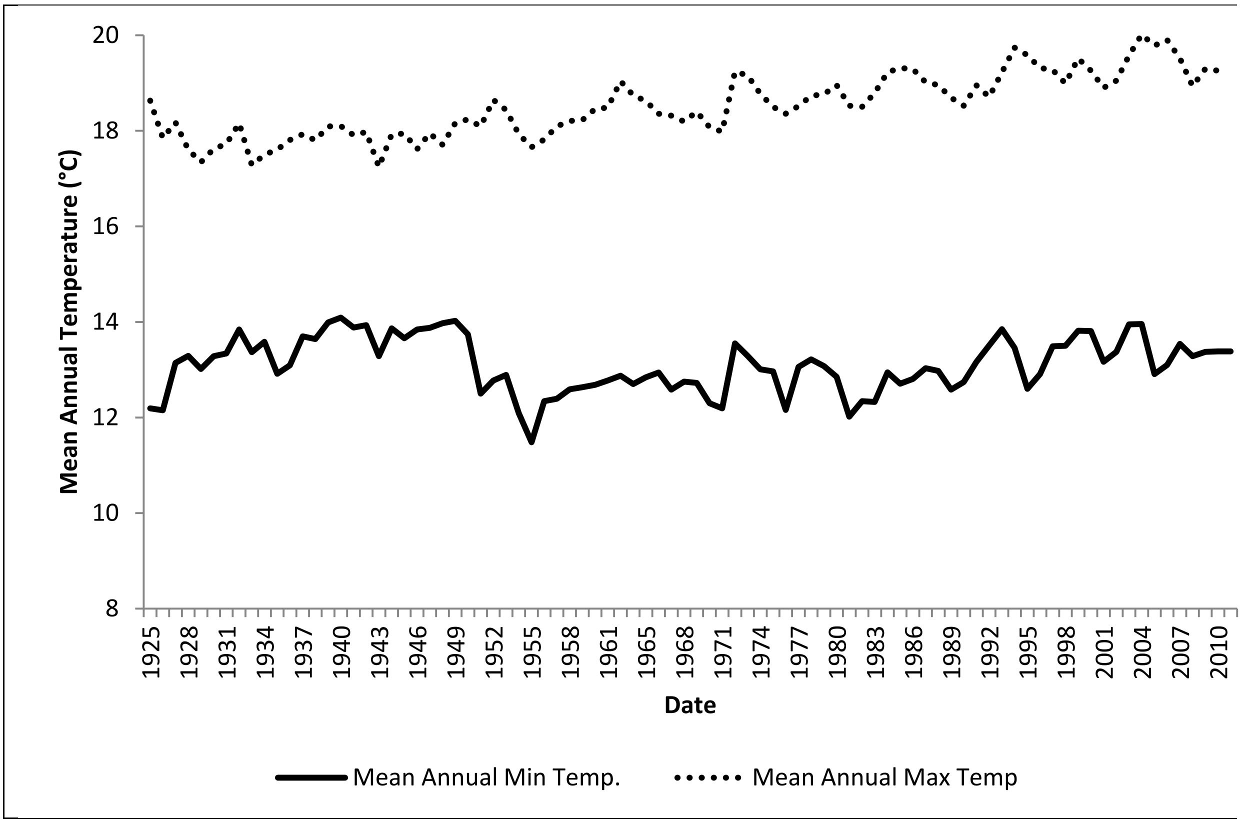

Figure 3.5: Mean annual maximum and minimum annual temperature (°C) from 1925 to 2009 at Cape Point, Table Mountain National Park (Data from the South African Weather Service).

There is relatively little variation in temperature on the Cape Peninsula owing to the ameliorating influence of the narrow land mass (Cowling et al.1996). Mean annual temperature on the summit of Table Mountain is 16°C. This figure increases to between 18-20°C at sea level (Cowling et al. 1996). There is no frost at sea level on the Peninsula and it only occurs rarely on the summit of Table Mountain (Cowling et al. 1996). Snow occurs occasionally on Table Mountain in winter and has also been recorded on the summit of Devil's Peak. It rarely settles and usually melts within a couple of days (Pauw & Johnson, 1999: pp. 35).

3.1.5. Fire History

The landscapes of the Cape Peninsula have a long history of anthropogenic fire. The minimum period that the vegetation of the biome has been subjected to some form of fire management is considered by Deacon (1983) to be at least 100,000 years. The earliest written record of people living at the Cape is in the writings of Bartholomew Diaz. He and his mariners reported seeing veld burning taking place during their voyage in 1487-1488 (Deacon, 1983) and named the Cape the "tierra de fume" or land of smoke (Anderson & O' Farrell, 2012) . The Khoisan who inhabited the Cape prior to arrival of the European colonists regularly practiced fire stick farming to increase yields of geophytes such as *Watsonia* ssp. which were eaten as a high carbohydrate food (Joubert, 1991; Anderson & O' Farrell, 2012).

Regular anthropogenic burning continued long after the early colonists arrived. However, the main objective of burning changed as fixed colonial settlements became more common (Deacon, 1983). Stock grazing became more intensive and the vegetation was burnt to increase forage yield which lead to a quantum increase in human impact on the landscape (Joubert, 1991).

However, burning for pastoral agriculture was a controversial practice because fire was seen as destroying the 'balance of nature' (Pooley, 2012). In 1687 a law was passed which forbade the setting alight of pastures without prior permission from the Government and Officer of Justice. Penalties for contravention were severe: a "severe scourging" on the first offence and death by hanging for the second (Botha, 1926). This strict legislation remained in place until the mid 1800s but despite this, regular burning continued (Pooley, 2012).

South African experts and officials also believed that bad farming practices including veld burning were the cause of widespread soil erosion and drought (Pooley, 2012). Clementsian principles of vegetation succession were applied to better understand ecosystem dynamics in the fynbos and Bews (1931) theorised that fire reversed the natural progression, regressing complex climax communities to simple communities of primitive plants (Pooley, 2012). The fire 'problem' led to the Symposium on Veld Burning in 1924 where Margaret Levyns said: "I am convinced that bush fires constitute a menace to the future of our country and that steps to prevent them should be taken before it is too late" (Levyns, 1926: pp. 347).

However, despite the misplaced 'conceptual fear' of fire in the landscape (due to ignorance of fynbos/fire dynamics), historical evidence suggests that the vegetation of the Cape Peninsula was being burnt too frequently (Rebelo et al. 2010) and outside the optimum summer fire season. Neville Pillans (1924) indicates that the Peninsula fynbos was being burnt at all times of year with exception of the three wettest months of winter. Average fire frequency of 1-3 years were reported by Pillans (1924). Widespread high fire frequency transformed shrub-dominated fynbos to sparse vegetation dominated by annual species, Restionaceae, Cyperaceae and Poaceae. There was also extensive alien invasion of *Pinus* and *Hakea* (Pillans, 1924). High fire frequency also greatly reduced afrotemperate forest cover, particularly along water courses (Pillans, 1924).

In 1949, landowners formed the Cape Peninsula Fire Protection Committee (FPC) which enforced a policy of complete fire suppression for the next two decades (Van Wilgen, 2012). In the 1960s there were extensive and catastrophic fires on the Peninsula which led to a reassessment of fire management protocol (Rebelo et al. 2010). In 1968, emerging research that redefined fynbos as a fire-dependent ecosystem led to the Forestry Department introducing a policy of controlled burning every 12-15 years. However, this recommendation was not adopted by all landowners on the Peninsula (Van Wilgen, 2012).

Unfortunately changes in policy failed to initiate major changes in fire management practice and few controlled burns took place on the Cape Peninsula between 1970 and 2008 (Forsyth & Van Wilgen, 2008). Despite advances in knowledge brought about by the highly successful and world-renowned Fynbos Biome Project, landowners and managers continued to adopt a cautious approach to fire (Pooley, 2012; Van Wilgen, 2012). A series of intense wildfires on the Peninsula during the 1970s increased awareness of potential fire threat and led to a blanket ban on open air fires in 1976 (Van Wilgen et al, 2012).

In 1998 the Veld and Forest Fire Act was passed by the South African Government (Rebelo et al. 2010). This innovative legislation recognises the need for an integrated approach to fire management which accommodates both fire hazard reduction and regular fires to maintain healthy ecosystems (Van Wilgen et al. 2012). However, those responsible for its implementation look primarily at risk reduction and fire safety. Fire exclusion is the most common approach in practice (Rebelo et al. 2010) and permission to conduct controlled burns is hard to obtain owing to this safety-based focus (Van Wilgen et al. 2012).

However, the formation of the Cape Peninsula National Park in 1998 led to a more unified approach to fire management and the production of the first comprehensive National Park Fire Management Plan in 2000 (Forsyth et al. 2000). In summary, this plan calls for a more flexible approach to fire management and recognises the need to conduct prescribed burning (Van Wilgen et al. 2012). Despite this, fire management for conservation still remains an area of controversy (Van Wilgen et al. 2012).

Fire return intervals on the Cape Peninsula have decreased since 1970. This has been predominantly attributed to increased ignition sources as a result of increase in human population (Forsyth & Van Wilgen, 2008). Only six of the 373 fires on record between 1970 and 2007 were attributed to natural causes such as lightning and rock falls (Forsyth & Van Wilgen, 2008). However, this trend has not been apparent throughout TMNP and some areas have been subjected to fire frequencies that are too low. Where this is the case Afrotemperate forest can expand into adjacent fynbos and forest/fynbos ecotones become less well-defined (Rebelo et al. 2010; Van Wilgen et al. 2012).

3.1.6. Regional Biodiversity

The Cape Peninsula is an internationally renowned area of exceptional plant diversity at all taxonomic levels (Helme & Trinder-Smith, 2006). It is recognised as a biodiversity hotspot and is classified as a UNESCO World Heritage Site (Rebelo et al. 2010). The Peninsula also forms an important component of the Cape Floristic Region (CFR) (Simmons & Cowling, 1996). The CFR comprises of a land area of approximately 90,000km^2 (similar in size to Malawi or Portugal) which constitutes less than 4% of the total area of the Southern African subcontinent (Goldblatt & Manning, 2000). This area is home to around 9,000 species of vascular plants of which 69% are endemic. Most of these (8,888 species) are flowering plants (Goldblatt & Manning, 2000). The flora of the CFR comprises almost 44% of the approximately 20,500 plant species that occur in all of Southern Africa (Goldblatt & Manning, 2000).

The Cape Peninsula has a total of 2285 plant species (Cowling et al. 1996) and Table Mountain alone has almost 1,500 species in just 57 km^2 (Cowling & Richardson, 1995). This means that the area has the greatest concentration of plant species (per unit area) in the CFR (Helme & Trinder-Smith, 2006). The flora of the Cape Peninsula also has exceptionally high endemicity, with endemic species constituting 7% of the total Peninsula flora. This value is particularly high for a continental landmass although some island floras attain far higher levels (Helme & Trinder-Smith, 2006). The Peninsula is identified as a centre of endemism for several plant genera including *Erica*, *Roella*, *Tetraria* and *Muraltia* (Helme & Trinder-Smith, 2006). It is thus deemed to be a global priority for conservation (Rebelo et al. 2010).

The high plant species richness, high beta and gamma diversity and high endemicity of the Cape Peninsula is thought to occur as a result of exceptional levels of environmental heterogeneity (Simmons & Cowling, 1996). The area is characterised physiographically by high topographic diversity, long and steep gradients in annual precipitation and a great diversity of nutrient-poor soils (Cowling et al. 1996). In consequence, the number of ecological communities is high (Simmons & Cowling, 1996).

3.1.7. Main Vegetation Types

The dominant vegetation of the Cape Peninsula is fynbos, which is a Mediterranean climate shrubland that is both fire prone and fire dependent (Helme & Trinder-Smith, 2006). In Table Mountain National Park it covers a total area of 22,906 ha (Forsyth & Van Wilgen, 2008). Distribution of Peninsula vegetation types is strongly influenced by underlying geology (Cowling et al. 1996). The two most common fynbos types that occur on the Cape Peninsula are Peninsula Sandstone Fynbos and Peninsula Granite Fynbos (Mucina & Rutherford, 2006). The former is the most extensively explored vegetation type of the fynbos biome, owing to its location within the Cape Town metropolitan area (Mucina & Rutherford, 2006).

Peninsula Sandstone Fynbos occurs only on the Cape Peninsula. However, it is deemed to be a least threatened vegetation type owing to its high altitudinal range (20 – 1,086m asl.) and locality within TMNP (90% of Peninsula Sandstone Fynbos lies within the park) (Mucina & Rutherford, 2006). It is a medium dense tall proteoid shrubland over a dense, moderately tall, ericoid-leaved shrubland. There are also patches of restioid fynbos and asteraceous fynbos within this vegetation type (Mucina & Rutherford, 2006).

Peninsula Granite Fynbos occurs on the lower slopes of the Cape Peninsula from Lion's Head in the north southwards to Smitswinkel Bay. This is a diverse vegetation type that is dominated by asteraceous and proteoid fynbos (Mucina & Rutherford, 2006). It is also well conserved within TMNP, but there is concern that much of the conserved fynbos of this vegetation type has been transformed into Afrotemperate forest at Orange Kloof and Kirstenbosch owing to fire suppression policies (Mucina & Rutherford, 2006).

There are also small fragments of Hangklip Sand Fynbos and Cape Winelands Shale Fynbos on the Cape Peninsula (Mucina & Rutherford, 2006). The former is found on old dune fields at Hout Bay and in the Fish Hoek Gap at altitudes of 20-150m asl. The latter is present on the lower slopes of Devil's Peak on soils derived from Malmesbury Shales (Mucina & Rutherford, 2006). Peninsula Shale Renosterveld occurs on Signal Hill (Joubert, 1991) and on the lower northern slopes of Table Mountain and Devil's Peak (Mucina & Rutherford, 2006). This is a critically endangered vegetation unit of which 77% has already been transformed (Mucina & Rutherford, 2006). It is a low grassy shrubland that also occurs on the relatively nutrient-rich soils derived from the Malmesbury Shales

(Van Wilgen et al. 2012). This vegetation type is also fire prone and covers 828 ha of TMNP (Forsyth & Van Wilgen, 2008).

There are two main forest types that occur on the Cape Peninsula which combined have a total of 33 tree species (Pauw & Johnson, 1999): Western Cape Milkwood Forest and Western Cape Afrotemperate Forest (Mucina & Rutherford, 2006). Western Cape Milkwood Forest occurs primarily within the coastal zone, often in association with streams and seeps on sand dunes (Von Maltitz et al. 2003). It is dominated predominantly by *Sideroxylon inerme* and has much lower species diversity than Western Cape Afrotemperate Forest. On the Cape Peninsula much of this vegetation type has been affected by the increase in coastal development since the 1800s.

Western Cape Afrotemperate Forest is a more species diverse forest type that occurs in fire refugia on the Peninsula where moisture availability is high (Von Maltitz et al. 2003). This may be in areas of higher precipitation on the Peninsula or in association with streams or seeps. Western Cape Afrotemperate Forest is also commonly found on boulder screes which act as an effective barrier to fire as well as in mountain kloofs along drainage lines (Von Maltitz et al. 2003). It occurs on most Peninsula soil types although some authors believe that forest distribution is biased towards granite-derived soils (Luger & Moll, 1993).

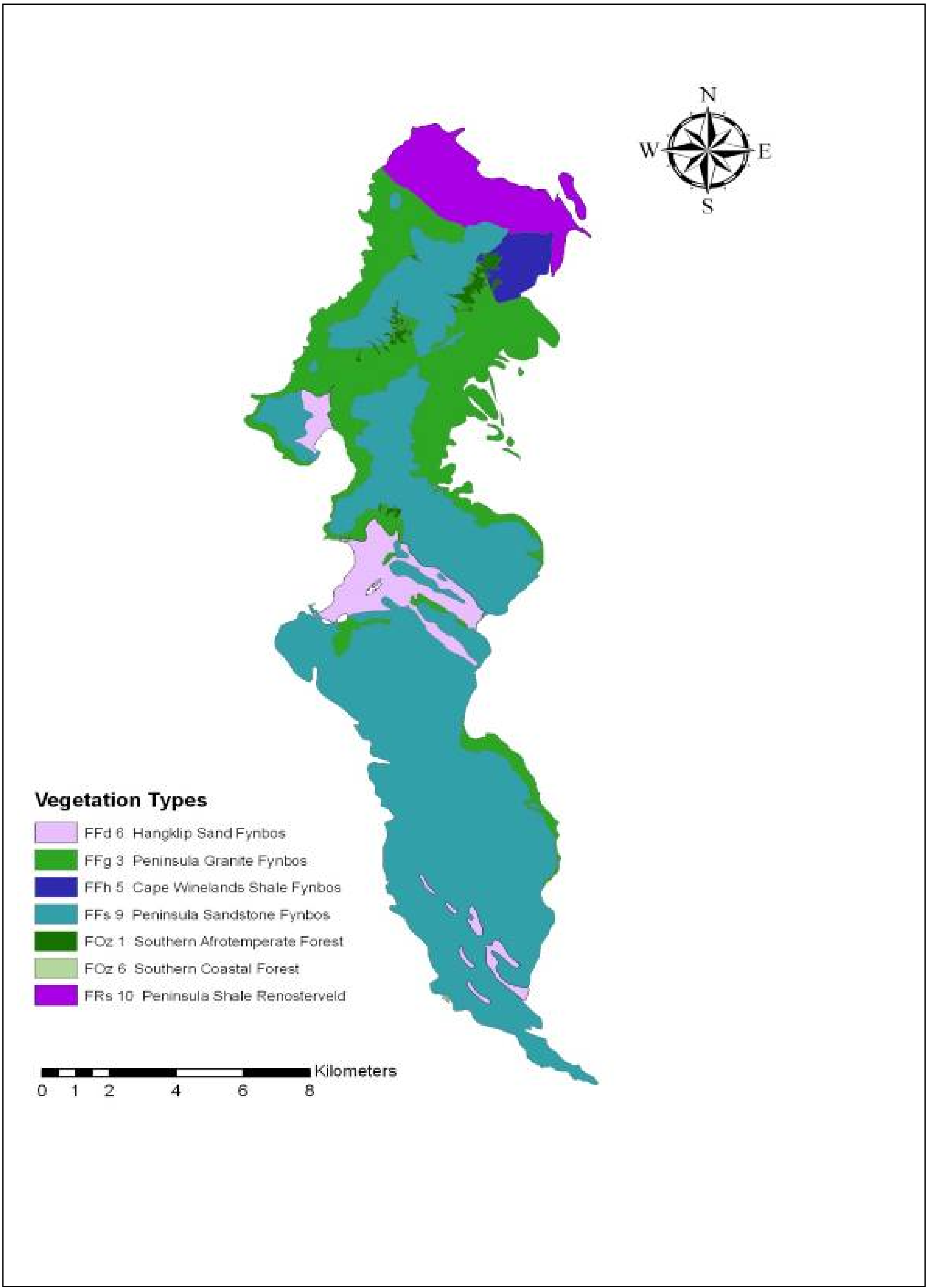

Figure 3.6: Vegetation types of the Cape Peninsula (Data sourced from Mucina & Rutherford, 2006). Note that this GIS dataset uses nomenclature from Mucina & Rutherford's forest groups instead of forest types so therefore on this map Western Cape Afrotemperate Forest and Western Cape Milkwood Forest are delimited as Southern Afrotemperate Forest and Southern Coastal Forest respectively.

Chapter 4: An Aerial Photograph Analysis of Change in Forest Cover on the Cape Peninsula from 1944 to 2008

4.1. Introduction

Aerial photography has long been recognised as a powerful tool in historical ecology for examining dynamics of landscape change (Bowman et al. 2001; Swetnam et al. 1999; Kennedy & Spies, 2004). The technique has been used for a diverse range of applications from forest inventories and disturbance mapping to wildlife management (Morgan et al. 2010). Aerial photographs are often the most comprehensive source of information available on past vegetation state and distribution (Kadmon & Harari-Kremer, 1999). They are therefore invaluable to both researchers and conservation managers for providing baseline information on ecosystem reference conditions and monitoring temporal vegetation change (Swetnam et al. 1999; Kennedy & Spies, 2004).

Use of aerial photography for remote sensing of vegetation change is often neglected in favour of more modern and technologically advanced techniques such as the use of satellite imagery (Swetnam et al. 1999; Bowman et al. 2001). Datasets derived from metric photogrammetry have been criticised for having a degree of error owing to image tilt, relief displacement and marginal image blurring commonly found in older historical aerial photos (Morgan et al. 2010). Use of satellite imagery is cheaper, easily accessible, has broad spatial coverage and regular revisitation frequency (Kennedy & Spies, 2004). It is therefore increasingly being used in preference to aerial photography by researchers, land managers and policy makers (Swetnam et al. 1999).

However, satellite imagery has a relatively coarse resolution of only 25-80 m or more (Kennedy & Spies, 2004). It is therefore not suitable for studies investigating fine scale ecological change (Swetnam et al. 1999). In addition, satellite imagery has only been available since the 1970s and so offers a relatively short temporal scale of analysis (Bowman et al. 2001). Aerial photographs have a much higher resolution than satellite imagery (Pickard, 2002) and can significantly expand the temporal depth of study (Kadmon & Harari-Kremer, 1999) owing to their availability from the 1930s onwards (Bowman et al. 2001). The technique also offers spatially continuous historical information, in contrast to other historical reconstruction techniques such as pollen analysis or dendrochronology which also lack precise spatial coverage (Morgan et al. 2010).

Traditionally metric photogrammetry was undertaken through manual interpretation (Morgan et al. 2010). The development of GIS technologies has revolutionised the efficient handling of data and allows spatial rectification of digitised aerial photographs (Corrigan et al. 2010). Polygons delimiting areas of the image according to land cover type can then be outlined (Morgan et al. 2010) This allows chronological sequences of aerial images to be precisely overlaid to detect dynamic behaviour of stands of vegetation (Bowman et al. 2001).

This technique is particularly useful in monitoring fine scale temporal changes in woody vegetation distribution (Corrigan et al. 2010). The high temporal depth of aerial photographs allows effective monitoring of temporal and spatial change in forest vegetation (Bowman et al. 2001). A longer term historic perspective is required owing to the longevity of forest trees (Clark, 1985). Aerial photographs have been used for decades by researchers and land managers to monitor changes in forest distribution

Kennedy & Spies, 2004). The technique has revealed encroachment of woody vegetation into ancient grasslands following long term absence of fire in the Valles Caldera of New Mexico, USA (Coop & Givnish, 2007), in the Oregon Coastal Ranges, USA (Kennedy & Spies, 2004) and in Kansas, USA (Loehle et al. 1996).

Monitoring forest vegetation dynamics is particularly important in landscapes where there is a mosaic of fragmented forest patches within other vegetation types or anthropogenically transformed areas (Corrigan et al. 2010). Shifts can occur in the forest ecotone in response to disturbances such as grazing and changes in fire regime (Mast et al. 1997). A historic mosaic landscape can shift towards forest as a result of fire exclusion owing to urbanisation or protection by conifer plantations from fire (Corrigan et al. 2010). Protected areas can also sometimes be subjected to over-protection through mismanagement and long term fire exclusion which can lead to the expansion of woody vegetation cover. This can result in loss of a functional ecosystem, a reduction in gene flow and loss of biodiversity (Corrigan et al. 2010).

There have been numerous studies examining temporal and spatial dynamics of woody vegetation and associated impacts of change in South Africa's savanna ecosystems (Donaldson, 1969; Trollope, 1980). However, there have been relatively few studies examining temporal ecotonal change using aerial photographs in South Africa's forests. Exceptions include a detailed examination by Lawes et al. (2007) of change in the Karkloof-Balgowan forest archipelago of the Kwa-Zulu Natal midlands, the work of Corrigan et al. (2010) on the forests of the Kwa-Nibela Peninsula in St. Lucia and a study undertaken by O' Connor (2010) looking at changes in riparian forest in Mapungubwe National Park. Most of this research has taken place in the eastern parts of South Africa.

This study will be one of the first to use aerial photographs to examine temporal and spatial change in the Afrotemperate forests of the Western Cape. There is currently little quantitative data available about ecotonal dynamics in this ecosystem. In 1993 Luger and Moll used aerial photographs to conduct a relatively localised study to examine forest distribution change in Orange Kloof. Their findings indicated that Western Cape Afrotemperate Forest had doubled in extent in this area since the 1930s. Concerns have been raised by other authors (Rebelo et al. 2010; Van Wilgen, 2012) about an increase in woody cover in Table Mountain National Park owing to fire exclusion but there are currently no other quantitative spatial data to support these assertions.

This research uses digitised and georeferenced aerial photographs to map changes in distribution of forest cover in Table Mountain National Park from 1944 to 2008. This will create a comprehensive dataset examining temporal and spatial dynamics of forest change to assist future management of the park.

4.2. Methods

4.2.1. Preparing the Aerial Photo Dataset

The historic aerial photographs used in the study were sourced from General Surveys and Mapping in Mowbray, Cape Town. Images were initially sourced as contact prints for all years where the aerial photo dataset available encompassed the entire Cape Peninsula. The earliest available set of images dated back to 1944. Contact prints of image sets from 1958 and 1976 were also examined but their scale, resolution and image quality were considered too poor to be used in this analysis. The 1944 prints were then scanned at a high resolution of 1,000 dots per inch (DPI) and the digital images created were saved in duplicate as JPEG and TIFF files. In some cases there was significant overlap between aerial images. Where this was the case the better quality image was selected for scanning. Some of the earlier aerial photos were very variable in quality owing to past negative damage. To rectify this, any images derived from damaged negatives were enhanced in Adobe Photoshop CS5 to improve clarity for analysis.

All 200 of the 1944 aerial photo scans were imported individually into ArcGIS 9.1 and were georeferenced to their respective localities. Raster files from the Cape Peninsula's 1:50,000 topographic maps (also sourced from General Surveys and Mapping) were used as a base layer. Each image was georeferenced with 6-8 connections made between the image and map. This was deemed to be the optimum with best compromise between geographic accuracy and distortion of the aerial image. Points of connection used were identifiable landscape features visible on both the image and the map such as road junctions, corners of buildings or large rocks.

The most modern available set of aerial photographs for the Cape Peninsula dates from 2008. This dataset was obtained from the South African National Parks' Cape Research Centre and was previously georeferenced by staff from the City of Cape Town.

4.2.2. Aerial Photo Ground-Truthing & Forest Vegetation Survey

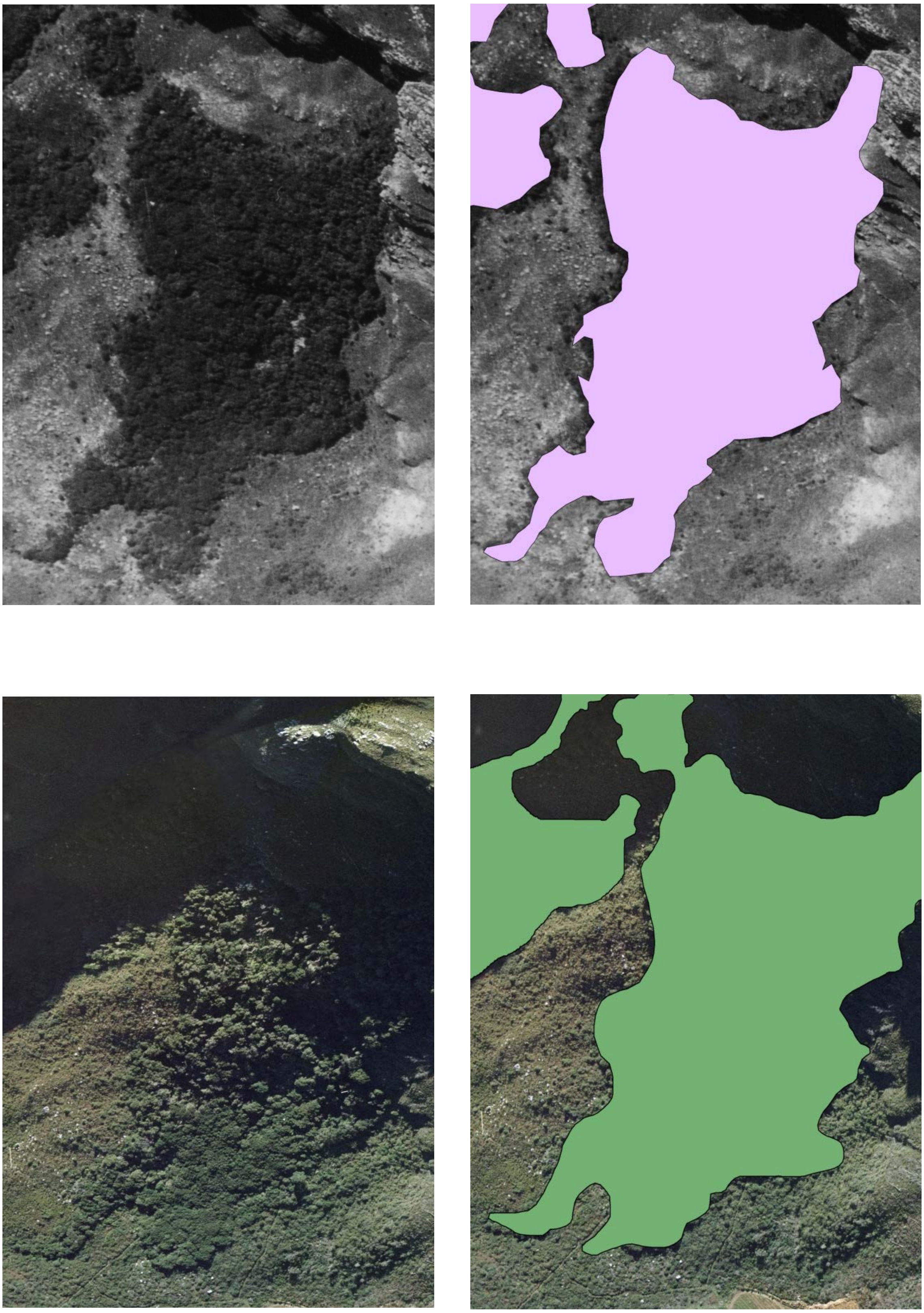

Figure 4.1: Forest patch 112 at Noordhoek Estate in 1944 (Upper) and 2008 (Lower): Left images showing aerial photographs only and right showing forest patches delimited using an ArcGIS 10 Shapefile.

A GIS shapefile of all 212 known patches of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest was compiled in 2008 after a survey of the Peninsula forests was commissioned by SANParks (Euston-Brown et al. 2008). However, resources to undertake this project were insufficient and so the Peninsula forest dataset was incomplete. It wasn't possible in 2008 in the time available to visit all forest patches described in the study. Therefore the species lists authored by Euston-Brown were incomplete and many forest patches were not ground-truthed. This was either owing to extreme inaccessibility or being located on the southern reaches of the Peninsula.

The 2008 GIS shapefile of the Peninsula forests and the associated woody taxa species lists (Euston-Brown et al. 2008) were used as a baseline for the project. One key aim of this project was to generate complete species lists for all Peninsula forests and to fully ground-truth all sites. Forest patch ground-truthing was done to verify accuracy of forest/fynbos ecotonal boundaries delimited by Euston-Brown and to determine whether the forest patches listed in the survey were correctly classified as forest. For the purposes of this research forest was defined by having a closed canopy with more than three individuals of a height greater than four metres and dominance of woody forest taxa (Euston-Brown et al, 2008).

Each of the 212 forest patches described by Euston-Brown was revisited by the author. A decision was then taken whether to keep or delete the forest patch from the shapefile according to the criteria described above. The accuracy of the margins drawn on the shapefile was also verified and edited as necessary. The 1944 aerial images were used in conjunction with forest patch ground-truthing to delimit the 1944 forest boundaries. Hard copies of the aerial images were taken into the field to aid this process. At each site all woody forest taxa present were recorded and assigned a cover abundance value from 0.1-5 (See Table 4.1 for a key to abundance values) (after Euston-Brown et al. 2008). This also included woody shrubs present at the forest ecotone such as *Searsia lucida* and *Podylaria calyptrata*. Several new sites where forest cover was evident from aerial images or maps but not recorded by Euston-Brown were also visited by the author.

Table 4.1: Key to abundance values used in the woody forest taxa species lists (presented in Appendix I).

Abundance Value	Definition
Blank	Not present
0.1	Very rare in forest patch
0.5	Present in low numbers
1	Present with 1-5% cover
2	Present with 5-25% cover
3	Common with 25-50% cover
4	Abundant and dominant with >50% cover
5	Completely dominant with >75% cover

The output dataset comprised a record of species presence and abundance for all sites in association with two shapefiles (Figure 4.1). One shapefile showed forest cover on the Cape Peninsula in 1944 (Figure 4.1) and the second showed contemporary forest cover (Figure 4.1). The two shapefiles could then be analysed further to examine changes in forest distribution in Table Mountain National Park between 1944 and present.

4.2.3. Classification of the Cape Peninsula Forests

An NMDS Ordination was run on the woody forest species dataset in Primer 5 (Version 5.1.2, Primer-E Ltd, Plymouth, United Kingdom). Firstly a Similarity Matrix was calculated to analyse similarity in species composition of forest patches. Bray-Curtis Similarity was used with no transformation or standardisation of the dataset. After this an NMDS Ordination was run with 100 iterations and plotted as a two-dimensional graph. Stress values can vary from 0 (minimum) to 1 (maximum) indicating how easily the data can be arranged on two and three-dimensional graphs respectively.

Following this, two different one-way ANOSIMs were run using 999 permutations to examine the degree of difference between forest types for two different classifications of the Peninsula forests. The first one was that of Mucina & Rutherford (2006) which classifies the Peninsula forests into two different types: Western Cape Afrotemperate Forest (Southern Coastal Forest Group) and Western Cape Milkwood Forest (Southern Afrotemperate Forest Group). The second ANOSIM was used to analyse the degree of difference between the four different forest types delimited by Euston-Brown et al. (2008). These four groups were Tall Moist Forest, Mountain Podocarpus Forest, Dry Scree Forest and Milkwood Forest. R-values vary from -1 to 1 with the p-value indicating its significance. An R value of 1 indicates maximum distinction between the groups whereas a value of 0 shows that there is no distinction present. A value of – 1 means that samples of different groups are more similar to each other than the samples within each group.

4.2.4. Forest Species Richness

A General Linear Model (GLM) run in Statistica 7 was used to conduct a multifactorial analysis of influence of forest type and forest patch size on species richness of woody forest taxa. Forest species richness formed the dependent variable and factors analysed were forest type and forest patch size. Type 6 Sums of Squares were used to account for unbalanced group sizes. Only significant interaction terms were included in the final model.

4.2.5. Analysis of Forest Cover and Correlates of Forest Change

As the ground-truthing process was completed, the 1944 and contemporary ecotonal boundaries of each forest patch were digitised in ArcGIS 10 (Figure 4.1). The 2008 Euston-Brown shapefile was used as a base for digitising contemporary forest distribution and the 2008 forest distribution was edited or redrawn as necessary with forest patches being reshaped, added or deleted (Figure 4.1). The contemporary forest distribution shapefile was used as a baseline for the 1944 distribution shapefile and the latter was completed using the 1944 aerial photo dataset (Figure 4.1). ArcGIS software was then used to calculate the area of each forest patch and so change in forest patch size between 1944 and 2008 could be calculated using an Excel spreadsheet.

Datasets on associated environmental parameters were also collected. Climate data (mean annual temperature and mean annual precipitation) for each forest patch was derived from WorldClim data (Hijmans et al. 2005). Maximum and minimum altitude and aspect of each forest patch was recorded by overlaying the 2008 aerial photographs over a Digital Elevation Model (DEM) of the Cape Peninsula. A GIS shapefile showing annual fire history of TMNP since 1976 was compiled by Forsyth and Van Wilgen (2008) and sourced from the Cape Research Centre. The contemporary forest shapefile was overlaid in ArcGIS and the number of fires that had burnt the margin of each patch since 1976 was recorded. Data on geology and soils for each site were recorded from GIS shapefiles from the South African Geological Survey sourced from the UCT GIS lab.

Statistical analysis was then conducted to examine which ecological parameters were causing the changes in forest distribution recorded. A General Linear Model (GLM) run in Statistica 7 was used to conduct a multifactorial analysis of correlates of change. Percentage change in forest cover from 1944 to 2012 formed the dependent variable and factors analysed were forest type, forest patch size, mean annual precipitation, mean annual temperature, soil type, geology and fire frequency since 1975. Altitudinal and aspect datasets were closely auto-correlated with mean annual precipitation and mean annual temperature but explained less variation in forest change so were therefore not used in this analysis. Type 3 Sums of Squares were used to account for unbalanced group sizes with regard to forest type, soil type and geology. Only significant interaction terms were included in the final model.

4.3. Results

4.3.1. Ordination and ANOSIM Results

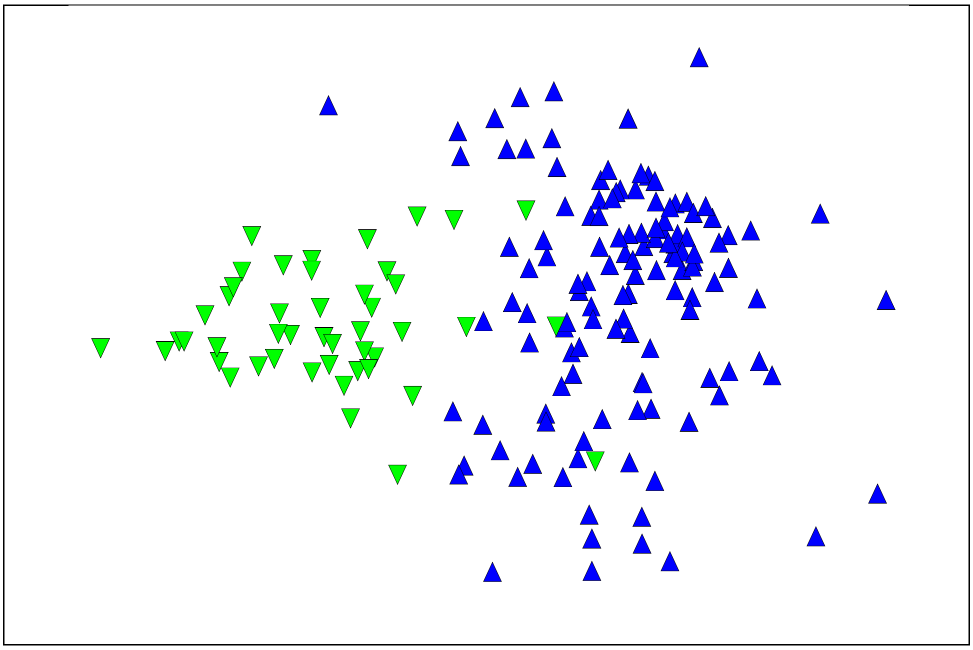

Figure 4.2: Ordination showing distribution of Cape Peninsula forest patches according to Mucina & Rutherford's 2006 classification into two different forest types: Western Cape Afrotemperate Forest (Southern Afrotemperate Forest Group) shown in blue and Western Cape Milkwood Forest (Southern Coastal Forest Group) shown in green.

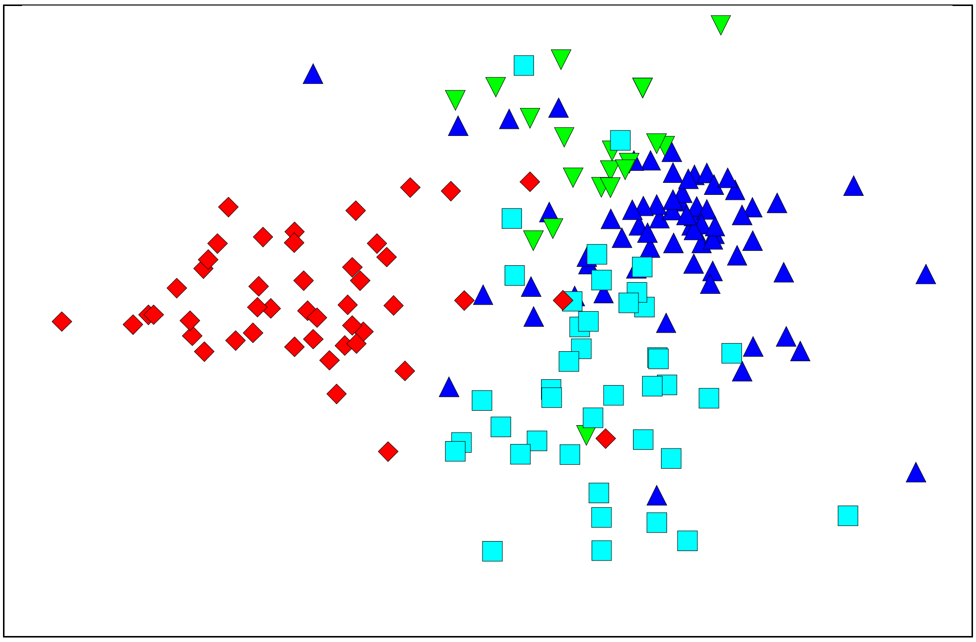

Figure 4.3: Ordination showing classification of the Cape Peninsula Forests into four different forest types according to Euston-Brown et al. (2008). The four groups shown are Tall Moist Forest (Dark Blue), Mountain Podocarpus Forest (Green), Dry Scree Forest (Pale Blue) and Milkwood Forest (Red).

The results of the NMDS Ordination are shown in Figures 4.2 and 4.3. The stress value recorded was lowest for the three dimensional plot at 0.14, however the two dimensional plot was used to aid graph interpretation. This had a stress value of 0.19. The results of this ordination are shown twice owing to different colour coding used for the Mucina and Rutherford (2006) (Figure 4.2) and Euston-Brown et al. (2008) (Figure 4.3) forest classifications. Results of the ANOSIM on the Mucina & Rutherford (2006) classification showed that the Cape Peninsula forests can be divided into two groups: Western Cape Afrotemperate Forest and Western Cape Milkwood Forest (ANOSIM: Global R = 0.69, $p < 0.001$). There is some overlap between the two groups shown both in the ANOSIM and the ordination (Figure 4.2) indicating a transition between Western Cape Afrotemperate Forest and Western Cape Milkwood Forest.

Table 4.2: Pairwise results of the ANOSIM testing the distinction of forest types classified according to Euston-Brown et al. (2008): Global R = 0.574; Global $p < 0.001$.

Forest Type	**R**	**p**
Tall Moist Forest vs. Mountain Podocarpus Forest	0.241	0.004
Tall Moist Forest vs. Dry Scree Forest	0.332	0.001
Tall Moist Forest vs. Milkwood Forest	0.82	0.001
Mountain Podocarpus Forest vs. Dry Scree Forest	0.37	0.001
Mountain Podocarpus Forest vs. Milkwood Forest	0.793	0.001
Dry Scree Forest vs. Milkwood Forest	0.684	0.001

The second ANOSIM showed that there are also significant differences between the forest groups delimited in the Euston-Brown et al. (2008) classification (ANOSIM: Global R = 0.574, $p < 0.001$) (Table 4.1). However, these groupings were less distinct than the Mucina and Rutherford (2006) classification. The Milkwood Forest group used in the Euston-Brown et al. (2008) classification is directly equivalent to the Western Cape Milkwood Forest (Southern Coastal Forest) from Mucina and Rutherford (2006). This was shown to be a distinct group separate from Tall Moist Forest, Mountain Podocarpus Forest and Dry Scree Forest in the pairwise tests in the ANOSIM analysis (Table 4.2).

The pairwise tests also showed that there was little difference between Tall Moist Forest, Dry Scree Forest and Mountain Podocarpus Forest. The ordination (Figure 4.3) also shows that there is no clear distinction between these groups. This is in line with the findings of the Mucina & Rutherford (2006) classification which combines all forest patches from these three separate groups into one group of Western Cape Afrotemperate Forest. Therefore this classification is more appropriate and will be used for purposes of all further analyses. The map in Figure 4.3 shows the distribution of Western Cape Afrotemperate Forest (Southern Afrotemperate Forest Group) and Western Cape Milkwood Forest (Southern Coastal Forest Group) on the Cape Peninsula.

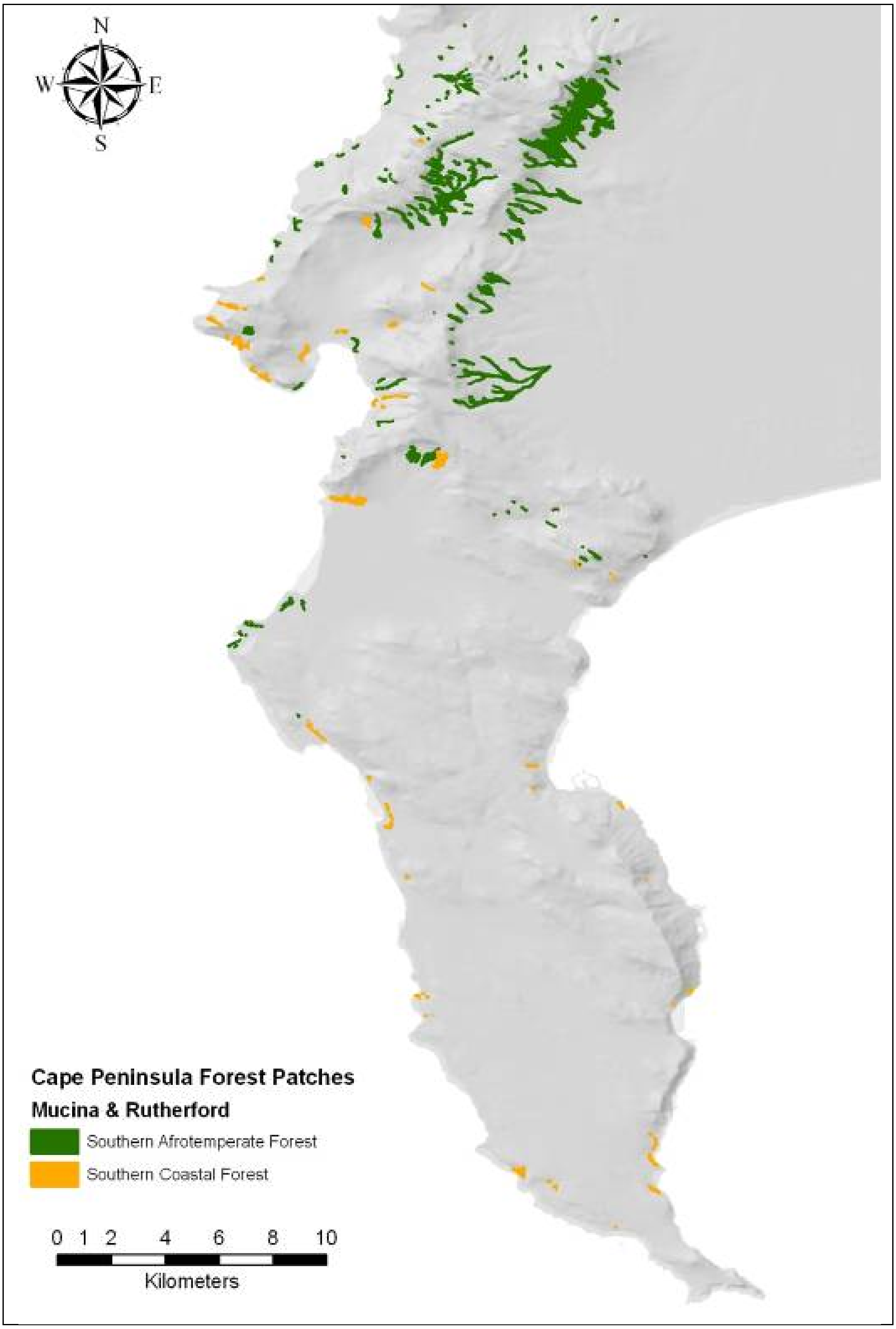

Figure. 4.4: Map of the Cape Peninsula Forests showing distribution and classification according to Mucina & Rutherford (2006) of the two different forest groups occurring on the Cape Peninsula: Southern Afrotemperate Forest and Southern Coastal Forest. For the purposes of this study the forest types (types within Mucina & Rutherford's (2006) forest groups) are used.

4.3.2. Forest Species Richness

Results from the General Linear Model (GLM) showed that forest patch size and forest type were significant factors in influencing forest woody species richness (Table 4.3). The model presented explains 42% of variation in forest woody species richness (Table 4.3).

Table 4.3: General Linear Model of influence of forest patch size and forest type on forest woody species richness in Western Cape Afrotemperate Forest and Western Cape Milkwood Forest: All significant P Values are highlighted in bold.

Dependent Variable	Explanatory Variables	p	Whole Model p	Whole Model R^2	Whole Model Equation
Forest woody species richness	x_1 = Forest patch size (m^2)	**0.000000**	**0.00**	0.423463	$y = -7.84873 + 5.77659x_1 + 3.47123x_2$
	x_2 = Forest Type (M&R)	**0.000000**			

4.3.3. Results of Forest Distribution Change Analysis

Most patches of both Western Cape Afrotemperate Forest and Western Cape Milkwood Forest on the Peninsula either experienced stasis or increased in extent from 1944 to 2008 (Table 4.1). The highest increase in cover of Western Cape Afrotemperate Forest was recorded in Orange Kloof, Disa Gorge and Blinkwater Ravine on Table Mountain. There was also an increase in the number of forest patches since 1944 from a total of 149 to 174 (Figure 4.4). Only 13 forest patches had reduced cover. Most of these were patches of Western Cape Milkwood Forest on the southern Peninsula in the Cape of Good Hope section of TMNP.

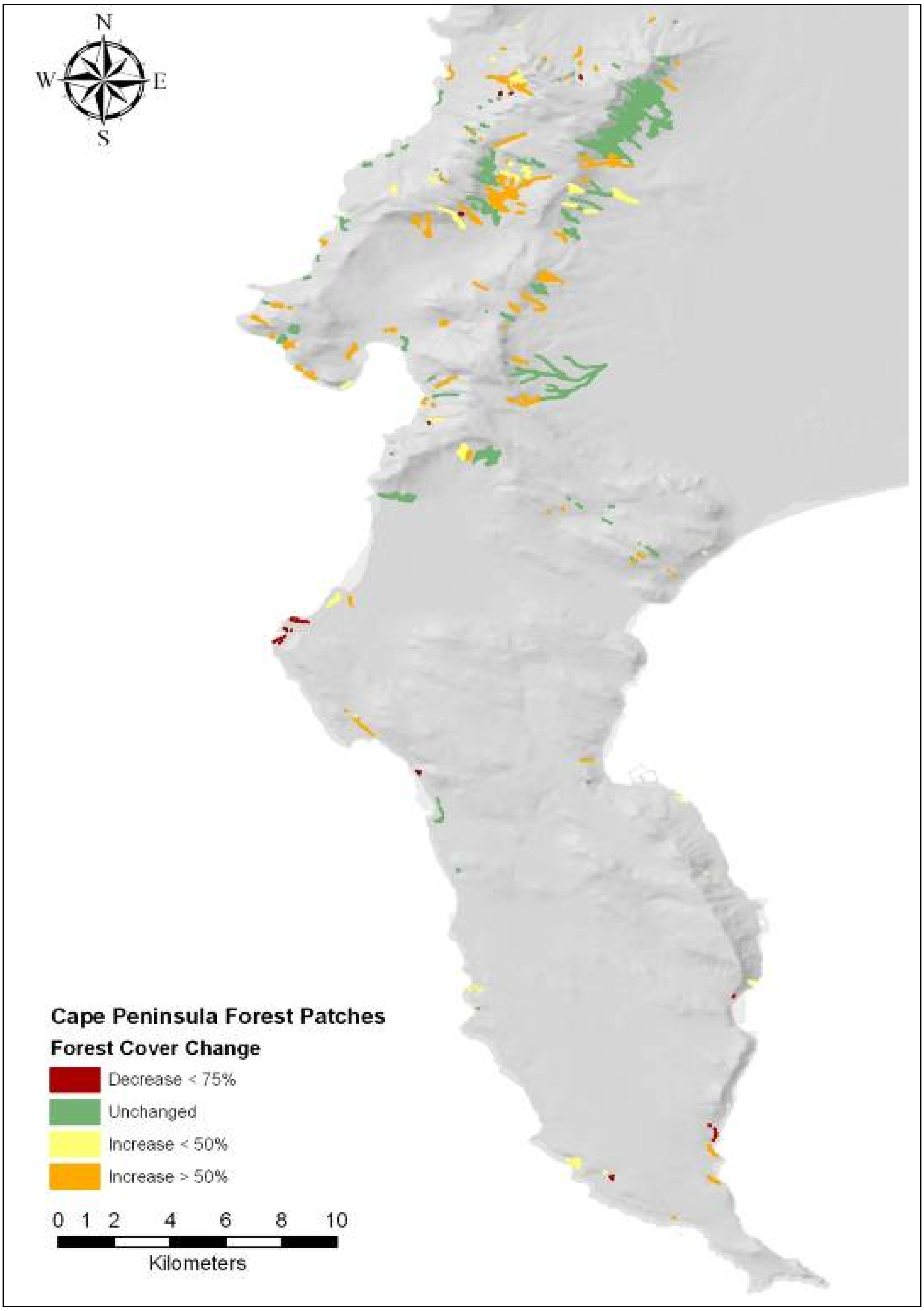

Figure 4.5: Changes in distribution of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest on the Cape Peninsula from 1944 to 2008

Table 4.4: Changes in forest cover of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest on the Cape Peninsula from 1944 to 2008

	Western Cape Afrotemperate Forest	Western Cape Milkwood Forest	Total
No. of forest patches in 1944	107	42	149
No. of forest patches in 2008	127	47	174
No. of forest patches with greater cover	68	28	96
No. of forest patches with no cover change	51	14	65
No. of forest patches with reduced cover	8	5	13
Total Area (ha) 1944	471.9	412.2	884.2
Total Area (ha) 2008	713.7	747.8	1461.5
% Increase in forest cover	51.2%	81.4%	65.3%

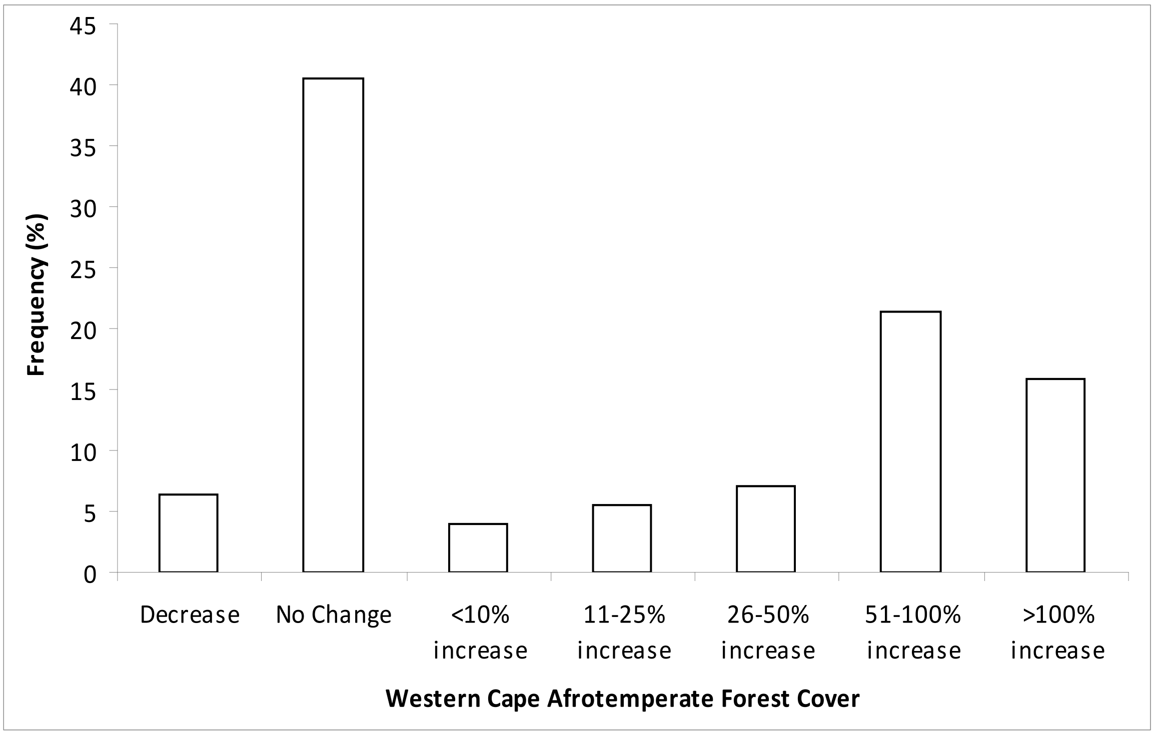

Figure 4.5: Distribution across percentage cover change classes of Western Cape Afrotemperate Forest on the Cape Peninsula from 1944 to 2008 showing decrease in forest cover and proportional degree of cover increase.

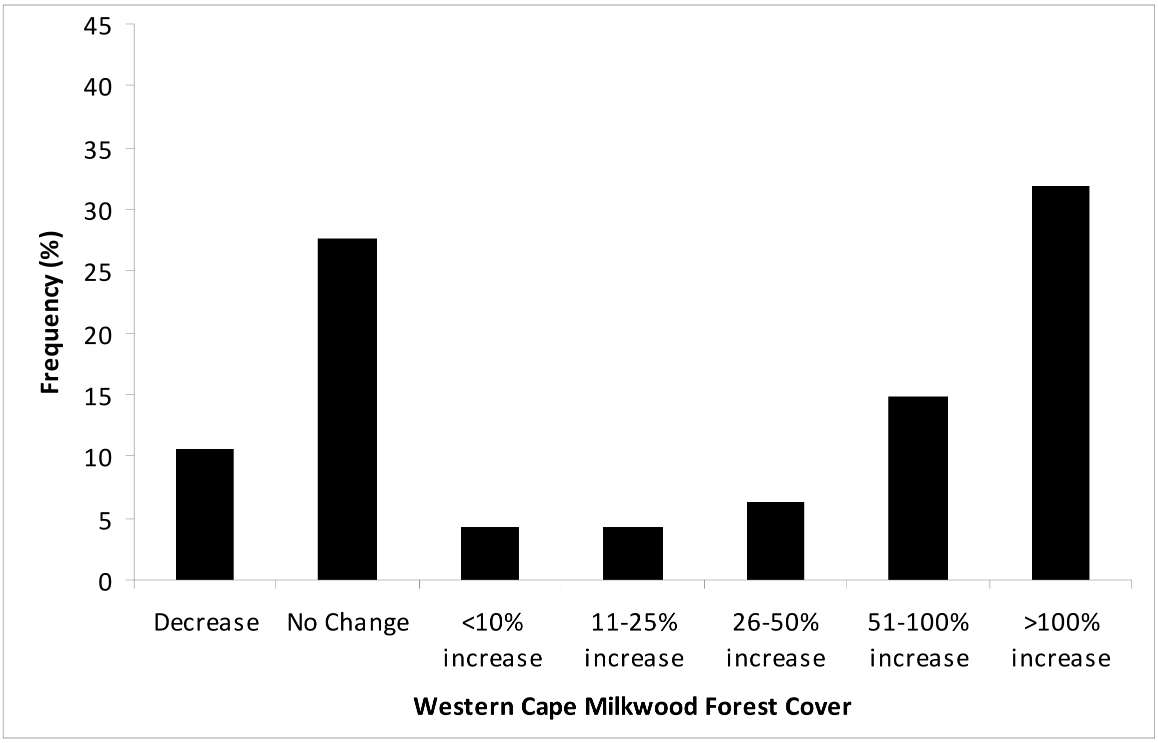

Figure 4.6: Distribution across percentage cover change classes of Western Cape Milkwood Forest on the Cape Peninsula from 1944 to 2008 showing decrease in forest cover and proportional degree of cover increase.

4.3.4. Correlates of Forest Patch Change

Results from the General Linear Model (GLM) showed that forest type, mean annual temperature, geology and forest patch size were significant factors in influencing rates of change in forest cover (Table 4.5). Mean annual precipitation, soil type and number of fires since 1975 were also included in the analysis but were not significant. Altitude and aspect were also initially included in the GLM but later excluded. This is owing to their auto-correlation with mean annual precipitation and mean annual temperature and having a lower level of explanatory power. The model presented explains 39% of change in forest cover (Table 4.5).

Table 4.5: General Linear Model of influence of ecological drivers upon forest cover change in Western Cape Afrotemperate Forest and Western Cape Milkwood Forest: Abbreviations: Forest Type = AF = Western Cape Afrotemperate Forest; CF = Western Cape Milkwood Forest; Soil Type = R = Rocky: Little/No Soil; RYA = Red-yellow apedal; PC = Plinthic Catena; GM = Glenrosa/Mispah Forms; M = Miscellaneous Soils; LF = Lamotte Form; Geology = A = Arenite; G = Granite; S = Sedimentary; Sh = Shale. All significant P Values are highlighted in bold.

Dependent Variable	**Explanatory Variables**	**p**	**Whole Model p**	**Whole Model R^2**	**Whole Model Equation**
Forest Cover Change (%)	x_1 = Forest Type (M&R)	**0.000732**	**0.000000**	0.392790	y = -2349.77 + {[AF 1807.24] [CF – 1807.24]} + $0.42x_2$ + $12.41x_3$ + {[R 31.05] [RYA -31.53] [PC 9.78] [GM -2.87] [M -5.45] [LF - 0.98]} + {[A 384.14] [G -164.04] [S – 311.22] [Sh 91.11]} + $11.84x_6$ + $0.00x_7$ + {[AF -112.66] [CF 112.66]} + {[A -0.35] [G 0.12] [S 0.33] [Sh – 0.09]} + {[AF 0.00] [CF 0.00]} + [R 0.00] [RYA 0.00] [PC 0.00] [GM 0.00] [M 0.00] [LF 0.00]}
	x_2 = Mean Annual Precipitation	0.113019			
	x_3 = Mean Annual Temperature	**0.000241**			
	x_4 = Soil Type	0.726860			
	x_5 = Geology	**0.001713**			
	x_6 = # Fires since 1975	0.218142			
	x_7 = Forest patch size	**0.000013**			
	x_1*x_3	**0.000673**			
	x_5*x_2	**0.002451**			
	x_1*x_7	**0.000033**			
	x_4*x_7	**0.000000**			

There was a higher rate of change recorded in Western Cape Afrotemperate Forest than in Western Cape Milkwood Forest (Table 4.5). The higher the mean annual temperature, the higher the rate of change in forest cover (Table 4.5). Geology was also a significant influence and the highest rates of change were recorded on arenite, following in descending order by shale, granite and sedimentary geology (Figure 4.4). As the interaction terms show, change in forest cover differs with temperature between the two forest types and also between different soil types. Changes in forest cover vary according to geology with precipitation.

4.4. Discussion

4.4.1. Classification of the Cape Peninsula Forests

Results from the NMDS Ordination (Figure 4.2 & 4.3) and ANOSIM analysis (Table 4.2) shows that the forests of the Cape Peninsula can be most appropriately divided into two different forest types. These two different groups are consistent with the South African National Vegetation Map by Mucina & Rutherford (2006) which divides the forests on the Cape Peninsula into two different forest types viz. Western Cape Afrotemperate Forest and Western Cape Milkwood Forest. Western Cape Afrotemperate Forest is part of the Southern Afrotemperate Forest group (FOz 1) and Western Cape Milkwood Forest forms part of the Southern Coastal Forest Group (FOz 6). Both of these forest types are intrazonal vegetation types within the Fynbos Biome (Mucina & Rutherford, 2006). The pairwise tests of the ANOSIM analysis (Table 4.2) showed that these two groups are statistically significant and show greater distinction between the Mucina & Rutherford (2006) forest types than those defined by the more recent Euston-Brown et al. (2008) classification. The Mucina & Rutherford (2006) classification was therefore used for the purposes of all further subdivision of analyses in this thesis.

The forests of the Southern Afrotemperate Forest Group can be defined as tall, multilayered afrotemperate forests dominated by yellowwood trees which on the Cape Peninsula is represented by *Podocarpus latifolius* (Mucina & Rutherford, 2006). The Western Cape Afrotemperate Forests of the Western Cape are a floristically depauperate type within this group (Von Maltitz et al. 2003). This forest type occurs on a variety of soil types, including shallow Mispah, Glenrosa and Houhoek forms to sandy humic Fernwood form, derived from Table Mountain Sandstones and Shales of the Cape Supergroup as well as Cape Granite (Mucina & Rutherford, 2006). Important larger woody taxa of the Peninsula's Western Cape Afrotemperate Forests include *Podocarpus latifolius*, *Cunonia capensis*, *Curtisia dentata*, *Ocotea bullata*, *Olinia ventosa*, *Rapanea melanophloeos* and *Ilex mitis.* Small trees also present include *Canthium inerme*, *Diospyros whyteana* and *Cassine peragua* (Mucina & Rutherford, 2006).

Western Cape Milkwood Forest is defined as relatively low forest dominated by *Sideroxylon inerme.* On the Cape Peninsula at the westernmost extreme of their distribution they are both floristically and structurally impoverished (Mucina & Rutherford, 2006). On the Cape Peninsula Western Cape Milkwood Forest is substantially less species diverse than Western Cape Afrotemperate Forest. Western Cape Milkwood Forest occurs at relatively low altitudes from 0-30m asl. It is found predominantly on well-drained sandy soils of coastal dune origin (Mucina & Rutherford, 2006). Important woody taxa in the Cape Peninsula's Western Cape Milkwood Forests include *Sideroxylon inerme*, *Chionanthus foveolatus*, *Colpoon compressum*, *Tarchonanthus littoralis* and *Maurocenia frangula* (Euston-Brown et al. 2008).

There have been multiple attempts over the last 40 years to describe and classify the forests of the Cape Peninsula (Campbell & Moll, 1977; McKenzie et al. 1977; Von Maltitz et al. 2003; Euston-Brown et al. 2008). These have taken place at different scales and identified a plethora of different vegetation communities. The first attempt to classify the Peninsula forests was undertaken by Campbell and Moll (1977) but their efforts were limited to forests of Table Mountain on the northern Peninsula. The classification they produced was at a much finer scale than the one presented here and divided the forest communities into a total of three associations using Braun-Blaunquet concepts and techniques described by Werger (1974) (Campbell & Moll, 1977).

Although the output of Campbell and Moll's (1977) work was a relatively fine-scale classification of the forests of Table Mountain and divided these forests up into small communities, it was based on a relatively small species dataset in comparison to the work presented in this data chapter. Campbell and Moll (1977) collected data from 10 x 10 m relevés rather than looking at the broader picture of relative species composition of each forest patch. A total of 101 relevés were surveyed, but ninety-four were on Table Mountain itself. There was also a bias towards the more extensive forests on the southern and eastern slopes of Table Mountain, with no forest relevés surveyed on the western and northern slopes of Table Mountain. Results therefore exclude numerous forest patches and give a skewed perspective of community and sub-association dominance.

The most recent effort to produce a classification of the Cape Peninsula forests was undertaken by Euston-Brown et al. (2008). However, in contrast to the work of Campbell and Moll (1977) and the classification presented in this study, it was relatively subjective and no ordination was used in its construction. Both species composition and vegetation structure were used to differentiate between forest types (Euston-Brown et al. 2008). Euston-Brown et al. (2008) divided the Peninsula forests into four groups based on apparent species dominance, canopy height, growth form, aspect and substrate. This included Tall Moist Forest, Mountain Podocarpus Forest, Dry Scree Forest and Milkwood Forest (Euston-Brown et al. 2008).

This research used an NMDS Ordination (Figures 4.2 & 4.3) and ANOSIM analysis (Table 4.1) to test the statistical significance of the Euston-Brown et al. (2008) classification in order to find out whether the Peninsula forests could be divided into a greater number of forest types than those presented in the earlier work of Von Maltitz et al. (2003) and Mucina & Rutherford (2006). Results from the NMDS Ordination demonstrated that when looking only at species composition there is little to differentiate between Tall Moist Forest, Mountain Podocarpus Forest and Dry Scree Forest. These results are supported by the findings of the ANOSIM analysis (Table 4.1) which shows these three groups to be statistically significant but with a much lower R-value indicating a high degree of similarity between them. The fourth group, Milkwood Forest has a much higher R Value indicating a greater difference between Milkwood Forest and the other three groups. This is in line with the findings of the Mucina & Rutherford (2008) vegetation map where all the Peninsula's afrotemperate forests are included in one group.

Mountain Podocarpus Forest does not appear to have been recognised prior to this study and may be endemic to the Cape Peninsula (Euston-Brown et al. 2008). This forest type did not emerge as a strongly distinct vegetation community in the NMDS Ordination conducted in this study purely on the basis of species composition. However, the possibility that it should be recognised as such should not be discounted. It is possible than an ordination which included data on vegetation structure including forest canopy height and with finer scale data available on geology and soils may reveal these forest patches to be a unique Cape Peninsula endemic forest sub-type. More research is required to find out about this (Euston-Brown et al. 2008).

The NMDS ordination also revealed that there was a gradient in species composition between different forest types with some sites showing a species composition characterised by assemblages of species typical of both Western Cape Afrotemperate Forest and Western Cape Milkwood Forest. There was the case for several forest patches visible in the central part of the graph where the two different forest types overlap. At Kogelbaai adjacent to the sea the forest comprises predominantly species typical of Western Cape Milkwood Forest whereas further inland where the same forest patch extends up into the kloofs the species richness increases and the composition becomes far more typical of that of Western Cape Afrotemperate Forest. Other examples of forest patches that are transitional in composition between the two forest types, in all likelihood due to being adjacent to the coastline but in more topographically sheltered areas with higher moisture availability also include the forests at Grootboskloof and Booi se Skerm at Cape Point and most forest patches on the Karbonkelberg adjacent to Hout Bay. This shows that although there are two distinct forest types, not all forest patches on the Peninsula are strongly characteristic of one or the other forest type.

4.4.2. Forest Species Richness

There was a considerable degree of variation in size between the different forest patches throughout the Peninsula and so therefore a General Linear Model was run to examine the effect of species richness on both forest patch size and forest type in variation in woody species richness in the Peninsula forests. Both these explanatory factors were found to be significant. In both forest types the larger the forest patch, the greater the species richness. In South Africa forests it has been shown that the larger the spatial area of forest the greater the species richness (Heltshe & Forrester, 1983; Geldenhuys, 1992; Mucina & Rutherford, 2006). However, research by Geldenhuys (1992) has also revealed that forest woody species richness is more strongly correlated with the proximity to other forests and the number of available dispersal corridors (Geldenhuys, 1992; Mucina & Rutherford, 2006).

Results from the General Linear Model also showed that there was higher species richness in Western Cape Afrotemperate Forest than in Western Cape Milkwood Forest. This is in contrast with findings in other parts of the country that indicate that montane forests have lower species richness than coastal forests, which is the case in both the Southern Cape forests and the forests of Kwa-Zulu Natal (Mucina & Rutherford, 2006). It is not clear exactly why this is the case but it is likely that harsher habitat conditions at the coast including relatively nutrient-poor soils, lower moisture availability and regular salt spray-bearing winds are all contributory factors.

4.4.3. Correlates of Forest Patch Change

The aerial photography dataset revealed an increase in forest cover of 65.3% on the Cape Peninsula from 1944 to 2008. There was a greater increase in cover of Western Cape Afrotemperate Forest of 51.2% and the number of patches increased from 107 to 127 (Table 4.4). The rate of increase in Western Cape Milkwood Forest was higher at 81.4 % and there were a total of five new patches which had formed since 1944 (Table 4.1). With the exception of the work of Luger and Moll (1993) in Orange Kloof on Table Mountain, this is the first time that such high rates of increase in spatial extent of indigenous forest cover have been recorded in South Africa.

This section of the thesis will examine the role of drivers potentially responsible for this change in the context of other work in the forest literature. A general linear model was used to examine the impact of local variation in forest type, forest patch size, mean annual precipitation, mean annual temperature, soil type, geology and the number of fires to burn the margin of each forest patch after 1975 on changes in the distribution of forest cover that were revealed by the aerial photo dataset. Variation in forest type, forest patch size, mean annual temperature and geology were all found to be significant factors in explaining variation in rate of forest patch change. Mean annual precipitation, soil type and fire frequency after 1975 were all found to be non-significant explanatory factors.

Altitude was also initially included in the model but this factor was later excluded owing to autocorrelation with temperature and precipitation. The higher the temperature, the higher the rate of forest change. Temperature decreases with altitude and so it is therefore expected that the higher the altitude, the lower the rate of forest cover change. Western Cape Milkwood Forest occurs primarily in the coastal zone at lower altitudes than Western Cape Afrotemperate Forest and so this helps to explain why there is a significantly higher rate of forest cover increase in this forest type. There have been numerous studies undertaken that show increasing temperatures lead to higher forest growth rates

(Kirshbaum, 1998). In addition, higher temperatures increase decomposition rates of soil organic matter so that nutrients are made more readily available to plants (Kirshbaum, 1998). This is particularly significant in the case of both Western Cape Afrotemperate Forest and Western Cape Milkwood Forest because both these forest types develop on relatively nutrient-poor soils (Mucina & Rutherford, 2006). Owing to this, the majority of tree roots are in the upper soil profile where soil nutrient status increases to enhance forest growth following decomposition of leaf litter (Mucina & Rutherford, 2006). Therefore, there are interaction feedbacks between forest vegetation and associated soils (Mucina & Rutherford, 2006). These results hold significance in the face of changing climate as increasing temperatures may cause more rapid rates of forest expansion in areas where there is long term absence of fire.

The smaller the forest patch, the higher the rate of forest change. Many of the smallest forest patches on the Peninsula are relatively newly-established and dominated by fast-growing and rapidly recruiting pioneer species such as *Kiggelaria africana* and a total of 25 new forest patches (encompassing both forest types) have grown since the original aerial photo dataset was taken in 1944. It is likely that these new pioneer forest nuclei (Midgley et al. 2002) will continue to expand with continued absence of fire. Lower expansion rates have occurred in the larger forest patches as the majority of these are much older and have already expanded as far as the constraints of topography and fire-bearing prevailing winds will allow (Geldenhuys, 1998; Geldenhuys, 2000). Geldenhuys (1998) suggests that localised factors such as geology and precipitation govern the locality of the forest patch but that the direction of prevailing winds in combination with local topography influences the pathways of fire through the landscape which in turn influence the extent and distribution of forest within the landscape (Geldenhuys, 1998; Geldenhuys, 2000; Mucina & Rutherford, 2006).

The influence of moisture availability as a determinant of forest cover change is extremely difficult to quantify owing to multiple sources of moisture influencing forest growth and extent. Variation in mean annual rainfall is the easiest component of available moisture to quantify and findings from this research found this to be a non-significant driver of rates of forest distribution change. This may be owing to mesoscale variations in rainfall on the Peninsula not encompassed at the coarse scales of the WorldClim dataset used (Hijmans et al. 2005). However, moisture availability from rainfall is often augmented by mist and fog (Midgley et al. 2003) and this is particularly the case on Table Mountain (Pauw & Johnson, 1999).

Early experiments undertaken by Marloth in 1904 revealed that condensation on vegetation from fog significantly increased moisture availability on the plateau (Pauw & Johnson, 1999). The weather bureau has estimated that fog precipitation on the summit of Table Mountain reaches on average 3,294 mm per year, which is double the precipitation from rainfall (Pauw & Johnson, 1999). It is possible that additional moisture from mist is a key influence on rates of forest change, but there is little data available on this. Western Cape Afrotemperate Forest is also commonly found growing in association with rivers, streams and seeps (Alston & Richardson, 2006). It is also extremely hard to quantify levels of moisture available from these sources owing to high levels of heterogeneity influenced by seasonal variation, topography and soils (Cowling et al. 1996). In consequence, quantitative data on influence of moisture availability on rates of forest distribution change is lacking.

In contrast, geology was found to be a significant explanatory factor on rates of forest cover change. The highest rates of change were recorded on arenite, followed in descending order by shale, granite and sedimentary geology. Soils derived from arenite are predominantly quartzitic sands and extremely nutrient poor (Cowling et al. 1996; Theron, 1984) and so it is unlikely that presence of arenite geology is the main driver of higher rates of change on these soils. However, arenite geology covers the majority of the Peninsula and so it is likely more by probability that the highest rates of change are recorded here.

In contrast, the presence of shale and granite geologies will definitely contribute to higher rates of forest change than on sedimentary geology owing to the fact that soils derived from both the former are far more nutrient rich clays (Cowling et al. 1996; Theron, 1984; Mucina & Rutherford, 2006).

The results from the general linear model help to explain the role of physical site based explanatory factors in explaining rates of forest cover change on the Peninsula. However, it is also important to consider both the role of disturbance and landscape history (using historical evidence) to explain the changes revealed (Swetnam et al. 1999). Fire frequency after 1975 was shown to be a non significant explanatory factor of rates of forest change but it is likely that fire history and other landscape changes prior to this date may have an influence. This will be explored in more detail in Section 4.4.4 and Chapter 5 of the thesis.

4.4.4. Ecological Impacts of Land Use and Fire: Forest Depletion and Recovery

The negative environmental impact of the early colonists on the forests of the Cape Peninsula has been well documented and thoroughly reviewed by numerous authors. However, the focus has predominantly been upon the extensive harvesting of timber for firewood, building and other industries such as lime burning and brick-making (Steytler & Nieuwmeyer, 1985). Vignettes of information are also scattered through the literature indicating that negative impacts of agricultural practices were as much to blame for forest degradation as timber harvesting in the time after the arrival of Van Riebeeck in 1652. However, this topic has not been reviewed comprehensively by prior authors.

High levels of fire frequency and high fire intensity cause patches of indigenous forest to gradually shrink in size over time (Schmidt & Vlok, 2002). Firstly the shrubby vegetation cover (which on the Cape Peninsula is dominated by *Searsia lucida*, *Searsia tomentosa, Podylaria calyptrata* and *Polygala myrtifolia*) buffering the ecotonal margin is burnt (Manders, 1990). High intensity fires will also eventually burn less fire sensitive forest tree species at the ecotonal margin, exposing more fire sensitive tree species that grow in the forest interior (Granger, 1984). The majority of these species are not able to resprout after fire (Manders, 1990). Narrow strips of riparian forest growing along drainage lines are particularly vulnerable to high fire intensity and frequency.

Prior to arrival of European colonists, the Khoi-San used to burn the fynbos regularly to increase populations of geophytes such as *Watsonia* spp. which were used as a carbohydrate rich food source (Deacon, 1983). Soon after arrival of Dutch colonists, land was divided up into farms and agricultural activity was prevalent throughout the landscape. At the end of the Seventeenth Century, the Dutch East India Company established a winter harbour at Simons Bay with surrounding farms supplying vegetables and dairy and beef produce (Opie, 1967). As land further south along the Cape Peninsula was divided up into farms, the remaining wildlife including grysbok, zebra, red hartebeest, leopards, duikers, and Cape buffalo were either completely shot out or drastically reduced in numbers (Opie, 1967). This story of extensive agricultural development was also true of land further north on the lower slopes of Table Mountain (Deacon, 1983).

By the 1800s the Peninsula’s roads were still patchy and in poor condition and horses played an important role in facilitating transport, much in preference to the slower ox wagons (Opie, 1967). However, horses required good quality forage and demand for good grazing land was high. This led to extensive and regular burning of fynbos to increase the grass component of the vegetation (Opie, 1967). During the South African War, grazing was required for more than six thousand remount horses and the intensity and the extent of burning for pasture increased accordingly (Opie, 1967). Cattle farming also became progressively more widespread (Opie, 1967). Meanwhile, the shrubby component of the fynbos was becoming increasingly depleted owing to harvesting of long-lived woody Proteaceae such as *Protea nitida* and *Leucospermum conocarpodendron* for firewood (Opie, 1967).

The impacts of burning for agriculture and firewood harvesting of woody Proteaceae on the landscapes of the Cape Peninsula is detailed by Adamson and Salter (1950). The authors commented that the vegetation of the Cape Peninsula has been significantly modified by fire and that at time of writing it was hard to find any area of the landscape that had escaped from being burnt for any length of time. They then went on to say that this frequent burning had significantly reduced the numbers of trees and shrubs and it was feared that some species had been driven out altogether. It was also highlighted that these frequent fires had significantly reduced the extent of the Cape Peninsula forests. This point is also made by Spilhaus (1950).

Adamson and Salter (1950) also detail the impacts of pastoral agriculture on the landscapes of the Peninsula. It is commented that the area has no natural grassland and shows little resistance to heavy grazing. Animals were kept in considerable numbers in the vicinity of Cape Town for milk production and this led to almost complete elimination in woody vegetation and a significant reduction in vegetation cover in the surrounding fynbos (Adamson & Salter, 1950). Areas mentioned that suffered severe degradation owing to pastoral agriculture were the valley at Fishhoek and the slopes above Camps Bay (Adamson & Salter, 1950).

In summary, the impact of agriculture caused severe transformation of the vegetation of the Cape Peninsula as detailed by the historical evidence presented here. The shrubby component of the Peninsula fynbos was greatly reduced by a combination of firewood harvesting and frequent burning to increase grazing capacity for livestock (Adamson & Salter, 1950; Spilhaus, 1950) The Peninsula forests were also significantly reduced in extent by high fire frequency. It is therefore concluded that the increases in forest cover recorded by the aerial photo dataset document a recovery of forest vegetation from agricultural impacts. The dataset shows an increase in the number of forest patches colonising areas that were burnt too frequently in the past to allow forest vegetation to grow and an expansion of existing forest patches as they recover from greatly reduced extent in consequence of high fire frequencies. The landscapes of the Cape Peninsula are anthropogenic landscapes with a long history of influence. This is reflected in the vegetation changes through time that this dataset has revealed.

Chapter 5:Changes in Land Cover on the Cape Peninsula from 1880 to 2012 as revealed by Repeat Photography

5.1. Introduction

A longer term perspective on ecological dynamics of environmental systems can significantly enhance an understanding of pattern and process, especially in the context of landscapes transformed by anthropogenic influences or changing climate (Nüsser, 2000). Knowledge of past ecological conditions and disturbance history such as climate and fire frequency can be used to infer changes in past vegetation structure and dynamics. However, records are often too brief or fragmentary to be useful (Swetnam et al. 1999). In these cases, an alternative approach is required to provide a more detailed reconstruction (Rhemtulla et al. 2002).

Repeat photography can be defined as the process of locating the position from where an existing photograph was taken, occupying the same site and taking a new photo to create a photo pair of the same view (Rogers et al. 1984). The technique is a powerful tool for examining processes of landscape change across decadal timescales (Rohde, 1997). Repeat photography was initially used to document glacial change in cryospheric landscapes (Roush et al. 2007). Other applications include assessing long term dynamics of vegetation cover (Clark & Hardegree, 2005) such as treeline ecotonal changes (Roush et al. 2007), vegetation recovery following removal of alien invasive species (Michel et al. 2010) and assessing long term impacts of agriculture on the landscape (Moseley, 2006; Hoffman & Cowling, 1990a).

Repeat photography was first used in 1888 to document landscape change (Roush et al. 2007) but there has been a steady interest in the medium since the publication of Hastings and Turner's classic study '*The Changing Mile*' in 1967 (Watt-Gremm, 2007). Other notable studies in this field include Hoffman and Cowling's (1990b) study on vegetation change in South Africa's Karoo desert and *'A Legacy of Change'* (Bahre, 1991) documenting landscape change in the Sonoran Desert in the USA (Rohde, 1997).

Repeat photography is an effective tool for analysing spatio-temporal dynamics of visually distinct vegetation types (Clark & Hardegree, 2005). This makes it particularly useful for investigating temporal changes across ecotones with different vegetation growth forms such as forest/grassland boundaries. There have been numerous studies undertaken using repeat photography to examine the impacts of changing climate on the dynamics of the alpine treeline ecotone in the USA and Canada (Roush et al. 2007; Levesque, 2005). The technique has also been used to reveal previously undocumented climate-driven forest/heathland ecotonal change in Mediterranean Beech Forest in the Montseny Mountains in Catalonia, NE Spain (Penuales & Boada, 2003).

Despite this, ground-based repeat photography has never been used before to examine forest/fynbos temporal ecotonal changes in South Africa. Most prior studies on South African forest distribution dynamics have used aerial photographs to document change (Luger & Moll, 1993; Corrigan et al. 2010; Lawes et al. 2004b; O' Connor, 2010). However, more modern remote sensing techniques such as use of digital aerial photographs will only provide a temporal dataset documenting environmental change from the 1930s to present while the earliest satellite imagery will only provide data from the 1970s onwards (Manier & Laven, 2002).

Use of repeat photography can significantly expand the temporal depth of analyses owing to the availability of ground-based historical images from the 1860s (Clark & Hardegree, 2005). They are therefore used in conjunction with digital aerial photographs for this study. Complementary and comparative analyses using multiple lines of evidence are an excellent way to enhance environmental reconstructions. This is particularly the case when different techniques offer greater variation in temporal and spatial scales (Swetnam et al. 1999).

Owing to their oblique perspective and continuously varying scale, repeat photographs can only be used to quantify relative change rather than spatially explicit attributes (Watt-Gremm, 2007). It is therefore important to use the technique in conjunction with other measures of ecological change to achieve best possible results (Hendrick & Copenheaver, 2009). When using repeat photography it is important to recognise these limitations but where other datasets are absent the technique offers a rich resource to document long term historical change (Clark & Hardegree, 2005).

To date the majority of studies that use repeat photography have used qualitative methods to document change (Roush et al. 2007). The most common approach has been to present the original and repeat images together and then visually compare the differences between them including perceived relative extent of vegetation types (Clark & Hardegree, 2005). However, this method is highly subjective and will only reveal the most obvious changes (Rhemtulla et al. 2002). It is a powerful and simple way of illustrating landscape change to a broad audience which may include non-specialist stakeholders and policymakers and is an excellent starting point for assessing management policy (Pickard, 2002). The new repeat image also acts as a benchmark for future evaluation (Swetnam et al. 1999).

However, a visual qualitative approach exploits only the minimum potential of repeat photos as a scientific resource (Clark & Hardegree, 2005). One of the earliest efforts to extract quantitative data of forest cover change from repeat photographs was undertaken by Hofgaard et al. (1991). They used this technique to examine changes in forest physiognomy in response to climatic variability in old-growth montane karst forest in northern Sweden. Since then, a variety of different methods have been developed to use repeat photographs to examine relative changes in land cover (Roush et al. 2007; Webb et al. 2010). Clarke and Hardegree (2005) recorded land cover classes from 900 randomly distributed pixel points in each image. Roush et al. (2007) used a fishnet grid to mirror landscape topography in ArcGIS to minimise the impact of continually changing scale within the image. Rhemtulla et al. (2002) takes the analysis a step further by employing use of a transition matrix to document vegetation changes during their research in Jasper National Park in Canada.

Quantitative analyses of an extensive repeat photography dataset will be used to investigate land cover change on the Cape Peninsula from 1900 to present. This will allow fine scale analysis of relative change in forest distribution alongside changes in associated land cover classes.

5.2. Methods

The methods used in this project are after Rohde (1997), Duncan et al. (2005), Webb et al. (2010) and Pontius et al. (2004).

5.2.1. Selection of Historical Photos

The historical ground images used in the project were sourced predominantly from the South African National Archives in Cape Town. Images were selected from the Elliot Collection, AG Collection, CA

Collection, Green Collection and the Steer Collection and scanned by the author as high resolution TIFF images at 300 dpi with the long side of the image set at 450 mm. Other images used were sourced from the Mountain Club of South Africa's historic photo archives, located within the University of Cape Town's Library and Archives department.

A total of 50 images showing Western Cape Afrotemperate Forest and Western Cape Milkwood Forest were selected for use in the study. Although images were selected to include sites from throughout the Cape Peninsula there was a paucity of images available showing landscapes south of Table Mountain (Figure 5.1). Once appropriate historic photos for the project were identified, the final collection of images was chosen according to image quality and clarity and ease of photo point identification. Any images of inferior quality or indiscernible locality were rejected. Dates vary with the earliest image being from 1889 and the most recent image from 1980. Altogether the collection encompasses 123 years.

5.2.2. Locating historical photo points and associated field data collected

The location of the historic images selected was then relocated in the field. This task was undertaken by initial location of key landmarks on a topographic map followed by visual triangulation using relatively static landscape features such as rocks or buildings. This is a trial and error process involving repeated moves of the camera until the scene within the camera viewfinder best matches the historic image (Elliot & Baker, 2004).The locality of all 50 repeat photo points used in the study are shown in Figure 5.4.

In most cases it was possible to identify and use the exact historic photo point. However, under some circumstances a proximal alternative was used. This was necessary if the original view was obscured by vegetation or development. At each photo point a repeat image was taken. As far as possible the replicate image was taken at the same time of day (where known) as the original. The repeat images were taken using a Canon 450D camera on a tripod to allow for easy measurement of camera height. The centre of the original image was identified and this point was used to align the centre of the repeat image. A 17-85mm zoom lens was used to closely replicate the original frame.

The locality and altitude of historic photo point sites were recorded using a Global Positioning System (GPS). Photographic details of each image were recorded including focal length, f-stop, shutter speed and time the image was taken. After a repeat photo of the historic image was been taken, the camera was rotated first 30˚ and then 60˚ to the left and right to take two additional images. This provides a panoramic record of the site which could be used by future researchers. Additional field locality data was also recorded, including geology, soil type, bioregion and vegetation type. The latter two were identified according to Mucina & Rutherford (2006).

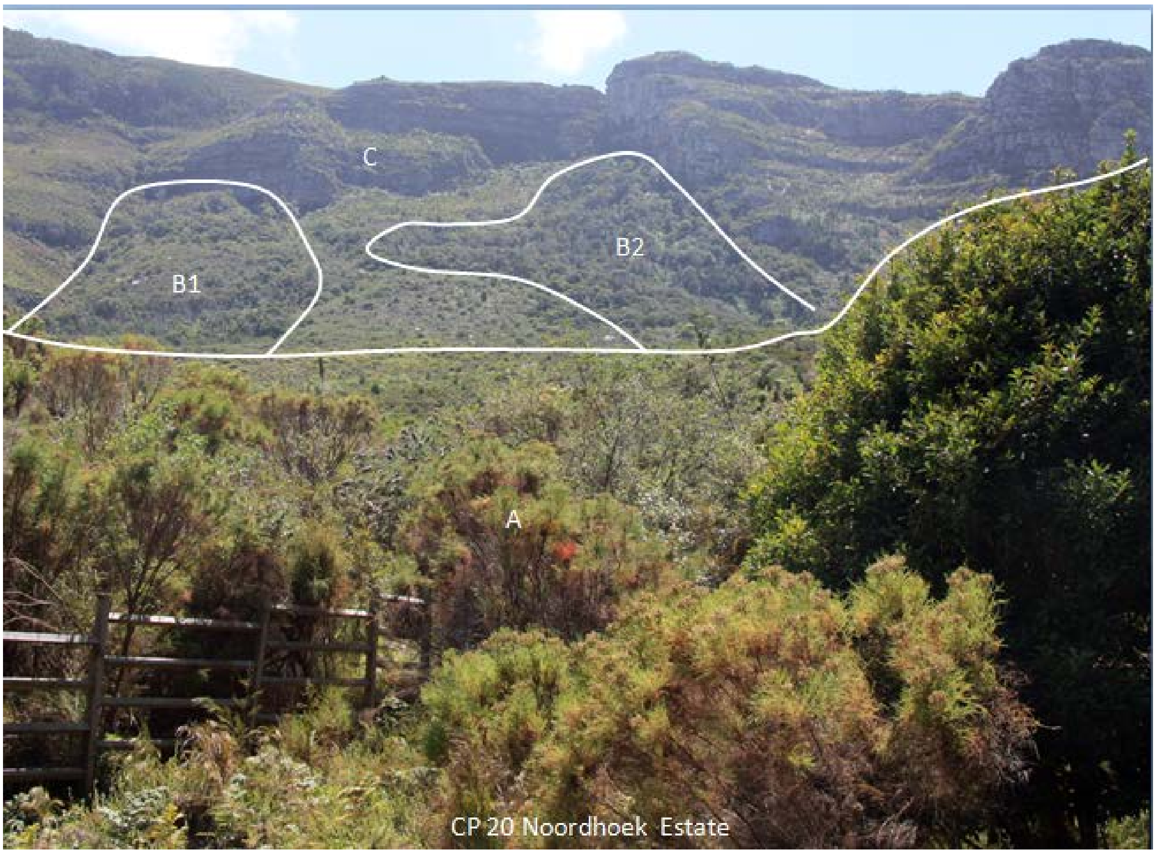

Figure 5.1: Repeat image with key landforms demarcated for analysis of repeat photo set.

After the initial photo and site metadata were recorded, the landscape encompassed by the image was divided according to geomorphic landform to facilitate analysis (Figure 5.1) (Also see repeat photo dataset in Appendix II). For each landform notes were taken in the field to provide a general ecological description of the site and to record key environmental changes which had occurred since the original image was taken. The next stage was to visit each divided component of the landscape to undertake a more detailed survey of the vegetation. The percentage cover for all dominant species was recorded for each landform and binoculars were used to aid identification of taxa at more inaccessible sites. If a species could not be identified in the field it was given a working name and a specimen was collected for later identification using field guides and/or available herbarium specimens.

5.2.3. Matching & Analysis of Photo Pairs

After the repeat photographs were taken and associated metadata collected, the repeat and original images were matched using Adobe Photoshop CS4. Both the original and repeat images were imported into Photoshop and their resolution adjusted to 300 pixels/inch. Both images were changed to 16 cm in length along the longest side. The photos were then rescaled to the same dimension, placed on top of each other and then adjusted to ensure they were correctly aligned. After this both images were cropped to create two perfectly matched photographs.

The complete repeat photo collection (which is presented in full with associated metadata in Appendix II) was then used to investigate land cover change on the Cape Peninsula, with a particular focus on the temporal change in Western Cape Afrotemperate Forest and Western Cape Milkwood Forest. The collection was divided into images showing both forest types and then was subdivided according to time step: all photo pairs with the original image taken prior to 1970 were allocated to one category and more recent images were analysed separately. A 360 point grid was placed over each image in Adobe Photoshop CS4 (Figure 5.2). At each gridline intersection the land cover type was recorded. Categories used were: Western Cape Afrotemperate Forest, Western Cape Milkwood Forest (only two images in the collection had both forest types present), fynbos, exposed rock, alien trees and shrubs, alien grass, development and sand. Both exposed rock and sand were recorded to be used as an additional indicator of change in vegetation cover and biomass. The non-variable land cover classes of sky and sea were recorded as null values. This dataset was then used to examine changes in land cover between the time step of the original and repeat photographs. Average percentage change and standard deviation of land cover changes were calculated.

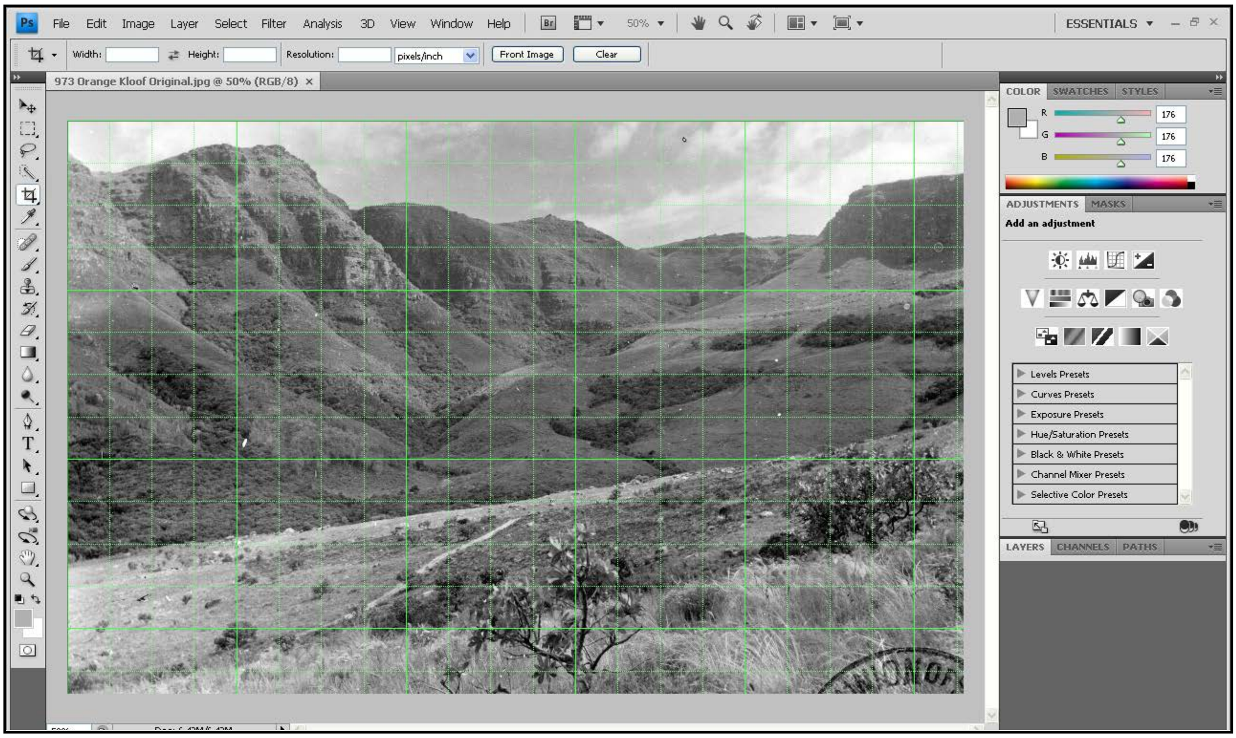

Figure 5.2: Image in Adobe Photoshop CS4 with grid overlaid for analysis.

5.2.4. Transition Matrix Analysis of Repeat Photo Pairs

Transition matrices were then used to analyse trends and trajectories of proportional change in relative spatial extent of each land cover class after Pontius et al. (2004). For the purposes of this analysis, the repeat photo dataset was divided both by forest type and then into two time steps with repeat image pairs from 1900 to 2012 and 1970 to 2012 being analysed separately. Firstly, the land cover change datasets were entered into cross-tabulation matrices (Shoyama & Braimoh, 2011). These cross-tabulation matrices consisted of nine rows detailing the vegetation type at *t0* (the original images) and nine columns showing the land cover type (classes used are listed in Section 5.2.3) at *t1* (the repeat images). The transition probability matrix used is presented in Table 5.1.

Table 5.1. Transition probability matrix used for analysis of land cover change in the repeat photo dataset after Pontius et al. (2004).

					t_{+1} (2011)					
t_0 (1970)		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
		Fynbos	**W/C Afro-temperate Forest**	**W/C Milkwood Forest**	**Rock**	**Woody Aliens**	**Alien Grass**	**Sand**	**Develop-ment**	**Null**
1	**Fynbos**	$P_{1,1}$	$P_{2,1}$	$P_{3,1}$	$P_{4,1}$	$P_{5,1}$	$P_{6,1}$	$P_{7,1}$	$P_{8,1}$	$P_{9,1}$
2	**W/C Afro-temperate Forest**	$P_{2,1}$	$P_{2,2}$	$P_{3,2}$	$P_{4,2}$	$P_{5,2}$	$P_{6,2}$	$P_{7,2}$	$P_{8,2}$	$P_{9,2}$
3	**W/C Milkwood Forest**	$P_{3,1}$	$P_{2,3}$	$P_{3,3}$	$P_{4,3}$	$P_{5,3}$	$P_{6,3}$	$P_{7,3}$	$P_{8,3}$	$P_{9,3}$
4	**Rock**	$P_{4,1}$	$P_{2,4}$	$P_{3,4}$	$P_{4,4}$	$P_{5,4}$	$P_{6,4}$	$P_{7.4}$	$P_{8,4}$	$P_{9,4}$
5	**Woody aliens**	$P_{5,1}$	$P_{2,5}$	$P_{3,5}$	$P_{4,5}$	$P_{5,5}$	$P_{6,5}$	$P_{7,5}$	$P_{8,5}$	$P_{9,5}$
6	**Alien grass**	$P_{6,1}$	$P_{2,6}$	$P_{3,6}$	$P_{4,6}$	$P_{5,6}$	$P_{6,6}$	$P_{7,6}$	$P_{8,6}$	$P_{9,6}$
7	**Sand**	$P_{7,1}$	$P_{2,7}$	$P_{3,7}$	$P_{4,7}$	$P_{5,7}$	$P_{6,7}$	$P_{7,7}$	$P_{8,7}$	$P_{9,7}$
8	**Develop-ment**	$P_{8,1}$	$P_{2,8}$	$P_{3,8}$	$P_{4,8}$	$P_{5,8}$	$P_{6,8}$	$P_{7,8}$	$P_{8,8}$	$P_{9,8}$
9	**Null**	$P_{9,1}$	$P_{2,9}$	$P_{3,9}$	$P_{4,9}$	$P_{5,9}$	$P_{6,9}$	$P_{7,9}$	$P_{8,9}$	$P_{9,9}$

Matrix algebra was then used to calculate a Markov Probability Curve (Figure 5.3) for each land cover class showing the trajectory of change between the original and repeat image including extrapolation of predicted change one time step into the future from the time elapsed between the original and repeat images (Pontius et al. 2004).

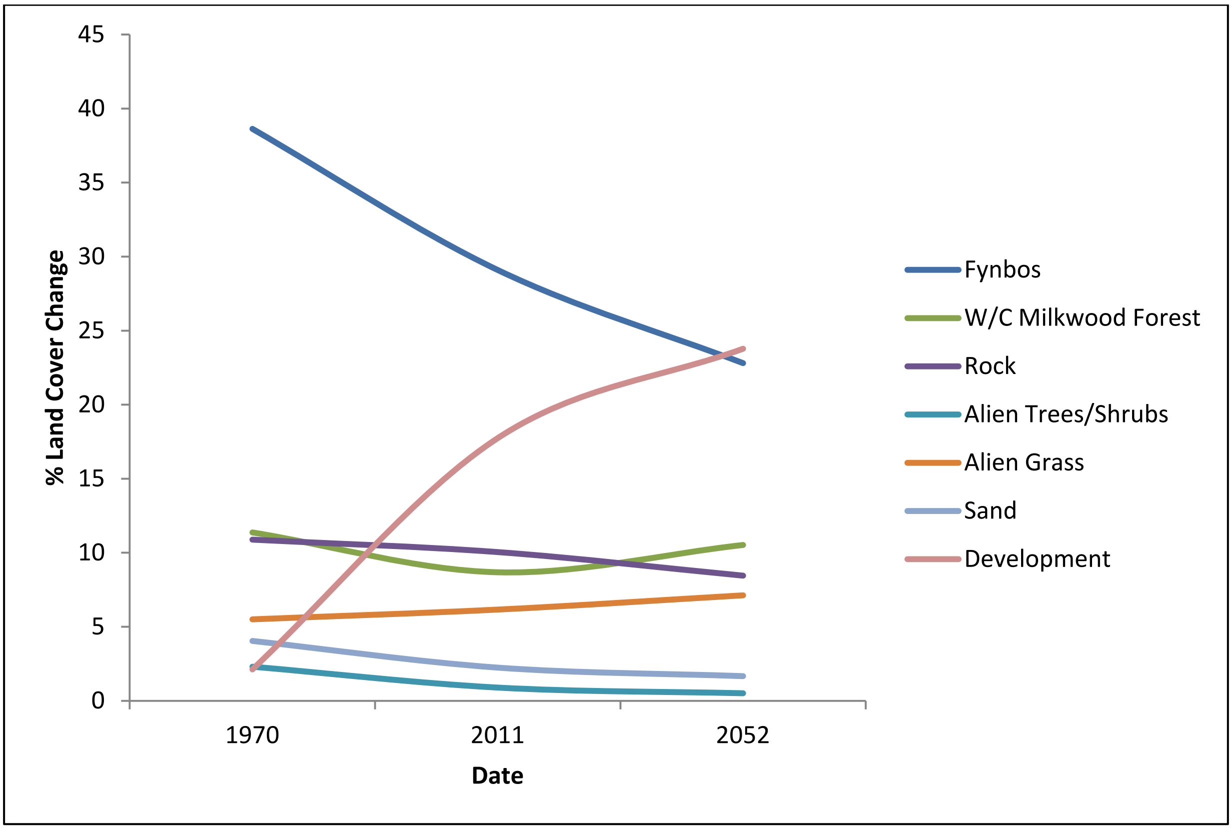

Figure 5.3. Markov probability curve showing land cover change in repeat photo dataset from 1970 to 2012 with one extra time step of 42 years extrapolated into the future to 2052.

For each probability curve the data points were converted using an Excel spreadsheet to allow re-plotting of the data as a straight line graph. The equations of the straight line graphs were used to calculate the trajectories of proportional change in the dataset with decadal time steps. Once this had been completed these results were plotted as a proportional bar histogram to model trajectories of land cover change (shown in results Section 5.3.4) (Shoyama & Braimoh, 2011).

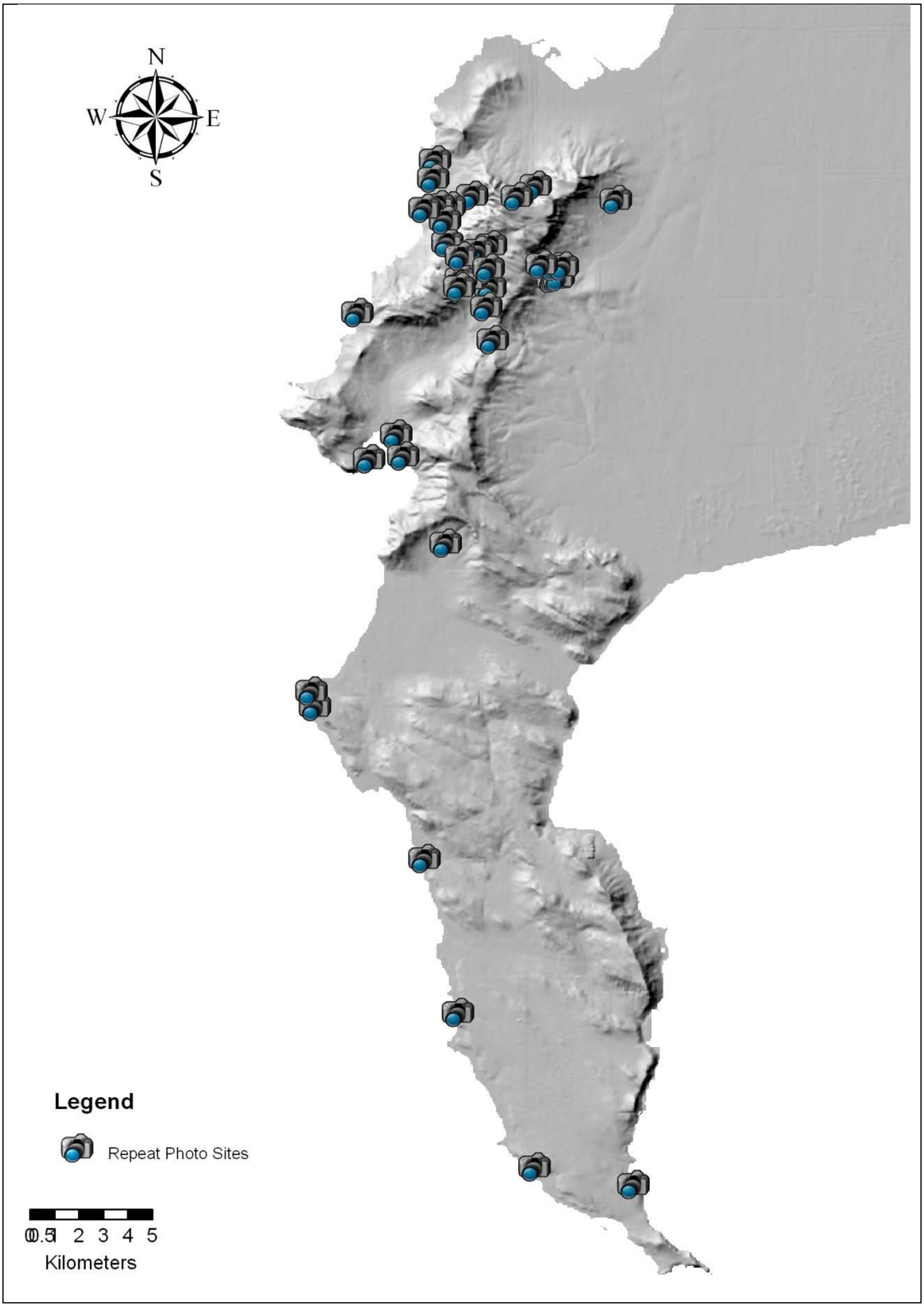

Figure 5.4: Locations of all repeat photo sites (See Appendix II for full dataset).

5.3. Results

5.3.1. Cape Peninsula Historic Land Cover Change

Average percentage change in land cover between the original and repeat images was recorded. There was considerable variation in change in cover of Fynbos. However, on average there was a decrease in fynbos cover of 5%. Western Cape Afrotemperate Forest increased in cover by almost 5% according to the repeat photo dataset (Figure 5.5). This is in contrast to a slight decrease in cover of 1% in Western Cape Milkwood Forest. A decrease of more than 5% in cover of visible rock was noticed throughout the Peninsula. There was a slight decrease in cover of bare dune sand and alien trees and shrubs. In contrast, there was a slight increase in cover of alien grasses. There was a high rate of increase of cover from building development with an increase of 7% (Figure 5.5).

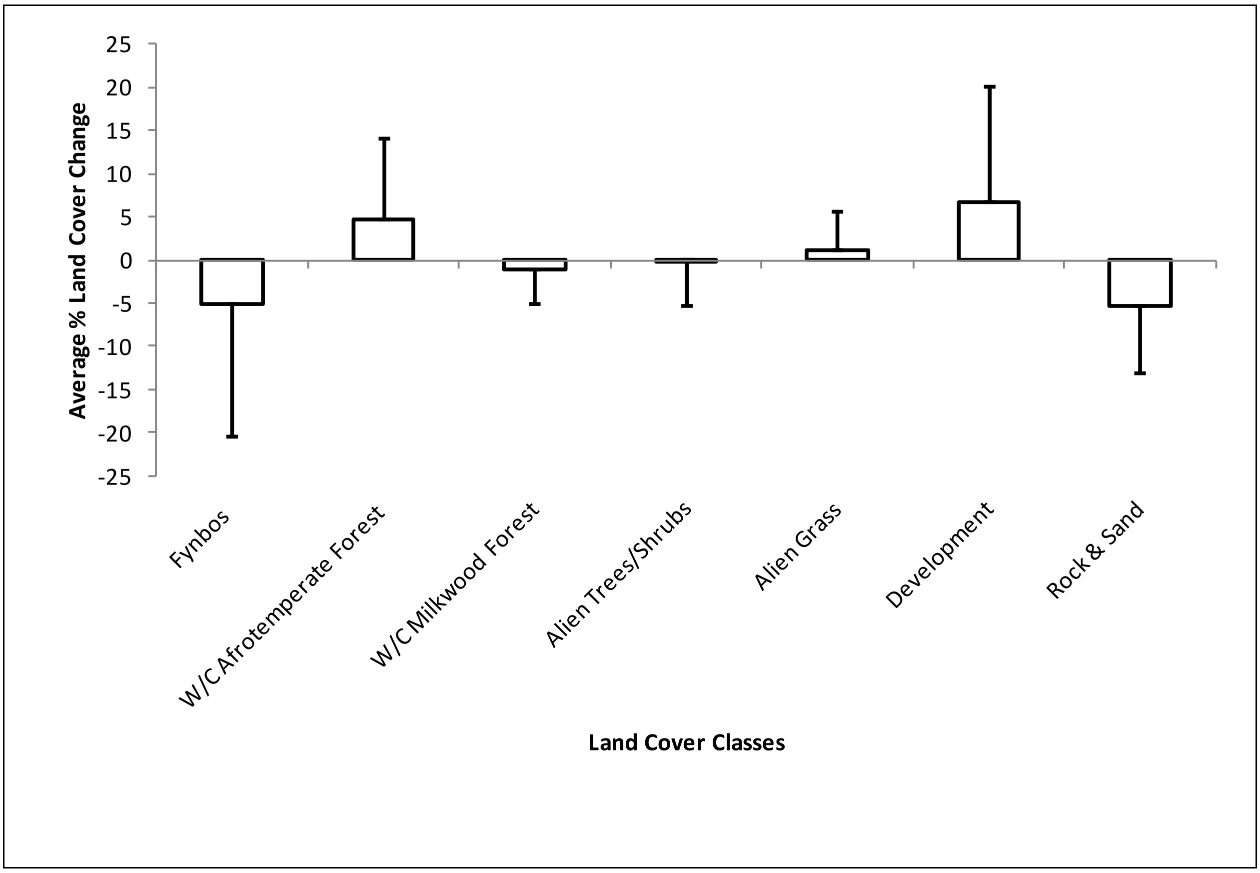

Figure 5.5: Percentage land cover change from 1880 to 2012 (+stdev) between 50 original and repeat images in repeat photo dataset of the Cape Peninsula

5.3.2. Photographic Evidence of Vegetation Change in

Western Cape Afrotemperate Forest

Increase in forest cover was recorded at all 50 of the repeat photo sites, although there was a high degree of variance in extent of forest cover increase. The highest increase in relative forest image cover was recorded at Blinkwater Ravine on the western side of Table Mountain (Figure 5.6). The original image used was taken by Cairncross in 1882 during the building of the Pipe Track on the lower slopes of the Twelve Apostles above Camps Bay. This is one of the earliest historic images in the repeat photo dataset.

The original image reveals the lower slopes of Blinkwater Ravine and the Twelve Apostles in 1882 to have predominantly fynbos vegetation cover. The vegetation here is relatively low-growing and comprised mainly shrubs with a smaller grass component. Some larger geophytes, thought to be *Watsonia tabularis*, are visible in the foreground of the image. The lower slopes are scattered with large sandstone boulders throughout. On the lower slopes of Porcupine Buttress there is a small patch of scree forest. Blinkwater Ravine is forested in the upper reaches along the drainage line and there is a long and narrow patch of scree forest visible in the adjacent Fountain Ravine.

Since the original image was taken there has been a substantial increase in extent of Western Cape Afrotemperate Forest in Blinkwater and other adjacent ravines. Relative forest image cover has increased by 52% at this site over the last 130 years. The present vegetation on the lower slopes is now dominated by forest precursor species, in particular *Phylica buxifolia*, *Searsia tomentosa* and *Searsia lucida*. These are typically forest margin species but here they now dominate the vegetation. The vegetation at this site is now far taller and there has been a significant increase in woody biomass.

The forest/fynbos ecotone is now far less well-defined and there has been a 25% decrease in fynbos cover. On the upper slopes there has been a slight expansion in spatial extent of the scree forest on Porcupine Buttress, but this is minimal in comparison to the vegetation changes that have occurred further downslope. Owing to the increase in vegetation height and biomass, there has been a decrease in rock cover recorded owing to most of the large sandstone boulders visible in the original image now being obscured. Visible rock cover has decreased by nearly 27% at this site.

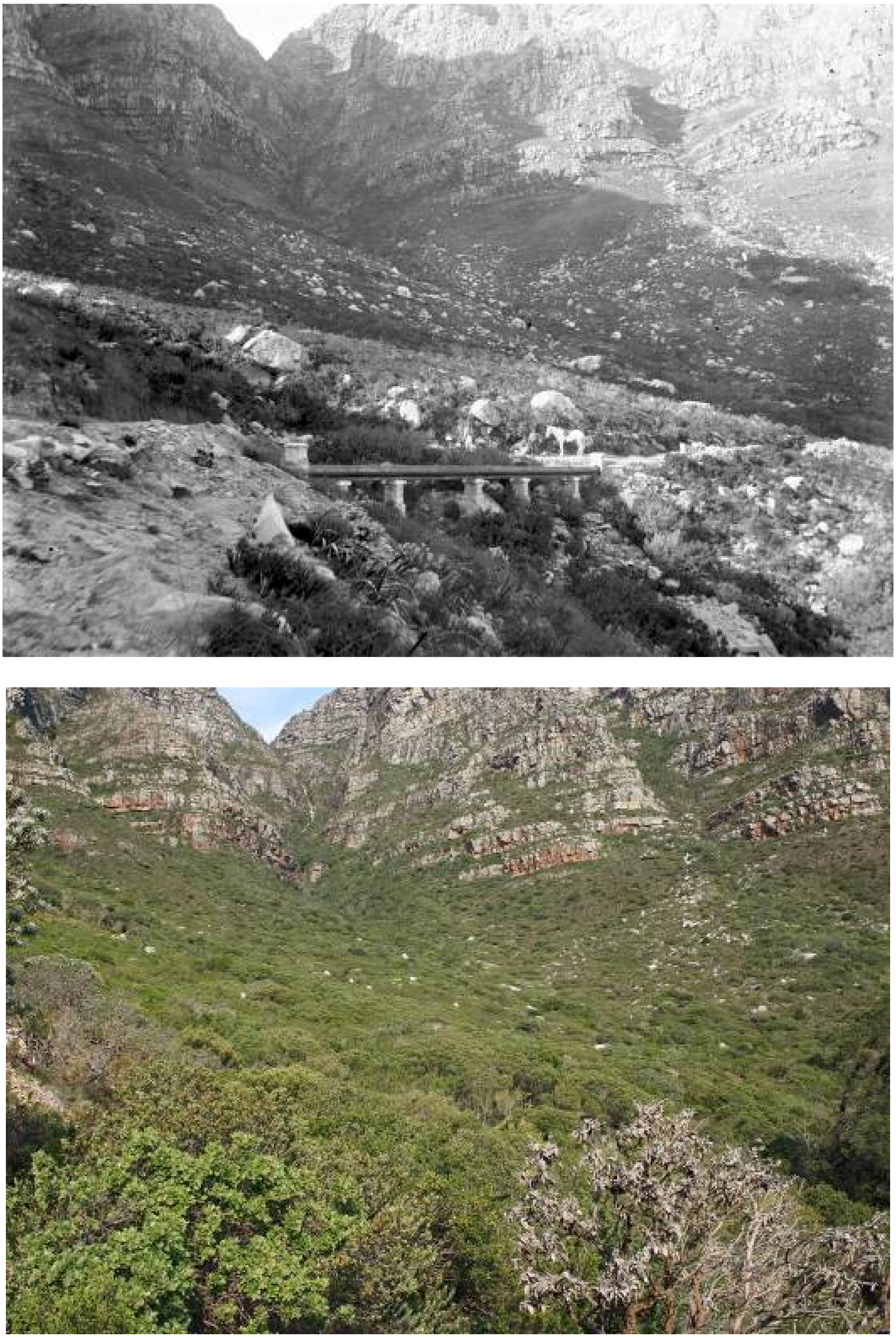

Figure 5.6: Site 766 Blinkwater Ravine original image (upper) by Jurgens (1882). Repeat image (lower) (07/09/2011). Since 1882 there has been significant expansion of Western Cape Afrotemperate Forest cover. There has also been an increase in shrubby vegetation (dominated by Phylica buxifolia) at the forest-fynbos ecotone which is now far less well-defined. Vegetation biomass has increased leading to a decrease in visible rock cover since the original image was taken.

Figure 5.7: Site 973 Orange Kloof: Original image (upper) from the Elliot Collection (South African National Archives) (c.1900). Repeat image (lower) by Zoë C Poulsen (21/09/2011). There has also been a significant increase in forest cover at this site since the original image was taken. Some forest patches have coalesced and the forest-fynbos ecotone is now far less well-defined. Forest precursor species have colonised the adjacent fynbos creating a forest/fynbos mosaic. Grass cover has also decreased and been replaced by increasing shrubby vegetation cover.

High rates of increase in relative forest cover were also recorded in Orange Kloof on the southern slopes of Table Mountain (Figure 5.7). The original image (c. 1900) shows low growing grass-dominated vegetation, with scattered individuals of *Protea nitida* visible in the foreground. The south-facing slope below the ring road has several small patches of Western Cape Afrotemperate Forest in association with streams descending along drainage lines from below Orange Face with well-defined ecotonal margins. There is also Western Cape Afrotemperate Forest growing on boulder scree on the lower slope of Frustration Buttress as well as in the adjacent Frustration Gully and Intake Ravine. These forest patches have well-defined margins and coalesce in the riparian zone of the Disa Stream on the lower slopes of Orange Kloof.

Since 1900 there has been a 36% increase in relative cover of Western Cape Afrotemperate Forest at this site. The area shown in the foreground of the image is now highly disturbed and dominated by alien grasses and *Searsia lucida*. After the original image was taken, this area of Orange Kloof was afforested with alien *Pinus* spp. and then cleared during the early 1990s. The lower slopes of Orange Kloof below the Ring Road are now almost completely covered by climax forest and the scattered patches visible in the original image have now almost completely coalesced. The forest-fynbos ecotone is now far less well-defined.

Figure 5.8: Forest/fynbos mosaic vegetation in Orange Kloof below the Ring Road on Table Mountain dominated by woody taxa.

The fynbos vegetation that remains in Orange Kloof below the Ring Road now comprises predominantly of woody taxa owing to long term fire exclusion in this area. This creates forest/fynbos mosaic vegetation in areas in proximity to forest patches where the ecotone is now far less well-defined than it was in 1900. Shrubby fynbos elements such as *Widdringtonia nodiflora, Protea nitida, Leucospermum conocarpodendron, Podylaria calyptrata* and *Polygala myrtifolia* dominate the vegetation alongside forest margin species including *Phylica buxifolia*, *Searsia lucida*, *Searsia tomentosa* and *Chrysanthemoides monilifera*. There are also densely scattered individuals of forest precursor tree species including *Kiggelaria africana*, *Maytenus oleoides* and *Virgilia oroboides* (Figure 5.8). Wetter areas comprise predominantly mesic species including a strong Restioid element with *Osmitopsis astericoides* alongside scattered individuals of *Cunonia capensis* (Figure 5.9).

Figure 5.9: Forest/fynbos mosaic vegetation typical of mesic seepage area in Orange Kloof below the Ring Road on Table Mountain

Similar increase in forest cover has been revealed by the more recent repeat photo pairs of Orange Kloof (Sites 603 - 608 in Appendix II). All the other original images of this area used were taken by Eugene Moll in 1972. On the eastern slopes of Orange Kloof forest expansion has continued since the 1970s. On the lower slopes of Orange Buttress, Orange Ridge and Frustration Arête there has been an increase in domination of shrub cover in the fynbos vegetation. There has been a slight expansion in forest cover along ephemeral stream drainage lines in Intake Ravine and Frustration Gully as well as at the margins of the scree forest on the adjacent Frustration Buttress. On Frustration Buttress the forest-fynbos ecotone is now far less well-defined. Since 1972 the forest canopy here has shown an increase in height and is now far more differentiated: it looks far more uniform in the original image.

On the upper south-facing slopes on the cliffs below Orange Face, there has been a slight expansion in forest cover since 1972. This is also true of forest below the Ring Road on the lower southern slopes. There has been a slight increase in shrubby cover in the surrounding fynbos since Moll's original image was taken: this increase predominantly comprises of *Protea nitida*. On the west-facing slopes below the peaks of Belle Ombre and Klassenkop there has been relative stasis in vegetation since the 1970s. The only change observed was a slight expansion in cover of riparian forest along the Original Disa Stream below the De Villiers Dam.

The repeat photo dataset also revealed significant change in relative forest cover in Disa Gorge on Table Mountain (Figure 5.10). Historical images from 1900 show the riparian zone of the kloof with relatively low-growing shrubby vegetation. Since then the gorge has been colonised by Western Cape Afrotemperate Forest, dominated by moisture-loving species such as *Cunonia capensis* and *Ilex mitis*. Disa Gorge runs in a south-westerly direction adjacent to the Back Table and holds the upper reaches of the Disa Stream prior to its flow into Orange Kloof below.

The Disa Stream runs below the Woodhead Dam which was built in 1897 on the summit plateau of Table Mountain. The upper section of the stream now has its flow regulated by the dam sluices and since the dam was constructed the stream now no longer experiences seasonal flow typical of pristine streams elsewhere on the mountain (Pauw & Johnson, 1999: pp. 149). In consequence, year round stream flow has greatly increased moisture availability in the kloof. This is thought to be the main reason for forest expansion in this area.

Figure 5.10: Site 975 Disa Gorge: Original image (Upper) by Cameron from the Mountain Club of South Africa archives (c. 1900). Repeat image (lower) by Zoë C Poulsen (04/10/2011). Forest cover has significantly increased in the kloof and is dominated by moisture-loving forest taxa such as Ilex mitis and Cunonia capensis. There has also been an increase in forest canopy height. This increase is partially attributed to upriver flow regulation of the Disa River causing increase in summer moisture availability.

More recent repeat images from the 1970 and 1980s have revealed an ongoing increase in woody cover on the Twelve Apostles over the last 30 years. An image taken by Hall in 1980 (Figure 5.11) shows the lower slopes of the Twelve Apostles below Postern and Kasteels Buttresses after a fire burnt through the area. With the exception of a few low shrubs in the foreground of the image and several alien Stone Pines, there is very little woody vegetation cover remaining after the fire.

Since then, there has been a significant increase in woody cover in the fynbos on the lower slopes. The upper scree slopes in Kasteelspoort have now been almost entirely colonised by *Phylica buxifolia*. There has also been an increase in woody cover along the lower reaches of the Kasteelspoort stream, which is visible in the foreground of the image. This is primarily dominated by forest precursor species such as *Kiggelaria africana*. Further upstream both above and immediately below the Pipe Track in the stream's riparian zone there are scattered individuals of *Halleria lucida* and *Rapanea melanophloeos* growing in association with *Podylaria calyptrata*.

Figure 5.11: Site 999 Theresa Drive Original Image (Upper) by Hall (1980). Repeat image (lower) by Zoë C Poulsen (02/12/2011). The original image was taken after a fire burnt this part of the Twelve Apostles. The upper scree of Kasteelspoort and lower foreground slopes have now been colonised by forest precursor species including *Kiggelaria africana* and *Phylica buxifolia*. The surrounding fynbos also shows an increase in shrubby vegetation cover.

5.3.3. Photographic Evidence of Vegetation Change in Western Cape Milkwood Forest

The repeat photography dataset shows an overall decrease in cover of Western Cape Milkwood Forest owing to coastal housing development. This is illustrated by the repeat photo dataset from Site 981 at Kommetjie. The original image taken by Green in 1900 (Figure 5.12) was taken prior to the town of Kommetjie being built. The historic photo shows an extensive area of lowland fynbos with a few scattered houses and a coastline lined with an uninterrupted belt of Western Cape Milkwood Forest. Since the original image was taken, almost the entire coastal plain is covered with coastal housing development. Only a few fragments of Western Cape Milkwood Forest remain, which are predominantly individual specimens of *Sideroxylon inerme*.

Figure 5.12: Site 981 Kommetjie original image (Upper) from the Green Collection (South African National Archives) (c. 1900). Repeat image (Lower) by Zoë C Poulsen (27/10/2011). Repeat image (Lower) by Zoë C Poulsen (27/10/2011). The original image shows extensive Western Cape Milkwood Forest cover along the Kommetjie coastline. Most of this forest has now been cleared for housing development, with only scattered Sideroxylon inerme remaining owing to its earlier protected status than other Western Cape Milkwood Forest taxa.

5.3.4. Transition Matrices & Land Cover Change Projections to 2050

Transition matrices were used after Pontius et al. (2004) to examine projected changes in land cover over the next 50 years (Figures 5.13 – 5.16). The repeat images were divided into two different time steps for this analysis: repeat photo pairs from 1900 to 2012 and 1970 to 2012 were assigned to separate classes for purpose of this analysis. Images were also subdivided according to whether they showed Western Cape Afrotemperate Forest or Western Cape Milkwood Forest. From 1900 to present in the Western Cape Afrotemperate Forest images fynbos cover decreased from 38% in 1900 to 34% in 2010. If this rate of change continues, projections from the transition matrices suggest that fynbos will decrease to 32% of land cover by 2050. In contrast, Western Cape Afrotemperate Forest comprised only 7% of land cover in 1900 and increased to 15% in 2010. By 2050 if current rates of change continue Western Cape Afrotemperate Forest is projected to increase to 17% of total cover, representing an increase of more than 10% since 1900 (Figure 5.13).

In the Western Cape Milkwood Forest images from 1900 to 2012 there were similar trends in fynbos land cover change. In contrast, Western Cape Milkwood Forest declines in percentage land cover from 7% in 1900 to 2% in 2010. Over the next fifty years this vegetation type is predicted to remain stable (Figure 5.14). Similar trends are also present in the transition matrices derived from photo pairs from 1970 to 2012.

In both the Western Cape Afrotemperate Forest and Western Cape Milkwood Forest images, fynbos cover decreased from 40% in 1970 to 33.47% in 2010 and if current rates of change continue this is projected to decrease to 28% by 2050 (Figures 5.15 & 5.16). Western Cape Afrotemperate Forest increased from 31% in 1970 to 40% in 2010 and is projected to increase to 47% by 2050 if current rates of change continue (Figure 5.15). Western Cape Milkwood Forest constituted 11% of total cover in 1970, which decreased to 9% by 2010, prior to a slight projected increase to 10% by 2050 (Figure. 5.16).

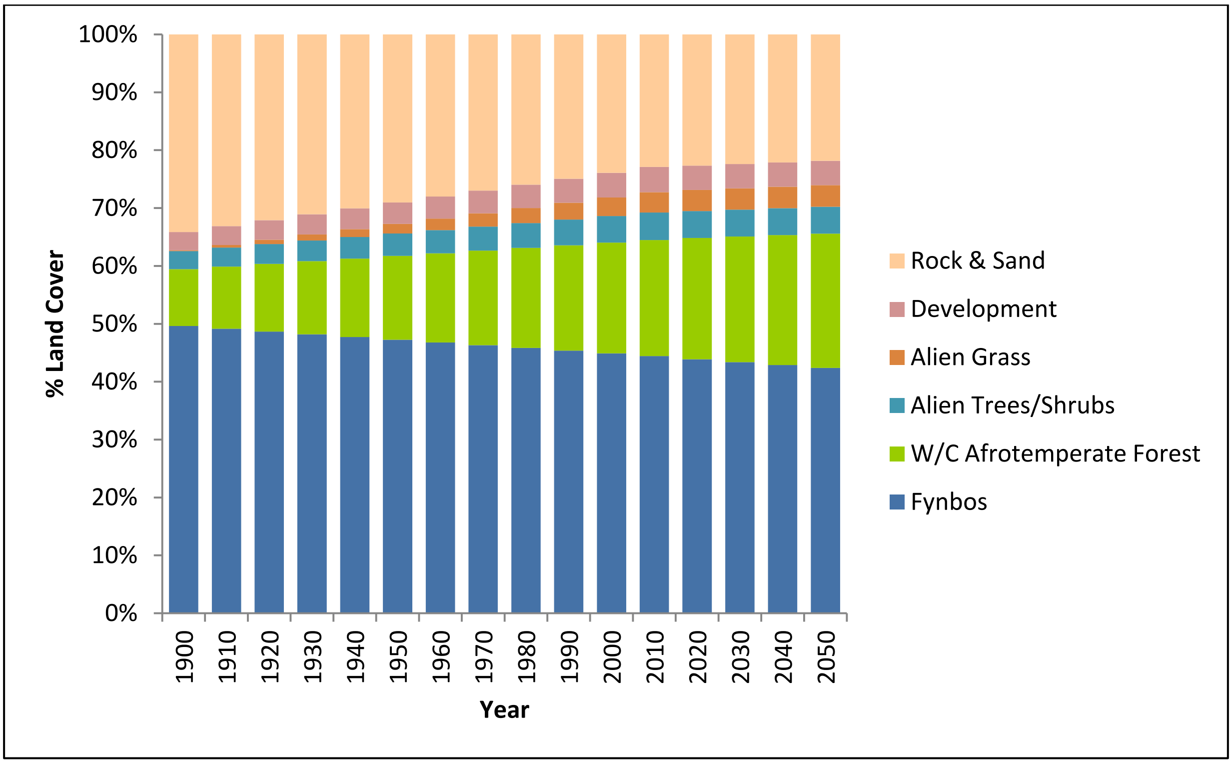

Figure 5.13: Transition matrix analysis showing changes in land cover in Western Cape Afrotemperate Forest repeat images from 1900 to 2010 and projected future land cover changes to 2050.

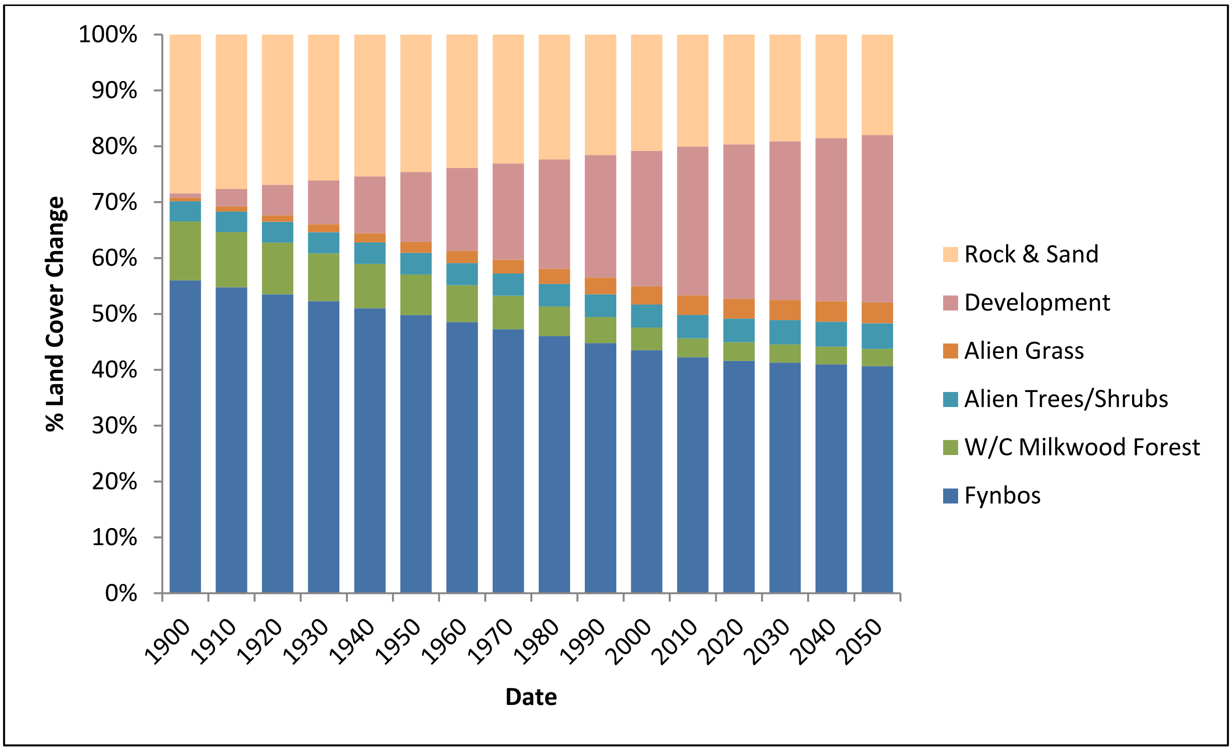

Figure 5.14: Transition matrix analysis showing changes in land cover in Western Cape Milkwood Forest repeat images from 1900 to 2010 and projected future land cover changes to 2050.

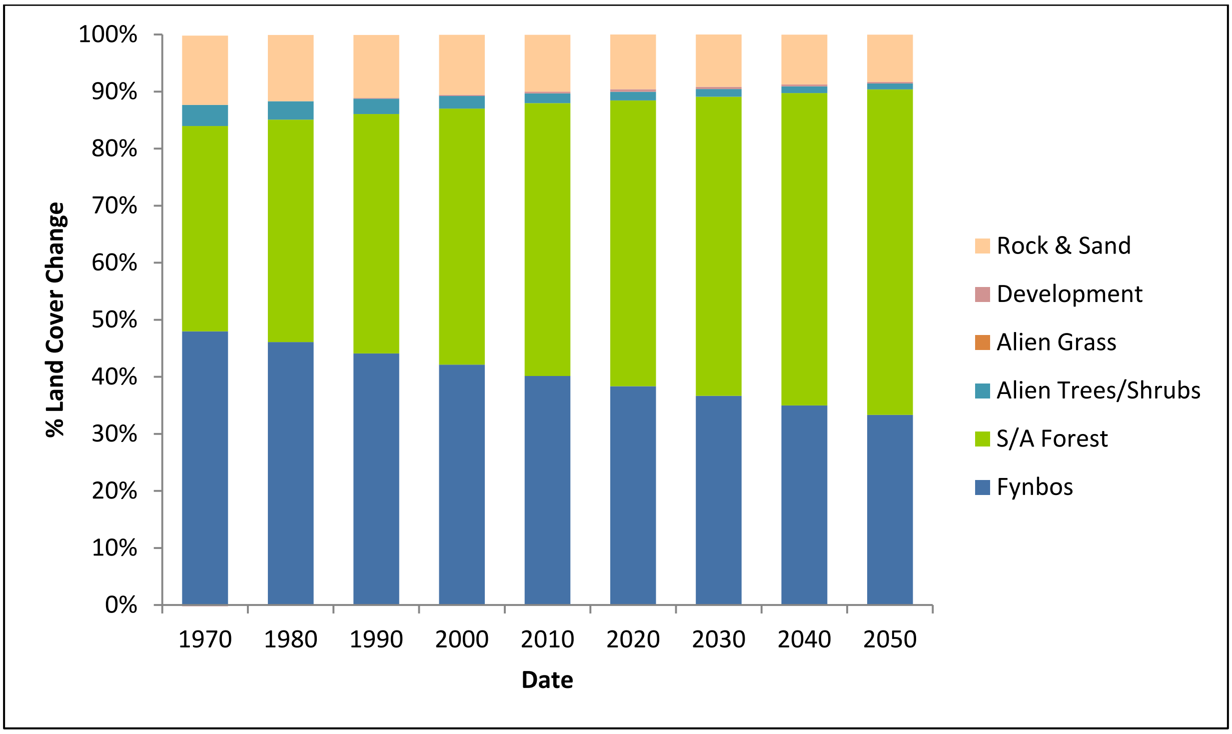

Figure 5.15: Transition matrix analysis showing changes in land cover in Western Cape Afrotemperate Forest repeat images from 1970 to 2012 and projected future land cover changes to 2050.

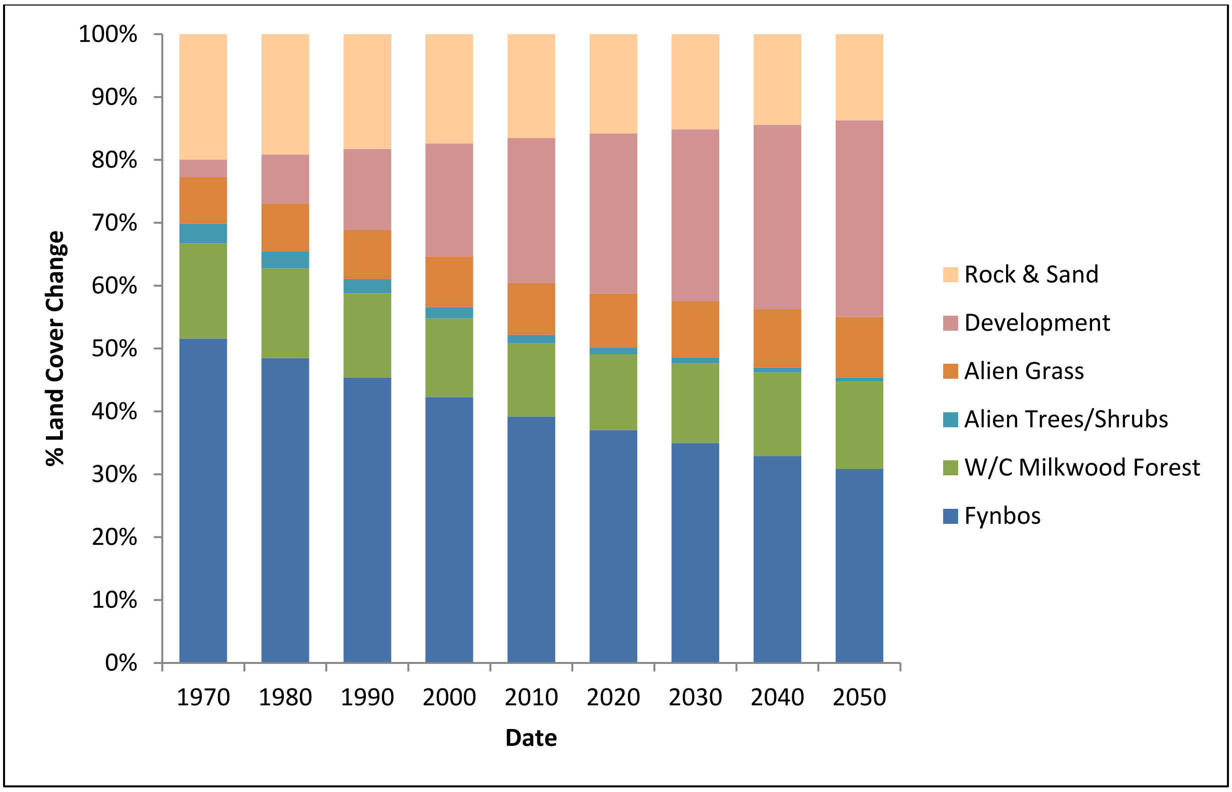

Figure 5.16: Transition matrix analysis showing changes in land cover in Western Cape Milkwood Forest repeat images from 1970 to 2012 and projected future land cover changes to 2050.

5.4. Discussion

Results from the repeat photography dataset have found an overall increase of 5% of Western Cape Afrotemperate Forest on the Cape Peninsula. The biggest increases in Western Cape Afrotemperate Forest occurred in Blinkwater Ravine (52% increase in forest cover over the last 130 years) and Orange Kloof (36% increase in forest cover over the last 112 years) on Table Mountain. This has been accompanied by a decrease in exposed rock cover throughout the Cape Peninsula, indicating an overall increase in woody biomass. This increase in forest cover concurs with the findings of Luger & Moll (1993) who found that Western Cape Afrotemperate Forest cover doubled in Orange Kloof from 1930 to 1993 owing to long-term absence of fire.

With exception of the work of Luger and Moll (1993), this is the first study of its kind to examine temporal and spatial dynamics of forest in the Western Cape. It is also the first time ground-based repeat photography has been used as a tool to examine ecotonal vegetation change in South Africa's forest biome. To date various authors have raised concern about the encroachment of forest trees into surrounding fynbos (Rebelo et al. 2010; Van Wilgen, 2012; Midgley et al. 2003) but this is the first effort to quantify that change beyond the reaches of Orange Kloof. Prior to this research there was also no quantitative data available on forest distribution dynamics encompassing the whole of TMNP.

There have been a considerable number of studies undertaken examining the determinants of distribution of South African indigenous forest (McKenzie et al. 1977; Van Daalen, 1981; Manders, 1990; Masson & Moll, 1987). However, to date there have been relatively few studies examining the dynamics of long term temporal and spatial change in South Africa's forests. Lawes et al. (2004b) investigated changes in distribution of Eastern Mistbelt Forest in the Karkloof-Balgowan Archipelago in Kwa-Zulu Natal from 1944-1996. Findings revealed little change in forest distribution. Some smaller patches of forest had been lost from the landscape owing to anthropogenic transformation, but overall this represented a relatively small decrease in forest cover of 5.7%. Rivers-Moore et al. (2003) also looked at change in Eastern Mistbelt Forest in the Midmar Catchment near Pietermaritzburg in Kwa-Zulu Natal over a similar timescale. In contrast to the findings of Lawes et al. (2004), there was a slight increase in forest cover, but this was accompanied by a reduction in number of forest patches from 120 to 61. This was partially owing to patch coalescence but numerous small patches had also disappeared, as was also revealed by Lawes et al. (2004).

More recently, Corrigan et al. (2010) examined spatial changes in forest cover in Sand Forest and Coastal Forest on the Kwa-Nibela Peninsula in St Lucia in Kwa-Zulu Natal from 1937 to 2008 using aerial photographs. In contrast to the work of Lawes et al. (2004), there was an increase in forest cover recorded which was attributed to fire exclusion, but this forest cover became more fragmented owing to increased anthropogenic exploitation (Corrigan et al. 2010). O' Connor (2010) also examined dynamics of forest distribution in Lowveld Riverine Forest in Mapungubwe National Park in Limpopo Province from 1955 to 2004. The results of this study revealed that the combination of severe drought, a megaflood event and impact of elephants caused transition of riparian forest to woodland.

5.4.1. Drivers of Vegetation Change: Land Use and Fire

Analyses were conducted to determine the main drivers of forest distribution change in TMNP as detailed in Chapter 4. Results from the general linear model showed that forest type, forest patch size, temperature and geology were all significant explanatory factors in explaining rates of forest change on the Peninsula. However, this technique only allows consideration of the role of physical site factors and provides little temporal depth to the analysis. It is also important to consider the role of historical disturbance factors in interpreting the results from the repeat photo dataset and further clues can be found from an examination of the historical literature.

Colonisation of adjacent biomes with woody vegetation after long-term absence of fire from the system has been widely documented in numerous ecosystems throughout the world. In the Bunya Mountains in eastern Australia, woody vegetation has been found to be expanding into adjacent montane grasslands (Fairfax et al. 2009). This has been attributed to a decrease in anthropogenic burning in association with the cessation of traditional land management practices by Aboriginal communities. Regular burning used to take place to maintain habitats for yam beds, to provide habitat for native game and as a hunting tool (Bowman et al. 2001).

This trend has also been reported by numerous studies examining changes at the forest-prairie grassland ecotone in the USA (Bragg & Hulbert, 1976; Loehle et al. 1996; Mast et al. 1997; Briggs et al. 2002; Coop & Givnish, 2007). Coop and Givnish (2007) investigated invasion of upland coniferous forest across the ecotone into neighbouring montane grassland in the Valles Caldera in New Mexico. A significant increase in tree cover was discovered and adjacent grasslands reduced by nearly 18% from 1935 to 1996 (Coop & Givnish, 2007). Decrease in fire frequency was cited as one of the most significant reasons for the change (Coop & Givnish, 2007).

Historical evidence suggests that the trends of increase in woody vegetation cover reflect an initial decline in forest and shrub cover owing to overgrazing, high fire frequencies and firewood harvesting followed by more recent fire suppression policies causing first recovery and then further expansion in woody vegetation cover (Denslow, 1985). The early colonists farmed the Peninsula intensively and poor agricultural practices caused significant vegetation degradation (Opie, 1967). The area was heavily overgrazed by both cattle and horses (Opie 1967; Adamson & Salter, 1950). In order to increase the grass component of the fynbos to increase the available grazing it was burnt at regular intervals and fire frequency and fire intensity were high (Marloth, 1924; Adamson & Salter, 1950).

The effects of this practice were described by several authors in 1924 at the National Symposium on Veld Fire burning. Marloth (1926) stated that the annual burning of vegetation was responsible for the deterioration of veld across the country and particularly in the Cape. He then went on to describe how since the early colonists arrived the fynbos had degraded and that most of the shrubby components including many hundreds of shrubby species within the Proteaceae, Ericaceae, Bruniaceae, Asteraceae and others had been lost from the landscape owing to annual veld burning. Marloth (1926) also suggested that the only places where woody vegetation was present was in protected rocky areas.

At the same Symposium Neville Pillans (1926) also provided a detailed description of vegetation degradation in response to high fire frequencies. He said that veld burning to improve forage production took place in all seasons with exception of the wettest winter months (May-August) and at intervals of one to three years, thus far higher than natural fire frequencies in fynbos (Pillans, 1926). Pillans also described the vegetation changes that had taken place in response to these high fire frequencies. He suggested that as a result of frequent, successive fires, the shrubby vegetation component had been gradually replaced by annuals, grasses and species within the Cyperaceae (Pillans, 1926).

The vegetation described by Pillans (1926) is similar in appearance to the vegetation observed in historic images of the Cape Peninsula in the 1880s and early 1900s. He also described in detail the effects that high frequencies of anthropogenic fires have had on the forest vegetation of the Cape Peninsula. He suggested that in the past almost every ravine was clothed with forest and most mountain streams on the Peninsula had a thick riparian vegetation of forest taxa (Pillans, 1926). Fires were so frequent, however, that eventually this was no longer the case and most stream banks were then lined with charred tree stumps. A few patches of forest remained in fire refugia on scree slopes but these were few and far between (Pillans, 1926).

The vegetation of the Peninsula became so degraded by overgrazing and high fire frequency that soil erosion became widespread (Pillans, 1926; Adamson & Salter, 1950; Opie, 1967). This was bemoaned by a Mr Malleson who was present at the Veld Fire Symposium. He said that speaking as a farmer, veld burning was ‘a terrible menace’ as excessive burning removed soil humus and eventually destroyed grasses useful for forage. Malleson also said that as a result of this, South Africa used to produce the best wheat in the world and now it produced the least or worst in the world (Botha, 1926).

The fynbos vegetation of the Cape Peninsula became so degraded by overgrazing, excessive burning and harvesting of woody shrubs for firewood that eventually fuel loads would have been reduced to such an extent that either vegetation wouldn’t burn at all or fire intensities were significantly reduced (Midgley et al, 2003). Historical evidence indicates this was the case for the vegetation on the lower slopes of the Twelve Apostles above Camps Bay as Adamson and Salter (1950) described the vegetation there as being highly degraded. This vegetation eventually wouldn’t have burnt owing to lack of fuel. By the 1930s veld burning for agriculture was seen as such a destructive practice that widespread fire exclusion practices were introduced to protect the veld (Pooley, 2012).

This part of the story of the fire history of the Cape Peninsula was completely overlooked by Simon Pooley (2012) in his recent detailed review on ‘Recovering the lost history of fire in South Africa’s fynbos’. He comments on the criticisms of the practice of veld burning made by Marloth and Levyns and attributes their opinions to simply a lack of understanding of the integral role of fire in fynbos ecology (Pooley, 2012). Marloth (1926), Levyns (1926) and Pillans (1926) were criticising veld burning not because they didn’t fully understand its importance in fynbos ecology but because high fire frequencies from burning for agriculture were severely degrading the fynbos and forests of the Cape Peninsula. This serves to illustrate the importance of the use of historical photographs and repeat photography to gain a more comprehensive picture of landscape change and ecological history because the photographic archive supports the descriptions of fynbos degradation from agricultural veld burning made by multiple historical authors (Pillans, 1926; Marloth, 1926; Adamson & Salter, 1950; Spilhaus, 1950; Opie, 1967).

The absence of fire owing to the minimal fuel load and reduction in agricultural burning resulted in the lower slopes of Blinkwater Ravine being colonised with an extensive area of woody vegetation. By 1944 the historical aerial photographs used in Chapter 4 revealed that Blinkwater Ravine was covered in shrubby vegetation such as *Phylica buxifolia* and *Rhus tomentosa*. Although there is less historical evidence available to support this hypothesis, the repeat photography datasets suggest that similar processes of vegetation change have also occurred in Orange Kloof. However, contemporary fire suppression policies owing to urbanisation in the City of Cape Town have facilitated further expansion of woody vegetation cover in these areas (Rebelo et al. 2010).

However, research by Forsyth and Van Wilgen (2008) has revealed that in Table Mountain National Park mean fire return intervals have declined by 18.1 years since 1975 from 31.6 to 13.5 years. Concerns were raised about the impact of these changes on the fynbos of TMNP and particularly likely impacts of decreasing mean fire intervals on obligate reseeding Proteaceae (Forsyth & Van Wilgen, 2008) These findings have raised considerable alarm and have been widely discussed in global change literature (Syphard et al. 2009; Abbot & Le Maitre, 2009; Chown, 2010).

However, these increases in fire frequency are dwarfed by the 1-3 year mean fire return intervals that historical evidence suggests were occurring on the Cape Peninsula in the 18th-19th Century. None of the authors who later discussed the findings of Van Wilgen and Forsyth (2008) have raised this point and do not consider the bigger picture of the Cape Peninsula's fire history and its impact on the landscape. This serves to illustrate the importance of detailed analysis of available historical literature to look at past landscape changes to inform best interpretation of present datasets and when making future projections. This is particularly important in the face of changing climate and future global change.

5.4.2. Influence of CO_2

Increases in woody vegetation cover are being increasingly attributed to increases in elevated atmospheric CO_2 levels in response to changing climate. CO_2 causes enhanced growth in woody vegetation taxa in multiple ways (Bond & Midgley, 2012). Several mechanisms have been proposed to explain the phenomena, including elevated CO_2 concentrations favouring C3 over C4 photosynthesis and reducing transpiration rate of grasses causing deeper percolation of soil moisture which in turn causes enhanced tree growth (Bond & Midgley, 2012). In savanna ecosystems where bush encroachment is a widespread problem, this potential driver of change is receiving increasing attention (Bond & Midgley, 2012).

Elevated levels of CO_2 may be a contributing factor in the increase in woody vegetation biomass on the Cape Peninsula. However, historical evidence (Botha, 1926; Pillans, 1926; Levyns, 1926; Marloth, 1926; Opie, 1967; Pooley, 2012) suggests that land use change and changing fire frequencies are the most significant drivers of vegetation change. The aerial and repeat photo datasets show that expansion of forest on the Cape Peninsula appears not to be a recent phenomenon of the last half century but started as soon as the frequent burning regimes of the 19th century were halted. However, it is extremely difficult to differentiate the effects of CO_2 on woody vegetation cover increase from other key drivers. Responses of woody taxa to elevated CO_2 vary greatly between species. Some taxa experience significantly enhanced growth whereas others show no response at all (Bond & Midgley, 2012). At present there has been no research undertaken on the effects of elevated CO_2 on South African indigenous forest taxa. Further research is required to gain a better understanding of likely responses to better predict forest ecotonal dynamics in the face of changing climate.

5.4.3. Alternative Stable States and the Landscape Trap

Results from both the aerial (Chapter 4) and repeat photo (Chapter 5) datasets have shown that there has been an significant increase in forest cover on the Peninsula since 1880 when the earliest repeat photographs were taken. The more comprehensive Peninsula wide analysis provided by the aerial photography dataset has shown a far greater increase in forest cover (65.2%) than the 5% relative increase indicated by the repeat photo dataset. This is owing to the more localised extent of the latter dataset. However, the repeat photo dataset provides a far greater temporal depth to the analyses and a much finer scale (Swetnam et al. 1999). It is also an important point to note that the spatial extent of increase in forest cover found in the study only takes into account increase in closed canopy forest as defined in Section 4.2.2. There are other areas on the Peninsula where long-term absence of fire has led to the forest/fynbos ecotone becoming far less well-defined and the surrounding fynbos to be colonised by forest precursor species.

This is the case in multiple areas such as Orange Kloof and Kirstenbosch where these taxa have colonised extensive areas of Peninsula Granite Fynbos after long term absence of fire (Van Wilgen et al. 2012). In the case of the latter expansion of urban development, including the building of the M3 freeway has turned this area into a predominantly fire shadow area (Geldenhuys, 2000). Prior to urban development occurring in this part of the city, strong south-easterly winds would have driven fires across the Cape Flats up to the lower margins of the forests of Newlands and Kirstenbosch (Geldenhuys, 2000). Now urban development acts as a buffer to fires being driven onto these slopes by prevailing winds (Geldenhuys, 2000), which has led to a significant increase in woody vegetation cover in this area.

Although rates of forest change are influenced by local environmental factors as was shown by the general linear model, they are also affected by other environmental factors such as urban development, past grazing and long term fire history. The combination of these factors together has driven the significant increase in forest cover on the Cape Peninsula that the dataset has revealed. It was suggested by Mount’s 1979 Stable Fire Cycle Model that positive feedback cycles between fire and vegetation were strong enough to eliminate vegetation state transitions and that physical environmental factors were the dominant control on vegetation patterns (Wood & Bowman, 2012).

Results from this study have unequivocally shown that this is the not the case for the Peninsula forests. A model that better explains the changes revealed is that of alternative stable states theory (Wood & Bowman, 2012; Scheffer et al. 2001). Alternative stable states theory suggests that across flammable landscapes there are complex feedback interactions between fire, vegetation and other environmental variables which help to maintain coexisting vegetation communities through time such as forest patches within a mosaic of fynbos vegetation (Wood & Bowman, 2012). These positive feedbacks encourage ecosystem resilience and ecotonal stability (Wood & Bowman, 2012). However, if there is a breakdown in these positive feedback interactions, for example a long term absence of fire from the vegetation, leading to the ecosystem being pushed beyond its resilience threshold then the vegetation community may shift to an alternative stable state (Wood & Bowman, 2012). Long term absence of fire will lead to the adjacent fynbos community becoming colonised by forest precursor species and eventually the forest patch will increase in spatial area.

Forest vegetation is a relatively inflammable vegetation type in comparison to fynbos, and will only burn after long periods of hot and dry weather in relatively windy conditions (Geldenhuys, 1998; Geldenhuys, 2000). After the surrounding fynbos becomes colonised by forest precursor species it is therefore much harder for fire to reverse it back to fynbos and so therefore there are two alternative stable states whereby transition between the two requires breakdown in certain positive feedback interactions (Wood & Bowman, 2012). The repeat photo dataset has shown that there are large areas of the Peninsula where forest has significantly expanded after long term absence of fire, or the vegetation surrounding the forest has been colonised by woody forest precursor species. The fact that forest vegetation will only burn under certain ecological conditions detailed earlier in the discussion ensures that the likelihood of reversal back to the previous alternate stable state of fynbos is difficult and may require additional management interventions (Geldenhuys, 1998).

The idea of the 'Landscape Trap' builds conceptually on alternate stable states theory and is explored in the work of Lindenmayer et al. (2011). This is defined as a landscape which is transformed to a different structural and functional state as a result of feedbacks between human and natural disturbance regimes (Lindenmayer et al. 2011). The question is then raised of whether the expansion of forest in areas of the Peninsula can be referred to as a "trapped landscape"? It is concluded that this is not the case. It is true that in some areas of the Peninsula a shift has taken place within the recent historic past from one alternate stable state to another, but it cannot be described as a "trapped landscape" because it can be argued that the ecosystem has not been compromised and still operates within normal ecological parameters for a new vegetation type rather than becoming a novel ecosystem. In contrast to landscapes that have been transformed by invasion by alien species, areas of one fully functional ecosystem have experienced transformation to a different ecosystem: in this case from fynbos to forest. It is down to the environmental managers of TMNP to decide the most appropriate route forward for the fynbos and forests of the Cape Peninsula.

Chapter 6: Synthesis and Conclusions

6.1. Review of Aims and Objectives

The main aim of this research was to investigate indigenous forest distribution change within Table Mountain National Park from 1880 to the present using historical aerial photographs and ground-based repeat photography. To address this aim, firstly a detailed literature review was undertaken. This encompassed a synthesis of current knowledge of the indigenous forests of the Cape Peninsula including its context within South Africa, historical distribution, ecological determinants of distribution and drivers and processes of ecotonal change (Chapter 2). This review highlighted the paucity of research undertaken in South Africa's forest biome, particularly with regard to temporal and spatial distribution change. A detailed examination of the contemporary environment of the Cape Peninsula was conducted in Chapter 3 including the regional context, topography and hydrology, geology and soils, climate, fire history, regional biodiversity and main vegetation types.

In Chapter 4 all forest patches on the Cape Peninsula were mapped in detail using aerial photographs and were ground-truthed using the map produced by Euston-Brown et al. (2008) as a starting point. Detailed species data were collected which was used to run an NMS Ordination in which the relationship between different forest patches on the Cape Peninsula was shown. Historical aerial photographs were also used to map forest distribution on the Peninsula in 1944. The resultant GIS shapefiles were then used to analyse distribution changes across a 64 year time step. This dataset was then used to examine rates of forest ecotonal change in the context of key abiotic drivers including altitude, aspect, temperature, precipitation, soil, geology and fire frequency since 1975. The aerial photography dataset proved to be an effective tool which revealed significant increases in forest cover in TMNP since 1944.

Chapter 5 used the technique of ground-based repeat photography for the first time to quantitatively examine relative changes in the distribution of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest in TMNP. Fifty repeat photo pairs were used to map changes in land cover from 1880 to present, significantly expanding the temporal depth of analysis. Transition matrices were used after Pontius et al. (2004) to project proportional changes in land cover over the next fifty years assuming that current rates of change remaining constant. Use of both aerial photography and repeat photography to quantify forest distribution change met the specific objectives detailed in Chapter 1. The results from both Chapter 4 and Chapter 5 were discussed in the context of associated literature including past historical evidence of vegetation change on the Cape Peninsula and associated implications of change for the future.

6.2. Research Synthesis

An initial review of previous studies within this field revealed little apparent change in the distribution of South African indigenous forest in the recent historic past. Most forest change prior to the availability of photographic records was perceived to be primarily due to anthropogenic deforestation for timber by early colonists within the first 50 years after Van Riebeeck arrived with the Dutch East India Company at the Cape in 1652 (Sim, 1907). The fragmented distribution of the forests of the Cape Peninsula was attributed by numerous earlier authors to this past exploitation destroying all but the most remote and inaccessible forest patches (McKenzie, 1977; Masson & Moll, 1977; Steytler & Nieuwmeyer, 1985). Contemporary distribution of the Peninsula forests was perceived to be relatively stable in most areas, but concerns were raised about the potential invasion of Western Cape Afrotemperate Forest taxa into Peninsula Granite Fynbos where long term fire exclusion had occurred (Rebelo et al. 2010; Van Wilgen, 2012).

An extensive field work exercise in which all forest patches on the Cape Peninsula were visited and species list and cover abundance values determined together with the NMS Ordination of this data set clearly divided the Cape Peninsula forests into two groups. These groups largely corresponded with the South African National Vegetation Map. Similar nomenclature was therefore used and the two groups delimited by species composition were identified as Western Cape Afrotemperate Forest and Western Cape Milkwood Forest. Findings from an analysis of aerial photographs of forest patches on the Cape Peninsula revealed that from 1944 to 2008 there has been an increase in forest cover on the Cape Peninsula of 65.3%. There was also an increase in the number of forest patches from 149 to 174. Only thirteen forest patches were found to have decreased in size and this is mainly attributed to housing development in coastal areas. In Western Cape Afrotemperate Forest there was an increase in forest cover of 51.2% from 1944 to 2008. In Western Cape Milkwood Forest there was a higher rate of increase recorded across the same time step with an increase of 81.4% recorded since 1944.

The results from the repeat photography analysis largely support these findings, although the levels of relative change in forest cover were considerably lower than that of the aerial photo dataset. Relative cover of Western Cape Afrotemperate Forest had increased by 5% and in Western Cape Milkwood Forest there was a decrease of 1%. This contrast in findings between the two datasets is explained by the availability of historical ground photographs showing Western Cape Milkwood Forest being limited to the vicinity of the Peninsula’s coastal towns. The repeat photography dataset also revealed a decrease in visible rock cover, indicating an increase in vegetation biomass on the Cape Peninsula over the last 130 years.

Transition matrix analyses were used to analyse relative change in proportional land cover from the original to the repeat images. From 1900 to present in the Western Cape Afrotemperate Forest images, fynbos land cover decreased from 37.64% to 33.7%. If this rate of change continues, by 2050 fynbos cover will have decreased to 32.23% of total land cover. In contrast, Western Cape Afrotemperate Forest cover increased from 7.45% total cover in 1900 to 15.22% by 2010. If current rates of change continue, Western Cape Afrotemperate Forest will increase to 17.45% of total cover by 2050. This represents an increase of more than 10% since 1900. If these projected changes occur this represents a significant threat to fynbos biodiversity. In contrast in the Western Cape Milkwood Forest dataset, the projected rates of decrease are unlikely to occur owing to present moratorium on further coastal development in the vicinity of the remaining forest patches due to their protection within TMNP.

Analyses of these changes in relation to key abiotic drivers revealed non-significant relationships between rate of forest distribution change and altitude, aspect, temperature, precipitation, soil and geology. There was a significant relationship at the 5% level for the correlation between the number of fires since 1975 and the rate of change in Western Cape Milkwood Forest: the higher the fire frequency the lower the rate of change in forest cover. However, in Western Cape Afrotemperate Forest the relationship between fire frequency and rate of forest change was found to be non-significant. This, therefore, suggests a primary role for other drivers such as land use change, fire history prior to 1975 and increasing CO_2.

Historical literature suggests that this may be the case. Further reading in light of findings from the aerial photography and repeat photography datasets indicated that the changes observed have happened as a result of forest recovery following past depletion by widespread burning for agriculture. Evidence from several botanists in the early 20th century suggests that the early colonists were burning the veld at intervals of 1-3 years to improve forage yields for livestock including cattle and horses (Pillans, 1926; Marloth, 1926). Overgrazing was rife and in addition woody Proteaceae were being harvested from the natural veld for use as firewood (Opie, 1967). These influences in combination caused widespread transformation of the physiognomy of fynbos vegetation and a decrease in the cover of forest, particularly along drainage lines (Pillans, 1926). The lower slopes of the Twelve Apostles above Camps Bay were particularly severely affected (Adamson & Salter, 1950). These findings are further illustrated by the repeat photo dataset. Cessation of extensive veld burning for agriculture in response to the concerns raised at the National Symposium on Veld Fire Burning allowed the vegetation to slowly recover.

In some areas of the Peninsula including Orange Kloof and Blinkwater Ravine on Table Mountain, rates of forest expansion have been significantly higher than average. In Blinkwater Ravine, the highest rates of forest increase took place from 1880 to 1944 with relatively little increase from 1944 to 2008. On the lower slopes of the Twelve Apostles the fynbos had become so degraded by repeated high frequency burning that there was no fuel load and the vegetation eventually wouldn't burn (Midgley et al. 2003). The resultant lack of fire allowed colonisation of the site by the large area of woody vegetation present today. It is possible that the extensive expansion of forest vegetation in Orange Kloof is partially in consequence of similar processes, although this has been accelerated by long term artificial exclusion of fire from the area (Luger & Moll, 1993).

Concerns have been raised about the encroachment of woody vegetation in some areas upon areas of the endemic vegetation type Peninsula Granite Fynbos (Rebelo et al. 2010; Van Wilgen, 2012). Forest species can expand relatively easily across the ecotone into adjacent fynbos in the absence of fire with fruit-eating birds and bats acting as vectors (Manders & Richardson, 1992; Pauw & Johnson, 1999). This creates nuclei of forest trees that expand to compete with fire sensitive fynbos vegetation already present. These nuclei are highly fire resistant and only burn in the highest intensity burns. Extensive invasion of Afrotemperate forest taxa through this process poses a significant threat to remaining Peninsula Granite Fynbos owing to fire resistance of the former making restoration to a baseline state extremely difficult.

Further research is urgently required to determine the best management approach to deal with this. However, the path to undertaking this challenge is paved with controversy and so managers of TMNP have to date operated a 'laissez-faire' approach. Despite this, forest encroachment on Peninsula Granite Fynbos is causing irreversible transformation of this vegetation type and this problem requires urgent attention particularly in the face of changing climate.

6.3. Future Research Directions

The findings from this research quantify temporal dynamics of Western Cape Afrotemperate Forest for the first time for the whole of the Cape Peninsula. However, this study was undertaken on a relatively local scale and further work is required to determine whether trends in forest distribution change observed on the Cape Peninsula are similar elsewhere. Long-term historical data on forest distribution and forest ecotonal change is vital for effective management and conservation both of forests and surrounding vegetation.

This knowledge is particularly useful in fire management. For example, findings of decreasing forest patch size over time indicate whether an area is being burnt too frequently. Alternatively, extensive ecotonal expansion into surrounding vegetation reveals that fire return intervals are too high. An important project to undertake is to produce a comprehensive map detailing the current spatial extent of all of the Western Cape's indigenous forests. Knowledge of the current spatial extent of these fragmented forests should form part of critical baseline information for conservation and will assist in monitoring and identifying any future changes. This is particularly important in the face of changing climate.

There is also a significant need for a greater number of historical studies of past vegetation changes in response to anthropogenic influence on the landscape. This study has illustrated the potential for use of both repeat photography and aerial photography as effective tools to undertake this work. The greater temporal depth offered by use of repeat photography greatly outweighs the necessary assumptions associated with the technique in relation to continuous changes in scale in oblique images. As illustrated by this study, a longer temporal perspective significantly enhances the accuracy of interpretations of findings of more recent landscape change. Use of repeat photography (both aerial and ground-based) in conjunction with historical documents also assists with extrapolating the effects of anthropogenic factors such as land use change from more recent global change drivers.

6.4. Conclusions

- Findings from aerial photograph analysis revealed a total of 174 patches of Western Cape Afrotemperate Forest and Western Cape Milkwood Forest on the Cape Peninsula, covering a total extent of 1461 ha of TMNP.

- There has been an overall increase in relative forest cover on the Cape Peninsula between 1944 and 2008 of 65.3%. The number of forest patches has increased from 149 in 1944 to 174 in 2008.

- In Western Cape Afrotemperate Forest there has been an increase in relative forest cover of 51.2% between 1944 and 2008.

- In Western Cape Milkwood Forest there has been an increase in forest cover of 81.4% between 1944 and 2008.

- Transition matrix analyses based on repeat ground photographs showed that between 1900 and 2010 Western Cape Afrotemperate Forest cover increased from 7.45% to 15.22%. If current rates of change continue, by 2050 Western Cape Afrotemperate Forest is projected to increase to 17.65% of total cover. Between 1900 and 2010 Western Cape Milkwood Forest cover declined in total land cover from 6.51% to 2.0%. If current rates of change continue, by 2050 it will decrease to 1.9%.

- Statistical analyses of abiotic drivers of rate of forest change have found no correlation with aspect, altitude, temperature, precipitation, soils or geology. There was a significant correlation between rate of forest change in Western Cape Milkwood Forest and fire frequency since 1975.

- These findings suggest that other abiotic factors, such as land use changes, fire frequency prior to 1975 or CO_2 provide the most parsimonious explanation for the change in forest cover.

- Historical evidence suggests that the forests and their surrounding vegetation were significantly transformed by the high frequency burning for agriculture and livestock forage production, thus indicating the increases observed in forest cover since the early 20th century are a recovery from past reduction in extent.

- The highest rates of expansion of forest cover were recorded in Blinkwater Ravine and Orange Kloof. This is of concern for biodiversity and the conservation of Peninsula Granite Fynbos. More research is required to inform the best management response to this problem.

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Appendix I: Cape Peninsula forest patches and associated species dataset

SITE 1 FIRST WATERFALL RAVINE - DEVIL'S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Cassine schinoides*	0.5
3	Euphorbiaceae	*Clutia pulchella*	1
4	Cunoniaceae	*Cunonia capensis*	2
5	Cornaceae	*Curtisia dentata*	1
6	Ebenaceae	*Diospyros whyteana*	3
7	Celastraceae	*Gymnosporia buxifolia*	0.5
8	Scrophulariaceae	*Halleria lucida*	3
9	Aquifoliaceae	*Ilex mitis*	0.1
10	Achariaceae	*Kiggelaria africana*	4
11	Celastraceae	*Maytenus oleioides*	1
12	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
13	Rhamnaceae	*Phylica buxifolia*	0.5
14	Podocarpaceae	*Podocarpus latifolius*	0.1
15	Myrsinaceae	*Rapanea melanophloeos*	2
16	Anacardiaceae	*Searsia laevigata*	1
17	Anacardiaceae	*Searsia lucida*	1
18	Anacardiaceae	*Scutia myrtina*	0.5

SITE 2 SECOND WATERFALL RAVINE – DEVIL’S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	0.1
3	Rubiaceae	*Afrocanthium mundianum*	0.5
4	Celastraceae	*Cassine peragua*	1
5	Celastraceae	*Cassine schinoides*	1
6	Euphorbiaceae	*Clutia pulchella*	0.5
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	1
9	Ebenaceae	*Diospyros whyteana*	1
10	Celastraceae	*Gymnosporia buxifolia*	0.5
11	Scrophulariaceae	*Halleria lucida*	1
12	Aquifoliaceae	*Ilex mitis*	2
13	Achariaceae	*Kiggelaria africana*	2
14	Celastraceae	*Maytenus acuminata*	0.5
15	Celastraceae	*Maytenus oleioides*	0.5
16	Lauraceae	*Ocotea bullata*	0.1
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
18	Oleaceae	*Olea europea* ssp. *africana*	0.1
19	Oliniaceae	*Olinia ventosa*	1
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	2
22	Anacardiaceae	*Searsia laevigata*	0.5
23	Anacardiaceae	*Searsia lucida*	2
24	Anacardiaceae	*Searsia tomentosa*	0.1

SITE 3 NEWLANDS FOREST

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Proteaceae	*Brabejum stellatifolium*	0.5
3	Rubiaceae	*Canthium inerme*	1
4	Rubiaceae	*Afrocanthium mundianum*	0.5
5	Celastraceae	*Cassine peragua*	2
6	Celastraceae	*Cassine schinoides*	1
7	Oleaceae	*Chionanthus foveolatus*	0.5
8	Euphorbiaceae	*Clutia pulchella*	0.5
9	Cunoniaceae	*Cunonia capensis*	2
10	Cornaceae	*Curtisia dentata*	2
11	Ebenaceae	*Diospyros whyteana*	2
12	Malvaceae	*Grewia occidentalis*	0.5
13	Celastraceae	*Gymnosporia buxifolia*	0.5
14	Scrophulariaceae	*Halleria lucida*	1
15	Aquifoliaceae	*Ilex mitis*	1
16	Achariaceae	*Kiggelaria africana*	2
17	Celastraceae	*Maytenus acuminata*	1
18	Celastraceae	*Maytenus oleioides*	0.1
19	Lauraceae	*Ocotea bullata*	0.1
20	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
21	Oleaceae	*Olea europea* ssp. *africana*	0.1
22	Oliniaceae	*Olinia ventosa*	3
23	Santalaceae	*Culpoon compressum*	0.5
24	Fabaceae	*Podylaria calyptrata*	0.5
25	Podocarpaceae	*Podocarpus latifolius*	0.5
26	Polygalaceae	*Polygala myrtifolia*	0.5
27	Myrsinaceae	*Rapanea melanophloeos*	2
28	Anacardiaceae	*Searsia glauca*	0.1
29	Anacardiaceae	*Searsia lucida*	1
30	Anacardiaceae	*Searsia tomentosa*	0.5
31	Salicaceae	*Scolopia mundii*	0.5
32	Rhamnaceae	*Scutia myrtina*	0.5
33	Asclepiadaceae	*Secamone alpini*	1
34	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

<u>SITE 4 NEWLANDS FOREST</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Celastraceae	*Cassine peragua*	4
4	Celastraceae	*Cassine schinoides*	0.5
5	Euphorbiaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	2
7	Cornaceae	*Curtisia dentata*	3
8	Ebenaceae	*Diospyros whyteana*	3
9	Scrophulariaceae	*Halleria lucida*	1
10	Aquifoliaceae	*Ilex mitis*	0.5
11	Achariaceae	*Kiggelaria africana*	1
12	Celastraceae	*Maytenus acuminata*	1
13	Celastraceae	*Maytenus oleioides*	0.5
14	Lauraceae	*Ocotea bullata*	0.1
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
16	Oleaceae	*Olea europea* ssp. *africana*	1
17	Oliniaceae	*Olinia ventosa*	4
18	Fabaceae	*Podylaria calyptrata*	0.5
19	Podocarpaceae	*Podocarpus latifolius*	1
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	3
22	Vitaceae	*Rhoicissus tomentosa*	0.5
23	Anacardiaceae	*Searsia laevigata*	0.5
24	Anacardiaceae	*Searsia lucida*	1
25	Anacardiaceae	*Searsia tomentosa*	0.5
26	Salicaceae	*Scolopia mundii*	0.1
27	Rhamnaceae	*Scutia myrtina*	0.5
28	Asclepiadaceae	*Secamone alpini*	1
29	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 5 NEWLANDS FOREST

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Proteaceae	*Brabejum stellatifolium*	2
2	Rubiaceae	*Canthium inerme*	2
3	Celastraceae	*Cassine peragua*	0.5
4	Ebenaceae	*Diospyros whyteana*	4
5	Scrophulariaceae	*Halleria lucida*	2
6	Aquifoliaceae	*Ilex mitis*	1
7	Achariaceae	*Kiggelaria africana*	2
8	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
9	Podocarpaceae	*Podocarpus latifolius*	1
10	Myrsinaceae	*Rapanea melanophloeos*	2
11	Anacardiaceae	*Searsia laevigata*	0.5
12	Anacardiaceae	*Searsia lucida*	1
13	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

SITE 6 KIRSTENBOSCH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Celastraceae	*Cassine peragua*	0.1
3	Oleaceae	*Chionanthus foveolatus*	0.5
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	3
6	Cornaceae	*Curtisia dentata*	1
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Malvaceae	*Grewia occidentalis*	0.1
9	Scrophulariaceae	*Halleria lucida*	0.1
10	Achariaceae	*Kiggelaria africana*	2
11	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
12	Oliniaceae	*Olinia ventosa*	2
13	Myrsinaceae	*Rapanea melanophloeos*	2
14	Anacardiaceae	*Searsia laevigata*	1
15	Anacardiaceae	*Searsia lucida*	1
16	Salicaceae	*Scolopia mundii*	0.5
17	Asclepiadaceae	*Secamone alpini*	0.5
18	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 7 KIRSTENBOSCH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Proteaceae	*Brabejum stellatifolium*	0.5
3	Rubiaceae	*Canthium inerme*	3
4	Rubiaceae	*Afrocanthium mundianum*	0.5
5	Celastraceae	*Cassine peragua*	3
6	Celastraceae	*Cassine schinoides*	1
7	Celtidaceae	*Celtis africana*	0.1
8	Oleaceae	*Chionanthus foveolatus*	2
9	Euphorbiaceae	*Clutia pulchella*	2
10	Cunoniaceae	*Cunonia capensis*	3
11	Cornaceae	*Curtisia dentata*	3
12	Araliaceae	*Cussonia thyrsiflora*	0.5
13	Ebenaceae	*Diospyros whyteana*	3
14	Malvaceae	*Grewia occidentalis*	0.5
15	Celastraceae	*Gymnosporia buxifolia*	0.5
16	Scrophulariaceae	*Halleria lucida*	3
17	Aquifoliaceae	*Ilex mitis*	1
18	Achariaceae	*Kiggelaria africana*	3
19	Celastraceae	*Maurocenia frangula*	0.5
20	Celastraceae	*Maytenus acuminata*	1
21	Celastraceae	*Maytenus oleioides*	0.5
22	Lauraceae	*Ocotea bullata*	0.5
23	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
24	Oleaceae	*Olea europea* ssp. *africana*	0.5
25	Oliniaceae	*Olinia ventosa*	3
26	Santalaceae	*Culpoon compressum*	0.5
27	Fabaceae	*Podylaria calyptrata*	1
28	Podocarpaceae	*Podocarpus latifolius*	2
29	Polygalaceae	*Polygala myrtifolia*	0.5
30	Myrsinaceae	*Rapanea melanophloeos*	3
31	Vitaceae	*Rhoicissus tomentosa*	0.5
32	Anacardiaceae	*Searsia glauca*	0.1
33	Anacardiaceae	*Searsia laevigata*	0.5
34	Anacardiaceae	*Searsia lucida*	1
35	Anacardiaceae	*Searsia tomentosa*	0.5

36	Celastraceae	*Robsonodendron eucleiforme*	0.1
37	Rhamnaceae	*Scutia myrtina*	1
38	Asclepiadaceae	*Secamone alpini*	2
39	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 8 NURSERY RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Proteaceae	*Brabejum stellatifolium*	1
2	Rubiaceae	*Canthium inerme*	2
3	Celastraceae	*Cassine peragua*	3
4	Celastraceae	*Cassine schinoides*	3
5	Oleaceae	*Chionanthus foveolatus*	1
6	Euphorbiaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	3
8	Cornaceae	*Curtisia dentata*	3
9	Ebenaceae	*Diospyros whyteana*	4
10	Scrophulariaceae	*Halleria lucida*	2
11	Aquifoliaceae	*Ilex mitis*	2
12	Achariaceae	*Kiggelaria africana*	2
13	Celastraceae	*Maytenus acuminata*	3
14	Celastraceae	*Maytenus oleioides*	1
15	Lauraceae	*Ocotea bullata*	1
16	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
17	Oleaceae	*Olea europea* ssp. *africana*	0.5
18	Oliniaceae	*Olinia ventosa*	2
19	Fabaceae	*Podylaria calyptrata*	1
20	Podocarpaceae	*Podocarpus latifolius*	2
21	Polygalaceae	*Polygala myrtifolia*	1
22	Myrsinaceae	*Rapanea melanophloeos*	3
23	Anacardiaceae	*Searsia glauca*	0.5
24	Anacardiaceae	*Searsia lucida*	1
25	Anacardiaceae	*Searsia tomentosa*	1
26	Salicaceae	*Scolopia mundii*	0.1
27	Asclepiadaceae	*Secamone alpini*	0.5
28	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 9 CASTLE ROCKS – NURSERY RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Celastraceae	*Cassine peragua*	2
3	Celastraceae	*Cassine schinoides*	2
4	Cunoniaceae	*Cunonia capensis*	3
5	Cornaceae	*Curtisia dentata*	2
6	Ebenaceae	*Diospyros whyteana*	3
7	Scrophulariaceae	*Halleria lucida*	1
8	Achariaceae	*Kiggelaria africana*	3
9	Celastraceae	*Maytenus acuminata*	0.5
10	Celastraceae	*Maytenus oleioides*	0.5
11	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
12	Oleaceae	*Olea europea* ssp. *africana*	0.5
13	Podocarpaceae	*Podocarpus latifolius*	2
14	Myrsinaceae	*Rapanea melanophloeos*	2
15	Anacardiaceae	*Searsia glauca*	0.5
16	Anacardiaceae	*Searsia laevigata*	1
17	Asclepiadaceae	*Secamone alpini*	0.5

<u>SITE 10 ROOIKAT RAVINE</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	3
4	Oleaceae	*Chionanthus foveolatus*	0.1
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	4
7	Cornaceae	*Curtisia dentata*	2
8	Araliaceae	*Cussonia thyrsiflora*	0.5
9	Ebenaceae	*Diospyros whyteana*	1
10	Scrophulariaceae	*Halleria lucida*	2
11	Aquifoliaceae	*Ilex mitis*	3
12	Achariaceae	*Kiggelaria africana*	3
13	Celastraceae	*Maytenus acuminata*	3
14	Celastraceae	*Maytenus oleioides*	1
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
16	Lauraceae	*Olinia ventosa*	1
17	Santalaceae	*Colpoon compressum*	0.5
18	Rhamnaceae	*Phylica buxifolia*	0.5
19	Fabaceae	*Podylaria calyptrata*	0.5
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	3
22	Anacardiaceae	*Searsia tomentosa*	0.5
23	Asclepiadaceae	*Secamone alpini*	0.5
24	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 11 SPILHAUS RAVINE – CECILIA FOREST

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	2
4	Celastraceae	*Cassine schinoides*	2
5	Oleaceae	*Chionanthus foveolatus*	1
6	Euphorbiaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	3
9	Ebenaceae	*Diospyros whyteana*	3
10	Malvaceae	*Grewia occidentalis*	0.1
11	Scrophulariaceae	*Halleria lucida*	2
12	Aquifoliaceae	*Ilex mitis*	2
13	Achariaceae	*Kiggelaria africana*	3
14	Celastraceae	*Maytenus acuminata*	1
15	Celastraceae	*Maytenus oleioides*	1
16	Lauraceae	*Ocotea bullata*	1
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
18	Oleaceae	*Olea europea* ssp. *africana*	0.5
19	Oliniaceae	*Olinia ventosa*	3
20	Rhamnaceae	*Phylica buxifolia*	1
21	Fabaceae	*Podylaria calyptrata*	1
22	Podocarpaceae	*Podocarpus latifolius*	1
23	Polygalaceae	*Polygala myrtifolia*	0.5
24	Myrsinaceae	*Rapanea melanophloeos*	3
25	Anacardiaceae	*Searsia lucida*	1
26	Anacardiaceae	*Searsia tomentosa*	0.5
27	Salicaceae	*Scolopia mundii*	0.5
28	Rhamnaceae	*Scutia myrtina*	1
29	Asclepiadaceae	*Secamone alpini*	2
30	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1
31	Cupressaceae	*Widdringtonia nodiflora*	1

SITE 12 KLAASSENBOSCH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	3
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Celastraceae	*Cassine schinoides*	1
5	Oleaceae	*Chionanthus foveolatus*	1
6	Euphorbiaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	2
9	Ebenaceae	*Diospyros whyteana*	2
10	Scrophulariaceae	*Halleria lucida*	2
11	Aquifoliaceae	*Ilex mitis*	0.5
12	Achariaceae	*Kiggelaria africana*	1
13	Celastraceae	*Maytenus oleioides*	1
14	Proteaceae	*Leucadendron argenteum*	1
15	Lauraceae	*Ocotea bullata*	1
16	Oleaceae	*Olea capensis* ssp. *capensis*	1
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
18	Oliniaceae	*Olinia ventosa*	3
19	Fabaceae	*Podylaria calyptrata*	2
20	Podocarpaceae	*Podocarpus latifolius*	0.1
21	Polygalaceae	*Polygala myrtifolia*	1
22	Myrsinaceae	*Rapanea melanophloeos*	2
23	Rhamnaceae	*Scutia myrtina*	1
24	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	2

SITE 13 CECILIA FOREST

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	3
3	Celastraceae	*Cassine peragua*	3
4	Celastraceae	*Cassine schinoides*	2
5	Oleaceae	*Chionanthus foveolatus*	1
6	Euphorbiaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	1
9	Ebenaceae	*Diospyros whyteana*	2
10	Malvaceae	*Grewia occidentalis*	0.5
11	Celastraceae	*Gymnosporia buxifolia*	1
12	Scrophulariaceae	*Halleria lucida*	2
13	Aquifoliaceae	*Ilex mitis*	1
14	Achariaceae	*Kiggelaria africana*	3
15	Proteaceae	*Leucadendron argenteum*	0.5
16	Celastraceae	*Maytenus acuminata*	2
17	Celastraceae	*Maytenus oleioides*	1
18	Lauraceae	*Ocotea bullata*	2
19	Oleaceae	*Olea capensis* ssp. *capensis*	1
20	Oliniaceae	*Olinia ventosa*	3
21	Rhamnaceae	*Phylica buxifolia*	1
22	Fabaceae	*Podylaria calyptrata*	1
23	Polygalaceae	*Polygala myrtifolia*	0.5
24	Myrsinaceae	*Rapanea melanophloeos*	3
25	Anacardiaceae	*Searsia lucida*	0.5
26	Anacardiaceae	*Searsia tomentosa*	1
27	Salicaceae	*Scolopia mundii*	1
28	Rhamnaceae	*Scutia myrtina*	1
29	Asclepiadaceae	*Secamone alpini*	1
30	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	2
31	Cupressaceae	*Widdringtonia nodiflora*	1

SITE 14 DE HEL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	3
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	0.5
6	Oleaceae	*Chionanthus foveolatus*	2
7	Cunoniaceae	*Cunonia capensis*	1
8	Ebenaceae	*Diospyros whyteana*	2
9	Malvaceae	*Grewia occidentalis*	0.5
10	Celastraceae	*Gymnosporia buxifolia*	0.5
11	Scrophulariaceae	*Halleria lucida*	1
12	Achariaceae	*Kiggelaria africana*	2
13	Celastraceae	*Maytenus oleioides*	1
14	Oleaceae	*Olea europea* ssp. *africana*	1
15	Oliniaceae	*Olinia ventosa*	3
16	Fabaceae	*Podylaria calyptrata*	0.5
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	3
19	Vitaceae	*Rhoicissus tomentosa*	3
20	Anacardiaceae	*Searsia tomentosa*	1
21	Salicaceae	*Scolopia mundii*	2
22	Rhamnaceae	*Scutia myrtina*	0.5
23	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

SITE 15 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	0.5
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	2
6	Oleaceae	*Chionanthus foveolatus*	0.5
7	Euphorbiaceae	*Clutia pulchella*	0.5
8	Cunoniaceae	*Cunonia capensis*	3
9	Cornaceae	*Curtisia dentata*	0.5
10	Ebenaceae	*Diospyros whyteana*	1
11	Malvaceae	*Grewia occidentalis*	0.1
12	Scrophulariaceae	*Halleria lucida*	1
13	Achariaceae	*Kiggelaria africana*	1
14	Celastraceae	*Maytenus acuminata*	0.5
15	Celastraceae	*Maytenus oleioides*	1
16	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
17	Oliniaceae	*Olinia ventosa*	0.5
18	Rhamnaceae	*Phylica buxifolia*	0.5
19	Fabaceae	*Podylaria calyptrata*	0.5
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	2
22	Anacardiaceae	*Searsia glauca*	1
23	Anacardiaceae	*Searsia lucida*	2
24	Anacardiaceae	*Searsia tomentosa*	0.5
25	Salicaceae	*Scolopia mundii*	1
26	Asclepiadaceae	*Secamone alpini*	0.5
27	Cupressaceae	*Widdringtonia nodiflora*	0.1

SITE 16 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Celastraceae	*Cassine schinoides*	1
3	Euphorbiaceae	*Clutia pulchella*	0.5
4	Cunoniaceae	*Cunonia capensis*	3
5	Scrophulariaceae	*Halleria lucida*	3
6	Achariaceae	*Kiggelaria africana*	2
7	Celastraceae	*Maytenus oleioides*	1
8	Oleaceae	*Olea europea* ssp. *africana*	1
9	Santalaceae	*Colpoon compressum*	0.5
10	Rhamnaceae	*Phylica buxifolia*	0.5
11	Fabaceae	*Podylaria calyptrata*	0.5
12	Myrsinaceae	*Rapanea melanophloeos*	1
13	Anacardiaceae	*Searsia glauca*	1
14	Anacardiaceae	*Searsia lucida*	1
15	Anacardiaceae	*Searsia tomentosa*	0.5

<u>SITE 17 ORIGINAL DISA STREAM – ORANGE KLOOF</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	0.1
3	Celastraceae	*Cassine peragua*	0.5
4	Celastraceae	*Cassine schinoides*	0.5
5	Oleaceae	*Chionanthus foveolatus*	0.5
6	Euphorbiaceae	*Clutia pulchella*	0.5
7	Cunoniaceae	*Cunonia capensis*	3
8	Cornaceae	*Curtisia dentata*	2
9	Araliaceae	*Cussonia thyrsiflora*	0.1
10	Ebenaceae	*Diospyros whyteana*	0.5
11	Ericaceae	*Erica caffra*	0.1
12	Scrophulariaceae	*Halleria lucida*	2
13	Aquifoliaceae	*Ilex mitis*	1
14	Achariaceae	*Kiggelaria africana*	0.5
15	Celastraceae	*Maurocenia frangula*	0.5
16	Celastraceae	*Maytenus acuminata*	1
17	Celastraceae	*Maytenus oleioides*	0.5
18	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
19	Oleaceae	*Olea europea* ssp. *africana*	0.1
20	Oliniaceae	*Olinia ventosa*	0.5
21	Santalaceae	*Colpoon compressum*	0.5
22	Rhamnaceae	*Phylica buxifolia*	0.5
23	Fabaceae	*Podylaria calyptrata*	0.5
24	Podocarpaceae	*Podocarpus latifolius*	0.5
25	Polygalaceae	*Polygala myrtifolia*	0.5
26	Myrsinaceae	*Rapanea melanophloeos*	3
27	Anacardiaceae	*Searsia glauca*	0.5
28	Anacardiaceae	*Searsia lucida*	1
29	Anacardiaceae	*Searsia tomentosa*	0.1
30	Asclepiadaceae	*Secamone alpini*	0.5
31	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 18 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	2
3	Celastraceae	*Cassine schinoides*	1
4	Oleaceae	*Chionanthus foveolatus*	1
5	Cunoniaceae	*Cunonia capensis*	2
6	Cornaceae	*Curtisia dentata*	2
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Scrophulariaceae	*Halleria lucida*	1
9	Aquifoliaceae	*Ilex mitis*	2
10	Achariaceae	*Kiggelaria africana*	0.5
11	Celastraceae	*Maurocenia frangula*	0.5
12	Celastraceae	*Maytenus acuminata*	1
13	Celastraceae	*Maytenus oleioides*	0.5
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
15	Oleaceae	*Olea europea* ssp. *africana*	0.5
16	Oliniaceae	*Olinia ventosa*	2
17	Podocarpaceae	*Podocarpus latifolius*	1
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	1
20	Anacardiaceae	*Searsia glauca*	0.1
21	Anacardiaceae	*Searsia laevigata*	1
22	Anacardiaceae	*Searsia lucida*	1
23	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 19 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	2
3	Celastraceae	*Cassine schinoides*	1
4	Oleaceae	*Chionanthus foveolatus*	1
5	Cunoniaceae	*Cunonia capensis*	3
6	Cornaceae	*Curtisia dentata*	2
7	Araliaceae	*Cussonia thyrsiflora*	0.5
8	Ebenaceae	*Diospyros whyteana*	0.5
9	Scrophulariaceae	*Halleria lucida*	1
10	Aquifoliaceae	*Ilex mitis*	1
11	Achariaceae	*Kiggelaria africana*	0.5
12	Celastraceae	*Maurocenia frangula*	2
13	Celastraceae	*Maytenus acuminata*	2
14	Celastraceae	*Maytenus oleioides*	0.5
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
16	Oliniaceae	*Olinia ventosa*	0.5
17	Podocarpaceae	*Podocarpus latifolius*	2
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	2
20	Anacardiaceae	*Searsia glauca*	0.5
21	Anacardiaceae	*Searsia laevigata*	1
22	Anacardiaceae	*Searsia lucida*	1
23	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 20 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	3
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	2
4	Oleaceae	*Chionanthus foveolatus*	1
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	1
7	Cornaceae	*Curtisia dentata*	0.5
8	Araliaceae	*Cussonia thyrsiflora*	0.5
9	Ebenaceae	*Diospyros whyteana*	0.1
10	Scrophulariaceae	*Halleria lucida*	2
11	Achariaceae	*Kiggelaria africana*	1
12	Celastraceae	*Maurocenia frangula*	3
13	Celastraceae	*Maytenus acuminata*	1
14	Celastraceae	*Maytenus oleioides*	0.5
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
16	Oliniaceae	*Olinia ventosa*	2
17	Fabaceae	*Podylaria calyptrata*	0.5
18	Podocarpaceae	*Podocarpus latifolius*	3
19	Polygalaceae	*Polygala myrtifolia*	0.5
20	Myrsinaceae	*Rapanea melanophloeos*	2
21	Anacardiaceae	*Searsia glauca*	0.5
22	Anacardiaceae	*Searsia laevigata*	0.5
23	Anacardiaceae	*Searsia lucida*	0.5
24	Anacardiaceae	*Searsia tomentosa*	0.5
25	Asclepiadaceae	*Secamone alpini*	1
26	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 21 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	2
4	Oleaceae	*Chionanthus foveolatus*	0.5
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	3
7	Cornaceae	*Curtisia dentata*	1
8	Araliaceae	*Cussonia thyrsiflora*	0.5
9	Ebenaceae	*Diospyros whyteana*	0.5
10	Ericaceae	*Erica caffra*	0.1
11	Scrophulariaceae	*Halleria lucida*	1
12	Achariaceae	*Kiggelaria africana*	2
13	Celastraceae	*Maurocenia frangula*	3
14	Celastraceae	*Maytenus acuminata*	1
15	Celastraceae	*Maytenus oleioides*	0.5
16	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
17	Oliniaceae	*Olinia ventosa*	0.5
18	Fabaceae	*Podylaria calyptrata*	0.5
19	Podocarpaceae	*Podocarpus latifolius*	3
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	2
22	Anacardiaceae	*Searsia lucida*	1
23	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 22 WYNBERG CAVES – BACK TABLE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	2
4	Euphorbiceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	2
6	Araliaceae	*Cussonia thyrsiflora*	0.1
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Scrophulariaceae	*Halleria lucida*	3
9	Aquifoliaceae	*Ilex mitis*	2
10	Achariaceae	*Kiggelaria africana*	3
11	Celastraceae	*Maurocenia frangula*	2
12	Celastraceae	*Maytenus acuminata*	2
13	Lauraceae	*Ocotea bullata*	0.1
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
15	Oliniaceae	*Olinia ventosa*	0.5
16	Fabaceae	*Podylaria calyptrata*	0.5
17	Podocarpaceae	*Podocarpus latifolius*	3
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	3
20	Anacardiaceae	*Searsia laevigata*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Celastraceae	*Robsonodendron eucleiforme*	2

SITE 23 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	3
2	Celastraceae	*Cassine peragua*	2
3	Celastraceae	*Cassine schinoides*	1
4	Euphorbiceae	*Clutia pulchella*	0.5
5	Ebenaceae	*Diospyros whyteana*	3
6	Scrophulariaceae	*Halleria lucida*	1
7	Aquifoliaceae	*Ilex mitis*	2
8	Achariaceae	*Kiggelaria africana*	2
9	Celastraceae	*Maurocenia frangula*	3
10	Celastraceae	*Maytenus acuminata*	2
11	Celastraceae	*Maytenus oleoides*	2
12	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
13	Oliniaceae	*Olinia ventosa*	0.5
14	Fabaceae	*Podylaria calyptrata*	0.5
15	Podocarpaceae	*Podocarpus latifolius*	3
16	Polygalaceae	*Polygala myrtifolia*	0.5
17	Myrsinaceae	*Rapanea melanophloeos*	3
18	Anacardiaceae	*Searsia glauca*	0.1
19	Anacardiaceae	*Searsia laevigata*	0.5
20	Anacardiaceae	*Searsia lucida*	1
21	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 24 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	3
2	Rubiaceae	*Canthium inerme*	0.5
3	Celastraceae	*Cassine peragua*	1
4	Celastraceae	*Cassine schinoides*	1
5	Oleaceae	*Chionanthus foveolatus*	0.5
6	Euphorbiaceae	*Clutia pulchella*	0.5
7	Araliaceae	*Cussonia thyrsiflora*	0.1
8	Ebenaceae	*Diospyros whyteana*	0.5
9	Scrophulariaceae	*Halleria lucida*	0.5
10	Achariaceae	*Kiggelaria africana*	2
11	Celastraceae	*Maurocenia frangula*	2
12	Celastraceae	*Maytenus acuminata*	2
13	Celastraceae	*Maytenus oleoides*	2
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
15	Oliniaceae	*Olinia ventosa*	2
16	Podocarpaceae	*Podocarpus latifolius*	3
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	3
19	Anacardiaceae	*Searsia glauca*	0.5
20	Anacardiaceae	*Searsia laevigata*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Anacardiaceae	*Searsia tomentosa*	0.5
23	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 25 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	2
3	Celastraceae	*Cassine schinoides*	2
4	Oleaceae	*Chionanthus foveolatus*	0.5
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	3
7	Cornaceae	*Curtisia dentata*	2
8	Araliaceae	*Cussonia thyrsiflora*	0.1
9	Ebenaceae	*Diospyros whyteana*	0.5
10	Scrophulariaceae	*Halleria lucida*	1
11	Aquifoliaceae	*Ilex mitis*	1
12	Achariaceae	*Kiggelaria africana*	0.1
13	Celastraceae	*Maytenus acuminata*	1
14	Celastraceae	*Maytenus oleoides*	0.5
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
16	Oleaceae	*Olea europea* ssp. *africana*	0.1
17	Oliniaceae	*Olinia ventosa*	2
18	Santalaceae	*Colpoon compressum*	0.5
19	Rhamnaceae	*Phylica buxifolia*	0.5
20	Fabaceae	*Podylaria calyptrata*	0.5
21	Podocarpaceae	*Podocarpus latifolius*	2
22	Polygalaceae	*Polygala myrtifolia*	0.5
23	Myrsinaceae	*Rapanea melanophloeos*	2
24	Anacardiaceae	*Searsia laevigata*	1
25	Anacardiaceae	*Searsia lucida*	1
26	Anacardiaceae	*Searsia tomentosa*	0.5
27	Celastraceae	*Robsonodendron eucleiforme*	0.1
28	Asclepiadaceae	*Secamone alpini*	0.5
29	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 26 DISA GORGE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Celastraceae	*Cassine schinoides*	1
3	Euphorbiaceae	*Clutia pulchella*	0.5
4	Cunoniaceae	*Cunonia capensis*	3
5	Cornaceae	*Curtisia dentata*	1
6	Ebenaceae	*Diospyros whyteana*	1
7	Scrophulariaceae	*Halleria lucida*	1
8	Aquifoliaceae	*Ilex mitis*	2
9	Achariaceae	*Kiggelaria africana*	1
10	Celastraceae	*Maytenus acuminata*	1
11	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
12	Oleaceae	*Olea europea* ssp. *africana*	0.5
13	Podocarpaceae	*Podocarpus latifolius*	1
14	Polygalaceae	*Polygala myrtifolia*	0.5
15	Myrsinaceae	*Rapanea melanophloeos*	2
16	Anacardiaceae	*Searsia glauca*	0.1
17	Anacardiaceae	*Searsia laevigata*	1
18	Anacardiaceae	*Searsia lucida*	1

SITE 27 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	1
6	Oleaceae	*Chionanthus foveolatus*	2
7	Euphorbiaceae	*Clutia pulchella*	0.5
8	Cunoniaceae	*Cunonia capensis*	1
9	Cornaceae	*Curtisia dentata*	1
10	Araliaceae	*Cussonia thyrsiflora*	0.5
11	Ebenaceae	*Diospyros whyteana*	3
12	Malvaceae	*Grewia occidentalis*	0.5
13	Celastraceae	*Gymnosporia buxifolia*	0.5
14	Scrophulariaceae	*Halleria lucida*	1
15	Aquifoliaceae	*Ilex mitis*	0.5
16	Achariaceae	*Kiggelaria africana*	1
17	Celastraceae	*Maurocenia frangula*	0.5
18	Celastraceae	*Maytenus acuminata*	2
19	Celastraceae	*Maytenus oleoides*	1
20	Lauraceae	*Ocotea bullata*	0.1
21	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
22	Oleaceae	*Olea europea* ssp. *africana*	0.5
23	Oliniaceae	*Olinia ventosa*	2
24	Santalaceae	*Colpoon compressum*	0.5
25	Rhamnaceae	*Phylica buxifolia*	0.5
26	Fabaceae	*Podylaria calyptrata*	0.5
27	Podocarpaceae	*Podocarpus latifolius*	1
28	Polygalaceae	*Polygala myrtifolia*	0.5
29	Myrsinaceae	*Rapanea melanophloeos*	2
30	Anacardiaceae	*Searsia glauca*	0.5
31	Anacardiaceae	*Searsia laevigata*	1
32	Anacardiaceae	*Searsia lucida*	1
33	Anacardiaceae	*Searsia tomentosa*	0.5
34	Celastraceae	*Robsonodendron eucleiforme*	1
35	Salicaceae	*Scolopia mundii*	1

36	Rhamnaceae	*Scutia myrtina*	1
37	Asclepiadaceae	*Secamone alpini*	1
38	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5
39	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 28 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	1
6	Oleaceae	*Chionanthus foveolatus*	2
7	Euphorbiaceae	*Clutia pulchella*	0.5
8	Cunoniaceae	*Cunonia capensis*	1
9	Cornaceae	*Curtisia dentata*	1
10	Ebenaceae	*Diospyros whyteana*	3
11	Malvaceae	*Grewia occidentalis*	0.5
12	Celastraceae	*Gymnosporia buxifolia*	0.5
13	Scrophulariaceae	*Halleria lucida*	0.5
14	Aquifoliaceae	*Ilex mitis*	1
15	Achariaceae	*Kiggelaria africana*	1
16	Celastraceae	*Maytenus acuminata*	1
17	Celastraceae	*Maytenus oleoides*	0.5
18	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
19	Oleaceae	*Olea europea* ssp. *africana*	0.5
20	Oliniaceae	*Olinia ventosa*	3
21	Santalaceae	*Colpoon compressum*	0.5
22	Rhamnaceae	*Phylica buxifolia*	0.5
23	Fabaceae	*Podylaria calyptrata*	0.5
24	Podocarpaceae	*Podocarpus latifolius*	1
25	Polygalaceae	*Polygala myrtifolia*	0.5
26	Myrsinaceae	*Rapanea melanophloeos*	3
27	Anacardiaceae	*Searsia laevigata*	0.1
28	Anacardiaceae	*Searsia lucida*	1
29	Anacardiaceae	*Searsia tomentosa*	0.5
30	Celastraceae	*Robsonodendron eucleiforme*	1
31	Salicaceae	*Scolopia mundii*	1
32	Rhamnaceae	*Scutia myrtina*	1
33	Asclepiadaceae	*Secamone alpini*	2
34	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5
35	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 29 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	3
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	0.5
6	Oleaceae	*Chionanthus foveolatus*	2
7	Euphorbiaceae	*Clutia pulchella*	0.5
8	Cunoniaceae	*Cunonia capensis*	1
9	Cornaceae	*Curtisia dentata*	1
10	Araliaceae	*Cussonia thyrsiflora*	0.1
11	Ebenaceae	*Diospyros whyteana*	1
12	Malvaceae	*Grewia occidentalis*	0.5
13	Celastraceae	*Gymnosporia buxifolia*	1
14	Scrophulariaceae	*Halleria lucida*	1
15	Aquifoliaceae	*Ilex mitis*	0.5
16	Achariaceae	*Kiggelaria africana*	2
17	Celastraceae	*Maurocenia frangula*	0.1
18	Celastraceae	*Maytenus acuminata*	1
19	Celastraceae	*Maytenus oleoides*	0.5
20	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
21	Oleaceae	*Olea europea* ssp. *africana*	0.5
22	Oliniaceae	*Olinia ventosa*	2
23	Fabaceae	*Podylaria calyptrata*	0.5
24	Podocarpaceae	*Podocarpus latifolius*	2
25	Polygalaceae	*Polygala myrtifolia*	0.5
26	Myrsinaceae	*Rapanea melanophloeos*	3
27	Anacardiaceae	*Searsia glauca*	0.5
28	Anacardiaceae	*Searsia laevigata*	1
29	Anacardiaceae	*Searsia lucida*	1
30	Celastraceae	*Robsonodendron eucleiforme*	2
31	Rhamnaceae	*Scolopia mundii*	0.1
32	Asclepiadaceae	*Secamone alpini*	2
33	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 30 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	0.1
3	Oleaceae	*Cassine peragua*	0.1
4	Oleaceae	*Chionanthus foveolatus*	0.1
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	0.5
7	Cornaceae	*Curtisia dentata*	0.5
8	Ebenaceae	*Diospyros whyteana*	0.5
9	Malvaceae	*Grewia occidentalis*	0.1
10	Celastraceae	*Gymnosporia buxifolia*	0.1
11	Scrophulariaceae	*Halleria lucida*	2
12	Aquifoliaceae	*Ilex mitis*	0.5
13	Achariaceae	*Kiggelaria africana*	2
14	Celastraceae	*Maytenus acuminata*	0.1
15	Celastraceae	*Maytenus oleoides*	0.1
16	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
17	Oleaceae	*Olea europea* ssp. *africana*	0.1
18	Oliniaceae	*Olinia ventosa*	0.1
19	Fabaceae	*Podylaria calyptrata*	0.1
20	Podocarpaceae	*Podocarpus latifolius*	2
21	Polygalaceae	*Polygala myrtifolia*	0.1
22	Myrsinaceae	*Rapanea melanophloeos*	3
23	Anacardiaceae	*Searsia glauca*	0.1
24	Anacardiaceae	*Searsia lucida*	0.5
25	Anacardiaceae	*Searsia tomentosa*	0.5
26	Asclepiadaceae	*Secamone alpini*	0.1

SITE 31 ORANGE GULLY – ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	2
4	Celastraceae	*Cassine peragua*	2
5	Euphorbiaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	3
7	Cornaceae	*Curtisia dentata*	2
8	Ebenaceae	*Diospyros whyteana*	2
9	Celastraceae	*Gymnosporia buxifolia*	0.5
10	Scrophulariaceae	*Halleria lucida*	2
11	Aquifoliaceae	*Ilex mitis*	2
12	Achariaceae	*Kiggelaria africana*	2
13	Celastraceae	*Maytenus acuminata*	1
14	Celastraceae	*Maytenus oleoides*	0.5
15	Oleaceae	*Olea europea* ssp. *africana*	0.5
16	Oliniaceae	*Olinia ventosa*	1
17	Fabaceae	*Podylaria calyptrata*	0.5
18	Podocarpaceae	*Podocarpus latifolius*	0.5
19	Polygalaceae	*Polygala myrtifolia*	0.5
20	Myrsinaceae	*Rapanea melanophloeos*	3
21	Anacardiaceae	*Searsia lucida*	1
22	Rhamnaceae	*Scutia myrtina*	0.5

<u>SITE 32 LANGKLOOF – ORANGE KLOOF</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	0.5
6	Oleaceae	*Chionanthus foveolatus*	2
7	Euphorbiaceae	*Clutia pulchella*	0.5
8	Cunoniaceae	*Cunonia capensis*	1
9	Cornaceae	*Curtisia dentata*	1
10	Ebenaceae	*Diospyros whyteana*	1
11	Celastraceae	*Gymnosporia buxifolia*	0.5
12	Scrophulariaceae	*Halleria lucida*	1
13	Aquifoliaceae	*Ilex mitis*	1
14	Achariaceae	*Kiggelaria africana*	0.5
15	Celastraceae	*Maurocenia frangula*	0.5
16	Celastraceae	*Maytenus acuminata*	1
17	Celastraceae	*Maytenus oleoides*	0.5
18	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
19	Oleaceae	*Olea europea* ssp. *africana*	0.5
20	Oliniaceae	*Olinia ventosa*	2
21	Fabaceae	*Podylaria calyptrata*	0.5
22	Podocarpaceae	*Podocarpus latifolius*	1
23	Polygalaceae	*Polygala myrtifolia*	0.5
24	Myrsinaceae	*Rapanea melanophloeos*	2
25	Anacardiaceae	*Searsia glauca*	0.5
26	Anacardiaceae	*Searsia laevigata*	0.1
27	Anacardiaceae	*Searsia lucida*	1
28	Rhamnaceae	*Scutia myrtina*	0.5
29	Asclepiadaceae	*Secamone alpini*	2

SITE 33 ORANGE KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Rubiaceae	*Cassine peragua*	2
3	Rubiaceae	*Cassine schinoides*	3
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	4
6	Cornaceae	*Curtisia dentata*	0.1
7	Ebenaceae	*Diospyros whyteana*	1
8	Scrophulariaceae	*Halleria lucida*	2
9	Aquifoliaceae	*Ilex mitis*	0.5
10	Achariaceae	*Kiggelaria africana*	3
11	Celastraceae	*Maytenus acuminata*	3
12	Celastraceae	*Maytenus oleoides*	0.5
13	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
14	Oleaceae	*Olea europea* ssp. *africana*	2
15	Oliniaceae	*Olinia ventosa*	0.5
16	Podocarpaceae	*Podocarpus latifolius*	0.5
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	4
19	Anacardiaceae	*Searsia glauca*	0.1
20	Anacardiaceae	*Searsia lucida*	1

<u>SITE 34 MYBURGH'S WATERFALL RAVINE</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	1
3	Celastraceae	*Cassine peragua*	3
4	Celastraceae	*Cassine schinoides*	2
5	Oleaceae	*Chionanthus foveolatus*	3
6	Euphorbiaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	2
9	Araliaceae	*Cussonia thyrsiflora*	0.1
10	Ebenaceae	*Diospyros whyteana*	2
11	Scrophulariaceae	*Halleria lucida*	2
12	Aquifoliaceae	*Ilex mitis*	1
13	Achariaceae	*Kiggelaria africana*	2
14	Celastraceae	*Maurocenia frangula*	0.5
15	Celastraceae	*Maytenus acuminata*	3
16	Celastraceae	*Maytenus oleoides*	0.5
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
18	Oleaceae	*Olea europea* ssp. *africana*	0.5
19	Oliniaceae	*Olinia ventosa*	2
20	Fabaceae	*Podylaria calyptrata*	1
21	Podocarpaceae	*Podocarpus latifolius*	3
22	Polygalaceae	*Polygala myrtifolia*	0.5
23	Myrsinaceae	*Rapanea melanophloeos*	3
24	Anacardiaceae	*Searsia glauca*	0.5
25	Anacardiaceae	*Searsia lucida*	1
26	Anacardiaceae	*Searsia tomentosa*	0.5
27	Celastraceae	*Robsonodendron eucleiforme*	2
28	Rhamnaceae	*Scutia myrtina*	0.5
29	Asclepiadaceae	*Secamone alpini*	2
30	Cupressaceae	*Widdringtonia nodiflora*	0.5

<u>SITE 35 MYBURGH'S KLOOF</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Rubiaceae	*Canthium inerme*	3
3	Rubiaceae	*Afrocanthium mundianum*	0.5
4	Celastraceae	*Cassine peragua*	3
5	Oleaceae	*Chionanthus foveolatus*	3
6	Euphorbiaceae	*Clutia pulchella*	3
7	Cunoniaceae	*Cunonia capensis*	0.5
8	Cornaceae	*Curtisia dentata*	0.1
9	Ebenaceae	*Diospyros whyteana*	1
10	Malvaceae	*Grewia occidentalis*	1
11	Celastraceae	*Gymnosporia buxifolia*	2
12	Scrophulariaceae	*Halleria lucida*	0.5
13	Aquifoliaceae	*Ilex mitis*	0.1
14	Achariaceae	*Kiggelaria africana*	0.1
15	Celastraceae	*Maurocenia frangula*	2
16	Celastraceae	*Maytenus acuminata*	3
17	Celastraceae	*Maytenus oleoides*	1
18	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
19	Oleaceae	*Olea europea* ssp. *africana*	1
20	Oliniaceae	*Olinia ventosa*	3
21	Fabaceae	*Podylaria calyptrata*	0.5
22	Podocarpaceae	*Podocarpus latifolius*	0.5
23	Myrsinaceae	*Rapanea melanophloeos*	2
24	Anacardiaceae	*Searsia laevigata*	0.5
25	Anacardiaceae	*Searsia lucida*	0.5
26	Anacardiaceae	*Searsia tomentosa*	0.5
27	Rhamnaceae	*Scutia myrtina*	0.5
28	Asclepiadaceae	*Secamone alpini*	1

SITE 36 SOLDATEBOS – OUDEKRAAL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	0.5
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	1
4	Oleaceae	*Chionanthus foveolatus*	2
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Araliaceae	*Cussonia thyrsiflora*	0.5
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Celastraceae	*Gymnosporia buxifolia*	1
9	Celastraceae	*Maurocenia frangula*	3
10	Celastraceae	*Maytenus acuminata*	2
11	Celastraceae	*Maytenus oleoides*	0.5
12	Oleaceae	*Olea europea* ssp. *africana*	2
13	Oliniaceae	*Olinia ventosa*	1
14	Santalaceae	*Culpoon compressum*	0.5
15	Rhamnaceae	*Phylica buxifolia*	0.5
16	Polygalaceae	*Polygala myrtifolia*	0.5
17	Myrsinaceae	*Rapanea melanophloeos*	1
18	Anacardiaceae	*Searsia lucida*	1
19	Rhamnaceae	*Scutia myrtina*	1
20	Asclepiadaceae	*Secamone alpini*	1
21	Sapotaceae	*Sideroxylon inerme*	1
22	Asteraceae	*Tarchonanthus littoralis*	1

SITE 37 BOSKLOOF – OUDEKRAAL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	1
5	Celastraceae	*Cassine schinoides*	0.1
6	Euphorbiaceae	*Clutia pulchella*	0.5
7	Cunoniaceae	*Cunonia capensis*	1
8	Araliaceae	*Cussonia thyrsiflora*	0.5
9	Celastraceae	*Gymnosporia buxifolia*	0.5
10	Scrophulariaceae	*Halleria lucida*	2
11	Achariaceae	*Kiggelaria africana*	4
12	Celastraceae	*Maurocenia frangula*	3
13	Celastraceae	*Maytenus acuminata*	2
14	Celastraceae	*Maytenus oleoides*	0.5
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
16	Oleaceae	*Olea europea* ssp. *africana*	2
17	Oliniaceae	*Olinia ventosa*	3
18	Podocarpaceae	*Podocarpus latifolius*	0.1
19	Myrsinaceae	*Rapanea melanophloeos*	2
20	Anacardiaceae	*Searsia lucida*	2
21	Anacardiaceae	*Searsia tomentosa*	0.5
22	Rhamnaceae	*Scutia myrtina*	0.5

SITE 38 GROOTKOP SOUTH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	3
2	Oleaceae	*Chionanthus foveolatus*	1
3	Euphorbiaceae	*Clutia pulchella*	1
4	Cunoniaceae	*Cunonia capensis*	3
5	Scrophulariaceae	*Halleria lucida*	2
6	Celastraceae	*Maytenus oleoides*	0.5
7	Rhamnaceae	*Phylica buxifolia*	1
8	Podocarpaceae	*Podocarpus latifolius*	2
9	Myrsinaceae	*Rapanea melanophloeos*	2
10	Anacardiaceae	*Searsia laevigata*	0.5
11	Anacardiaceae	*Searsia tomentosa*	0.1

SITE 39 GROOTKOP SOUTH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	3
2	Oleaceae	*Chionanthus foveolatus*	1
3	Euphorbiaceae	*Clutia pulchella*	1
4	Cunoniaceae	*Cunonia capensis*	3
5	Scrophulariaceae	*Halleria lucida*	2
6	Celastraceae	*Maytenus oleoides*	0.5
7	Rhamnaceae	*Phylica buxifolia*	1
8	Podocarpaceae	*Podocarpus latifolius*	2
9	Myrsinaceae	*Rapanea melanophloeos*	2
10	Anacardiaceae	*Searsia laevigata*	0.5
11	Anacardiaceae	*Searsia tomentosa*	0.1

SITE 40 GROOTKOP WEST

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	3
2	Oleaceae	*Chionanthus foveolatus*	2
3	Cunoniaceae	*Cunonia capensis*	1
4	Araliaceae	*Cussonia thyrsiflora*	0.5
5	Scrophulariaceae	*Halleria lucida*	1
6	Celastraceae	*Maurocenia frangula*	1
7	Celastraceae	*Maytenus oleoides*	2
8	Oleaceae	*Olea europea* ssp. *africana*	3
9	Rhamnaceae	*Phylica buxifolia*	2
10	Myrsinaceae	*Rapanea melanophloeos*	2
11	Anacardiaceae	*Searsia laevigata*	0.5
12	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 41 OUDEKRAAL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	0.5
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	1
4	Oleaceae	*Chionanthus foveolatus*	2
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Araliaceae	*Cussonia thyrsiflora*	0.5
7	Ebenaceae	*Diospyros glabra*	0.5
8	Malvaceae	*Grewia occidentalis*	1
9	Achariaceae	*Kiggelaria africana*	3
10	Celastraceae	*Maurocenia frangula*	0.5
11	Oleaceae	*Olea capensis* ssp. *capensis*	1
12	Oleaceae	*Olea exasperata*	0.5
13	Oliniaceae	*Olinia ventosa*	0.5
14	Fabaceae	*Podylaria calyptrata*	0.5
15	Celastraceae	*Pterocelastrus tricuspidatus*	1
16	Anacardiaceae	*Searsia glauca*	1
17	Celastraceae	*Cassine maritima*	1
18	Salicaceae	*Scolopia mundii*	1
19	Rhamnaceae	*Scutia myrtina*	1
20	Asclepiadaceae	*Secamone alpini*	1

SITE 42 BAKHOVEN

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Ebenaceae	*Euclea racemosa*	2
2	Celastraceae	*Gymnosporia buxifolia*	1
3	Celastraceae	*Maurocenia frangula*	1
4	Celastraceae	*Maytenus acuminata*	0.5
5	Celastraceae	*Maytenus oleoides*	1
6	Santalaceae	*Colpoon compressum*	1
7	Anacardiaceae	*Searsia lucida*	1
8	Sapotaceae	*Sideroxylon inerme*	5
9	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 43 SLANGOLIE RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	0.5
5	Oleaceae	*Chionanthus foveolatus*	0.5
6	Rhamnaceae	*Clutia pulchella*	0.5
7	Araliaceae	*Cussonia thyrsiflora*	0.5
8	Ebenaceae	*Diospyros whyteana*	2
9	Celastraceae	*Gymnosporia buxifolia*	2
10	Scrophulariaceae	*Halleria lucida*	1
11	Achariaceae	*Kiggelaria africana*	1
12	Celastraceae	*Maurocenia frangula*	3
13	Celastraceae	*Maytenus acuminata*	1
14	Celastraceae	*Maytenus oleoides*	0.5
15	Oleaceae	*Olea europea* ssp. *africana*	2
16	Oliniaceae	*Olinia ventosa*	2
17	Podocarpaceae	*Podocarpus latifolius*	0.1
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	3
20	Anacardiaceae	*Searsia glauca*	0.1
21	Anacardiaceae	*Searsia laevigata*	0.5
22	Anacardiaceae	*Searsia lucida*	1
23	Anacardiaceae	*Searsia tomentosa*	0.5
24	Rhamnaceae	*Scutia myrtina*	2

SITE 44 SLANGOLIE RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Rubiaceae	*Canthium inerme*	1
3	Celastraceae	*Cassine peragua*	2
4	Celastraceae	*Cassine schinoides*	0.5
5	Oleaceae	*Chionanthus foveolatus*	2
6	Euphorbiaceae	*Clutia pulchella*	0.5
7	Cunoniaceae	*Cunonia capensis*	0.5
8	Cornaceae	*Curtisia dentata*	2
9	Araliaceae	*Cussonia thyrsiflora*	0.5
10	Ebenaceae	*Diospyros whyteana*	2
11	Celastraceae	*Gymnosporia buxifolia*	0.5
12	Scrophulariaceae	*Halleria lucida*	0.5
13	Achariaceae	*Kiggelaria africana*	1
14	Celastraceae	*Maurocenia frangula*	2
15	Celastraceae	*Maytenus oleoides*	0.5
16	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
17	Oleaceae	*Olea europea* ssp. *africana*	2
18	Oliniaceae	*Olinia ventosa*	2
19	Santalaceae	*Culpoon compressum*	0.5
20	Rhamnaceae	*Phylica buxifolia*	1
21	Polygalaceae	*Polygala myrtifolia*	0.5
22	Myrsinaceae	*Rapanea melanophloeos*	2
23	Anacardiaceae	*Searsia glauca*	0.1
24	Anacardiaceae	*Searsia lucida*	1
25	Rhamnaceae	*Scutia myrtina*	0.5
26	Asclepiadaceae	*Secamone alpini*	0.5
27	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 45 SLANGOLIE RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Scrophulariaceae	*Halleria lucida*	2
4	Achariaceae	*Kiggelaria africana*	2
5	Celastraceae	*Maurocenia frangula*	1
6	Celastraceae	*Maytenus acuminata*	2
7	Celastraceae	*Maytenus oleoides*	0.5
8	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
9	Oleaceae	*Olea europea* ssp. *africana*	1
10	Podocarpaceae	*Podocarpus latifolius*	2
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Anacardiaceae	*Searsia lucida*	1

SITE 46 TRANQUILITY CRACKS

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine schinoides*	3
2	Cunoniaceae	*Cunonia capensis*	2
3	Celastraceae	*Gymnosporia buxifolia*	1
4	Scrophulariaceae	*Halleria lucida*	3
5	Podocarpaceae	*Podocarpus latifolius*	4
6	Myrsinaceae	*Rapanea melanophloeos*	2

SITE 47 WOODY RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	0.1
3	Celastraceae	*Cassine peragua*	3
4	Oleaceae	*Chionanthus foveolatus*	0.5
5	Euphorbiaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	0.1
7	Araliaceae	*Cussonia thyrsiflora*	0.5
8	Ebenaceae	*Diospyros whyteana*	1
9	Ebenaceae	*Euclea racemosa*	0.5
10	Celastraceae	*Gymnosporia buxifolia*	1
11	Scrophulariaceae	*Halleria lucida*	1
12	Achariaceae	*Kiggelaria africana*	1
13	Celastraceae	*Maurocenia frangula*	3
14	Oleaceae	*Olea europea* ssp. *africana*	3
15	Oliniaceae	*Olinia ventosa*	2
16	Rhamnaceae	*Phylica buxifolia*	1
17	Polygalaceae	*Polygala myrtifolia*	1
18	Myrsinaceae	*Rapanea melanophloeos*	1
19	Anacardiaceae	*Searsia glauca*	0.5
20	Anacardiaceae	*Searsia lucida*	1
21	Asteraceae	*Tarchonanthus littoralis*	0.5
22	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5
23	Cupressaceae	*Widdringtonia nodiflora*	0.1

SITE 48 WOODY RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	0.5
2	Euphorbiaceae	*Clutia pulchella*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Achariaceae	*Kiggelaria africana*	2
5	Celastraceae	*Maurocenia frangula*	0.5
6	Oleaceae	*Olea europea* ssp. *africana*	2
7	Santalaceae	*Colpoon compressum*	0.5
8	Podocarpaceae	*Podocarpus latifolius*	2
9	Myrsinaceae	*Rapanea melanophloeos*	0.5
10	Anacardiaceae	*Searsia glauca*	0.5
11	Anacardiaceae	*Searsia laevigata*	0.1
12	Anacardiaceae	*Searsia lucida*	0.5

SITE 49 PIPE TRACK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Araliaceae	*Cussonia thyrsiflora*	0.5
3	Malvaceae	*Grewia occidentalis*	0.5
4	Celastraceae	*Gymnosporia buxifolia*	0.5
5	Achariaceae	*Kiggelaria africana*	2
6	Celastraceae	*Maytenus oleoides*	0.5
7	Oleaceae	*Olea europea* ssp. *africana*	2
8	Santalaceae	*Colpoon compressum*	0.5
9	Rhamnaceae	*Phylica buxifolia*	0.5
10	Polygalaceae	*Polygala myrtifolia*	0.5
11	Anacardiaceae	*Searsia laevigata*	0.5
12	Anacardiaceae	*Searsia lucida*	0.5
13	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 50 PIPE TRACK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	0.5
6	Achariaceae	*Kiggelaria africana*	0.5
7	Celastraceae	*Maurocenia frangula*	0.5
8	Celastraceae	*Maytenus oleoides*	0.5
9	Oleaceae	*Olea europea* ssp. *africana*	1
10	Rhamnaceae	*Phylica buxifolia*	1
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Myrsinaceae	*Rapanea melanophloeos*	0.5
13	Anacardiaceae	*Searsia laevigata*	0.1
14	Anacardiaceae	*Searsia lucida*	0.5
15	Anacardiaceae	*Searsia tomentosa*	0.5
16	Sapotaceae	*Sideroxylon inerme*	0.1

SITE 51 PIPE TRACK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Rubiaceae	*Afrocanthium mundianum*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	0.5
6	Achariaceae	*Kiggelaria africana*	0.5
7	Celastraceae	*Maurocenia frangula*	0.5
8	Celastraceae	*Maytenus oleoides*	0.5
9	Oleaceae	*Olea europea* ssp. *africana*	2
10	Rhamnaceae	*Phylica buxifolia*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Anacardiaceae	*Searsia laevigata*	0.5
13	Anacardiaceae	*Searsia lucida*	0.5
14	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 52 PIPE TRACK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	0.5
6	Scrophulariaceae	*Halleria lucida*	0.5
7	Achariaceae	*Kiggelaria africana*	1
8	Celastraceae	*Maurocenia frangula*	1
9	Celastraceae	*Maytenus oleoides*	0.5
10	Oleaceae	*Olea europea* ssp. *africana*	2
11	Oliniaceae	*Olinia ventosa*	1
12	Rhamnaceae	*Phylica buxifolia*	0.5
13	Polygalaceae	*Polygala myrtifolia*	0.5
14	Anacardiaceae	*Searsia glauca*	0.1
15	Anacardiaceae	*Searsia laevigata*	0.5
16	Anacardiaceae	*Searsia lucida*	1
17	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 53 BLINKWATER – SCREE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	3
2	Euphorbiaceae	*Clutia pulchella*	2
3	Araliaceae	*Cussonia thyrsiflora*	2
4	Celastraceae	*Gymnosporia buxifolia*	2
5	Scrophulariaceae	*Halleria lucida*	3
6	Achariaceae	*Kiggelaria africana*	3
7	Celastraceae	*Maurocenia frangula*	3
8	Celastraceae	*Maytenus oleoides*	3
9	Oleaceae	*Olea europea* ssp. *africana*	3
10	Oliniaceae	*Olinia ventosa*	3
11	Anacardiaceae	*Searsia lucida*	0.5
12	Anacardiaceae	*Searsia tomentosa*	0.1

SITE 54 BLINKWATER – CAVES

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Euphorbiaceae	*Clutia pulchella*	1
2	Araliaceae	*Cussonia thyrsiflora*	0.5
3	Ebenaceae	*Diospyros whyteana*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	3
6	Celastraceae	*Maurocenia frangula*	2
7	Celastraceae	*Maytenus oleoides*	1
8	Oleaceae	*Olea europea* ssp. *africana*	0.5
9	Rhamnaceae	*Phylica buxifolia*	1
10	Myrsinaceae	*Rapanea melanophloeos*	0.1
11	Anacardiaceae	*Searsia lucida*	1

SITE 55 BLINKWATER – SCREE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Celastraceae	*Cassine peragua*	0.5
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Araliaceae	*Cussonia thyrsiflora*	0.5
6	Celastraceae	*Gymnosporia buxifolia*	1
7	Achariaceae	*Kiggelaria africana*	0.5
8	Celastraceae	*Maurocenia frangula*	1
9	Celastraceae	*Maytenus oleoides*	0.5
10	Oleaceae	*Olea europea* ssp. *africana*	3
11	Oliniaceae	*Olinia ventosa*	1
12	Rhamnaceae	*Phylica buxifolia*	0.5
13	Polygalaceae	*Polygala myrtifolia*	0.5
14	Anacardiaceae	*Searsia laevigata*	0.5
15	Anacardiaceae	*Searsia lucida*	0.5
16	Anacardiaceae	*Searsia tomentosa*	0.5

<u>SITE 56 BLINKWATER – SCREE</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Ebenaceae	*Euclea racemosa*	0.5
6	Malvaceae	*Grewia occidentalis*	0.5
7	Celastraceae	*Gymnosporia buxifolia*	2
8	Scrophulariaceae	*Halleria lucida*	1
9	Achariaceae	*Kiggelaria africana*	2
10	Celastraceae	*Maurocenia frangula*	2
11	Celastraceae	*Maytenus oleoides*	1
12	Oleaceae	*Olea europea* ssp. *africana*	3
13	Oliniaceae	*Olinia ventosa*	2
14	Santalaceae	*Colpoon compressum*	0.5
15	Rhamnaceae	*Phylica buxifolia*	1
16	Polygalaceae	*Polygala myrtifolia*	0.5
17	Anacardiaceae	*Searsia glauca*	0.1
18	Anacardiaceae	*Searsia lucida*	0.5
19	Anacardiaceae	*Searsia tomentosa*	0.5
20	Asteraceae	*Tarchonanthus littoralis*	0.1

SITE 57 BLINKWATER RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	3
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Oleaceae	*Chionanthus foveolatus*	2
5	Euphorbiaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	0.5
7	Ebenaceae	*Euclea racemosa*	0.5
8	Malvaceae	*Grewia occidentalis*	0.5
9	Celastraceae	*Gymnosporia buxifolia*	2
10	Scrophulariaceae	*Halleria lucida*	3
11	Aquifoliaceae	*Ilex mitis*	1
12	Achariaceae	*Kiggelaria africana*	3
13	Celastraceae	*Maytenus acuminata*	0.5
14	Celastraceae	*Maytenus oleoides*	2
15	Oleaceae	*Olea europea* ssp. *africana*	3
16	Oliniaceae	*Olinia ventosa*	2
17	Santalaceae	*Culpoon compressum*	1
18	Rhamnaceae	*Phylica buxifolia*	1
19	Fabaceae	*Podylaria calyptrata*	2
20	Polygalaceae	*Polygala myrtifolia*	2
21	Myrsinaceae	*Rapanea melanophloeos*	3
22	Anacardiaceae	*Searsia glauca*	0.5
23	Anacardiaceae	*Searsia lucida*	1
24	Anacardiaceae	*Searsia tomentosa*	2
25	Rhamnaceae	*Scutia myrtina*	2
26	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 58 BLINKWATER RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	0.5
3	Celastraceae	*Cassine peragua*	0.5
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	0.5
7	Achariaceae	*Kiggelaria africana*	1
8	Oleaceae	*Olea europea* ssp. *africana*	0.5
9	Oliniaceae	*Olinia ventosa*	0.5
10	Santalaceae	*Colpoon compressum*	1
11	Rhamnaceae	*Phylica buxifolia*	1
12	Fabaceae	*Podylaria calyptrata*	1
13	Anacardiaceae	*Searsia lucida*	0.5
14	Anacardiaceae	*Searsia tomentosa*	0.1
15	Asteraceae	*Tarchonanthus littoralis*	0.5
16	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 59 BLINKWATER & GROTTO RAVINES

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	3
3	Celastraceae	*Cassine peragua*	1
4	Euphorbiaceae	*Clutia pulchella*	1
5	Cunoniaceae	*Cunonia capensis*	0.1
6	Araliaceae	*Cussonia thyrsiflora*	0.1
7	Ebenaceae	*Diospyros whyteana*	2
8	Celastraceae	*Gymnosporia buxifolia*	1
9	Scrophulariaceae	*Halleria lucida*	1
10	Achariaceae	*Kiggelaria africana*	2
11	Celastraceae	*Maurocenia frangula*	2
12	Celastraceae	*Maytenus acuminata*	2
13	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
14	Oleaceae	*Olea europea* ssp. *africana*	2
15	Oliniaceae	*Olinia ventosa*	4
16	Rhamnaceae	*Phylica buxifolia*	0.5
17	Fabaceae	*Podylaria calyptrata*	0.5
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	2
20	Anacardiaceae	*Searsia glauca*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Anacardiaceae	*Searsia tomentosa*	0.5
23	Rhamnaceae	*Scutia myrtina*	1

SITE 60 FOUNTAIN RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	0.5
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	1
6	Araliaceae	*Cussonia thyrsiflora*	0.5
7	Ebenaceae	*Diospyros whyteana*	2
8	Celastraceae	*Gymnosporia buxifolia*	3
9	Scrophulariaceae	*Halleria lucida*	3
10	Aquifoliaceae	*Ilex mitis*	0.5
11	Achariaceae	*Kiggelaria africana*	0.5
12	Celastraceae	*Maurocenia frangula*	2
13	Celastraceae	*Maytenus acuminata*	2
14	Celastraceae	*Maytenus oleoides*	2
15	Oleaceae	*Olea europea* ssp. *africana*	3
16	Oliniaceae	*Olinia ventosa*	2
17	Rhamnaceae	*Phylica buxifolia*	0.5
18	Podocarpaceae	*Podocarpus latifolius*	0.1
19	Polygalaceae	*Polygala myrtifolia*	0.5
20	Myrsinaceae	*Rapanea melanophloeos*	1
21	Anacardiaceae	*Searsia lucida*	1

SITE 61 BLINKWATER – KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	0.5
2	Euphorbiaceae	*Clutia pulchella*	3
3	Celastraceae	*Gymnosporia buxifolia*	0.5
4	Scrophulariaceae	*Halleria lucida*	1
5	Achariaceae	*Kiggelaria africana*	3
6	Celastraceae	*Maurocenia frangula*	2
7	Celastraceae	*Maytenus oleoides*	3
8	Oleaceae	*Olea europea* ssp. *africana*	1
9	Rhamnaceae	*Phylica buxifolia*	0.1
10	Anacardiaceae	*Searsia laevigata*	0.5
11	Anacardiaceae	*Searsia lucida*	0.5
12	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 62 CAIRN RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Celastraceae	*Cassine schinoides*	1
3	Euphorbiaceae	*Clutia pulchella*	2
4	Cunoniaceae	*Cunonia capensis*	1
5	Araliaceae	*Cussonia thyrsiflora*	0.5
6	Celastraceae	*Gymnosporia buxifolia*	3
7	Scrophulariaceae	*Halleria lucida*	1
8	Achariaceae	*Kiggelaria africana*	1
9	Celastraceae	*Maurocenia frangula*	1
10	Celastraceae	*Maytenus acuminata*	0.5
11	Celastraceae	*Maytenus oleoides*	2
12	Oleaceae	*Olea europea* ssp. *africana*	2
13	Rhamnaceae	*Phylica buxifolia*	0.1
14	Polygalaceae	*Polygala myrtifolia*	2
15	Myrsinaceae	*Rapanea melanophloeos*	1
16	Anacardiaceae	*Searsia laevigata*	0.5
17	Anacardiaceae	*Searsia lucida*	0.1
18	Anacardiaceae	*Searsia tomentosa*	1

SITE 63 CAIRN RAVINE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Celastraceae	*Cassine schinoides*	1
3	Euphorbiaceae	*Clutia pulchella*	2
4	Cunoniaceae	*Cunonia capensis*	2
5	Araliaceae	*Cussonia thyrsiflora*	0.5
6	Celastraceae	*Gymnosporia buxifolia*	3
7	Scrophulariaceae	*Halleria lucida*	1
8	Achariaceae	*Kiggelaria africana*	1
9	Celastraceae	*Maurocenia frangula*	1
10	Celastraceae	*Maytenus acuminata*	0.5
11	Celastraceae	*Maytenus oleoides*	2
12	Oleaceae	*Olea europea* ssp. *africana*	2
13	Rhamnaceae	*Phylica buxifolia*	0.1
14	Polygalaceae	*Polygala myrtifolia*	2
15	Myrsinaceae	*Rapanea melanophloeos*	1
16	Anacardiaceae	*Searsia lucida*	0.5
17	Anacardiaceae	*Searsia tomentosa*	1

SITE 64 MATTHEW JACKSON'S GULLY – CAMPS BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Malvaceae	*Grewia occidentalis*	0.5
3	Celastraceae	*Gymnosporia buxifolia*	1
4	Achariaceae	*Kiggelaria africana*	1
5	Oleaceae	*Olea europea* ssp. *africana*	4
6	Anacardiaceae	*Searsia glauca*	0.1
7	Anacardiaceae	*Searsia lucida*	0.5
8	Anacardiaceae	*Searsia tomentosa*	2
9	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 65 CAMPS BAY STREAM

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Cunoniaceae	*Cunonia capensis*	0.1
2	Celastraceae	*Gymnosporia buxifolia*	1
3	Achariaceae	*Kiggelaria africana*	1
4	Oleaceae	*Olea europea* ssp. *africana*	2
5	Podocarpaceae	*Podocarpus latifolius*	0.1
6	Anacardiaceae	*Searsia lucida*	0.5
7	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

SITE 66 PLATTEKLIP STREAM

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	3
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Oleaceae	*Chionanthus foveolatus*	0.5
4	Araliaceae	*Cussonia thyrsiflora*	0.1
5	Ebenaceae	*Diospyros whyteana*	2
6	Scrophulariaceae	*Halleria lucida*	0.1
7	Achariaceae	*Kiggelaria africana*	1
8	Celastraceae	*Maytenus oleoides*	0.1
9	Oleaceae	*Olea europea* ssp. *africana*	1
10	Santalaceae	*Colpoon compressum*	0.1
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Myrsinaceae	*Rapanea melanophloeos*	1
13	Anacardiaceae	*Searsia laevigata*	0.1
14	Anacardiaceae	*Searsia lucida*	0.5
15	Asclepiadaceae	*Secamone alpini*	0.5
16	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 67 PLATTEKLIP STREAM – DEER PARK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Rubiaceae	*Canthium inerme*	0.5
2	Rubiaceae	*Afrocanthium mundianum*	0.1
3	Celastraceae	*Cassine peragua*	0.1
4	Oleaceae	*Chionanthus foveolatus*	0.1
5	Euphorbiaceae	*Clutia pulchella*	0.1
6	Araliaceae	*Cussonia thyrsiflora*	0.1
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Malvaceae	*Grewia occidentalis*	0.1
9	Celastraceae	*Gymnosporia buxifolia*	0.5
10	Scrophulariaceae	*Halleria lucida*	0.5
11	Achariaceae	*Kiggelaria africana*	3
12	Celastraceae	*Maytenus oleoides*	0.5
13	Oleaceae	*Olea europea* ssp. *africana*	1
14	Santalaceae	*Colpoon compressum*	0.1
15	Rhamnaceae	*Phylica buxifolia*	0.5
16	Fabaceae	*Podylaria calyptrata*	0.5
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	1
19	Anacardiaceae	*Searsia glauca*	0.1
20	Anacardiaceae	*Searsia laevigata*	0.1
21	Anacardiaceae	*Searsia lucida*	0.5
22	Anacardiaceae	*Searsia tomentosa*	0.1
23	Asclepiadaceae	*Secamone alpini*	0.5
24	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 68 TAFELBERG ROAD

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	3
2	Achariaceae	*Kiggelaria africana*	3
3	Oleaceae	*Olea europea* ssp. *africana*	3
4	Santalaceae	*Colpoon compressum*	1
5	Rhamnaceae	*Phylica buxifolia*	3
6	Anacardiaceae	*Searsia lucida*	2
7	Anacardiaceae	*Searsia tomentosa*	1
8	Asteraceae	*Tarchonanthus littoralis*	2

SITE 69 TAFELBERG FRONTAL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	2
2	Celastraceae	*Cassine peragua*	3
3	Euphorbiaceae	*Clutia pulchella*	2
4	Araliaceae	*Cussonia thyrsiflora*	2
5	Ebenaceae	*Diospyros whyteana*	2
6	Celastraceae	*Maurocenia frangula*	3
7	Celastraceae	*Maytenus oleoides*	0.5
8	Oleaceae	*Olea europea* ssp. *africana*	3
10	Oliniaceae	*Olinia ventosa*	3
11	Polygalaceae	*Polygala myrtifolia*	1
12	Anacardiaceae	*Searsia lucida*	1

SITE 70 PLATTEKLIP GORGE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Cassine schinoides*	0.5
3	Euphorbiaceae	*Clutia pulchella*	1
4	Cunoniaceae	*Cunonia capensis*	0.1
5	Ebenaceae	*Diospyros whyteana*	4
6	Scrophulariaceae	*Halleria lucida*	1
7	Achariaceae	*Kiggelaria africana*	2
8	Celastraceae	*Maurocenia frangula*	0.1
9	Celastraceae	*Maytenus acuminata*	0.5
10	Celastraceae	*Maytenus oleoides*	1
11	Oleaceae	*Olea europea* ssp. *africana*	3
12	Rhamnaceae	*Phylica buxifolia*	2
13	Polygalaceae	*Polygala myrtifolia*	2
14	Myrsinaceae	*Rapanea melanophloeos*	0.1
15	Anacardiaceae	*Searsia lucida*	1

SITE 71 PLATTEKLIP GORGE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Cassine schinoides*	0.5
3	Euphorbiaceae	*Clutia pulchella*	1
4	Cunoniaceae	*Cunonia capensis*	0.1
5	Ebenaceae	*Diospyros whyteana*	4
6	Scrophulariaceae	*Halleria lucida*	1
7	Achariaceae	*Kiggelaria africana*	2
8	Celastraceae	*Maurocenia frangula*	0.1
9	Celastraceae	*Maytenus acuminata*	0.5
10	Celastraceae	*Maytenus oleoides*	1
11	Oleaceae	*Olea europea* ssp. *africana*	3
12	Rhamnaceae	*Phylica buxifolia*	2
13	Polygalaceae	*Polygala myrtifolia*	2
14	Myrsinaceae	*Rapanea melanophloeos*	0.1
15	Anacardiaceae	*Searsia lucida*	0.5
16	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 72 PLATTEKLIP GORGE UPPER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Celastraceae	*Cassine peragua*	2
3	Oleaceae	*Chionanthus foveolatus*	2
4	Euphorbiaceae	*Clutia pulchella*	1
5	Cunoniaceae	*Cunonia capensis*	2
6	Ebenaceae	*Diospyros whyteana*	1
7	Scrophulariaceae	*Halleria lucida*	3
8	Achariaceae	*Kiggelaria africana*	1
9	Celastraceae	*Maurocenia frangula*	1
10	Celastraceae	*Maytenus oleoides*	0.5
11	Oleaceae	*Olea europea* ssp. *africana*	0.5
12	Rhamnaceae	*Phylica buxifolia*	0.5
13	Podocarpaceae	*Podocarpus latifolius*	0.5
14	Myrsinaceae	*Rapanea melanophloeos*	2
15	Anacardiaceae	*Searsia laevigata*	0.5
16	Anacardiaceae	*Searsia tomentosa*	0.5

SITE 73 VREDEHOEK UPPER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	4
2	Achariaceae	*Kiggelaria africana*	4
3	Celastraceae	*Maytenus oleoides*	1
4	Oleaceae	*Olea europea* ssp. *africana*	3
5	Santalaceae	*Colpoon compressum*	2
6	Anacardiaceae	*Searsia lucida*	3
7	Anacardiaceae	*Searsia tomentosa*	1

SITE 74 SILVERSTROOM

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.1
2	Celastraceae	*Cassine peragua*	0.5
3	Euphorbiaceae	*Clutia pulchella*	2
4	Cunoniaceae	*Cunonia capensis*	0.5
5	Araliaceae	*Cussonia thyrsiflora*	0.1
6	Ebenaceae	*Diospyros whyteana*	3
7	Achariaceae	*Kiggelaria africana*	3
8	Celastraceae	*Maurocenia frangula*	0.5
9	Celastraceae	*Maytenus acuminata*	1
10	Celastraceae	*Maytenus oleoides*	1
11	Oleaceae	*Olea europea* ssp. *africana*	2
12	Oliniaceae	*Olinia ventosa*	1
13	Santalaceae	*Colpoon compressum*	1
14	Rhamnaceae	*Phylica buxifolia*	2
15	Polygalaceae	*Polygala myrtifolia*	0.5
16	Anacardiaceae	*Searsia lucida*	2
17	Anacardiaceae	*Searsia tomentosa*	0.1
18	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	2

SITE 75 DEVIL’S PEAK – KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Celastraceae	*Cassine schinoides*	1
3	Euphorbiaceae	*Clutia pulchella*	4
4	Cunoniaceae	*Cunonia capensis*	1
5	Ebenaceae	*Diospyros whyteana*	3
6	Scrophulariaceae	*Halleria lucida*	1
7	Achariaceae	*Kiggelaria africana*	1
8	Celastraceae	*Maurocenia frangula*	0.1
9	Celastraceae	*Maytenus acuminata*	0.1
10	Celastraceae	*Maytenus oleoides*	3
11	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
12	Oleaceae	*Olea europea* ssp. *africana*	1
13	Rhamnaceae	*Phylica buxifolia*	4
14	Myrsinaceae	*Rapanea melanophloeos*	1
15	Anacardiaceae	*Searsia laevigata*	0.1
16	Anacardiaceae	*Searsia lucida*	0.5
17	Anacardiaceae	*Searsia tomentosa*	0.1

SITE 76 DE WAAL DRIVE – DEVIL'S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Gymnosporia buxifolia*	0.5
2	Achariaceae	*Kiggelaria africana*	3
3	Oleaceae	*Olea europea* ssp. *africana*	3
4	Polygalaceae	*Polygala myrtifolia*	0.5
5	Anacardiaceae	*Searsia glauca*	0.5
6	Anacardiaceae	*Searsia laevigata*	0.1
7	Rhamnaceae	*Scutia myrtina*	1

SITE 77 DE WAAL DRIVE – DEVIL'S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Achariaceae	*Kiggelaria africana*	3
2	Oleaceae	*Olea europea* ssp. *africana*	3
3	Anacardiaceae	*Searsia glauca*	0.1
4	Anacardiaceae	*Searsia lucida*	0.1
5	Rhamnaceae	*Scutia myrtina*	0.5
6	Fabaceae	*Virgilia oroboides*	0.5

SITE 78 DEVIL'S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Achariaceae	*Kiggelaria africana*	2
2	Myrsinaceae	*Rapanea melanophloeos*	0.5
3	Anacardiaceae	*Searsia tomentosa*	1
4	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	4

SITE 79 DEVIL'S PEAK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Proteaceae	*Brabejum stellatifolium*	2
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	2
4	Celastraceae	*Cassine peragua*	3
5	Euphorbiaceae	*Clutia pulchella*	2
6	Cunoniaceae	*Cunonia capensis*	3
7	Cornaceae	*Curtisia dentata*	2
8	Ebenaceae	*Diospyros whyteana*	2
9	Celastraceae	*Gymnosporia buxifolia*	1
10	Scrophulariaceae	*Halleria lucida*	2
11	Aquifoliaceae	*Ilex mitis*	2
12	Achariaceae	*Kiggelaria africana*	4
13	Celastraceae	*Maytenus oleoides*	2
14	Oleaceae	*Olea europea* ssp. *africana*	1
15	Oliniaceae	*Olinia ventosa*	1
16	Myrsinaceae	*Rapanea melanophloeos*	3
17	Anacardiaceae	*Searsia tomentosa*	2
18	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	2

SITE 80 OUDEKRAAL

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Celastraceae	*Cassine peragua*	0.1
3	Ebenaceae	*Euclea racemosa*	0.5
4	Malvaceae	*Grewia occidentalis*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Celastraceae	*Maurocenia frangula*	0.5
7	Oleaceae	*Olea europea* ssp. *africana*	2
8	Santalaceae	*Colpoon compressum*	0.1
9	Anacardiaceae	*Searsia glauca*	0.5
10	Anacardiaceae	*Searsia laevigata*	0.5
11	Celastraceae	*Cassine maritima*	0.5
12	Sapotaceae	*Sideroxylon inerme*	3
13	Asteraceae	*Tarchonanthus littoralis*	3

SITE 81 LLANDUDNO

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Ebenaceae	*Euclea racemosa*	1
4	Celastraceae	*Maurocenia frangula*	1
5	Oleaceae	*Olea europea* ssp. *africana*	2
6	Oleaceae	*Olea exasperata*	0.5
7	Santalaceae	*Colpoon compressum*	0.5
8	Rhamnaceae	*Phylica buxifolia*	0.1
9	Anacardiaceae	*Searsia glauca*	1
10	Anacardiaceae	*Searsia lucida*	2
11	Anacardiaceae	*Searsia tomentosa*	0.1
12	Celastraceae	*Cassine maritima*	1
13	Asclepiadaceae	*Secamone alpini*	0.1
14	Sapotaceae	*Sideroxylon inerme*	4
15	Asteraceae	*Tarchonanthus littoralis*	2

SITE 82 SANDY BAY NORTH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Asteraceae	*Chrysanthemoides monilifera*	2
2	Celastraceae	*Maytenus oleoides*	1
3	Anacardiaceae	*Searsia laevigata*	2
4	Sapotaceae	*Sideroxylon inerme*	4
5	Asteraceae	*Tarchonanthus littoralis*	2

SITE 83 SANDY BAY SOUTH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Araliaceae	*Cussonia thyrsiflora*	1
4	Celastraceae	*Gymnosporia buxifolia*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Celastraceae	*Maytenus oleoides*	2
7	Oleaceae	*Olea europea* ssp. *africana*	1
8	Anacardiaceae	*Searsia laevigata*	1
9	Sapotaceae	*Sideroxylon inerme*	4
10	Asteraceae	*Tarchonanthus littoralis*	1

SITE 84 SANDY BAY

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	0.1
2	Araliaceae	*Cussonia thyrsiflora*	0.5
3	Ebenaceae	*Euclea racemosa*	1
4	Celastraceae	*Maurocenia frangula*	0.1
5	Oleaceae	*Olea europea* ssp. *africana*	0.1
6	Oleaceae	*Olea exasperata*	0.1
7	Santalaceae	*Colpoon compressum*	0.1
8	Anacardiaceae	*Searsia glauca*	0.5
9	Anacardiaceae	*Cassine maritima*	0.1
10	Sapotaceae	*Sideroxylon inerme*	4
11	Asteraceae	*Tarchonanthus littoralis*	0.1

SITE 85 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	2
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Celastraceae	*Maurocenia frangula*	2
7	Celastraceae	*Maytenus oleoides*	0.5
8	Oleaceae	*Olea europea* ssp. *africana*	1
9	Oleaceae	*Olea exasperata*	3
10	Santalaceae	*Colpoon compressum*	0.5
11	Rhamnaceae	*Phylica buxifolia*	0.5
12	Polygalaceae	*Polygala myrtifolia*	0.5
13	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
14	Anacardiaceae	*Searsia glauca*	0.5
15	Anacardiaceae	*Searsia lucida*	0.5
16	Celastraceae	*Cassine maritima*	1
17	Sapotaceae	*Sideroxylon inerme*	3
18	Asteraceae	*Tarchonanthus littoralis*	2

SITE 86 KARBONKELBERG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	2
3	Oleaceae	*Chionanthus foveolatus*	0.5
4	Euphorbiaceae	*Clutia pulchella*	0.1
5	Cunoniaceae	*Cunonia capensis*	0.1
6	Cornaceae	*Curtisia dentata*	2
7	Araliaceae	*Cussonia thyrsiflora*	0.1
8	Ebenaceae	*Diospyros whyteana*	1
9	Scrophulariaceae	*Halleria lucida*	1
10	Achariaceae	*Kiggelaria africana*	1
11	Celastraceae	*Maurocenia frangula*	1
12	Celastraceae	*Maytenus acuminata*	1
13	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
14	Oleaceae	*Olea europea* ssp. *africana*	0.1
15	Oliniaceae	*Olinia ventosa*	0.5
16	Podocarpaceae	*Podocarpus latifolius*	2
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	2
19	Anacardiaceae	*Searsia glauca*	0.5
20	Anacardiaceae	*Searsia lucida*	0.5
21	Celastraceae	*Robsonodendron eucleiforme*	2
22	Asclepiadaceae	*Secamone alpini*	0.1
23	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 87 KARBONKELBERG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Rubiaceae	*Afrocanthium mundianum*	0.5
3	Celastraceae	*Cassine peragua*	1
4	Euphorbiaceae	*Clutia pulchella*	0.1
5	Araliaceae	*Cussonia thyrsiflora*	0.5
6	Ebenaceae	*Diospyros whyteana*	1
7	Achariaceae	*Kiggelaria africana*	0.5
8	Celastraceae	*Maurocenia frangula*	3
9	Celastraceae	*Maytenus oleoides*	0.1
10	Oleaceae	*Olea europea* ssp. *africana*	2
11	Oliniaceae	*Olinia ventosa*	3
12	Fabaceae	*Podylaria calyptrata*	0.1
13	Podocarpaceae	*Podocarpus latifolius*	1
14	Polygalaceae	*Polygala myrtifolia*	0.1
15	Myrsinaceae	*Rapanea melanophloeos*	0.5
16	Anacardiaceae	*Searsia glauca*	0.5
17	Anacardiaceae	*Searsia laevigata*	0.1
18	Anacardiaceae	*Searsia lucida*	0.5
19	Anacardiaceae	*Searsia tomentosa*	0.1
20	Celastraceae	*Cassine maritima*	0.1
21	Asclepiadaceae	*Secamone alpini*	0.5
22	Sapotaceae	*Sideroxylon inerme*	2
23	Asteraceae	*Tarchonanthus littoralis*	0.5
24	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 88 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Oleaceae	*Chionanthus foveolatus*	1
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	2
5	Celastraceae	*Gymnosporia buxifolia*	0.5
6	Celastraceae	*Maurocenia frangula*	2
7	Oleaceae	*Olea europea* ssp. *africana*	0.5
8	Oleaceae	*Olea exasperata*	0.5
9	Santalaceae	*Colpoon compressum*	0.5
10	Rhamnaceae	*Phylica buxifolia*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.1
12	Anacardiaceae	*Searsia glauca*	1
13	Anacardiaceae	*Searsia lucida*	0.1
14	Celastraceae	*Cassine maritima*	0.5
15	Asclepiadaceae	*Secamone alpini*	0.1
16	Sapotaceae	*Sideroxylon inerme*	2
17	Asteraceae	*Tarchonanthus littoralis*	2

SITE 89 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Oleaceae	*Chionanthus foveolatus*	1
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	2
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Celastraceae	*Maurocenia frangula*	2
7	Oleaceae	*Olea europea* ssp. *africana*	1
8	Oleaceae	*Olea exasperata*	1
9	Santalaceae	*Colpoon compressum*	0.5
10	Rhamnaceae	*Phylica buxifolia*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Celastraceae	*Pterocelastrus tricuspidatus*	2
13	Anacardiaceae	*Searsia glauca*	0.5
14	Anacardiaceae	*Searsia lucida*	0.5
15	Celastraceae	*Cassine maritima*	1
16	Asclepiadaceae	*Secamone alpini*	0.5
17	Sapotaceae	*Sideroxylon inerme*	2
18	Asteraceae	*Tarchonanthus littoralis*	2
19	Cupressaceae	*Widdringtonia nodiflora*	1

SITE 90 KARBONKELBERG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	3
2	Celastraceae	*Cassine peragua*	1
3	Oleaceae	*Chionanthus foveolatus*	3
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Araliaceae	*Cussonia thyrsiflora*	1
6	Ebenaceae	*Diospyros whyteana*	2
7	Ebenaceae	*Euclea racemosa*	0.5
8	Celastraceae	*Gymnosporia buxifolia*	1
9	Achariaceae	*Kiggelaria africana*	1
10	Celastraceae	*Maurocenia frangula*	2
11	Celastraceae	*Maytenus acuminata*	2
12	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
13	Oleaceae	*Olea europea* ssp. *africana*	2
14	Oliniaceae	*Olinia ventosa*	2
15	Santalaceae	*Colpoon compressum*	0.5
16	Rhamnaceae	*Phylica buxifolia*	0.5
17	Podocarpaceae	*Podocarpus latifolius*	3
18	Polygalaceae	*Polygala myrtifolia*	0.5
19	Myrsinaceae	*Rapanea melanophloeos*	2
20	Anacardiaceae	*Searsia glauca*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Celastraceae	*Robsonodendron eucleiforme*	0.1
23	Celastraceae	*Cassine maritima*	0.1
24	Asclepiadaceae	*Secamone alpini*	0.5
25	Asteraceae	*Tarchonanthus littoralis*	2

SITE 91 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Araliaceae	*Cussonia thyrsiflora*	0.5
3	Ebenaceae	*Euclea racemosa*	2
4	Celastraceae	*Maurocenia frangula*	2
5	Oleaceae	*Olea europea* ssp. *africana*	1
6	Oleaceae	*Olea exasperata*	1
7	Santalaceae	*Colpoon compressum*	1
8	Rhamnaceae	*Phylica buxifolia*	1
9	Polygalaceae	*Polygala myrtifolia*	1
10	Celastraceae	*Pterocelastrus tricuspidatus*	1
11	Anacardiaceae	*Searsia glauca*	1
12	Anacardiaceae	*Searsia lucida*	1
13	Celastraceae	*Cassine maritima*	1
14	Sapotaceae	*Sideroxylon inerme*	3
15	Asteraceae	*Tarchonanthus littoralis*	2

SITE 92 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Oleaceae	*Olea europea* ssp. *africana*	0.5
7	Polygalaceae	*Polygala myrtifolia*	0.5
8	Celastraceae	*Pterocelastrus tricuspidatus*	0.1
9	Anacardiaceae	*Searsia glauca*	1
10	Anacardiaceae	*Searsia lucida*	0.5
11	Anacardiaceae	*Searsia tomentosa*	0.1
12	Celastraceae	*Cassine maritima*	0.5
13	Sapotaceae	*Sideroxylon inerme*	4
14	Asteraceae	*Tarchonanthus littoralis*	2

SITE 93 KARBONKELBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Anacardiaceae	*Searsia glauca*	0.5
7	Anacardiaceae	*Searsia lucida*	0.1
8	Anacardiaceae	*Searsia tomentosa*	0.5
9	Celastraceae	*Cassine maritima*	0.5
10	Sapotaceae	*Sideroxylon inerme*	4
11	Asteraceae	*Tarchonanthus littoralis*	1

SITE 94 THE SENTINEL

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Araliaceae	*Cussonia thyrsiflora*	1
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Celastraceae	*Maurocenia frangula*	3
7	Celastraceae	*Maytenus oleoides*	2
8	Santalaceae	*Colpoon compressum*	2
9	Celastraceae	*Putterlickia pyracantha*	1
10	Anacardiaceae	*Searsia glauca*	1
11	Anacardiaceae	*Searsia lucida*	1
12	Sapotaceae	*Sideroxylon inerme*	3
13	Asteraceae	*Tarchonanthus littoralis*	2

SITE 95 HOUT BAY HARBOUR

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Sapotaceae	*Sideroxylon inerme*	5

SITE 96 HOUT BAY

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	1
2	Achariaceae	*Kiggelaria africana*	1
3	Celastraceae	*Maurocenia frangula*	2
4	Celastraceae	*Maytenus oleoides*	1
5	Oleaceae	*Olea europea* ssp. *africana*	1
6	Anacardiaceae	*Searsia laevigata*	1
7	Sapotaceae	*Sideroxylon inerme*	4

SITE 97 LOOSESTONE GULLY – HOUT BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Rubiaceae	*Canthium inerme*	0.5
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	1
5	Oleaceae	*Chionanthus foveolatus*	2
6	Euphorbiaceae	*Clutia pulchella*	0.1
7	Cunoniaceae	*Cunonia capensis*	0.1
8	Araliaceae	*Cussonia thyrsiflora*	0.1
9	Ebenaceae	*Diospyros whyteana*	1
10	Malvaceae	*Grewia occidentalis*	0.1
11	Celastraceae	*Gymnosporia buxifolia*	0.5
12	Scrophulariaceae	*Halleria lucida*	1
13	Achariaceae	*Kiggelaria africana*	1
14	Celastraceae	*Maurocenia frangula*	1
15	Celastraceae	*Maytenus acuminata*	0.5
16	Celastraceae	*Maytenus oleoides*	0.5
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
18	Oleaceae	*Olea europea* ssp. *africana*	3
19	Oliniaceae	*Olinia ventosa*	1
20	Fabaceae	*Podylaria calyptrata*	0.1
21	Polygalaceae	*Polygala myrtifolia*	0.1
22	Myrsinaceae	*Rapanea melanophloeos*	1
23	Anacardiaceae	*Searsia laevigata*	0.5
24	Anacardiaceae	*Searsia lucida*	1
25	Anacardiaceae	*Searsia tomentosa*	0.5
26	Rhamnaceae	*Scutia myrtina*	0.5
27	Asclepiadaceae	*Secamone alpini*	0.5

SITE 98 BOKKEMANSKLOOF – HOUT BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.1
2	Celastraceae	*Cassine peragua*	2
3	Oleaceae	*Chionanthus foveolatus*	2
4	Araliaceae	*Cussonia thyrsiflora*	1
5	Ebenaceae	*Diospyros whyteana*	2
6	Ebenaceae	*Euclea racemosa*	0.1
7	Malvaceae	*Grewia occidentalis*	0.1
8	Celastraceae	*Gymnosporia buxifolia*	1
9	Celastraceae	*Maurocenia frangula*	2
10	Celastraceae	*Maytenus acuminata*	2
11	Celastraceae	*Maytenus oleoides*	1
12	Oleaceae	*Olea europea* ssp. *africana*	0.1
13	Rhamnaceae	*Phylica buxifolia*	0.5
14	Polygalaceae	*Polygala myrtifolia*	0.5
15	Myrsinaceae	*Rapanea melanophloeos*	2
16	Anacardiaceae	*Searsia glauca*	0.1
17	Anacardiaceae	*Searsia laevigata*	0.1
18	Anacardiaceae	*Searsia lucida*	0.5
19	Anacardiaceae	*Searsia tomentosa*	0.5
20	Asclepiadaceae	*Secamone alpini*	0.1
21	Asteraceae	*Tarchonanthus littoralis*	2

SITE 99 CONSTANTIABERG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Proteaceae	*Brabejum stellatifolium*	1
2	Celastraceae	*Cassine peragua*	0.5
3	Asteraceae	*Chrysanthemoides monilifera*	0.5
4	Euphorbiaceae	*Clutia pulchella*	2
5	Cunoniaceae	*Cunonia capensis*	0.5
6	Scrophulariaceae	*Halleria lucida*	3
7	Achariaceae	*Kiggelaria africana*	3
8	Celastraceae	*Maytenus oleoides*	1
9	Rhamnaceae	*Phylica buxifolia*	1
10	Polygalaceae	*Polygala myrtifolia*	1
11	Myrsinaceae	*Rapanea melanophloeos*	1
12	Anacardiaceae	*Searsia laevigata*	1
13	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

SITE 100 BAVIAANSKLOOF – HOUT BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Celastraceae	*Cassine peragua*	1
4	Cannabaceae	*Celtis africana*	0.1
5	Oleaceae	*Chionanthus foveolatus*	2
6	Cunoniaceae	*Cunonia capensis*	2
7	Cornaceae	*Curtisia dentata*	1
8	Araliaceae	*Cussonia thyrsiflora*	0.5
9	Ebenaceae	*Diospyros whyteana*	2
10	Malvaceae	*Grewia occidentalis*	0.1
11	Celastraceae	*Gymnosporia buxifolia*	0.5
12	Scrophulariaceae	*Halleria lucida*	1
13	Achariaceae	*Kiggelaria africana*	0.5
14	Celastraceae	*Maurocenia frangula*	1
15	Celastraceae	*Maytenus acuminata*	2
16	Celastraceae	*Maytenus oleoides*	0.5
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
18	Oleaceae	*Olea europea* ssp. *africana*	1
19	Oliniaceae	*Olinia ventosa*	2
20	Santalaceae	*Colpoon compressum*	0.5
21	Rhamnaceae	*Phylica buxifolia*	0.5
22	Fabaceae	*Podylaria calyptrata*	0.5
23	Polygalaceae	*Polygala myrtifolia*	0.5
24	Myrsinaceae	*Rapanea melanophloeos*	2
25	Anacardiaceae	*Searsia laevigata*	0.1
26	Anacardiaceae	*Searsia lucida*	0.5
27	Anacardiaceae	*Searsia tomentosa*	0.5
28	Asclepiadaceae	*Secamone alpini*	1
29	Asteraceae	*Tarchonanthus littoralis*	0.5

<u>SITE 101 HOUT BAY</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	0.5
2	Celastraceae	*Gymnosporia buxifolia*	0.5
3	Celastraceae	*Maurocenia frangula*	0.5
4	Anacardiaceae	*Searsia glauca*	1
5	Anacardiaceae	*Searsia laevigata*	0.5
6	Anacardiaceae	*Searsia lucida*	1
7	Anacardiaceae	*Cassine maritima*	0.1
8	Sapotaceae	*Sideroxylon inerme*	5

<u>SITE 102 HOUT BAY</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Celastraceae	*Cassine peragua*	1
3	Oleaceae	*Chionanthus foveolatus*	0.1
4	Ebenaceae	*Euclea racemosa*	0.1
5	Malvaceae	*Grewia occidentalis*	3
6	Celastraceae	*Gymnosporia buxifolia*	2
7	Achariaceae	*Kiggelaria africana*	0.1
8	Celastraceae	*Maurocenia frangula*	0.5
9	Oleaceae	*Olea europea* ssp. *africana*	3
10	Santalaceae	*Colpoon compressum*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Myrsinaceae	*Rapanea melanophloeos*	0.1
13	Anacardiaceae	*Searsia glauca*	1
14	Anacardiaceae	*Searsia lucida*	1
15	Anacardiaceae	*Searsia tomentosa*	0.1
16	Celastraceae	*Cassine maritima*	0.1
17	Sapotaceae	*Sideroxylon inerme*	3
18	Asteraceae	*Tarchonanthus littoralis*	2

SITE 103 KOGELBAAI

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Celastraceae	*Cassine peragua*	0.5
2	Asteraceae	*Chrysanthemoides monilifera*	0.5
3	Oleaceae	*Chionanthus foveolatus*	1
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Araliaceae	*Cussonia thyrsiflora*	1
6	Malvaceae	*Grewia occidentalis*	1
7	Scrophulariaceae	*Halleria lucida*	1
8	Achariaceae	*Kiggelaria africana*	1
9	Celastraceae	*Maurocenia frangula*	2
10	Celastraceae	*Maytenus oleoides*	1
11	Oleaceae	*Olea europea* ssp. *africana*	2
12	Oleaceae	*Olea exasperata*	1
13	Santalaceae	*Colpoon compressum*	1
14	Rhamnaceae	*Phylica buxifolia*	0.5
15	Polygalaceae	*Polygala myrtifolia*	1
16	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
17	Celastraceae	*Putterlickia pyracantha*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	1
19	Anacardiaceae	*Searsia glauca*	1
20	Anacardiaceae	*Searsia lucida*	0.5
21	Anacardiaceae	*Searsia tomentosa*	0.5
22	Asclepiadaceae	*Scutia myrtina*	1
23	Sapotaceae	*Sideroxylon inerme*	2
24	Asteraceae	*Tarchonanthus littoralis*	3

SITE 104 CHAPMAN'S PEAK DRIVE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Celastraceae	*Cassine peragua*	2
3	Oleaceae	*Chionanthus foveolatus*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Malvaceae	*Grewia occidentalis*	0.1
6	Celastraceae	*Gymnosporia buxifolia*	2
7	Scrophulariaceae	*Halleria lucida*	1
8	Achariaceae	*Kiggelaria africana*	0.1
9	Celastraceae	*Maytenus acuminata*	0.5
10	Oleaceae	*Olea europea* ssp. *africana*	3
11	Oliniaceae	*Olinia ventosa*	1
12	Rhamnaceae	*Phylica buxifolia*	0.5
13	Fabaceae	*Podylaria calyptrata*	1
14	Polygalaceae	*Polygala myrtifolia*	0.5
15	Myrsinaceae	*Rapanea melanophloeos*	1
16	Anacardiaceae	*Searsia glauca*	0.5
17	Anacardiaceae	*Searsia laevigata*	0.1
18	Anacardiaceae	*Searsia lucida*	0.5
19	Anacardiaceae	*Searsia tomentosa*	0.5
20	Asteraceae	*Tarchonanthus littoralis*	3
21	Cupressaceae	*Widdringtonia nodiflora*	0.1

SITE 105 BLACKBURN KLOOF – CHAPMAN'S PEAK DRIVE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	3
3	Celastraceae	*Cassine peragua*	3
4	Oleaceae	*Chionanthus foveolatus*	3
5	Euphorbiaceae	*Clutia pulchella*	0.5
6	Cunoniaceae	*Cunonia capensis*	1
7	Cornaceae	*Curtisia dentata*	0.5
8	Malvaceae	*Grewia occidentalis*	1
9	Celastraceae	*Gymnosporia buxifolia*	1
10	Scrophulariaceae	*Halleria lucida*	1
11	Achariaceae	*Kiggelaria africana*	1
12	Celastraceae	*Maurocenia frangula*	1
13	Celastraceae	*Maytenus oleoides*	3
14	Oleaceae	*Olea europea* ssp. *africana*	2
15	Oliniaceae	*Olinia ventosa*	2
16	Rhamnaceae	*Phylica buxifolia*	0.5
17	Polygalaceae	*Polygala myrtifolia*	0.5
18	Myrsinaceae	*Rapanea melanophloeos*	2
19	Anacardiaceae	*Searsia glauca*	0.5
20	Anacardiaceae	*Searsia laevigata*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Anacardiaceae	*Searsia tomentosa*	0.5
23	Asclepiadaceae	*Secamone alpini*	0.5
24	Asteraceae	*Tarchonanthus littoralis*	1

SITE 106 BLACKBURN KLOOF – CHAPMAN'S PEAK DRIVE LOWER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Oleaceae	*Chionanthus foveolatus*	1
4	Malvaceae	*Grewia occidentalis*	1
5	Celastraceae	*Gymnosporia buxifolia*	2
6	Achariaceae	*Kiggelaria africana*	1
7	Celastraceae	*Maytenus acuminata*	1
8	Oleaceae	*Olea europea* ssp. *africana*	3
9	Oleaceae	*Olea exasperata*	1
10	Polygalaceae	*Polygala myrtifolia*	0.5
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Anacardiaceae	*Searsia lucida*	1
13	Anacardiaceae	*Searsia tomentosa*	1
14	Asteraceae	*Tarchonanthus littoralis*	2

SITE 107 CHAPMAN'S PEAK DRIVE – KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	0.1
3	Celastraceae	*Cassine peragua*	3
4	Oleaceae	*Chionanthus foveolatus*	0.5
5	Euphorbiaceae	*Clutia pulchella*	0.1
6	Cunoniaceae	*Cunonia capensis*	0.5
7	Araliaceae	*Cussonia thyrsiflora*	0.1
8	Ebenaceae	*Diospyros whyteana*	0.1
9	Malvaceae	*Grewia occidentalis*	0.5
10	Celastraceae	*Gymnosporia buxifolia*	2
11	Achariaceae	*Kiggelaria africana*	0.1
12	Celastraceae	*Maytenus acuminata*	2
13	Celastraceae	*Maytenus oleoides*	1
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
15	Oleaceae	*Olea europea* ssp. *africana*	3
16	Oliniaceae	*Olinia ventosa*	2
17	Santalaceae	*Colpoon compressum*	0.5
18	Rhamnaceae	*Phylica buxifolia*	0.5
19	Fabaceae	*Podylaria calyptrata*	0.5
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	1
22	Anacardiaceae	*Searsia glauca*	0.5
23	Anacardiaceae	*Searsia lucida*	1
24	Anacardiaceae	*Searsia tomentosa*	0.5
25	Asclepiadaceae	*Secamone alpini*	0.1
26	Asteraceae	*Tarchonanthus littoralis*	1
27	Cupressaceae	*Widdringtonia nodiflora*	0.1

SITE 108 CHAPMAN'S PEAK DRIVE – KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Cunoniaceae	*Cunonia capensis*	0.1
3	Cornaceae	*Curtisia dentata*	0.1
4	Malvaceae	*Grewia occidentalis*	0.5
5	Celastraceae	*Gymnosporia buxifolia*	0.5
6	Scrophulariaceae	*Halleria lucida*	0.1
7	Achariaceae	*Kiggelaria africana*	1
8	Celastraceae	*Maytenus oleoides*	0.5
9	Oleaceae	*Olea europea* ssp. *africana*	2
10	Santalaceae	*Colpoon compressum*	0.5
11	Myrsinaceae	*Rapanea melanophloeos*	0.5
12	Anacardiaceae	*Searsia glauca*	0.5
13	Anacardiaceae	*Searsia lucida*	1
14	Anacardiaceae	*Searsia tomentosa*	0.5
15	Sapotaceae	*Sideroxylon inerme*	2
16	Asteraceae	*Tarchonanthus littoralis*	1
17	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.1

SITE 109 CHAPMAN'S PEAK DRIVE – KLOOF

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	0.1
2	Celastraceae	*Cassine peragua*	2
3	Oleaceae	*Chionanthus foveolatus*	1
4	Euphorbiaceae	*Clutia pulchella*	0.5
5	Cunoniaceae	*Cunonia capensis*	3
6	Araliaceae	*Cussonia thyrsiflora*	0.1
7	Ebenaceae	*Diospyros whyteana*	0.5
8	Malvaceae	*Grewia occidentalis*	0.1
9	Celastraceae	*Gymnosporia buxifolia*	1
10	Scrophulariaceae	*Halleria lucida*	1
11	Achariaceae	*Kiggelaria africana*	1
12	Celastraceae	*Maurocenia frangula*	2
13	Celastraceae	*Maytenus acuminata*	1
14	Celastraceae	*Maytenus oleoides*	0.5
15	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.1
16	Oleaceae	*Olea europea* ssp. *africana*	3
17	Oliniaceae	*Olinia ventosa*	2
18	Rhamnaceae	*Phylica buxifolia*	0.1
19	Fabaceae	*Podylaria calyptrata*	0.1
20	Polygalaceae	*Polygala myrtifolia*	0.5
21	Myrsinaceae	*Rapanea melanophloeos*	2
22	Anacardiaceae	*Searsia glauca*	0.5
23	Anacardiaceae	*Searsia lucida*	1
24	Anacardiaceae	*Searsia tomentosa*	0.1
25	Asclepiadaceae	*Secamone alpini*	0.5
26	Asteraceae	*Tarchonanthus littoralis*	0.5

<u>SITE 110 CHAPMAN'S PEAK DRIVE – KLOOF</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	0.5
2	Celastraceae	*Cassine peragua*	1
3	Oleaceae	*Chionanthus foveolatus*	1
4	Malvaceae	*Grewia occidentalis*	0.1
5	Celastraceae	*Gymnosporia buxifolia*	2
6	Scrophulariaceae	*Halleria lucida*	1
7	Achariaceae	*Kiggelaria africana*	0.5
8	Oleaceae	*Olea europea* ssp. *africana*	2
9	Fabaceae	*Podylaria calyptrata*	0.5
10	Polygalaceae	*Polygala myrtifolia*	0.5
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Anacardiaceae	*Searsia glauca*	0.5
13	Anacardiaceae	*Searsia lucida*	1
14	Anacardiaceae	*Searsia tomentosa*	0.5
15	Asteraceae	*Tarchonanthus littoralis*	0.5

<u>SITE 111 CHAPMAN'S PEAK DRIVE – KLOOF</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Araliaceae	*Cussonia thyrsiflora*	0.5
2	Ebenaceae	*Euclea racemosa*	0.1
3	Malvaceae	*Grewia occidentalis*	1
4	Celastraceae	*Maurocenia frangula*	2
5	Oleaceae	*Olea europea* ssp. *africana*	1
6	Anacardiaceae	*Searsia glauca*	0.5
7	Anacardiaceae	*Searsia lucida*	1
8	Sapotaceae	*Sideroxylon inerme*	4
9	Asteraceae	*Tarchonanthus littoralis*	2

<u>SITE 112 NOORDHOEK ESTATE</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	0.5
3	Rubiaceae	*Afrocanthium mundianum*	0.5
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	2
6	Cannabaceae	*Celtis africana*	0.1
7	Oleaceae	*Chionanthus foveolatus*	0.5
8	Euphorbiaceae	*Clutia pulchella*	0.5
9	Cunoniaceae	*Cunonia capensis*	1
10	Cornaceae	*Curtisia dentata*	2
11	Araliaceae	*Cussonia thyrsiflora*	0.1
12	Ebenaceae	*Diospyros whyteana*	1
13	Malvaceae	*Grewia occidentalis*	0.5
14	Celastraceae	*Gymnosporia buxifolia*	0.1
15	Scrophulariaceae	*Halleria lucida*	2
16	Aquifoliaceae	*Ilex mitis*	0.1
17	Icacinaceae	*Kiggelaria africana*	2
18	Celastraceae	*Maurocenia frangula*	0.1
19	Celastraceae	*Maytenus acuminata*	1
20	Celastraceae	*Maytenus oleoides*	0.5
21	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
22	Oleaceae	*Olea europea* ssp. *africana*	1
23	Oliniaceae	*Olinia ventosa*	3
24	Fabaceae	*Podylaria calyptrata*	0.5
25	Podocarpaceae	*Podocarpus latifolius*	2
26	Polygalaceae	*Polygala myrtifolia*	0.1
27	Myrsinaceae	*Rapanea melanophloeos*	2
28	Anacardiaceae	*Searsia tomentosa*	0.1
29	Rhamnaceae	*Scutia myrtina*	0.1
30	Asclepiadaceae	*Secamone alpini*	0.1

<u>SITE 113 NOORDHOEK ESTATE</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	0.1
6	Oleaceae	*Chionanthus foveolatus*	2
7	Cunoniaceae	*Cunonia capensis*	0.5
8	Cornaceae	*Curtisia dentata*	0.1
9	Araliaceae	*Cussonia thyrsiflora*	0.1
10	Ebenaceae	*Diospyros whyteana*	1
11	Malvaceae	*Grewia occidentalis*	1
12	Celastraceae	*Gymnosporia buxifolia*	1
13	Scrophulariaceae	*Halleria lucida*	2
14	Aquifoliaceae	*Ilex mitis*	0.1
15	Achariaceae	*Kiggelaria africana*	2
16	Celastraceae	*Maurocenia frangula*	0.5
17	Celastraceae	*Maytenus acuminata*	2
18	Celastraceae	*Maytenus oleoides*	0.5
19	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
20	Oleaceae	*Olea europea* ssp. *africana*	2
21	Oliniaceae	*Olinia ventosa*	3
22	Fabaceae	*Podylaria calyptrata*	0.5
23	Podocarpaceae	*Podocarpus latifolius*	0.5
24	Polygalaceae	*Polygala myrtifolia*	0.5
25	Myrsinaceae	*Rapanea melanophloeos*	2
26	Anacardiaceae	*Searsia tomentosa*	0.5
27	Asclepiadaceae	*Secamone alpini*	2

SITE 114 NOORDHOEK ESTATE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.5
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	2
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	1
6	Cannabaceae	*Celtis africana*	0.1
7	Oleaceae	*Chionanthus foveolatus*	1
8	Euphorbiaceae	*Clutia pulchella*	0.1
9	Cunoniaceae	*Cunonia capensis*	2
10	Cornaceae	*Curtisia dentata*	1
11	Araliaceae	*Cussonia thyrsiflora*	0.1
12	Ebenaceae	*Diospyros whyteana*	1
13	Malvaceae	*Grewia occidentalis*	1
14	Celastraceae	*Gymnosporia buxifolia*	0.5
15	Scrophulariaceae	*Halleria lucida*	1
16	Aquifoliaceae	*Ilex mitis*	2
17	Achariaceae	*Kiggelaria africana*	2
18	Celastraceae	*Maurocenia frangula*	0.5
19	Celastraceae	*Maytenus acuminata*	2
20	Celastraceae	*Maytenus oleoides*	0.5
21	Oleaceae	*Olea capensis* ssp. *macrocarpa*	3
22	Oleaceae	*Olea europea* ssp. *africana*	1
23	Oliniaceae	*Olinia ventosa*	2
24	Fabaceae	*Podylaria calyptrata*	0.5
25	Podocarpaceae	*Podocarpus latifolius*	2
26	Polygalaceae	*Polygala myrtifolia*	0.5
27	Myrsinaceae	*Rapanea melanophloeos*	2
28	Anacardiaceae	*Searsia tomentosa*	0.1
29	Salicaceae	*Scolopia mundii*	0.1
30	Asclepiadaceae	*Secamone alpini*	2

SITE 115 NOORDHOEK ESTATE

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	2
4	Celastraceae	*Cassine peragua*	3
5	Celastraceae	*Cassine schinoides*	0.5
6	Oleaceae	*Chionanthus foveolatus*	1
7	Euphorbiaceae	*Clutia pulchella*	0.1
8	Cunoniaceae	*Cunonia capensis*	0.5
9	Cornaceae	*Curtisia dentata*	1
10	Araliaceae	*Cussonia thyrsiflora*	0.1
11	Ebenaceae	*Diospyros whyteana*	2
12	Malvaceae	*Grewia occidentalis*	0.1
13	Celastraceae	*Gymnosporia buxifolia*	0.5
14	Scrophulariaceae	*Halleria lucida*	1
15	Aquifoliaceae	*Ilex mitis*	0.1
16	Achariaceae	*Kiggelaria africana*	3
17	Celastraceae	*Maurocenia frangula*	2
18	Celastraceae	*Maytenus acuminata*	2
19	Celastraceae	*Maytenus oleoides*	0.5
20	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
21	Oleaceae	*Olea europea* ssp. *africana*	2
22	Oliniaceae	*Olinia ventosa*	3
23	Fabaceae	*Podylaria calyptrata*	0.5
24	Podocarpaceae	*Podocarpus latifolius*	3
25	Polygalaceae	*Polygala myrtifolia*	0.5
26	Myrsinaceae	*Rapanea melanophloeos*	2
27	Anacardiaceae	*Searsia tomentosa*	0.1
28	Rhamnaceae	*Scutia myrtina*	0.1
29	Asclepiadaceae	*Secamone alpini*	1

SITE 116 NOORDHOEK

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Oleaceae	*Chionanthus foveolatus*	1
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	1
5	Malvaceae	*Grewia occidentalis*	0.5
6	Celastraceae	*Gymnosporia buxifolia*	0.5
7	Celastraceae	*Maurocenia frangula*	2
8	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
9	Oleaceae	*Olea europea* ssp. *africana*	2
10	Oleaceae	*Olea exasperata*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.1
12	Anacardiaceae	*Searsia glauca*	2
13	Anacardiaceae	*Searsia lucida*	1
14	Anacardiaceae	*Searsia tomentosa*	0.1
15	Celastraceae	*Cassine maritima*	0.1
16	Sapotaceae	*Sideroxylon inerme*	4
17	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 117 KLEIN SLANGKOP

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Oleaceae	*Chionanthus foveolatus*	2
4	Celastraceae	*Gymnosporia buxifolia*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Celastraceae	*Maytenus oleoides*	2
7	Oleaceae	*Olea exasperata*	1
8	Santalaceae	*Colpoon compressum*	2
9	Anacardiaceae	*Searsia glauca*	1
10	Sapotaceae	*Sideroxylon inerme*	2

SITE 118 KLEIN SLANGKOP

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Maurocenia frangula*	2
2	Celastraceae	*Maytenus oleoides*	2
3	Oleaceae	*Olea exasperata*	1
4	Anacardiaceae	*Searsia glauca*	1
5	Anacardiaceae	*Searsia tomentosa*	1
6	Sapotaceae	*Sideroxylon inerme*	4

SITE 119 KOMMETJIE

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	0.5
2	Ebenaceae	*Euclea racemosa*	1
3	Celastraceae	*Gymnosporia buxifolia*	0.1
4	Celastraceae	*Maurocenia frangula*	1
5	Oleaceae	*Olea europea* ssp. *africana*	0.5
6	Oleaceae	*Olea exasperata*	0.1
7	Celastraceae	*Pterocelastrus tricuspidatus*	0.1
8	Anacardiaceae	*Searsia glauca*	2
9	Celastraceae	*Cassine maritima*	0.1
10	Sapotaceae	*Sideroxylon inerme*	4

SITE 120 WITSANDS

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	2
2	Celastraceae	*Maytenus oleoides*	2
3	Sapotaceae	*Sideroxylon inerme*	4

<u>SITE 121 WITSANDS</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Maytenus oleoides*	2
3	Anacardiaceae	*Searsia glauca*	1
4	Anacardiaceae	*Searsia tomentosa*	2
5	Sapotaceae	*Sideroxylon inerme*	4
6	Asteraceae	*Tarchonanthus littoralis*	1

<u>SITE 122 SOETWATER</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Maytenus oleoides*	1
3	Anacardiaceae	*Searsia glauca*	2
4	Anacardiaceae	*Searsia tomentosa*	1
5	Sapotaceae	*Sideroxylon inerme*	4
6	Asteraceae	*Tarchonanthus littoralis*	2

SITE 123 SOETWATER

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Oleaceae	*Chionanthus foveolatus*	1
4	Celastraceae	*Maytenus oleoides*	1
5	Anacardiaceae	*Searsia glauca*	1
6	Sapotaceae	*Sideroxylon inerme*	4

SITE 124 HOEK SE KRANS – SCARBOROUGH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
7	Anacardiaceae	*Searsia glauca*	1
8	Celastraceae	*Cassine maritima*	0.5
9	Sapotaceae	*Sideroxylon inerme*	3
10	Asteraceae	*Tarchonanthus littoralis*	1

SITE 125 SCARBOROUGH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.1
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Oleaceae	*Chionanthus foveolatus*	0.1
4	Araliaceae	*Cussonia thyrsiflora*	0.1
5	Ebenaceae	*Euclea racemosa*	1
6	Oleaceae	*Olea exasperata*	0.5
7	Santalaceae	*Colpoon compressum*	0.5
8	Anacardiaceae	*Searsia glauca*	1
9	Sapotaceae	*Sideroxylon inerme*	4

SITE 126 SCARBOROUGH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Asteraceae	*Chrysanthemoides monilifera*	2
2	Araliaceae	*Cussonia thyrsiflora*	0.5
3	Celastraceae	*Maytenus oleoides*	2
4	Anacardiaceae	*Searsia glauca*	1
5	Sapotaceae	*Sideroxylon inerme*	4

SITE 127 DASSIEFONTEIN

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Celastraceae	*Cassine peragua*	2
2	Oleaceae	*Chionanthus foveolatus*	2
3	Araliaceae	*Cussonia thyrsiflora*	1
4	Celastraceae	*Maurocenia frangula*	2
5	Celastraceae	*Maytenus oleoides*	2
6	Anacardiaceae	*Searsia lucida*	1
7	Anacardiaceae	*Searsia tomentosa*	1
8	Sapotaceae	*Sideroxylon inerme*	3
9	Asteraceae	*Tarchonanthus littoralis*	2

SITE 128 OLIFANTSBOS

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Oleaceae	*Chionanthus foveolatus*	0.1
2	Ebenaceae	*Euclea racemosa*	2
3	Celastraceae	*Maurocenia frangula*	0.5
4	Santalaceae	*Colpoon compressum*	0.1
5	Anacardiaceae	*Searsia lucida*	0.5
6	Celastraceae	*Cassine maritima*	0.1
7	Sapotaceae	*Sideroxylon inerme*	4
8	Asteraceae	*Tarchonanthus littoralis*	0.1

<u>SITE 129 OLIFANTSBOS COTTAGE</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	0.1
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	0.5
5	Celastraceae	*Maurocenia frangula*	3
6	Oleaceae	*Olea exasperata*	2
7	Santalaceae	*Colpoon compressum*	0.5
8	Rhamnaceae	*Phylica buxifolia*	0.5
9	Polygalaceae	*Polygala myrtifolia*	0.5
10	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
11	Anacardiaceae	*Searsia lucida*	1
12	Celastraceae	*Cassine maritima*	1
13	Sapotaceae	*Sideroxylon inerme*	1
14	Asteraceae	*Tarchonanthus littoralis*	3

SITE 130 GIFKOMMETJIE

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Asteraceae	*Chrysanthemoides monilifera*	1
3	Oleaceae	*Chionanthus foveolatus*	1
4	Araliaceae	*Cussonia thyrsiflora*	0.5
5	Ebenaceae	*Euclea racemosa*	1
6	Celastraceae	*Maurocenia frangula*	2
7	Oleaceae	*Olea exasperata*	0.5
8	Santalaceae	*Colpoon compressum*	0.1
9	Rhamnaceae	*Phylica buxifolia*	0.1
10	Celastraceae	*Pterocelastrus tricuspidatus*	1
11	Anacardiaceae	*Searsia laevigata*	1
12	Anacardiaceae	*Searsia lucida*	1
13	Celastraceae	*Cassine maritima*	0.5
14	Sapotaceae	*Sideroxylon inerme*	4
15	Asteraceae	*Tarchonanthus littoralis*	2

SITE 131 GROOTBLOUBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Araliaceae	*Cussonia thyrsiflora*	2
2	Celastraceae	*Maytenus oleoides*	1
3	Polygalaceae	*Polygala myrtifolia*	1
4	Sapotaceae	*Sideroxylon inerme*	4

SITE 132 GROOTBLOUBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Oleaceae	*Chionanthus foveolatus*	3
3	Araliaceae	*Cussonia thyrsiflora*	2
4	Celastraceae	*Maurocenia frangula*	2
5	Celastraceae	*Maytenus oleoides*	2
6	Oleaceae	*Olea europea* ssp. *africana*	2
7	Polygalaceae	*Polygala myrtifolia*	1
8	Vitaceae	*Rhoicissus tomentosa*	1
9	Anacardiaceae	*Searsia laevigata*	2
10	Sapotaceae	*Sideroxylon inerme*	3
11	Asteraceae	*Tarchonanthus littoralis*	3

SITE 133 PLATBOOM

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Asteraceae	*Chrysanthemoides monilifera*	1
2	Ebenaceae	*Euclea racemosa*	2
3	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
4	Anacardiaceae	*Searsia laevigata*	1
5	Sapotaceae	*Sideroxylon inerme*	5

SITE 134 BUFFELSBAAI

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	0.1
2	Araliaceae	*Cussonia thyrsiflora*	0.1
3	Ebenaceae	*Euclea racemosa*	0.5
4	Santalaceae	*Colpoon compressum*	0.1
5	Celastraceae	*Pterocelastrus tricuspidatus*	0.5
6	Celastraceae	*Cassine maritima*	0.5
7	Sapotaceae	*Sideroxylon inerme*	4

SITE 135 BORDJIESDRIF

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Araliaceae	*Cussonia thyrsiflora*	0.1
2	Ebenaceae	*Euclea racemosa*	1
3	Celastraceae	*Pterocelastrus tricuspidatus*	0.1
4	Celastraceae	*Cassine maritima*	0.5
5	Sapotaceae	*Sideroxylon inerme*	4

<u>SITE 136 BOOI SE SKERM</u>

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Asteraceae	*Chrysanthemoides monilifera*	1
2	Ebenaceae	*Euclea racemosa*	1
3	Oleaceae	*Olea exasperata*	1
4	Polygalaceae	*Polygala myrtifolia*	1
5	Celastraceae	*Pterocelastrus tricuspidatus*	1
6	Anacardiaceae	*Searsia laevigata*	3
7	Sapotaceae	*Sideroxylon inerme*	5

<u>SITE 137 BOOI SE SKERM</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	1
3	Araliaceae	*Cussonia thyrsiflora*	1
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Celastraceae	*Maytenus acuminata*	0.1
7	Santalaceae	*Colpoon compressum*	0.5
8	Rhamnaceae	*Phylica buxifolia*	2
9	Polygalaceae	*Polygala myrtifolia*	0.5
10	Celastraceae	*Pterocelastrus tricuspidatus*	0.1
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Sapotaceae	*Sideroxylon inerme*	1
13	Asteraceae	*Tarchonanthus littoralis*	1

SITE 138 SMITSWINKELSBAAI

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Cunoniaceae	*Cunonia capensis*	1
3	Araliaceae	*Cussonia thyrsiflora*	0.5
4	Ebenaceae	*Euclea racemosa*	1
5	Celastraceae	*Gymnosporia buxifolia*	2
6	Achariaceae	*Kiggelaria africana*	0.5
7	Celastraceae	*Maurocenia frangula*	3
8	Santalaceae	*Colpoon compressum*	0.5
9	Rhamnaceae	*Phylica buxifolia*	0.5
10	Polygalaceae	*Polygala myrtifolia*	0.5
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Anacardiaceae	*Searsia laevigata*	2
13	Celastraceae	*Cassine maritima*	0.5
14	Asteraceae	*Tarchonanthus littoralis*	3

SITE 139 STEENBRASROTS – SMITSWINKELSBAAI

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	2
3	Cunoniaceae	*Cunonia capensis*	2
4	Araliaceae	*Cussonia thyrsiflora*	1
5	Ebenaceae	*Euclea racemosa*	0.1
6	Celastraceae	*Gymnosporia buxifolia*	1
7	Scrophulariaceae	*Halleria lucida*	0.5
8	Achariaceae	*Kiggelaria africana*	2
9	Celastraceae	*Maurocenia frangula*	0.5
10	Polygalaceae	*Polygala myrtifolia*	0.5
11	Myrsinaceae	*Rapanea melanophloeos*	3
12	Anacardiaceae	*Searsia laevigata*	2
13	Anacardiaceae	*Searsia tomentosa*	0.5
14	Celastraceae	*Cassine maritima*	0.5
15	Asclepiadaceae	*Secamone alpini*	0.5
16	Asteraceae	*Tarchonanthus littoralis*	2

SITE 140 SWARTKOP – ROCKLANDS

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Asteraceae	*Chrysanthemoides monilifera*	2
3	Scrophulariaceae	*Halleria lucida*	3
4	Achariaceae	*Kiggelaria africana*	2
5	Celastraceae	*Maytenus oleoides*	3
6	Santalaceae	*Colpoon compressum*	1
7	Polygalaceae	*Polygala myrtifolia*	1
8	Anacardiaceae	*Searsia laevigata*	1
9	Anacardiaceae	*Searsia tomentosa*	2
10	Asteraceae	*Tarchonanthus littoralis*	2

SITE 141 BOULDERS BEACH

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Asteraceae	*Chrysanthemoides monilifera*	2
3	Ebenaceae	*Euclea racemosa*	3
4	Celastraceae	*Gymnosporia buxifolia*	2
5	Celastraceae	*Maurocenia frangula*	1
6	Oleaceae	*Olea europea* ssp. *africana*	2
7	Anacardiaceae	*Searsia laevigata*	1
8	Celastraceae	*Cassine maritima*	0.5
9	Asteraceae	*Tarchonanthus littoralis*	3

<u>SITE 142 BAVIAANSKLOOF – SIMONSTOWN</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	2
2	Cunoniaceae	*Cunonia capensis*	0.1
3	Ebenaceae	*Euclea racemosa*	0.1
4	Celastraceae	*Gymnosporia buxifolia*	0.5
5	Achariaceae	*Kiggelaria africana*	3
6	Celastraceae	*Maurocenia frangula*	2
7	Celastraceae	*Maytenus acuminata*	0.1
8	Celastraceae	*Maytenus oleoides*	0.1
9	Oleaceae	*Olea europea* ssp. *africana*	1
10	Santalaceae	*Colpoon compressum*	0.1
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Myrsinaceae	*Rapanea melanophloeos*	0.5
13	Anacardiaceae	*Searsia tomentosa*	0.5
14	Asclepiadaceae	*Secamone alpini*	0.5

SITE 143 PARADISE KLOOF – SIMONSTOWN

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Oleaceae	*Chionanthus foveolatus*	0.5
3	Araliaceae	*Cussonia thyrsiflora*	1
4	Ebenaceae	*Euclea racemosa*	0.1
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Achariaceae	*Kiggelaria africana*	2
7	Celastraceae	*Maurocenia frangula*	1
8	Celastraceae	*Maytenus oleoides*	0.1
9	Oleaceae	*Olea europea* ssp. *africana*	2
10	Santalaceae	*Colpoon compressum*	0.5
11	Polygalaceae	*Polygala myrtifolia*	0.1
12	Anacardiaceae	*Searsia laevigata*	2
14	Anacardiaceae	*Searsia tomentosa*	0.5
15	Asteraceae	*Tarchonanthus littoralis*	3

<u>SITE 144 KALK BAY</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Proteaceae	*Brabejum stellatifolium*	3
2	Celastraceae	*Cassine peragua*	0.5
3	Oleaceae	*Chionanthus foveolatus*	1
4	Celastraceae	*Maurocenia frangula*	1
5	Celastraceae	*Maytenus acuminata*	0.1
6	Celastraceae	*Maytenus oleoides*	1
7	Oleaceae	*Olea europea* ssp. *africana*	1
8	Santalaceae	*Colpoon compressum*	0.5
9	Rhamnaceae	*Phylica buxifolia*	1
10	Fabaceae	*Podylaria calyptrata*	0.1
11	Polygalaceae	*Polygala myrtifolia*	0.5
12	Anacardiaceae	*Searsia laevigata*	2
13	Anacardiaceae	*Searsia tomentosa*	0.5
14	Asteraceae	*Tarchonanthus littoralis*	1
15	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	2

SITE 145 CAVE PEAK – KALK BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	2
2	Achariaceae	*Kiggelaria africana*	2
3	Celastraceae	*Maurocenia frangula*	2
4	Podocarpaceae	*Podocarpus latifolius*	3
5	Myrsinaceae	*Rapanea melanophloeos*	2

SITE 146 CAVE PEAK – KALK BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Oleaceae	*Chionanthus foveolatus*	2
2	Araliaceae	*Cussonia thyrsiflora*	1
3	Celastraceae	*Maurocenia frangula*	2
4	Rhamnaceae	*Phylica buxifolia*	1
5	Podocarpaceae	*Podocarpus latifolius*	3
6	Polygalaceae	*Polygala myrtifolia*	1
7	Myrsinaceae	*Rapanea melanophloeos*	2
9	Anacardiaceae	*Searsia laevigata*	1
10	Asteraceae	*Tarchonanthus littoralis*	2

SITE 147 CAVE PEAK – KALK BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Oleaceae	*Chionanthus foveolatus*	1
3	Celastraceae	*Maurocenia frangula*	2
4	Celastraceae	*Maytenus acuminata*	1
5	Podocarpaceae	*Podocarpus latifolius*	4
6	Myrsinaceae	*Rapanea melanophloeos*	2
7	Asteraceae	*Tarchonanthus littoralis*	2
8	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 148 KROON SE BOS – ECHO VALLEY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	2
2	Celastraceae	*Cassine peragua*	1
3	Celastraceae	*Cassine schinoides*	0.5
4	Oleaceae	*Chionanthus foveolatus*	3
5	Araliaceae	*Cussonia thyrsiflora*	1
6	Achariaceae	*Kiggelaria africana*	2
7	Celastraceae	*Maurocenia frangula*	3
8	Celastraceae	*Maytenus acuminata*	2
9	Oleaceae	*Olea europea* ssp. *africana*	1
10	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
11	Oliniaceae	*Olinia ventosa*	2
12	Podocarpaceae	*Podocarpus latifolius*	3
13	Polygalaceae	*Polygala myrtifolia*	0.5
14	Myrsinaceae	*Rapanea melanophloeos*	2
15	Anacardiaceae	*Searsia tomentosa*	0.5
16	Asclepiadaceae	*Secamone alpini*	0.5
17	Asteraceae	*Tarchonanthus littoralis*	0.5

SITE 149 SPES BONA FOREST – KALK BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Celastraceae	*Cassine peragua*	0.5
3	Celastraceae	*Cassine schinoides*	2
4	Oleaceae	*Chionanthus foveolatus*	2
5	Araliaceae	*Cussonia thyrsiflora*	1
6	Celastraceae	*Maurocenia frangula*	0.5
7	Celastraceae	*Maytenus acuminata*	0.5
8	Celastraceae	*Maytenus oleoides*	0.5
9	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
10	Oleaceae	*Olea europea* ssp. *africana*	2
11	Podocarpaceae	*Podocarpus latifolius*	2
12	Polygalaceae	*Polygala myrtifolia*	0.5
13	Myrsinaceae	*Rapanea melanophloeos*	1

SITE 150 SPES BONA FOREST – KALK BAY

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	3
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Celastraceae	*Cassine schinoides*	2
5	Oleaceae	*Chionanthus foveolatus*	2
6	Cunoniaceae	*Cunonia capensis*	0.1
7	Araliaceae	*Cussonia thyrsiflora*	0.5
8	Ebenaceae	*Euclea racemosa*	0.1
9	Achariaceae	*Kiggelaria africana*	0.1
10	Celastraceae	*Maurocenia frangula*	3
11	Celastraceae	*Maytenus acuminata*	1
12	Celastraceae	*Maytenus oleoides*	0.1
13	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
14	Oleaceae	*Olea europea* ssp. *africana*	1
15	Oliniaceae	*Olinia ventosa*	2
16	Santalaceae	*Colpoon compressum*	0.5
17	Rhamnaceae	*Phylica buxifolia*	0.5
18	Podocarpaceae	*Podocarpus latifolius*	3
19	Polygalaceae	*Polygala myrtifolia*	0.5
20	Myrsinaceae	*Rapanea melanophloeos*	1
21	Asclepiadaceae	*Secamone alpini*	0.5

SITE 151 MUIZENBERG

Forest type: Western Cape Milkwood Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	0.5
2	Cunoniaceae	*Cunonia capensis*	0.5
3	Malvaceae	*Grewia occidentalis*	1
4	Celastraceae	*Maurocenia frangula*	1
5	Celastraceae	*Maytenus oleoides*	0.5
6	Oleaceae	*Olea europea* ssp. *africana*	1
7	Santalaceae	*Colpoon compressum*	0.5
8	Fabaceae	*Podylaria calyptrata*	0.5
9	Polygalaceae	*Polygala myrtifolia*	0.5
10	Myrsinaceae	*Rapanea melanophloeos*	0.5
11	Anacardiaceae	*Searsia glauca*	0.5
12	Anacardiaceae	*Searsia lucida*	0.5
13	Anacardiaceae	*Searsia tomentosa*	0.5
14	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 152 KLEIN TUINKLOOF – OU KAAPSE WEG

Forest type: Western Cape Afrotemperate Forest

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Oleaceae	*Chionanthus foveolatus*	2
3	Cunoniaceae	*Cunonia capensis*	3
4	Celastraceae	*Maytenus oleoides*	2
5	Fabaceae	*Podylaria calyptrata*	1
6	Polygalaceae	*Polygala myrtifolia*	1
7	Myrsinaceae	*Rapanea melanophloeos*	2
8	Anacardiaceae	*Searsia lucida*	1
9	Anacardiaceae	*Searsia tomentosa*	1
10	Salicaceae	*Scolopia mundii*	2
11	Asteraceae	*Tarchonanthus littoralis*	2

SITE 153 OU KAAPSE WEG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Euphorbiaceae	*Clutia pulchella*	1
3	Celastraceae	*Gymnosporia buxifolia*	2
4	Scrophulariaceae	*Halleria lucida*	2
5	Achariaceae	*Kiggelaria africana*	0.5
6	Celastraceae	*Maytenus oleoides*	1
7	Oliniaceae	*Olinia ventosa*	1
8	Fabaceae	*Podylaria calyptrata*	0.5
9	Myrsinaceae	*Rapanea melanophloeos*	2
10	Anacardiaceae	*Searsia lucida*	1
11	Anacardiaceae	*Searsia tomentosa*	0.5
12	Asteraceae	*Tarchonanthus littoralis*	2

SITE 154 SILVERMYN – OU KAAPSE WEG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Asteraceae	*Chrysanthemoides monilifera*	2
3	Cunoniaceae	*Cunonia capensis*	3
4	Myrsinaceae	*Rapanea melanophloeos*	3
5	Anacardiaceae	*Searsia lucida*	1
6	Anacardiaceae	*Searsia tomentosa*	1
7	Asteraceae	*Tarchonanthus littoralis*	2

SITE 155 OU KAAPSE WEG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	1
2	Celastraceae	*Maytenus oleoides*	1
3	Santalaceae	*Colpoon compressum*	1
4	Rhamnaceae	*Phylica buxifolia*	2
5	Fabaceae	*Podylaria calyptrata*	1
6	Anacardiaceae	*Searsia lucida*	1
7	Cupressaceae	*Widdringtonia nodiflora*	1

SITE 156 SILVERMINE WATERFALL

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Proteaceae	*Brabejum stellatifolium*	0.1
2	Celastraceae	*Cassine peragua*	0.1
3	Cunoniaceae	*Cunonia capensis*	4
4	Ebenaceae	*Diospyros whyteana*	0.1
5	Achariaceae	*Kiggelaria africana*	1
6	Celastraceae	*Maytenus acuminata*	2
7	Celastraceae	*Maytenus oleoides*	1
8	Fabaceae	*Podylaria calyptrata*	0.5
9	Myrsinaceae	*Rapanea melanophloeos*	1
10	Anacardiaceae	*Searsia lucida*	0.5
11	Anacardiaceae	*Searsia tomentosa*	0.5
12	Asteraceae	*Tarchonanthus littoralis*	1
13	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5
14	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 157 BOKKOP – OU KAAPSE WEG

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	**Family**	**Genus & Species**	**Abundance Value**
1	Celastraceae	*Maytenus oleoides*	2
2	Santalaceae	*Colpoon compressum*	2
3	Anacardiaceae	*Searsia lucida*	1
4	Asteraceae	*Tarchonanthus littoralis*	3

SITE 158 BOEKENHOUTSKLOOF – KLEIN CONSTANTIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	2
4	Oleaceae	*Chionanthus foveolatus*	1
5	Rhamnaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	1
7	Cornaceae	*Curtisia dentata*	2
8	Ebenaceae	*Diospyros whyteana*	3
9	Malvaceae	*Grewia occidentalis*	1
10	Celastraceae	*Gymnosporia buxifolia*	1
11	Scrophulariaceae	*Halleria lucida*	2
12	Achariaceae	*Kiggelaria africana*	4
13	Celastraceae	*Maytenus acuminata*	1
14	Oleaceae	*Olea capensis* ssp. *capensis*	2
15	Oleaceae	*Olea europea* ssp. *africana*	2
16	Oliniaceae	*Olinia ventosa*	3
17	Rhamnaceae	*Phylica buxifolia*	1
18	Fabaceae	*Podylaria calyptrata*	1
19	Myrsinaceae	*Rapanea melanophloeos*	3
20	Vitaceae	*Rhoicissus tomentosa*	1
21	Anacardiaceae	*Searsia tomentosa*	1
22	Rhamnaceae	*Scutia myrtina*	2
23	Asclepiadaceae	*Secamone alpini*	2
24	Asteraceae	*Tarchonanthus littoralis*	0.1

SITE 159 DONKERBOSKLOOF – KLEIN CONSTANTIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Celastraceae	*Cassine peragua*	2
4	Oleaceae	*Chionanthus foveolatus*	2
5	Euphorbiaceae	*Clutia pulchella*	1
6	Cunoniaceae	*Cunonia capensis*	3
7	Cornaceae	*Curtisia dentata*	3
8	Ebenaceae	*Diospyros whyteana*	2
9	Celastraceae	*Gymnosporia buxifolia*	1
10	Scrophulariaceae	*Halleria lucida*	1
11	Aquifoliaceae	*Ilex mitis*	3
12	Achariaceae	*Kiggelaria africana*	1
13	Celastraceae	*Maytenus acuminata*	2
14	Oleaceae	*Olea capensis* ssp. *capensis*	1
15	Oleaceae	*Olea europea* ssp. *africana*	1
16	Oliniaceae	*Olinia ventosa*	1
17	Rhamnaceae	*Phylica buxifolia*	1
18	Fabaceae	*Podylaria calyptrata*	1
19	Podocarpaceae	*Podocarpus latifolius*	2
20	Polygalaceae	*Polygala myrtifolia*	1
21	Myrsinaceae	*Rapanea melanophloeos*	3
22	Anacardiaceae	*Searsia tomentosa*	1
23	Rhamnaceae	*Scutia myrtina*	2
24	Asclepiadaceae	*Secamone alpini*	2

SITE 160 LANGBOSKLOOF – KLEIN CONSTANTIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	1
3	Celastraceae	*Cassine peragua*	2
4	Celastraceae	*Cassine schinoides*	1
5	Oleaceae	*Chionanthus foveolatus*	1
6	Cornaceae	*Curtisia dentata*	0.1
7	Ebenaceae	*Diospyros whyteana*	2
8	Malvaceae	*Grewia occidentalis*	1
9	Celastraceae	*Gymnosporia buxifolia*	0.5
10	Scrophulariaceae	*Halleria lucida*	1
11	Aquifoliaceae	*Ilex mitis*	0.1
12	Achariaceae	*Kiggelaria africana*	1
13	Celastraceae	*Maytenus oleoides*	0.5
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	0.5
15	Oleaceae	*Olea europea* ssp. *africana*	2
16	Oliniaceae	*Olinia ventosa*	2
17	Fabaceae	*Podylaria calyptrata*	0.5
18	Podocarpaceae	*Podocarpus latifolius*	0.1
19	Myrsinaceae	*Rapanea melanophloeos*	2
20	Anacardiaceae	*Searsia laevigata*	0.5
21	Anacardiaceae	*Searsia lucida*	1
22	Anacardiaceae	*Searsia tomentosa*	0.5
23	Salicaceae	*Scolopia mundii*	0.1
24	Asclepiadaceae	*Secamone alpini*	0.1
25	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.1

SITE 161 GROOTBOSKLOOF – KLEIN CONSTANTIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	1
2	Rubiaceae	*Canthium inerme*	1
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	1
6	Oleaceae	*Chionanthus foveolatus*	0.5
7	Cunoniaceae	*Cunonia capensis*	0.5
8	Cornaceae	*Curtisia dentata*	0.1
9	Ebenaceae	*Diospyros whyteana*	1
10	Malvaceae	*Grewia occidentalis*	1
11	Celastraceae	*Gymnosporia buxifolia*	0.5
12	Scrophulariaceae	*Halleria lucida*	0.5
13	Aquifoliaceae	*Ilex mitis*	0.5
14	Achariaceae	*Kiggelaria africana*	0.5
15	Celastraceae	*Maytenus acuminata*	0.5
16	Lauraceae	*Ocotea bullata*	0.1
17	Oleaceae	*Olea capensis* ssp. *macrocarpa*	2
18	Oleaceae	*Olea europea* ssp. *africana*	1
19	Oliniaceae	*Olinia ventosa*	2
20	Myrsinaceae	*Rapanea melanophloeos*	2
21	Vitaceae	*Rhoicissus tomentosa*	2
22	Anacardiaceae	*Searsia laevigata*	0.5
23	Anacardiaceae	*Searsia lucida*	1
24	Anacardiaceae	*Searsia tomentosa*	0.5
25	Salicaceae	*Scolopia mundii*	0.5
26	Rhamnaceae	*Scutia myrtina*	0.5
27	Asclepiadaceae	*Secamone alpini*	1
28	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.5

SITE 162 GROOT CONSTANTIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	0.5
3	Rubiaceae	*Afrocanthium mundianum*	0.5
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	2
6	Oleaceae	*Chionanthus foveolatus*	0.1
7	Rhamnaceae	*Clutia pulchella*	0.1
8	Cunoniaceae	*Cunonia capensis*	0.5
9	Cornaceae	*Curtisia dentata*	0.1
10	Araliaceae	*Cussonia thyrsiflora*	0.1
11	Ebenaceae	*Diospyros whyteana*	1
12	Malvaceae	*Grewia occidentalis*	0.5
13	Celastraceae	*Gymnosporia buxifolia*	0.1
14	Scrophulariaceae	*Halleria lucida*	0.5
15	Aquifoliaceae	*Ilex mitis*	0.1
16	Achariaceae	*Kiggelaria africana*	2
17	Celastraceae	*Maytenus acuminata*	0.5
18	Celastraceae	*Maytenus oleoides*	0.1
19	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
20	Oleaceae	*Olea europea* ssp. *africana*	0.1
21	Oliniaceae	*Olinia ventosa*	2
22	Fabaceae	*Podylaria calyptrata*	0.1
23	Polygalaceae	*Polygala myrtifolia*	0.1
24	Myrsinaceae	*Rapanea melanophloeos*	2
25	Vitaceae	*Rhoicissus tomentosa*	1
26	Anacardiaceae	*Searsia lucida*	0.5
27	Anacardiaceae	*Searsia tomentosa*	0.1
28	Rhamnaceae	*Scutia myrtina*	0.5
29	Asclepiadaceae	*Secamone alpini*	0.5
30	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.1
31	Cupressaceae	*Widdringtonia nodiflora*	0.5

SITE 163 CONSTANTIA NEK

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Icacinaceae	*Apodytes dimidiata*	0.1
2	Rubiaceae	*Canthium inerme*	2
3	Rubiaceae	*Afrocanthium mundianum*	1
4	Celastraceae	*Cassine peragua*	2
5	Celastraceae	*Cassine schinoides*	0.5
6	Cunoniaceae	*Cunonia capensis*	1
7	Ebenaceae	*Diospyros whyteana*	1
8	Malvaceae	*Grewia occidentalis*	1
9	Celastraceae	*Gymnosporia buxifolia*	0.5
10	Scrophulariaceae	*Halleria lucida*	0.5
11	Aquifoliaceae	*Ilex mitis*	0.1
12	Achariaceae	*Kiggelaria africana*	3
13	Celastraceae	*Maytenus acuminata*	0.1
14	Celastraceae	*Maytenus oleoides*	0.1
15	Lauraceae	*Ocotea bullata*	0.1
16	Oleaceae	*Olea europea* ssp. *africana*	0.5
17	Oliniaceae	*Olinia ventosa*	2
18	Fabaceae	*Podylaria calyptrata*	0.1
19	Polygalaceae	*Polygala myrtifolia*	0.5
20	Myrsinaceae	*Rapanea melanophloeos*	2
21	Vitaceae	*Rhoicissus tomentosa*	3
22	Anacardiaceae	*Searsia laevigata*	0.5
23	Anacardiaceae	*Searsia lucida*	1
24	Salicaceae	*Scolopia mundii*	1
25	Rhamnaceae	*Scutia myrtina*	2
26	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	0.1

SITE 164 TOKAI

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Celastraceae	*Cassine schinoides*	2
3	Cunoniaceae	*Cunonia capensis*	2
4	Ebenaceae	*Diospyros whyteana*	1
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Scrophulariaceae	*Halleria lucida*	2
7	Aquifoliaceae	*Ilex mitis*	2
8	Achariaceae	*Kiggelaria africana*	3
9	Celastraceae	*Maytenus oleoides*	1
10	Oleaceae	*Olea capensis* ssp. *capensis*	1
11	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
12	Oleaceae	*Olea europea* ssp. *africana*	1
13	Oliniaceae	*Olinia ventosa*	1
14	Rhamnaceae	*Phylica buxifolia*	1
15	Podocarpaceae	*Podocarpus latifolius*	1
16	Polygalaceae	*Polygala myrtifolia*	1
17	Myrsinaceae	*Rapanea melanophloeos*	4
18	Anacardiaceae	*Searsia tomentosa*	1
19	Asclepiadaceae	*Secamone alpini*	1

<u>SITE 165 PRINSKASTEELSRIVIER</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	1
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Celastraceae	*Cassine schinoides*	2
5	Oleaceae	*Chionanthus foveolatus*	1
6	Rhamnaceae	*Clutia pulchella*	1
7	Cunoniaceae	*Cunonia capensis*	2
8	Cornaceae	*Curtisia dentata*	2
9	Ebenaceae	*Diospyros whyteana*	1
10	Celastraceae	*Gymnosporia buxifolia*	1
11	Scrophulariaceae	*Halleria lucida*	2
12	Aquifoliaceae	*Ilex mitis*	1
13	Achariaceae	*Kiggelaria africana*	3
14	Celastraceae	*Maytenus acuminata*	1
15	Oleaceae	*Olea capensis* ssp. *capensis*	1
16	Oleaceae	*Olea europea* ssp. *africana*	1
17	Oliniaceae	*Olinia ventosa*	1
18	Fabaceae	*Podylaria calyptrata*	1
19	Podocarpaceae	*Podocarpus latifolius*	1
20	Myrsinaceae	*Rapanea melanophloeos*	2
21	Anacardiaceae	*Searsia tomentosa*	1
22	Rhamnaceae	*Scutia myrtina*	1
23	Asclepiadaceae	*Secamone alpini*	2

SITE 166 CECILIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Achariaceae	*Kiggelaria africana*	3
2	Asclepiadaceae	*Secamone alpini*	2

SITE 167 CECILIA

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	1
3	Celastraceae	*Cassine peragua*	1
4	Ebenaceae	*Diospyros whyteana*	2
5	Scrophulariaceae	*Halleria lucida*	2
6	Achariaceae	*Kiggelaria africana*	4
7	Fabaceae	*Podylaria calyptrata*	1
8	Myrsinaceae	*Rapanea melanophloeos*	2
9	Anacardiaceae	*Searsia tomentosa*	1
10	Asclepiadaceae	*Secamone alpini*	2

<u>SITE 168 CECILIA</u>

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	2
4	Celastraceae	*Cassine schinoides*	1
5	Cunoniaceae	*Cunonia capensis*	2
6	Cornaceae	*Curtisia dentata*	2
7	Ebenaceae	*Diospyros whyteana*	2
8	Celastraceae	*Gymnosporia buxifolia*	1
9	Scrophulariaceae	*Halleria lucida*	2
10	Aquifoliaceae	*Ilex mitis*	2
11	Achariaceae	*Kiggelaria africana*	4
12	Celastraceae	*Maytenus oleoides*	1
13	Oleaceae	*Olea capensis* ssp. *capensis*	1
14	Oleaceae	*Olea capensis* ssp. *macrocarpa*	1
15	Oliniaceae	*Olinia ventosa*	1
16	Myrsinaceae	*Rapanea melanophloeos*	3
17	Rhamnaceae	*Scutia myrtina*	2
18	Asclepiadaceae	*Secamone alpini*	1
19	Fabaceae	*Virgilia oroboides* ssp. *oroboides*	1

SITE 169 KLAASENBOSCH

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Celastraceae	*Cassine peragua*	2
3	Cornaceae	*Curtisia dentata*	2

SITE 170 TOKAI UPPER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	2
2	Euphorbiaceae	*Clutia pulchella*	1
3	Ebenaceae	*Diospyros whyteana*	1
4	Scrophulariaceae	*Halleria lucida*	1
5	Celastraceae	*Maurocenia frangula*	2
6	Celastraceae	*Maytenus oleoides*	1
7	Oleaceae	*Olea europea* ssp. *africana*	1
8	Rhamnaceae	*Phylica buxifolia*	1
9	Celastraceae	*Pterocelastrus tricuspidatus*	1
10	Myrsinaceae	*Rapanea melanophloeos*	4
11	Vitaceae	*Rhoicissus tomentosa*	1

SITE 171 TOKAI UPPER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Afrocanthium mundianum*	2
2	Euphorbiaceae	*Clutia pulchella*	2
3	Ebenaceae	*Diospyros whyteana*	1
4	Achariaceae	*Kiggelaria africana*	2
5	Oleaceae	*Olea europea* ssp. *africana*	1
6	Myrsinaceae	*Rapanea melanophloeos*	3
7	Vitaceae	*Rhoicissus tomentosa*	1

SITE 172 TOKAI UPPER

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Cunoniaceae	*Cunonia capensis*	4
2	Scrophulariaceae	*Halleria lucida*	3
3	Achariaceae	*Kiggelaria africana*	2
4	Celastraceae	*Maytenus oleoides*	1
5	Fabaceae	*Podylaria calyptrata*	0.5

SITE 173 TOKAI PLANTATION

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Celastraceae	*Cassine peragua*	2
2	Cornaceae	*Curtisia dentata*	2
3	Ebenaceae	*Diospyros whyteana*	2
4	Malvaceae	*Grewia occidentalis*	1
5	Celastraceae	*Gymnosporia buxifolia*	1
6	Scrophulariaceae	*Halleria lucida*	2
7	Achariaceae	*Kiggelaria africana*	3
8	Oliniaceae	*Olinia ventosa*	2
9	Fabaceae	*Podylaria calyptrata*	0.5
10	Podocarpaceae	*Podocarpus latifolius*	2
11	Polygalaceae	*Polygala myrtifolia*	1
12	Myrsinaceae	*Rapanea melanophloeos*	3
13	Vitaceae	*Rhoicissus tomentosa*	1

SITE 174 PRINSKASTEELSRIVIER – TOKAI

Forest type: Western Cape Afrotemperate Forest

Forest patch species composition:

No.	Family	Genus & Species	Abundance Value
1	Rubiaceae	*Canthium inerme*	2
2	Rubiaceae	*Afrocanthium mundianum*	2
3	Celastraceae	*Cassine peragua*	1
4	Cornaceae	*Curtisia dentata*	1
5	Ebenaceae	*Diospyros whyteana*	0.5
6	Malvaceae	*Grewia occidentalis*	2
7	Achariaceae	*Kiggelaria africana*	4
8	Celastraceae	*Maytenus acuminata*	1
9	Celastraceae	*Maytenus oleoides*	1
10	Oliniaceae	*Olinia ventosa*	2

Appendix II: Cape Peninsula Repeat Photographs and associated data

603 ORANGE KLOOF WEST 1

Figure 1.1: Original image by Eugene Moll (c.1970)

Figure 1.2: Repeat image by Zoë C Poulsen (06/01/2011)

SITE INFORMATION

Site No: 603 **Date:** 06/01/2011 **Time spent on site:** 08:30am

Concise Site Name: Orange Kloof West 1

General description of location: On ring road above Orange Kloof about 200m from where road turns west and crossed Original Disa Stream.

Province: Western Cape **Region:** FF02 SW Fynbos;

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.99281 **Altitude (m):** 377m asl.

E 18.40170

Original Photographer: Eugene Moll

Original number: Moll_190 **Original date:** c. 1970

Original site/photograph name: Forest at Orange Kloof

Notes on accuracy of repeat photo station location: Within 10m of original. Site now obscured by tree growth. We are in front and a bit higher.

Location Map:

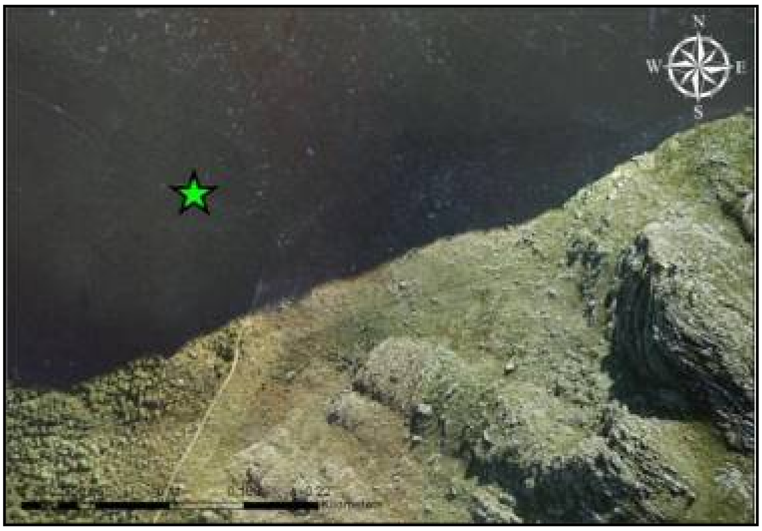

Figure 1.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and Timm Hoffman

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 603 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen and Rick Rohde

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	132	17mm	1/100	10	300°	8:46am
Canon 450D	Digital	133	17mm	1/100	10	-45°	8:49am
Canon 450D	Digital	134	17mm	1/80	10	+45°	8:50am
Olympus C8080	Digital	530	28mm	1/250	8	300°	8:56am
Olympus C8080	Digital	531	28mm	1/250	8	300°	8:56am
Olympus C8080	Digital	532	28mm	1/250	8	-45°	8:56am
Olympus C8080	Digital	533	28mm	1/250	8	+45°	8:56am
Minolta x-300s	Fujichrome 100 ASA	1	35mm	1/30	22	300°	9:00am

Notes on weather conditions: Clear and hot

Site no: 603 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Geology: Table Mountain Sandstone, Ring Road goes over granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow coarse-grained quartzite soils, with granite-derived soils below the Ring Road.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Steep east-facing slope with shallow soils and incised ravines and kloofs.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

Fynbos Biome; FF02 South-West Fynbos Bioregion; FFg3 Peninsula Granite Fynbos; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

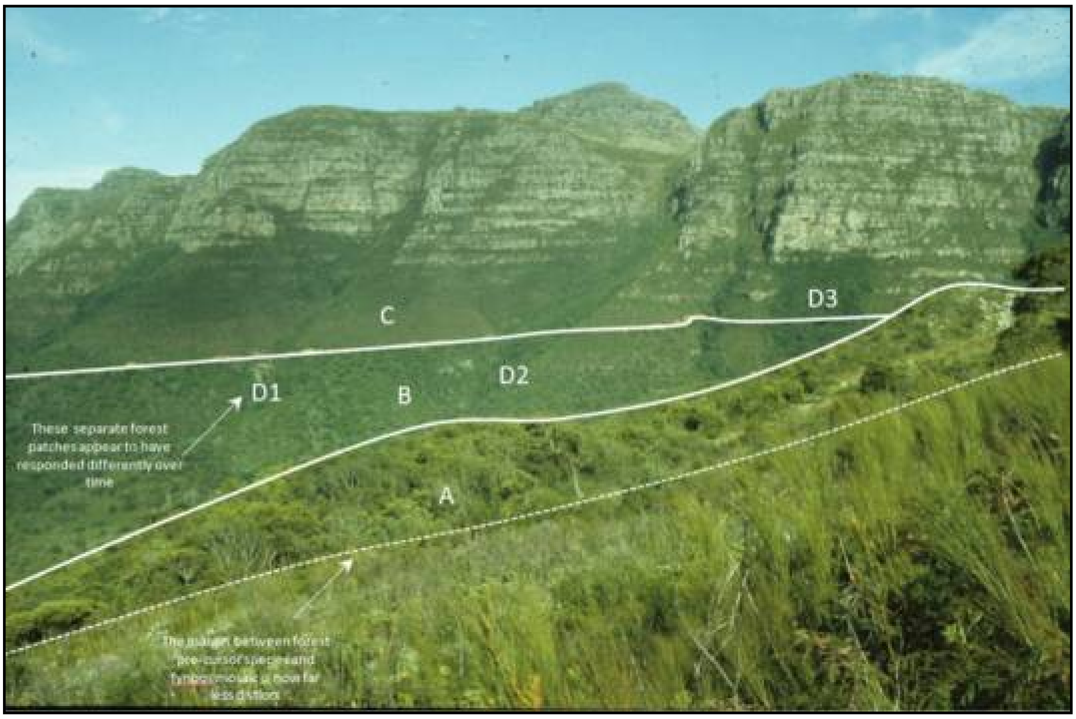

Figure 1.4: Key landforms demarcated for analysis of repeat photo set

Landform A: Foreground South-Facing: Foreground has thickened up considerably with mainly forest margin species such as *Widdringtonia nodiflora, Cunonia capensis* and *Maytenus oleoides* at the expense of Restioid Fynbos. Bracken fern also appears to have thickened. A few alien pines are present as well. The distinct margin between the Restioid Fynbos patch and ‘pre-forest’ patch has disappeared or become less distinct.

Landform B: East-facing slope below the Ring Road: Forest vegetation appears to have thickened and the forest canopy appears taller than previously. Bare areas that appear to have been fynbos in the past have now become colonised by shrubby/forest precursor species.

Landform C: East-facing slopes above Ring Road: It appears to have been sparsely vegetated in the past and comprised predominantly of fynbos vegetation. Today it is less dense than below the Ring Road but is more vegetated than it was in the past.

Landform D: Afrotemperate forest in kloofs: This has expanded its area and canopy height is taller and much less uniform than in the past. Boundaries between the forest and fynbos appear less distinct today than in the past.

Site no: 603 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Landform A: Foreground, south-facing

Landform B: East-facing slope, below ring road

Landform C: East-facing slope, above ring road

Landform D: Afrotemperate forest in kloofs

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Maytenus oleioides*	*Maytenus oleioides*	5	X	1	1	N/A
2	*Searsia lucida*	*Searsia lucida*	5	X	X	X	N/A
3	*Cunonia capensis*	*Cunonia capensis*	2	2	1	2	N/A
4	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	20	1	5	X	N/A
5	*Pinus pinaster*	*Pinus pinaster*	0.5	X	X	X	N/A
6	*Rubus* spp.	*Rubus* spp.	2	1	1	X	N/A
7	*Pteridium aquilinum*	*Pteridium aquilinum*	20	8	10	X	N/A
8	Restionaceae	Restionaceae	2	15	10	X	N/A
9	*Clutia pulchella*	*Clutia pulchella*	2	0.5	X	0.5	N/A
10	*Podylaria calyptrata*	*Podylaria calyptrata*	5	2	5	X	N/A
11	*Watsonia tabularis*	*Watsonia tabularis*	5	2	4	X	N/A
12	*Tetraria themalis*	*Tetraria themalis*	5	X	X	X	N/A
13	*Psoralea pinnata*	*Psoralea pinnata*	2	X	X	X	N/A
14	*Searsia tomentosa*	*Searsia tomentosa*	2	5	1	0.5	N/A
15	*Asparagus capensis*	*Asparagus capensis*	1	X	X	X	N/A
16	*Pennaea mucronata*	*Pennaea mucronata*	2	X	5	X	N/A
17	*Osmitopsis astericoides*	*Osmitopsis astericoides*	2	X	X	X	N/A
18	*Erica* spp. (Long red flowers)	*Erica* spp. (Long red flowers)	0.5	X	X	X	N/A
19	*Cassine schinoides*	*Cassine schinoides*	1	X	X	X	N/A
20	*Astilbe ericoides*	*Astilbe ericoides*	2	X	2	X	N/A
21	*Capelia tabularis*	*Capelia tabularis*	1	X	0.5	X	N/A
22	*Cassine peragua*	*Cassine peragua*	1	X	X	X	N/A
23	*Morella serrata*	*Morella serrata*	1	X	X	X	N/A
24	*Protea cyanoides*	*Protea cyanoides*	1	X	X	X	N/A

25	*Diospyros glabra*	*Diospyros glabra*	0.5	X	X	X	N/A
27	*Syncarpha vestita*	*Syncarpha vestita*	0.5	X	X	X	N/A
28	*Erica* spp. (White)		0.1	X	X	X	N/A
29	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	1	X	X	X	N/A
30	*Erica tristis*	*Erica tristis*	5	X	X	X	N/A
31	*Polygala myrtifolia*	*Polygala myrtifolia*	X	X	X	0.1	N/A
32	*Podocarpus latifolius*	*Podocarpus latifolius*	X	2	X	5	N/A
33	*Rapanea melanophloeos*	*Rapanea melanophloeos*	X	5	0.5	1	N/A
34	*Maytenus heterophylla*	*Maytenus heterophylla*	X	2	X	X	N/A
35	*Kiggelaria africana*	*Kiggelaria africana*	X	10	1	4	N/A
36	*Olea europea africana*	*Olea europea africana*	X	1	X	0.5	N/A
37	*Canthium inerme*	*Canthium inerme*	X	5	X	5	N/A
38	*Ilex mitis*	*Ilex mitis*	X	X	X	0.5	N/A
39	*Olea capensis* subsp. *capensis*	*Olea capensis* subsp. *capensis*	X	2	X	X	N/A
40	*Protea nitida*	*Protea nitida*	X	15	X	X	N/A
41	*Myrsine africana*	*Myrsine africana*	X	2	2	X	N/A
42	*Searsia laevigata*	*Searsia laevigata*	X	4	2	X	N/A
43	*Maytenus acuminata*	*Maytenus acuminata*	X	1	X	X	N/A
44	*Virgilia oroboides*	*Virgilia oroboides*	X	3	X	X	N/A
45	*Leucadendron argenteum*	*Leucadendron argenteum*	X	2	0.5	X	N/A
46	*Curtisia dentata*	*Curtisia dentata*	X	1	X	1	N/A
47	*Cliffortia filifolia*	*Cliffortia filifolia*	X	2	2	X	N/A
48	*Brunia nodiflora*	*Brunia nodiflora*	X	X	1	X	N/A
49	*Leucadendron salignum*	*Leucadendron salignum*	X	X	4	X	N/A
50	*Halleria lucida*	*Halleria lucida*	X	1	X	1	N/A

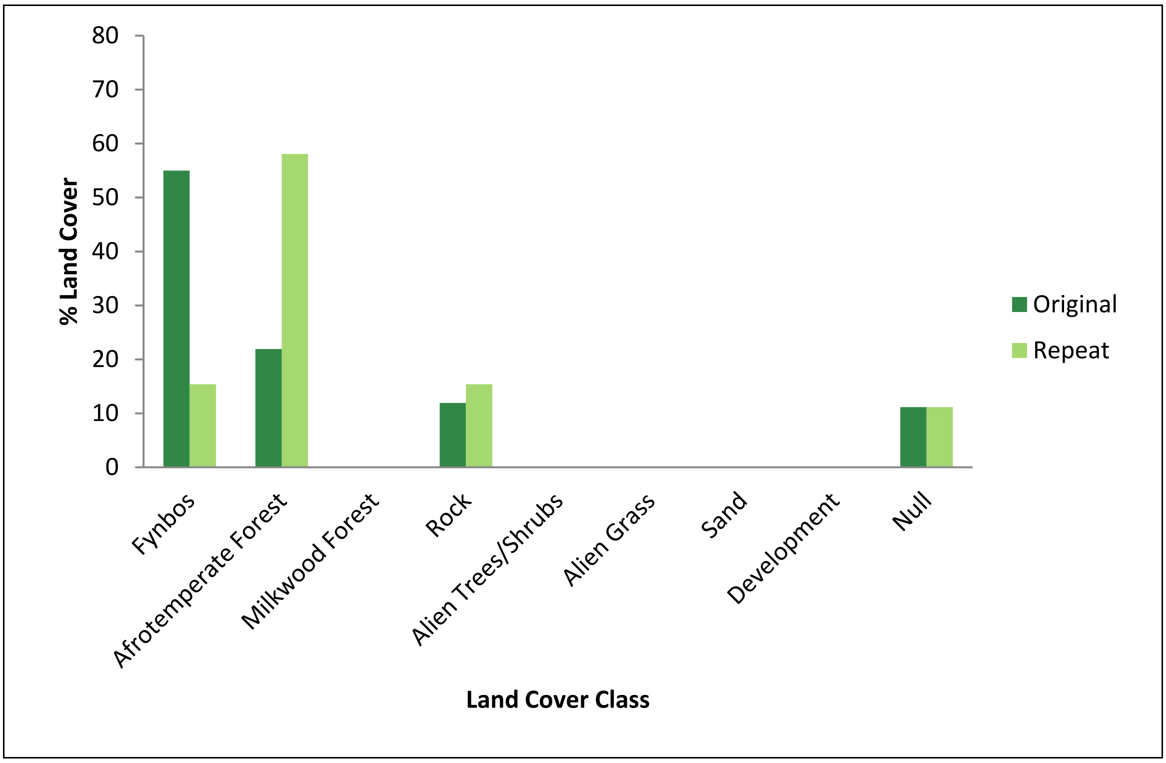

Figure 1.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 603 Orange Kloof West 1

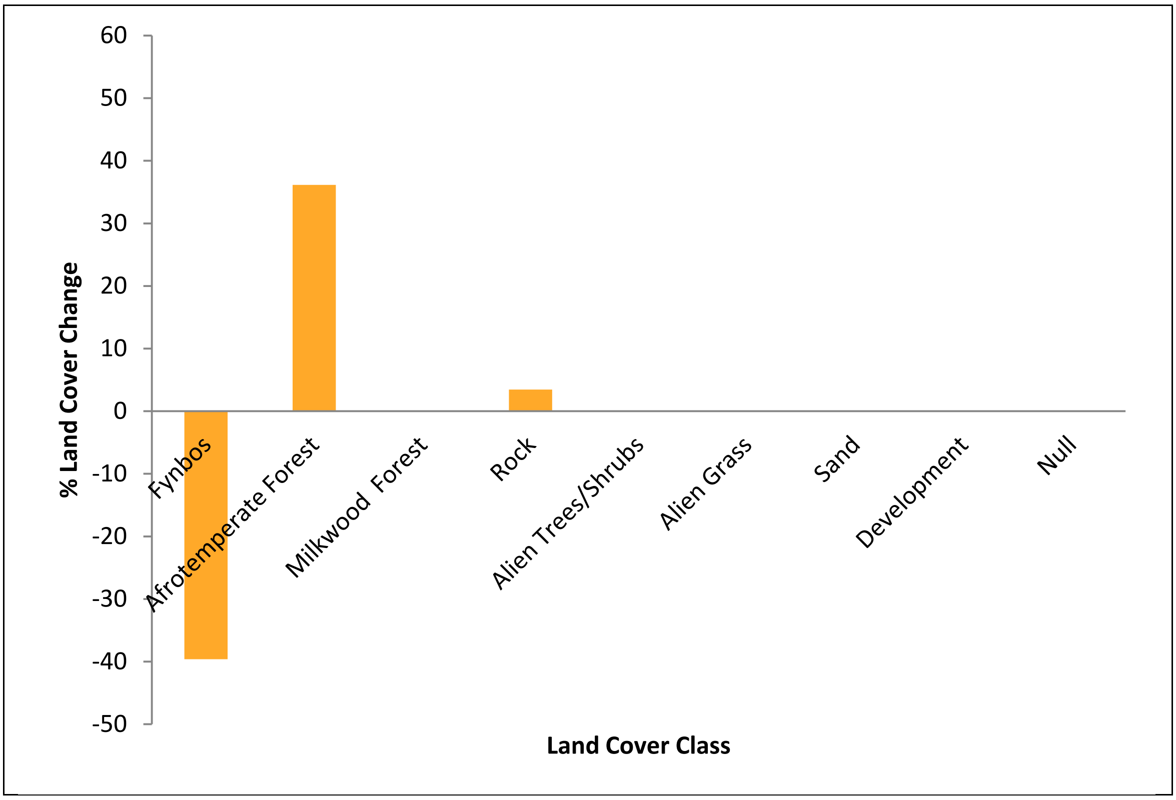

Figure 1.6: Percentage change in land cover classes between 1970 and 2011 at Site 603 Orange Kloof West 1

604 ORANGE KLOOF WEST 2:

Figure 2.1: Original image by Eugene Moll (c. 1970)

Figure 2.2: Repeat image by Zoë C Poulsen (06/01/2011)

SITE INFORMATION

Site No: 604 **Date:** 06/01/2011 **Time spent on site:** 10:30am

Concise Site Name: Orange Kloof West 2

General description of location: Looking across to western slope of kloof from ring road zigzag – distinct rectangular forest patch.

Province: Western Cape **Bioregion:** SW Fynbos (ff02)

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.98965 **Altitude (m):** 374m asl.

E 018.39348

Original Photographer: Eugene Moll

Original number: Moll_684 **Original date:** March 1981

Original site/photograph name: Forest patch, Orange Kloof

Notes on accuracy of repeat photo station location: Within 20m of original location

Location Map:

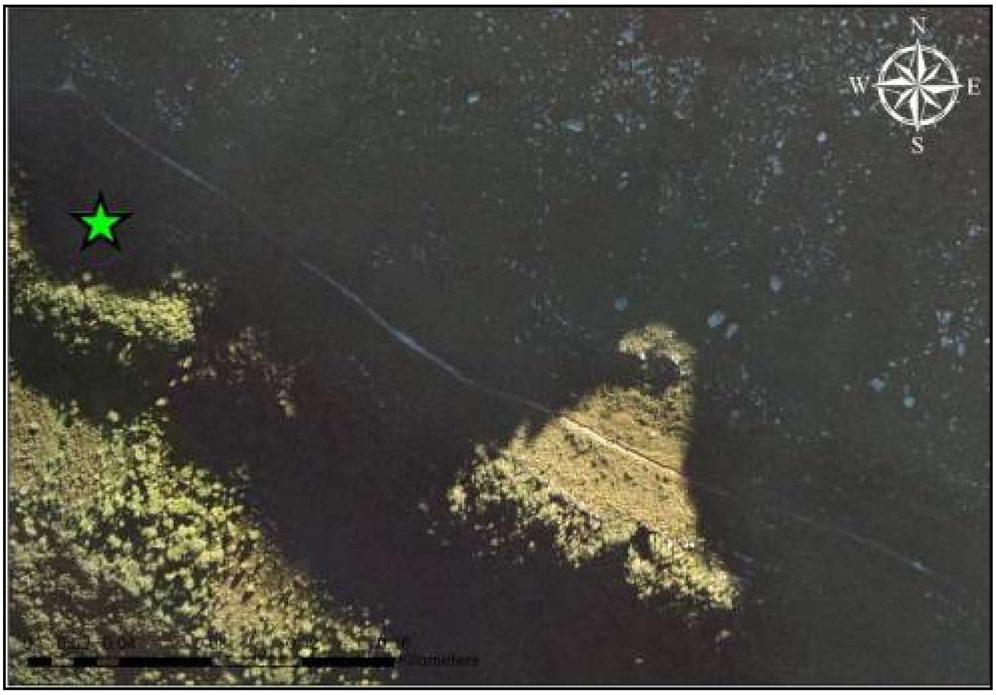

Figure 2.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and M Timm Hoffman

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 604 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: 2.1m

Photographer's Name: Timm Hoffman and Rick Rohde

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	137	17	1/60	F9	290°	10:58
Canon 450D	Digital	138	20	1/50	F9	290°	10:58
Canon 450D	Digital	139	17	1/80	F9	290°	10:58
Canon 450D	Digital	140	17	1/100	F9	-45°	10:58
Canon 450D	Digital	141	17	1/60	F9	+45°	10:58
Olympus C8080	Digital	537	28	1/100	F8	290°	11:01
Minolta x300S	Fujichrome Provia 100 ASA	3	35	1/15 – 1/8	F22	290°	11:06
Minolta x300S	Fujichrome Provia 100 ASA	4	40	1/15 – 1/8	F22	290°	11:07
Minolta x300S	Fujichrome Provia 100 ASA	5	35	1/15 – 1/8	F22	290°	11:07

Notes on weather conditions: Clear and hot

Site no: 604 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Geology: Sandstone and granite geology (Palaeozoic)

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow (>0.5m) coarse grained soil (Quartzite) on upper slopes derived from Table Mountain Sandstone. In the lower valley there are much deeper (<2m) granite-derived soils.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Steep east-facing with shallow soils and incised ravines or kloofs.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

Peninsula Sandstone Fynbos (FFs9); Peninsula Granite Fynbos (FFg3); Western Cape Afrotemperate Forest (F0Z1);

Description of major changes:

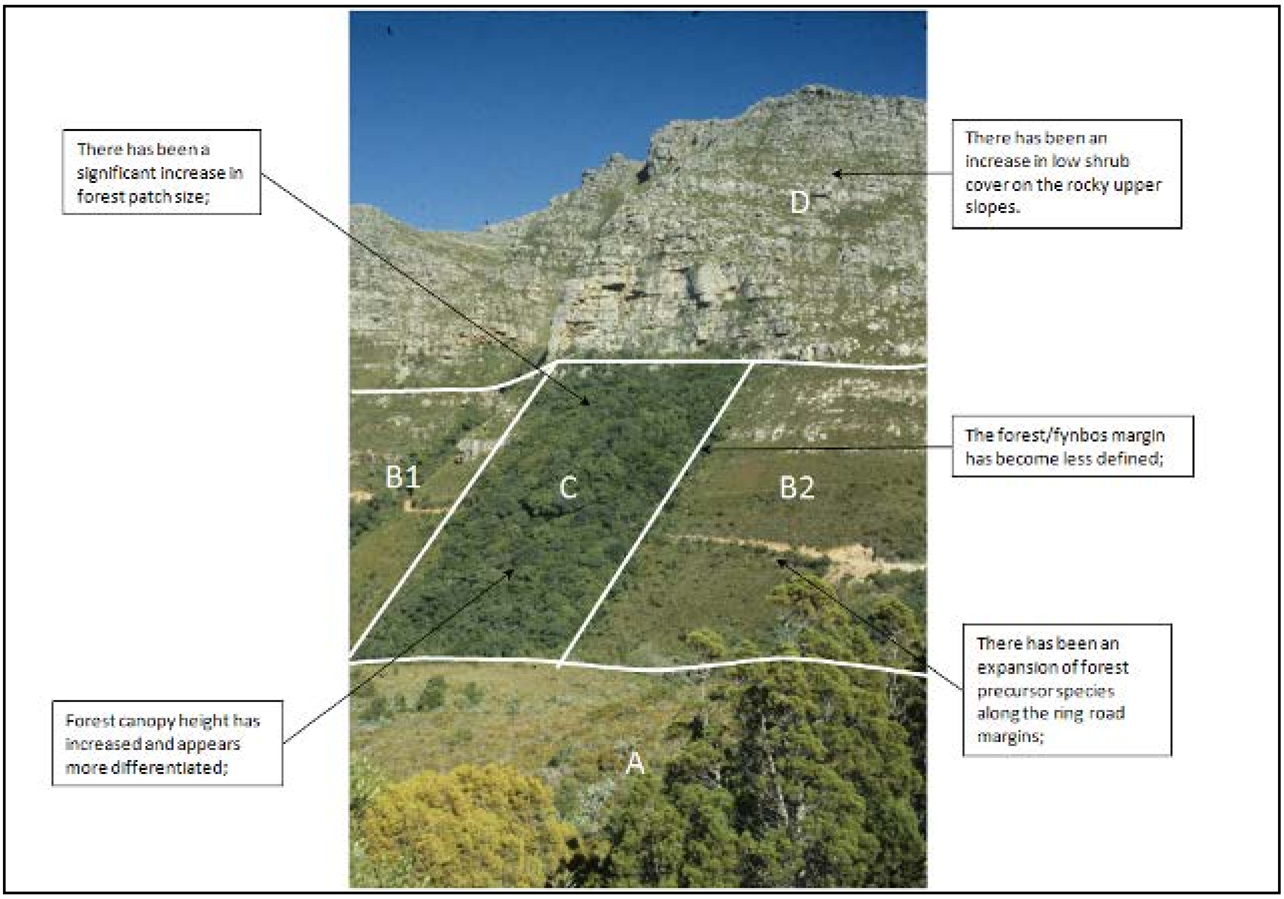

Figure 2.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos meadow in foreground below **-** This has been obscured by the growth of trees along the vehicle track. While it is still relatively open, there has been an encroachment of forest precursor species;

Landform B: Fynbos of east-facing slope – The left hand patch has become more dense with forest precursor species. However, on the right hand side of the forest, the fynbos patch is relatively unchanged. The erosion scar above and below the track has become more vegetated. Below the track there is a slight increase in shrub cover. Above the track there appears to have been very little change.

Landform C: Forest Patch: The edges of the forest are far less distinct, and the patch size has increased quite considerably, particularly to the left. The margin is more distinct on the right hand side than the left. Overall canopy height is greater and more differentiated – it looked more uniform in the original photograph.

Landform D: Rocky upper slopes: Appears to have been an increase in low shrubby elements; Rock is less visible;

Site no: 604 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 23/09/2011

Landform A: Fynbos in foreground below

Landform B: Fynbos east-facing slope

Landform C: Forest patch

Landform D: Rocky upper slopes

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Maytenus oleioides*	*Maytenus oleioides*	2	5	5	2	N/A
2	*Cunonia capensis*	*Cunonia capensis*	5	10	5	2	N/A
3	*Berkheya barbata*	*Berkheya barbata*	0.5	X	X	X	N/A
4	*Osmitopsis astericoides*	*Osmitopsis astericoides*	2	X	X	X	N/A
5	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	*5*	*15*	X	10	N/A
6	*Pteridium aquilinum*	*Pteridium aquilinum*	10	20	X	X	N/A
7	Restionaceae	Restionaceae	10	20	X	5	N/A
8	*Watsonia tabularis*	*Watsonia tabularis*	2	X	X	X	N/A
9	*Erica tristis*	*Erica tristis*	1	X	X	15	N/A
10	*Pelargonium cuculatum*	*Pelargonium cuculatum*	0.5	X	X	0.1	N/A
11	*Searsia tomentosa*	*Searsia tomentosa*	2	X	0.1	2	N/A
12	*Capelia tabularis*	*Capelia tabularis*	0.5	2	X	X	N/A
13	*Searsia lucida*	*Searsia lucida*	2	5	X	2	N/A
14	*Berzelia lanuginosa*	*Berzelia lanuginosa*	10	X	X	X	N/A
15	*Anemone tenuifolia*	*Anemone tenuifolia*	0.1	X	X	X	N/A
16	*Astilbe ericoides*	*Astilbe ericoides*	1	2	X	X	N/A
17	*Pseudoselago serrata*	*Pseudoselago serrata*	1	X	X	X	N/A
18	*Asparagus rubicundus*	*Asparagus rubicundus*	1	X	X	X	N/A
19	*Myrsine africana*	*Myrsine africana*	2	2	X	1	N/A
20	*Erica hirtifolia*	*Erica hirtifolia*	0.5	X	X	X	N/A
21	*Brunia nodiflora*	*Brunia nodiflora*	1	X	X	X	N/A
22	*Scabiosa africana*	*Scabiosa africana*	0.5	X	X	X	N/A
23	*Polygala garcini*	*Polygala garcini*	0.1	X	X	X	N/A
24	*Sutera hispida*	*Sutera hispida*	0.1	X	X	X	N/A
25	*Halleria lucida*	*Halleria lucida*	0.5	X	2	X	N/A

27	*Diospyros glabra*	*Diospyros glabra*	1	X	X	X	N/A
28	*Virgilia oroboides*	*Virgilia oroboides*	X	5	X	X	N/A
29	*Penaea mucronata*	*Penaea mucronata*	X	2	X	X	N/A
30	*Leucodendron coniferum*	*Leucodendron coniferum*	X	1	X	X	N/A
31	*Struthiola alata*	*Struthiola alata*	X	1	X	X	N/A
32	*Erica* sp. (Pink)	*Erica* sp. (Pink)	X	0.5	X	X	N/A
33	*Adenandra uniflora*	*Adenandra uniflora*	X	0.1	X	X	N/A
34	*Cassine schinoides*	*Cassine schinoides*	X	1	2	X	N/A
35	*Erica plukenetii*	*Erica plukenetii*	X	1	X	X	N/A
36	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	X	2	X	X	N/A
37	*Cliffortia filifolia*	*Cliffortia filifolia*	X	5	X	X	N/A
38	*Olea capensis*	*Olea capensis*	X	1	1	X	N/A
39	*Clutia pulchella*	*Clutia pulchella*	X	X	2	X	N/A
40	*Cussonia thyrsifolia*	*Cussonia thyrsifolia*	X	X	1	X	N/A
41	*Diospyros whyteana*	*Diospyros whyteana*	X	X	10	X	N/A
42	*Kiggelaria africana*	*Kiggelaria africana*	X	X	10	X	N/A
43	*Maytenus acuminata*	*Maytenus acuminata*	X	X	15	X	N/A
44	*Podocarpus latifolius*	*Podocarpus latifolius*	X	X	25	X	N/A
45	*Polygala myrtifolia*	*Polygala myrtifolia*	X	X	1	5	N/A
46	*Cassine peragua*	*Cassine peragua*	X	X	15	5	N/A
47	*Olinia ventosa*	*Olinia ventosa*	X	X	25	X	N/A
48	*Afrocanthium mundianum*	*Afrocanthium mundianum*	X	X	2	X	N/A
49	*Raphanea melanophloeos*	*Raphanea melanophloeos*	X	X	1	X	N/A
50	*Curtisia dentata*	*Curtisia dentata*	X	X	10	X	N/A
51	*Olea capensis* subsp. *macrocarpa*	*Olea capensis* subsp. *macrocarpa*	X	X	X	X	N/A
52	*Protea nitida*	*Protea nitida*	X	X	X	15	N/A
53	*Olea europea africana*	*Olea europea africana*	X	X	X	10	N/A

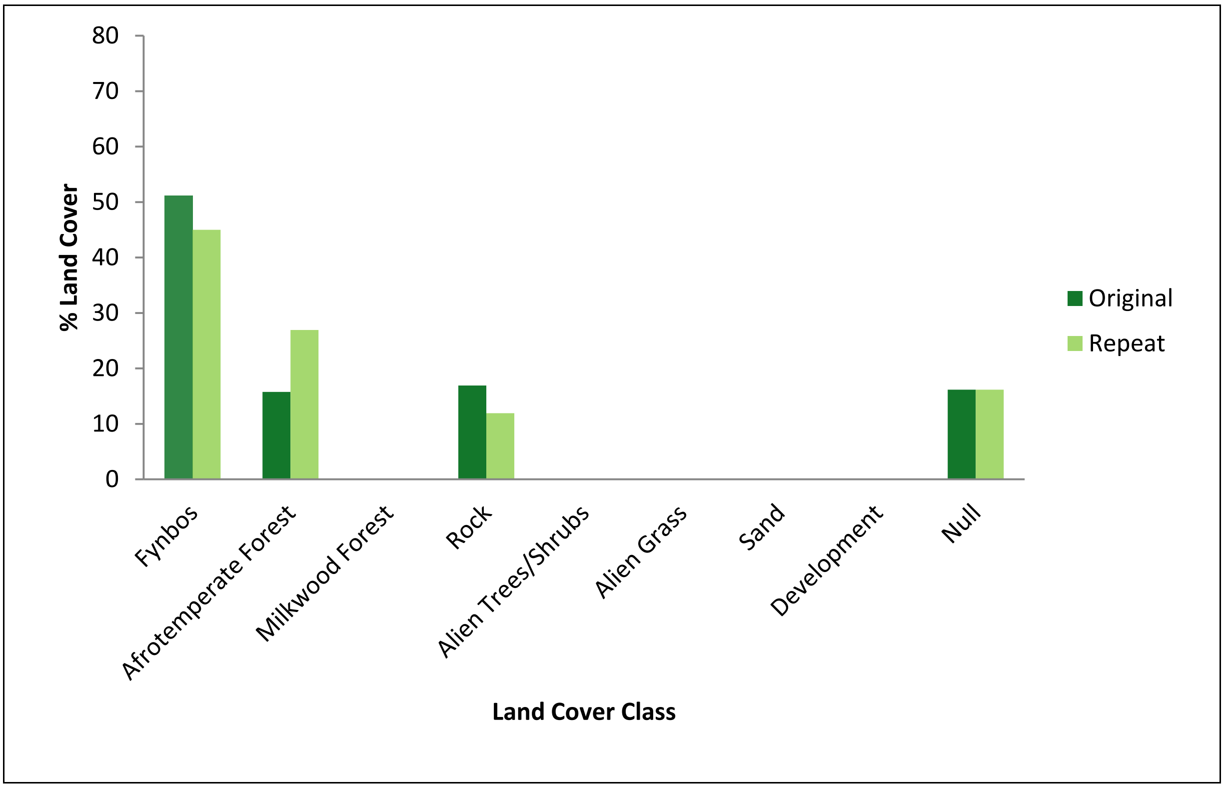

Figure 2.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 604 Orange Kloof West 2

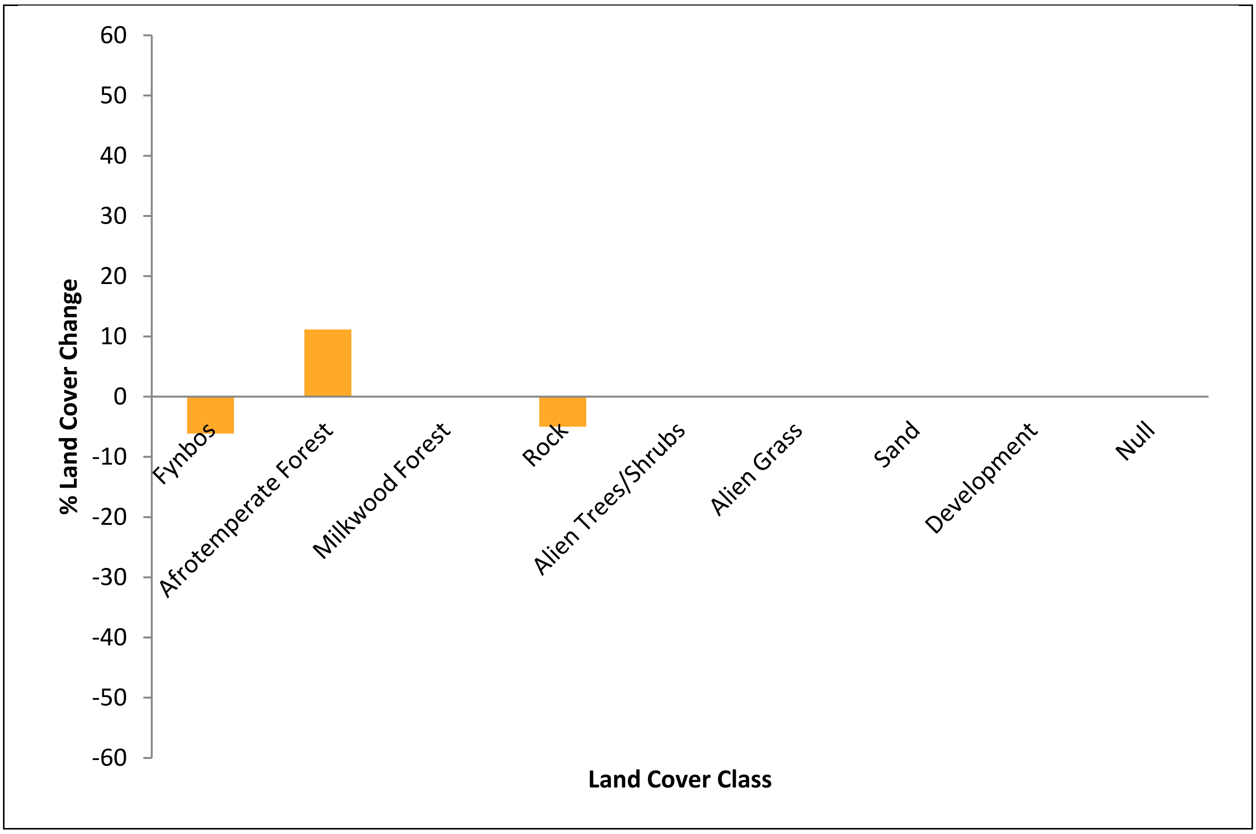

Figure 2.6: Percentage change in land cover classes between 1970 and 2011 at Site 604 Orange Kloof West 2

605 ORANGE KLOOF VALLEY:

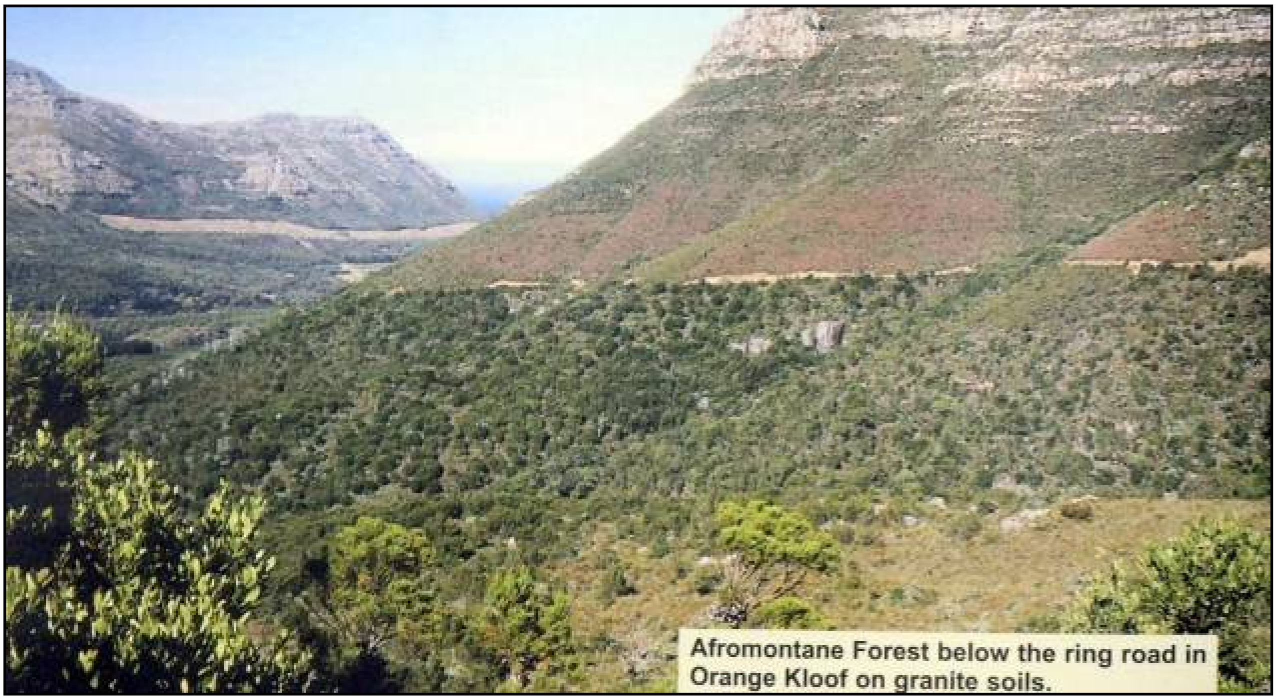

Figure 3.1: Original image by Eugene Moll (c.1970) from Trinder-Smith et al. (2006)

Figure 3.2: Repeat image by Zoë C Poulsen (06/01/2011)

SITE INFORMATION

Site No: 605 **Date:** 06/01/2011 **Time spent on site:** 11:45am

Concise Site Name: Orange Kloof Valley

General description of location: Looking south down Hout Bay Valley from Ring Road in Orange Kloof. This image was taken right next to 604.

Province: Western Cape **Bioregion:** FF02 SW Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S -33.98964 **Altitude (m):** 366m asl.

E 018.39240

Original Photographer: Eugene Moll

Original number: None **Original date:** c. 1970

Original site/photograph name: In Wildflowers of the Table Mountain National Park pp. 24 (Terry Trinder-Smith)

Notes on accuracy of repeat photo station location: Within a few metres

Location Map:

Figure 3.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and Timm Hoffman

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 605 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: Standing on rock

Photographer's Name: Rick Rohde

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Olympus C8080	Digital	S38	28mm	1/160	8	245°	11:54am
Olympus C8080	Digital	S39	28mm	1/160	8	245°	11:54am
Olympus C8080	Digital	S40	28mm	1/160	8	245°	11:54am
Canon 450D	Digital	143	28mm	1/50	9	245°	11:56am
Canon 450D	Digital	144	28mm	1/100	8	245°	11:56am
Minolta x-300s	Fujichrome Provia	7	28mm	1/125	8	245°	11:58am
Minolta x-300s	Fujichrome Provia	8	28mm	1/60	11	245°	11:58am

Notes on weather conditions: Clear and hot

Site no: 605 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Geology: Granite and Table Mountain Sandstone (Palaeozoic age)

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow soils on upper slopes derived from Table Mountain Sandstone less than 0.5m in depth. On the lower slopes soils are much deeper (greater than 2m) granite derived soils.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: NE-facing granite and Table Mountain Sandstone slopes.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

Fynbos Biome: FF02 SW Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest.

Description of major changes:

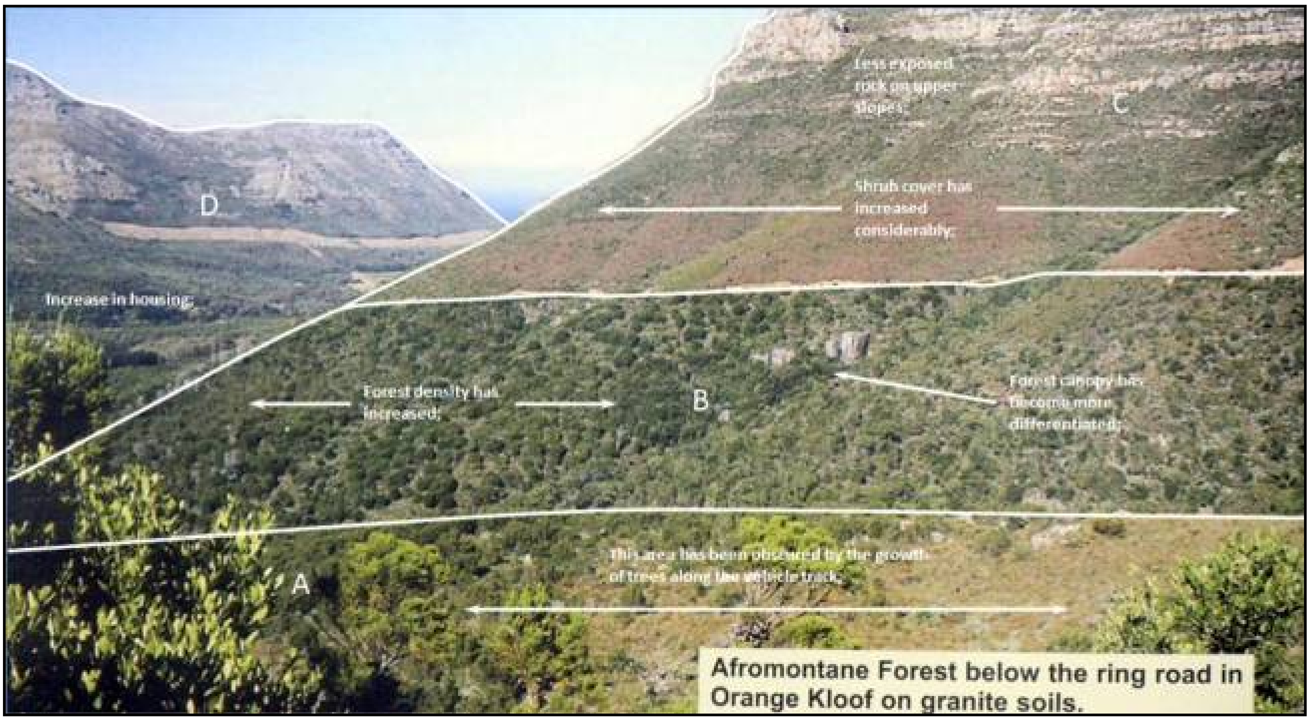

Figure 3.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos meadow: This has been obscured by the growth of trees along the vehicle track. While it is still relatively open, there has been an encroachment of forest precursor species.

Landform B: Below the Ring Road: Forest has become denser on slopes on the left hand side and forest in diagonal kloof has a higher and more differentiated canopy. Other than these changes is relatively similar.

Landform C: Above Ring Road: Shrub cover has increased considerably, less exposed rock on upper slopes. Shrub cover is denser on middle buttress and has coalesced of there being distinct individuals.

Landform D: NW facing slope in left distance: Firebreak is less distinct now than before. Increase in housing on lower slopes; Decrease in size of erosion scars; Still presence of alien pines which might have increased a bit. Eucalyptus trees border the firebreak.

Site no: 605 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Landform A: Fynbos meadow

Landform B: Below the ring road

Landform C: Above the ring road

Landform D: NW facing slope in left distance (No species data collected) (N/D)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Maytenus oleioides*	*Maytenus oleioides*	2	X	1	N/D	N/A
2	*Cunonia capensis*	*Cunonia capensis*	5	2	1	N/D	N/A
3	*Berkheya barbata*	*Berkheya barbata*	0.5	X	X	N/D	N/A
4	*Osmitopsis astericoides*	*Osmitopsis astericoides*	2	X	X	N/D	N/A
5	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	5	1	5	N/D	N/A
6	*Pteridium aquilinum*	*Pteridium aquilinum*	10	8	10	N/D	N/A
7	Restionaceae	Restionaceae	10	15	10	N/D	N/A
8	*Watsonia tabularis*	*Watsonia tabularis*	2	2	4	N/D	N/A
9	*Erica tristis*	*Erica tristis*	1	X	X	N/D	N/A
10	*Pelargonium cuculatum*	*Pelargonium cuculatum*	0.5	X	X	N/D	N/A
11	*Searsia tomentosa*	*Searsia tomentosa*	2	5	1	N/D	N/A
12	*Capelia tabularis*	*Capelia tabularis*	0.5	X	0.5	N/D	N/A
13	*Searsia lucida*	*Searsia lucida*	2	X	X	N/D	N/A
14	*Berzelia lanuginosa*	*Berzelia lanuginosa*	10	X	X	N/D	N/A
15	*Anemone tenuifolia*	*Anemone tenuifolia*	0.1	X	X	N/D	N/A
16	*Astilbe ericoides*	*Astilbe ericoides*	1	X	2	N/D	N/A
17	*Pseudoselago spuria*	*Pseudoselago spuria*	1	X	X	N/D	N/A
18	*Asparagus rubicundus*	*Asparagus rubicundus*	1	X	X	N/D	N/A
19	*Myrsine africana*	*Myrsine africana*	2	2	2	N/D	N/A
20	*Erica hirtifolia*	*Erica hirtifolia*	0.5	X	X	N/D	N/A
21	*Brunia nodiflora*	*Brunia nodiflora*	1	X	1	N/D	N/A
22	*Scabiosa africana*	*Scabiosa africana*	0.5	X	X	N/D	N/A
23	*Polygala garcini*	*Polygala garcini*	0.1	X	X	N/D	N/A
24	*Sutera hispida*	*Sutera hispida*	0.1	X	X	N/D	N/A

25	*Halleria lucida*	*Halleria lucida*	0.5	2	X	N/D	N/A
26	*Diospyros glabra*	*Diospyros glabra*	1	X	X	N/D	N/A
27	*Rubus* spp.	*Rubus* spp.	X	1	1	N/D	N/A
28	*Clutia pulchella*	*Clutia pulchella*	X	0.5	X	N/D	N/A
29	*Podalyria calptrata*	*Podalyria calptrata*	X	2	5	N/D	N/A
30	*Podocarpus latifolius*	*Podocarpus latifolius*	X	2	X	N/D	N/A
31	*Rapanea melanoploeos*	*Rapanea melanoploeos*	X	5	0.5	N/D	N/A
32	*Maytenus heterophylla*	*Maytenus heterophylla*	X	2	X	N/D	N/A
33	*Kiggelaria africana*	*Kiggelaria africana*	X	10	1	N/D	N/A
34	*Olea europea africana*	*Olea europea africana*	X	1	X	N/D	N/A
35	*Canthium inerme*	*Canthium inerme*	X	5	X	N/D	N/A
36	*Olea capensis* subsp. *capensis*	*Olea capensis* subsp. *capensis*	X	2	X	N/D	N/A
37	*Protea nitida*	*Protea nitida*	X	15	X	N/D	N/A
38	*Searsia laevigata*	*Searsia laevigata*	X	4	2	N/D	N/A
39	*Maytenus acuminata*	*Maytenus acuminata*	X	1	X	N/D	N/A
40	*Virgilia oroboides*	*Virgilia oroboides*	X	3	X	N/D	N/A
41	*Leucadendron argenteum*	*Leucadendron argenteum*	X	2	0.5	N/D	N/A
42	*Curtisia dentata*	*Curtisia dentata*	X	1	X	N/D	N/A
43	*Cliffortia filifolia*	*Cliffortia filifolia*	X	2	2	N/D	N/A
44	*Pennaea mucronata*	*Pennaea mucronata*	X	X	5	N/D	N/A
45	*Leucadendron salignum*	*Leucadendron salignum*	X	X	4	N/D	N/A

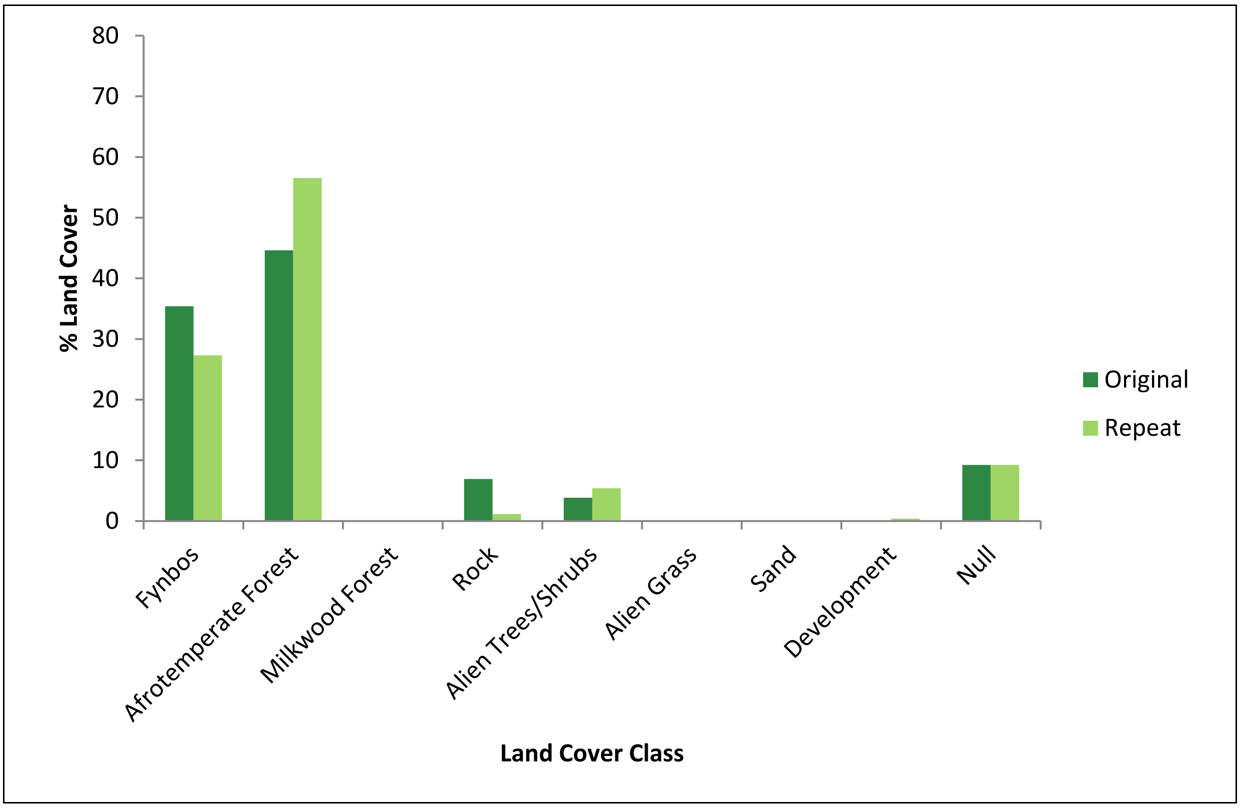

Figure 3.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 605 Orange Kloof Valley

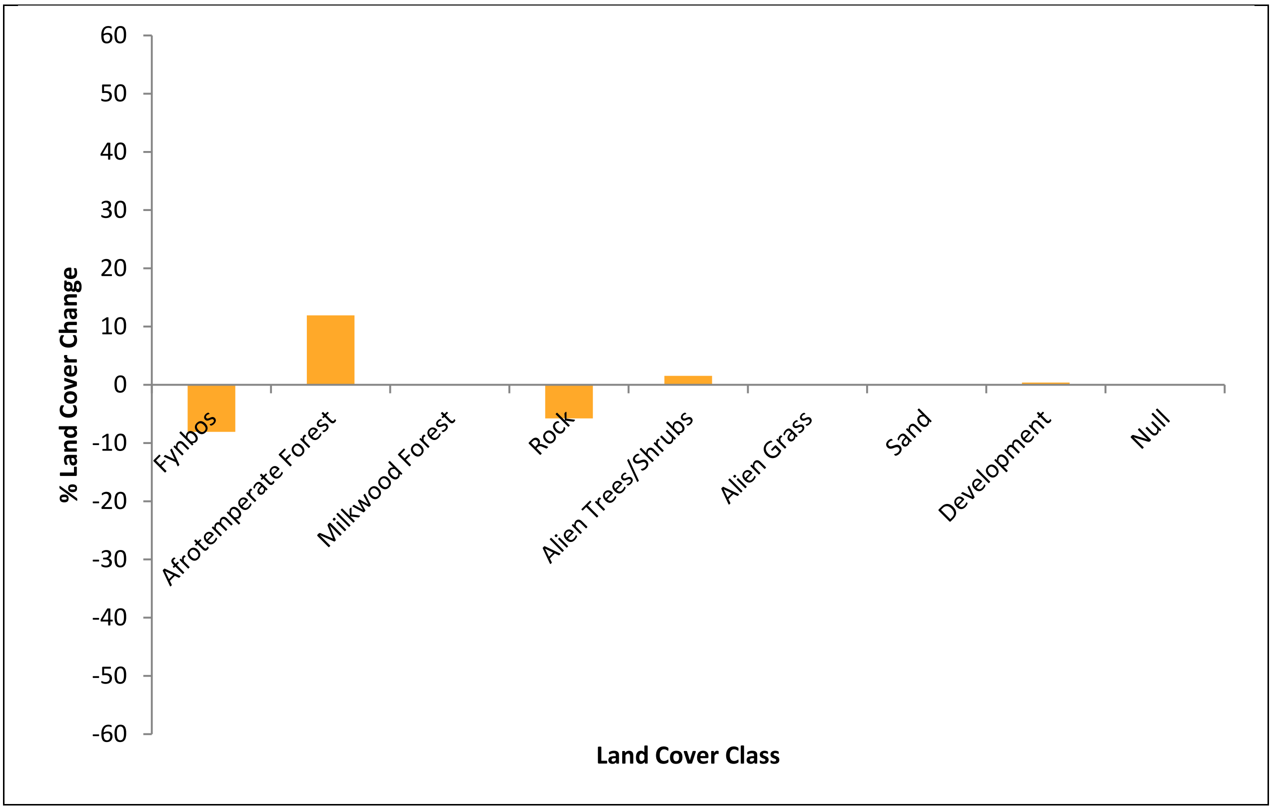

Figure 3.6: Percentage change in land cover classes between 1970 and 2011 at Site 605 Orange Kloof Valley

606 ORANGE KLOOF EAST 1:

Figure 4.1: Original image by Eugene Moll (c.1970)

Figure 4.2: Repeat image by Zoë C Poulsen (06/01/2011)

SITE INFORMATION

Site No: 606 **Date:** 06/01/2011 **Time spent on site:** 12:30am

Concise Site Name: Orange Kloof East 1

General description of location: Looking east towards west-facing slope across Orange Kloof. Taken from edge of Ring Road

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.98936 **Altitude (m):** 347m asl.

E 18.38887

Original Photographer: Eugene Moll

Original number: Moll_188 **Original date:** c. 1970

Original site/photograph name: Forest at Orange Kloof looking from Ring Road

Notes on accuracy of repeat photo station location: Within a few metres; possibly should be a few metres to the left.

Location Map:

Figure 4.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and Timm Hoffman

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 606 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: 153cm

Photographer's Name: Rick Rohde & Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	145	17mm	1/100	8	140°	12:41am
Canon 450D	Digital	146	17mm	1/100	8	-45°	12:41am
Canon 550D	Digital	147	17mm	1/125	8	+45°	12:41am
Olympus C8080	Digital	S43	28mm	1/200	8	140°	12:44am
Olympus C8080	Digital	S44	28mm	1/200	8	140°	12:44am
Olympus C8080	Digital	S45	28mm	1/200	8	140°	12:44am
Olympus C8080	Digital	S46	28mm	1/200	8	140°	12:44am
Minolta 300s	Fujichrome Provia	10	35mm	1/60	11	140°	12:47am

Notes on weather conditions: Clear and hot

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On upper slopes there are shallow soils (less than 0.5m deep) derived from Table Mountain Sandstone. On the lower slopes in the valley basin there are much deeper granite-derived soils (<2m in depth).

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Steep west-facing slopes of Klassenkop and Belle Ombre in the distance which widens and flattens into Orange Kloof amphitheatre.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

Fynbos Biome (FF02 South-West Fynbos); FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

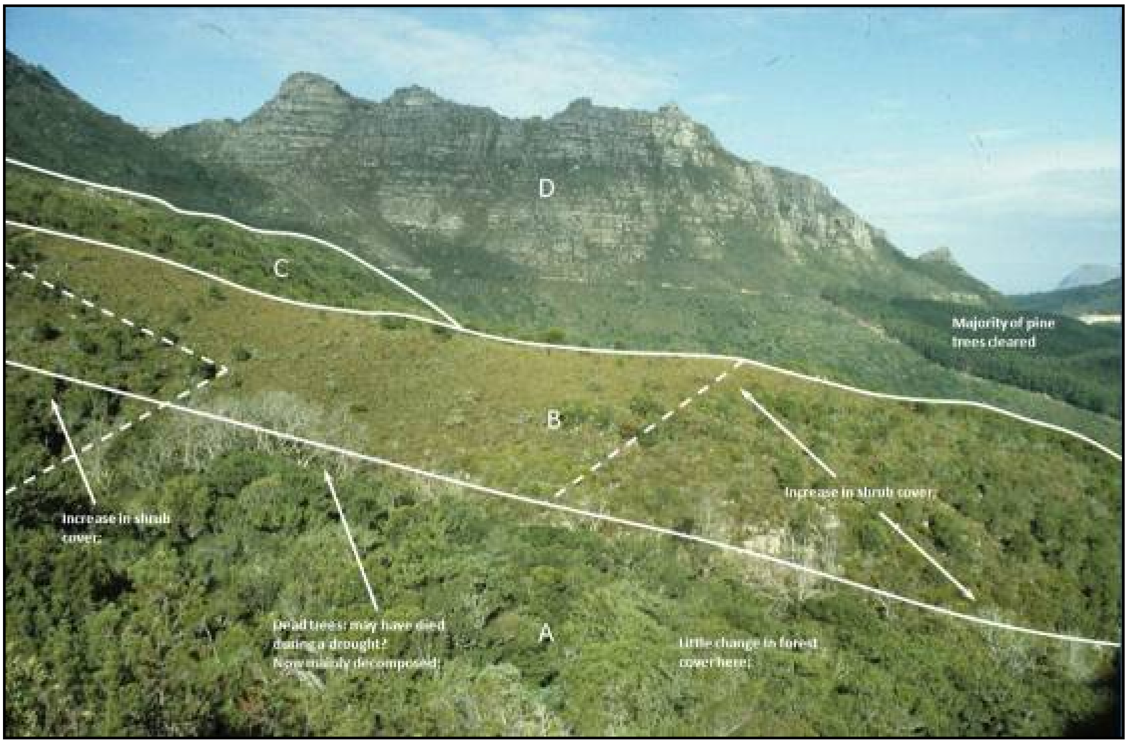

Figure 4.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Afrotemperate forest in kloof below: Little change; dead trees have decomposed. They must have died during a drought which has not occurred again. Small triangle on left midground has increased in cover. *Protea nitida* has been replaced by forest precursor species.

Landform B: Fynbos ridge in midground: There has been a modest increase in shrubby species although many of the original fynbos elements (e.g. *Protea nitida* 'green patch') have remained the same. The rocky 'cliff' on the right is now obscured by enhanced shrub growth.

Landform C: Woody ridge in midground: There has been little change since it was originally thickly vegetated.

Landform D: Distant slope (West-facing): Below the Ring Road, it is more or less unchanged. Pine trees have been removed mostly and natural vegetation has been allowed to recover. Above the Ring Road is very similar perhaps a slight increase in greenness. The firebreak has faded; The very green patch of bracken has stayed the same. On the right there is a dense 'fence-line' that suggests a fire went through and stopped there.

Site no: 606 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 23/09/2011

Landform A: Western Cape Afrotemperate Forest in kloof below

Landform B: Fynbos ridge in midground

Landform C: Woody ridge in midground

Landform D: Distant slope west-facing

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Leucospermum conocarpodendron*	*Leucospermum conocarpodendron*	X	X	X	10	N/A
2	*Kiggelaria africana*	*Kiggelaria africana*	5	X	5	5	N/A
3	*Watsonia tabularis*	*Watsonia tabularis*	X	10	2	5	N/A
4	*Searsia lucida*	*Searsia lucida*	3	0.5	10	10	N/A
5	*Passerina vulgaris*	*Passerina vulgaris*	X	X	X	2	N/A
6	*Podylaria calyptrata*	*Podylaria calyptrata*	2	X	5	5	N/A
7	*Protea lepidocarpodendron*	*Protea lepidocarpodendron*	X	X	X	20	N/A
8	*Leucadendron coniferum*	*Leucadendron coniferum*	X	X	X	2	N/A
9	*Maytenus oleioides*	*Maytenus oleioides*	2	X	5	5	N/A
10	*Diospyros glabra*	*Diospyros glabra*	8	X	X	0.1	N/A
11	*Halleria lucida*	*Halleria lucida*	1	X	2	2	N/A
12	*Muraltia hoisteria*	*Muraltia hoisteria*	X	X	X	2	N/A
13	*Protea nitida*	*Protea nitida*	X	5	X	10	N/A
14	*Cunonia capensis*	*Cunonia capensis*	2	X	20	5	N/A
15	*Brunia nodiflora*	*Brunia nodiflora*	X	X	X	2	N/A
16	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	X	X	X	5	N/A
17	*Searsia tomentosa*	*Searsia tomentosa*	5	2	2	2	N/A
18	*Pelargonium cuculatum*	*Pelargonium cucullatum*	X	X	X	1	N/A
19	*Morella serrata*	*Morella serrata*	X	3	X	1	N/A
20	*Rapanea melanophloeos*	*Rapanea melanophloeos*	5	X	1	0.5	N/A
21	Restionaceae	Restionaceae	X	30	1	20	N/A
22	*Scabiosa africana*	*Scabiosa africana*	X	X	X	1	N/A
23	*Cassine peragua*	*Cassine peragua*	15	5	X	0.5	N/A
24	*Pucedanum galbanum*	*Pudedanum galbanum*	X	X	X	1	N/A
25	*Lobostemon montana*	*Lobostemon montana*	X	X	X	1	N/A

26	*Elegia capensis*	*Elegia capensis*	X	X	X	10	N/A
27	*Erica abietina* subsp. *constantiana*	*Erica abietina* subsp. *constantiana*	X	X	X	0.1	N/A
28	*Moraea tripetala*	*Moraea tripetala*	X	X	X	0.1	N/A
29	*Wachendorfia paniculata*	*Wachendorfia paniculata*	X	X	X	0.1	N/A
30	*Erica baccans*	*Erica baccans*	X	X	X	2	N/A
31	*Lobelia pinifolia*	*Lobelia pinifolia*	X	X	X	1	N/A
32	*Pennaea mucronata*	*Pennaea mucronata*	X	2	X	0.5	N/A
33	*Pelargonium myrrifolium*	*Pelargonium myrrifolium*	X	X	X	0.1	N/A
34	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	X	X	X	1	N/A
35	*Salvia africana caerulea*	*Salvia africana caerulea*	X	X	X	1	N/A
36	*Capelia tabularis*	*Capelia tabularis*	X	0.5	X	1	N/A
37	*Pteridium aquilinum*	*Pteridium aquilinum*	2	3	20	10	N/A
38	*Callimia squarrosa*	*Callimia squarrosa*	X	X	X	2	N/A
39	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	2	4	5	1	N/A
40	*Phylica buxifolia*	*Phylica buxifolia*	X	X	2	X	N/A
41	*Olea capensis*	*Olea capensis*	X	X	2	X	N/A
42	*Ilex mitis*	*Ilex mitis*	0.5	X	2	X	N/A
43	*Colpoon compressum*	*Colpoon compressum*	X	X	2	X	N/A
44	*Bolusafra bituminosa*	*Bolusafra bituminosa*	X	X	2	X	N/A
45	*Myrsine africana*	*Myrsine africana*	X	X	1	X	N/A
46	*Sutera hispida*	*Sutera hispida*	X	X	5	X	N/A
47	*Clutia pulchella*	*Clutia pulchella*	2	X	2	X	N/A
48	*Osmitopsis astericoides*	*Osmitopsis astericoides*	X	X	5	X	N/A
49	*Erica tristis*	*Erica tristis*	X	X	2	X	N/A
50	*Thamnochortus fruticosus*	*Thamnochortus fruticosus*	X	10	2	X	N/A
51	*Tetraria bromoides*	*Tetraria bromoides*	X	3	X	X	N/A
52	*Astilbe ericoides*	*Astilbe ericoides*	X	2	X	X	N/A
53	*Tetraria themalis*	*Tetraria themalis*	X	2	X	X	N/A
54	*Leucadendron strobilinum*	*Leucadendron strobilinum*	X	2	X	X	N/A
55	*Erica* spp. (No flowers)	*Erica* spp. (No flowers)	X	10	X	X	N/A
56	*Montinia caryophyllacea*	*Montinia caryophyllacea*	2	0.5	X	X	N/A
57	*Berzelia abrotanoides*	*Berzelia abrotanoides*	X	5	X	X	N/A

58	*Olea europea africana*	*Olea europea africana*	0.1	X	X	X	N/A
59	*Podocarpus latifolius*	*Podocarpus latifolius*	5	X	X	X	N/A
60	*Maytenus heterophylla*	*Maytenus heterophylla*	2	X	X	X	N/A
61	*Olinia ventosa*	*Olinia ventosa*	2	X	X	X	N/A
62	*Curtisia dentata*	*Curtisia dentata*	1	X	X	X	N/A
63	*Maytenus acuminata*	*Maytenus acuminata*	0.5	X	X	X	N/A
64	*Polygala myrtifolia*	*Polygala myrtifolia*	0.1	X	X	X	N/A
65	*Asparagus capensis*	*Asparagus capensis*	2	X	X	X	N/A
66	*Canthium inerme*	*Canthium inerme*	5	X	X	X	N/A
68	*Maurocenia frangula*	*Maurocenia frangula*	0.5	X	X	X	N/A
69	*Cassine schinoides*	*Cassine schinoides*	2	X	X	X	N/A
70	*Chionanthus foveolatus*	*Chionanthus foveolatus*	0.5	X	X	X	N/A

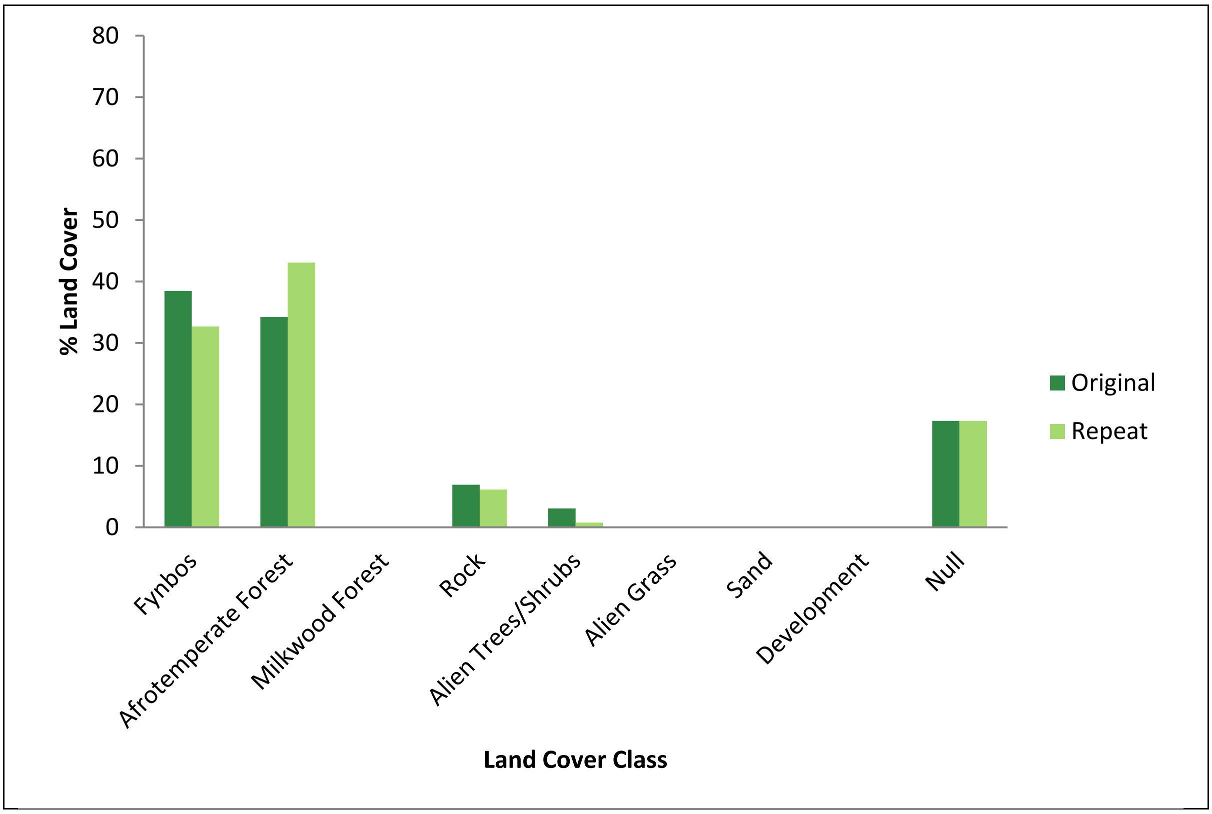

Figure 4.5: Percentages of land cover classes present in original (1970) and repeat (2011) images at Site 606 Orange Kloof East 1

Figure 4.6: Percentage change in land cover classes between 1970 and 2011 at Site 606 Orange Kloof East 1

607 ORANGE KLOOF SOUTH 1:

Figure 5.1: Original image by Eugene Moll (c.1970)

Figure 5.2: Repeat image by Zoë C Poulsen (06/01/2011)

<u>**SITE INFORMATION**</u>

Site No: 607 **Date:** 06.01/2011 **Time spent on site:** 1:15pm

Concise Site Name: Orange Kloof South

General description of location: Looking NE to Table Mountain (Back Table) to 'Orange Face'.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.99226 **Altitude (m):** 343m asl.

E 18.38799

Original Photographer: Eugene Moll

Original number: Moll_079 **Original date:** c. 1970

Original site/photograph name: Forest at Orange Kloof looking from Ring Road

Notes on accuracy of repeat photo station location: Within c. 20-25m but large clump of bushes next to road obscured the view

Location Map:

Figure 5.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and Timm Hoffman

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 607 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: 159cm

Photographer's Name: Zoë Poulsen & Rick Rohde

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	153	17mm	1/80	8	60°	1:27pm
Canon 450D	Digital	154	17mm	1/80	8	-30°	1:29pm
Canon 450D	Digital	155	17mm	1/60	8	+30°	1:31pm
Olympus C8080	Digital	S46	28mm	1/100	8	60°	1:33pm
Olympus C8080	Digital	S47	28mm	1/100	8	60°	1:33pm
Olympus C8080	Digital	S48	28mm	1/100	8	-45°	1:33pm
Olympus C8080	Digital	S49	28mm	1/100	8	+45°	1:33pm
Minolta x-300s	Fujichrome Provia	12	35mm	1/60	11	60°	1:36pm

Notes on weather conditions: Clear and hot

Site no: 607 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes of the valley basin there are much deeper soils derived from granite

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Relatively gentle south-facing slope below Orange Kloof face scarp

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

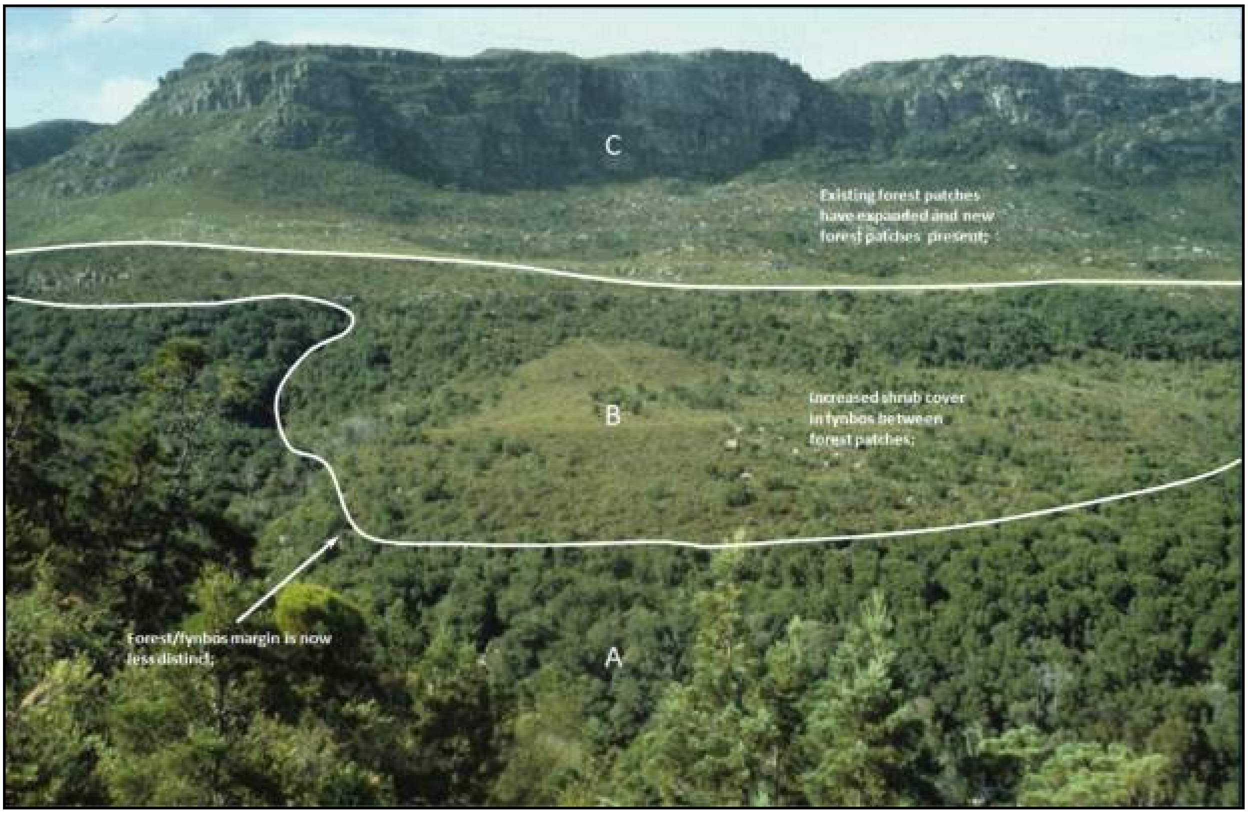

Figure 5.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Western Cape Afrotemperate Forest in kloof: Very little has changed; Margin is a little less distinct than previously.

Landform B: Middle ridge: In the middle open area there has been a slight increase in shrubby elements, particularly towards the forest margin below. The fynbos dominated 'wedge' is still present but perhaps with a slightly less distinct margin. To the right of the fynbos 'wedge' the thicket has increased considerably possibly because *Cunonia capensis* has increased in cover at this site. The forest patch to the left of the fynbos wedge is little changed. The canopy might be a little taller and more differentiated today.

Landform C: Slope and cliffs above the ring road: This area has experienced some increase of forest cover, especially at sites immediately below the cliff itself. Small pockets of forest cover are now evident on the upper sections of this slope. On the left of the ridgeline separating the upper and lower slope was quite distinct but this is less so today. Perhaps fire history has a role to play.

Site no: 607 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Landform A: Western Cape Afrotemperate Forest in kloof

Landform B: Middle ridge

Landform C: Slope and cliffs above the ring road (No species data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Watsonia tabularis*	*Watsonia tabularis*	X	10		N/A	N/A
2	*Searsia lucida*	*Searsia lucida*	3	0.5		N/A	N/A
3	*Protea nitida*	*Protea nitida*	X	5		N/A	N/A
4	*Searsia tomentosa*	*Searsia tomentosa*	5	2		N/A	N/A
5	Restionaceae	Restionaceae	X	30		N/A	N/A
6	*Cassine peragua*	*Cassine peragua*	15	5		N/A	N/A
7	*Capelia tabularis*	*Capelia tabularis*	X	0.5		N/A	N/A
8	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	2	4		N/A	N/A
9	*Thamnochortus fruticosus*	*Thamnochortus fruticosus*	X	10		N/A	N/A
10	*Tetraria bromoides*	*Tetraria bromoides*	X	3		N/A	N/A
11	*Astilbe ericoides*	*Astilbe ericoides*	X	2		N/A	N/A
12	*Tetraria themalis*	*Tetraria themalis*	X	2		N/A	N/A
13	*Leucadendron strobilinum*	*Leucadendron strobilinum*	X	2		N/A	N/A
14	*Erica* spp. (No flowers)		X	10		N/A	N/A
15	*Montinia caryophyllacea*	*Montinia caryophyllacea*	2	0.5		N/A	N/A
16	*Berzelia abrotanoides*	*Berzelia abrotanoides*	X	5		N/A	N/A
17	*Maytenus oleioides*	*Maytenus oleioides*	2	X		N/A	N/A
18	*Kiggelaria africana*	*Kiggelaria africana*	5	X		N/A	N/A
19	*Diospyros glabra*	*Diospyros glabra*	8	X		N/A	N/A
20	*Olea europea africana*	*Olea europea africana*	0.1	X		N/A	N/A
21	*Ilex mitis*	*Ilex mitis*	0.5	X		N/A	N/A
22	*Podocarpus latifolius*	*Podocarpus latifolius*	5	X		N/A	N/A
23	*Maytenus heterophylla*	*Maytenus heterophylla*	2	X		N/A	N/A
24	*Pteridium aquilinum*	*Pteridium aquilinum*	2	X		N/A	N/A
25	*Rapanea melanophloeos*	*Rapanea melanophloeos*	5	X		N/A	N/A

26	*Olinia ventosa*	*Olinia ventosa*	2	X		N/A	N/A
27	*Curtisia dentata*	*Curtisia dentata*	1	X		N/A	N/A
28	*Maytenus acuminata*	*Maytenus acuminata*	0.5	X		N/A	N/A
29	*Polygala myrtifolia*	*Polygala myrtifolia*	0.1	X		N/A	N/A
30	*Asparagus capensis*	*Asparagus capensis*	2	X		N/A	N/A
31	*Canthium inerme*	*Canthium inerme*	2	X		N/A	N/A
32	*Aristea macrocarpa*	*Aristea macrocarpa*	2	X		N/A	N/A
33	*Halleria lucida*	*Halleria lucida*	1	X		N/A	N/A
34	*Cunonia capensis*	*Cunonia capensis*	2	X		N/A	N/A
35	*Blechnum tabulare*	*Blechnum tabulare*	0.5	X		N/A	N/A
36	*Maurocenia frangula*	*Maurocenia frangula*	0.5	X		N/A	N/A
37	*Cassine schinoides*	*Hartogiella schinoides*	2	X		N/A	N/A
38	*Podylaria calyptrata*	*Podylaria calyptrata*	2	X		N/A	N/A
39	*Clutia pulchella*	*Clutia pulchella*	2	X		N/A	N/A
40	*Scolopia mundii*	*Scolopia mundii*	0.5	X		N/A	N/A
41	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	5	X		N/A	N/A
42	*Cyathea capensis*	*Cyathea capensis*	0.5	X		N/A	N/A
43	*Colpoon compressum*	*Colpoon compressum*	2	X		N/A	N/A
44	*Chionanthus foveolatus*	*Chionanthus foveolatus*	0.5	X		N/A	N/A
45	*Erica caffra*	*Erica caffra*	0.1	X		N/A	N/A

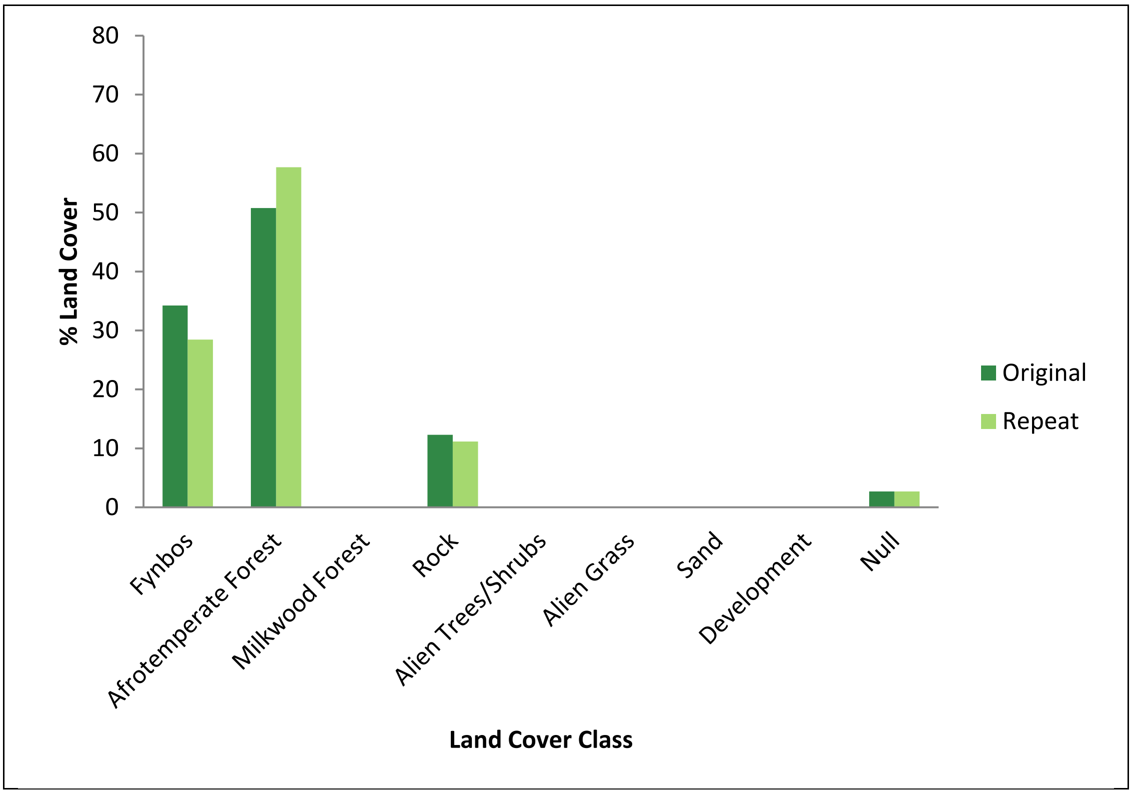

Figure 5.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 607 Orange Kloof South 1

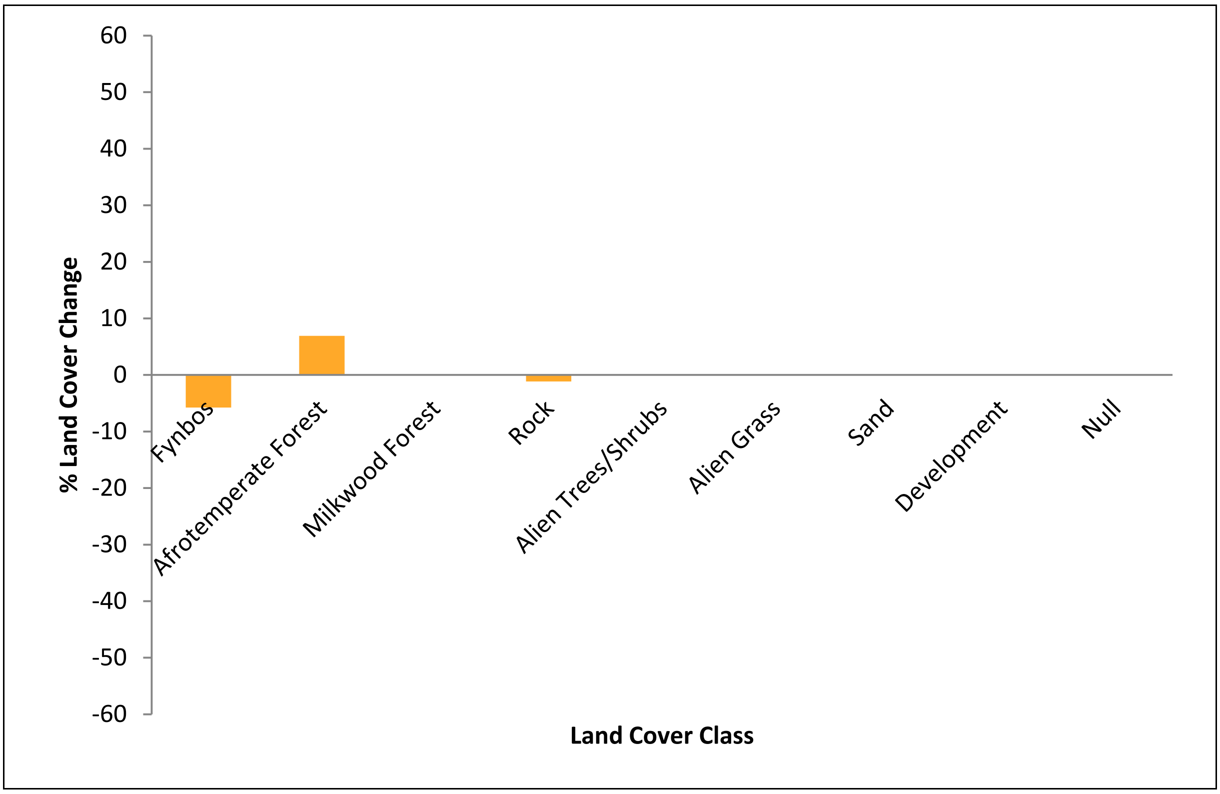

Figure 5.6: Percentage change in land cover classes between 1970 and 2011 at Site 607 Orange Kloof South

608 ORANGE KLOOF EAST 2:

Figure 6.1: Original image by Eugene Moll (c.1970)

Figure 6.2: Repeat image by Zoë C Poulsen (06/01/2011)

SITE INFORMATION

Site No: 608 **Date:** 06.01/2011 **Time spent on site:** 1:45pm

Concise Site Name: Orange Kloof East 2

General description of location: Looking ESE to De Villiers dam, Klassenkop and Belle Ombre Peaks and valley below Orange Kloof Ring Road;

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.99244 **Altitude (m):** 346m asl.

E 18.38801

Original Photographer: Eugene Moll

Original number: Moll_189 **Original date:** c. 1970

Original site/photograph name: Forest at Orange Kloof looking from Ring Road

Notes on accuracy of repeat photo station location: Within a few metres of original

Location Map:

Figure 6.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Rick Rohde and Timm Hoffman

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 608 **PHOTOGRAPHIC INFORMATION** **Date:** 06/01/2011

Camera Height: 159cm

Photographer's Name: Zoë Poulsen & Rick Rohde

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	157	17mm	1/100	8	110°	2:00pm
Canon 450D	Digital	158	17mm	1/80	8	-45°	2:01pm
Canon 450D	Digital	159	17mm	1/60	8	+45°	2:02pm
Olympus C8080	Digital	S50	28mm	1/100	8	110°	2:05pm
Olympus C8080	Digital	S51	28mm	1/100	8	110°	2:05pm
Olympus C8080	Digital	S52	28mm	1/100	8	-45°	2:05pm
Olympus C8080	Digital	S53	28mm	1/100	8	+45°	2:06pm
Minolta x-300s	Fujichrome Provia	14	35mm	1/60	11	110°	2:07pm

Notes on weather conditions: Clear and hot

Site no: 608 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Geology: Table Mountain Sandstone and Granite below the ring road

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes of the valley basin there are much deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Steep, west-facing slope and wide amphitheatre of Orange Kloof.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

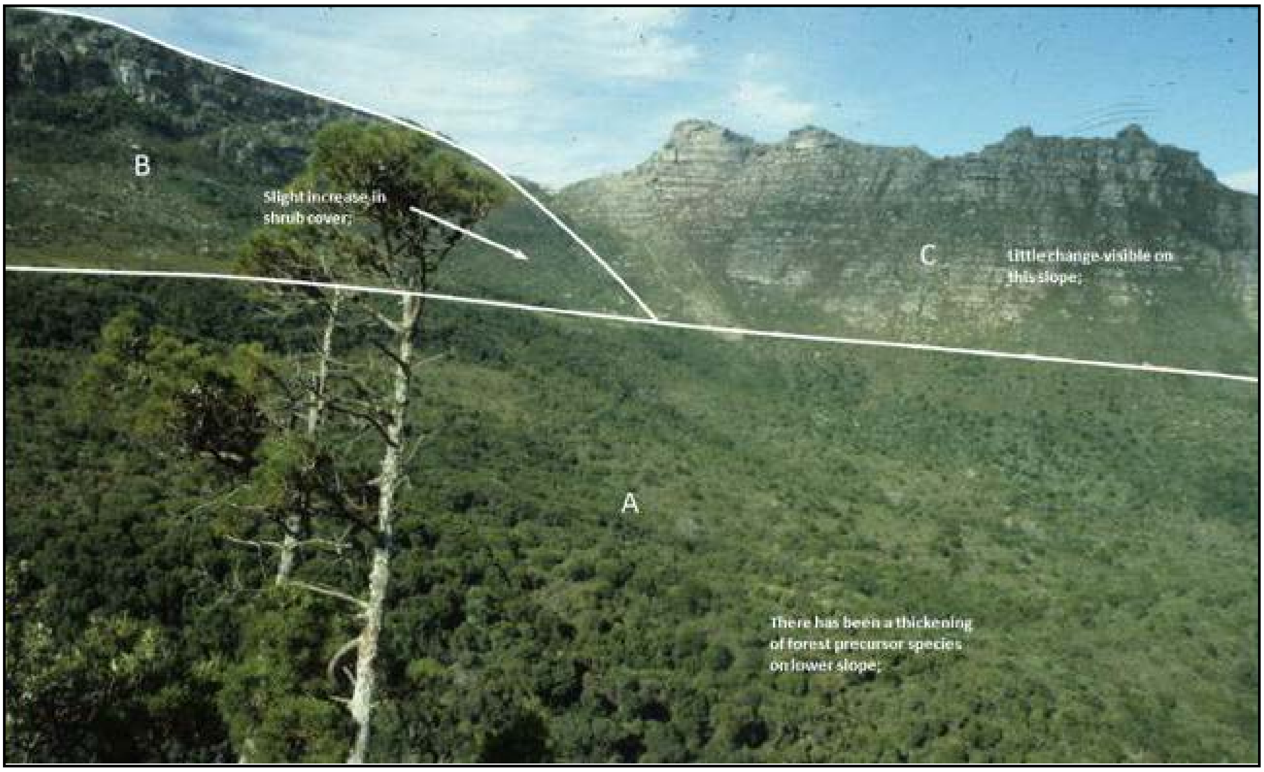

Figure 6.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Valley below ring road: Lower down towards the bottom of the slope there has been a significant thickening of shrub and forest precursor species. Higher up, towards the road itself this thickening is less obvious and open patches remain more or less the same as before.

Landform B: Left west-facing ridge above ring road: Very little change on this slope. There has been a slight increase in shrub cover to the left below the dam.

Landform C: Right west-facing ridge above ring road: No noticeable change in cover on this slope.

Site no: 608 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 06/01/2011

Landform A: Valley below ring road

Landform B: Left west-facing ridge above ring road

Landform C: Right west-facing slope above ring road

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Erica abietina* subsp. *constantiana*	*Erica abietina* subsp. *constatiana*		X	20	N/A	N/A
2	*Moreaea tripetala*	*Moraea tripetala*		X	0.1	N/A	N/A
3	*Maytenus oleioides*	*Maytenus oleioides*		2	2	N/A	N/A
4	*Struthiola ciliata*	*Struthiola ciliata*		X	2	N/A	N/A
5	*Protea nitida*	*Protea nitida*		X	5	N/A	N/A
6	*Brunia nodiflora*	*Brunia nodiflora*		X	2	N/A	N/A
7	*Protea lepidocarpodendron*	*Protea lepidocarpodendron*		X	10	N/A	N/A
8	*Leucadendron salignum*	*Leucadendron salignum*		X	2	N/A	N/A
9	*Tetraria themalis*	*Tetraria themalis*		X	2	N/A	N/A
10	*Wachendorfia paniculata*	*Wachendorfia paniculata*		X	1	N/A	N/A
11	*Erica baccans*	*Erica baccans*		X	3	N/A	N/A
12	*Lobelia pinifolia*	*Lobelia pinifolia*		X	2	N/A	N/A
13	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*		X	5	N/A	N/A
14	*Pennaea mucronata*	*Pennaea mucronata*		X	1	N/A	N/A
15	*Pelargonium myrrifolium*	*Pelargonium myrrifolium*		X	0.5	N/A	N/A
16	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*		X	2	N/A	N/A
17	*Salvia africana-caureula*	*Salvia africana-caureula*		X	0.5	N/A	N/A
18	*Searsia tomentosa*	*Searsia tomentosa*		5	2	N/A	N/A
19	*Lobostemon montana*	*Lobostemon montana*		X	2	N/A	N/A
20	*Muraltia heisteria*	*Muraltia heisteria*		X	5	N/A	N/A
21	*Capelia tabularis*	*Capelia tabularis*		X	1	N/A	N/A
22	*Berkheya barbata*	*Berkheya barbata*		X	5	N/A	N/A
23	*Pelargonium cucullatum*	*Pelargonium cucullatum*		X	2	N/A	N/A
24	*Searsia lucida*	*Searsia lucida*		3	10	N/A	N/A
25	*Stilbe ericoides*	*Stilbe ericoides*		X	2	N/A	N/A

26	*Leucospermum conocarpodendron*	*Leucospermum conocarpodendron*		X	5	N/A	N/A
27	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*		2	1	N/A	N/A
28	*Syncapha vestita*	*Syncarpha vestita*		X	2	N/A	N/A
29	*Mimetes fimbrifolius*	*Mimetes fimbrifolius*		X	1	N/A	N/A
30	*Kiggelaria africana*	*Kiggelaria africana*		5	X	N/A	N/A
31	*Diospyros glabra*	*Diospyros glabra*		8	X	N/A	N/A
32	*Cassine peragua*	*Cassine peragua*		15	X	N/A	N/A
33	*Olea europea africana*	*Olea europea africana*		0.1	X	N/A	N/A
34	*Ilex mitis*	*Ilex mitis*		0.5	X	N/A	N/A
35	*Podocarpus latifolius*	*Podocarpus latifolius*		5	X	N/A	N/A
36	*Maytenus heterophylla*	*Maytenus heterophylla*		2	X	N/A	N/A
37	*Pteridium aquilinum*	*Pteridium aquilinum*		2	X	N/A	N/A
38	*Rapanea melanophloeos*	*Rapanea melanophloeos*		5	X	N/A	N/A
39	*Olinia ventosa*	*Olinia ventosa*		2	X	N/A	N/A
40	*Curtisia dentata*	*Curtisia dentata*		1	X	N/A	N/A
41	*Maytenus acuminata*	*Maytenus acuminata*		0.5	X	N/A	N/A
42	*Polygala myrtifolia*	*Polygala myrtifolia*		0.1	X	N/A	N/A
43	*Asparagus capensis*	*Asparagus capensis*		2	X	N/A	N/A
44	*Canthium inerme*	*Canthium inerme*		5	X	N/A	N/A
45	*Aristea macrocarpa*	*Aristea macrocarpa*		2	X	N/A	N/A
46	*Halleria lucida*	*Halleria lucida*		1	X	N/A	N/A
47	*Cunonia capensis*	*Cunonia capensis*		2	X	N/A	N/A
48	*Blechnum tabulare*	*Blechnum tabulare*		0.5	X	N/A	N/A
49	*Maurocenia frangula*	*Maurocenia frangula*		0.5	X	N/A	N/A
50	*Montinia caryophyllacea*	*Montinia caryophyllacea*		2	X	N/A	N/A
51	*Cassine schinoides*	*Cassine schinoides*		2	X	N/A	N/A
52	*Podylaria calyptrata*	*Podylaria calyptrata*		2	X	N/A	N/A
53	*Clutia pulchella*	*Clutia pulchella*		2	X	N/A	N/A
54	*Scolopia mundii*	*Scolopia mundii*		0.5	X	N/A	N/A
55	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*		5	X	N/A	N/A
56	*Cyathea capensis*	*Cyathea capensis*		0.5	X	N/A	N/A
57	*Colpoon compressum*	*Colpoon compressum*			2	X	N/A

58	*Chionanthus foveolatus*	*Chionanthus foveolatus*			0.5	X	N/A	N/A
59	*Erica caffra*	*Erica caffra*			0.1	X	N/A	N/A

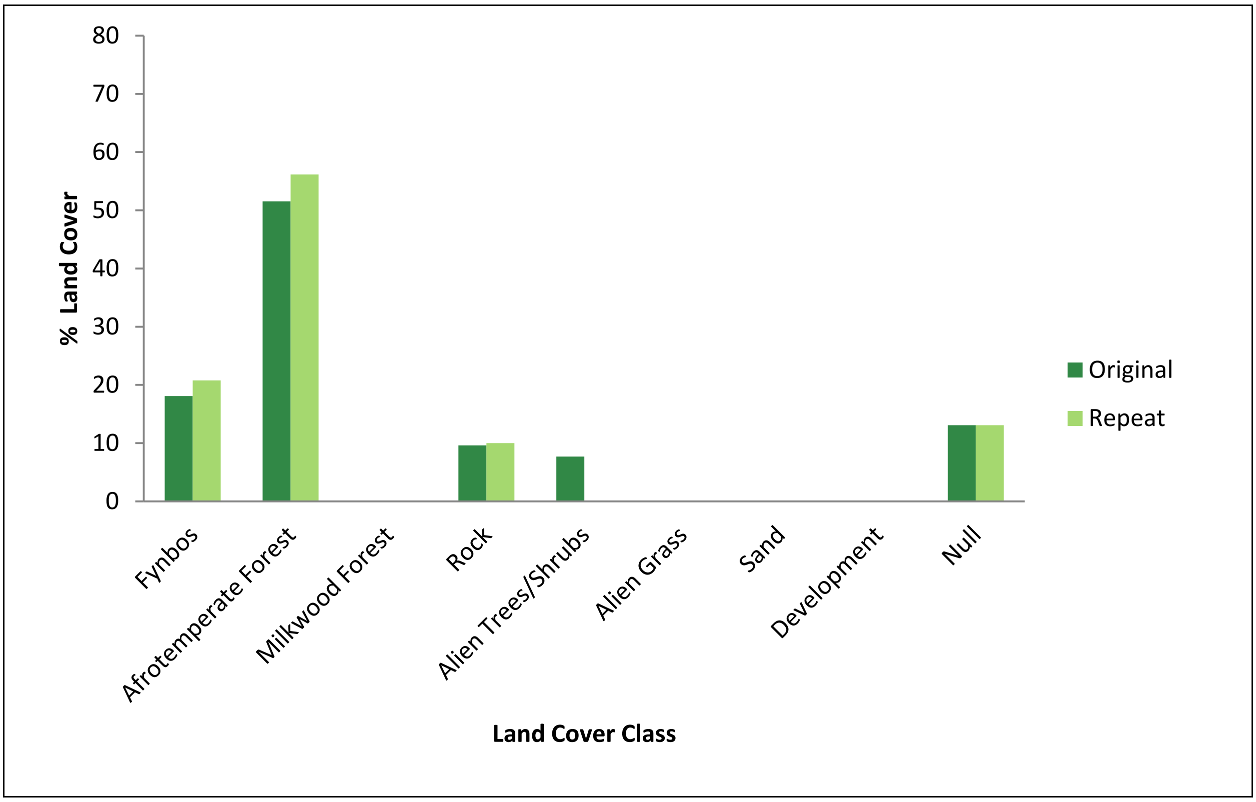

Figure 6.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 608 Orange Kloof East 2

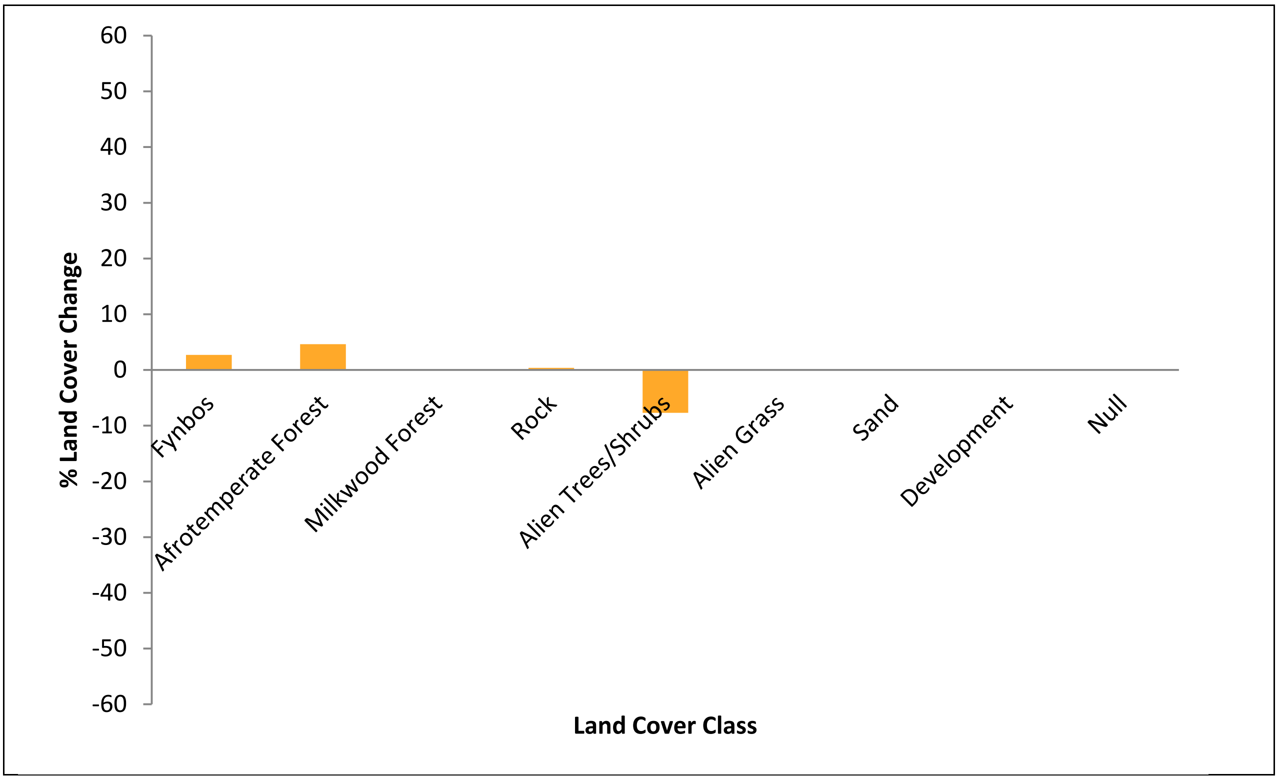

Figure 6.6: Percentage change in land cover classes between 1970 and 2011 at Site 608 Orange Kloof East 2

969 KIRSTENBOSCH:

Figure 7.1: Original image by Hall (c.1980)

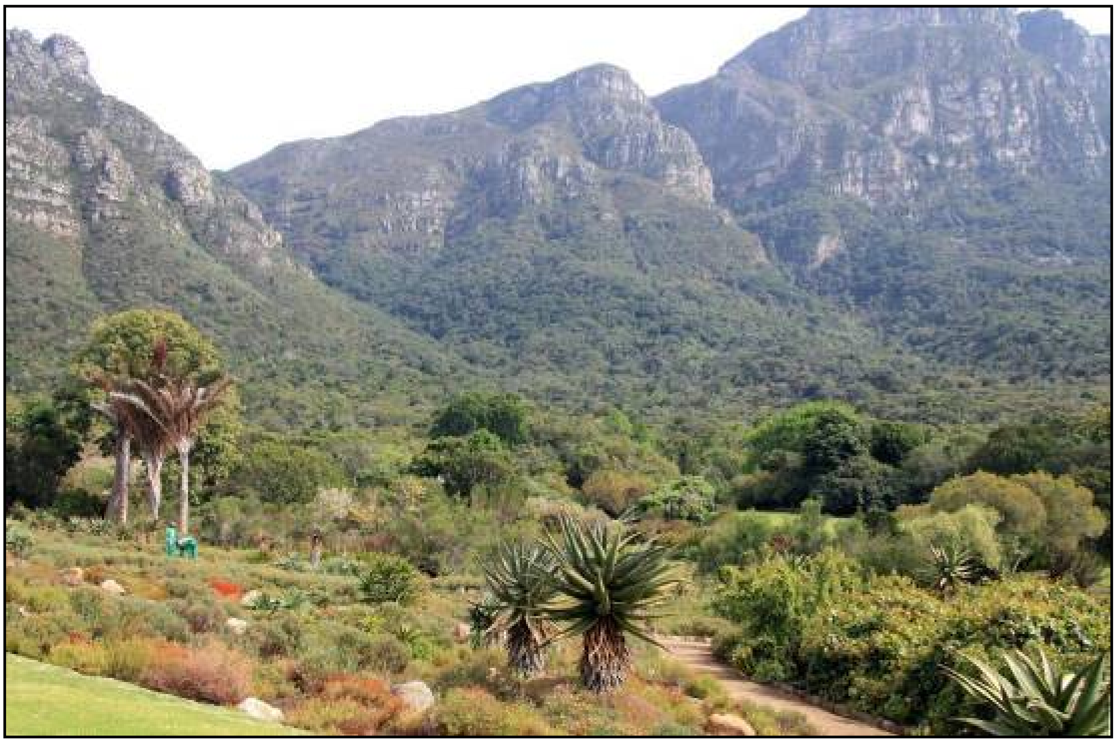

Figure 7.2: Repeat image by Zoë C Poulsen (21/09/2011)

SITE INFORMATION

Site No: 969 **Date:** 21/09/2011 **Time spent on site:** 9:01am

Concise Site Name: Kirstenbosch Main Entrance

General description of location: On lawns below Matthew's Rockery at Kirstenbosch National Botanic Gardens looking towards Fernwood Buttress, Window Gorge, Skeleton Gorge and Castle Rocks on Table Mountain.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S 33.989479 **Altitude (m):** 141m asl.

E 18.431443

Original Photographer: Hall

Original number: Hall_197 **Original date:** c. 1980

Original site/photograph name: Table Mountain looking from Kirstenbosch Botanical Gardens

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

Figure 7.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 969 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	492	24mm	1/125	8	300°	9:10am
Canon 450D	Digital	493	24mm	1/125	8	300°	9:15am
Canon 450D	Digital	494	24mm	1/125	8	300°	9:16am

Notes on weather conditions: Cool spring day with scattered low cloud on the mountain

Site no: 969 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes within the botanical gardens there are much deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking west towards the predominantly forested eastern-facing slopes of Table Mountain up above Kirstenbosch with steep-sided kloofs of Window Gorge, Skeleton Gorge and Nursery Ravine.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest; Cultivated landscape of Kirstenbosch Botanical Gardens;

Description of major changes:

Figure 7.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Kirstenbosch Botanical Gardens – Cultivated – There has been considerable change in the planting of the flowerbeds in the foreground of the image, and an increase in height of the trees in the background of the gardens in this image.

Landform B: Western Cape Afrotemperate Forest on lower slope – There has been little change at this site. There has been a slight increase in canopy height of trees and the forest canopy looks more differentiated. There has been expansion at the forest margins into the surrounding fynbos.

Landform C: Fynbos and cliff faces on upper Table Mountain slopes – On the upper slopes of Table Mountain there has been relatively little change since the original image was taken. There has been an increase in shrubby cover owing to exclusion of fire from the area and a few scattered pine trees have colonised the slopes. There has been an increase in *Protea nitida* and expansion of forest precursor species into the surrounding fynbos. There is also less bare rock visible on the cliff faces.

Site no: 969 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Landform A: Kirstenbosch Botanical Gardens – Cultivated (No species data collected: N/D)

Landform B: Western Cape Afrotemperate Forest on lower slope

Landform C: Fynbos and cliff faces on upper Table Mountain Slopes; (No species data collected: N/D)

Landform D: N/A

Landform E: N/A

No.	**Working name**	**Species name**	**% cover in landform**				
			A	**B**	**C**	**D**	**E**
1	*Apodyytes dimidiata*	*Apodytes dimidiata*	N/D	0.5	N/D	N/A	N/A
2	*Brabejum stellatifolium*	*Brabejum stellatifolium*	N/D	0.5	N/D	N/A	N/A
3	*Canthium inerme*	*Canthium inerme*	N/D	30	N/D	N/A	N/A
4	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	0.5	N/D	N/A	N/A
5	*Cassine peragua*	*Cassine peragua*	N/D	25	N/D	N/A	N/A
6	*Cassine schinoides*	*Cassine schinoides*	N/D	5	N/D	N/A	N/A
7	*Celtis africana*	*Celtis africana*	N/D	0.1	N/D	N/A	N/A
8	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	10	N/D	N/A	N/A
9	*Clutia pulchella*	*Clutia pulchella*	N/D	10	N/D	N/A	N/A
10	*Cunonia capensis*	*Cunonia capensis*	N/D	25	N/D	N/A	N/A
11	*Curtisia dentata*	*Curtisia dentata*	N/D	25	N/D	N/A	N/A
12	*Cussonia thyrsifolia*	*Cussonia thyrsifolia*	N/D	0.5	N/D	N/A	N/A
13	*Diospyros whyteana*	*Diospyros whyteana*	N/D	25	N/D	N/A	N/A
14	*Grewia occidentalis*	*Grewia occidentalis*	N/D	0.5	N/D	N/A	N/A
15	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.5	N/D	N/A	N/A
16	*Halleria lucida*	*Halleria lucida*	N/D	25	N/D	N/A	N/A
17	*Ilex mitis*	*Ilex mitis*	N/D	5	N/D	N/A	N/A
18	*Kiggelaria africana*	*Kiggelaria africana*	N/D	25	N/D	N/A	N/A
19	*Maurocenia frangula*	*Maurocenia frangula*	N/D	0.5	N/D	N/A	N/A
20	*Maytenus acuminata*	*Maytenus acuminata*	N/D	5	N/D	N/A	N/A
21	*Maytenus oleioides*	*Maytenus oleioides*	N/D	0.5	N/D	N/A	N/A
22	*Ocotea bullata*	*Ocotea bullata*	N/D	0.5	N/D	N/A	N/A
23	*Olea capensis* subsp. *macrocarpa*	*Olea capensis* subsp. *macrocarpa*	N/D	25	N/D	N/A	N/A
24	*Olea europea* subsp. *africana*	*Olea europea* subsp. *africana*	N/D	0.5	N/D	N/A	N/A
25	*Olinia ventosa*	*Olinia ventosa*	N/D	25	N/D	N/A	N/A

26	*Colpoon compressum*	*Colpoon compressum*	N/D	0.5	N/D	N/A	N/A
27	*Podylaria calpytrata*	*Podylaria calyptrata*	N/D	5	N/D	N/A	N/A
28	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	10	N/D	N/A	N/A
29	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	N/D	N/A	N/A
30	*Rapanea melanoploeos*	*Rapanea melanoploeos*	N/D	25	N/D	N/A	N/A
31	*Rhoicissus tomentosa*	*Rhoicissus tomentosa*	N/D	0.5	N/D	N/A	N/A
32	*Searsia lucida*	*Searsia lucida*	N/D	5	N/D	N/A	N/A
33	*Searsia tomentosa*	*Searsia tomentosa*	N/D	0.5	N/D	N/A	N/A
34	*Cassine eucleiformis*	*Cassine eucleiformis*	N/D	0.1	N/D	N/A	N/A
35	*Scutia myrtina*	*Scutia myrtina*	N/D	5	N/D	N/A	N/A
36	*Secamone alpini*	*Secamone alpini*	N/D	10	N/D	N/A	N/A
37	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	N/D	0.5	N/D	N/A	N/A

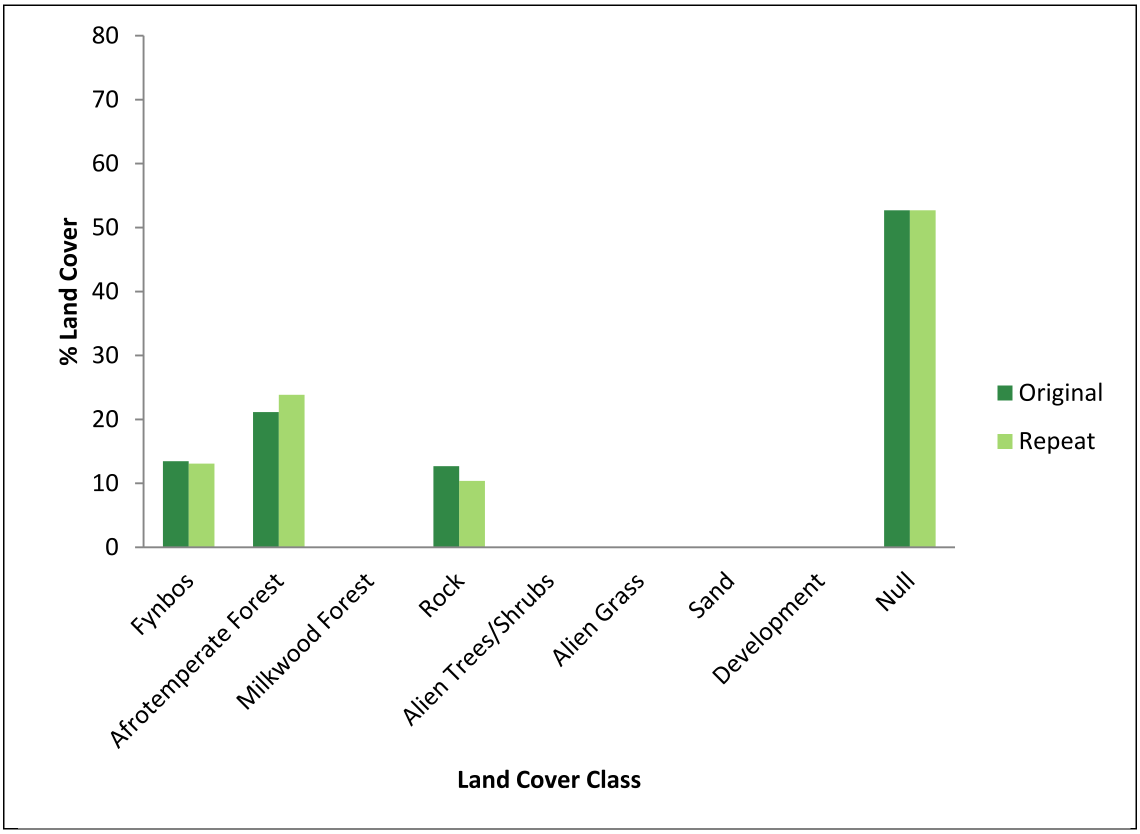

Figure 7.5: Percentages of land cover classes present in original (1980) and repeat image (2011) at Site 969 Kirstenbosch

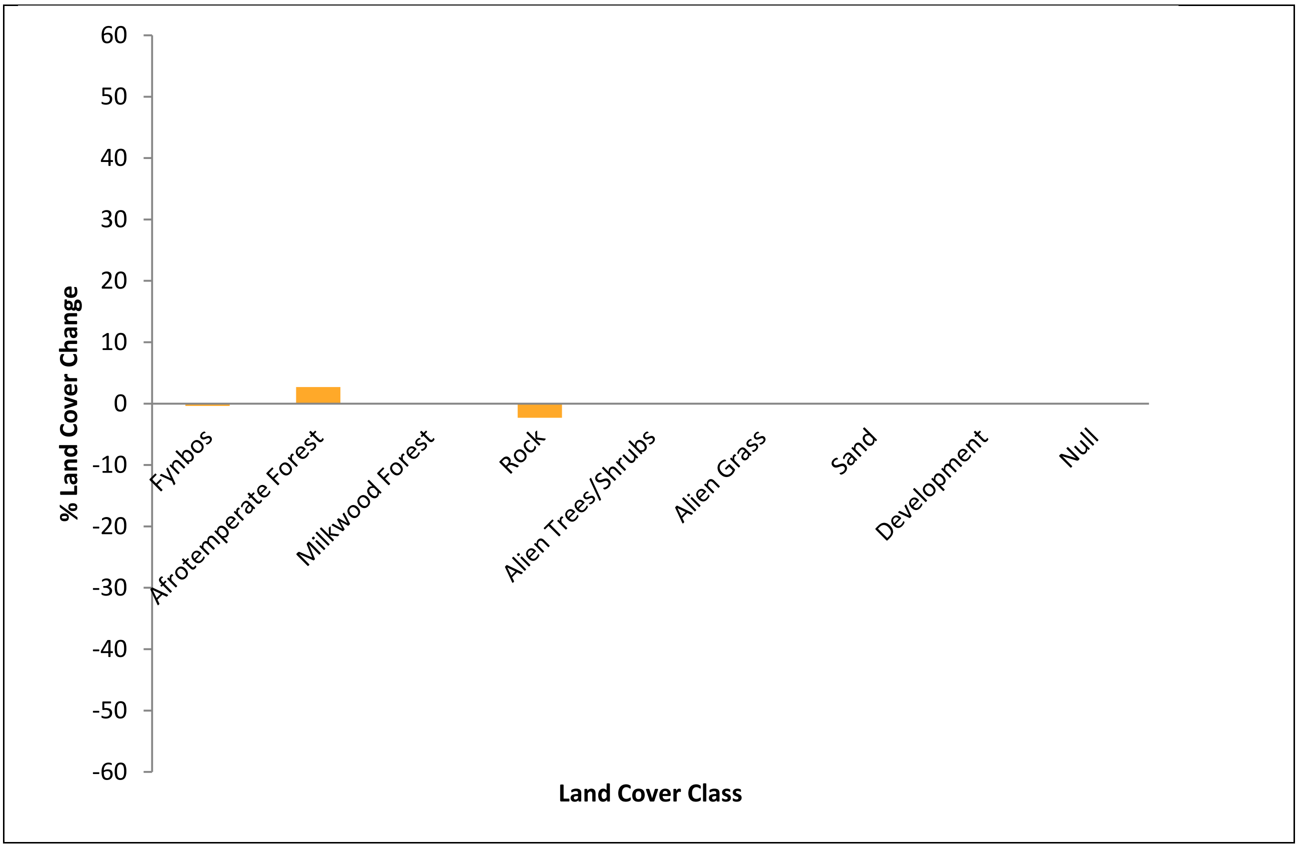

Figure 7.6: Percentage change in land cover classes between 1980 and 2011 at Site 969 Kirstenbosch

970 KIRSTENBOSCH:

Figure 8.1: Original image from the Elliot Collection (South African National Archives) (c. 1900)

Figure 8.2: Repeat image by Zoë C Poulsen (21/09/2011)

<u>**SITE INFORMATION**</u>

Site No: 970 **Date:** 21/09/2011 **Time spent on site:** 10:30am

Concise Site Name: Cycad Amphitheatre: Kirstenbosch National Botanical Gardens

General description of location: Upper path in Cycad Amphitheatre at Kirstenbosch National Botanical Gardens looking west towards Nursery and Vaalkat Buttresses and Nursery and Vaalkat Ravines.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** 33.989665 **Altitude (m):** 168m

E 18.429075

Original Photographer: Elliot

Original number: E5859 **Original date:** c. 1900

Original site/photograph name: Cycad Amphitheatre, Kirstenbosch

Notes on accuracy of repeat photo station location: Within 10m of original location

Location Map:

Figure 8.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 970 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	496	35mm	1/80	8	270°	10:35am
Canon 450D	Digital	497	35mm	1/80	8	270°	10:35am

Notes on weather conditions: Cool spring day with scattered low cloud on the mountain

Site no: 970 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone and granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes within the botanical gardens there are much deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking west towards the steep and rocky Vaalkat and Nursery Buttresses and forested Nursery and Vaalkat Ravines. In the foreground is the Cycad Amphitheatre of the Botanical Gardens that slopes gently in a north-easterly direction;

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 8.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Cycad Amphitheatre – Botanical Gardens: Since the original image was taken the substantial stand of pine trees behind the Cycad Amphitheatre has been cleared and this area now contains scattered mature indigenous trees and lawn and flower beds. Much of the original cycad plantings remain present and have increased in size. Additional cycads have been added to the amphitheatre in the intervening years and there is now formal lawn in between the plantings, replacing the long grass there previously.

Landform B: Western Cape Afrotemperate Forest in Nursery Ravine: In Nursery Ravine there has been some expansion of forest vegetation into the surrounding fynbos. The forest canopy remains similar in height. The margins of the forest patch are far less well defined, indicating a much longer fire interval at this site since the original image was taken by Elliot.

Landform C: Fynbos on Nursery and Vaalkat Buttresses: On Nursery Buttress, Vaalkat Buttress and Rooikat Buttress in the original image there were scattered pine trees that have since been cleared. On Nursery Buttress below the contour path in the original image the vegetation was much less shrubby than above the contour path, indicating that the upper section of the buttress burnt more recently than the lower section. On Nursery Buttress there has been a substantial overall increase in shrubby cover. On Vaalkat Buttress and Rooikat Buttress there has also been a significant increase in shrub cover, but this is slightly less pronounced. On all three buttresses there is considerably less rock visible. The vegetation here is now dominated by *Searsia* spp. and *Protea nitida.* The forest/fynbos boundaries have become much less well defined and there has been an expansion of forest precursor species out into the fynbos surrounding Nursery Ravine.

Site no: 970 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Landform A: Cycad Amphitheatre – Kirstenbosch Botanical Gardens (No species data collected: N/D)

Landform B: Western Cape Afrotemperate Forest in Nursery Ravine

Landform C: Fynbos on Nursery and Vaalkat Buttresses: No species data collected: N/D)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Brabejum stellatifolium*	*Brabejum stellatifolium*	N/D	5	N/D	N/A	N/A
2	*Canthium inerme*	*Canthium inerme*	N/D	10	N/D	N/A	N/A
3	*Cassine peragua*	*Cassine peragua*	N/D	25	N/D	N/A	N/A
4	*Cassine schinoides*	*Cassine schinoides*	N/D	25	N/D	N/A	N/A
5	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	5	N/D	N/A	N/A
6	*Clutia pulchella*	*Clutia pulchella*	N/D	5	N/D	N/A	N/A
7	*Cunonia capensis*	*Cunonia capensis*	N/D	25	N/D	N/A	N/A
8	*Curtisia dentata*	*Curtisia dentata*	N/D	25	N/D	N/A	N/A
9	*Diospyros whyteana*	*Diospyros whyteana*	N/D	50	N/D	N/A	N/A
10	*Halleria lucida*	*Halleria lucida*	N/D	10	N/D	N/A	N/A
11	*Ilex mitis*	*Ilex mitis*	N/D	10	N/D	N/A	N/A
12	*Kiggelaria africana*	*Kiggelaria africana*	N/D	10	N/D	N/A	N/A
13	*Maytenus acuminata*	*Maytenus acuminata*	N/D	25	N/D	N/A	N/A
14	*Maytenus oleioides*	*Maytenus oleioides*	N/D	5	N/D	N/A	N/A
15	*Ocotea bullata*	*Ocotea bullata*	N/D	5	N/D	N/A	N/A
16	*Olea capensis* subsp. *macrocarpa*	*Olea capensis* subsp. *macrocarpa*	N/D	10	N/D	N/A	N/A
17	*Olea europea* subsp. *africana*	*Olea europea* subsp. *africana*	N/D	0.5	N/D	N/A	N/A
18	*Olinia ventosa*	*Olinia ventosa*	N/D	10	N/D	N/A	N/A
19	*Podylaria calyptrata*	*Podylaria calyptrata*	N/D	5	N/D	N/A	N/A
20	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	10	N/D	N/A	N/A
21	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	5	N/D	N/A	N/A
22	*Rapanea melanophloeos*	*Rapanea melanoploeos*	N/D	25	N/D	N/A	N/A
23	*Searsia lucida*	*Searsia lucida*	N/D	10	N/D	N/A	N/A
24	*Searsia tomentosa*	*Searsia tomentosa*	N/D	5	N/D	N/A	N/A
25	*Scolopia mundii*	*Scolopia mundii*	N/D	0.1	N/D	N/A	N/A

26	*Secamone alpini*	*Secamone alpini*	N/D	0.5	N/D	N/A	N/A
27	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	N/D	0.5	N/D	N/A	N/A

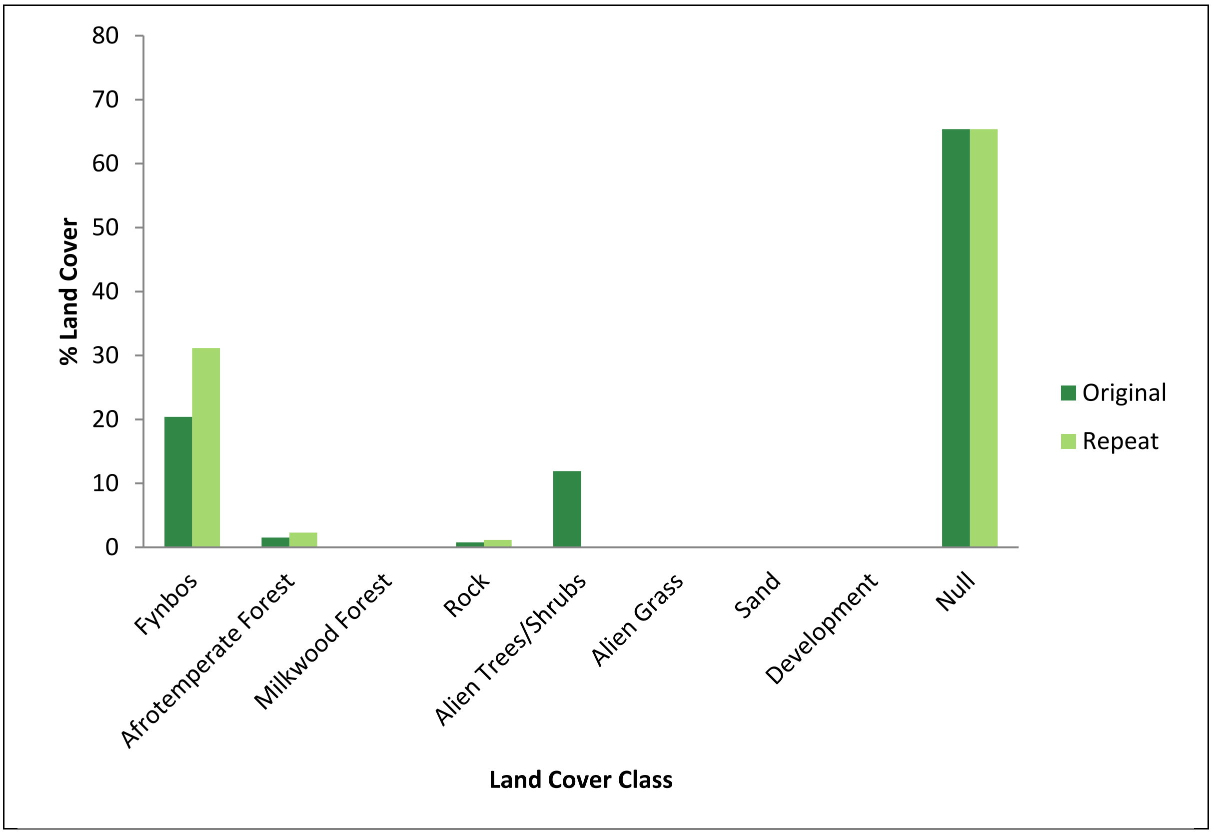

Figure 8.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 970 Kirstenbosch

Figure 8.6: Percentage change in land cover classes between 1900 and 2011 at Site 970 Kirstenbosch

971 KIRSTENBOSCH:

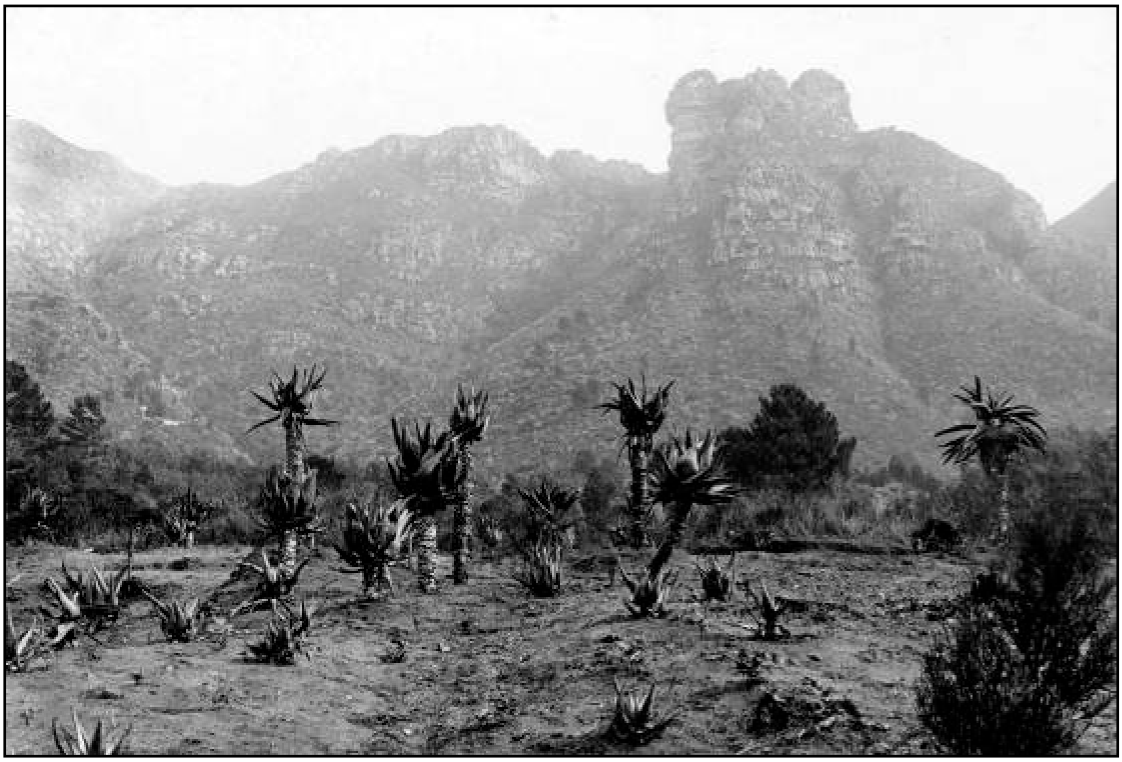

Figure 9.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 9.2: Repeat image by Zoë C Poulsen (21/09/2011)

SITE INFORMATION

Site No: 971 **Date:** 21/09/2011 **Time spent on site:** 11:40pm

Concise Site Name: Lawn below Matthew's Rockery, Kirstenbosch National Botanical Gardens

General description of location: Repeat photo was taken from the centre of the lawn below Matthew's Rockery at Kirstenbosch National Botanical Gardens. The view is looking west towards Nursery, Vaalkat and Rooikat Buttresses, Castle Rocks, Nursery Ravine and Vaalkat Ravine on Table Mountain.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S 33.989465 **Altitude (m):** 142m

E 18.431361

Original Photographer: Elliot Collection (South African National Archives)

Original number: E5759 **Original date:** c. 1900

Original site/photograph name: Kirstenbosch

Notes on accuracy of repeat photo station location: Within c.100m of original location

Location Map:

Figure 9.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 971 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	499	24mm	1/100	8	260°	11:50am
Canon 450D	Digital	500	24mm	1/100	8	260°	11:50am
Canon 450D	Digital	501	24mm	1/100	8	260°	11:50am

Notes on weather conditions: Sunny with scattered cloud cover

Site no: 971 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone

Soils ***(depth, texture, nutrient status, rockiness, litter, etc.)*****:** Shallow soils derived from Table Mountain Sandstone (less than 0.5m)

Landscape description ***(including aspect, slope, catena characteristics, etc.)*****:** View looking west from Kirstenbosch Botanical Gardens towards the east-facing steep rocky Nursery, Vaalkat and Rooikat Buttresses and Nursery and Vaalkat Ravines on Table Mountain.

Vegetation ***(biome, veld type, vegetation type, general description of dominant growth forms & species)*****:**

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 9.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Lawns of Kirstenbosch National Botanical Gardens: The area in the foreground of the original repeat was flowerbed originally. This has now been laid to lawn.

Landform B: Western Cape Afrotemperate Forest in Nursery Ravine: The Western Cape Afrotemperate Forest in Nursery Ravine has shown an increase in patch size and increase in canopy height and differentiation. The margins of the forest patch have become far less well defined as forest precursor species have colonised the surrounding fynbos. This suggests a decrease in fire frequency since the original image was taken.

Landform C: Fynbos on mountain slope: In the original image there were numerous scattered pine trees on the slopes of Nursery Buttress, Vaalkat Buttress and Rooikat Buttress. Most of these have been cleared but a few still remain present on the lower slopes of Nursery Buttress. On the upper slopes of Vaalkat Buttress there seems to have been an increase in cover of *Leucadendron* spp. since the original image was taken. On all of the mountain slopes in the image there has been a substantial increase in shrubby vegetation and also in vegetation height. The forest/fynbos margins have become far less well defined. Far less bare rock is visible than in the original image owing to this increase in shrub cover.

Site no: 971 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Landform A: Lawns of Kirstenbosch Botanical Garden (No data collected: N/D)

Landform B: Western Cape Afrotemperate Forest in Nursery Ravine

Landform C: Fynbos on mountain slope

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Cunonia capensis*	*Cunonia capensis*	N/D	5	2	N/A	N/A
2	*Cassine schinoides*	*Cassine schinoides*	N/D	10	X	N/A	N/A
3	*Diospyros whyteana*	*Diospyros whyteana*	N/D	10	X	N/A	N/A
4	*Rapanea melanoploeos*	*Rapanea melanoploeos*	N/D	5	0.5	N/A	N/A
5	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	2	N/A	N/A
6	*Clutia pulchella*	*Clutia pulchella*	N/D	5	X	N/A	N/A
7	*Cassine peragua*	*Cassine peragua*	N/D	10	2	N/A	N/A
8	*Canthium inerme*	*Canthium inerme*	N/D	2	X	N/A	N/A
9	*Halleria lucida*	*Halleria lucida*	N/D	5	1	N/A	N/A
10	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	2	X	N/A	N/A
11	*Kiggelaria africana*	*Kiggelaria africana*	N/D	2	1	N/A	N/A
12	*Cussonia thyrsifolia*	*Cussonia thrsifolia*	N/D	0.5	X	N/A	N/A
13	*Maytenus acuminata*	*Maytenus acuminata*	N/D	10	X	N/A	N/A
14	*Olea capensis* subsp. *capensis*	*Olea capensis* subsp. *capensis*	N/D	2	X	N/A	N/A
15	*Maytenus oleioides*	*Maytenus oleioides*	N/D	5	X	N/A	N/A
16	*Montinia caryophyllacea*	*Montinia caryophyllacea*	N/D	X	5	N/A	N/A
17	*Aristea major*	*Aristea major*	N/D	X	0.5	N/A	N/A
18	Restionaceae	Restionaceae	N/D	X	10	N/A	N/A
19	*Protea nitida*	*Protea nitida*	N/D	X	15	N/A	N/A
20	*Lichenstinia lacera*	*Lichenstinia lacera*	N/D	X	0.1	N/A	N/A
21	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	N/D	X	15	N/A	N/A
22	*Passerina vulgare*	*Passerina vulgare*	N/D	X	5	N/A	N/A
23	*Searsia lucida*	*Searsia lucida*	N/D	X	2	N/A	N/A
24	*Muraltia heisteria*	*Muraltia heisteria*	N/D	X	1	N/A	N/A
25	*Erica* spp.	*Erica* spp.	N/D	X	5	N/A	N/A

26	*Asparagus capensis*	*Asparagus capensis*	N/D	X	2	N/A	N/A
27	*Watsonia tabularis*	*Watsonia tabularis*	N/D	X	1	N/A	N/A
28	*Searsia tomentosa*	*Searsia tomentosa*	N/D	X	5	N/A	N/A
29	*Scutia myrtina*	*Scutia myrtina*	N/D	X	X	N/A	N/A
30	*Olinia ventosa*	*Olinia ventosa*	N/D	5	X	N/A	N/A
31	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	1	X	N/A	N/A
32	*Curtisia dentata*	*Curtisia dentata*	N/D	10	X	N/A	N/A
33	*Podylaria calyptrata*	*Podylaria calyptrata*	N/D	X	2	N/A	N/A
34	*Pelargonium cuculatum*	*Pelargonium cuculatum*	N/D	X	0.5	N/A	N/A
35	*Olea europea africana*	*Olea europea africana*	N/D	X	X	N/A	N/A
36	*Scabiosa africana*	*Scabiosa africana*	N/D	X	0.5	N/A	N/A
37	*Myrsine africana*	*Myrsine africana*	N/D	X	1	N/A	N/A
38	*Penaea mucronata*	*Penaea mucronata*	N/D	X	2	N/A	N/A
39	*Pteridium aquilinum*	*Pteridium aquilinum*	N/D	X	10	N/A	N/A
40	*Capelia tabulare*	*Capelia tabulare*	N/D	X	0.1	N/A	N/A
41	*Protea coronata*	*Protea coronata*	N/D	X	3	N/A	N/A
42	*Colpoon compressum*	*Colpoon compressum*	N/D	X	0.5	N/A	N/A
43	*Stoebe cinea*	*Stoebe cinea*	N/D	X	0.5	N/A	N/A
44	*Salvia africana caureula*	*Salvia africana caeurela*	N/D	X	0.5	N/A	N/A
45	*Erica baccans*	*Erica baccans*	N/D	X	0.1	N/A	N/A
46	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	N/D	X	0.1	N/A	N/A
47	*Balusifera bituminosa*	*Balusifera bituminosa*	N/D	X	0.5	N/A	N/A

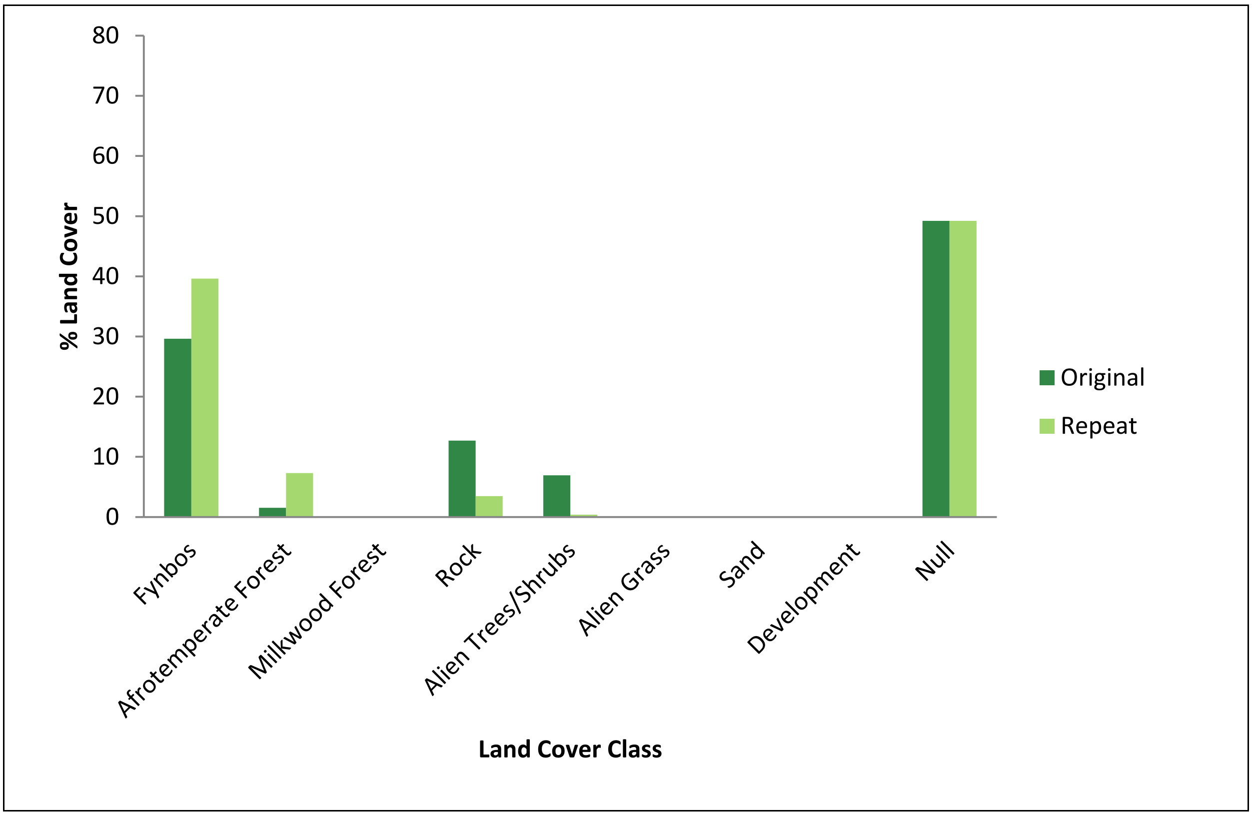

Figure 9.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 971 Kirstenbosch

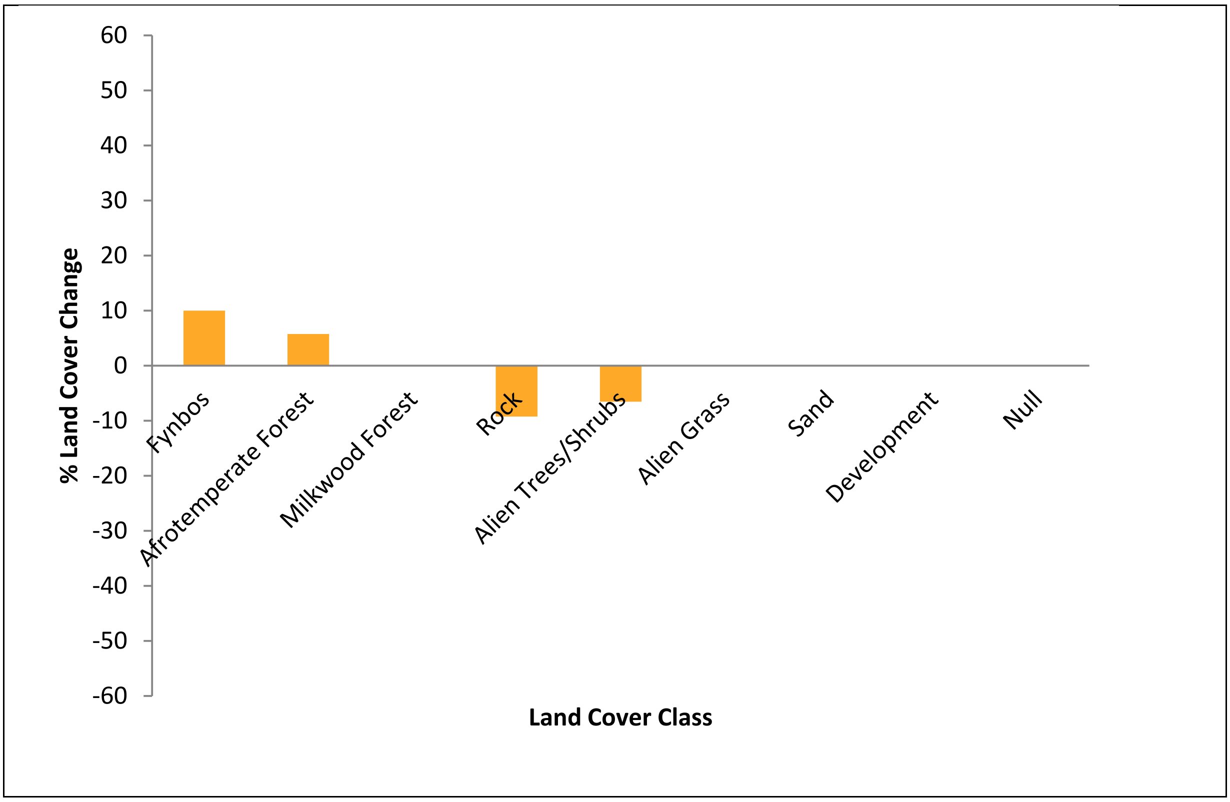

Figure 9.6: Percentage change in land cover classes between 1900 and 2011 at Site 971 Kirstenbosch

972 KIRSTENBOSCH:

Figure 10.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 10.2: Repeat image by Zoë C Poulsen (21/09/2011)

SITE INFORMATION

Site No: 972 **Date:** 21/09/2011 **Time spent on site:** 1:40pm

Concise Site Name: Pond near Silvertree Restaurant – Kirstenbosch National Botanical Gardens

General description of location: Photo taken standing on rock next to pond near the Silvertree Restaurant at Kirstenbosch National Botanical Gardens looking west towards the lower slopes of Table Mountain, encompassing Window Buttress, Window Gorge and Fernwood Buttress.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** 33.988850 **Altitude (m):** 133m

E 18.432023

Original Photographer: Elliot Collection – National Archives

Original number: E5712 **Original date:** c. 1900

Original site/photograph name: E5712

Notes on accuracy of repeat photo station location: Within 10m of original location

Location Map:

Figure 10.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 972 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	504	24mm	1/50	8	300°	1:50pm
Canon 450D	Digital	505	24mm	1/50	8	300°	1:50pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 972 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow soils derived from Table Mountain Sandstone (less than 0.5m)

Landscape description *(including aspect, slope, catena characteristics, etc.)*: This image shows the gently-sloping east-facing lawns of Kirstenbosch National Botanical Gardens in the foreground and in the background the rugged east-facing steep slopes of Table Mountain, encompassing the lower slopes of Window Buttress, Window Gorge and Fernwood Buttress.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 10.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Pond and lawns of Kirstenbosch Botanical Gardens: The pond has been enlarged since the original image was taken and the trees behind the lawn area have grown with time.

Landform B: Western Cape Afrotemperate Forest on Table Mountain: There has been a substantial increase in forest cover on these mountain slopes since the original image was taken. There has been an increase in canopy height since the original image was taken.

Landform C: Fynbos on upper slopes of Window Buttress, Table Mountain: There has been a substantial increase in shrubby cover in the fynbos on the upper slopes of Window Buttress. The area of fynbos vegetation cover has decreased since the original image was taken as forest precursor species have expanded into the surrounding vegetation. There has been an overall increase in vegetation height and there is substantially less bare rock visible.

Site no: 972 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Landform A: Pond and lawns of Kirstenbosch Botanical Gardens

Landform B: Western Cape Afrotemperate Forest on Table Mountain

Landform C: Fynbos on upper slopes of Window Buttress

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodyytes dimidiata*	*Apodytes dimidiata*	N/D	0.5	N/D	N/A	N/A
2	*Brabejum stellatifolium*	*Brabejum stellatifolium*	N/D	0.5	N/D	N/A	N/A
3	*Canthium inerme*	*Canthium inerme*	N/D	30	N/D	N/A	N/A
4	*Afroanthium mundianum*	*Afrocanthium mundianum*	N/D	0.5	N/D	N/A	N/A
5	*Cassine peragua*	*Cassine peragua*	N/D	25	N/D	N/A	N/A
6	*Cassine schinoides*	*Cassine schinoides*	N/D	5	N/D	N/A	N/A
7	*Celtis africana*	*Celtis africana*	N/D	0.1	N/D	N/A	N/A
8	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	10	N/D	N/A	N/A
9	*Clutia pulchella*	*Clutia pulchella*	N/D	10	N/D	N/A	N/A
10	*Cunonia capensis*	*Cunonia capensis*	N/D	25	N/D	N/A	N/A
11	*Curtisia dentata*	*Curtisia dentata*	N/D	25	N/D	N/A	N/A
12	*Cussonia thyrsifolia*	*Cussonia thyrsifolia*	N/D	0.5	N/D	N/A	N/A
13	*Diospyros whyteana*	*Diospyros whyteana*	N/D	25	N/D	N/A	N/A
14	*Grewia occidentalis*	*Grewia occidentalis*	N/D	0.5	N/D	N/A	N/A
15	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.5	N/D	N/A	N/A
16	*Halleria lucida*	*Halleria lucida*	N/D	25	N/D	N/A	N/A
17	*Ilex mitis*	*Ilex mitis*	N/D	5	N/D	N/A	N/A
18	*Kiggelaria africana*	*Kiggelaria africana*	N/D	25	N/D	N/A	N/A
19	*Maurocenia frangula*	*Maurocenia frangula*	N/D	0.5	N/D	N/A	N/A
20	*Maytenus acuminata*	*Maytenus acuminata*	N/D	5	N/D	N/A	N/A
21	*Maytenus oleioides*	*Maytenus oleioides*	N/D	0.5	N/D	N/A	N/A
22	*Ocotea bullata*	*Ocotea bullata*	N/D	0.5	N/D	N/A	N/A
23	*Olea capensis* subsp. *macrocarpa*	*Olea capensis* subsp. *macrocarpa*	N/D	25	N/D	N/A	N/A
24	*Olea europea* subsp. *africana*	*Olea europea* subsp. *africana*	N/D	0.5	N/D	N/A	N/A
25	*Olinia ventosa*	*Olinia ventosa*	N/D	25	N/D	N/A	N/A

26	*Colpoon compressum*	*Colpoon compressum*	N/D	0.5	N/D	N/A	N/A
27	*Podylaria calpytrata*	*Podylaria calyptrata*	N/D	5	N/D	N/A	N/A
28	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	10	N/D	N/A	N/A
29	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	N/D	N/A	N/A
30	*Rapanea melanoploeos*	*Rapanea melanoploeos*	N/D	25	N/D	N/A	N/A
31	*Rhoicissus tomentosa*	*Rhoicissus tomentosa*	N/D	0.5	N/D	N/A	N/A
32	*Searsia lucida*	*Searsia lucida*	N/D	5	N/D	N/A	N/A
33	*Searsia tomentosa*	*Searsia tomentosa*	N/D	0.5	N/D	N/A	N/A
34	*Scutia myrtina*	*Scutia myrtina*	N/D	5	N/D	N/A	N/A
35	*Secamone alpini*	*Secamone alpini*	N/D	10	N/D	N/A	N/A
36	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	N/D	0.5	N/D	N/A	N/A

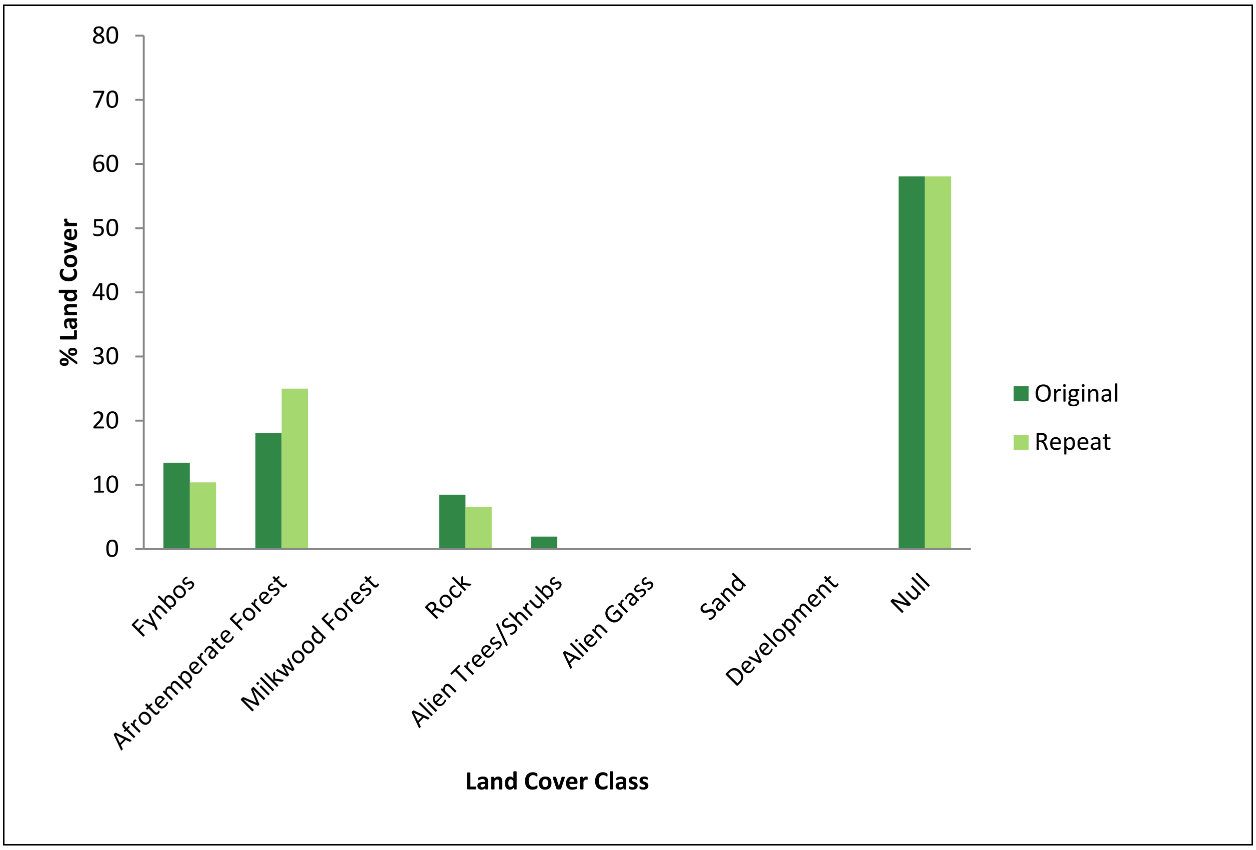

Figure 10.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 972 Kirstenbosch

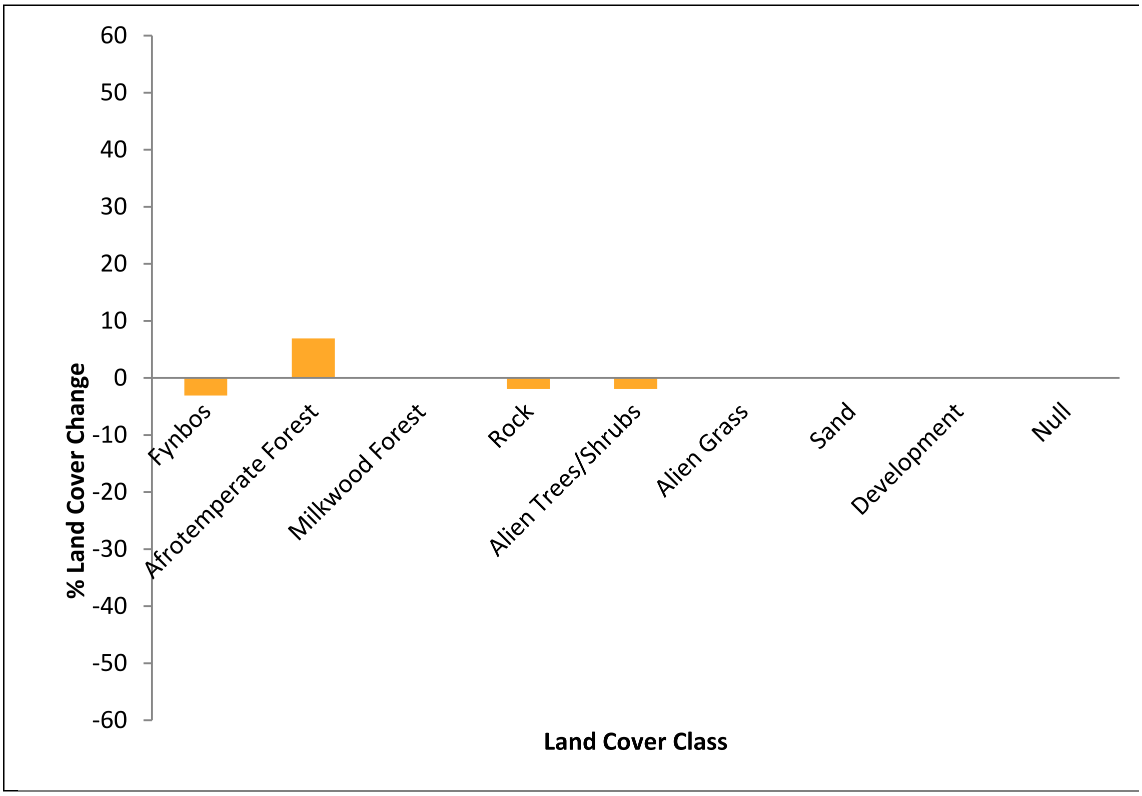

Figure 10.6: Percentage change in land cover classes between 1900 and 2011 at Site 972 Kirstenbosch

973 ORANGE KLOOF:

Figure 11.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 11.2: Repeat image by Zoë C Poulsen (21/09/2011)

SITE INFORMATION

Site No: 973 **Date:** 21/09/2011 **Time spent on site:** 2:55pm

Concise Site Name: Orange Kloof Ring Road – Pine plantation

General description of location: On ring road in Orange Kloof next to pine plantation looking north-west across Orange Kloof.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.999915 **Altitude (m):** 315m

E 18.399991

Original Photographer: Elliot Collection (National Archives)

Original number: E451 **Original date:** c. 1900

Original site/photograph name: Orange Kloof

Notes on accuracy of repeat photo station location: Within 10m of original site, owing to pine trees obscuring the view at the correct location.

Location Map:

Figure 11.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	**River system**	**Grazing land (communal)**	**Grazing land (private)**	**Cultivated field**	**Settlement**	**Conservation area**

Keywords:	**Communal lands**	**Land reform**	**Development**	**Indicator species**	**Population dynamics**	**Climate change**

Site no: 973 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	506	24mm	1/100	8	335°	3:00pm
Canon 450D	Digital	507	24mm	1/80	8	335°	3:00pm
Canon 450D	Digital	508	24mm	1/100	8	335°	3:00pm
Canon 450D	Digital	509	24mm	1/100	8	335°	3:00pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 973 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes of the valley basin there are much deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Shallow-sided Kloof of Orange Kloof – forming natural amphitheatre in the landscape. Steep-sided slopes of kloof margin facing east-south and west and shallower south-facing slopes.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 11.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground west-facing slope: There has been a massive increase in shrubby cover and decrease in grassy cover. Since the original image was taken this slope was afforested with pines and they were later cleared during the 1990s by SANParks. In the original image there were scattered *Protea nitida,* however now there has been an increase in cover of *Searsia* spp. which forms the dominant vegetation cover here.

Landform B: Western Cape Afrotemperate Forest in kloofs: There has been a massive increase in forest cover since the original photo was taken – almost all of the kloof is now covered by either pioneer or climax forest. At the margins of the forest there has been a substantial increase in shrubby cover.

Landform C: Fynbos south-facing slope above the ring road: There has been a significant increase in shrubby cover above the ring road. Forest patches on this slope have expanded and their margins have become less well defined. This is owing to exclusion of fire at this site over the long term. There has been an increase in cover of *Widdringtonia nodiflora*. On the upper south-facing slopes of the kloof there has been an increase in cover of *Leucadendron* spp.

Site no: 973 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Landform A: Foreground west-facing slope

Landform B: Western Cape Afrotemperate Forest in kloofs

Landform C: Fynbos south-facing slope above the ring road (N/D – No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Searsia tomentosa*	*Searsia tomentosa*	20	5	N/D	N/A	N/A
2	*Kiggelaria africana*	*Kiggelaria africana*	5	5	N/D	N/A	N/A
3	*Searsia lucida*	*Searsia lucida*	20	3	N/D	N/A	N/A
4	*Brunia nodiflora*	*Brunia nodiflora*	5	X	N/D	N/A	N/A
5	*Protea nitida*	*Protea nitida*	5	X	N/D	N/A	N/A
6	*Passerina vulgaris*	*Passerina vulgaris*	5	X	N/D	N/A	N/A
7	*Diospyros whyteana*	*Diospyros whyteana*	0.1	X	N/D	N/A	N/A
8	*Metalasia muricata*	*Metalasia muricata*	1	X	N/D	N/A	N/A
9	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	2	X	N/D	N/A	N/A
10	*Polygala myrtifolia*	*Polygala myrtifolia*	5	0.5	N/D	N/A	N/A
11	*Watsonia tabularis*	*Watsonia tabularis*	10	X	N/D	N/A	N/A
12	*Maytenus oleioides*	*Maytenus oleioides*	10	2	N/D	N/A	N/A
13	*Podylaria calyptrata*	*Podylaria calyptrata*	10	2	N/D	N/A	N/A
14	*Phylica buxifolia*	*Phylica buxifolia*	10	X	N/D	N/A	N/A
15	*Virgilia oroboides*	*Virgilia oroboides*	1	X	N/D	N/A	N/A
16	*Afrocanthium mundianum*	*Afrocanthium mundianum*	1	X	N/D	N/A	N/A
17	*Cunonia capensis*	*Cunonia capensis*	2	2	N/D	N/A	N/A
18	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	2	X	N/D	N/A	N/A
19	*Rapanea melanophloeos*	*Rapanea melanoploeos*	1	5	N/D	N/A	N/A
20	*Cassine peragua*	*Cassine peragua*	2	15	N/D	N/A	N/A
21	*Erica* spp. (Pink)	*Erica* spp. (Pink)	10	X	N/D	N/A	N/A
22	*Leucospermum conocarpodendron*	*Leucospermum conocarpodendron*	5	X	N/D	N/A	N/A
23	*Lobostemon montana*	*Lobostemon montana*	5	X	N/D	N/A	N/A
24	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	X	2	N/D	N/A	N/A
25	*Diospyros glabra*	*Diospyros glabra*	X	8	N/D	N/A	N/A

26	*Olea europea africana*	*Olea europea africana*	X	0.1	N/D	N/A	N/A
27	*Ilex mitis*	*Ilex mitis*	X	0.5	N/D	N/A	N/A
28	*Podocarpus latifolius*	*Podocarpus latifolius*	X	5	N/D	N/A	N/A
29	*Maytenus heterophylla*	*Maytenus heterophylla*	X	2	N/D	N/A	N/A
30	*Pteridium aquilinum*	*Pteridium aquilinum*	X	2	N/D	N/A	N/A
31	*Olinia ventosa*	*Olinia ventosa*	X	2	N/D	N/A	N/A
32	*Curtisia dentata*	*Curtisia dentata*	X	1	N/D	N/A	N/A
33	*Maytenus acuminata*	*Maytenus acuminata*	X	0.5	N/D	N/A	N/A
34	*Asparagus capensis*	*Asparagus capensis*	X	2	N/D	N/A	N/A
35	*Canthium inerme*	*Canthium inerme*	X	5	N/D	N/A	N/A
36	*Aristea macrocarpa*	*Aristea macrocarpa*	X	2	N/D	N/A	N/A
37	*Halleria lucida*	*Halleria lucida*	X	1	N/D	N/A	N/A
38	*Blechnum tabulare*	*Blechnum tabulare*	X	0.5	N/D	N/A	N/A
39	*Maurocenia frangula*	*Maurocenia frangula*	X	0.5	N/D	N/A	N/A
40	*Montinia caryophyllacea*	*Montinia caryophyllacea*	X	2	N/D	N/A	N/A
41	*Cassine schinoides*	*Cassine schinoides*	X	2	N/D	N/A	N/A
42	*Clutia pulchella*	*Clutia pulchella*	X	2	N/D	N/A	N/A
43	*Scolopia mundii*	*Scolopia mundii*	X	0.5	N/D	N/A	N/A
44	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	X	5	N/D	N/A	N/A
45	*Cyathea capensis*	*Cyathea capensis*	X	0.5	N/D	N/A	N/A
46	*Colpoon compressum*	*Colpoon compressum*	X	2	N/D	N/A	N/A
47	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	0.1	N/D	N/A	N/A
48	*Erica caffra*	*Erica caffra*	X	0.1	N/D	N/A	N/A

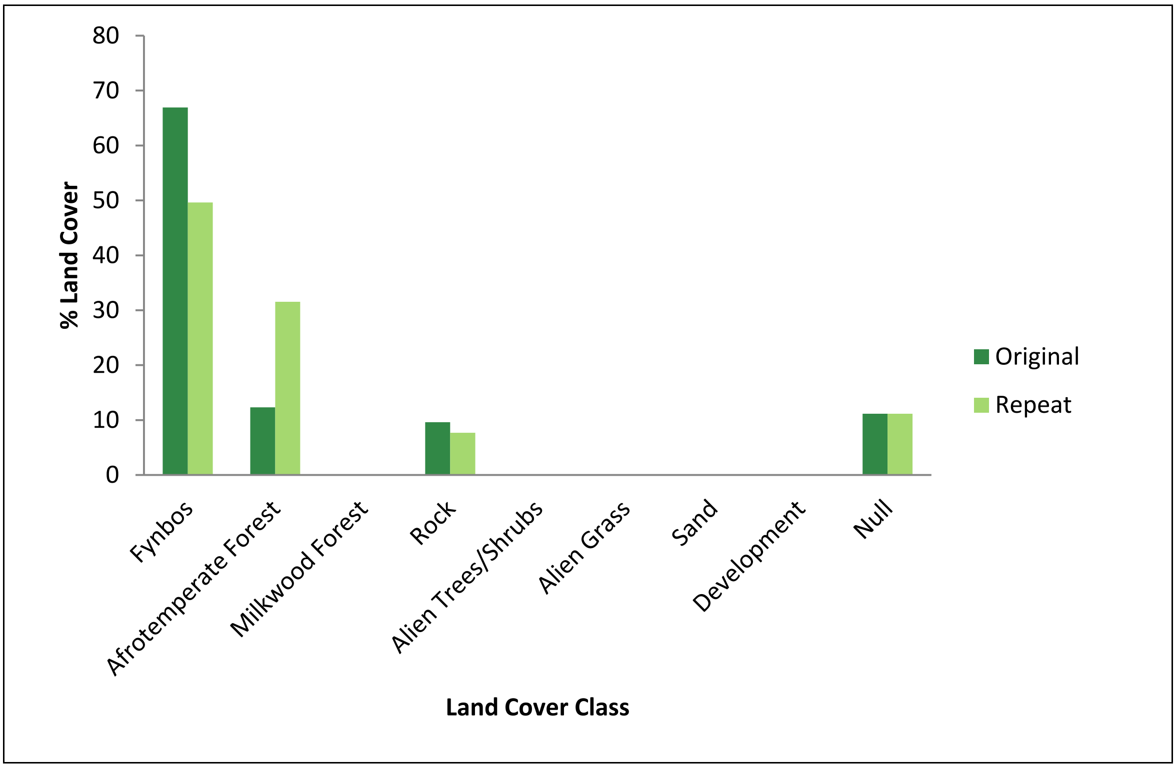

Figure 11.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 973 Orange Kloof

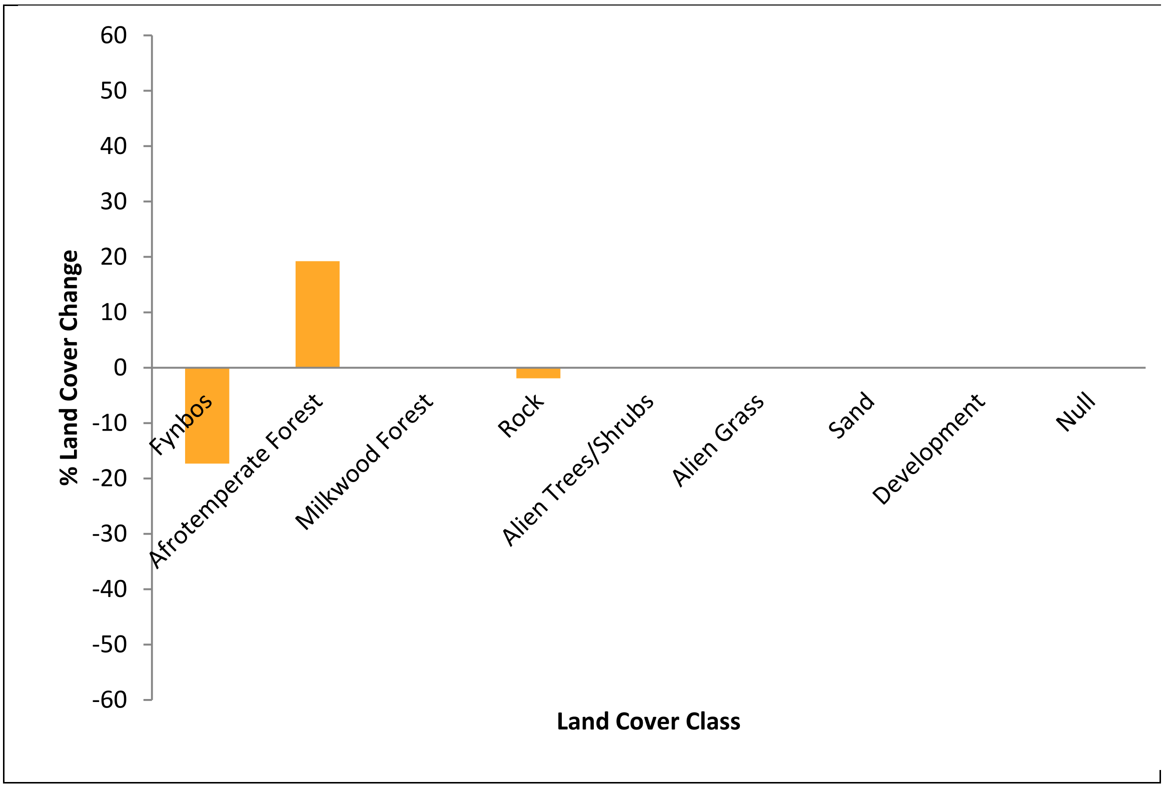

Figure 11.6: Percentage change in land cover classes between 1900 and 2011 at Site 973 Orange Kloof

974 DISA GORGE:

Figure 12.1: Original image by Whitworth (Mountain Club of South Africa Photographic Archives) (c.1900)

Figure 12.2: Repeat image by Zoë C Poulsen (04/10/2011)

SITE INFORMATION

Site No: 974 **Date:** 04/10/2011 **Time spent on site:** 1:20pm

Concise Site Name: Woodhead Dam Wall

General description of location: Centre of Woodhead Dam Wall looking down Disa Gorge towards Grootkop and Orange Kloof

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.97715 **Altitude (m):** 725m

E 018.40217

Original Photographer: Whitworth;

Original number: Whitworth_005 **Original date:** c. 1900

Original site/photograph name: Disa Gorge

Notes on accuracy of repeat photo station location: Within 50m of original location (Photo taken before the Woodhead Dam was built).

Location Map:

Figure 12.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 974 **PHOTOGRAPHIC INFORMATION** **Date:** 04/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	514	24mm	1/125	8.0	270°	1:41pm
Canon 450D	Digital	515	24mm	1/100	8.0	270°	1:42pm
Canon 450D	Digital	516	24mm	1/125	8.0	270°	1:43pm

Notes on weather conditions: Sunny with scattered cloud and gusty wind

Site no: 974 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 04/10/2011

Geology: Table Mountain Sandstone

Soils ***(depth, texture, nutrient status, rockiness, litter, etc.)*****:**

Shallow nutrient-poor soils derived from Table Mountain Sandstone

Landscape description ***(including aspect, slope, catena characteristics, etc.)*****:**

View looking south-west down Disa Gorge towards the peak of Grootkop in the distance showing steep north-west and south-east facing gorge cliffs with Western Cape Afrotemperate Forest in the gorge.

Vegetation ***(biome, veld type, vegetation type, general description of dominant growth forms & species)*****:**

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 12.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground north- west facing slope: Little change: there has been a slight increase in grassy cover and shrub cover.

Landform B: Western Cape Afrotemperate Forest in kloof: There has been a substantial increase in forest cover since the original image was taken. There has also been an increase in forest canopy height and the forest canopy has become more differentiated. There has been an expansion in forest cover up the gorge towards the current site of the Woodhead Dam.

Landform C: South-east facing slope in foreground: There has been a decrease in grassy cover and increase in Proteaceae cover. There are now more shrubby elements colonising the fynbos. Large *Mimetes* are now present and there has been an increase in number of *Leucadendron* spp. Individuals. There is also less bare rock visible.

Landform D: South-east facing slope and peak of Grootkop: Increase in shrubby cover on distant slopes.

Site no: 974 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 04/10/2011

Landform A: Foreground north-west facing slope

Landform B: Western Cape Afrotemperate Forest in kloof

Landform C: South-east facing slope in foreground

Landform D: South-east facing slope of Grootkop (N/D – No data collected)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Bobartia indica*	*Bobartia indica*	X	X	20	N/D	N/A
2	*Pelargonium cucullatum*	*Pelargonium cucullatum*	5	X	5	N/D	N/A
3	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	10	X	5	N/D	N/A
4	*Watsonia tabularis*	*Watsonia tabularis*	1	X	2	N/D	N/A
5	*Psoralea pinnata*	*Psoralea pinnata*	5	X	2	N/D	N/A
6	*Pteridium aquilinum*	*Pteridium aquilinum*	X	X	2	N/D	N/A
7	*Scabiosa africana*	*Scabiosa africana*	5	X	5	N/D	N/A
8	*Elegia cuspidata*	*Elegia cuspidata*	X	X	1	N/D	N/A
9	*Peucedanum galbanum*	*Peucedanum galbanum*	X	X	2	N/D	N/A
10	*Cliffortia polygonifolia*	*Cliffortia polygonifolia*	X	X	1	N/D	N/A
11	*Psoralea aphylla*	*Psoralea aphylla*	X	X	0.1	N/D	N/A
12	*Cunonia capensis*	*Cunonia capensis*	1	40	0.1	N/D	N/A
13	*Psoralea aculeata*	*Psoralea aculeata*	X	X	0.5	N/D	N/A
14	*Astilbe ericoides*	*Astilbe ericoides*	X	X	4	N/D	N/A
15	*Aristea major*	*Aristea major*	X	X	5	N/D	N/A
16	*Berzelia abietinoides*	*Berzelia abietinoides*	X	X	10	N/D	N/A
17	Poaceae	Poaceae	10	X	15	N/D	N/A
18	*Tetraria themalis*	*Tetraria themalis*	X	X	10	N/D	N/A
19	*Mimetes fimbrifolius*	*Mimetes fimbrifolius*	X	X	1	N/D	N/A
20	*Leucadendron strobilum*	*Leucadendron strobilinum*	X	X	0.5	N/D	N/A
21	*Erica plukeneti*	*Erica plukeneti*	X	X	0.5	N/D	N/A
22	Restionaceae	Restionaceae	X	X	2	N/D	N/A
23	*Cliffortia ferruginea*	*Cliffortia ferruginea*	X	X	2	N/D	N/A
24	*Crassula pelucida*	*Crassula pelucida*	X	X	1	N/D	N/A
25	*Rubus* spp.	*Rubus* spp.	5	X	2	N/D	N/A

26	*Athanasia pyramidifolia*	*Athanasia pyramidifolia*	2	X	X	N/D	N/A
27	Cyperaceae	Cyperaceae	60	X	X	N/D	N/A
28	*Searsia tomentosa*	*Searsia tomentosa*	0.5	X	X	N/D	N/A
29	*Searsia lucida*	*Searsia lucida*	0.1	X	X	N/D	N/A
30	*Podocarpus latifolius*	*Podocarpus latifolius*	0.5	5	X	N/D	N/A
31	*Rapanea melanoploeos*	*Rapanea melanoploeos*	0.5	5	X	N/D	N/A
32	*Sutera hispida*	*Sutera hispida*	2	X	X	N/D	N/A
33	*Cassine schinoides*	*Cassine schinoides*	2	5	X	N/D	N/A
34	*Myrsine africana*	*Myrsine africana*	0.5	X	X	N/D	N/A
35	*Lampranthus falsiformis*	*Lampranthus falsiformis*	2	X	X	N/D	N/A
36	*Spiloxene capensis*	*Spiloxene capensis*	0.1	X	X	N/D	N/A
37	*Halleria lucida*	*Halleria lucida*	2	30	X	N/D	N/A
38	*Phylica cephalotes*	*Phylica cephalotes*	0.1	X	X	N/D	N/A
39	*Bulbinella* spp.	*Bulbinella* spp.	5	X	X	N/D	N/A
40	*Ilex mitis*	*Ilex mitis*	X	10	X	N/D	N/A
41	*Kiggelaria africana*	*Kiggelaria africana*	X	5	X	N/D	N/A
42	*Maytenus acuminata*	*Maytenus acuminata*	X	10	X	N/D	N/A

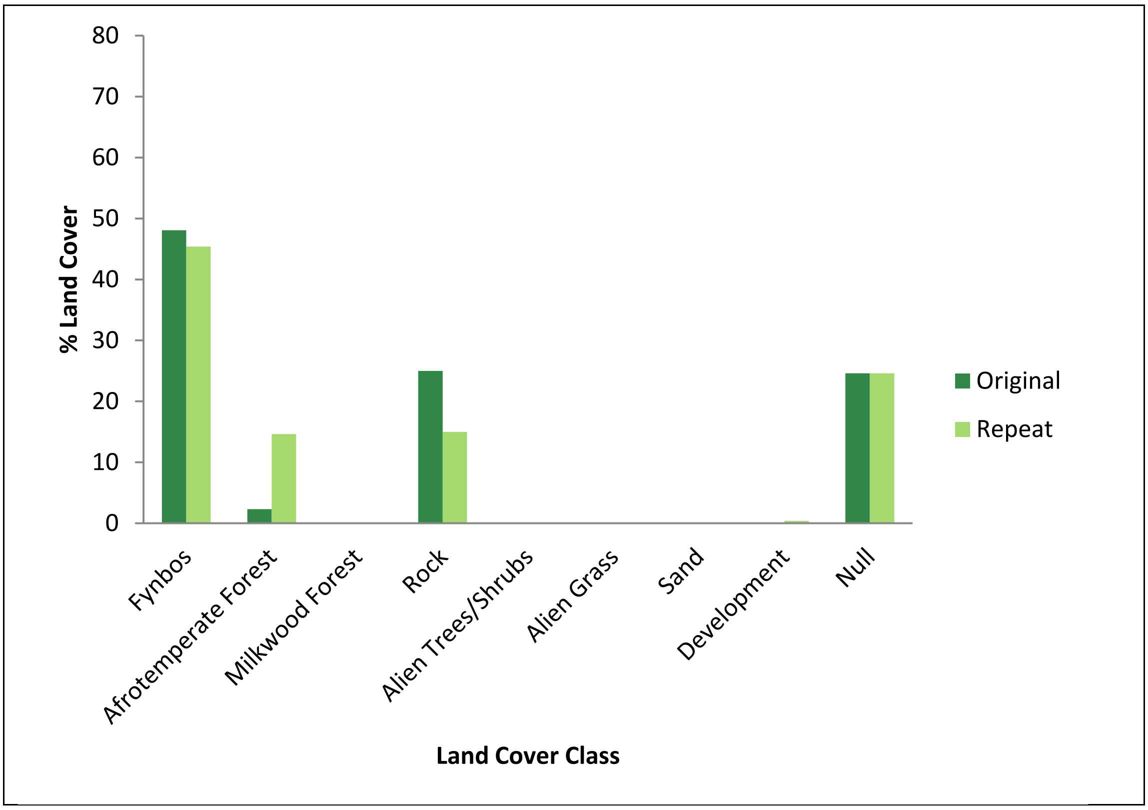

Figure 12.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 974 Disa Gorge

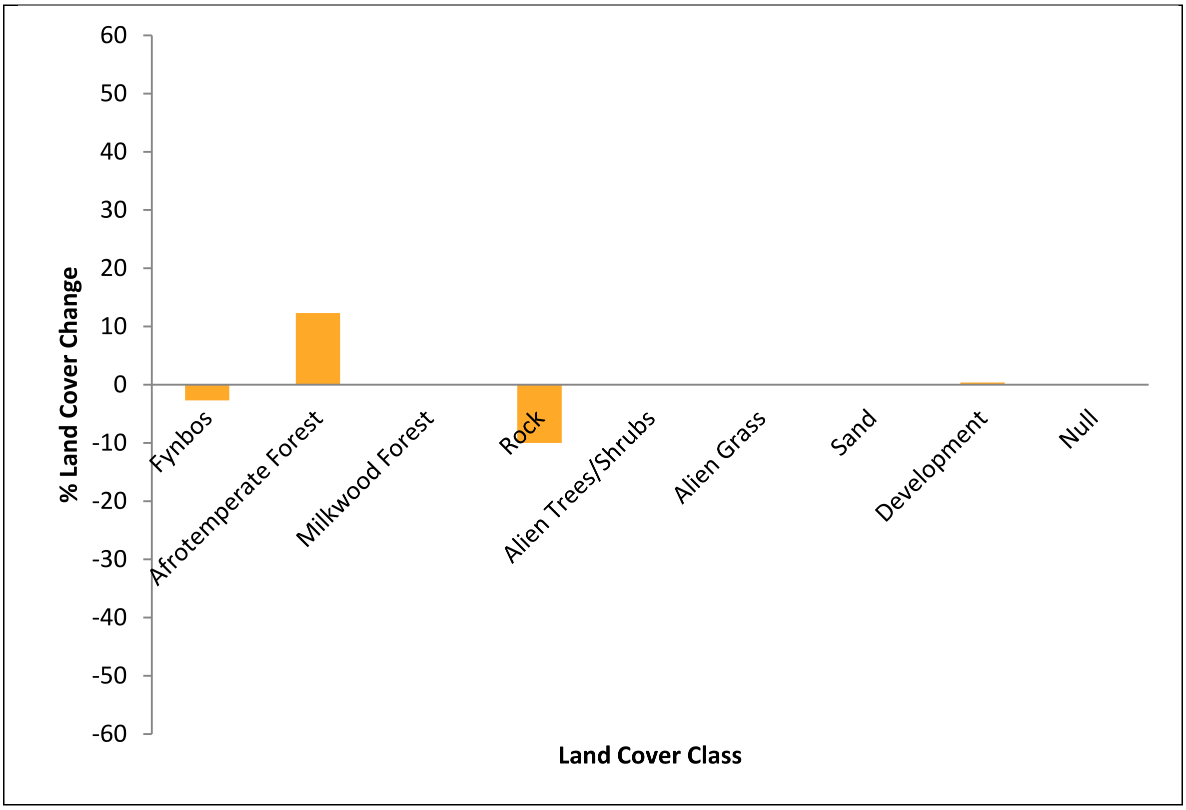

Figure 12.6: Percentage change in land cover classes between 1900 and 2011 at Site 974 Disa Gorge

975 DISA GORGE:

Figure 13.1: Original image by Cameron (Mountain Club of South Africa Photographic Archives) (c.1900)

Figure 13.2: Repeat image by Zoë C Poulsen (04/10/2011)

SITE INFORMATION

Site No: 975 **Date:** 04/10/2011 **Time spent on site:** 3:25pm

Concise Site Name: Disa Gorge – South-East

General description of location: On rock halfway down cliff on south-eastern side of Disa Gorge, Table Mountain.

Province: Western Cape **Bioregion:** Southwest Fynbos (F02)

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.97897 **Altitude (m):** 670m

E 018.39638

Original Photographer: Cameron

Original number: A1659 **Original date**: c. 1900

Original site/photograph name: Disa Gorge

Notes on accuracy of repeat photo station location: Within 2 metres of the original location, repeat suspected to be taken from on top of exactly the same flat-topped rock as the original.

Location Map:

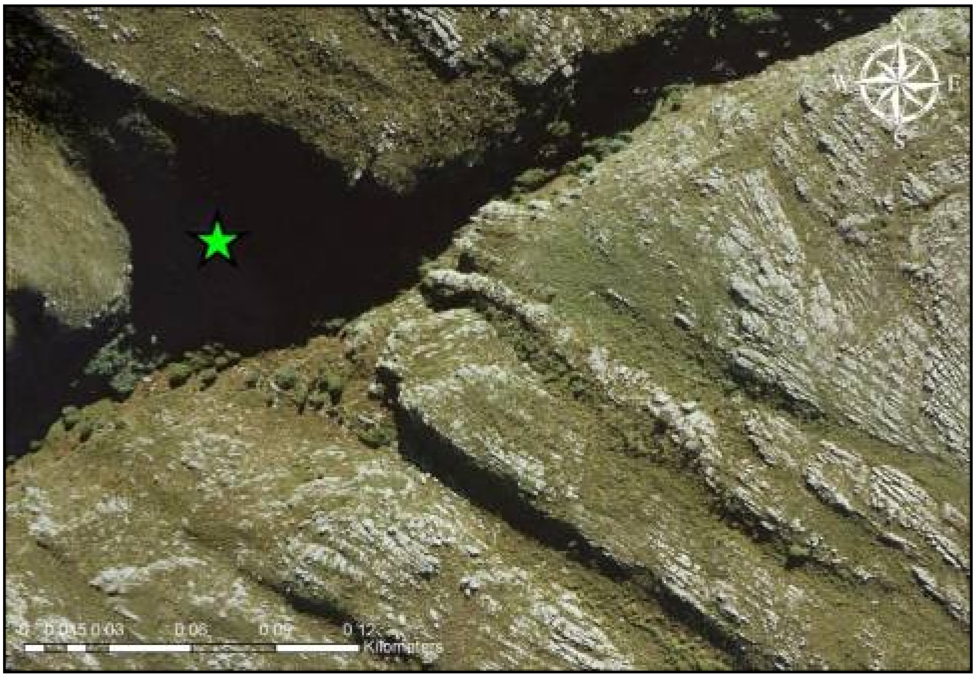

Figure 13.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site No: 975 **PHOTOGRAPHIC INFORMATION** **Date:** 04/10/2011

Camera Height: 1.5m

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	546	17cm	1/30	8.0	215°	3:40pm
Canon 450D	Digital	545	24cm	1/30	8.0	215°	3:39pm
Canon 450D	Digital	544	24cm	1/30	8.0	215°	3:39pm
Canon 450D	Digital	543	24cm	1/40	8.0	215°	3:38pm
Canon 450D	Digital	542	24cm	1/40	8.0	215°	3:38pm
Canon 450D	Digital	541	24cm	1/30	8.0	215°	3:38pm
Canon 450D	Digital	540	24cm	1/30	8.0	215°	3:37pm
Canon 450D	Digital	539	24cm	1/30	8.0	215°	3:37pm
Canon 450D	Digital	538	24cm	1/30	8.0	215°	3:36pm
Canon 450D	Digital	537	24cm	1/30	8.0	215°	3:36pm
Canon 450D	Digital	536	24cm	1/30	8.0	215°	3:36pm
Canon 450D	Digital	535	24cm	1/30	8.0	215°	3:36pm

Notes on weather conditions: Sunny day with scattered cloud and strong south-easterly breeze

Site no: 975 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 04/10/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Skeletal sandstone derived soils on steep sides of Disa Gorge in fynbos soils and deeper sandstone derived soils with substantial litter layer in areas covered by Western Cape Afrotemperate Forest.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: This image looks from a flat rock on the south-eastern side of the steep-sided Disa Gorge down towards the north-west facing opposite slopes of Disa Gorge and the peak of Grootkop in the far distance. In the centre of the image is the forested riparian zone below the Woodhead Dam.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

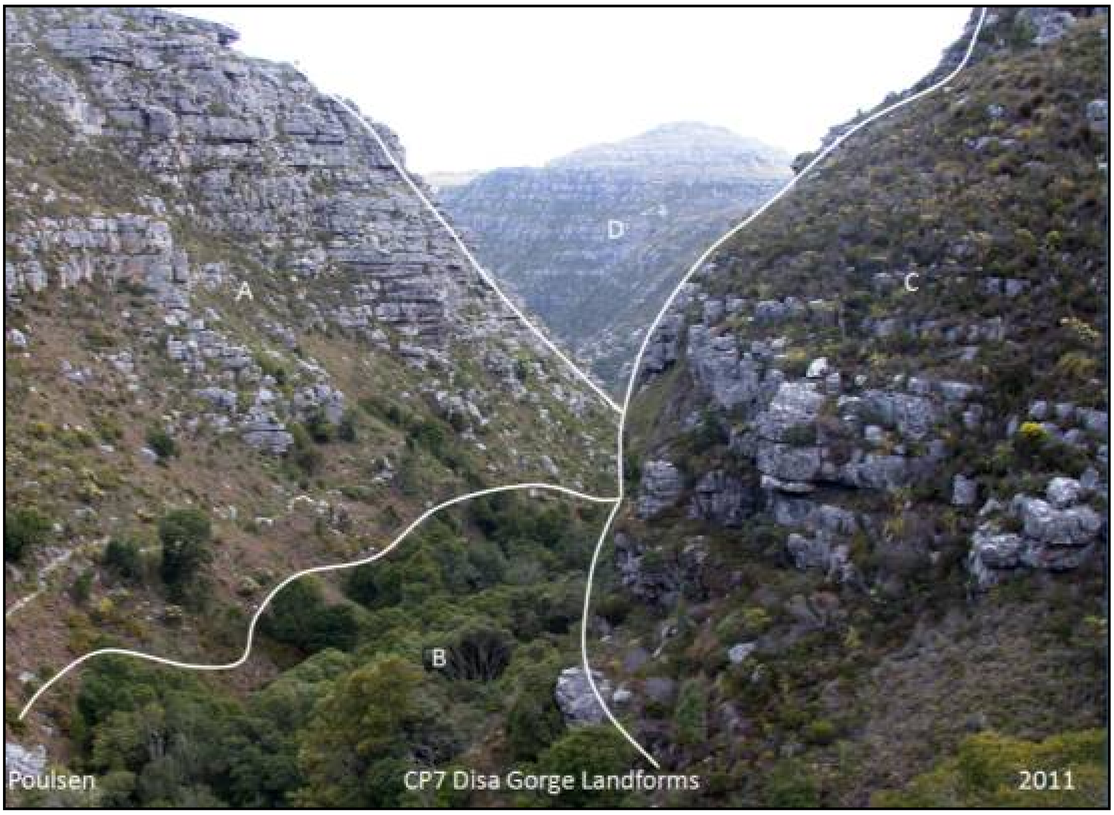

Figure 13.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: North-west facing slope in foreground: Little change: however there has been a slight increase in shrubby cover and increase in Proteaceae. There has also been a slight increase in vegetation height. The lower section of the slope has been colonised by scattered trees including *Rapanea melanophloeos* and *Cunonia capensis*.

Landform B: Western Cape Afrotemperate Forest in kloof: There has been substantial change in this area of the images. In the original image there was low shrubby riparian vegetation in the base of the gorge. This has now been colonised by extensive mature forest dominated by *Cunonia capensis*.

Landform C: South-east facing slope in foreground: Little change: only a few scattered young alien pines have colonised the lower slopes since the original image was taken.

Landform D: South-east facing slope of Grootkop in background: Increase in shrubby cover on distant slopes.

Site No: 975 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 04/10/2011

Landform A: North-west facing slope in foreground

Landform B: Western Cape Afrotemperate Forest in Kloof

Landform C: South-east facing slope in foreground (No data collected: N/D)

Landform D: South-east facing slope of Grootkop in background (No data collected: N/D)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Aristea major*	*Aristea major*	2	X	N/D	N/D	N/A
2	*Tetraria themalis*	*Tetraria themalis*	2	X	N/D	N/D	N/A
3	*Pteridium aquilinum*	*Pteridium aquilinum*	50	X	N/D	N/D	N/A
4	*Pelargonium cuculatum*	*Pelargonium cucullatum*	2	X	N/D	N/D	N/A
5	*Watsonia tabularis*	*Watsonia tabularis*	5	X	N/D	N/D	N/A
6	*Myrsine africana*	*Myrsine africana*	5	X	N/D	N/D	N/A
7	*Bobartia indica*	*Bobartia indica*	10	X	N/D	N/D	N/A
8	*Elegia cuspidata*	*Elegia cuspidata*	10	X	N/D	N/D	N/A
9	*Cliffortia ruscifolia*	*Cliffortia ruscifolia*	5	X	N/D	N/D	N/A
10	*Psoralea pinnata*	*Psoralea pinnata*	5	X	N/D	N/D	N/A
11	*Astilbe ericoides*	*Astilbe ericoides*	2	X	N/D	N/D	N/A
12	*Hermas villosa*	*Hermas villosa*	2	X	N/D	N/D	N/A
13	*Erica plukenetti*	*Erica plukenetti*	1	X	N/D	N/D	N/A
14	*Gibbaria ilicifolia*	*Gibbaria ilicifolia*	10	X	N/D	N/D	N/A
15	Ericaceae	Ericaceae	30	X	N/D	N/D	N/A
16	*Maytenus oleioides*	*Maytenus oleioides*	0.5	5	N/D	N/D	N/A
17	*Cunonia capensis*	*Cunonia capensis*	2	70	N/D	N/D	N/A
18	*Olea capensis* subsp. *capensis*	*Olea capensis* subsp. *capensis*	0.5	5	N/D	N/D	N/A
19	*Leucadendron strobilinum*	*Leucadendron strobilinum*	0.5	X	N/D	N/D	N/A
20	*Podocarpus latifolius*	*Podocarpus latifolius*	1	15	N/D	N/D	N/A
21	*Searsia tomentosa*	*Searsia tomentosa*	1	X	N/D	N/D	N/A
22	*Coleonema alba*	*Coleonema alba*	1	X	N/D	N/D	N/A
23	*Bulbinella* spp.	*Bulbinella* spp.	0.5	X	N/D	N/D	N/A
24	*Scabiosa africana*	*Scabiosa africana*	0.5	X	N/D	N/D	N/A
25	*Phylica buxifolia*	*Phylica buxifolia*	2	X	N/D	N/D	N/A

26	*Clutia pulchella*	*Clutia pulchella*	2	X	N/D	N/D	N/A
27	*Asparagus capensis*	*Asparagus capensis*	0.5	X	N/D	N/D	N/A
28	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	0.5	X	N/D	N/D	N/A
29	*Rapanea melanoploeos*	*Rapanea melanoploeos*	X	5	N/D	N/D	N/A
30	*Ilex mitis*	*Ilex mitis*	X	5	N/D	N/D	N/A
	Acacia melanoxylon	*Acacia melanoxylon*	X	15	N/D	N/D	N/A

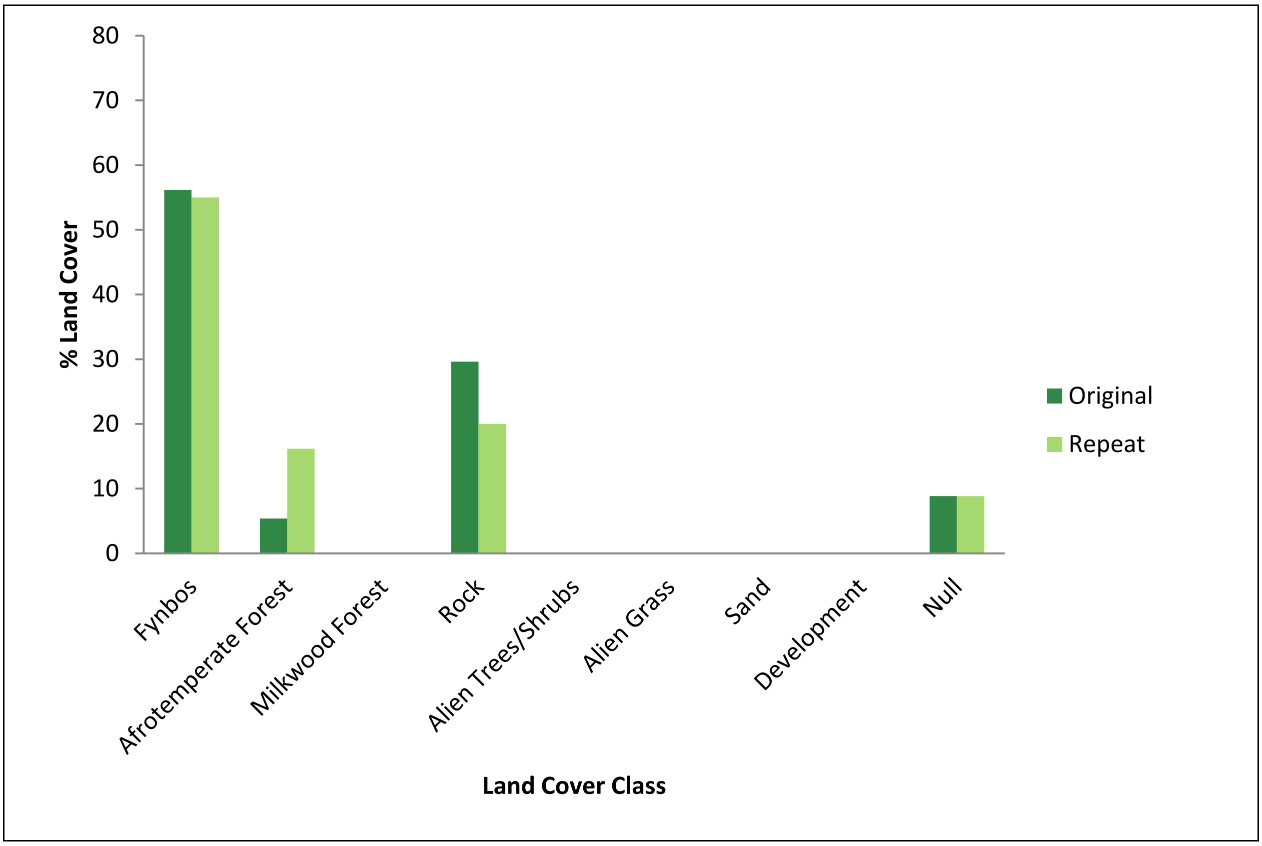

Figure 13.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 975 Disa Gorge

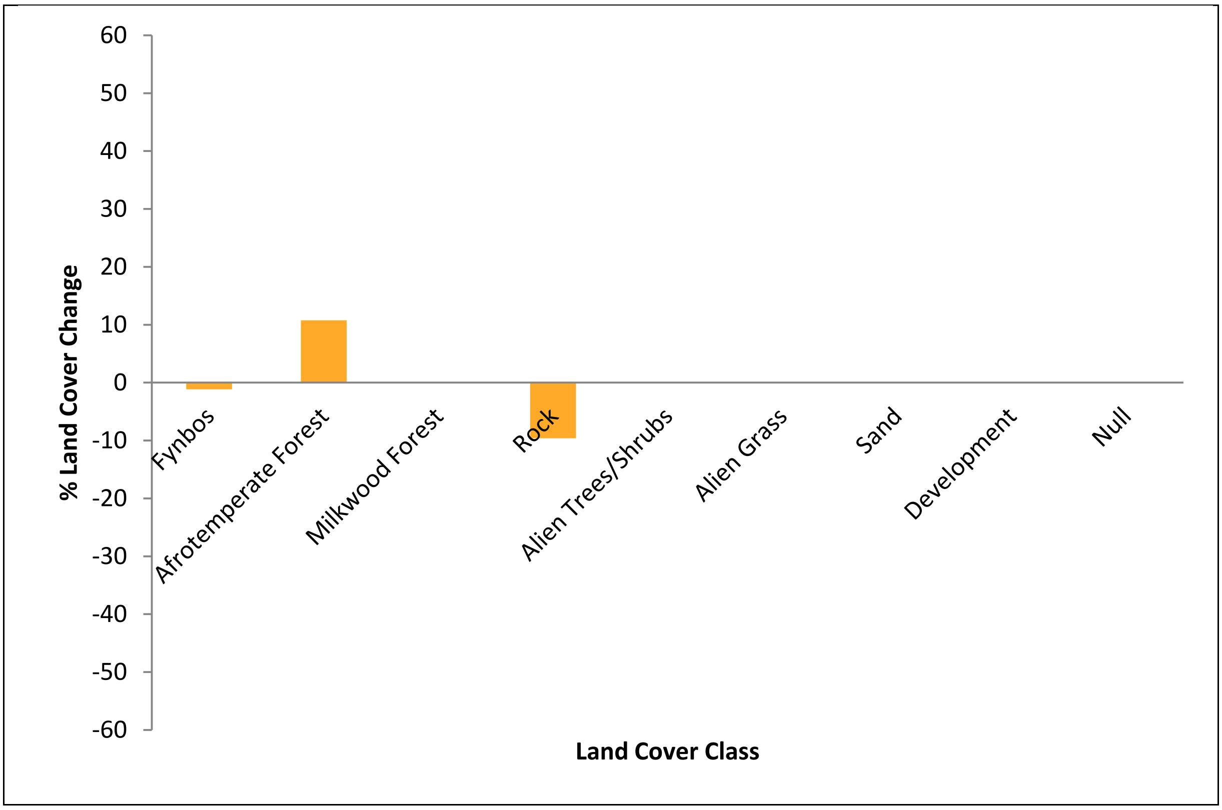

Figure 13.6: Percentage change in land cover classes between 1900 and 2011 at Site 975 Disa Gorge

766 BLINKWATER RAVINE:

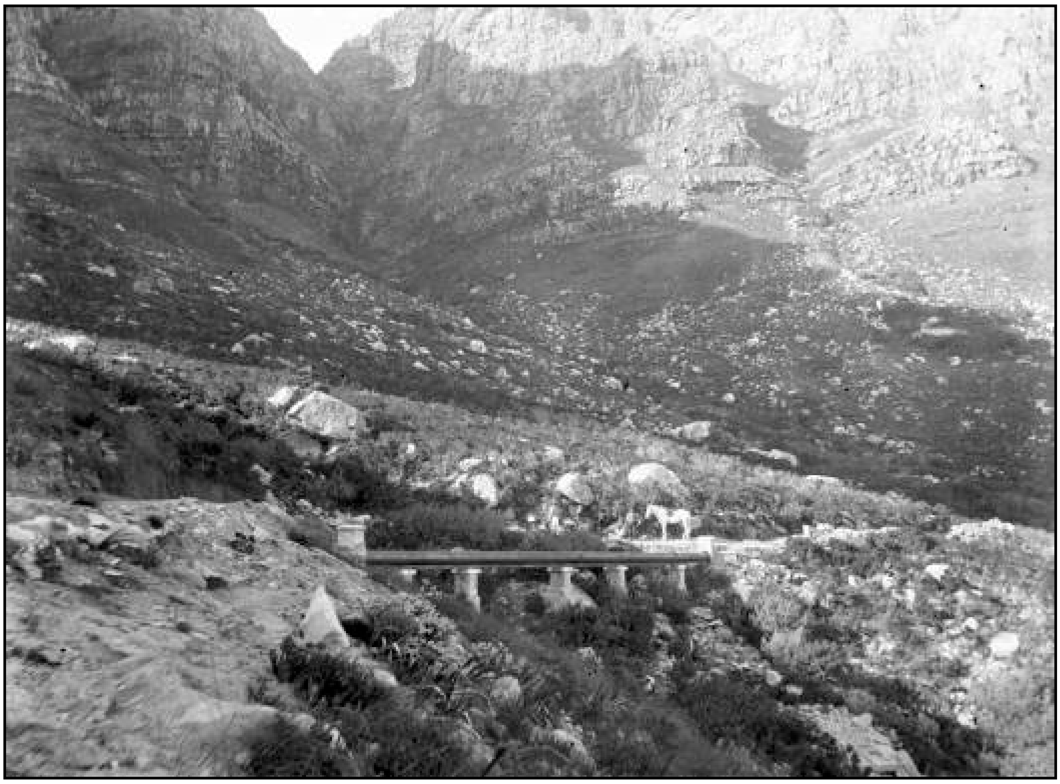

Figure 14.1: Original image by Jurgens (1882)

Figure 14.2: Repeat image by M Timm Hoffman (07/09/2011)

SITE INFORMATION

Site No: 766 **Date:** 07/09/2011 **Time spent on site:** 2:55pm

Concise Site Name: Blinkwater Ravine

General description of location: Three metres off the path down slope and about 2.2km from the start of the Pipe Track looking SSE into Blinkwater Ravine, Table Mountain.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3318CD

Coordinates: S -33.95873 **Altitude (m):** 297m

E 18.39392

Original Photographer: Cairncross

Original number: 013 **Original date:** 1882

Original site/photograph name: Cairncross_Jurgens_13_013

Notes on accuracy of repeat photo station location: Within 10m of original site

Location Map:

Figure 14.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Timm Hoffman, Max, Annabelle and Zoë Poulsen

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 766 **PHOTOGRAPHIC INFORMATION** **Date:** 07/09/2011

Camera Height: 165cm

Photographer's Name: M Timm Hoffman

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 400D	Digital	1974	18mm	1/125	8	155°	3:22pm
Canon 400D	Digital	1975	22mm	1/125	8	155°	3:22pm

Notes on weather conditions: Hot, windless cloudy day

Site no: 766 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 07/09/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Soils are derived from Table Mountain Sandstone and varied in depth. There are substantial boulder screes present in places.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: This image shows the broad west-facing Blinkwater Ravine below the steep buttresses of Cairn Buttress, Fountain Buttress, Grotto Buttress, Blinkwater Needle and Porcupine Buttress of the Twelve Apostles on Table Mountain.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 14.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground lower west facing slope: There has been a substantial increase in shrubby cover since the original image was taken. The vegetation height is now considerably higher, now predominantly dominated by *Phylica buxifolia*. Shrubby cover has increased so much that the Pipe Track and the pipe itself are no longer visible. Much of the boulder scree visible in the original image is now no longer visible.

Landform B: Upper west facing slopes below buttresses of Twelve Apostles: There has also been a considerable increase in shrubby cover on the upper slopes below the buttresses in Blinkwater Ravine. In the original image there was a lot of boulder scree visible, this has now been obscured by encroaching shrubby vegetation. The scree forest patch on Porcupine Buttress has increased in size with much less boulder scree now visible. On the upper slopes there has also been an increase in *Leucospermum conocarpodendron* alongside various forest precursor species.

Landform C: Upper Blinkwater Ravine buttresses: There has also been an increase in shrubby cover on the upper buttresses and within the upper section of Blinkwater Ravine there has been an expansion of forest and increase in forest canopy height. The evidence of a massive rock fall that closed the Blinkwater Ravine path in 1982 is still visible and the resultant boulder scree has not yet been vegetated. There is now almost no defined boundary between the forest and the fynbos. On the upper buttress slopes there has been an increase in shrubby cover but these shrubs are more scattered and less coalesced than the vegetation on the lower slopes.

Site no: 766 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 07/09/2011

Landform A: Foreground lower west-facing slope

Landform B: Western Cape Afrotemperate Forest in kloofs

Landform C: Upper Blinkwater Ravine Buttresses

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Phylica buxifolia*	*Phylica buxifolia*	10	5	0.5	N/A	N/A
2	*Colpoon compressum*	*Colpoon compressum*	5	5	X	N/A	N/A
3	*Lobostemon montana*	*Lobostemon montana*	3	X	X	N/A	N/A
4	*Searsia tomentosa*	*Searsia tomentosa*	10	10	X	N/A	N/A
5	*Searsia lucida*	*Searsia lucida*	20	5	5	N/A	N/A
6	*Anthospermum aethiopicum*	*Anthospermum aethiopicum*	5	X	X	N/A	N/A
7	*Leucospermum conocarpodendron*	*Leucospermum conocarpodendron*	5	X	X	N/A	N/A
8	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	5	X	X	N/A	N/A
9	*Podylaria calyptrata*	*Podylaria calyptrata*	10	10	0.5	N/A	N/A
10	*Metalasia muricata*	*Metalasia muricata*	2	X	X	N/A	N/A
11	*Maytenus heterophylla*	*Maytenus heterophylla*	3	10	5	N/A	N/A
12	*Passerina vulgaris*	*Passerina vulgaris*	1	X	X	N/A	N/A
13	*Peucedanum galbanum*	*Peucedanum galbanum*	1	X	X	N/A	N/A
14	*Maurocenia frangula*	*Maurocenia frangula*	2	X	10	N/A	N/A
15	*Kiggelaria africana*	*Kiggelaria africana*	5	30	10	N/A	N/A
16	*Pinus pinaster*	*Pinus pinaster*	1	X	X	N/A	N/A
17	*Olea europea africana*	*Olea europea africana*	5	30	10	N/A	N/A
18	*Polygala myrtifolia*	*Polygala myrtifolia*	2	10	0.5	N/A	N/A
19	*Clutia pulchella*	*Clutia pulchella*	2	5	5	N/A	N/A
20	*Searsia laevigata*	*Searsia laevigata*	2	X	X	N/A	N/A
21	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	1	X	0.1	N/A	N/A
22	*Myrsine africana*	*Myrsine africana*	2	X	X	N/A	N/A
23	*Maytenus oleioides*	*Maytenus oleoides*	2	10	X	N/A	N/A
24	*Searsia glauca*	*Searsia glauca*	5	5	X	N/A	N/A
25	*Canthium inerme*	*Canthium inerme*	1	30	10	N/A	N/A

26	*Grewia occidentalis*	*Grewia occidentalis*	1	0.5	X	N/A	N/A
27	*Olea capensis* subsp. *capensis*	*Olea capensis* subsp. *capensis*	3	X	X	N/A	N/A
28	*Coleonema alba*	*Coleonema alba*	1	X	X	N/A	N/A
29	*Salvia africana lutea*	*Salvia africana lutea*	1	X	X	N/A	N/A
30	*Cassine peragua*	*Cassine peragua*	2	5	5	N/A	N/A
31	*Afrocanthium mundianum*	*Afrocanthium mundianum*	X	10	30	N/A	N/A
32	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	10	X	N/A	N/A
33	*Cunonia capensis*	*Cunonia capensis*	X	0.5	0.1	N/A	N/A
34	*Euclea racemosa*	*Euclea racemosa*	X	0.5	X	N/A	N/A
35	*Halleria lucida*	*Halleria lucida*	X	30	5	N/A	N/A
36	*Ilex mitis*	*Ilex mitis*	X	5	X	N/A	N/A
37	*Maytenus acuminata*	*Maytenus acuminata*	X	0.1	10	N/A	N/A
38	*Olinia ventosa*	*Olinia ventosa*	X	10	50	N/A	N/A
39	*Rapanea melanoploeos*	*Rapanea melanoploeos*	X	30	10	N/A	N/A
40	*Scutia myrtina*	*Scutia myrtina*	X	10	5	N/A	N/A
41	*Diospyros whyteana*	*Diospyros whyteana*	X	X	10	N/A	N/A
42	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	X	X	0.1	N/A	N/A

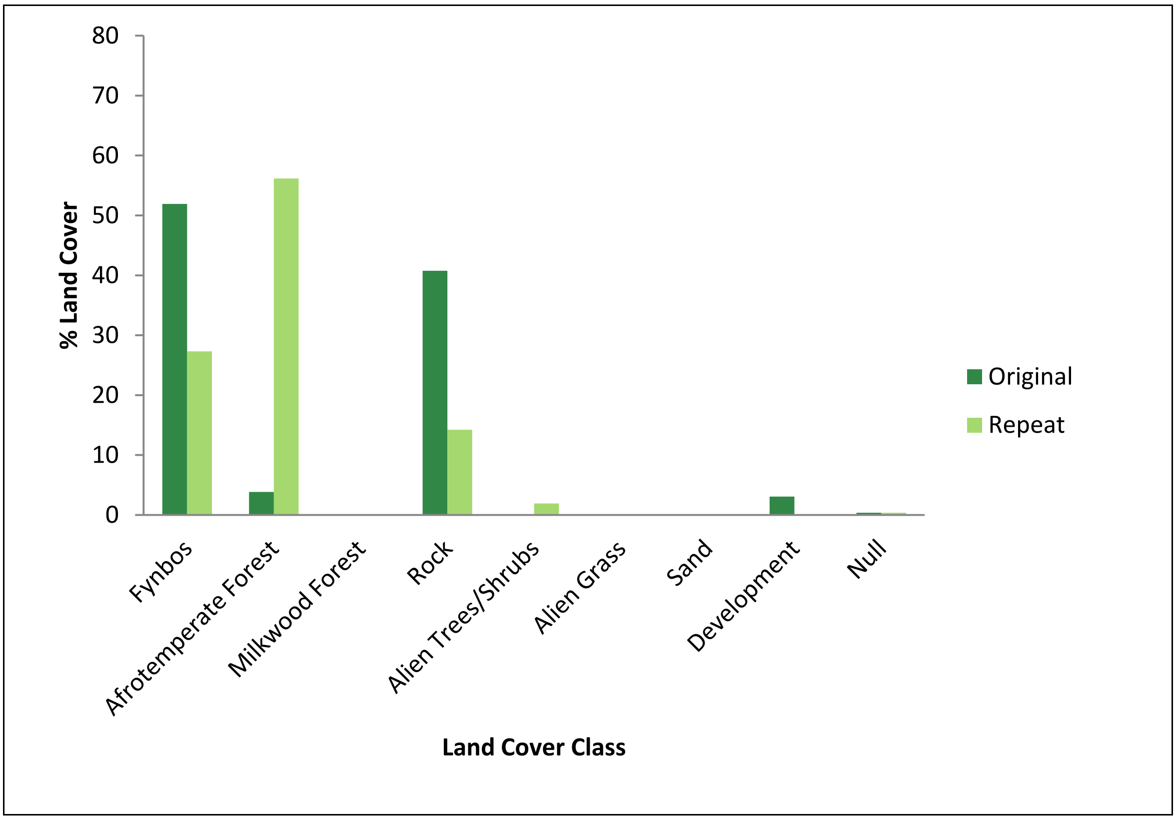

Figure 14.5: Percentages of land cover classes present in original (1882) and repeat image (2011) at Site 766 Blinkwater Ravine

Figure 14.6: Percentage change in land cover classes between 1882 and 2011 at Site 766 Blinkwater Ravine

976 SLANGOLIE RAVINE:

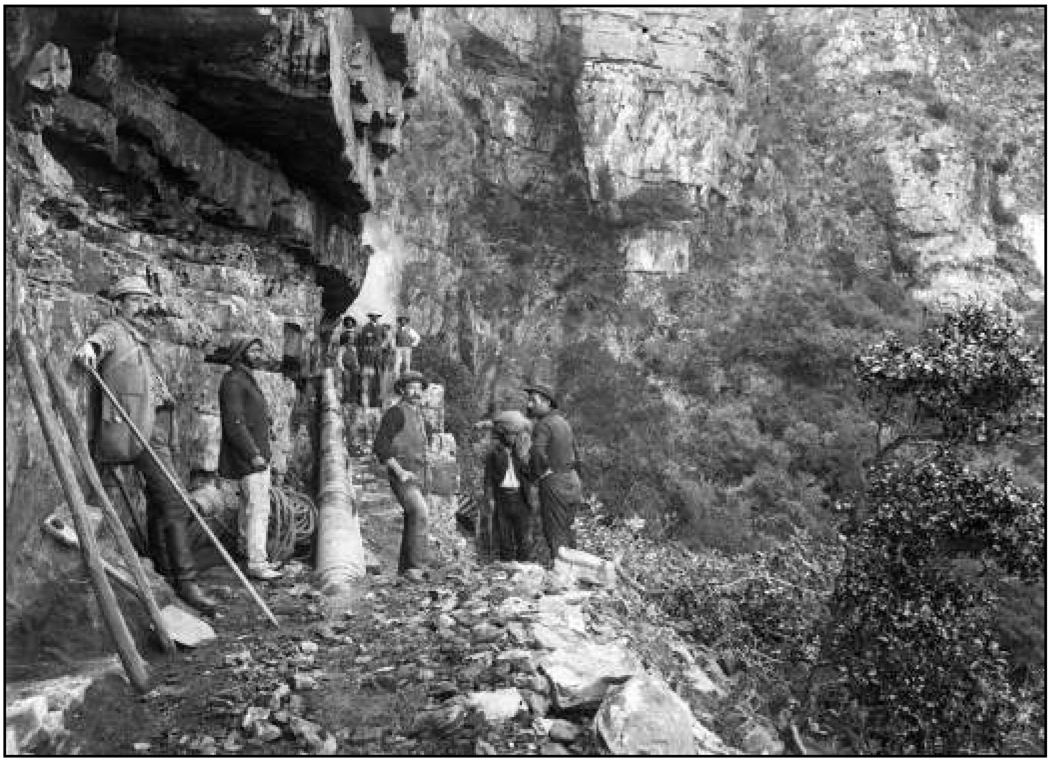

Figure 15.1: Original image by Cairncross/Jurgens (1882)

Figure 15.2: Repeat image by Zoë C Poulsen (09/10/2011)

SITE INFORMATION

Site No: 976 **Date:** 09/10/2011 **Time spent on site:** 12:25pm

Concise Site Name: Slangolie Ravine (Pipe Track)

General description of location: On the northern side of Slangolie Ravine taken from the Pipe Track

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S -33.976065 **Altitude (m):** 377m asl.

E 18.382875

Original Photographer: Cairncross

Original number: 13_031 **Original date:** 1882

Original site/photograph name: Pipe Track – Slangolie Ravine

Notes on accuracy of repeat photo station location: Within 20m of original location

Location Map:

Figure 15.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen, Sebastian Wyngaard and Jane Hewitson

Landscape type:

River system	**Grazing land (communal)**	**Grazing land (private)**	**Cultivated field**	**Settlement**	**Conservation area**

Keywords:

Communal lands	**Land reform**	**Development**	**Indicator species**	**Population dynamics**	**Climate change**

Site no: 976 **PHOTOGRAPHIC INFORMATION** **Date:** 09/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	536	24mm	1/80	8	110°	12:30pm
Canon 450D	Digital	537	24mm	1/80	8	110°	12:31pm
Canon 450D	Digital	538	24mm	1/80	8	110°	12:32pm
Canon 450D	Digital	539	24mm	1/80	8	110°	12:33pm
Canon 450D	Digital	540	24mm	1/80	8	110°	12:34pm
Canon 450D	Digital	541	24mm	1/80	8	110°	12:35pm
Canon 450D	Digital	542	24mm	1/80	8	110°	12:36pm
Canon 450D	Digital	543	24mm	1/80	8	110°	12:37pm
Canon 450D	Digital	544	24mm	1/80	8	110°	12:38pm
Canon 450D	Digital	545	24mm	1/80	8	110°	12:39pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 976 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 09/10/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow Table Mountain Sandstone derived soils with scree layer from rock falls covering most of the surface.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: This image shows a view looking south-east from the Pipe Track into Slangolie Ravine on the western side of Table Mountain. There are west facing cliffs in the background of the image and gentler west facing slopes in the foreground of the image covered with Western Cape Afrotemperate Forest.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 15.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Cliff in foreground above the Pipe Track: Little change here: cracks in the rock have been colonised by grasses and small shrubs since the original image was taken.

Landform B: Western Cape Afrotemperate Forest in kloof: There has been considerable growth in the forest in Slangolie Ravine since the original image was taken. There has been an expansion of the forest patch up the slopes of the ravine and a substantial increase in canopy height. There is now greater differentiation between heights of trees within the canopy and less bare rock is visible where the forest has expanded.

Landform C: Cliff face above forest in Slangolie Ravine: Less of this cliff face is now visible owing to increase in height of Afrotemperate forest growing in the kloof below. The cliff itself has been colonised by more shrubby vegetation including *Coleonema alba* and *Maytenus oleioides.* Slightly less bare rock is now visible owing to colonisation by Restionaceae and Cyperaceae.

Site no: 976 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 09/10/2011

Landform A: Cliff in foreground above the Pipe Track

Landform B: Western Cape Afrotemperate Forest in kloof

Landform C: Cliff face above forest in Slangolie Ravine

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Tarchonanthus camphorata*	*Tarchonanthus camphorata*	2	2	X	N/A	N/A
2	*Maurocenia frangula*	*Maurocenia frangula*	2	10	X	N/A	N/A
3	*Maytenus oleioides*	*Maytenus oleioides*	2	5	2	N/A	N/A
4	*Myrsine africana*	*Myrsine africana*	X	2	X	N/A	N/A
5	*Searsia glauca*	*Searsia glauca*	X	5	X	N/A	N/A
6	*Phylica buxifolia*	*Phylica buxifolia*	X	5	5	N/A	N/A
7	*Cassine peragua*	*Cassine peragua*	X	2	1	N/A	N/A
8	*Maytenus heterophylla*	*Maytenus heterophylla*	X	1	X	N/A	N/A
9	*Rapanea melanoploeos*	*Rapanea melanoploeos*	X	5	X	N/A	N/A
10	*Polygala myrtifolia*	*Polygala myrtifolia*	X	0.5	X	N/A	N/A
11	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	5	X	N/A	N/A
12	*Curtisia dentata*	*Curtisia dentata*	X	10	X	N/A	N/A
13	*Colpoon compressum*	*Colpoon compressum*	X	0.5	X	N/A	N/A
14	*Olea capensis*	*Olea capensis*	X	2	X	N/A	N/A
15	*Cunonia capensis*	*Cunonia capensis*	X	5	X	N/A	N/A
16	*Olea europea africana*	*Olea europea africana*	X	2	X	N/A	N/A
17	*Canthium inerme*	*Canthium inerme*	X	1	X	N/A	N/A
18	*Coleonema alba*	*Coleonema alba*	X	X	5	N/A	N/A
19	*Searsia tomentosa*	*Searsia tomentosa*	X	0.5	X	N/A	N/A
20	Restionaceae	Restionaceae	X	X	5	N/A	N/A
21	Cyperaceae	Cyperaceae	X	X	5	N/A	N/A

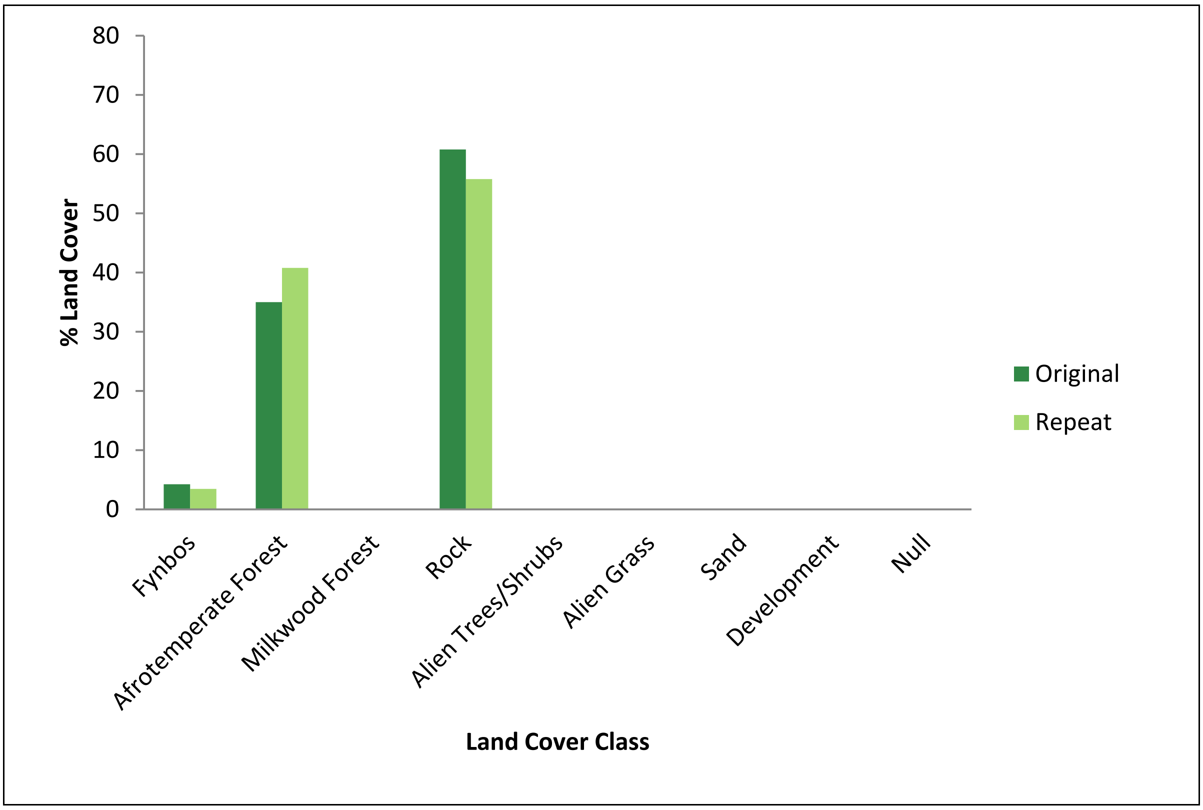

Figure 15.5: Percentages of land cover classes present in original (1882) and repeat image (2011) at Site 976 Slangolie Ravine

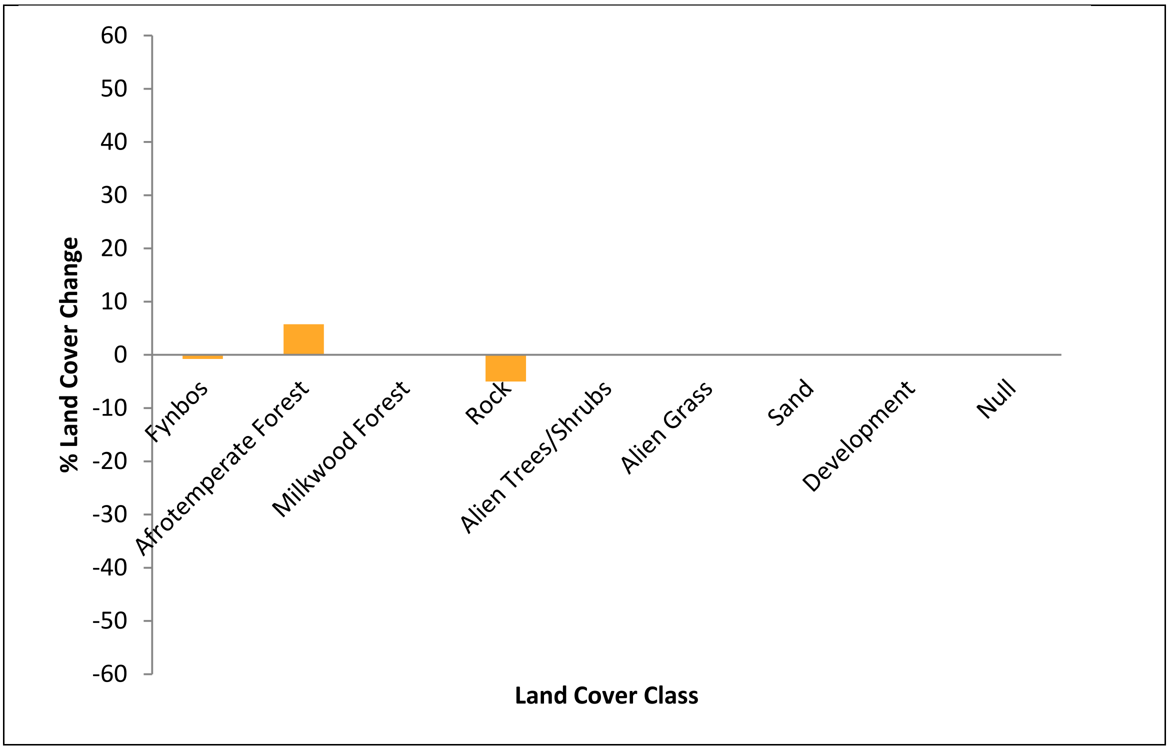

Figure 15.6: Percentage change in land cover classes between 1882 and 2011 at Site 976 Slangolie Ravine

977 KIRSTENBOSCH:

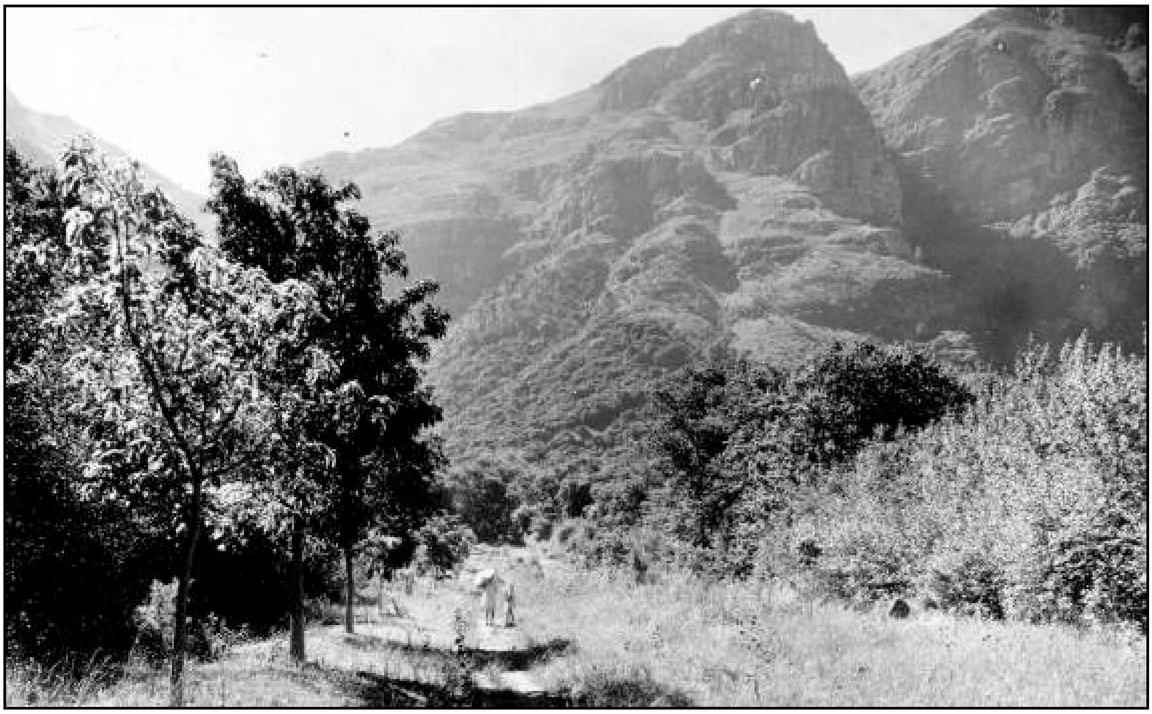

Figure 16.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 16.2: Repeat image by Zoë C Poulsen (12/10/2011)

SITE INFORMATION

Site No: 977 **Date:** 12/10/2011 **Time spent on site:** 10:20am

Concise Site Name: Apple Tree Track - Kirstenbosch

General description of location: Nursery track up towards Table Mountain at Kirstenbosch National Botanical Gardens at the crossroads by the apple tree.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -33.98531 **Altitude (m):** 177m asl.

E 18.43014

Original Photographer: Elliot Collection (National Archives);

Original number: E5290 **Original date:** c. 1900

Original site/photograph name: Kirstenbosch

Notes on accuracy of repeat photo station location: Within 200m of original location

Location Map:

Figure 16.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 977 **PHOTOGRAPHIC INFORMATION** **Date:** 12/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	437	17mm	1/60	8	315°	10:35am
Canon 450D	Digital	436	17mm	1/60	8	315°	10:36am
Canon 450D	Digital	435	17mm	1/60	8	315°	10:37am
Canon 450D	Digital	434	17mm	1/100	8	315°	10:37am

Notes on weather conditions: Warm weather, high cloud cover

Site no: 977 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 12/10/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Deep granite-derived soils in the botanical gardens below and skeletal Table Mountain Sandstone derived soils on the mountain slopes above.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: On the lower slopes in the foreground area of an abandoned farm now colonised with forest precursor species looking onto the slopes of Table Mountain (Window Gorge) in the background.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 16.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground slope of former farm: The track has been widened and there is a new junction onto the Nursery track not present in the previous image. The original trees on the left of the track have now been removed with the exception of one apple tree which still remains. Since the original image was taken forest precursor species have now colonised the area with *Diospyros whyteana* forming the dominant cover.

Landform B: Western Cape Afrotemperate Forest on lower slopes: Forest cover has increased since the original image was taken and the forest margins are now much less well defined. There has been a slight increase in forest canopy height.

Landform C: Upper fynbos covered slopes of Table Mountain: There has been an increase in vegetation height and an increase in shrubby cover on the upper slopes. There has also been an increase in Proteaceae cover; In addition, there has been a decrease in grassy cover since the original image was taken.

Site no: 977 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 12/10/2011

Landform A: Foreground slope of former farm

Landform B: Western Cape Afrotemperate Forest on lower slopes

Landform C: Upper fynbos-covered slopes of Table Mountain (N/D – No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Maytenus oleioides*	*Maytenus oleioides*	5	0.5	N/D	N/A	N/A
2	*Diospyros whyteana*	*Diospyros whyteana*	20	30	N/D	N/A	N/A
3	*Pteridium aquilinum*	*Pteridium aquilinum*	10	X	N/D	N/A	N/A
4	Apple tree	Apple tree	2	X	N/D	N/A	N/A
5	*Kiggelaria africana*	*Kiggelaria africana*	5	30	N/D	N/A	N/A
6	Poaceae	Poaceae	5	X	N/D	N/A	N/A
7	*Cassine peragua*	*Cassine peragua*	0.5	30	N/D	N/A	N/A
8	*Searsia tomentosa*	*Searsia tomentosa*	5	0.5	N/D	N/A	N/A
9	*Rapanea melanophloeos*	*Rapanea melanophloeos*	5	30	N/D	N/A	N/A
10	*Halleria lucida*	*Halleria lucida*	2	30	N/D	N/A	N/A
11	*Cyathea australis*	*Cyathea australis*	0.5	X	N/D	N/A	N/A
12	*Curtisia dentata*	*Curtisia dentata*	1	30	N/D	N/A	N/A
13	*Apodytes dimidiata*	*Apodytes dimidiata*	X	0.5	N/D	N/A	N/A
14	*Brabejum stellatifolium*	*Brabejum stellatifolium*	X	0.5	N/D	N/A	N/A
15	*Canthium inerme*	*Canthium inerme*	X	30	N/D	N/A	N/A
16	*Afrocanthium mundianum*	*Afrocanthium mundianum*	X	0.5	N/D	N/A	N/A
17	*Cassine schinoides*	*Cassine schinoides*	X	5	N/D	N/A	N/A
18	*Celtis africana*	*Celtis africana*	X	0.5	N/D	N/A	N/A
19	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	10	N/D	N/A	N/A
20	*Clutia pulchella*	*Clutia pulchella*	X	10	N/D	N/A	N/A
21	*Cunonia capensis*	*Cunonia capensis*	X	30	N/D	N/A	N/A
22	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	X	0.5	N/D	N/A	N/A
23	*Grewia occidentalis*	*Grewia occidentalis*	X	0.5	N/D	N/A	N/A
24	*Maytenus heterophylla*	*Maytenus heterophylla*	X	0.5	N/D	N/A	N/A
25	*Ilex mitis*	*Ilex mitis*	X	5	N/D	N/A	N/A

26	*Maurocenia frangula*	*Maurocenia frangula*	X	0.5	N/D	N/A	N/A
27	*Maytenus acuminata*	*Maytenus acuminata*	X	0.5	N/D	N/A	N/A
28	*Ocotea bullata*	*Ocotea bullata*	X	0.5	N/D	N/A	N/A
29	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	X	30	N/D	N/A	N/A
30	*Olea europea africana*	*Olea europea africana*	X	0.5	N/D	N/A	N/A
31	*Olinia ventosa*	*Olinia ventosa*	X	0.5	N/D	N/A	N/A
32	*Colpoon compressum*	*Colpoon compressum*	X	0.5	N/D	N/A	N/A
33	*Podylaria calyptrata*	*Podylaria calyptrata*	X	5	N/D	N/A	N/A
34	*Podocarpus latifolius*	*Podocarpus latifolius*	X	10	N/D	N/A	N/A
35	*Polygala myrtifolia*	*Polygala myrtifolia*	X	0.5	N/D	N/A	N/A
36	*Rhoicissus tomentosa*	*Rhoicissus tomentosa*	X	0.5	N/D	N/A	N/A
37	*Scutia myrtina*	*Scutia myrtina*	X	5	N/D	N/A	N/A
38	*Secamone alpini*	*Secamone alpini*	X	10	N/D	N/A	N/A
39	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	X	0.5	N/D	N/A	N/A

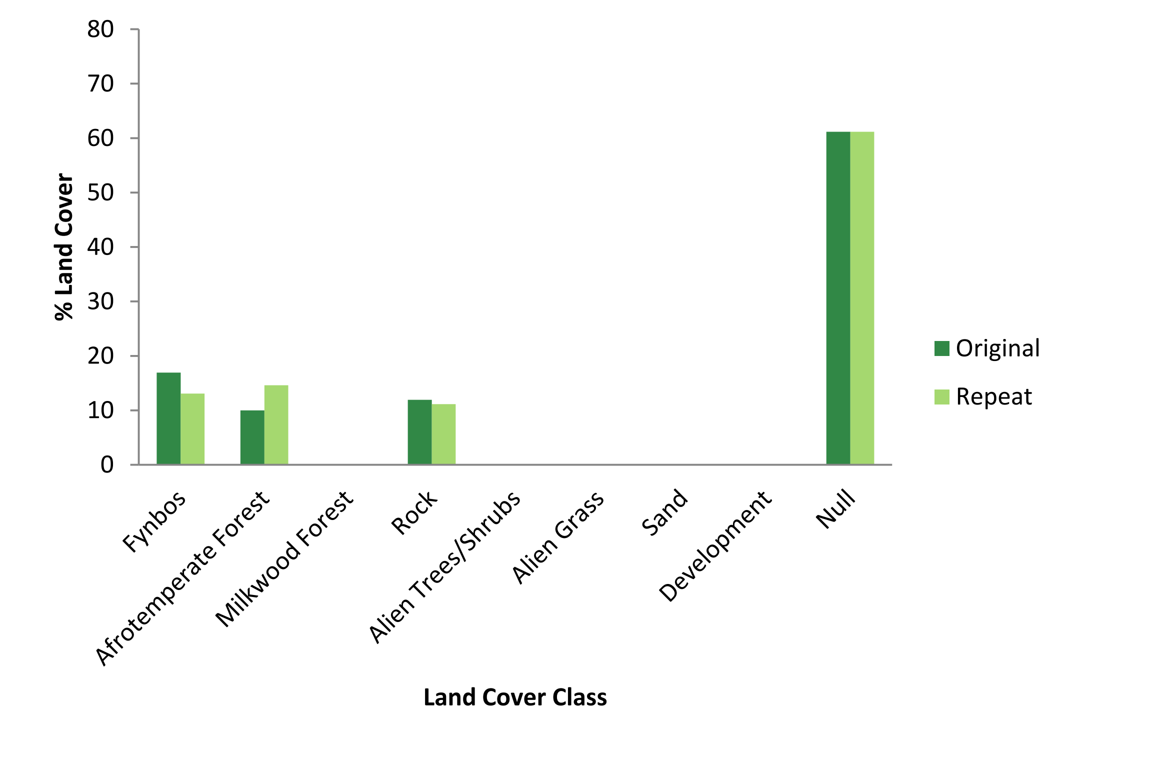

Figure 16.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 977 Kirstenbosch

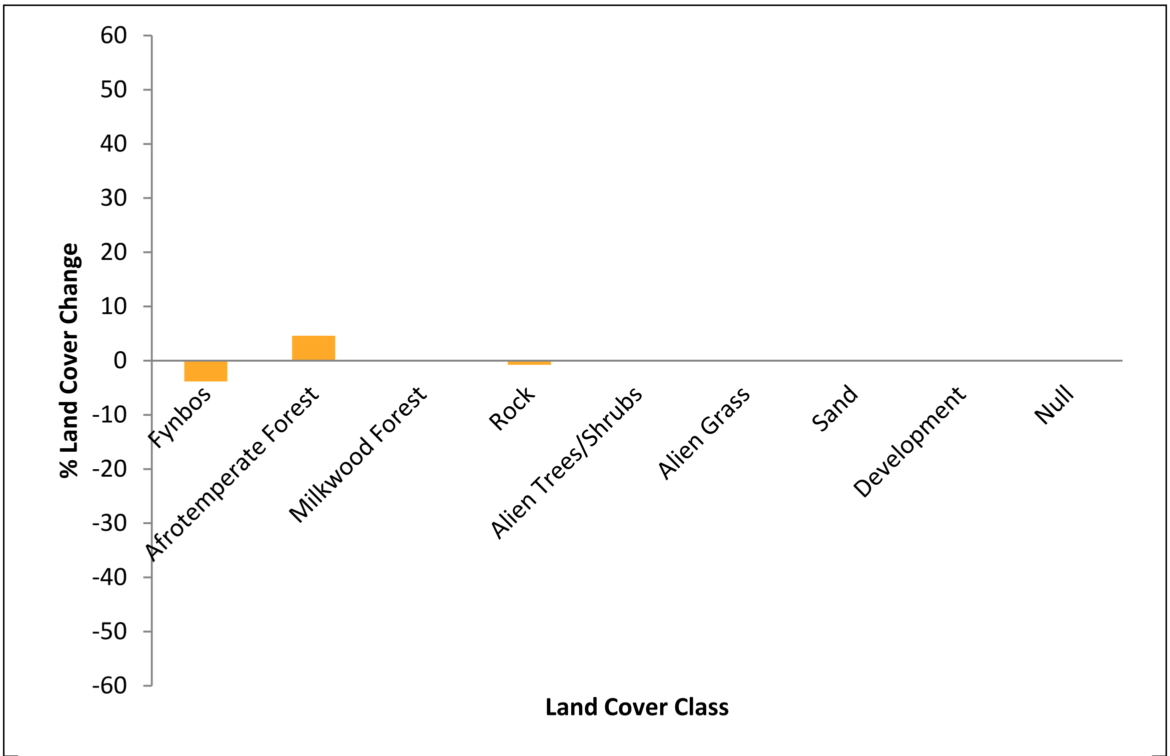

Figure 16.6: Percentage change in land cover classes between 1900 and 2011 at Site 977 Kirstenbosch

978 KIRSTENBOSCH:

Figure 17.1: Original image by Eugene Moll (c.1980)

Figure 17.2: Repeat image by Zoë C Poulsen (12/10/2011)

SITE INFORMATION

Site No: 978 **Date:** 12/10/2011 **Time spent on site:** 11:45am

Concise Site Name: Track above the cottages - Kirstenbosch

General description of location: Track above the cottages near the SANBI Research Centre at Kirstenbosch

Province: Western Cape

Bioregion: FF02 South-West Fynbos

Magisterial district: Wynberg

QDS: 3318CD

Coordinates: **S** -33.98504
E 18.43395

Altitude (m): 138m

Original Photographer: Eugene Moll

Original number: Moll_215

Original date: c.1980

Original site/photograph name: Kirstenbosch

Notes on accuracy of repeat photo station location: Within 200m of the original site

Location Map:

Figure 17.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 978 **PHOTOGRAPHIC INFORMATION** **Date:** 12/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	439	35mm	1/60	8	270°	11:50am
Canon 450D	Digital	438	35mm	1/60	8	270°	11:50am

Notes on weather conditions: Warm and sunny with high cloud cover

Site no: 978 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 12/10/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m) On the lower slopes of the valley basin there are much deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking west towards Fernwood Buttress, Window Buttress, Window Gorge and Skeleton Gorge on Table Mountain from Kirstenbosch NBG.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 17.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Shallow east facing slope in foreground: There has been an increase in vegetation cover since the original image was taken. There has been a decrease in grassy cover since this area was burnt. There has been an increase in shrubby cover (including *Searsia* spp.) and increase in cover of *Pteridium aquilinum.*

Landform B: Western Cape Afrotemperate Forest on lower mountain slopes: Very little change.

Landform C: Fynbos cover on upper slopes: There has been little change since original image was taken.

Site no: 978 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 12/10/2011

Landform A: Shallow east facing slope in foreground

Landform B: Western Cape Afrotemperate Forest on lower mountain slopes

Landform C: Fynbos cover on upper slopes (N/D – No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Pteridium aquilinum*	*Pteridium aquilinum*	50	X	N/D	N/A	N/A
2	*Searsia tomentosa*	*Searsia tomentosa*	10	0.5	N/D	N/A	N/A
3	*Pelargonium cucculatum*	*Pelargonium cucculatum*	2	X	N/D	N/A	N/A
4	*Podylaria calyptrata*	*Podylaria calyptrata*	5	X	N/D	N/A	N/A
5	*Passerina vulgare*	*Passerina vulgare*	5	X	N/D	N/A	N/A
6	Poaceae	Poaceae	2	X	N/D	N/A	N/A
7	*Maytenus oleioides*	*Maytenus oleioides*	10	0.5	N/D	N/A	N/A
8	*Erica hirtiflora*	*Erica hirtiflora*	5	X	N/D	N/A	N/A
9	*Erica tristis*	*Erica tristis*	5	X	N/D	N/A	N/A
10	*Diospyros whyteana*	*Diospyros whyteana*	X	30	N/D	N/A	N/A
11	*Kiggelaria africana*	*Kiggelaria africana*	X	30	N/D	N/A	N/A
12	*Cassine peragua*	*Cassine peragua*	X	30	N/D	N/A	N/A
13	*Rapanea melanophloeos*	*Rapanea melanophloeos*	X	30	N/D	N/A	N/A
14	*Halleria lucida*	*Halleria lucida*	X	30	N/D	N/A	N/A
15	*Curtisia dentata*	*Curtisia dentata*	X	30	N/D	N/A	N/A
16	*Apodytes dimidiata*	*Apodytes dimidiata*	X	0.5	N/D	N/A	N/A
17	*Brabejum stellatifolium*	*Brabejum stellatifolium*	X	0.5	N/D	N/A	N/A
18	*Canthium inerme*	*Canthium inerme*	X	30	N/D	N/A	N/A
19	*Afrocanthium mundianum*	*Afrocanthium mundianum*	X	0.5	N/D	N/A	N/A
20	*Cassine schinoides*	*Cassine schinoides*	X	5	N/D	N/A	N/A
21	*Celtis africana*	*Celtis africana*	X	0.5	N/D	N/A	N/A
22	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	10	N/D	N/A	N/A
23	*Clutia pulchella*	*Clutia pulchella*	X	10	N/D	N/A	N/A
24	*Cunonia capensis*	*Cunonia capensis*	X	30	N/D	N/A	N/A
25	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	X	0.5	N/D	N/A	N/A

26	*Grewia occidentalis*	*Grewia occidentalis*	X	0.5	N/D	N/A	N/A
27	*Maytenus heterophylla*	*Maytenus heterophylla*	X	0.5	N/D	N/A	N/A
28	*Ilex mitis*	*Ilex mitis*	X	5	N/D	N/A	N/A
29	*Maurocenia fragula*	*Maurocenia fragula*	X	0.5	N/D	N/A	N/A
30	*Maytenus acuminata*	*Maytenus acuminata*	X	0.5	N/D	N/A	N/A
31	*Ocotea bullata*	*Ocotea bullata*	X	0.5	N/D	N/A	N/A
32	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	X	30	N/D	N/A	N/A
33	*Olea europea africana*	*Olea europea africana*	X	0.5	N/D	N/A	N/A
34	*Olinia ventosa*	*Olinia ventosa*	X	0.5	N/D	N/A	N/A
35	*Colpoon compressum*	*Colpoon compressum*	X	0.5	N/D	N/A	N/A
36	*Podylaria calyptrata*	*Podylaria calyptrata*	X	5	N/D	N/A	N/A
37	*Podocarpus latifolius*	*Podocarpus latifolius*	X	10	N/D	N/A	N/A
38	*Polygala myrtifolia*	*Polygala myrtifolia*	X	0.5	N/D	N/A	N/A
39	*Rhoicissus tomentosa*	*Rhoicissus tomentosa*	X	0.5	N/D	N/A	N/A
40	*Scutia myrtina*	*Scutia myrtina*	X	5	N/D	N/A	N/A
41	*Secamone alpini*	*Secamone alpini*	X	10	N/D	N/A	N/A
42	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	X	0.5	N/D	N/A	N/A

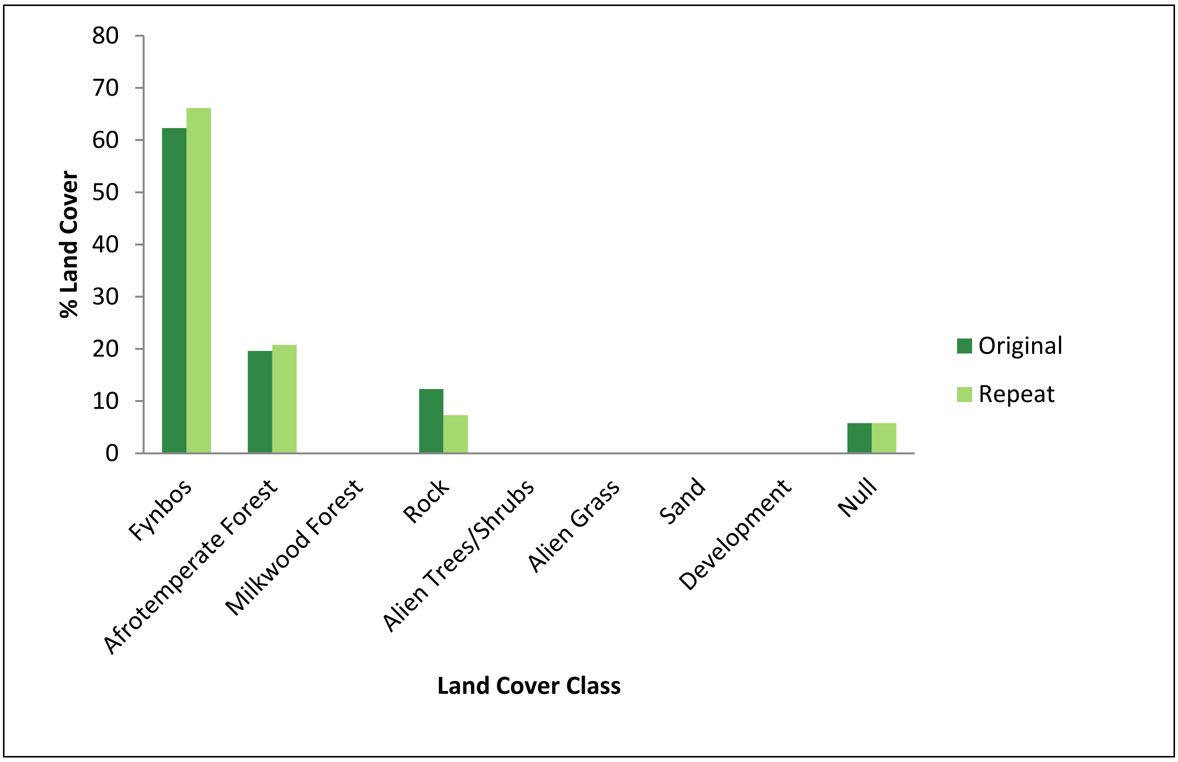

Figure 17.5: Percentages of land cover classes present in original (1980) and repeat image (2011) at Site 978 Kirstenbosch

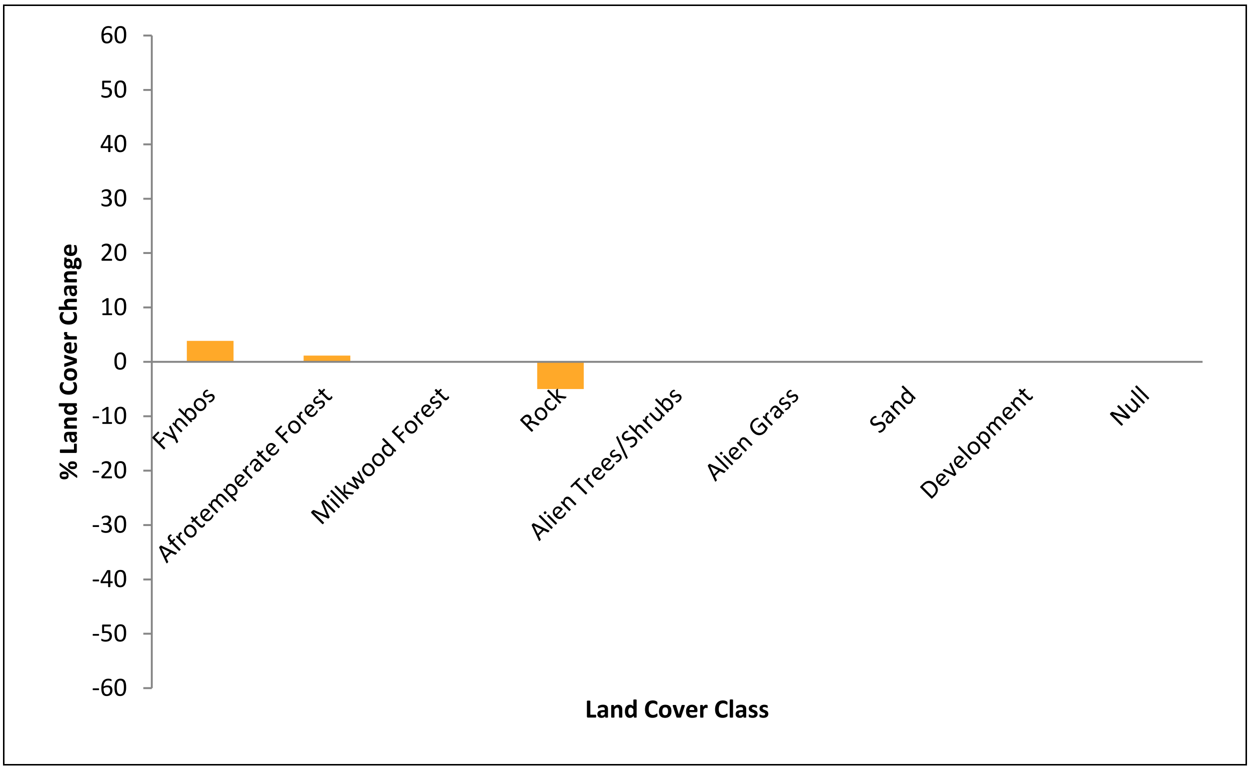

Figure 17.6: Percentage change in land cover classes between 1980 and 2011 at Site 978 Kirstenbosch

979 KIRSTENBOSCH:

Figure 18.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 18.2: Repeat image by Zoë C Poulsen (12/10/2011)

SITE INFORMATION

Site No: 979 **Date:** 12/10/2011 **Time spent on site:** 3:15pm

Concise Site Name: Kirstenbosch Contour Path

General description of location: On the contour path above Kirstenbosch National Botanical Gardens between Nursery Ravine and Skeleton Gorge

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S -33.98437 **Altitude (m):** 308m

E 18.42462

Original Photographer: Elliot Collection (National Archives)

Original number: E5874 **Original date:** c. 1900

Original site/photograph name: Kirstenbosch

Notes on accuracy of repeat photo station location: Within 100m of original site

Location Map:

Figure 18.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 979 **PHOTOGRAPHIC INFORMATION** **Date:** 12/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	448	50mm	1/320	8.0	0°	3:30pm
Canon 450D	Digital	447	50mm	1/320	4.5	0°	3:29pm
Canon 450D	Digital	446	50mm	1/320	4.5	0°	3:29pm
Canon 450D	Digital	445	50mm	1/320	4.0	0°	3:28pm
Canon 450D	Digital	444	50mm	1/320	4.0	0°	3:28pm
Canon 450D	Digital	443	50mm	1/320	4.5	0°	3:27pm
Canon 450D	Digital	442	50mm	1/320	4.5	0°	3:27pm
Canon 450D	Digital	441	50mm	1/25	8.0	0°	3:26pm
Canon 450D	Digital	440	50mm	1/25	8.0	0°	3:26pm

Notes on weather conditions: Warm and sunny with high cloud cover

Site no: 979 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 12/10/2011

Geology: Table Mountain Sandstone

Soils ***(depth, texture, nutrient status, rockiness, litter, etc.)*****:** Shallow skeletal soils derived from Table Mountain Sandstone.

Landscape description ***(including aspect, slope, catena characteristics, etc.)*****:** Steep east-facing slope on the contour path above Kirstenbosch is visible in the foreground of the image and the forested lower east-facing slopes at the bottom of Nursery Ravine are visible in the background.

Vegetation ***(biome, veld type, vegetation type, general description of dominant growth forms & species)*****:**

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 18.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: East facing slope in foreground: The vegetation in the foreground of the image has increased considerably in height since the original photo was taken. In the more recent image there has been a decrease in dominance of *Protea nitida* and the individuals now present have increased in height. There has been a significant increase in the dominance of *Widdringtonia nodiflora* and also *Searsia* ssp. to a lesser extent.

Landform B: Western Cape Afrotemperate Forest in background: Little change visible apart from slight increase in canopy height; Less of Landform B is visible than in the original image as there has been an increase in height in the foreground vegetation.

Landform A: East facing slope in foreground

Landform B: Western Cape Afrotemperate Forest in background

Landform C: N/A

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Muraltia spp.*	*Muraltia spp.*	5	X	N/A	N/A	N/A
2	*Protea nitida*	*Protea nitida*	20	X	N/A	N/A	N/A
3	*Searsia tomentosa*	*Searsia tomentosa*	5	0.5	N/A	N/A	N/A
4	*Montinia caryophyllacea*	*Montinia caryophyllacea*	2	X	N/A	N/A	N/A
5	*Watsonia tabularis*	*Watsonia tabularis*	2	X	N/A	N/A	N/A
6	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	30	X	N/A	N/A	N/A
7	*Pteridium aquilinum*	*Pteridium aquilinum*	10	X	N/A	N/A	N/A
8	*Myrsine africana*	*Myrsine africana*	2	X	N/A	N/A	N/A
9	*Passerina vulgaris*	*Passerina vulgaris*	2	X	N/A	N/A	N/A
10	*Searsia rosemarinifolia*	*Searsia rosemarinifolia*	0.5	X	N/A	N/A	N/A
11	*Penaea mucronata*	*Penaea mucronata*	2	X	N/A	N/A	N/A
12	*Erica hirtiflora*	*Erica hirtiflora*	2	X	N/A	N/A	N/A
13	*Asparagus capensis*	*Asparagus capensis*	5	X	N/A	N/A	N/A
14	*Podylaria calyptrata*	*Podylaria calyptrata*	5	5	N/A	N/A	N/A
15	*Searsia lucida*	*Searsia lucida*	5	X	N/A	N/A	N/A
16	*Protea coronata*	*Protea coronata*	5	X	N/A	N/A	N/A
17	*Salvia africana coerula*	*Salvia africana coerula*	0.5	X	N/A	N/A	N/A
18	*Rapanea melanophloeos*	*Rapanea melanophloeos*	2	30	N/A	N/A	N/A
19	*Kiggelaria africana*	*Kiggelaria africana*	1	30	N/A	N/A	N/A
20	*Halleria lucida*	*Halleria lucida*	0.1	30	N/A	N/A	N/A
21	*Stoebe cinerea*	*Stoebe cinerea*	0.1	X	N/A	N/A	N/A
22	*Diospyros glabra*	*Diospyros glabra*	0.1	X	N/A	N/A	N/A
23	*Maytenus oleioides*	*Maytenus oleioides*	X	0.5	N/A	N/A	N/A
24	*Diospyros whyteana*	*Diospyros whyteana*	X	30	N/A	N/A	N/A

25	*Cassine peragua*	*Cassine peragua*	X	30	N/A	N/A	N/A
26	*Curtisia dentata*	*Curtisia dentata*	X	30	N/A	N/A	N/A
27	*Apodytes dimidiata*	*Apodytes dimidiata*	X	30	N/A	N/A	N/A
28	*Brabejum stellatifolium*	*Brabejum stellatifolium*	X	30	N/A	N/A	N/A
29	*Canthium inerme*	*Canthium inerme*	X	30	N/A	N/A	N/A
30	*Afrocanthium mundianum*	*Afrocanthium mundianum*	X	0.5	N/A	N/A	N/A
31	*Cassine schinoides*	*Cassine schinoides*	X	5	N/A	N/A	N/A
32	*Celtis africana*	*Celtis africana*	X	0.5	N/A	N/A	N/A
33	*Chionanthus foveolatus*	*Chionanthus foveolatus*	X	10	N/A	N/A	N/A
34	*Clutia pulchella*	*Clutia pulchella*	X	10	N/A	N/A	N/A
35	*Cunonia capensis*	*Cunonia capensis*	X	30	N/A	N/A	N/A
36	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	X	0.5	N/A	N/A	N/A
37	*Grewia occidentalis*	*Grewia occidentalis*	X	0.5	N/A	N/A	N/A
38	*Maytenus heterophylla*	*Maytenus heterophylla*	X	0.5	N/A	N/A	N/A
39	*Ilex mitis*	*Ilex mitis*	X	5	N/A	N/A	N/A
40	*Maurocenia frangula*	*Maurocenia frangula*	X	0.5	N/A	N/A	N/A
41	*Maytenus acuminata*	*Maytenus acuminata*	X	0.5	N/A	N/A	N/A
42	*Ocotea bullata*	*Ocotea bullata*	X	0.5	N/A	N/A	N/A
43	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	X	30	N/A	N/A	N/A
44	*Olea europea africana*	*Olea europea africana*	X	0.5	N/A	N/A	N/A
45	*Olinia ventosa*	*Olinia ventosa*	X	0.5	N/A	N/A	N/A
46	*Colpoon compressum*	*Colpoon compressum*	X	0.5	N/A	N/A	N/A
47	*Podocarpus latifolius*	*Podocarpus latifolius*	X	10	N/A	N/A	N/A
48	*Polygala myrtifolia*	*Polygala myrtifolia*	X	0.5	N/A	N/A	N/A
49	*Rhoicissus tomentosa*	*Rhoicissus tomentosa*	X	0.5	N/A	N/A	N/A
50	*Scutia myrtina*	*Scutia myrtina*	X	5	N/A	N/A	N/A
51	*Secamone alpini*	*Secamone alpini*	X	10	N/A	N/A	N/A
52	*Widdringtonia nodiflora*	*Widdringtonia nodiflora*	X	0.5	N/A	N/A	N/A

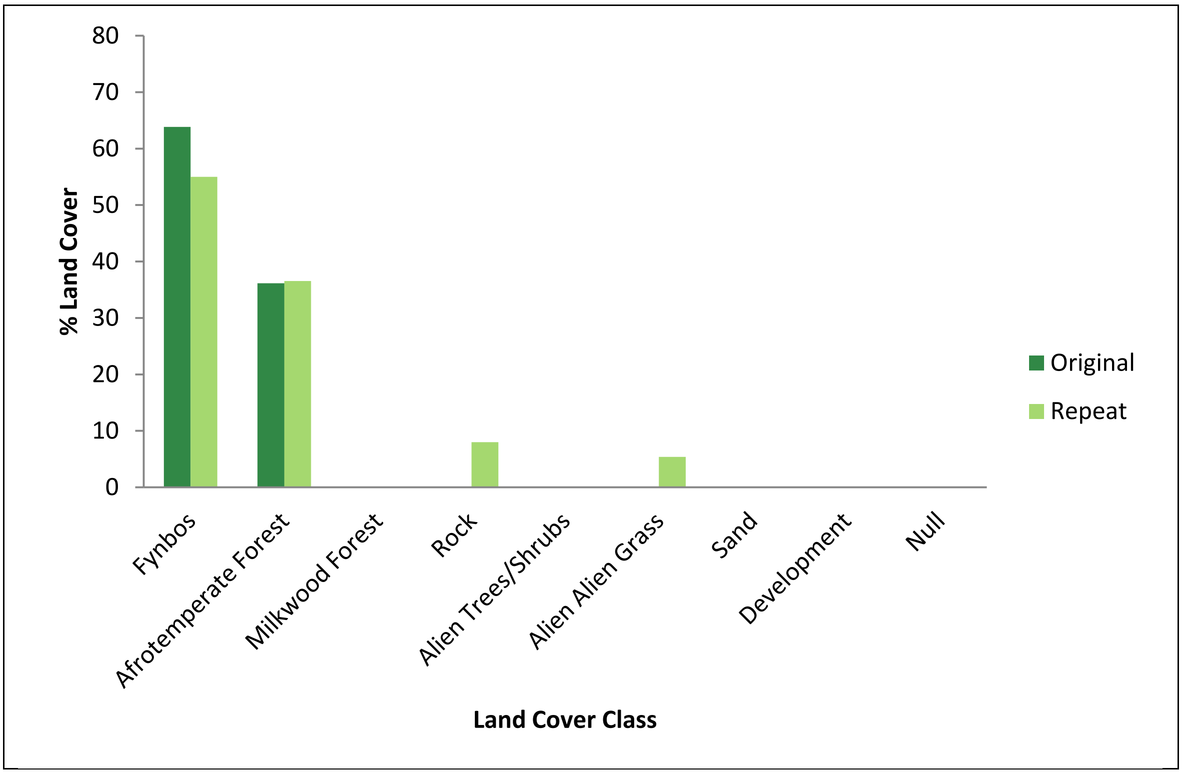

Figure 18.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 979 Kirstenbosch

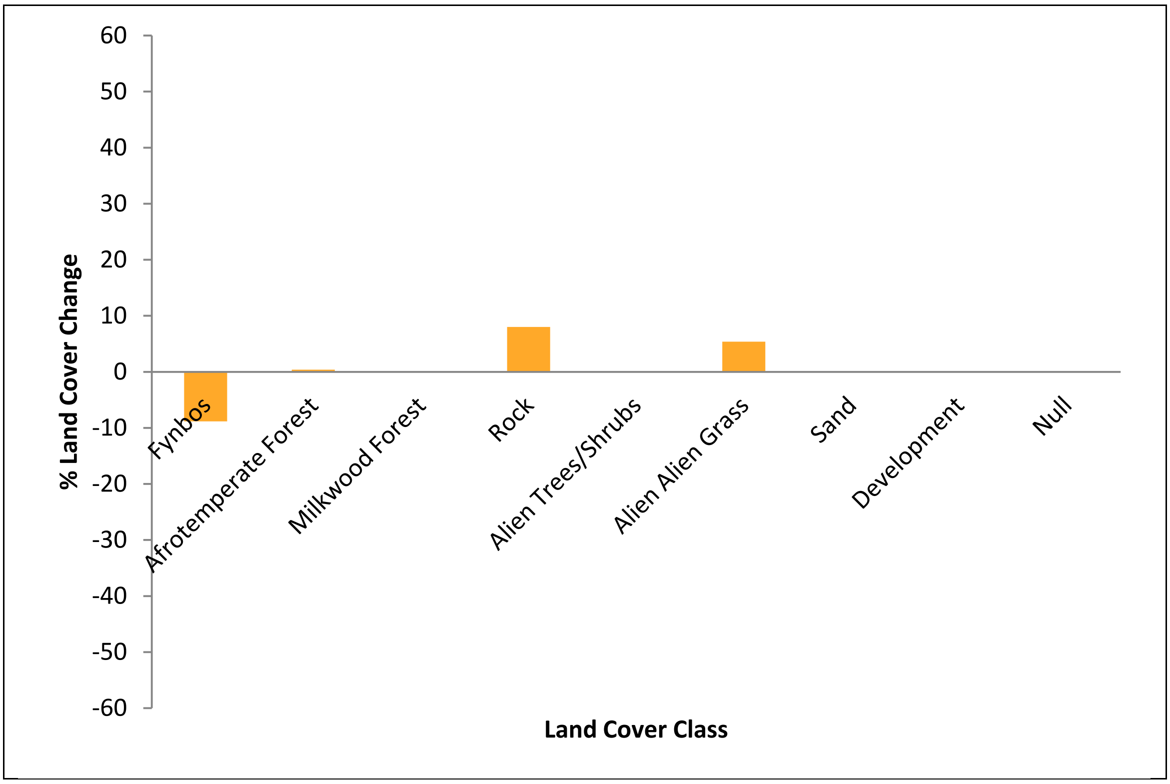

Figure 18.6: Percentage change in land cover classes between 1900 and 2011 at Site 979 Kirstenbosch

980 SCARBOROUGH A:

Figure 19.1: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.2: Repeat image by Zoë C Poulsen (27/10/2011)

980 SCARBOROUGH B:

Figure 19.3: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.4: Repeat image by Zoë C Poulsen (27/102011)

980 SCARBOROUGH C:

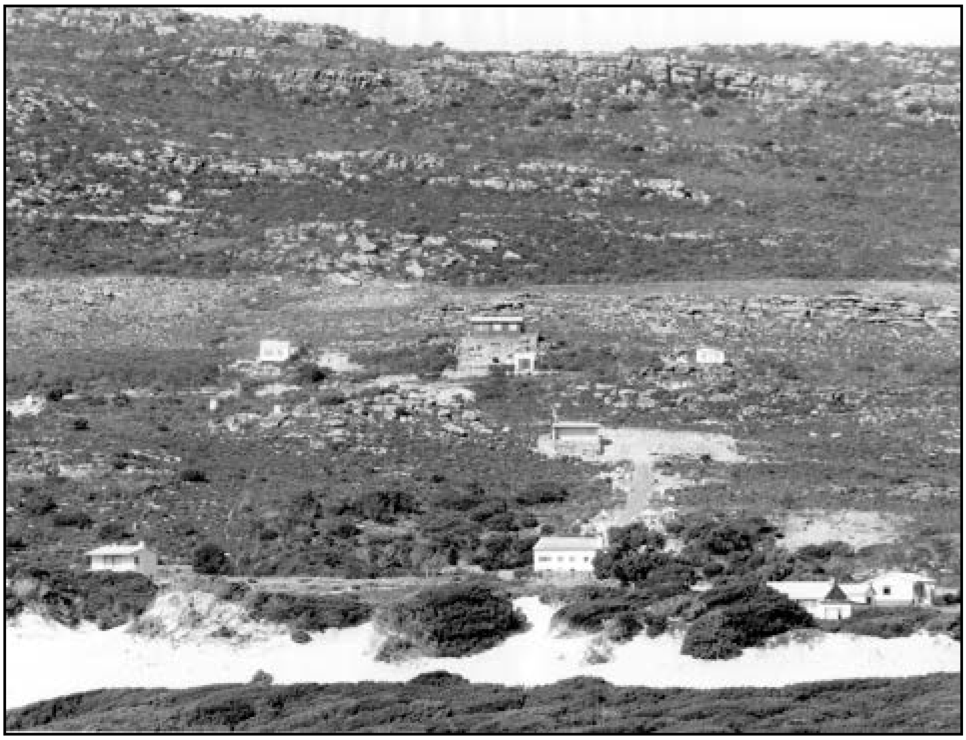

Figure 19.5: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.6: Repeat image by Zoë C Poulsen (27/10/2011)

980 SCARBOROUGH D:

Figure 19.7: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.8: Repeat image by Zoë C Poulsen (27/10/2011)

980 SCARBOROUGH E:

Figure 19.9: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.10: Repeat image by Zoë C Poulsen (27/10/2011)

980 SCARBOROUGH F:

Figure 19.11: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.12: Repeat image by Zoë C Poulsen (27/10/2011)

980 SCARBOROUGH G:

Figure 19.13: Original image from the CA Collection (South African National Archives) (1972)

Figure 19.14: Repeat image by Zoë C Poulsen (27/10/2011)

<u>**SITE INFORMATION**</u>

Site No: 980 **Date:** 27/10/2011 **Time spent on site:** 11:20am

Concise Site Name: Scarborough Beach

General description of location: On sand dunes at southern end of beach looking north-east;

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.20329 **Altitude (m):** 6m

E 18.37094

Original Photographer: CA Collection (National Archives)

Original number: CA185 – CA193 (Panorama image) **Original date:** 1972

Original site/photograph name: Scarborough

Notes on accuracy of repeat photo station location: Within 20m of original location

Location Map:

Figure 19.15: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 980 **PHOTOGRAPHIC INFORMATION** **Date:** 21/09/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	232	17mm	1/80	8	20°	9:36am
Canon 450D	Digital	233	17mm	1/80	8	20°	9:36am
Canon 450D	Digital	234	17mm	1/80	8	20°	9:37am
Canon 450D	Digital	235	17mm	1/100	8	20°	9:37am
Canon 450D	Digital	236	17mm	1/100	8	25°	9:37am
Canon 450D	Digital	237	17mm	1/100	8	25°	9:38am
Canon 450D	Digital	238	17mm	1/100	8	25°	9:38am
Canon 450D	Digital	239	17mm	1/80	8	35°	9:38am
Canon 450D	Digital	240	17mm	1/80	8	35°	9:39am
Canon 450D	Digital	241	17mm	1/80	8	35°	9:39am
Canon 450D	Digital	242	17mm	1/80	8	35°	9:39am
Canon 450D	Digital	243	17mm	1/80	8	40°	9:40am
Canon 450D	Digital	244	17mm	1/60	8	40°	9:40am
Canon 450D	Digital	245	17mm	1/60	8	40°	9:41am
Canon 450D	Digital	246	17mm	1/80	8	45°	9:41am
Canon 450D	Digital	247	17mm	1/80	8	45°	9:42am
Canon 450D	Digital	248	17mm	1/80	8	45°	9:42am
Canon 450D	Digital	249	17mm	1/80	8	60°	9:43am
Canon 450D	Digital	250	17mm	1/80	8	60°	9:43am
Canon 450D	Digital	251	17mm	1/80	8	60°	9:44am
Canon 450D	Digital	252	17mm	1/80	8	65°	9:45am
Canon 450D	Digital	253	17mm	1/80	8	65°	9:45am
Canon 450D	Digital	254	17mm	1/80	8	80°	9:46am

Notes on weather conditions: Cold and windy with scattered cloud and regular showers

Site no: 980 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 27/10/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone (less than 0.5m). In the foreground of the image there are sand dunes with little organic matter present in the soil.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: In the foreground of these images is the coastal dune complex present behind Scarborough beach. In the background is the west-facing mountain slopes of the Swartkop Mountains.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Landform A: Background mountain slopes:

1. Since the original image was taken the mountain slopes above Scarborough have changed relatively little. The location of the original firebreak has changed owing to expansion of housing development up the mountain side. The present firebreak is now much narrower and the original firebreak location is now transformed vegetation between houses and their gardens.

2. There has been little change on the upper mountain slopes since 1972. On the lower slopes there has been substantial expansion of housing development.

3. There has been a substantial expansion of housing development up the mountain slopes since the original image was taken. The ground surrounding this housing has been transformed and is now under garden cultivation. On the upper mountain slopes there has been a decrease overall in shrubby vegetation cover. However, there has been an increase in presence of scattered *Mimetes* spp. since the original image was taken.

4. Since the original image was taken there has been considerable housing development expansion up the mountain slopes. The areas surrounding these properties are now under garden cultivation. On the upper slopes there has been a decrease in shrubby vegetation. However, there has been a slight increase in numbers of *Mimetes* spp.

5. Since the original image was taken there has been a substantial increase in housing development up the mountainside. In the original image there was a well-maintained firebreak. This is now invisible and has become re-vegetated. In 1972 there was also a distinct erosion scar in the centre of the upper slopes. This has now become more vegetated. Overall, there has been a decrease in shrubby vegetation on the more pristine upper slopes.

6. In this set of images there has been relatively little change on the background mountain slopes. There is no longer a distinct firebreak present and there has been an overall decrease in shrubby vegetation cover. On the background peak on the right side of the original image there were scattered pine trees present. Since 1972 these pine trees have been cleared. The same right hand background mountain slope in 2011 had considerably less bare rock visible and is much more vegetated than was the case in the original image.

7. In the original image here there was very heavy pine tree infestation on the background mountain slopes. Most of these pine trees have now been cleared. These mountain slopes were much less vegetated in the past and now have much less bare rock and more vegetation cover.

Landform B: Western Cape Milkwood Forest in Foreground of images:

1. In the original image there was a thick belt of coastal forest extending back from the beach and the majority of this has now been cleared for housing development. A belt of coastal forest remains in the strip between Scarborough beach and the most seaward housing. This is mainly dominated by *Sideroxylon inerme* and since the original image was taken this remaining coastal forest has increased substantially in height and has become much more wind-pruned, forming a much more rounded canopy shape. In the foreground of the image some of the dune vegetation has been cleared to build a car park for beach visitors.

2. There has been little change in the foreground of the image in the vegetation. However, there has been slight change due to shift in the coastal foredunes. Additional sand has blown from the beach causing a slight increase in height and the existing vegetation to be covered by sand with less exposed at the surface. The taller shrubs have more bare lower branches than in the original image owing to wind pruning.

3. In the foreground of this set of images there has also been an increase in coastal dune height since the original image was taken. The shrubby vegetation growing in the dunes in the original image is acting as a trap for sand causing an increase in dune height. In 1972 there was considerably more bare sand present and the dunes were more mobile than they are today. The dunes have stabilised with time and are now considerably more vegetated. The shrubby vegetation on the seaward side has shown leaf loss on the lower branches owing to wind pruning which has occurred since the original image was taken.

4. Only the top edge of the foreground coastal dune system is visible within this set of images. The dunes on this part of the beach have remained a similar height in comparison to the original images. There is less shrubby vegetation present than was the case in 1972. However, overall there has been an increase in vegetation on the dunes with less bare sand present.

5. The dunes are almost invisible in the repeat image of this set, with only the top edge visible. This may mean that there has been a decrease in dune height since the original image was taken. There seems to have been a slight decrease in shrubby vegetation here.

6. Since the original image was taken in 1972, there has been a slight increase in shrubby vegetation in this pair of images with no bare dune sand visible in the repeat image. There was one bare patch of mobile sand in 1972 but this has now been covered by shrub cover. The shrub canopies have become more rounded and stunted in growth due to increased wind pruning since the original image was taken.

7. In this image the section of the Scarborough coastal dunes shown was completely vegetated in 1972. Since the original image was taken there has been an increase in canopy height of the shrub cover and an increase in level of canopy rounding due to wind pruning. There has been an increased coalescence between the shrubby vegetation.

Site no: 980 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 27/10/2011

Landform A: Background mountain slopes (N/D: No data collected)

Landform B: Western Cape Milkwood Forest in foreground of images

Landform C: N/A

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Cassine peragua*	*Cassine peragua*	N/D	0.1	N/A	N/A	N/A
2	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	N/D	5	N/A	N/A	N/A
3	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	0.1	N/A	N/A	N/A
4	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.1	N/A	N/A	N/A
5	*Euclea racemosa*	*Euclea racemosa*	N/D	5	N/A	N/A	N/A
6	*Olea exasperata*	*Olea exasperata*	N/D	0.5	N/A	N/A	N/A
7	*Colpoon compressum*	*Colpoon compressum*	N/D	0.5	N/A	N/A	N/A
8	*Searsia glauca*	*Searsia glauca*	N/D	5	N/A	N/A	N/A
9	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	80	N/A	N/A	N/A

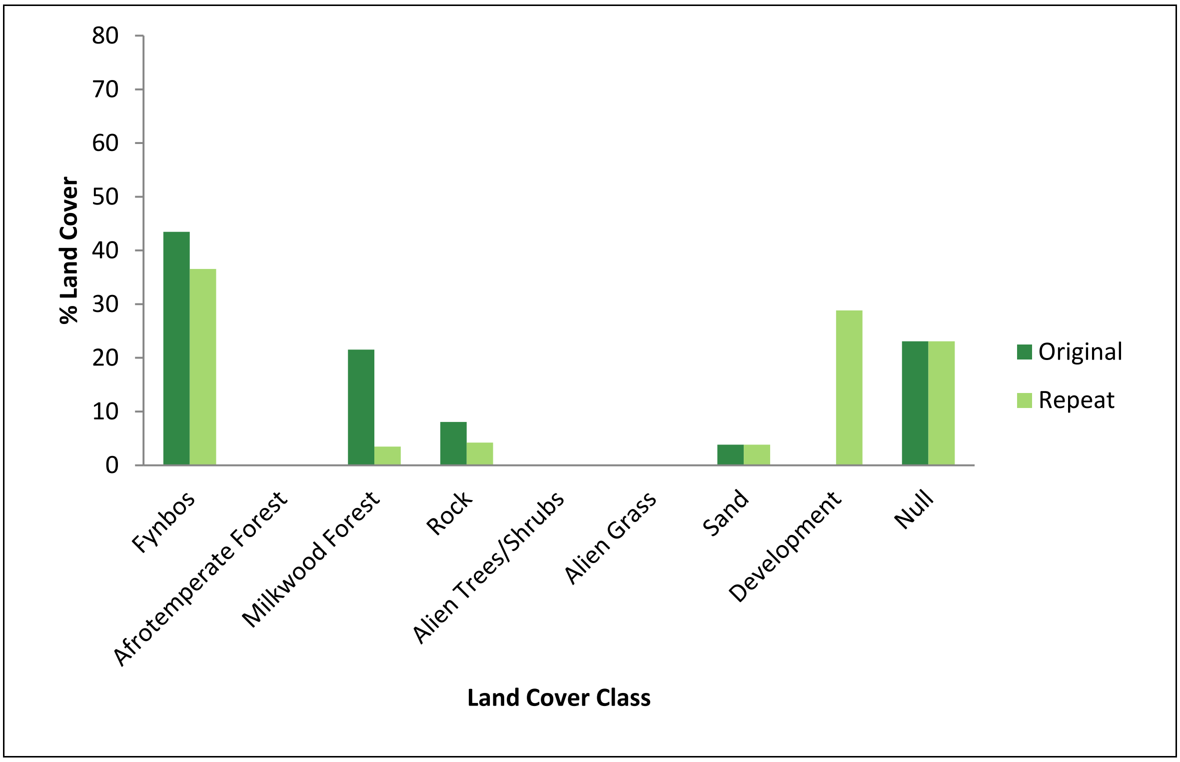

Figure 19.16: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough A

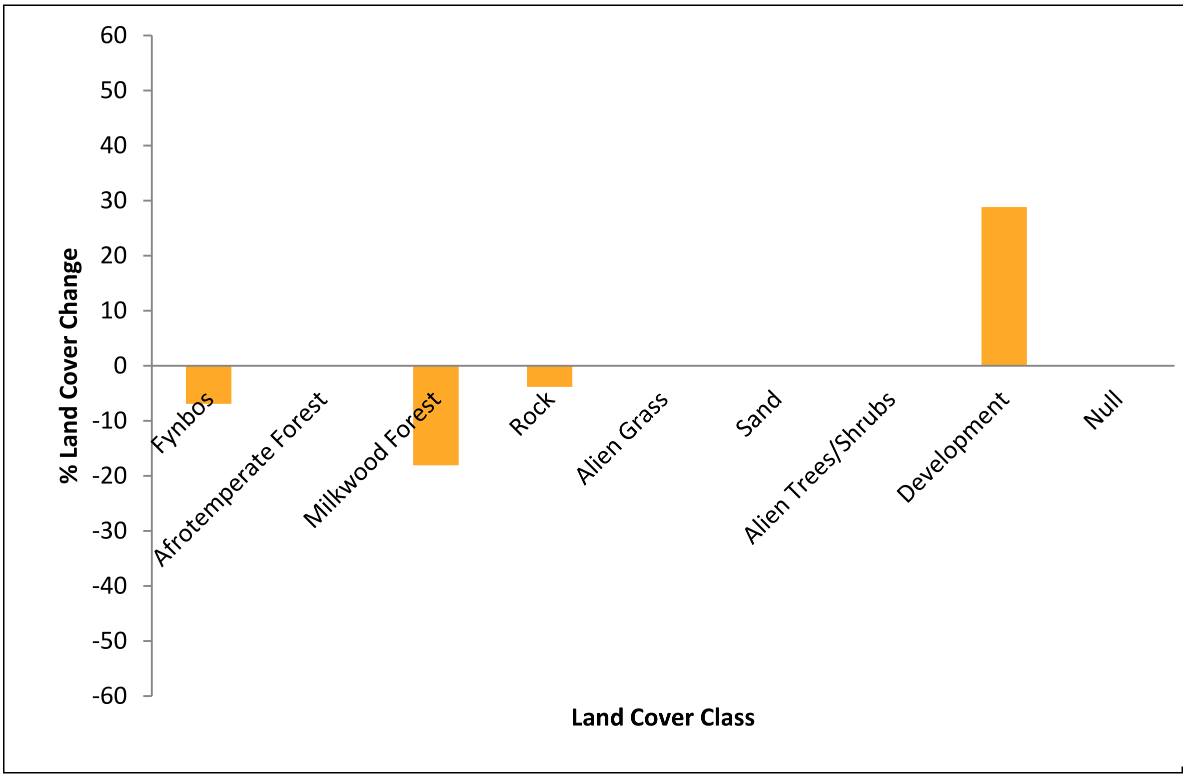

Figure 19.17: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough A

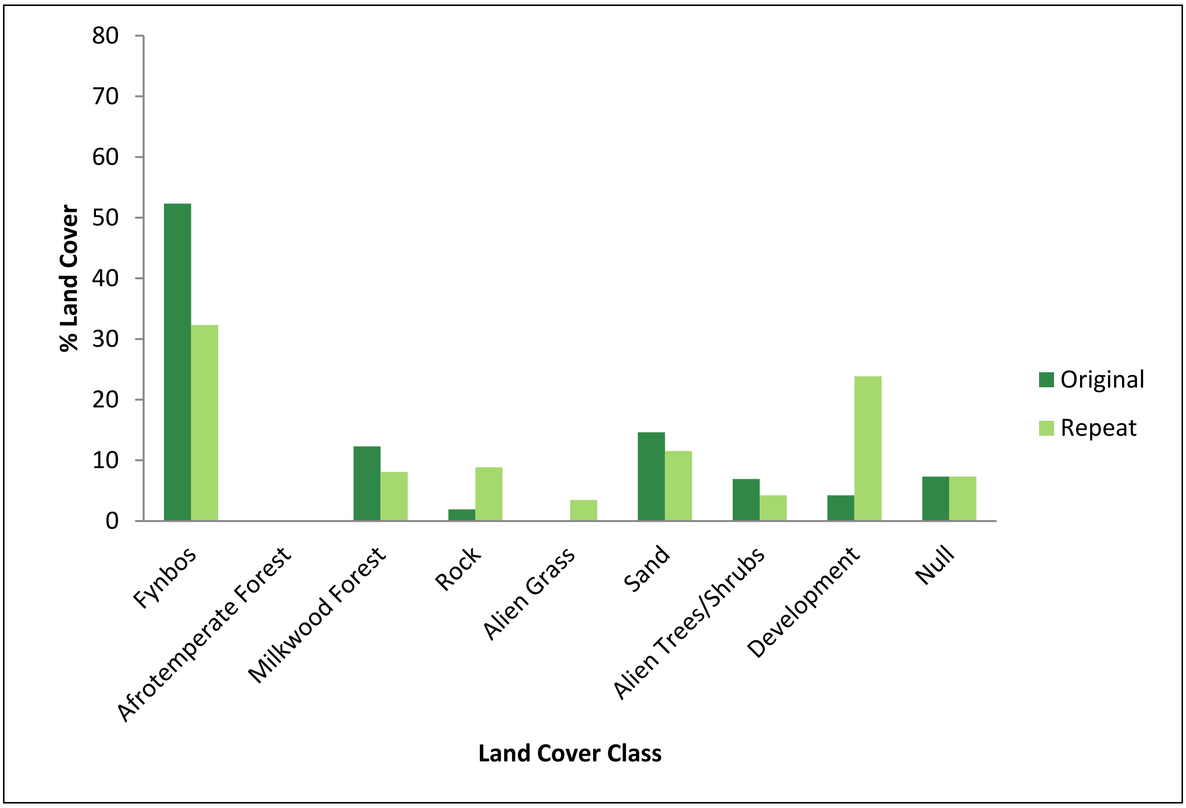

Figure 19.18: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough B

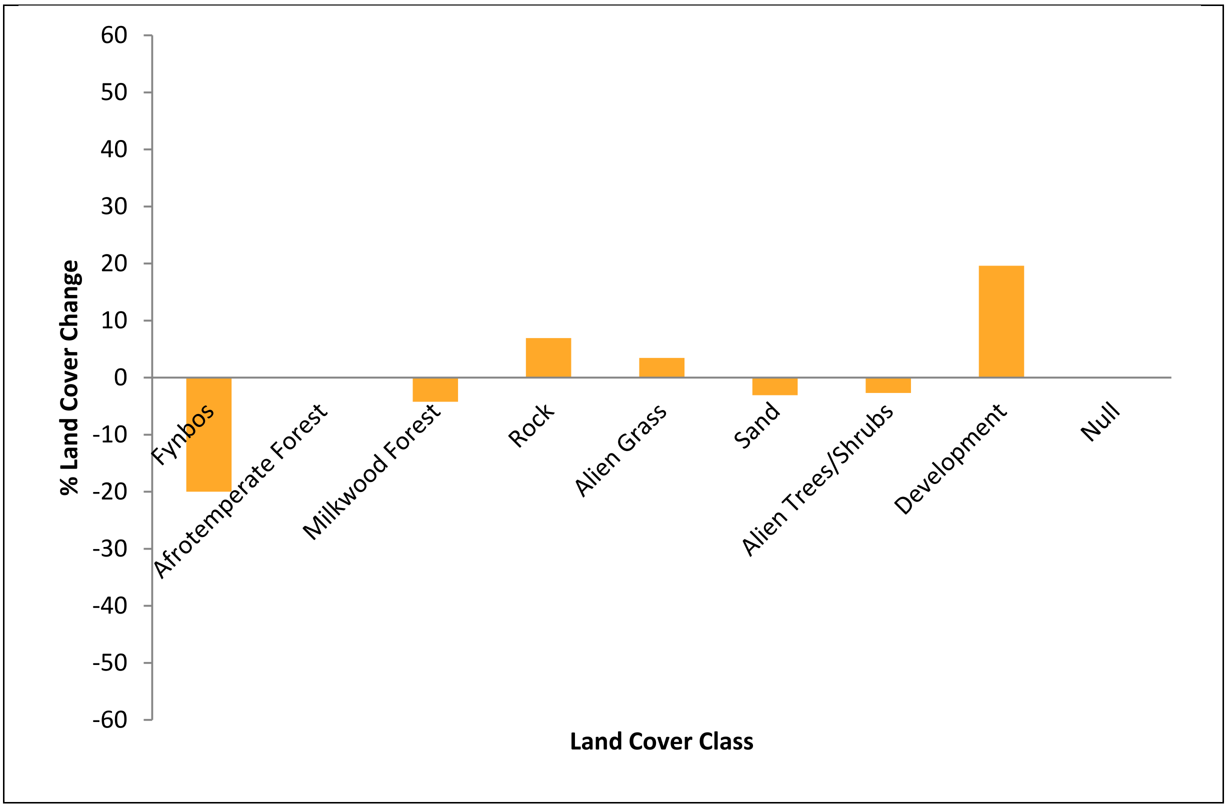

Figure 19.19: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough B

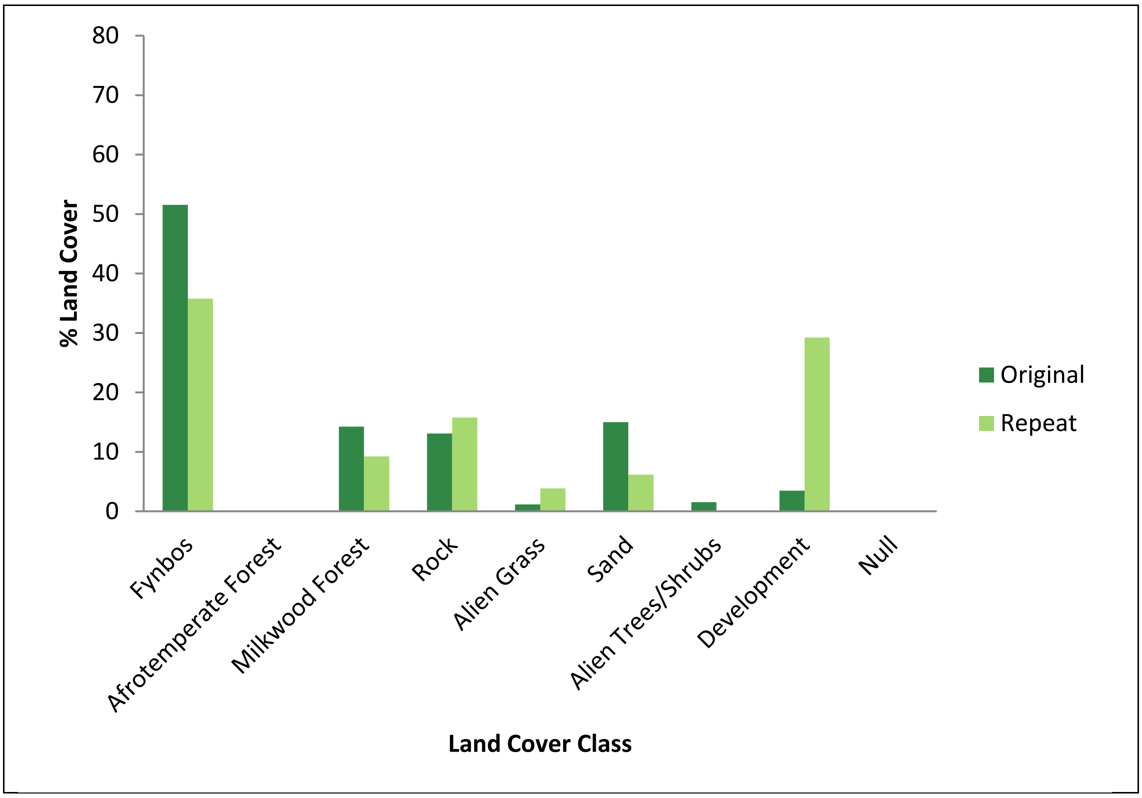

Figure 19.20: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough C

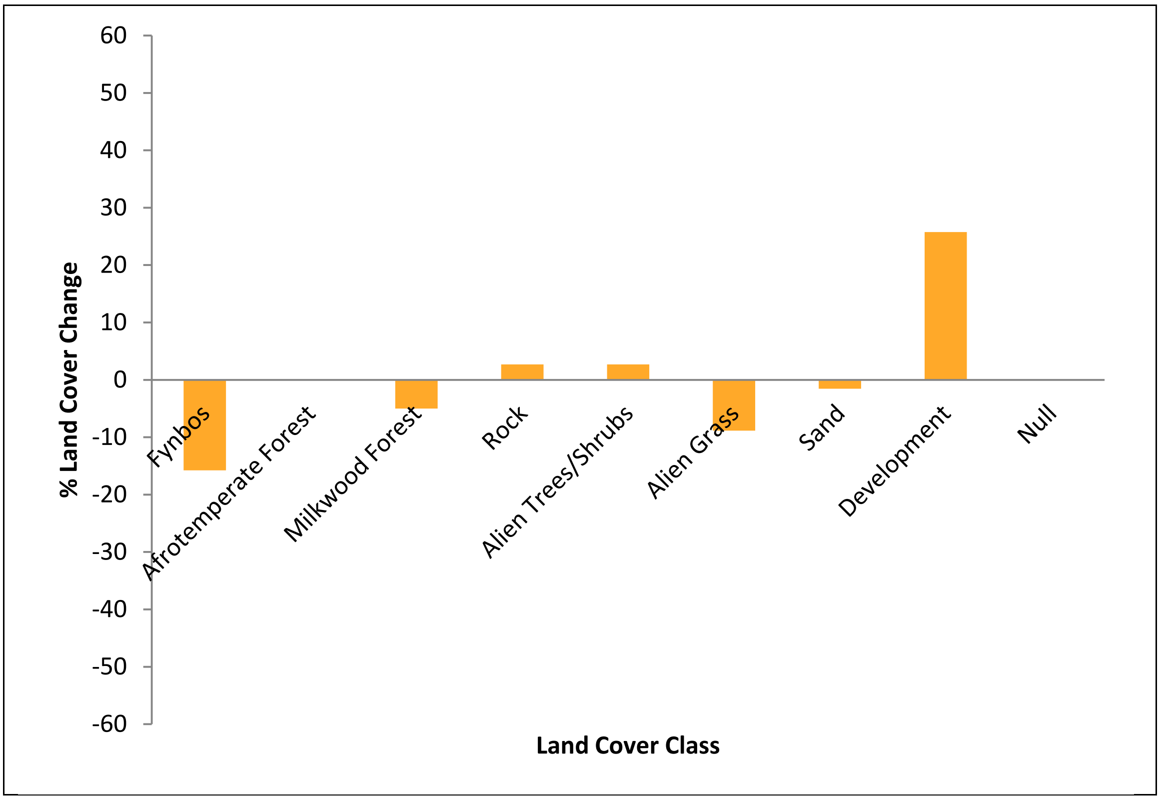

Figure 19.21: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough C

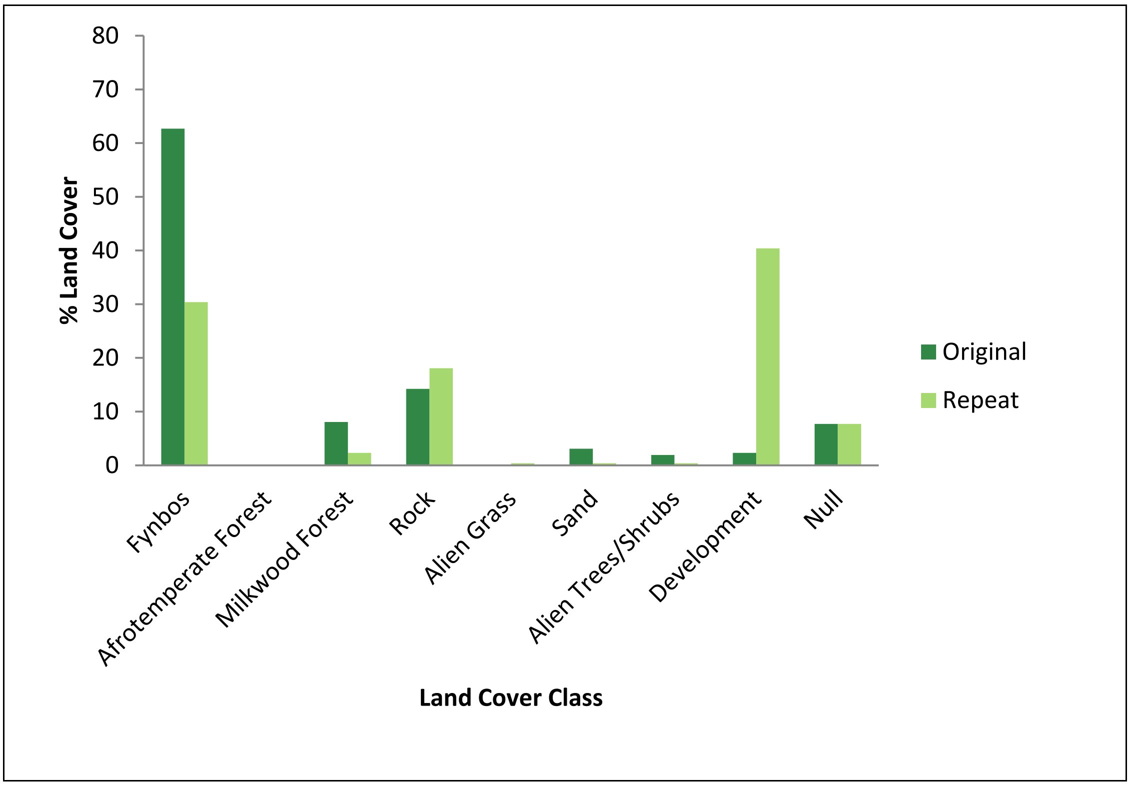

Figure 19.22: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough D

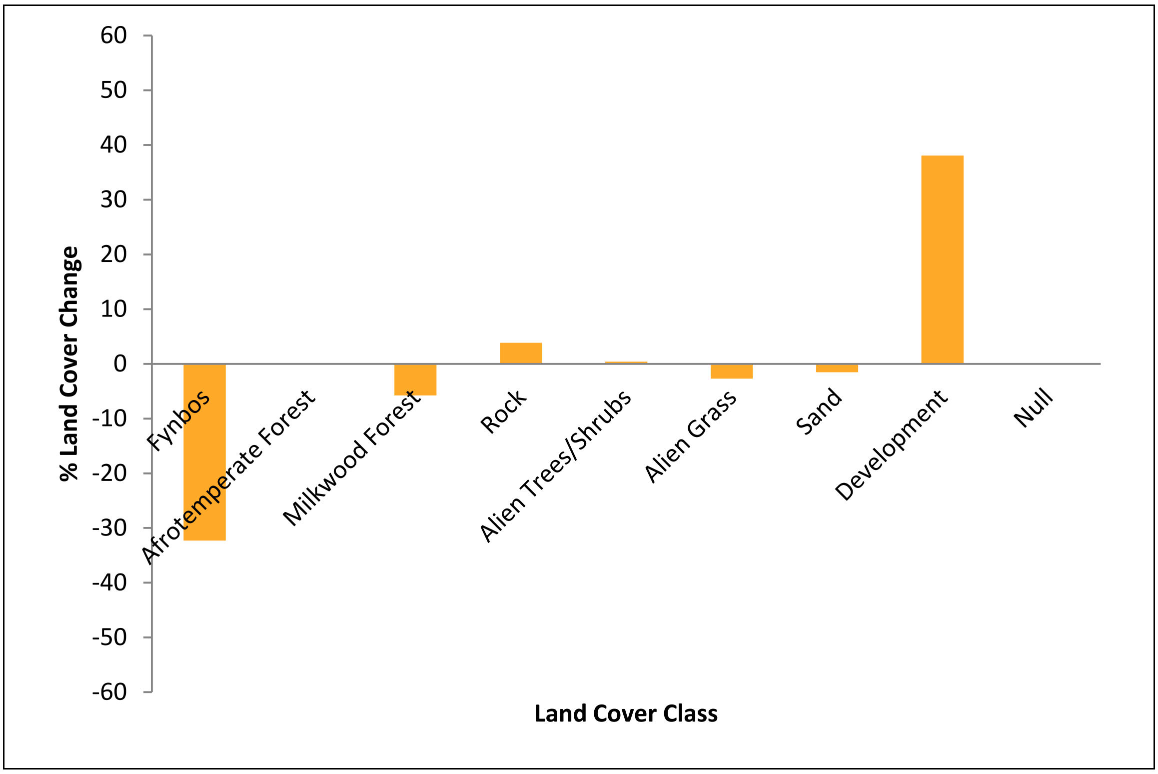

Figure 19.23: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough D

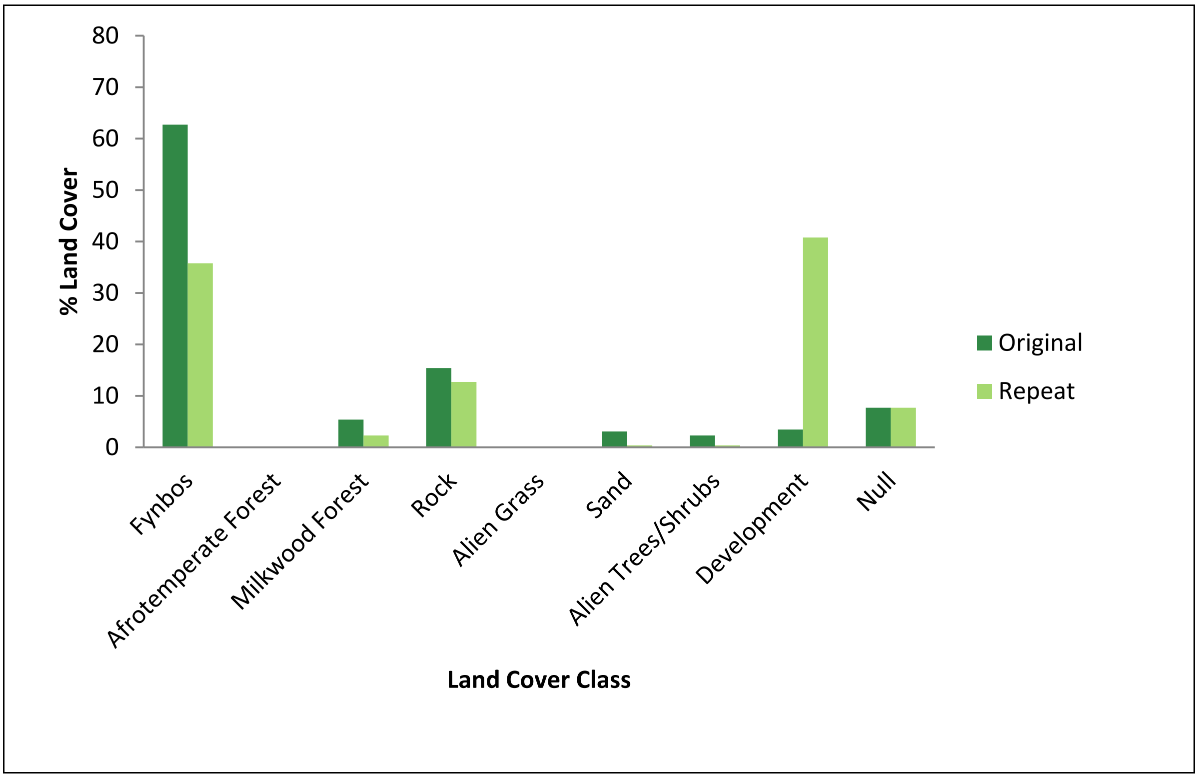

Figure 19.24: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough E

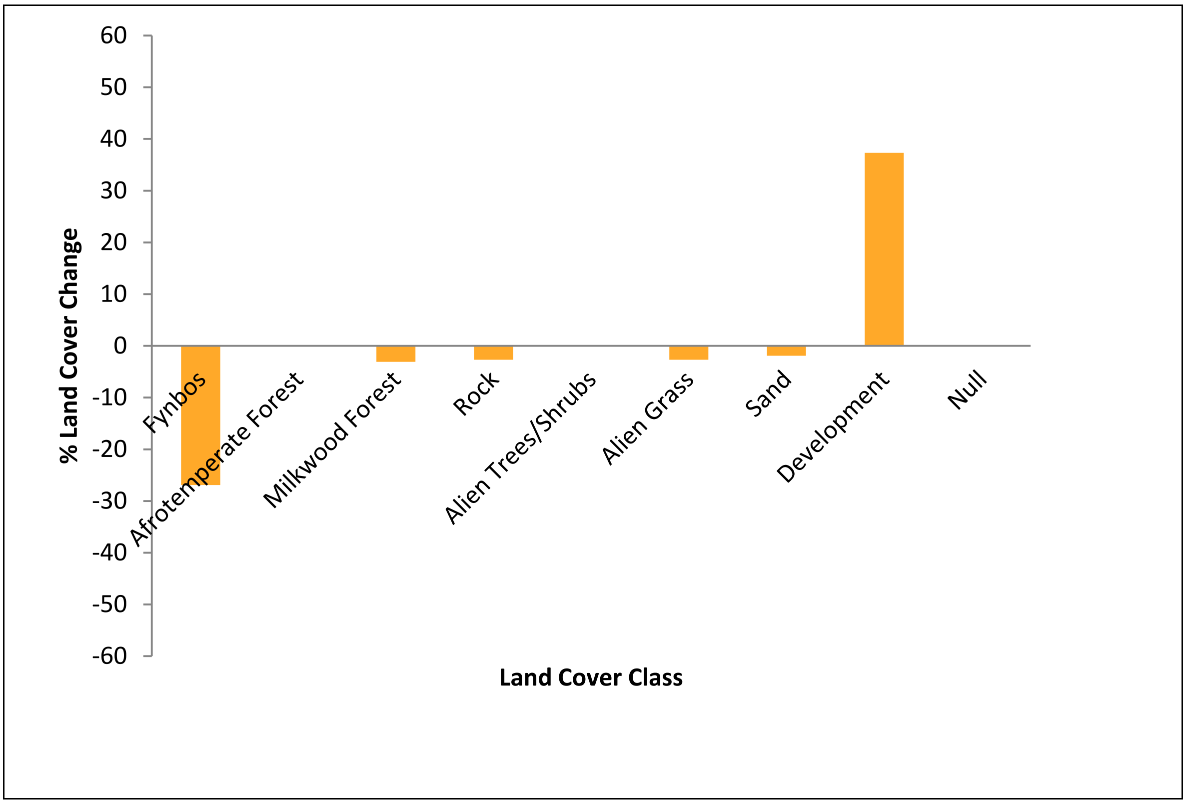

Figure 19.25: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough E

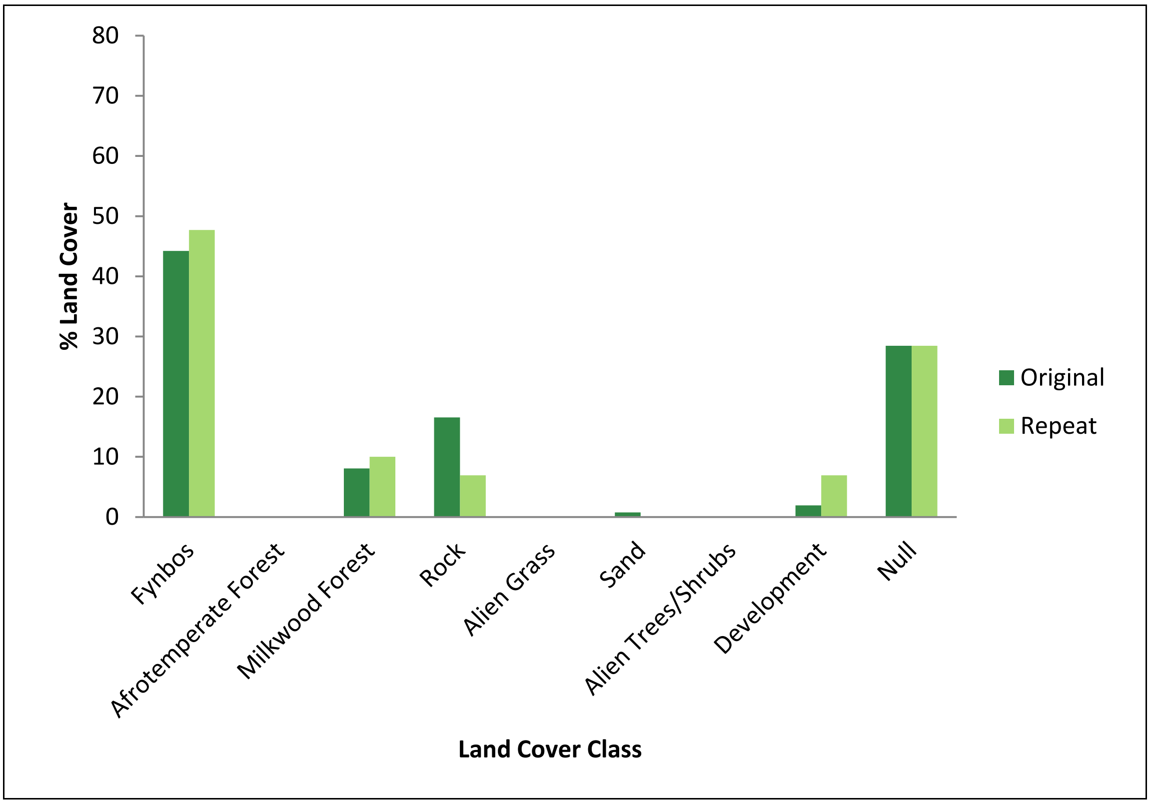

Figure 19.26: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough F

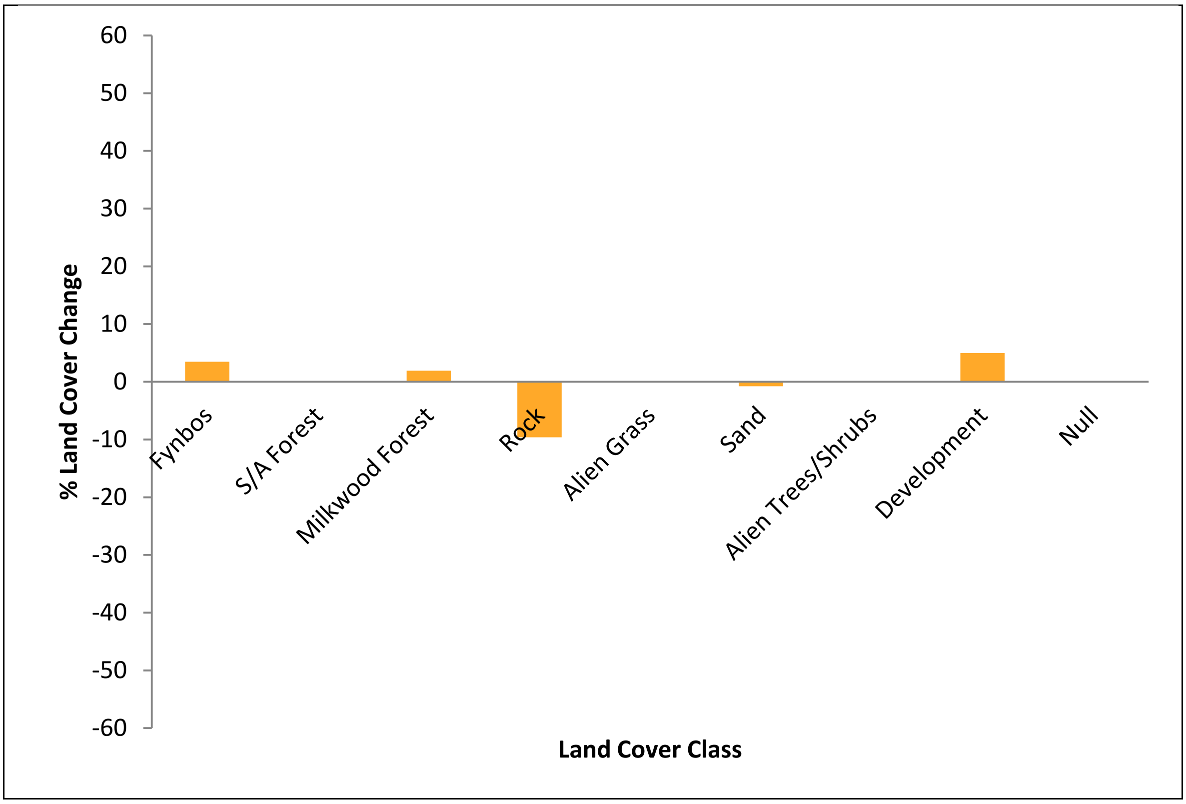

Figure 19.27: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough F

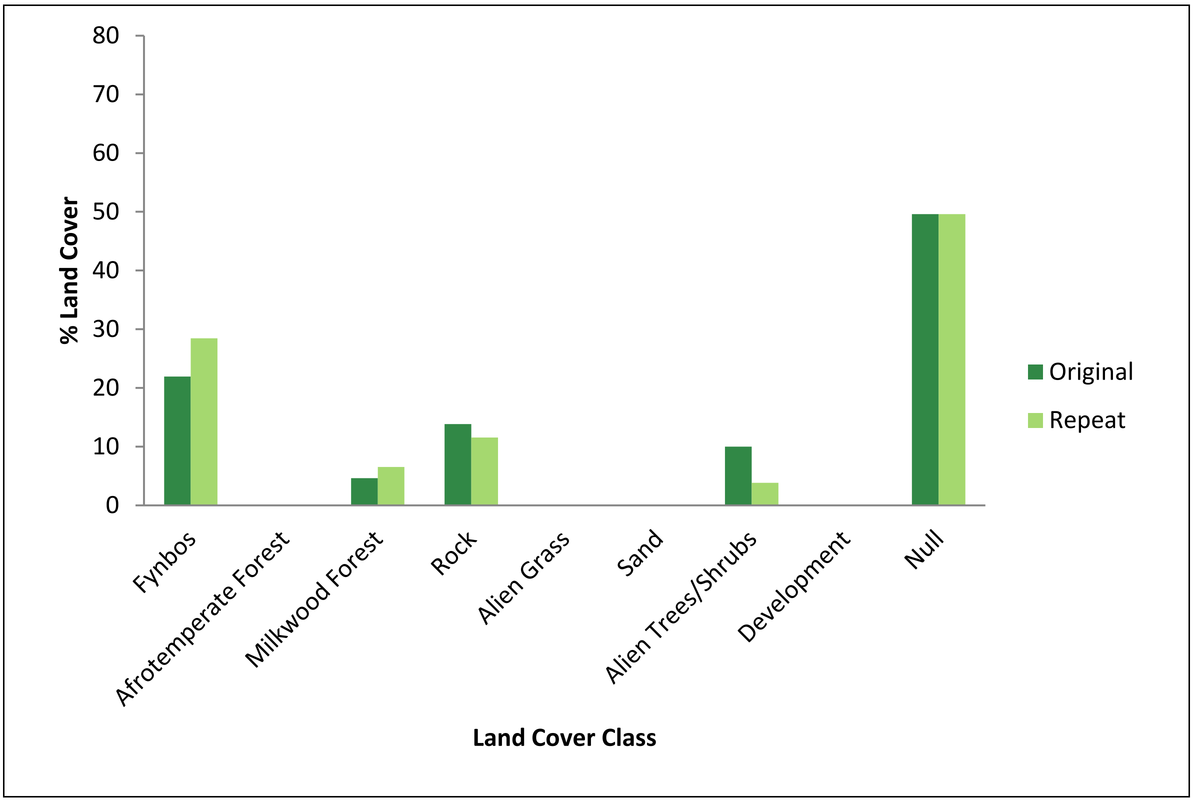

Figure 19.28: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 980 Scarborough G

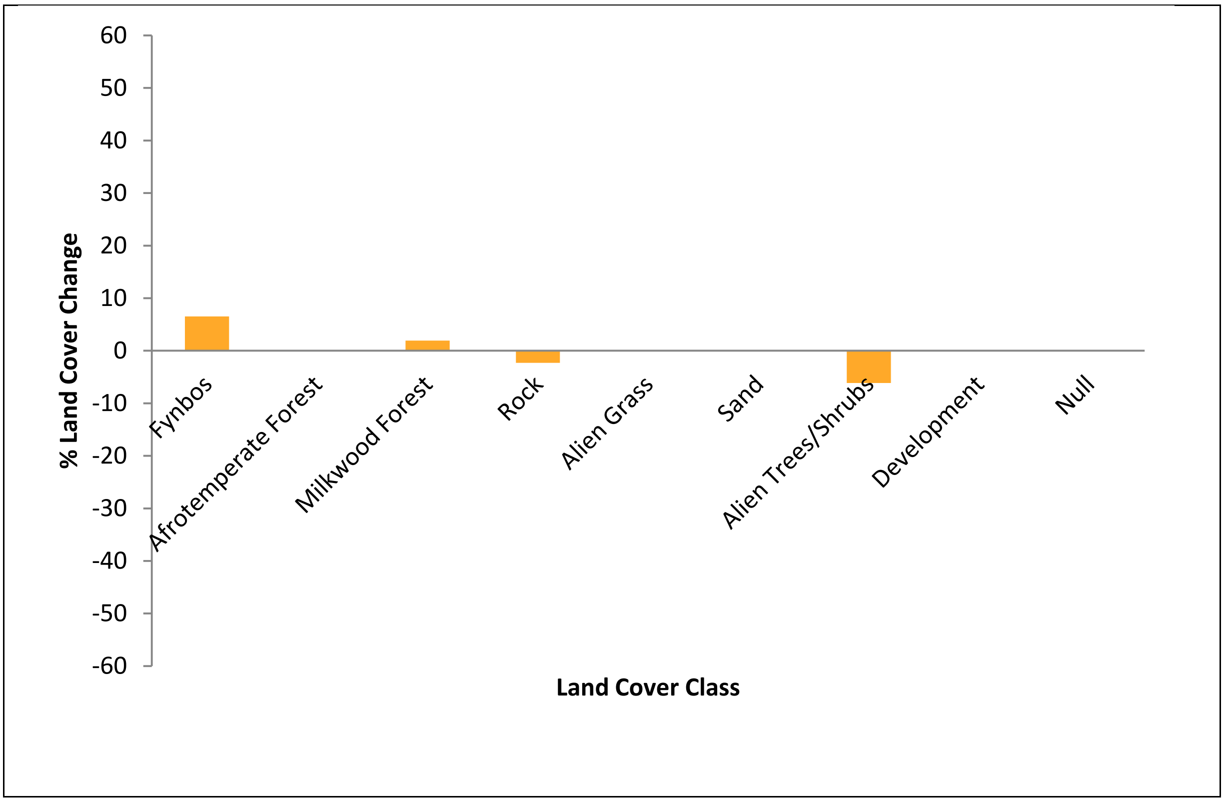

Figure 19.29: Percentage change in land cover classes between 1972 and 2011 at Site 980 Scarborough G

981 KOMMETJIE:

Figure 20.1: Original image from the Green Collection (South African National Archives) (1900)

Figure 20.2: Repeat image by Zoë C Poulsen (27/10/2011)

SITE INFORMATION

Site No: 981 **Date:** 27/10/2011 **Time spent on site:** 1:45pm

Concise Site Name: Kommetjie

General description of location: Next to road leading to Kommetjie looking north towards Chapman's Peak and Hout Bay.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.14680 **Altitude (m):** 46m

E 18.32272

Original Photographer: Green Collection (National Archives)

Original number: G246 **Original date**: c. 1900

Original site/photograph name: Kommetjie

Notes on accuracy of repeat photo station location: Within 50m of original site

Location Map:

Figure 20.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:	**River system**	**Grazing land (communal)**	**Grazing land (private)**	**Cultivated field**	**Settlement**	**Conservation area**

Keywords:	**Communal lands**	**Land reform**	**Development**	**Indicator species**	**Population dynamics**	**Climate change**

Site no: 981 **PHOTOGRAPHIC INFORMATION** **Date:** 27/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	506	24mm	1/100	8	340°	1:50pm
Canon 450D	Digital	507	24mm	1/80	8	340°	1:50pm
Canon 450D	Digital	508	24mm	1/100	8	340°	1:51pm
Canon 450D	Digital	509	24mm	1/100	8	340°	1:51pm
Canon 450D	Digital	510	24mm	1/100	8	340°	1:52pm
Canon 450D	Digital	511	24mm	1/100	8	340°	1:53pm
Canon 450D	Digital	512	24mm	1/100	8	340°	1:53pm
Canon 450D	Digital	513	24mm	1/100	8	340°	1:54pm

Notes on weather conditions: Sunny with cool breeze and scattered cloud

Site no: 981 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 27/10/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow soils derived from Table Mountain Sandstone, graduating to almost pure dune sand within the coastal zone. Inland now in Kommetjie most of the land is under coastal development so soils would have been altered by cultivation for gardens.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: This image set shows a view looking NNW from the road leading into Kommetjie towards Kommetjie town and its coastline with distant views beyond across the bay towards the Karbonkelberg, Hout Bay, Table Mountain and Chapman's Peak.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 20.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos and Strandveld vegetation in foreground: There has been a substantial expansion of housing development in Kommetjie since the original image was taken. In the original photo there are only a few small scattered houses present and now most of the original vegetation has been cleared and almost the whole area is covered with coastal housing development.

Landform B: Western Cape Milkwood Forest along Kommetjie coastline: Since the original image was taken there has been substantial coastal housing development, which has led to the destruction of most of the original vegetation in this area. Many of the coastal forest trees have been cleared and only scattered patches of *Sideroxylon inerme* now remain. In the original image there was a continuous belt of coastal forest and most of this no longer remains. The remaining coastal forest trees have increased in canopy height and age since the original image was taken.

Landform C: Mountains in background across the bay: Owing to the quality of the original image, it is hard to tell what changes have taken place. The most prominent change has been a substantial expansion of housing development in Hout Bay and the building of Chapman's Peak Drive.

Site no: 981 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 27/10/2011

Landform A: Fynbos and Strandveld in foreground of image (N/D – No data collected)

Landform B: Western Cape Milkwood Forest along Kommetjie coastline

Landform C: Background mountains across the bay (N/D – No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	0.5	N/D	N/A	N/A
2	*Euclea racemosa*	*Euclea racemosa*	N/D	5	N/D	N/A	N/A
3	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.1	N/D	N/A	N/A
4	*Maurocenia frangula*	*Maurocenia frangula*	N/D	5	N/D	N/A	N/A
5	*Olea europea africana*	*Olea europea africana*	N/D	0.5	N/D	N/A	N/A
6	*Olea exasperata*	*Olea exasperata*	N/D	0.1	N/D	N/A	N/A
7	*Pterocelastrus tricuspidatus*	*Pterocelastrus tricuspidatus*	N/D	0.1	N/D	N/A	N/A
8	*Searsia glauca*	*Searsia glauca*	N/D	10	N/D	N/A	N/A
9	*Cassine maritima*	*Cassine maritima*	N/D	0.1	N/D	N/A	N/A
10	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	50	N/D	N/A	N/A

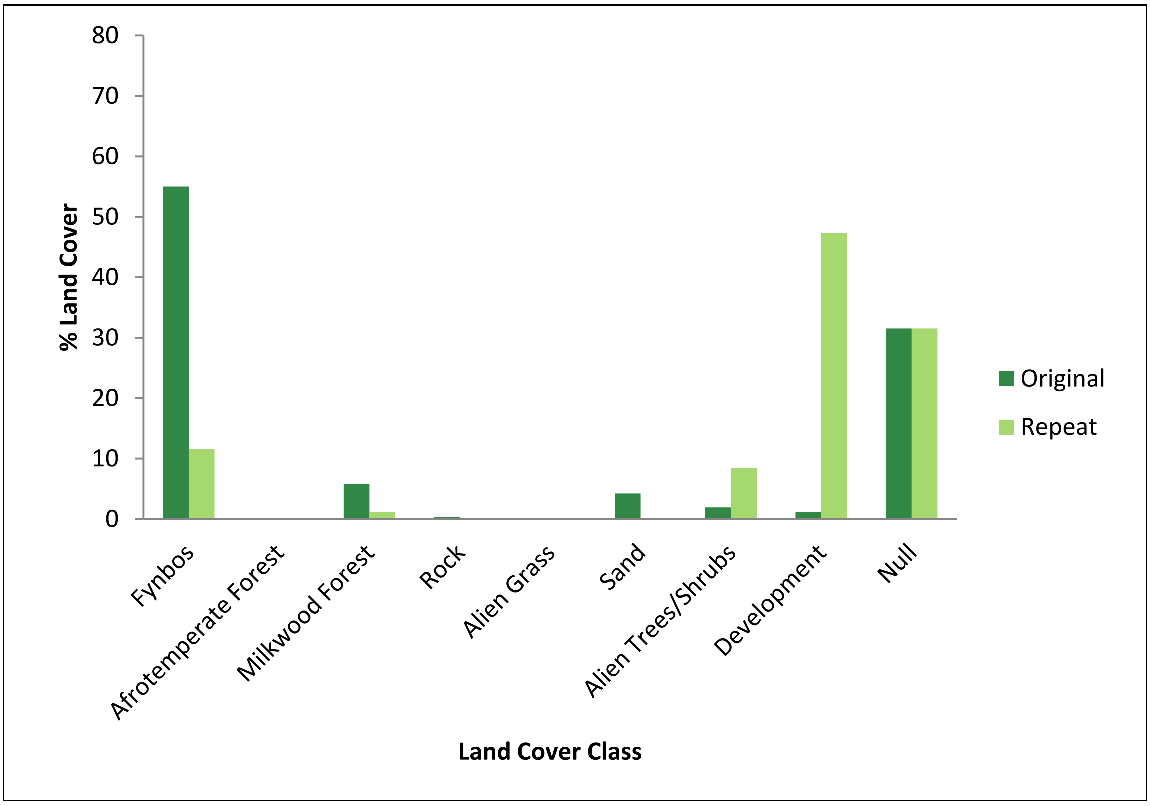

Figure 20.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 981 Kommetjie

Figure 20.6: Percentage change in land cover classes between 1900 and 2011 at Site 981 Kommetjie

982 KOMMETJIE A:

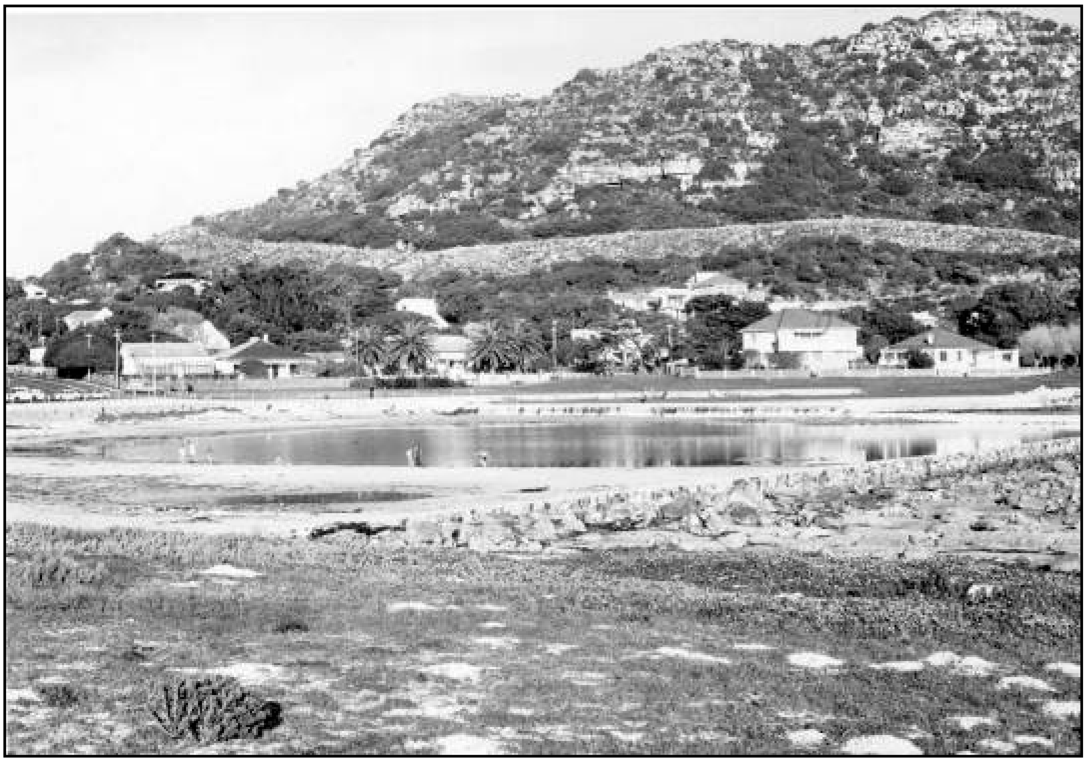

Figure 21.1: Original image from the CA Collection (South African National Archives) (1972)

Figure 21.2: Repeat image by Zoë C Poulsen (27/10/2011)

982 KOMMETJIE B:

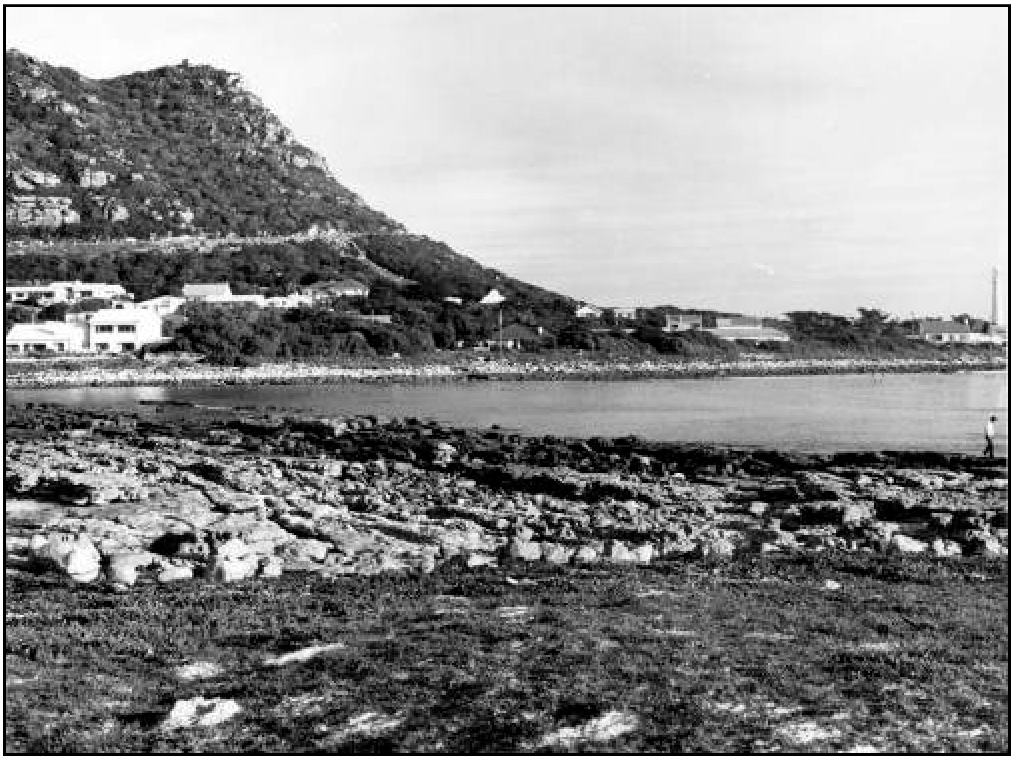

Figure 21.3: Original image from the CA Collection (South African National Archives) (1972)

Figure 21.4: Repeat image by Zoë C Poulsen (27/10/2011)

982 KOMMETJIE C:

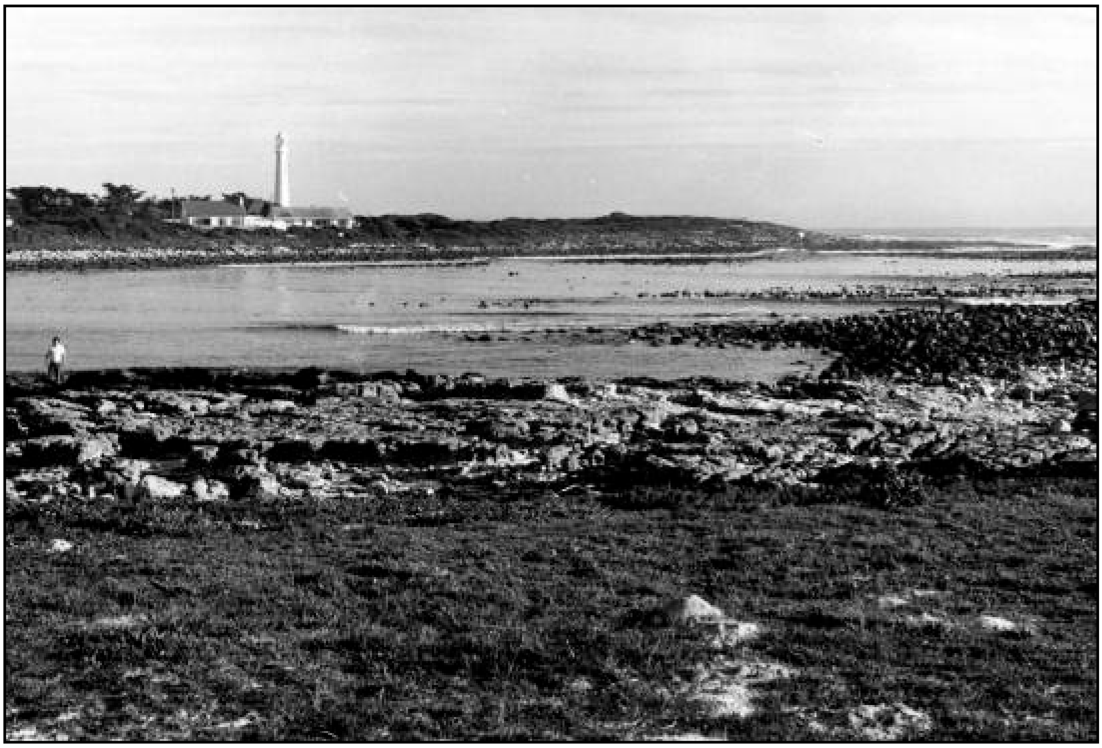

Figure 21.5: Original image from the CA Collection (South African National Archives) (1972)

Figure 21.6: Repeat image by Zoë C Poulsen (27/10/2011)

SITE INFORMATION

Site No: 982 **Date:** 27/10/2011 **Time spent on site:** 2:35pm

Concise Site Name: Kommetjie tidal pool

General description of location: Sand bar next to Kommetjie tidal pool looking south-east

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.14121 **Altitude (m):** 0m

E 18.32120

Original Photographer: CA Collection (National Archives)

Original number: CA1142 – CA1146 **Original date:** 1972

Original site/photograph name: Kommetjie Panorama

Notes on accuracy of repeat photo station location: Within 10m of original location

Location Map:

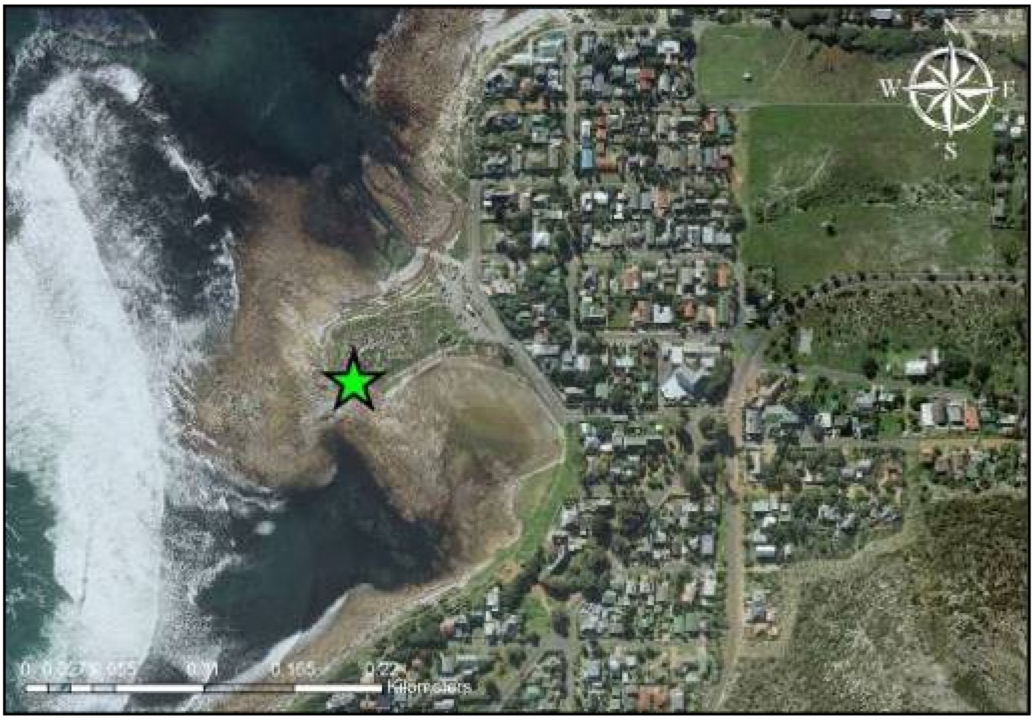

Figure 21.7: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 982 **PHOTOGRAPHIC INFORMATION** **Date:** 27/10/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	280	24mm	1/80	8	135°	2:40pm
Canon 450D	Digital	281	24mm	1/100	8	135°	2:40pm
Canon 450D	Digital	282	24mm	1/100	8	135°	2:41pm
Canon 450D	Digital	283	24mm	1/100	8	135°	2:41pm
Canon 450D	Digital	284	24mm	1/100	8	160°	2:42pm
Canon 450D	Digital	285	24mm	1/80	8	160°	2:42pm
Canon 450D	Digital	286	24mm	1/100	8	160°	2:43pm
Canon 450D	Digital	287	24mm	1/100	8	160°	2:43pm
Canon 450D	Digital	288	24mm	1/100	8	160°	2:44pm
Canon 450D	Digital	289	24mm	1/100	8	160°	2:44pm
Canon 450D	Digital	290	24mm	1/100	8	160°	2:45pm
Canon 450D	Digital	291	24mm	1/80	8	160°	2:45pm
Canon 450D	Digital	292	24mm	1/100	8	180°	2:46pm
Canon 450D	Digital	293	24mm	1/100	8	180°	2:46pm
Canon 450D	Digital	294	24mm	1/100	8	180°	2:47pm
Canon 450D	Digital	295	24mm	1/80	8	180°	2:47pm

Notes on weather conditions: Sunny with cool breeze and scattered cloud

Site no: 982 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 21/09/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain sand, ranging to dune sands in proximity to the beach and sand bar next to the tidal pool.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: Panorama view consisting of three images looking from sand bar across tidal pool in Kommetjie south towards Slangkop Lighthouse.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Landform A: Foreground sand bar:

1. Little change – slight increase in grass cover; Well defined path now visible in the foreground of the repeat image
2. Little change – slight increase in grass cover
3. Little change – slight increase in grass cover; Well defined path now visible in the foreground of the repeat image

Landform B: Western Cape Milkwood Forest along Kommetjie shoreline:

1. Very little of the original coastal forest belt present within this image, just a few scattered *Sideroxylon inerme* trees remain. Little change in this image
2. There has been a slight increase in canopy height in the coastal forest since the original image was taken. The tree canopies have also become more well-rounded owing to increased wind-pruning There has been a slight increase in forest patch cover.
3. There has been a slight increase in forest canopy height and forest patch size since the original image was taken. The forest canopy has also become more well-rounded owing to increased wind-pruning.

Landform C: Fynbos on NW facing slope in background:

1. The firebreak on the background slope has become vegetated since 1972 and is now far less well defined. There has been a slight decrease in shrubby vegetation cover since the original image was taken.
2. Little change – slight increase in shrubby vegetation cover
3. N/A – this slope isn't visible in this image

Landform A: Foreground sand bar (N/D: No data collected)

Landform B: Western Cape Milkwood Forest along Kommetjie shoreline

Landform C: Fynbos on NW-facing slope in background (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	0.5	N/D	N/A	N/A
2	*Euclea racemosa*	*Euclea racemosa*	N/D	5	N/D	N/A	N/A
3	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.1	N/D	N/A	N/A
4	*Maurocenia frangula*	*Maurocenia frangula*	N/D	5	N/D	N/A	N/A
5	*Olea europea africana*	*Olea europea africana*	N/D	0.5	N/D	N/A	N/A
6	*Olea exasperata*	*Olea exasperata*	N/D	0.1	N/D	N/A	N/A
7	*Pterocelastrus tricuspidatus*	*Pterocelastrus tricuspidatus*	N/D	0.1	N/D	N/A	N/A
8	*Searsia glauca*	*Searsia glauca*	N/D	10	N/D	N/A	N/A
9	*Cassine maritima*	*Cassine maritima*	N/D	0.1	N/D	N/A	N/A
10	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	50	N/D	N/A	N/A

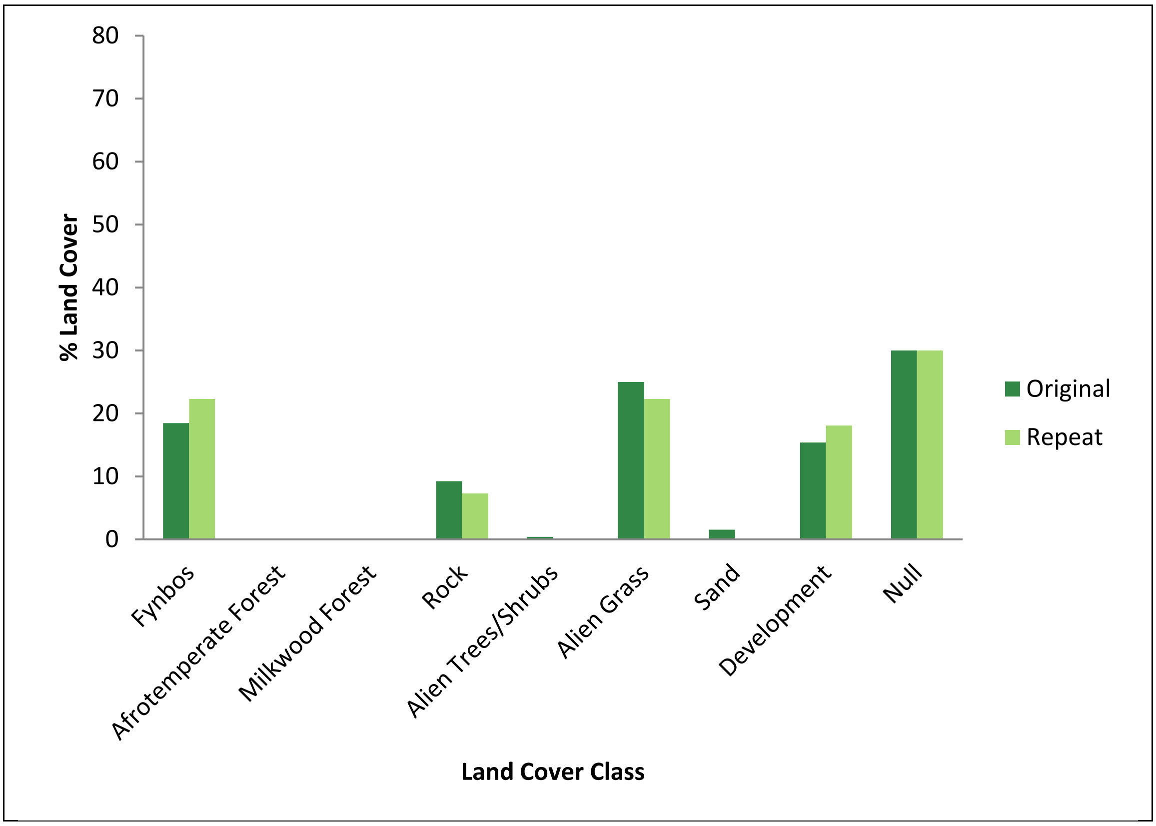

Figure 21.8: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 982 Kommetjie A

Figure 21.9: Percentage change in land cover classes between 1972 and 2011 at Site 982 Kommetjie A

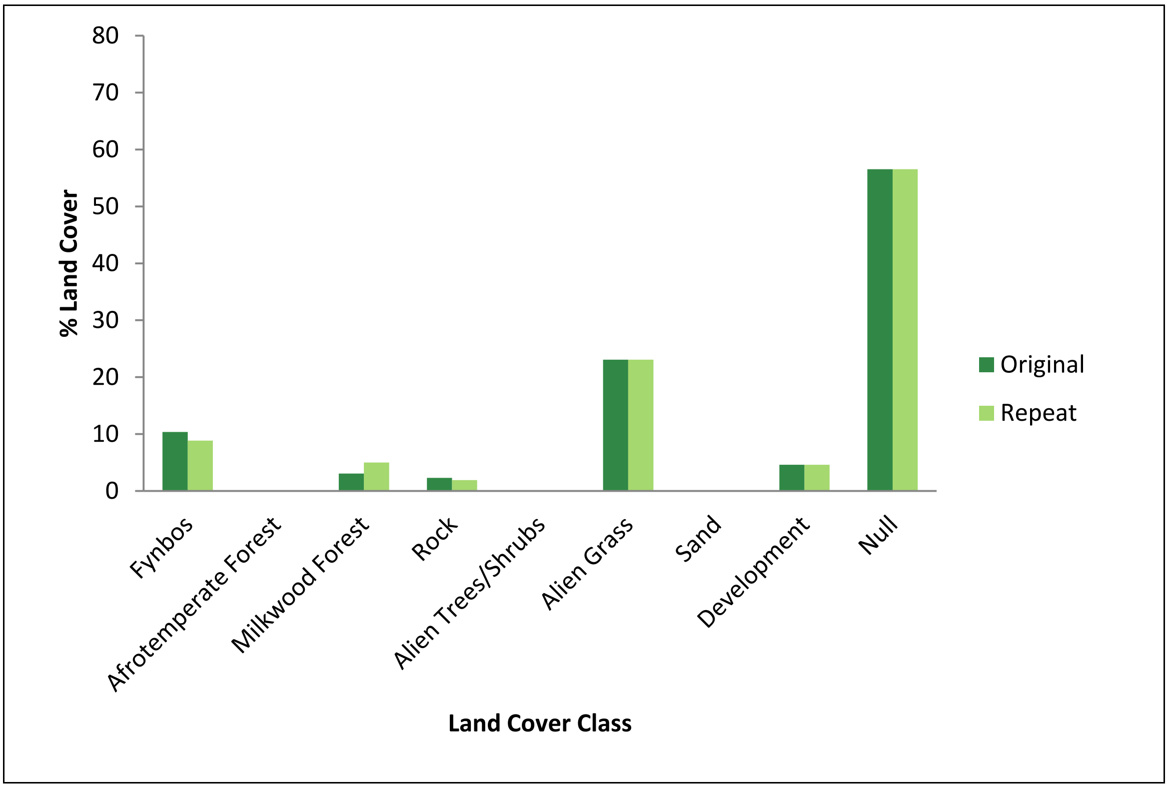

Figure 21.10: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 982 Kommetjie B

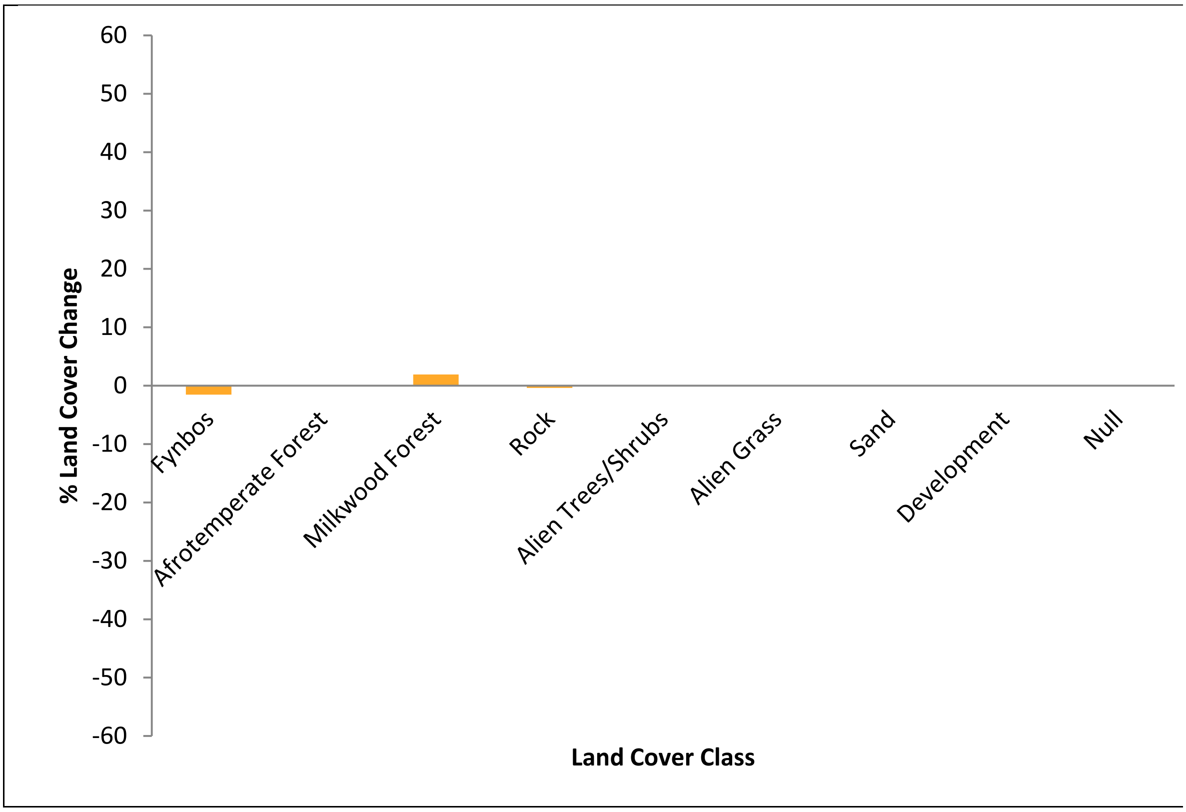

Figure 21.11: Percentage change in land cover classes between 1972 and 2011 at Site 982 Kommetjie B

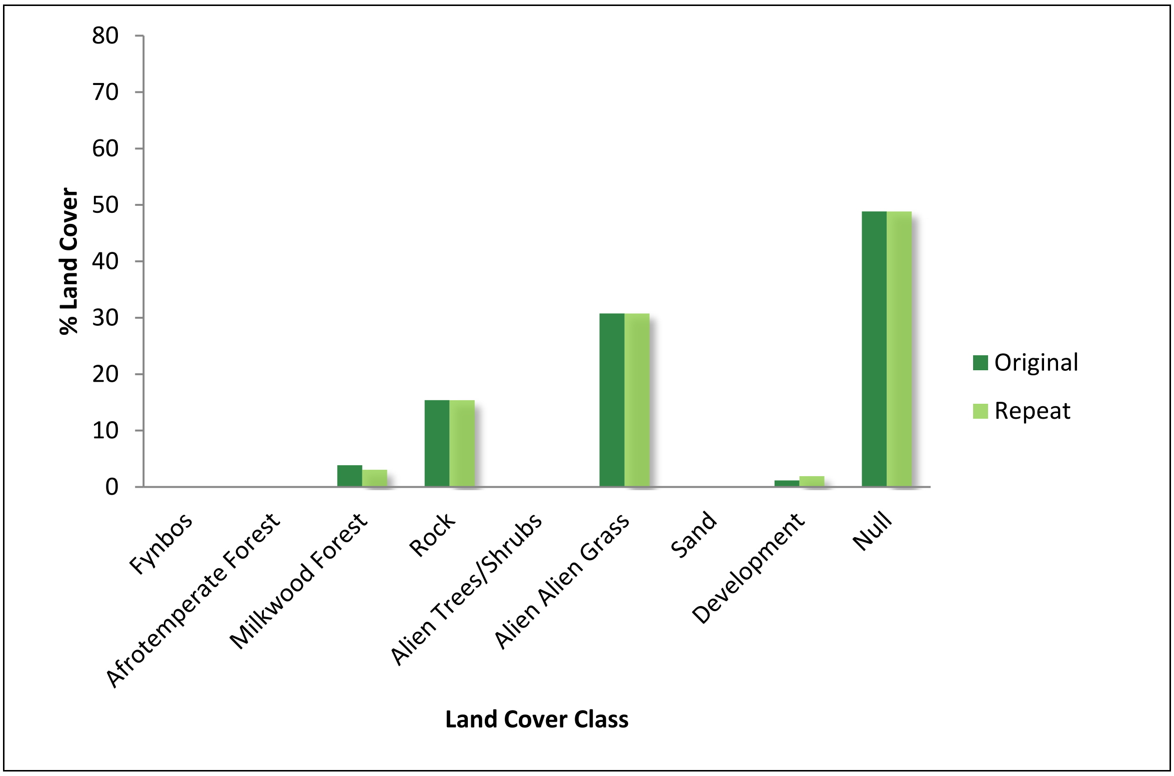

Figure 21.12: Percentages of land cover classes present in original (1972) and repeat image (2011) at Site 982 Kommetjie C

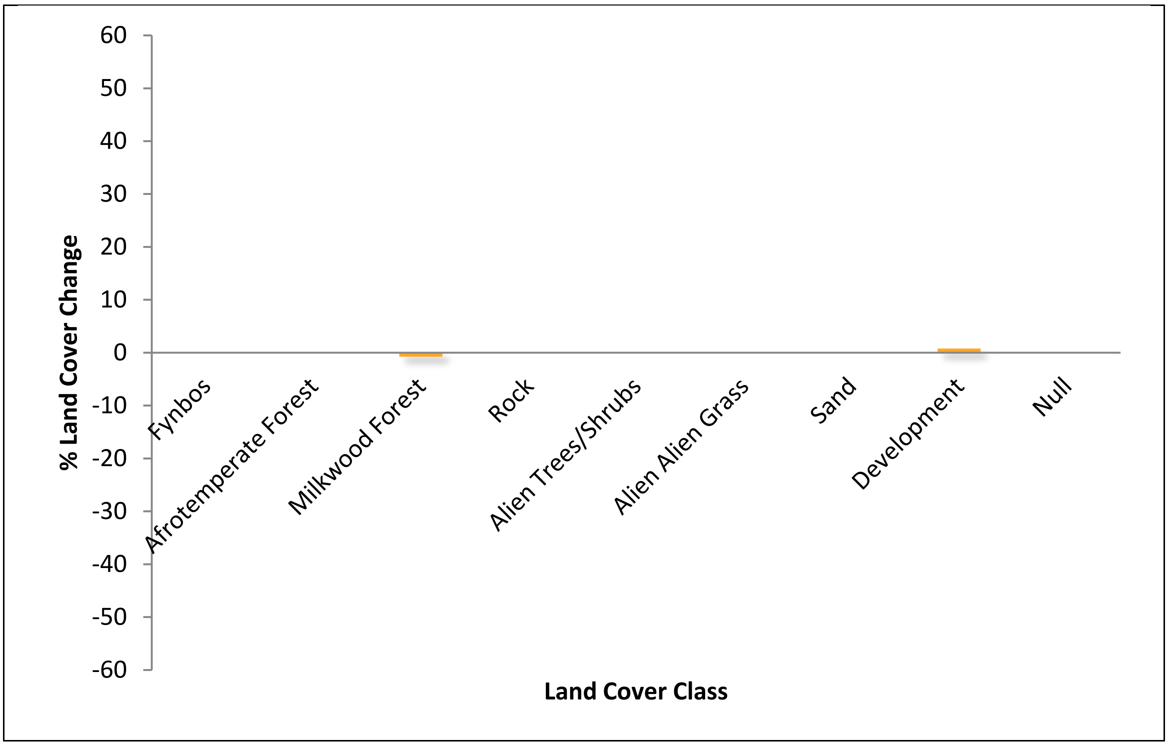

Figure 21.13: Percentage change in land cover classes between 1972 and 2011 at Site 982 Kommetjie C

983 OLIFANTSBOS:

Figure 22.1: Original image from the Green Collection (South African National Archives) (c.1900)

Figure 22.2: Repeat image by Zoë C Poulsen (03/11/2011)

SITE INFORMATION

Site No: 983 **Date:** 03/11/2011 **Time spent on site:** 9:10am

Concise Site Name: Olifantsbos, Cape Point

General description of location: On top of koppie immediately east of road to Olifantsbos car park in Cape of Good Hope section of Table Mountain National Park.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.259957 **Altitude (m):** 33m

E 18.385373

Original Photographer: Green Collection (National Archives)

Original number: G298 **Original date:** c. 1900

Original site/photograph name: Olifantsbos

Notes on accuracy of repeat photo station location: Within 10m of original site

Location Map:

Figure 22.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 983 **PHOTOGRAPHIC INFORMATION** **Date:** 03/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	323	24mm	1/80	8	245°	9:30am
Canon 450D	Digital	324	24mm	1/80	8	245°	9:30am
Canon 450D	Digital	325	24mm	1/80	8	245°	9:31am
Canon 450D	Digital	326	24mm	1/80	8	245°	9:31am
Canon 450D	Digital	327	24mm	1/80	8	245°	9:32am
Canon 450D	Digital	328	24mm	1/80	8	245°	9:32am

Notes on weather conditions: Sunny with scattered cloud

Site no: 983 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 03/11/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow soils derived from Table Mountain sandstone.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking west towards the old farm of Olifantsbos with the sea beyond.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 22.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: North-facing slopes south of road: There have been some changes on these slopes since the original photo was taken. The most significant change that has taken place has been change in distribution of shrubby vegetation. On the koppie in the foreground there was originally a belt of shrubby vegetation and this is no longer present. Overall on the foreground koppie there has been a slight increase in vegetation cover and less bare rock is present than in the original image. On the koppie in the background there has been almost no change. In the valley between the two koppies, there has been a slight increase in height of shrubby vegetation. Since the original image was taken, a tarmac road has been build to access the car parking area next to the Olifantsbos beach and the farmhouse has been demolished.

Landform B: Fynbos north of road: There has been a slight increase in shrubby cover since the original images were taken but large patches of grassy vegetation still remain present owing to heavy grazing in this area. The areas that were cultivated farmland in the original image have now been colonised by shrubby vegetation.

Landform C: Patches of Western Cape Milkwood Forest north of road: There has been an increase in forest/shrubby vegetation height and the forest patch canopy is now more well-rounded owing to increased wind pruning.

Landform A: North-facing slopes south of road (N/D: No data collected)

Landform B: Fynbos north of road (N/D: No data collected)

Landform C: Patches of Western Cape Milkwood Forest north of road

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	N/D	0.1	N/A	N/A
2	*Euclea racemosa*	*Euclea racemosa*	N/D	N/D	10	N/A	N/A
3	*Maurocenia frangula*	*Maurocenia frangula*	N/D	N/D	0.5	N/A	N/A
4	*Colpoon compressum*	*Colpoon compressum*	N/D	N/D	0.1	N/A	N/A
5	*Searsia lucida*	*Searsia lucida*	N/D	N/D	5	N/A	N/A
6	*Cassine maritima*	*Cassine maritima*	N/D	N/D	0.1	N/A	N/A
7	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	N/D	80	N/A	N/A
8	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	N/D	N/D	0.1	N/A	N/A

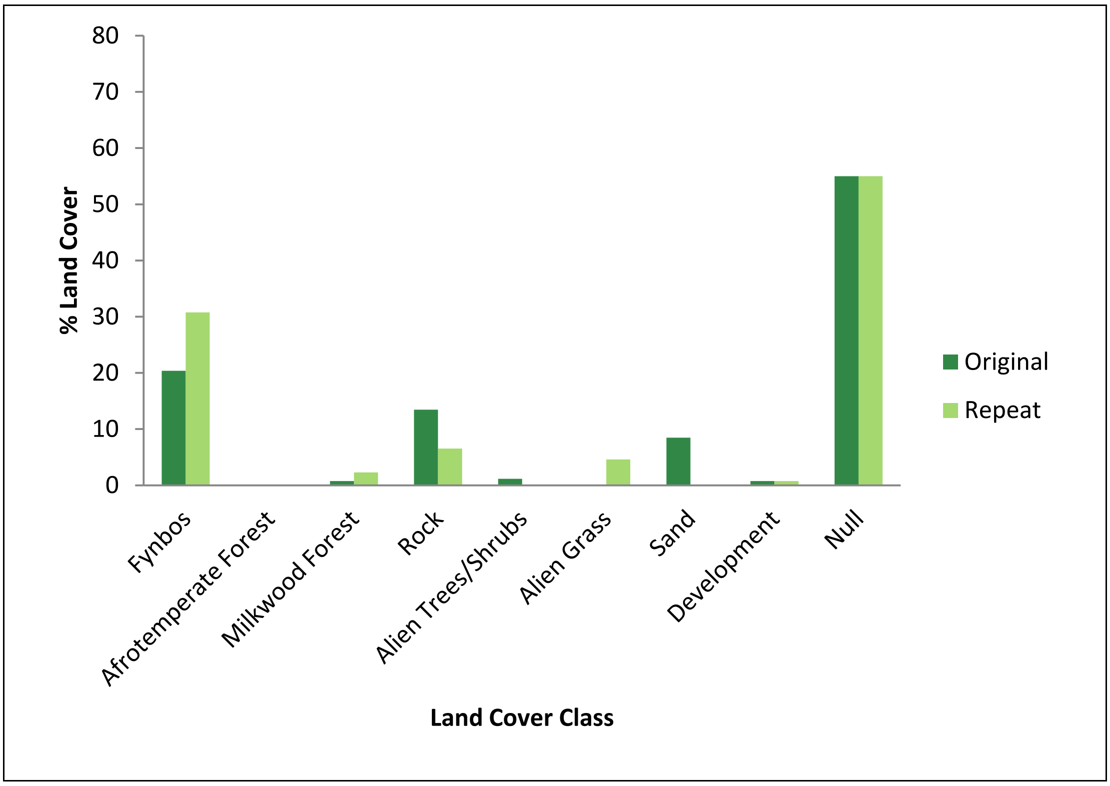

Figure 22.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 983 Olifantsbos

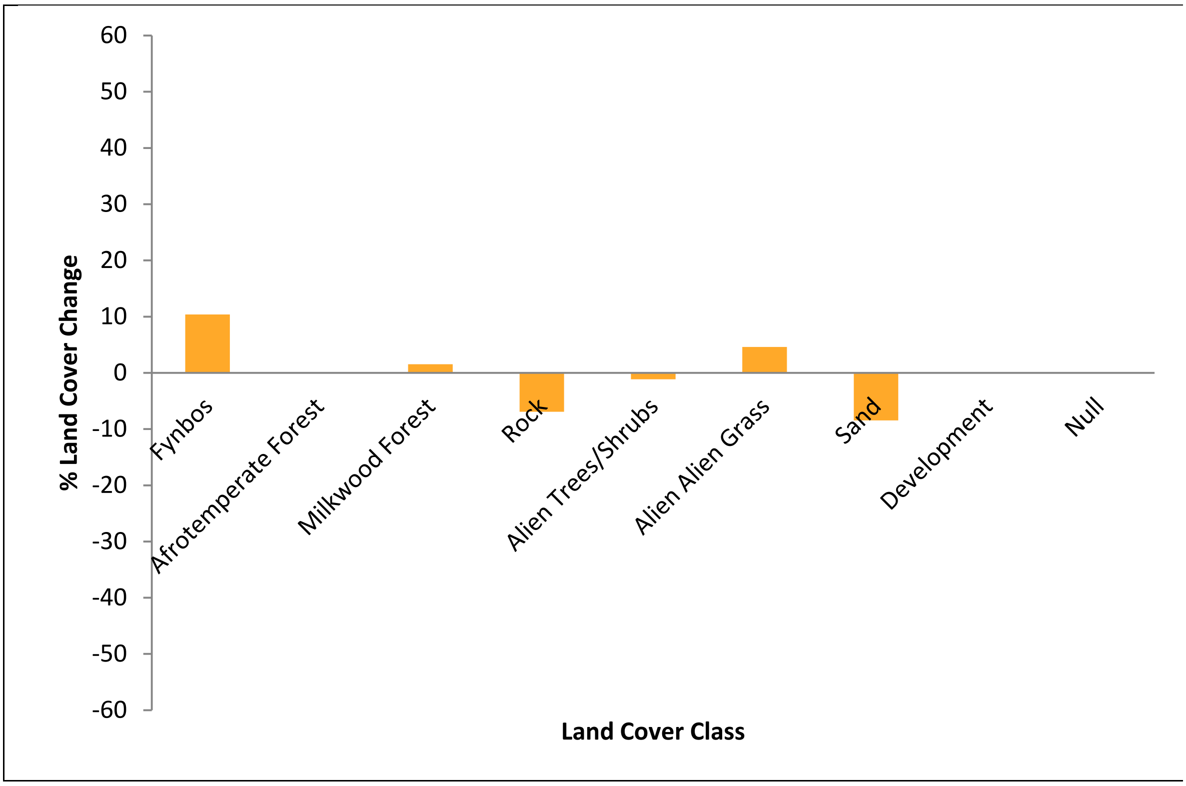

Figure 22.6: Percentage change in land cover classes between 1900 and 2011 at Site 983 Olifantsbos

984 BUFFELSBAAI:

Figure 23.1: Original image from the Green Collection (South African National Archives) (c.1900)

Figure 23.2: Original image by Zoë C Poulsen (03/11/2011)

<u>**SITE INFORMATION**</u>

Site No: 984 **Date:** 03/11/2011 **Time spent on site:** 1:30pm

Concise Site Name: Buffelsbaai

General description of location: Coastline south of Buffelsbaai looking north towards Kanonkop, Paulsberg, Judas Peak and Batsata Cove.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: S -34.323946 **Altitude (m):** 17m asl.

E 18.463015

Original Photographer: Green Collection (National Archives);

Original number: G300 **Original date:** c. 1900

Original site/photograph name: Paulsberg and Buffelsbaai

Notes on accuracy of repeat photo station location: Within 20m of original location

Location Map:

Figure 23.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 984 **PHOTOGRAPHIC INFORMATION** **Date:** 03/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	170	24mm	1/160	8	330°	2:30pm
Canon 450D	Digital	171	24mm	1/125	8	330°	2:31pm
Canon 450D	Digital	172	24mm	1/125	8	330°	2:32pm
Canon 450D	Digital	173	24mm	1/160	8	330°	2:33pm
Canon 450D	Digital	174	24mm	1/125	8	330°	2:34pm

Notes on weather conditions: Warm and sunny with scattered cloud and slight breeze

Site no: 984 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 03/11/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient-poor Table Mountain Sandstone derived soils

Landscape description *(including aspect, slope, catena characteristics, etc:* View looking northwards towards Buffelsbaai Beach in the foreground and the mountain peaks of Paulsberg, Kanonkop and Judas Peak.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 23.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: East-facing slopes south of Buffelsbaai in foreground of image: In the foreground of the image there has been a substantial increase in shrubby vegetation and a significant increase in vegetation height. The Western Cape Milkwood Forest patches have increased in height since the original image was taken. The canopy has become more well-rounded owing to increase wind pruning. There has also been a decrease in grassy vegetation cover at this site.

Landform B: East-facing slopes and rocky Peninsula in midground: The dune system behind Buffelsbaai Beach has become much less mobile and more vegetated with an increase in grass cover (less bare sand) since the original image was taken. There has also been an increase in dune height. A car park has now been built right next to the beach and kikuyu grass has been planted to create a lawn area right next to the beach. On the slopes behind there has been less prominent change, with a slight increase in shrubby cover and vegetation height since the original image was taken.

Landform C: Mountain peaks in background of image: On the distant peaks there has been an increase in vegetation cover and there is now less bare rock visible. On the lower seaward slopes of Paulsberg, Kanonkop and Judas Peak there has been a substantial increase in shrubby vegetation and an increase in vegetation height.

Site no: 984 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 03/11/2011

Landform A: East-facing slopes south of Buffelsbaai in foreground of image

Landform B: East-facing slopes and rocky peninsula in midground (N/D: No data collected)

Landform C: Mountain peaks in background of image (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Chionanthus foveolatus*	*Chionanthus foveolatus*	0.1	N/D	N/D	N/A	N/A
2	*Cussonia thyrsiflora*	*Cussonia thrysiflora*	0.1	N/D	N/D	N/A	N/A
3	*Euclea racemosa*	*Euclea racemosa*	0.5	N/D	N/D	N/A	N/A
4	*Colpoon compressum*	*Colpoon compressum*	0.1	N/D	N/D	N/A	N/A
5	*Pterocelastrus tricuspidatus*	*Pterocelastrus tricuspidatus*	0.5	N/D	N/D	N/A	N/A
6	*Cassine maritima*	*Cassine maritima*	0.5	N/D	N/D	N/A	N/A
7	*Sideroxylon inerme*	*Sideroxylon inerme*	80	N/D	N/D	N/A	N/A

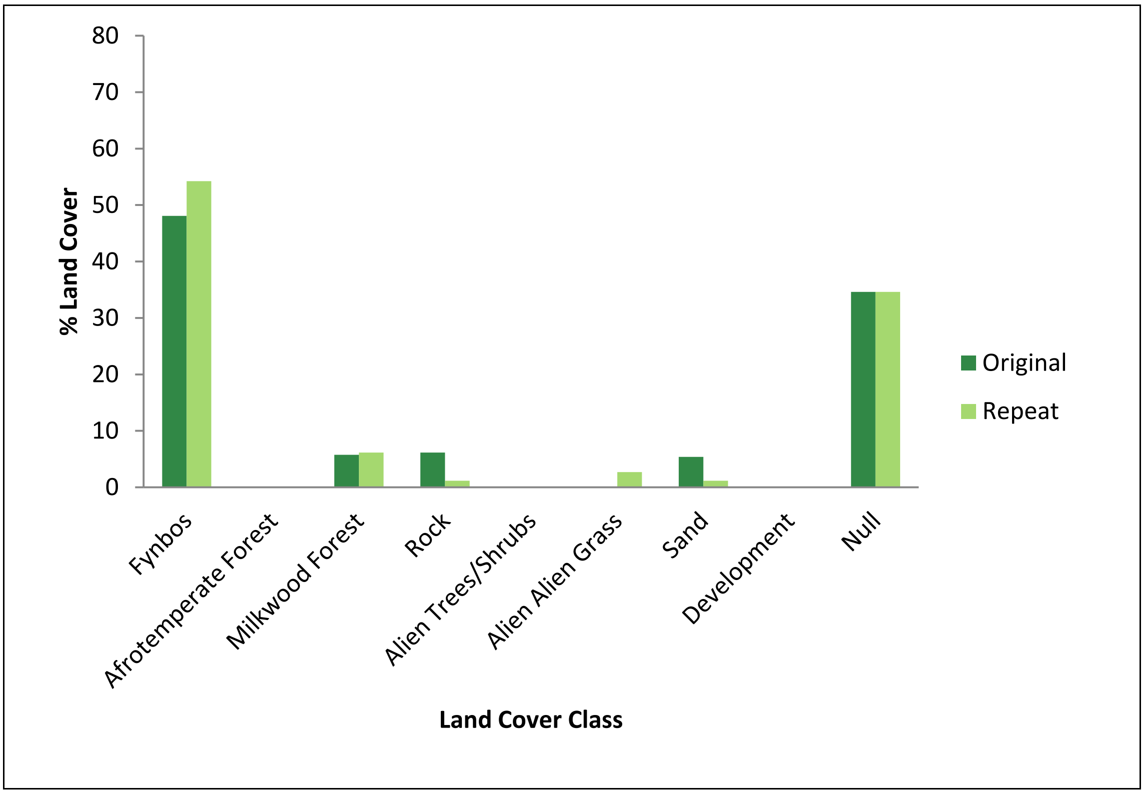

Figure 23.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 984 Buffelsbaai

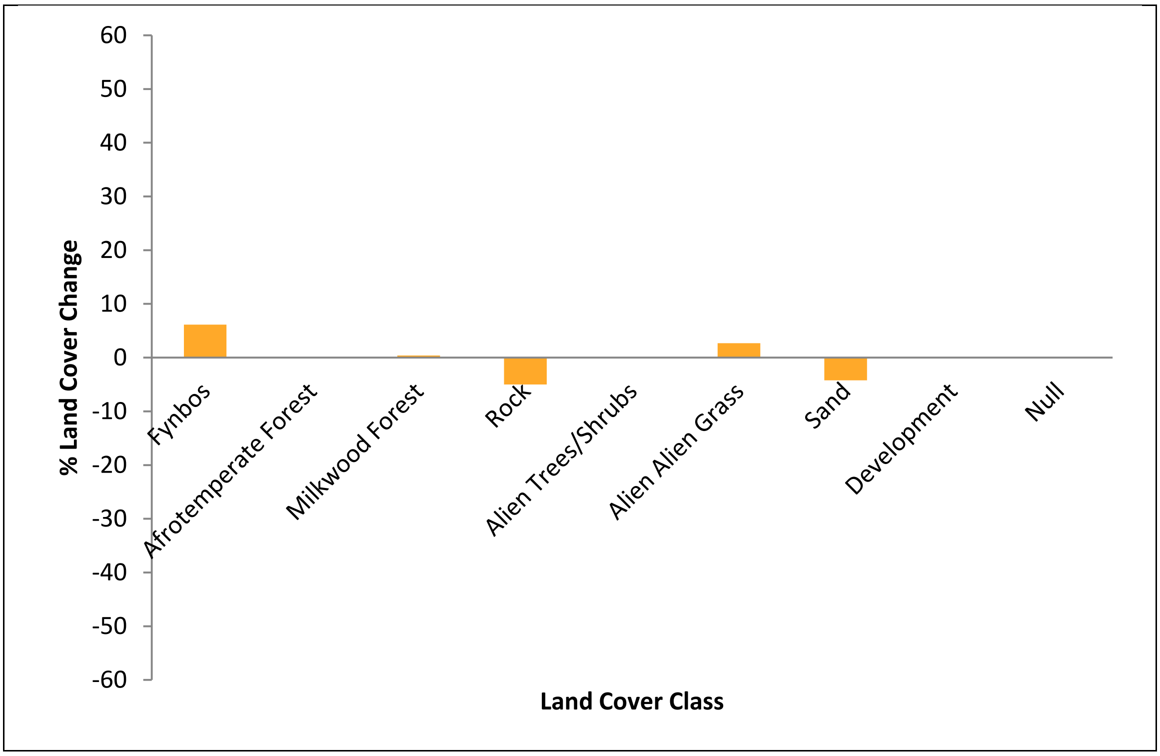

Figure 23.6: Percentage change in land cover classes between time of original (1900) and repeat image (2011) at Site 984 Buffelsbaai

985 GIFKOMMETJIE:

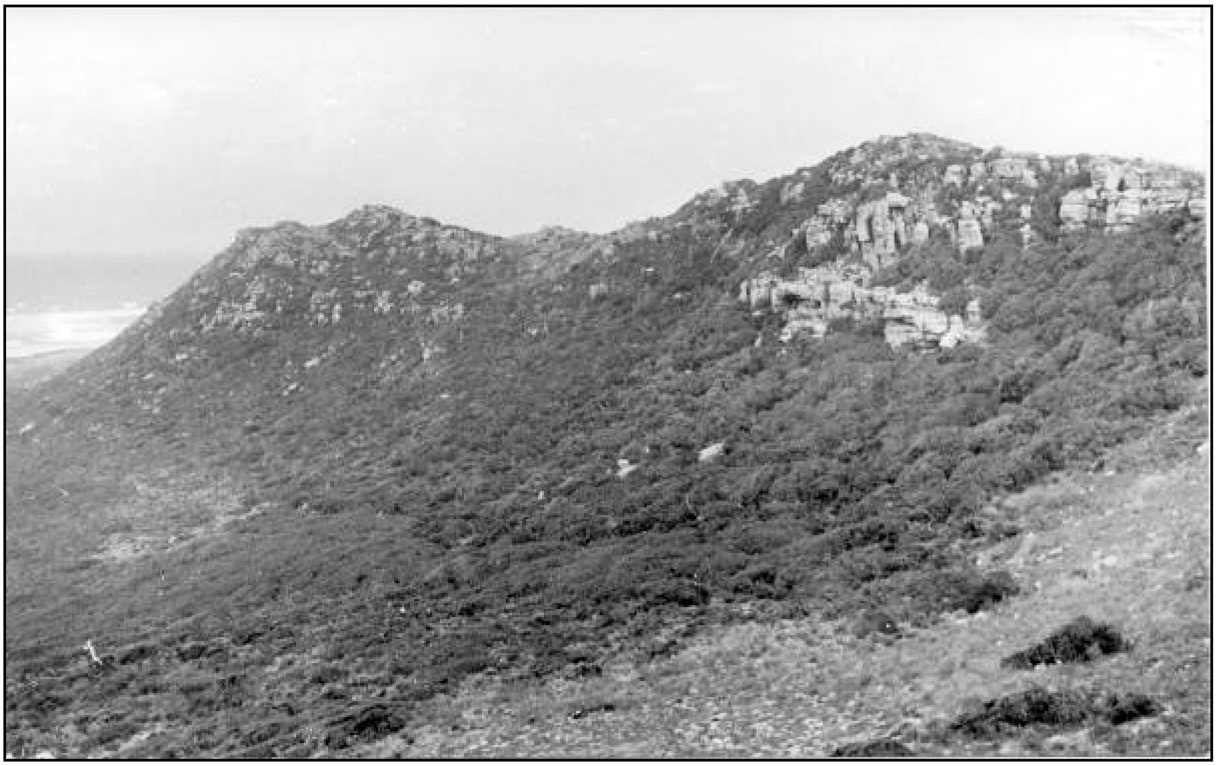

Figure 24.1: Original image by Hugh Taylor (1967)

Figure 24.2: Repeat image by Zoë C Poulsen (03/11/2011)

SITE INFORMATION

Site No: 985 **Date:** 03/11/2011 **Time spent on site:** 3:10pm

Concise Site Name: Gifkommetjie

General description of location: Photo taken on path below Gifkommetjie car park at top of steps looking NE into Gifkommetjie coastal forest.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.317087 **Altitude (m):** 72m asl.

E 18.419025

Original Photographer: Hugh Taylor

Original number: Taylor_210 **Original date:** 1967

Original site/photograph name: Gifkommetjie

Notes on accuracy of repeat photo station location: Within 5m of original site

Location Map:

Figure 24.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 985 **PHOTOGRAPHIC INFORMATION** **Date:** 03/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	335	24mm	1/100	8	45°	3:15pm
Canon 450D	Digital	336	24mm	1/100	8	45°	3:15pm
Canon 450D	Digital	337	24mm	1/100	8	45°	3:16pm
Canon 450D	Digital	338	24mm	1/100	8	45°	3:16pm
Canon 450D	Digital	339	24mm	1/100	8	45°	3:17pm
Canon 450D	Digital	340	24mm	1/100	8	45°	3:17pm
Canon 450D	Digital	341	24mm	1/100	8	45°	3:18pm
Canon 450D	Digital	342	24mm	1/100	8	45°	3:18pm

Notes on weather conditions: Warm and sunny with scattered cloud and slight breeze

Site no: 985 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 03/11/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking NE across Gifkommetjie towards Western Cape Milkwood Forest.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 24.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos west-facing slope in foreground of image: There has been a slight increase in shrubby cover since the original image was taken and slight increase in vegetation height.

Landform B: Western Cape Milkwood Forest west-facing slope in background of image: There has been a slight expansion of coastal forest since the original image was taken. There has been a slight increase in canopy height, resulting in less bare rock remaining visible. Otherwise there has been little change.

Site no: 985 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 03/11/2011

Landform A: Fynbos west-facing slope in foreground of image (N/D: No data collected)

Landform B: Western Cape Milkwood Forest west-facing slope in background of image

Landform C: N/A

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Cassine peragua*	*Cassine peragua*	N/D	0.5	N/A	N/A	N/A
2	*Chrysanthemoides monilifera*	*Chrysanthemoides monilifera*	N/D	5	N/A	N/A	N/A
3	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	5	N/A	N/A	N/A
4	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.5	N/A	N/A	N/A
5	*Euclea racemosa*	*Euclea racemosa*	N/D	5	N/A	N/A	N/A
6	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	N/A	N/A	N/A
7	*Olea exasperata*	*Olea exasperata*	N/D	0.5	N/A	N/A	N/A
8	*Colpoon compressum*	*Colpoon compressum*	N/D	0.1	N/A	N/A	N/A
9	*Phylica buxifolia*	*Phylica buxifolia*	N/D	0.1	N/A	N/A	N/A
10	*Pterocelastrus tricuspidatus*	*Pterocelastrus tricuspidatus*	N/D	5	N/A	N/A	N/A
11	*Searsia laevigata*	*Searsia laevigata*	N/D	5	N/A	N/A	N/A
12	*Searsia lucida*	*Searsia lucida*	N/D	5	N/A	N/A	N/A
13	*Cassine maritima*	*Cassine maritima*	N/D	0.5	N/A	N/A	N/A
14	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	50	N/A	N/A	N/A
15	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	N/D	10	N/A	N/A	N/A

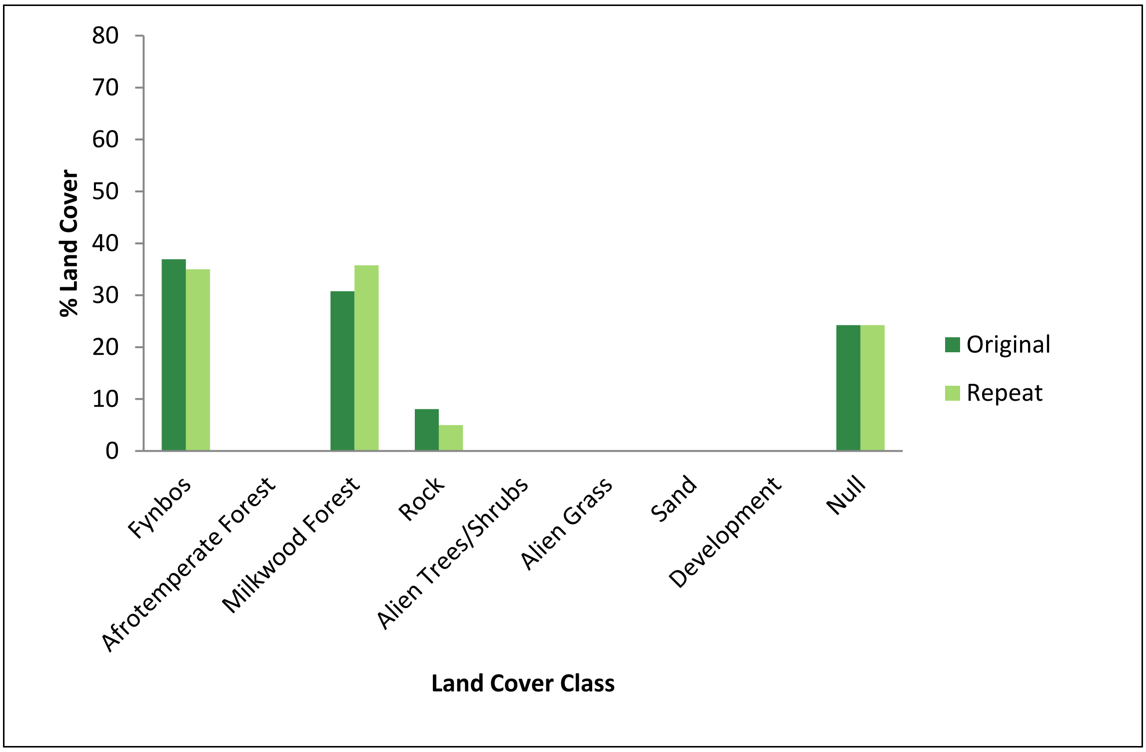

Figure 24.5: Percentages of land cover classes present in original (1967) and repeat image (2011) at Site 985 Gifkommetjie

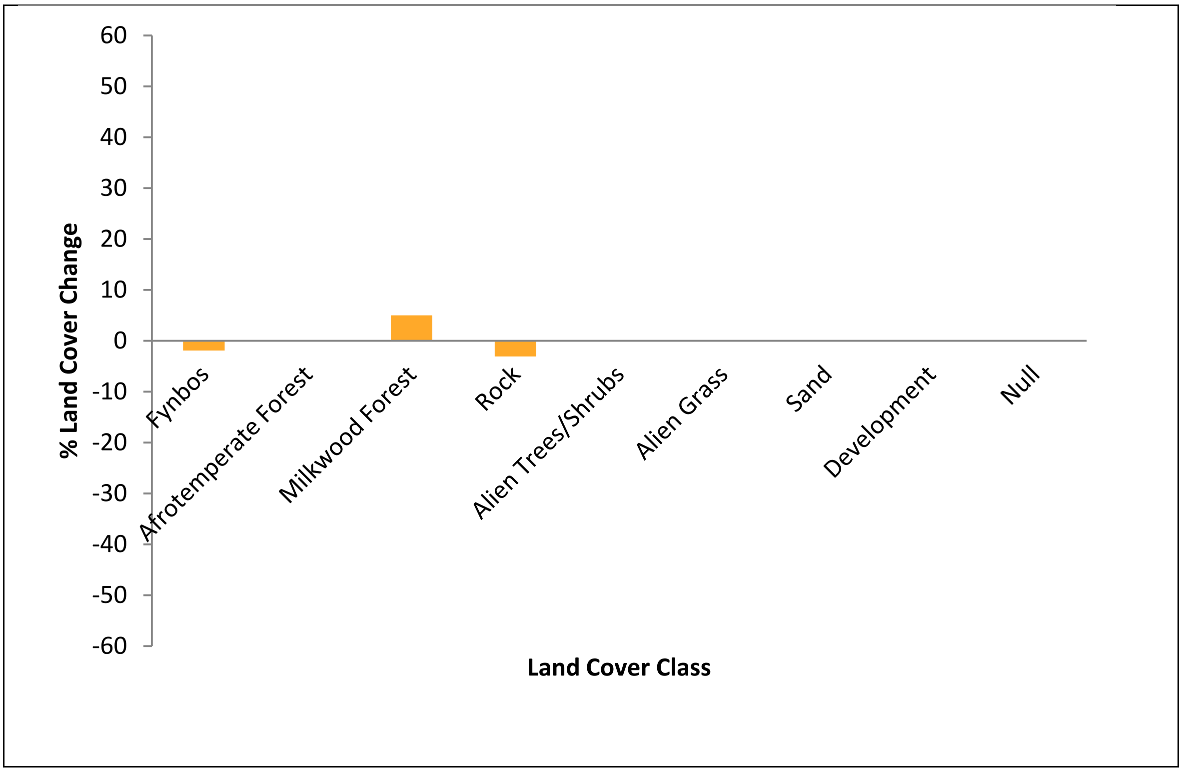

Figure 24.6: Percentage change in land cover classes between 1967 and 2011 at Site 985 Gifkommetjie

986 TAFELBERG ROAD:

Figure 25.1: Original image from the AG Collection (South African National Archives) (c.1900)

Figure 25.2: Repeat image by Zoë C Poulsen (11/11/2011)

SITE INFORMATION

Site No: 986 **Date:** 11/11/2011 **Time spent on site:** 8:40am

Concise Site Name: Tafelberg Road

General description of location: Tafelberg road looking SW towards Table Mountain front face and Platteklip Gorge.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3318CD

Coordinates: S -33.955156 **Altitude (m):** 382m asl.

E 18.422240

Original Photographer: AG Collection (National Archives)

Original number: AG994 **Original date:** c. 1910

Original site/photograph name: AG994

Notes on accuracy of repeat photo station location: Within 100m of original location

Location Map:

Figure 25.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 986 **PHOTOGRAPHIC INFORMATION** **Date:** 11/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	182	24mm	1/125	8	240°	9:00am
Canon 450D	Digital	183	24mm	1/125	8	240°	9:01am
Canon 450D	Digital	184	24mm	1/160	8	240°	9:02am
Canon 450D	Digital	185	24mm	1/125	8	240°	9:03am
Canon 450D	Digital	186	24mm	1/160	8	240°	9:04am
Canon 450D	Digital	187	24mm	1/125	8	240°	9:05am
Canon 450D	Digital	188	24mm	1/160	8	240°	9:06am
Canon 450D	Digital	189	24mm	1/160	8	240°	9:07am

Notes on weather conditions: Clear, sunny and warm

Site no: 986 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 11/11/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient-poor Table Mountain Sandstone derived soils.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking from below Tafelberg Road in a SW direction towards Platteklip Gorge, Silverstream Buttress and Africa Face on the front face of Table Mountain.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 25.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground NW-facing slope: There has been an increase in shrubby vegetation on this slope since the original image was taken, with much less bare rock visible. Since then Tafelberg Road has been widened and re-surfaced with tarmac. There is still a high percentage of grass cover.

Landform B: Midground NW-facing slope and cliffs: In the original image the upper section of the midground slope was colonised by pine trees. There is also an area of bare ground, either for planting of trees or remaining after pine tree clearance. All the pine trees have since been cleared with the exception of three large trees still present at the cliff base. The area of bare ground is now completely vegetated. The cliffs above are now far more vegetated with far less bare rock visible.

Landform C: Afrotemperate forest in Platteklip Gorge: In the original image there is almost no forest cover in Platteklip Gorge and there are extensive erosion gullies present. Since the original image was taken in c. 1910 there have been numerous rock falls with boulder scree infilling the gorge so the ground level is now higher and the lower sections of the gorge walls have been buried in some places. The ravine has become much more vegetated with far fewer erosion gullies now visible. On some of the boulder scree erosion scars there has been fairly extensive colonisation by forest, forming two narrow strips of scree forest: One occupies the lower section of the gorge and there is a second one further up. There is also a small patch of forest which has grown up against the cliff face on the western side of the gorge that seems not to be present in the original image.

Landform D: N-facing background slope and cliffs: On the lower slopes below the cliffs there has been an increase in vegetation cover and there is now much less bare rock visible. The cliffs above on Africa Face are much more vegetated than they were when the original image was taken in 1910.

Site no: 986 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 11/11/2011

Landform A: Foreground NW-facing slope (N/D: No data collected)

Landform B: Midground NW-facing slope and cliffs (N/D: No data collected)

Landform C: Western Cape Afrotemperate Forest in Platteklip Gorge

Landform D: N-facing background slope and cliffs (N/D: No data collected)

Landform E: N/A

No.	**Working name**	**Species name**	**% cover in landform**				
			A	**B**	**C**	**D**	**E**
1	*Cassine peragua*	*Cassine peragua*	N/D	N/D	10	N/D	N/A
2	*Cassine schinoides*	*Cassine schinoides*	N/D	N/D	0.5	N/D	N/A
3	*Clutia puchella*	*Clutia pulchella*	N/D	N/D	5	N/D	N/A
4	*Cunonia capensis*	*Cunonia capensis*	N/D	N/D	0.1	N/D	N/A
5	*Diospyros whyteana*	*Diospyros whyteana*	N/D	N/D	30	N/D	N/A
6	*Halleria lucida*	*Halleria lucida*	N/D	N/D	5	N/D	N/A
7	*Kiggelaria africana*	*Kiggelaria africana*	N/D	N/D	10	N/D	N/A
8	*Maurocenia frangula*	*Maurocenia frangula*	N/D	N/D	0.1	N/D	N/A
9	*Maytenus acuminata*	*Maytenus acuminata*	N/D	N/D	0.5	N/D	N/A
10	*Maytenus oleioides*	*Maytenus oleioides*	N/D	N/D	5	N/D	N/A
11	*Olea europea africana*	*Olea europea africana*	N/D	N/D	25	N/D	N/A
12	*Phylica buxifolia*	*Phylica buxifolia*	N/D	N/D	10	N/D	N/A
13	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	N/D	10	N/D	N/A
14	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	N/D	0.1	N/D	N/A
15	*Searsia lucida*	*Searsia lucida*	N/D	N/D	10	N/D	N/A

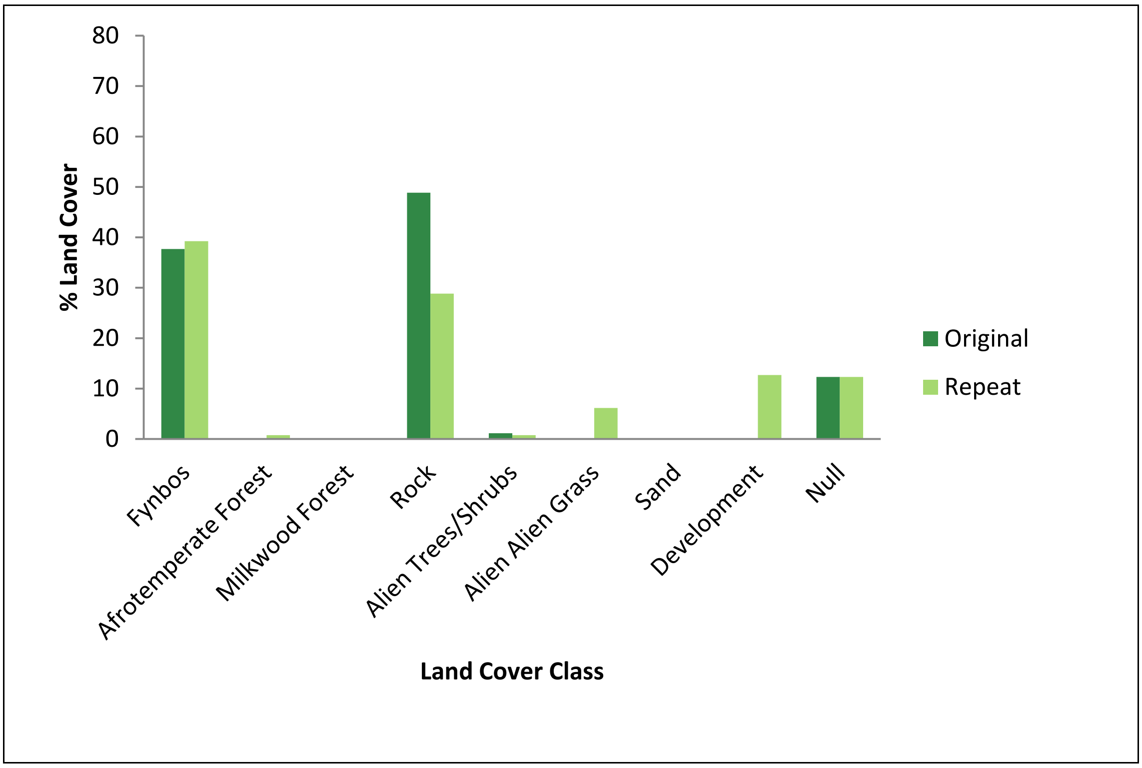

Figure 25.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 986 Tafelberg Road

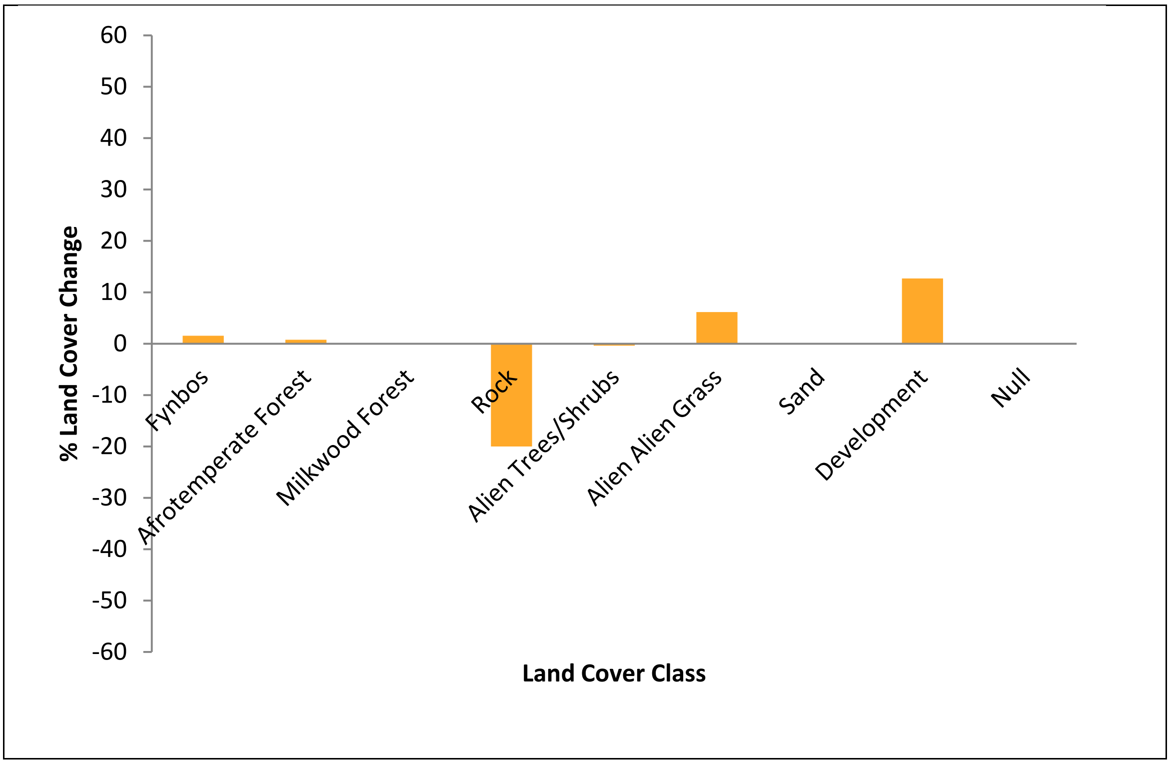

Figure 25.6: Percentage change in land cover classes between 1900 and 2011 at Site 986 Tafelberg Road

987 NOORDHOEK ESTATE:

Figure 26.1: Original image by Woods (c.1900)

Figure 26.2: Repeat image by Zoë C Poulsen (24/11/2011)

SITE INFORMATION

Site No: 987 **Date:** 24/11/2011 **Time spent on site:** 10:40am

Concise Site Name: Noordhoek Estate

General description of location: Cape Holly Road, Noordhoek Estate looking NNE towards Noordhoek Peak and Silvermines

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.086964 **Altitude (m):** 134m asl.

E 18.381356

Original Photographer: Woods

Original number: Woods_C1_007 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

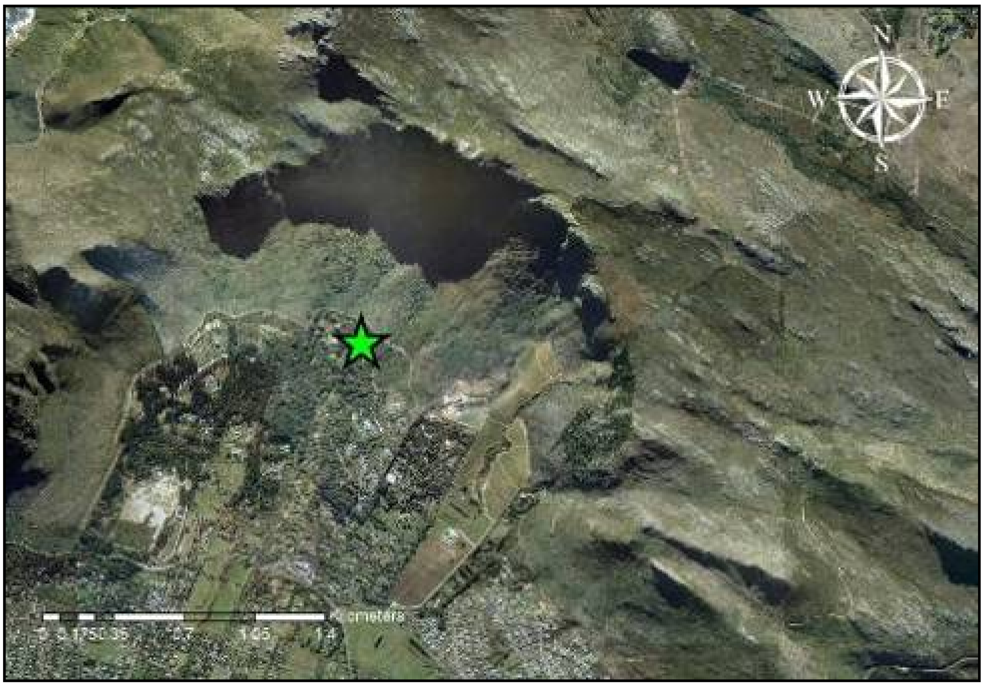

Figure 26.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 987 **PHOTOGRAPHIC INFORMATION** **Date:** 24/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	220	24mm	1/60	8	20°	11:00am
Canon 450D	Digital	221	24mm	1/80	8	20°	11:01am
Canon 450D	Digital	222	24mm	1/80	8	20°	11:02am
Canon 450D	Digital	223	24mm	1/100	8	20°	11:03am
Canon 450D	Digital	224	24mm	1/125	8	20°	11:04am
Canon 450D	Digital	225	24mm	1/125	8	20°	11:05am
Canon 450D	Digital	226	24mm	1/125	8	20°	11:06am
Canon 450D	Digital	227	24mm	1/125	8	20°	11:07am
Canon 450D	Digital	228	24mm	1/125	8	20°	11:08am
Canon 450D	Digital	229	24mm	1/125	8	20°	11:09am

Notes on weather conditions: Sunny with scattered cloud

Site no: 987 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 24/11/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: On the upper slopes there are shallow soils derived from Table Mountain Sandstone. On the lower slopes there are deeper soils derived from granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: The view looks from the lower SW-facing slopes of the Noordhoek Estate onto the extensive patches of Western Cape Afrotemperate Forest on the scarp slopes of Noordhoek Peak.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 26.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground SW-facing slope: There has been a substantial increase in shrubby vegetation in the foreground of the repeat image. The vegetation is now dominated by *Berzelia* spp. and *Podylaria calyptrata* with scattered forest precursor species (such as *Kiggelaria africana*). This is most likely to be due to long term exclusion of fire from the area. There has been a wooden fence erected in the left foreground of the repeat image. There has been an increase in Proteaceae dominated shrubby cover on the midground lower slopes and there is now much less bare rock visible.

Landform B: Western Cape Afrotemperate Forest on SW-facing background slope: Since the original image was taken there has been some expansion of the forest patch margins into the surrounding fynbos. The margins of the forest patches are now much less well-defined. There has also been an increase in forest canopy height and the canopy has become far more differentiated.

Landform C: Fynbos on SW-facing background slope: Since the original image was taken there has been a substantial increase in shrubby cover in the fynbos on these slopes. The fynbos has been colonised by scattered individuals of forest precursor species, creating a ‘mosaic effect’ of forest precursor/fynbos species. There is much less bare rock visible than was present in the original image. The area has also been colonised by numerous alien pine trees since the original image was taken by Woods.

Site no: 987 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 24/11/2011

Landform A: Foreground SW-facing slope (N/D: No data collected)

Landform B: Western Cape Afrotemperate Forest on SW-facing background slope

Landform C: Fynbos on SW-facing background slope (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodytes dimidiata*	*Apodytes dimidiata*	N/D	10	N/D	N/A	N/A
2	*Canthium inerme*	*Canthium inerme*	N/D	5	N/D	N/A	N/A
3	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	10	N/D	N/A	N/A
4	*Cassine peragua*	*Cassine peragua*	N/D	25	N/D	N/A	N/A
5	*Cassine schinoides*	*Cassine schinoides*	N/D	0.5	N/D	N/A	N/A
6	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	5	N/D	N/A	N/A
7	*Clutia pulchella*	*Clutia pulchella*	N/D	0.1	N/D	N/A	N/A
8	*Cunonia capensis*	*Cunonia capensis*	N/D	0.5	N/D	N/A	N/A
9	*Curtisia dentata*	*Curtisia dentata*	N/D	5	N/D	N/A	N/A
10	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.1	N/D	N/A	N/A
11	*Diospyros whyteana*	*Diospyros whyteana*	N/D	10	N/D	N/A	N/A
12	*Grewia occidentalis*	*Grewia occidentalis*	N/D	0.1	N/D	N/A	N/A
13	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.5	N/D	N/A	N/A
14	*Halleria lucida*	*Halleria lucida*	N/D	5	N/D	N/A	N/A
15	*Ilex mitis*	*Ilex mitis*	N/D	0.1	N/D	N/A	N/A
16	*Kiggelaria africana*	*Kiggelaria africana*	N/D	25	N/D	N/A	N/A
17	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	N/D	N/A	N/A
18	*Maytenus acuminata*	*Maytenus acuminata*	N/D	10	N/D	N/A	N/A
19	*Maytenus oleioides*	*Maytenus oleioides*	N/D	0.5	N/D	N/A	N/A
20	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	10	N/D	N/A	N/A
21	*Olea europea africana*	*Olea europea africana*	N/D	10	N/D	N/A	N/A
22	*Olinia ventosa*	*Olinia ventosa*	N/D	25	N/D	N/A	N/A
23	*Podylaria calyptrata*	*Podylaria calyptrata*	N/D	0.5	N/D	N/A	N/A
24	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	25	N/D	N/A	N/A
25	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	N/D	N/A	N/A

26	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	10	N/D	N/A	N/A
27	*Searsia tomentosa*	*Searsia tomentosa*	N/D	0.1	N/D	N/A	N/A
28	*Scutia myrtina*	*Scutia myrtina*	N/D	0.1	N/D	N/A	N/A
29	*Secamone alpini*	*Secamone alpini*	N/D	10	N/D	N/A	N/A

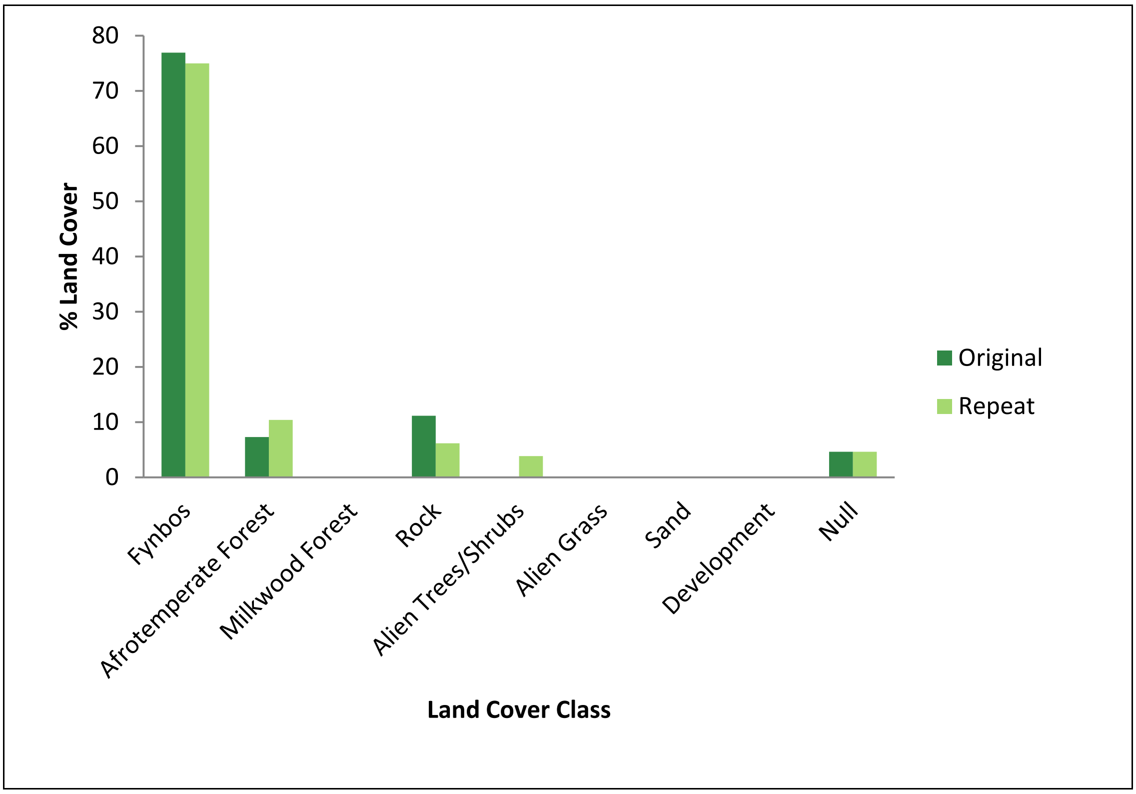

Figure 26.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 987 Noordhoek Estate

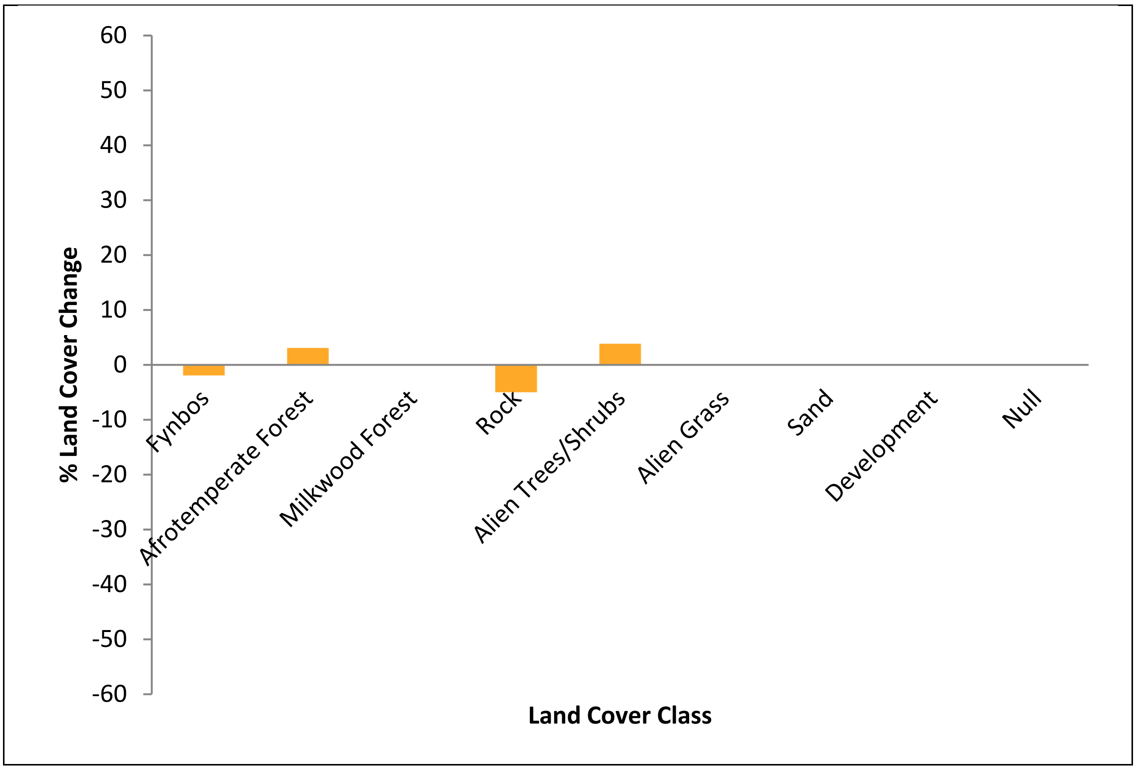

Figure 26.6: Percentage change in land cover classes between 1900 and 2011 at Site 987 Noordhoek Estate

988 HANGBERG:

Figure 27.1: Original image from the CA Collection (South African National Archives) (c.1930)

Figure 27.2: Repeat image by Zoë C Poulsen (26/11/2011)

<u>**SITE INFORMATION**</u>

Site No: 988 **Date:** 26/11/2011 **Time spent on site:** 9:05am

Concise Site Name: Hangberg – Cannon Battery

General description of location: Next to cannon battery in Hangberg (next to Harbour car park) looking east across Hout Bay to Constantiaberg.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: S -34.055696 **Altitude (m):** 4m asl.

E 18.347553

Original Photographer: CA Collection (National Archives)

Original number: CA2216 **Original date:** c. 1930

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 10m of original site

Location Map:

Figure 27.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 988 **PHOTOGRAPHIC INFORMATION** **Date:** 26/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	611	24mm	1/125	8	90°	9:15am
Canon 450D	Digital	612	24mm	1/125	8	90°	9:15am
Canon 450D	Digital	613	24mm	1/125	8	90°	9:16am
Canon 450D	Digital	614	24mm	1/125	8	90°	9:16am
Canon 450D	Digital	615	24mm	1/125	8	90°	9:17am
Canon 450D	Digital	616	24mm	1/125	8	90°	9:17am
Canon 450D	Digital	617	24mm	1/125	8	90°	9:18am
Canon 450D	Digital	618	24mm	1/125	8	90°	9:18am

Notes on weather conditions: Sunny with scattered cloud

Site no: 988 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow soils derived from Table Mountain Sandstone and granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking from Hangberg cannon battery eastwards across Hout Bay towards Constantiaberg and Chapman's Peak Drive.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 27.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Cannon Battery in foreground of image: No vegetation change.

Landform B: West-facing slope below the road: There has been considerable disturbance to the vegetation on this slope. In the original image there was a mix of coastal thicket/forest on the lower granitic slopes with alien pine trees also present. Since the original images were taken the majority of the alien vegetation has been cleared and there is far less shrubby/coastal scrub vegetation now present. The original vegetation on this slope has been considerably disturbed and degraded. There has been a significant increase in grassy cover in the disturbed areas. A large hotel has been built on the left side of this slope and there has been a firebreak added adjacent to this development.

Landform C: West-facing slopes of Constantiaberg above the road: On the upper slopes of Constantiaberg, there has been an increase in vegetation cover and there is much less bare rock visible. In the original image on the left hand side of the photo there is an area of alien pine trees, these have since been removed but the disturbance is still visible. There are several erosion dongas now present on the upper slopes.

Site no: 988 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Landform A: Cannon Battery in foreground of image (No data collected)

Landform B: West-facing slope below the road (No data collected)

Landform C: West-facing slopes of Constantiaberg above the road (No data collected)

Landform D: N/A

Landform E: N/A

(No Species Data Collected)

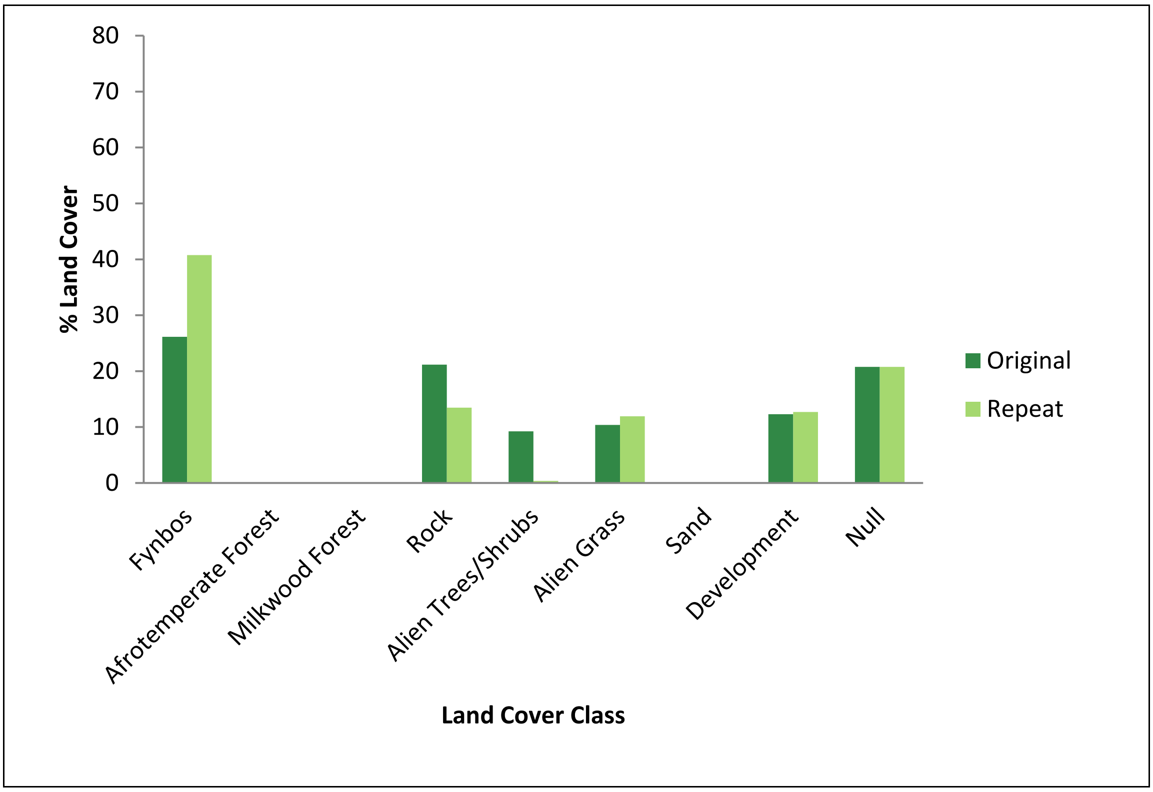

Figure 27.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 988 Hangberg

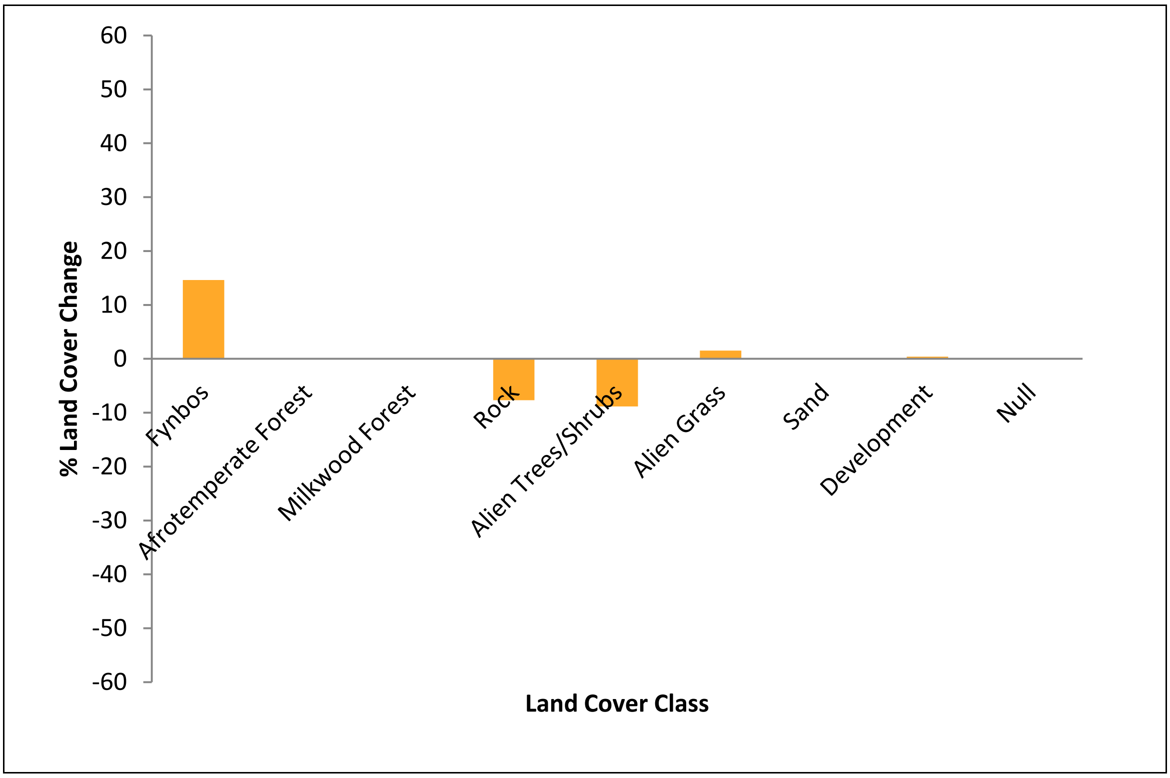

Figure 27.6: Percentage change in land cover classes between 1900 and 2011 at Site 988 Hangberg

989 HOUT BAY EAST:

Figure 28.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 28.2: Repeat image by Zoë C Poulsen (26/11/2011)

SITE INFORMATION

Site No: 989 **Date:** 26/11/2011 **Time spent on site:** 1:10pm

Concise Site Name: Hout Bay East

General description of location: In the centre of the car park at the east end of Hout Bay Beach

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: S -34.046690 **Altitude (m):** 6m asl.

E 18.359721

Original Photographer: Elliot Collection (National Archives)

Original number: E5404 **Original date:** c. 1900

Original site/photograph name: None given

Notes on accuracy of repeat photo station location: Within 100m of original location: There has been housing development at the correct location.

Location Map:

Figure 28.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 989 **PHOTOGRAPHIC INFORMATION** **Date:** 26/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	619	24mm	1/100	8	135°	1:20pm
Canon 450D	Digital	620	24mm	1/100	8	135°	1:20pm
Canon 450D	Digital	621	24mm	1/100	8	135°	1:21pm
Canon 450D	Digital	622	24mm	1/100	8	135°	1:21pm
Canon 450D	Digital	623	24mm	1/100	8	135°	1:22pm
Canon 450D	Digital	624	24mm	1/100	8	135°	1:22pm
Canon 450D	Digital	625	24mm	1/100	8	135°	1:23pm
Canon 450D	Digital	626	24mm	1/100	8	135°	1:23pm
Canon 450D	Digital	627	24mm	1/100	8	135°	1:24pm
Canon 450D	Digital	628	24mm	1/100	8	135°	1:24pm
Canon 450D	Digital	629	24mm	1/100	8	135°	1:25pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 989 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient-poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking south-east from Hout Bay Beach east car park over the lower slopes of Constantiaberg towards the west-facing slopes of Chapman's Peak and Chapman's Peak Drive.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 28.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground SW-facing slopes and Hout Bay Beach: There has been considerable disturbance on the slopes below Chapman's Peak Drive. Much of the shrub cover is no longer there and has been replaced with alien kikuyu grass. The trees on the slope above the ground have increased in height. A large hotel has been built just below Chapman's Peak Drive since the original image was taken. The pine plantation present in the original image has now been cleared but the site still remains very disturbed. A few pine trees are still present.

Landform B: West-facing slopes below Chapman's Peak Drive: In the original image the slopes below Hout Bay Battery were thickly colonised by alien pine trees. These have now been cleared but the area still remains very degraded. On this slope there has been a decrease in shrub cover and this has been replaced by alien kikuyu grass. On the background slopes below Chapman's Peak there has been a slight increase in shrub cover. There is also evidence in the repeat image of a recent fire on the slopes below the road.

Landform C: West-facing slopes above Chapman's Peak Drive: Above the road there has been an increase in vegetation cover with less bare rock visible. There has also been a slight increase in shrubby cover. There are a couple of new erosion scars not present in the original image. Otherwise, there has been very little change.

Site no: 989 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Landform A: Foreground SW-facing slopes and Hout Bay Beach

Landform B: West-facing slopes below Chapman's Peak Drive (N/D: No data collected)

Landform C: West-facing slopes above Chapman's Peak Drive (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Canthium inerme*	*Canthium inerme*	0.5	N/D	N/D	N/A	N/A
2	*Cassine peragua*	*Cassine peragua*	5	N/D	N/D	N/A	N/A
3	*Chionanthus foveolatus*	*Chionanthus foveolatus*	0.1	N/D	N/D	N/A	N/A
4	*Euclea racemosa*	*Euclea racemosa*	0.1	N/D	N/D	N/A	N/A
5	*Grewia occidentalis*	*Grewis occidentalis*	25	N/D	N/D	N/A	N/A
6	*Maytenus heterophylla*	*Maytenus heterophylla*	10	N/D	N/D	N/A	N/A
7	*Kiggelaria africana*	*Kiggelaria africana*	0.1	N/D	N/D	N/A	N/A
8	*Maurocenia frangula*	*Maurocenia frangula*	0.5	N/D	N/D	N/A	N/A
9	*Olea europea africana*	*Olea europea africana*	25	N/D	N/D	N/A	N/A
10	*Colpoon compressum*	*Colpoon compressum*	0.5	N/D	N/D	N/A	N/A
11	*Polygala myrtifolia*	*Polygala myrtifolia*	0.5	N/D	N/D	N/A	N/A
12	*Rapanea melanophloeos*	*Rapanea melanophloeos*	0.1	N/D	N/D	N/A	N/A
13	*Searsia glauca*	*Searsia glauca*	5	N/D	N/D	N/A	N/A
14	*Searsia lucida*	*Searsia lucida*	5	N/D	N/D	N/A	N/A
15	*Searsia tomentosa*	*Searsia tomentosa*	0.1	N/D	N/D	N/A	N/A
16	*Cassine maritima*	*Cassine maritima*	0.1	N/D	N/D	N/A	N/A
17	*Sideroxylon inerme*	*Sideroxylon inerme*	25	N/D	N/D	N/A	N/A
18	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	10	N/D	N/D	N/A	N/A

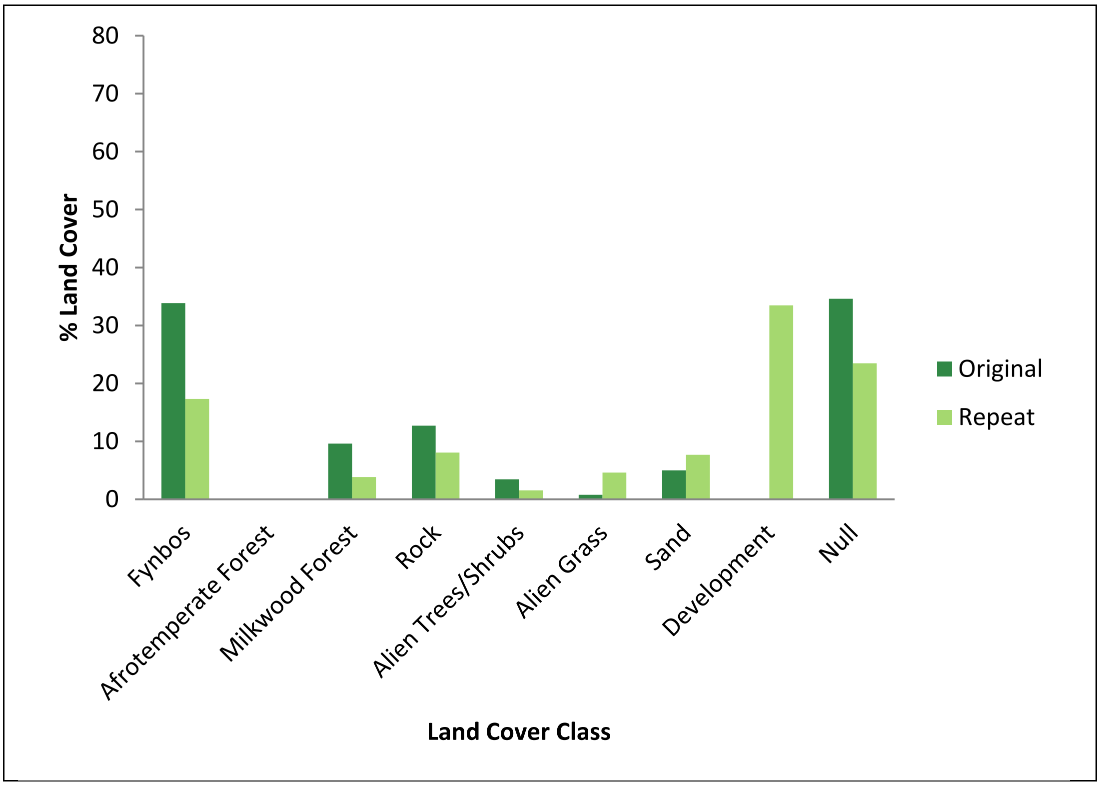

Figure 28.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 989 Hout Bay East

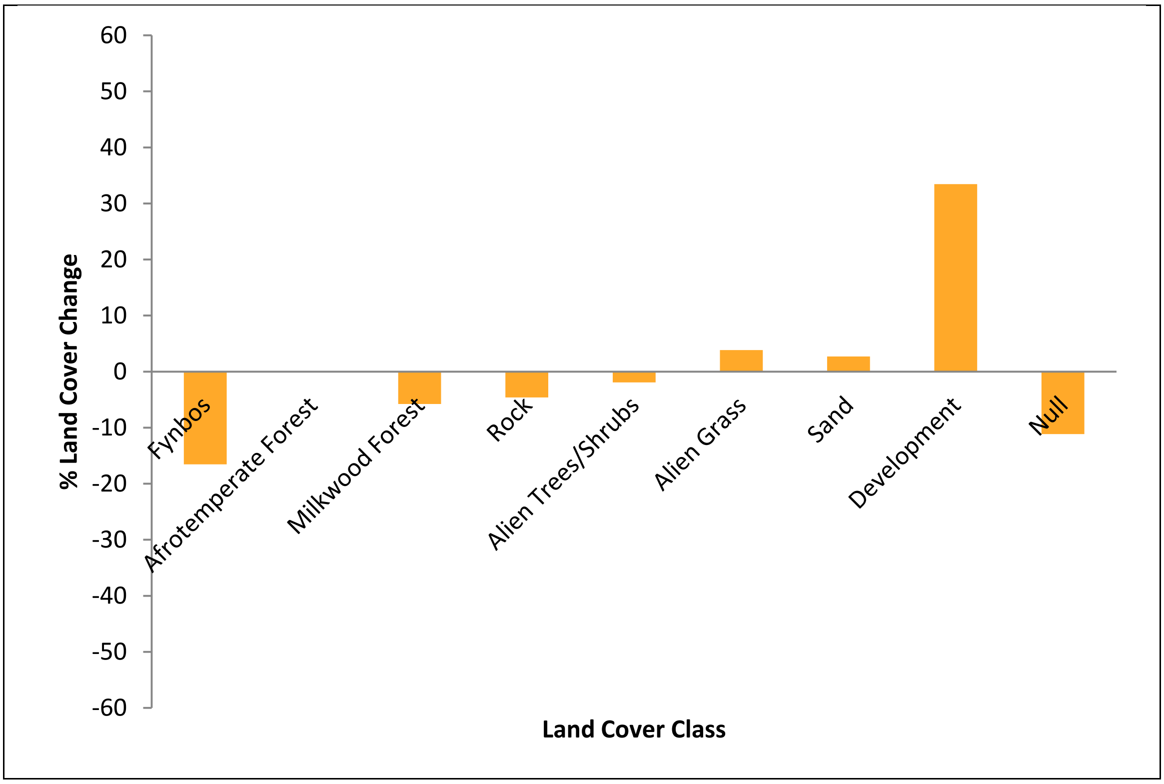

Figure 28.6: Percentage change in land cover classes between 1900 and 2011 at Site 989 Hout Bay East

990 HOUT BAY BATTERY:

Figure 29.1: Original image from the CA Collection (South African National Archives) (c.1930)

Figure 29.2: Repeat image by Zoë C Poulsen (26/11/2011)

SITE INFORMATION

Site No: 990 **Date:** 26/11/2011 **Time spent on site:** 2:20pm

Concise Site Name: Hout Bay Battery

General description of location: On top of rocky promontory below Hout Bay Battery, looking back towards Hout Bay

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: S -34.054784 **Altitude (m):** 16m asl.

E 18.362741

Original Photographer: CA Collection (National Archives);

Original number: CA3087 **Original date:** c. 1930

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 20m of original site, owing to cliff erosion making it impossible to safely reach the original site.

Location Map:

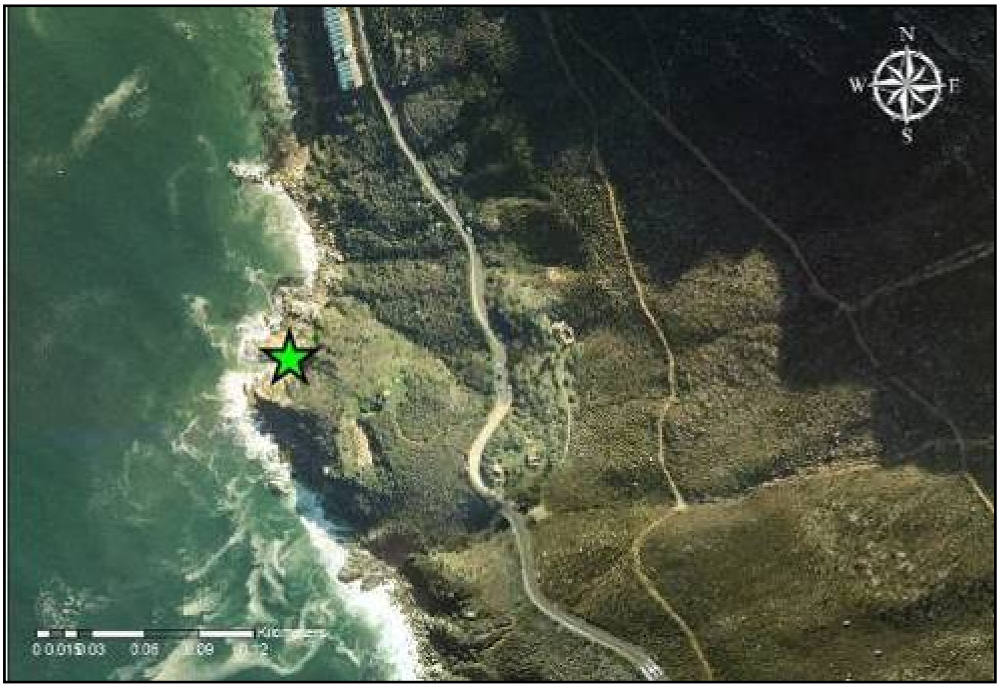

Figure 29.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 990 **PHOTOGRAPHIC INFORMATION** **Date:** 26/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	630	24mm	1/80	8	315°	2:40pm
Canon 450D	Digital	631	24mm	1/80	8	315°	2:40pm
Canon 450D	Digital	632	24mm	1/100	8	315°	2:41pm
Canon 450D	Digital	633	24mm	1/100	8	315°	2:41pm
Canon 450D	Digital	634	24mm	1/100	8	315°	2:42pm
Canon 450D	Digital	635	24mm	1/125	8	315°	2:42pm
Canon 450D	Digital	636	24mm	1/100	8	315°	2:43pm
Canon 450D	Digital	637	24mm	1/80	8	315°	2:43pm
Canon 450D	Digital	638	24mm	1/100	8	315°	2:44pm
Canon 450D	Digital	639	24mm	1/100	8	315°	2:44pm
Canon 450D	Digital	640	24mm	1/125	8	315°	2:45pm

Notes on weather conditions: Hot and sunny with no cloud and a slight south-easterly breeze

Site no: 990 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking north from promontory below Hout Bay Battery towards Hout Bay Beach, Little Lion's Head and the Back Table.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 29.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground west-facing slopes: In the original image this slope appears to have been heavily infested with alien trees in the past: a mix of pines and what is most likely to be rooikrans. Since then most of this has been cleared and shrubby vegetation dominated by *Searsia* spp. is the predominant vegetation cover. Where there are still disturbed areas the main vegetation is alien kikuyu grass. This is particularly the case where there has been a new firebreak put in next to the hotel that has now been built at this site.

Landform B: Background south-facing slopes of Little Lion's Head: Since the original image was taken there has been considerable expansion of housing development up the slopes of Little Lion's Head; Much of the southern slopes are now covered with alien pine trees. There is now a firebreak extending upslope above the pine trees.

Landform C: Background south-facing slopes of Table Mountain: There has also been some housing development extending up the lower slopes of Table Mountain. Some of the lower slopes have been colonised by alien vegetation. On the upper slopes there has been little change.

Site no: 990 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 26/11/2011

Landform A: Foreground west-facing slopes (No data collected)

Landform B: Background south-facing slopes of Little Lion's Head (No data collected)

Landform C: Background south-facing slopes of Table Mountain (No data collected)

Landform D: N/A

Landform E: N/A

(No Species Data Collected)

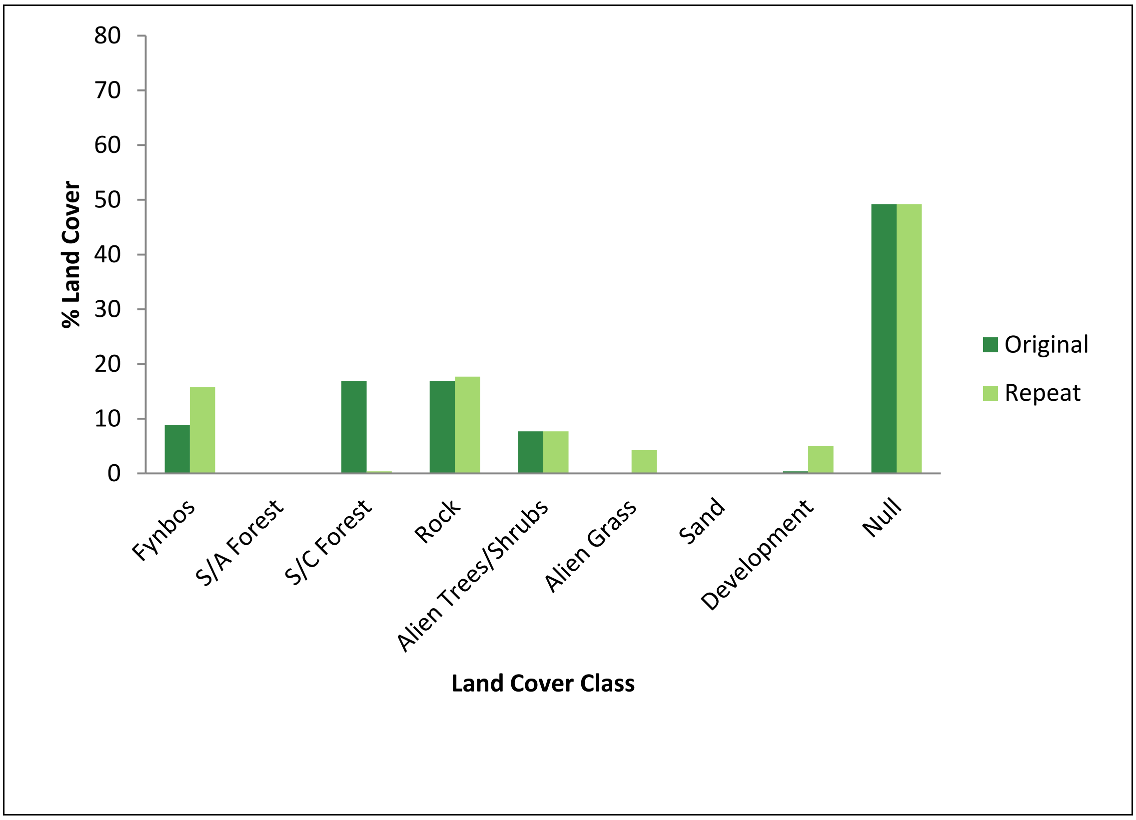

Figure 29.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 990 Hout Bay Battery

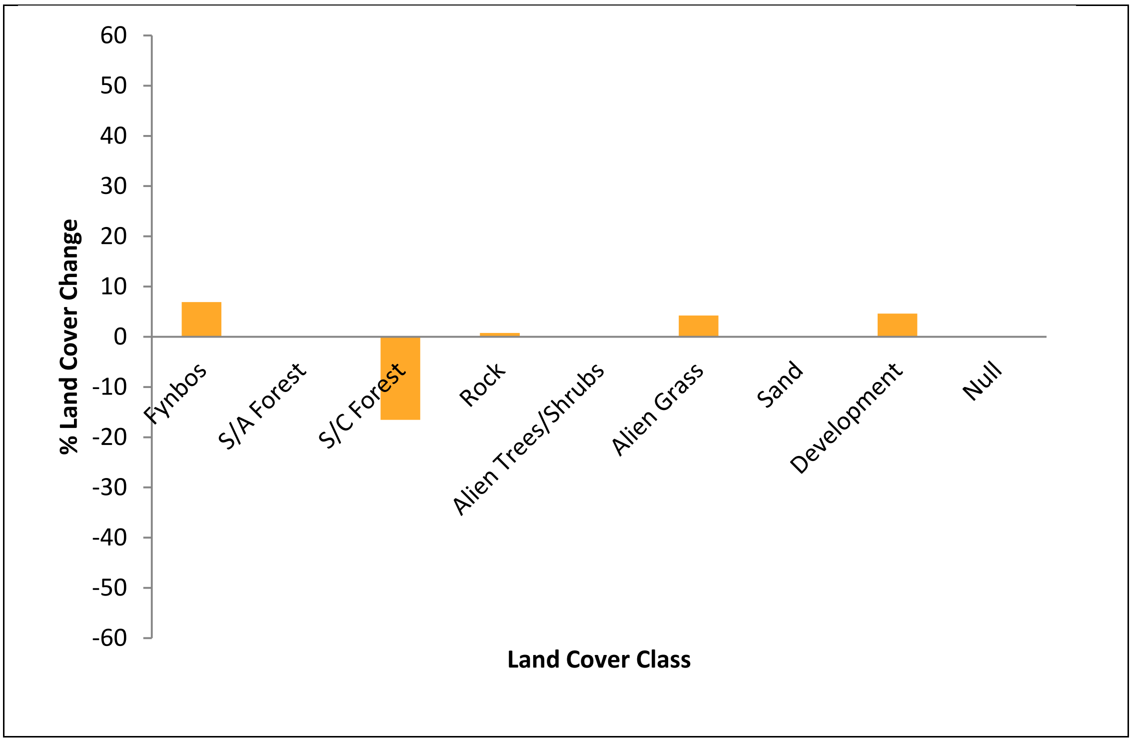

Figure 29.6: Percentage change in land cover classes between 1900 and 2011 at Site 990 Hout Bay Battery

991 CAMPS BAY SPORTS FIELD:

Figure 30.1: Original image by Lambert (c.1970)

Figure 30.2: Repeat image by Zoë C Poulsen (29/11/2011)

SITE INFORMATION

Site No: 991 **Date:** 29/11/2011 **Time spent on site:** 3:30pm

Concise Site Name: Camps Bay Sports Field

General description of location: In the centre of school sports fields next to Camps Bay Drive

Province: Western Cape

Bioregion: FF02 South-West Fynbos

Magisterial district: Cape Town

QDS: 3318CD

Coordinates: S -33.962301

E 18.378938

Altitude (m): 73m asl.

Original Photographer: Lambert

Original number: Lambert_A[TblMt]_096 **Original date:** c. 1970

Original site/photograph name: Twelve Apostles from Camps Bay

Notes on accuracy of repeat photo station location: Within 10m of original site

Location Map:

Figure 30.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 991 **PHOTOGRAPHIC INFORMATION** **Date:** 29/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	798	24mm	1/80	8	135°	3:40pm
Canon 450D	Digital	799	24mm	1/80	8	135°	3:40pm
Canon 450D	Digital	800	24mm	1/80	8	135°	3:41pm
Canon 450D	Digital	801	24mm	1/80	8	135°	3:41pm
Canon 450D	Digital	802	24mm	1/80	8	135°	3:42pm
Canon 450D	Digital	803	24mm	1/80	8	135°	3:42pm
Canon 450D	Digital	804	24mm	1/80	8	135°	3:43pm
Canon 450D	Digital	805	24mm	1/80	8	135°	3:43pm
Canon 450D	Digital	806	24mm	1/80	8	135°	3:44pm
Canon 450D	Digital	807	24mm	1/80	8	135°	3:44pm
Canon 450D	Digital	808	24mm	1/80	8	135°	3:45pm
Canon 450D	Digital	809	24mm	1/80	8	135°	3:45pm
Canon 450D	Digital	810	24mm	1/80	8	135°	3:46pm
Canon 450D	Digital	811	24mm	1/80	8	135°	3:46pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 991 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 29/11/2011

Geology: Table Mountain Sandstone

Soils ***(depth, texture, nutrient status, rockiness, litter, etc.)*****:** Shallow, nutrient-poor soils derived from Table Mountain Sandstone.

Landscape description ***(including aspect, slope, catena characteristics, etc.)*****:** View looking south-east from Camp's Bay sport's field looking south-east towards the steep west-facing buttresses of the Twelve Apostles on Table Mountain.

Vegetation ***(biome, veld type, vegetation type, general description of dominant growth forms & species)*****:**

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos;

Description of major changes:

Figure 30.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground west-facing slope: Since the original image was taken there has been housing development upslope in this area. The vegetation here is now much more disturbed and the dominant vegetation is alien kikuyu grass with scattered shrubby cover. There are a few of the original alien pine trees still present on this slope. However, a few of these pines have been cleared since the original photo was taken.

Landform B: Lower background slope of Twelve Apostles: There has been little change on these lower slopes: there were a few alien pine trees on the upper section of this slope, these have now been cleared. There has also been a slight increase in shrubby cover.

Landform C: Upper background slope and buttresses of Twelve Apostles: There has been little change on the upper slopes of the Twelve Apostles: There are two new erosion dongas not present in the original image. On the upper right of the image, in the Kasteelspoort gorge, there has been an increase in vegetation height with less bare rock now being visible.

Site no: 991 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 29/11/2011

Landform A: Foreground west-facing lower slope (No data collected)

Landform B: Lower background slope of Twelve Apostles (No data collected)

Landform C: Upper background slope and buttresses of Twelve Apostles (No data collected)

Landform D: N/A

Landform E: N/A

(No Species Data Collected)

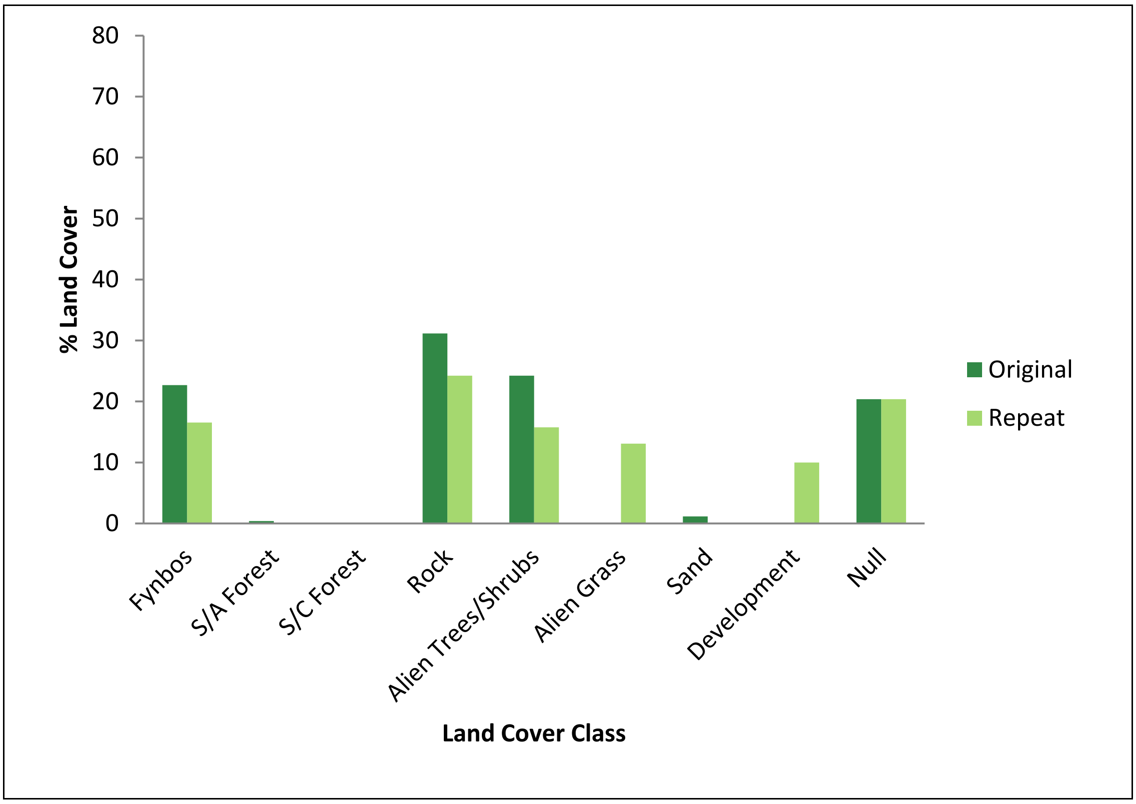

Figure 30.5: Percentages of land cover classes present in original (1980) and repeat image (2011) at Site 991 Camps Bay Sports Field

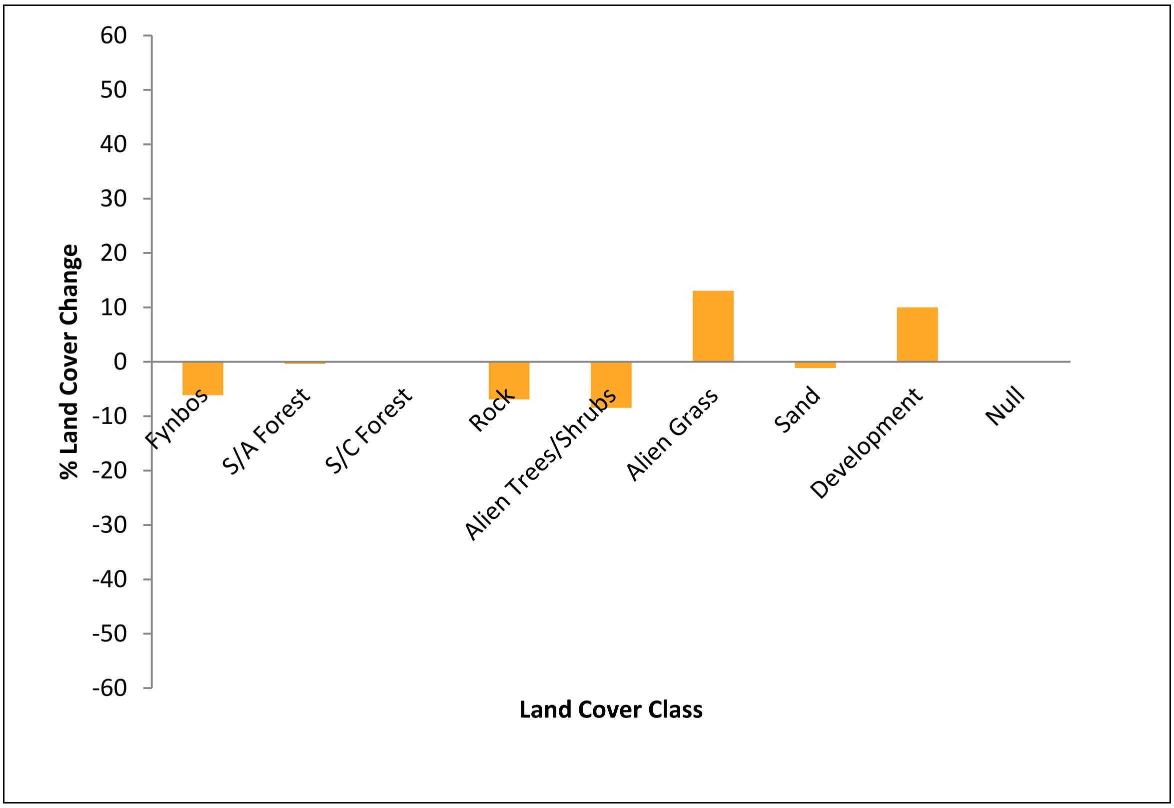

Figure 30.6: Percentage change in land cover classes between 1970 and 2011 at Site 991 Camps Bay Sports Field

992 FOUNTAIN BUTTRESS:

Figure 31.1: Original image by Cobern from the Mountain Club of South Africa Photographic Archives (c.1930)

Figure 31.2: Repeat image by Zoë C Poulsen (29/11/2011)

<u>**SITE INFORMATION**</u>

Site No: 992 **Date:** 29/11/2011 **Time spent on site:** 6:00pm

Concise Site Name: Fountain Buttress, Table Mountain

General description of location: On Theresa Drive (Camps Bay) below junction where track onto Table Mountain.

Province: Western Cape

Bioregion: FF02 South-West Fynbos

Magisterial district: Cape Town

QDS: 3318CD

Coordinates: **S** -33.962681

E 18.383983

Altitude (m): 180m asl.

Original Photographer: Cobern

Original number: Cobern_A11_008

Original date: c. 1930

Original site/photograph name: Fountain Buttress, Table Mountain

Notes on accuracy of repeat photo station location: Within 50m of original site: Housing development makes reaching the correct site impossible.

Location Map:

Figure 31.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 992 **PHOTOGRAPHIC INFORMATION** **Date:** 29/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	817	24mm	1/125	8	60°	6:05pm
Canon 450D	Digital	818	24mm	1/100	8	60°	6:05pm
Canon 450D	Digital	819	24mm	1/80	8	60°	6:06pm
Canon 450D	Digital	820	24mm	1/80	8	60°	6:06pm
Canon 450D	Digital	821	24mm	1/80	8	60°	6:07pm
Canon 450D	Digital	822	24mm	1/80	8	60°	6:07pm
Canon 450D	Digital	823	24mm	1/80	8	60°	6:08pm
Canon 450D	Digital	824	24mm	1/80	8	60°	6:08pm
Canon 450D	Digital	825	24mm	1/80	8	60°	6:09pm
Canon 450D	Digital	826	24mm	1/80	8	60°	6:09pm
Canon 450D	Digital	827	24mm	1/80	8	60°	6:10pm

Notes on weather conditions: Sunny with scattered cloud

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor Table Mountain Sandstone derived soils.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking towards Fountain Buttress on Table Mountain which faces in a south-westerly direction. The upper section of the buttress is steep cliff faces with more gentle slopes below, all with the same aspect. There is southern Afrotemperate forest growing in the ravines at the cliff face where there is shelter from fire.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 31.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos on lower slopes below Fountain Buttress: Little change.

Landform B: Western Cape Afrotemperate Forest in kloofs below Fountain Buttress: There has been a substantial increase in forest cover since the original image was taken. There has also been a slight increase in shrubby vegetation cover in the areas surrounding the forest patches.

Landform C: Cliffs on Fountain Buttress: There has been a slight increase in shrubby cover on Fountain Buttress, otherwise there has been little change.

Site no: 992 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 29/11/2011

Landform A: Fynbos on lower slopes below Fountain Buttress (N/D: No data collected)

Landform B: Western Cape Afrotemperate Forest in kloofs below Fountain Buttress

Landform C: Cliffs of Fountain Buttress (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Canthium inerme*	*Canthium inerme*	N/D	5	N/D	N/A	N/A
2	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	10	N/D	N/A	N/A
3	*Cassine peragua*	*Cassine peragua*	N/D	0.5	N/D	N/A	N/A
4	*Clutia pulchella*	*Clutia pulchella*	N/D	0.5	N/D	N/A	N/A
5	*Cunonia capensis*	*Cunonia capensis*	N/D	5	N/D	N/A	N/A
6	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.5	N/D	N/A	N/A
7	*Diospyros whyteana*	*Diospyros whyteana*	N/D	10	N/D	N/A	N/A
8	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	25	N/D	N/A	N/A
9	*Halleria lucida*	*Halleria lucida*	N/D	25	N/D	N/A	N/A
10	*Ilex mitis*	*Ilex mitis*	N/D	0.5	N/D	N/A	N/A
11	*Kiggelaria africana*	*Kiggelaria africana*	N/D	25	N/D	N/A	N/A
12	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	N/D	N/A	N/A
13	*Maytenus acuminata*	*Maytenus acuminata*	N/D	10	N/D	N/A	N/A
14	*Maytenus oleioides*	*Maytenus oleioides*	N/D	10	N/D	N/A	N/A
15	*Olea europea africana*	*Olea europea africana*	N/D	25	N/D	N/A	N/A
16	*Olinia ventosa*	*Olinia ventosa*	N/D	10	N/D	N/A	N/A
17	*Phylica buxifolia*	*Phylica buxifolia*	N/D	0.5	N/D	N/A	N/A
18	*Podocarpus latifolius*	*Podocarpus latifolius*	N/D	0.1	N/D	N/A	N/A
19	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	N/D	N/A	N/A
20	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	5	N/D	N/A	N/A
21	*Searsia lucida*	*Searsia lucida*	N/D	5	N/D	N/A	N/A

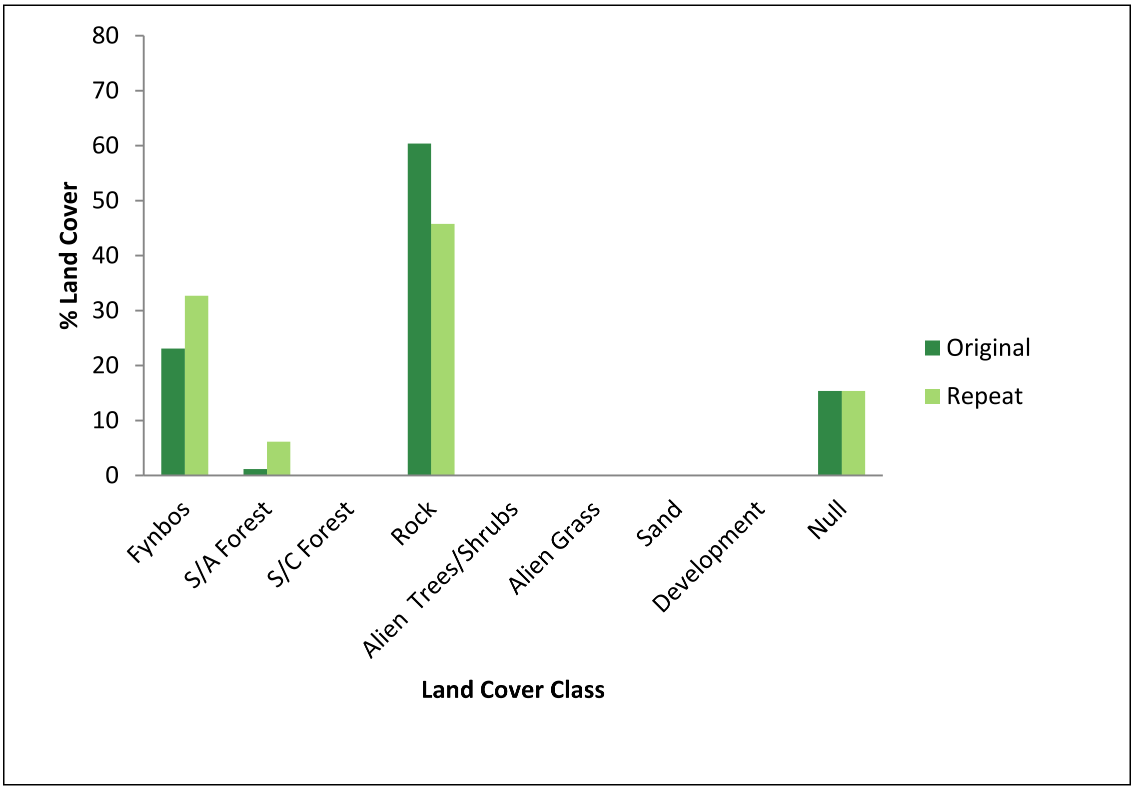

Figure 31.5: Percentages of land cover classes present in original (1930) and repeat image (2011) at Site 992 Fountain Buttress

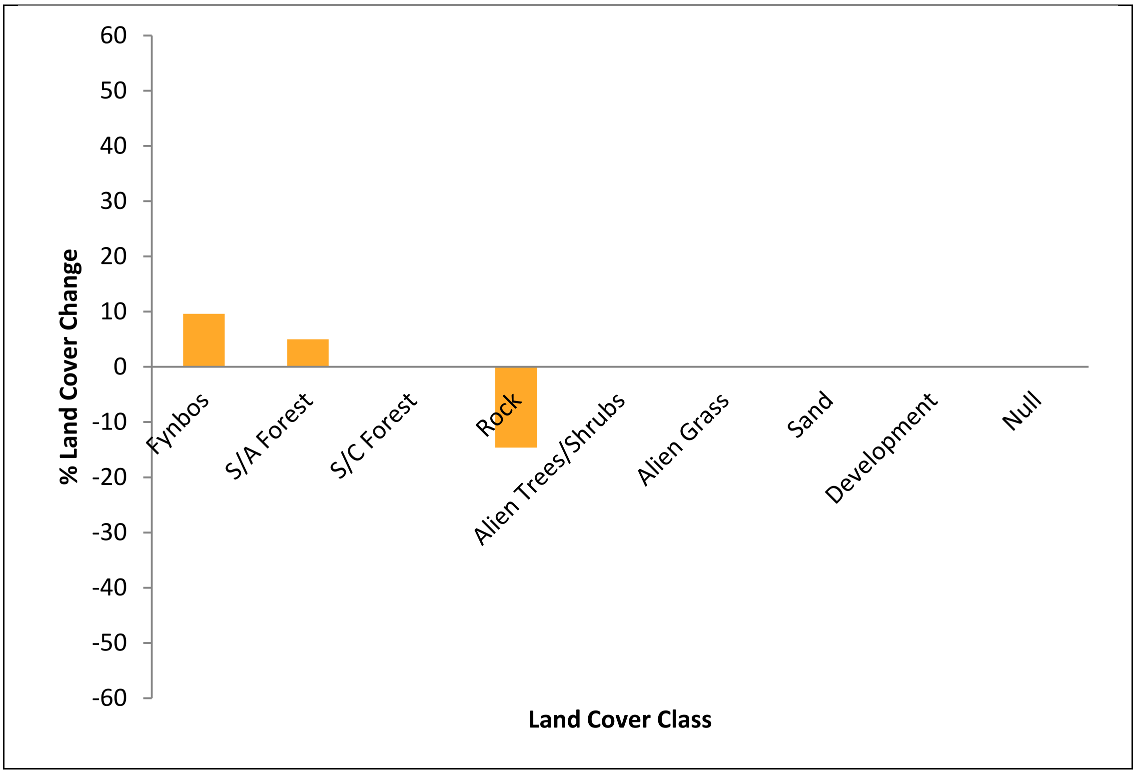

Figure 31.6: Percentage change in land cover classes between 1930 and 2011 at Site 992 Fountain Buttress

993 GROOTE SCHUUR OLD ZOO:

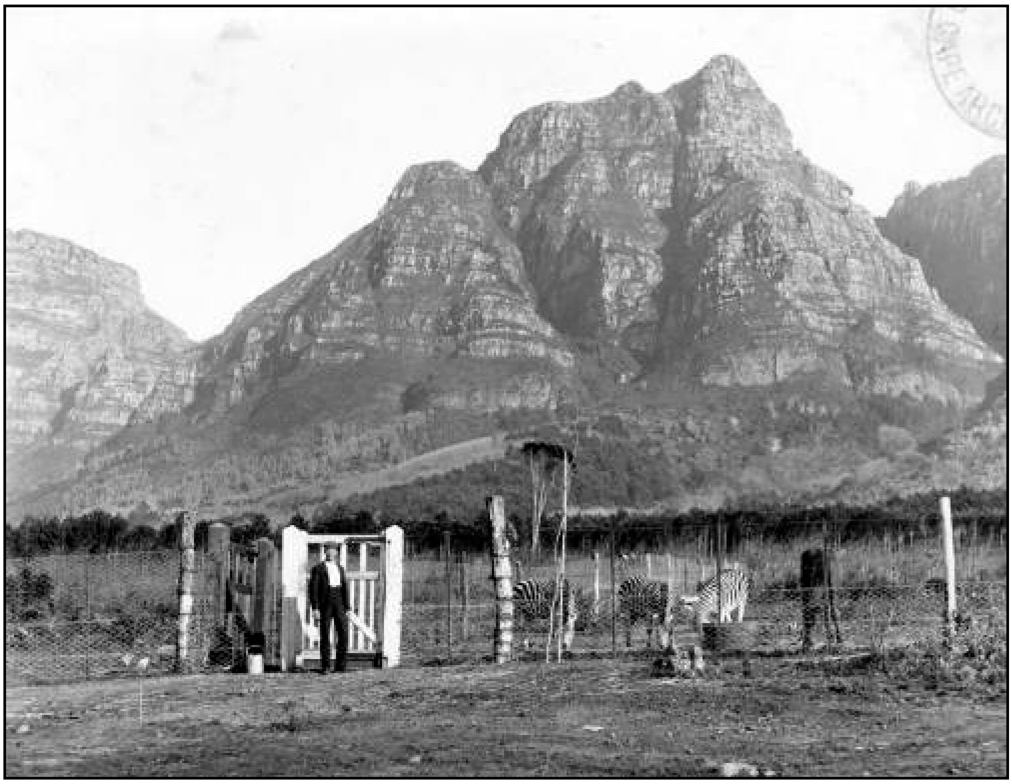

Figure 32.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 32.2: Repeat image by Zoë C Poulsen (30/11/2011)

SITE INFORMATION

Site No: 993 **Date:** 30/11/2011 **Time spent on site:** 8:30am

Concise Site Name: Groote Schuur Old Zoo

General description of location: In field next to Groote Schuur Estate Old Zoo looking west towards Devil's Peak

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: S -33.960524 **Altitude (m):** 130m asl.

E 18.457555

Original Photographer: Elliot Collection (National Archives)

Original number: E7975 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

Figure 32.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:	Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 993 **PHOTOGRAPHIC INFORMATION** **Date:** 30/11/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	828	24mm	1/125	8	270°	8:45am
Canon 450D	Digital	829	24mm	1/100	8	270°	8:45am
Canon 450D	Digital	830	24mm	1/125	8	270°	8:46am
Canon 450D	Digital	831	24mm	1/125	8	270°	8:46am
Canon 450D	Digital	832	24mm	1/125	8	270°	8:47am
Canon 450D	Digital	833	24mm	1/125	8	270°	8:47am
Canon 450D	Digital	834	24mm	1/125	8	270°	8:48am
Canon 450D	Digital	835	24mm	1/125	8	270°	8:48am

Notes on weather conditions: Hot and sunny with no cloud

Site no: 993 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 30/11/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient-poor soils derived from Table Mountain Sandstone.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking west from Groote Schuur Estate Old Zoo towards the eastern slopes of Devil's Peak and Table Mountain.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 32.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Groote Schuur Estate Zoo (foreground of image): The original image was taken when the zoo was still in operation and this area was heavily grazed and there was little vegetation present. The zoo has since closed down and this area has been abandoned. The fence of the zebra enclosure has been removed and the area is mainly colonised by alien grass with scattered shrub cover. The stone pines and Eucalyptus behind the enclosure have grown considerably in height since the original image was taken.

Landform B: Lower slopes of Devil's Peak: Since the original image was taken there has been considerable expansion in the area colonised by alien trees, including pines and Eucalyptus. The alien trees are now growing much further upslope in an area that was originally relatively pristine fynbos with scattered populations of *Leucadendron argenteum*.

Landform C: Western Cape Afrotemperate Forest in Second Waterfall Ravine: There has been considerable expansion of the Western Cape Afrotemperate Forest in Second Waterfall Ravine. In the original image only a small population of forest trees were growing in the ravine and since then there has been substantial expansion in tree growth up the ravine. There has also been an increase in canopy height in the forest there. There may have been expansion in the lower section of the forest patch; however, this section of the ravine is now obscured by the growth of alien Eucalyptus in front.

Landform D: Cliffs and upper slopes of Devil's Peak and Table Mountain: On the cliffs and upper slopes of Devil's Peak, there has been a substantial increase in cover of shrubby vegetation. There has been an overall increase in vegetation cover that means that there is now much less bare rock visible. This is particularly the case on the upper slopes of Table Mountain visible in the left hand side of the image.

Site no: 993 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 30/11/2011

Landform A: Groote Schuur Estate Zoo (foreground of image) (N/D: No data collected)

Landform B: Lower slopes of Devil's Peak (N/D: No data collected)

Landform C: Western Cape Afrotemperate Forest in Second Waterfall Ravine

Landform D: Cliffs and upper slopes of Devil's Peak and Table Mountain (N/D: No data collected)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodytes dimidiata*	*Apodytes dimidiata*	N/D	N/D	5	N/D	N/A
2	*Canthium inerme*	*Canthium inerme*	N/D	N/D	0.1	N/D	N/A
3	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	N/D	0.5	N/D	N/A
4	*Cassine peragua*	*Cassine peragua*	N/D	N/D	5	N/D	N/A
5	*Cassine schinoides*	*Cassine schinoides*	N/D	N/D	5	N/D	N/A
6	*Clutia pulchella*	*Clutia pulchella*	N/D	N/D	0.5	N/D	N/A
7	*Cunonia capensis*	*Cunonia capensis*	N/D	N/D	10	N/D	N/A
8	*Curtisia dentata*	*Curtisia dentata*	N/D	N/D	5	N/D	N/A
9	*Diospyros whyteana*	*Diospyros whyteana*	N/D	N/D	5	N/D	N/A
10	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	N/D	0.5	N/D	N/A
11	*Halleria lucida*	*Halleria lucida*	N/D	N/D	5	N/D	N/A
12	*Ilex mitis*	*Ilex mitis*	N/D	N/D	10	N/D	N/A
13	*Kiggelaria africana*	*Kiggelaria africana*	N/D	N/D	10	N/D	N/A
14	*Maytenus acuminata*	*Maytenus acuminata*	N/D	N/D	0.5	N/D	N/A
15	*Maytenus oleioides*	*Maytenus oleioides*	N/D	N/D	0.5	N/D	N/A
16	*Ocotea bullata*	*Ocotea bullata*	N/D	N/D	0.1	N/D	N/A
17	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	N/D	0.1	N/D	N/A
18	*Olea europea africana*	*Olea europea africana*	N/D	N/D	0.1	N/D	N/A
19	*Olinia ventosa*	*Olinia ventosa*	N/D	N/D	5	N/D	N/A
20	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	N/D	0.5	N/D	N/A
21	*Rapanea melanophloeos*	*Rapanea melanoploeos*	N/D	N/D	10	N/D	N/A
22	*Searsia laevigata*	*Searsia laevigata*	N/D	N/D	5	N/D	N/A
23	*Searsia lucida*	*Searsia lucida*	N/D	N/D	10	N/D	N/A
24	*Searsia tomentosa*	*Searsia tomentosa*	N/D	N/D	0.1	N/D	N/A

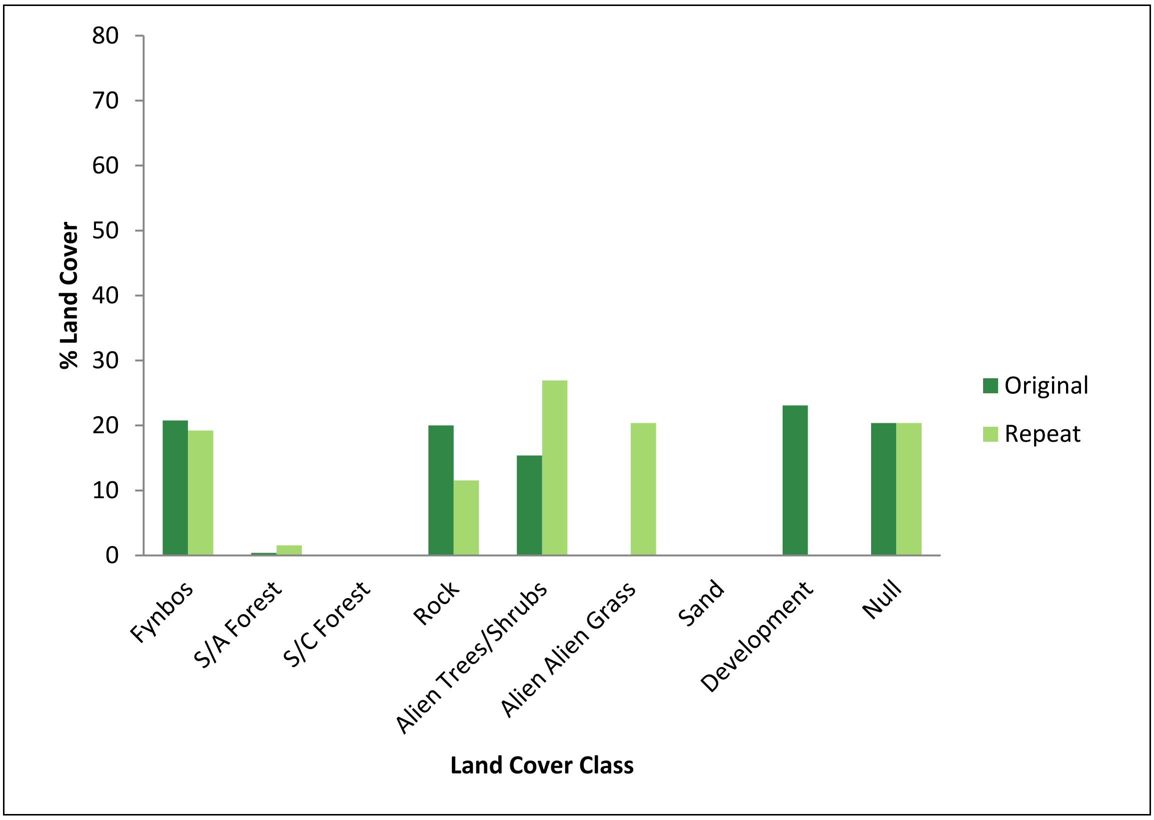

Figure 32.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 993 Groote Schuur Old Zoo

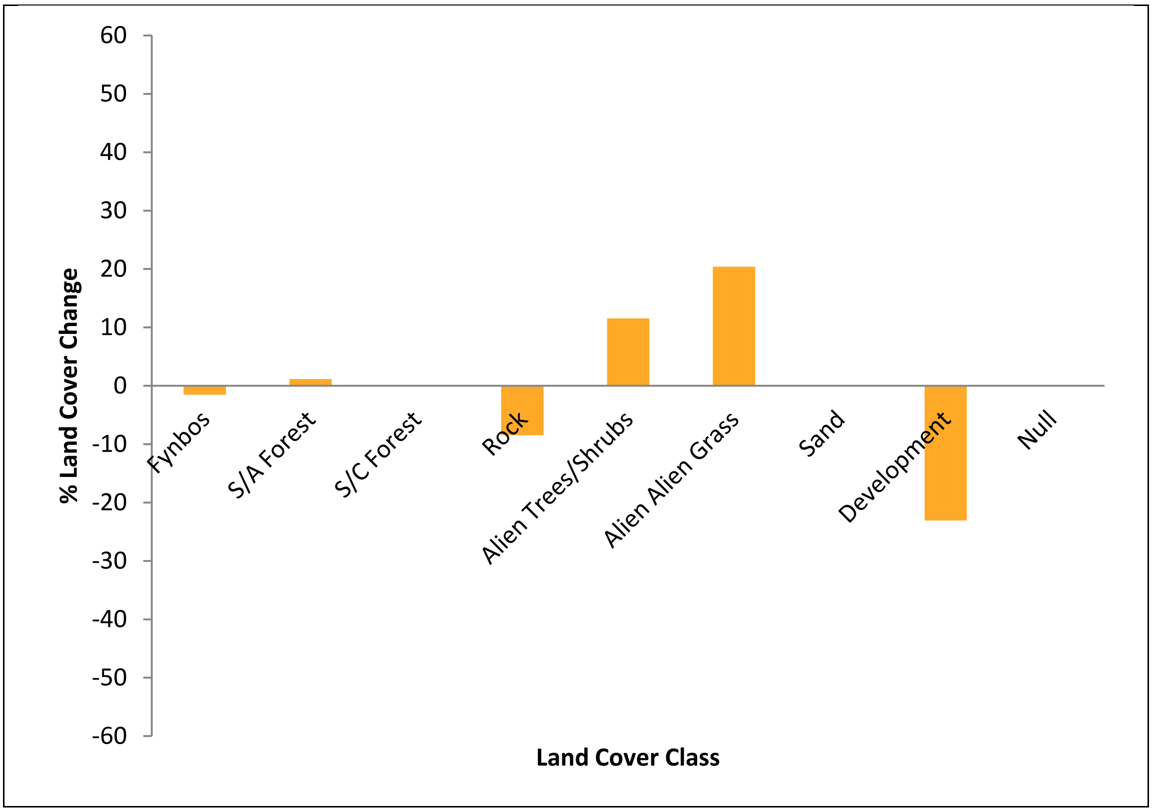

Figure 32.6: Percentage change in land cover classes between 1900 and 2011 at Site 993 Groote Schuur Old Zoo

994 HOUT BAY DRIVE:

Figure 33.1: Original image from the AG Collection (South African National Archives) (c.1900)

Figure 33.2: Repeat image by Zoë C Poulsen (01/12/2011)

SITE INFORMATION

Site No: 994 **Date:** 01/12/2011 **Time spent on site:** 10:00am

Concise Site Name: Hout Bay Drive

General description of location: Next to road into Hout Bay on left hand side just below Constantia Nek

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Wynberg **QDS:** 3318CD

Coordinates: **S** -34.012102 **Altitude (m):** 203m asl.

E 18.402548

Original Photographer: AG Collection (National Archives)

Original number: AG1798 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

Figure 33.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 994 **PHOTOGRAPHIC INFORMATION** **Date:** 01/12/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	923	24mm	1/100	8	290°	10:05am
Canon 450D	Digital	924	24mm	1/100	8	290°	10:05am
Canon 450D	Digital	925	24mm	1/100	8	290°	10:06am
Canon 450D	Digital	926	24mm	1/100	8	290°	10:06am
Canon 450D	Digital	927	24mm	1/100	8	290°	10:07am
Canon 450D	Digital	928	24mm	1/100	8	290°	10:07am
Canon 450D	Digital	929	24mm	1/100	8	290°	10:08am
Canon 450D	Digital	930	24mm	1/100	8	290°	10:08am
Canon 450D	Digital	931	24mm	1/100	8	290°	10:09am
Canon 450D	Digital	932	24mm	1/100	8	290°	10:09am
Canon 450D	Digital	933	24mm	1/100	8	290°	10:10am

Notes on weather conditions: Sunny with scattered cloud

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*:

Shallow nutrient-poor soils derived from Table Mountain Sandstone

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking north-west from Hout Bay Drive towards the south-east-facing Myburgh's Waterfall Ravine and Judas Peak. Little Lion's Head is visible in the far left of the image.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

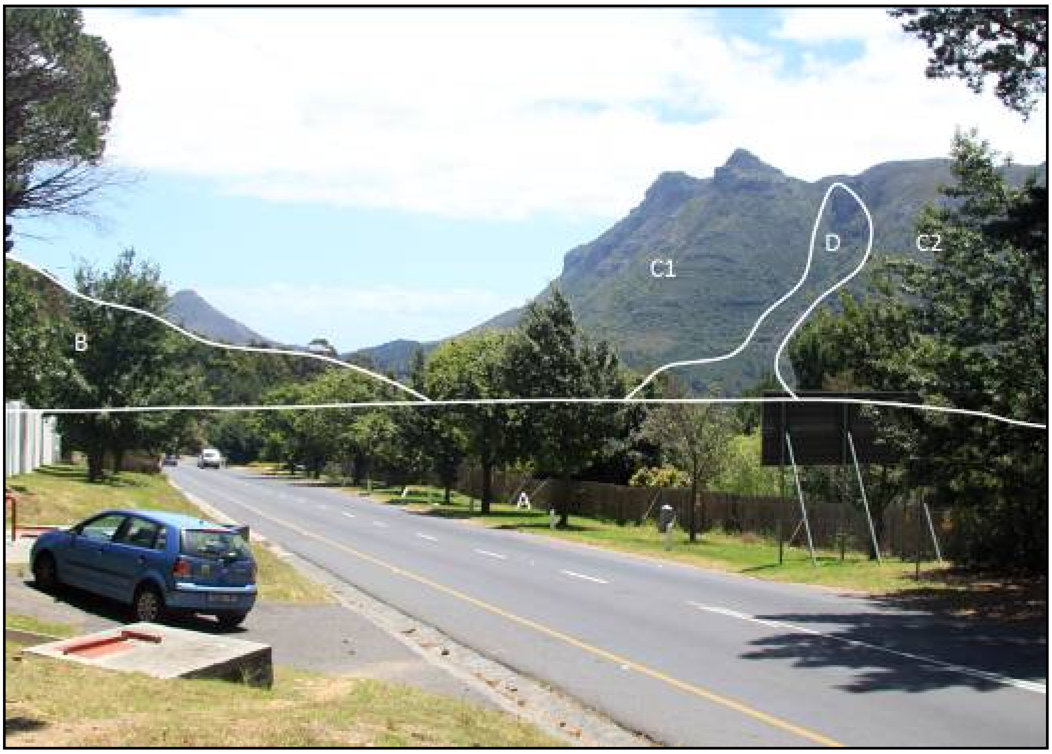

Figure 33.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: SW-facing slope in foreground: At the time the original image was taken, there was only a narrow dirt road along what is now Hout Bay Drive. The fynbos here at the time was still relatively pristine. The landscape here is now completely transformed and there is a two lane tarmac road along this route. None of the original fynbos remains and has now been replaced with alien grass verges with an avenue of trees planted either side of the road.

Landform B: NE-facing slope in midground: The vegetation on this slope has also been completely transformed since the original image was taken. The original vegetation was relatively pristine fynbos and the area has now been completely colonised by alien *Eucalyptus* and *Acacia* spp.

Landform C: Fynbos on south-facing slopes of Table Mountain in background: Since the original image was taken, there has been a substantial increase in woody vegetation cover on these slopes with expansion of forest precursor species from the forest patches on this slope out into the fynbos. There is no longer a defined margin between the forest and the fynbos. There is much less bare rock visible than in the original image.

Landform D: Western Cape Afrotemperate Forest on background south-facing slopes of Table Mountain: There has been a substantial increase in forest patch size on these slopes, to the extent that the individual forest patches have coalesced and the margins are now far less well defined.

Site no: 994 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 01/12/2011

Landform A: SW-facing slope in foreground (N/D: No data collected)

Landform B: NE-facing slope in midground (N/D: No data collected)

Landform C: Fynbos on south-facing slopes of Table Mountain in background (N/D: No data collected)

Landform D: Western Cape Afrotemperate Forest on background south-facing slopes of Table Mountain

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodytes dimidiata*	*Apodytes dimidiata*	N/D	N/D	N/D	10	N/A
2	*Canthium inerme*	*Canthium inerme*	N/D	N/D	N/D	0.5	N/A
3	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	N/D	N/D	5	N/A
4	*Cassine peragua*	*Cassine peragua*	N/D	N/D	N/D	5	N/A
5	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	N/D	N/D	10	N/A
6	*Clutia pulchella*	*Clutia pulchella*	N/D	N/D	N/D	0.1	N/A
7	*Cunonia capensis*	*Cunonia capensis*	N/D	N/D	N/D	0.1	N/A
8	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	N/D	N/D	0.1	N/A
9	*Diospyros whyteana*	*Diospyros whyteana*	N/D	N/D	N/D	5	N/A
10	*Grewia occidentalis*	*Grewia occidentalis*	N/D	N/D	N/D	0.1	N/A
11	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	N/D	N/D	0.5	N/A
12	*Halleria lucida*	*Halleria lucida*	N/D	N/D	N/D	5	N/A
13	*Kiggelaria africana*	*Kiggelaria africana*	N/D	N/D	N/D	5	N/A
14	*Maurocenia frangula*	*Maurocenia frangula*	N/D	N/D	N/D	5	N/A
15	*Maytenus acuminata*	*Maytenus acuminata*	N/D	N/D	N/D	0.5	N/A
16	*Maytenus oleioides*	*Maytenus oleioides*	N/D	N/D	N/D	0.5	N/A
17	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	N/D	N/D	0.5	N/A
18	*Olea europea africana*	*Olea europea africana*	N/D	N/D	N/D	25	N/A
19	*Olinia ventosa*	*Olinia ventosa*	N/D	N/D	N/D	5	N/A
20	*Podylaria calyptrata*	*Podylaria calyptrata*	N/D	N/D	N/D	0.1	N/A
21	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	N/D	N/D	0.1	N/A
22	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	N/D	N/D	5	N/A
23	*Searsia laevigata*	*Searsia laevigata*	N/D	N/D	N/D	0.1	N/A
24	*Searsia lucida*	*Searsia lucida*	N/D	N/D	N/D	5	N/A

25	*Searsia tomentosa*	*Searsia tomentosa*	N/D	N/D	N/D	0.5	N/A
26	*Scutia myrtina*	*Scutia myrtina*	N/D	N/D	N/D	0.5	N/A
27	*Secamone alpini*	*Secamone alpini*	N/D	N/D	N/D	0.5	N/A

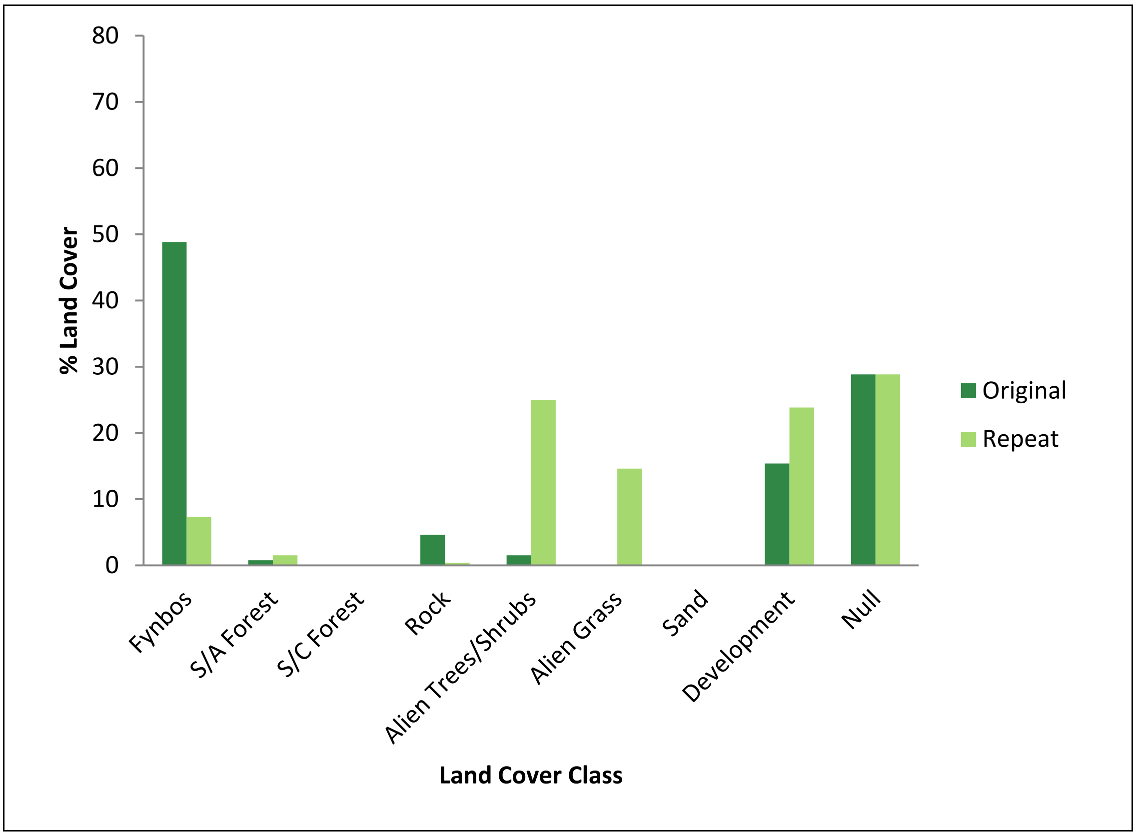

Figure 33.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 994 Hout Bay Drive

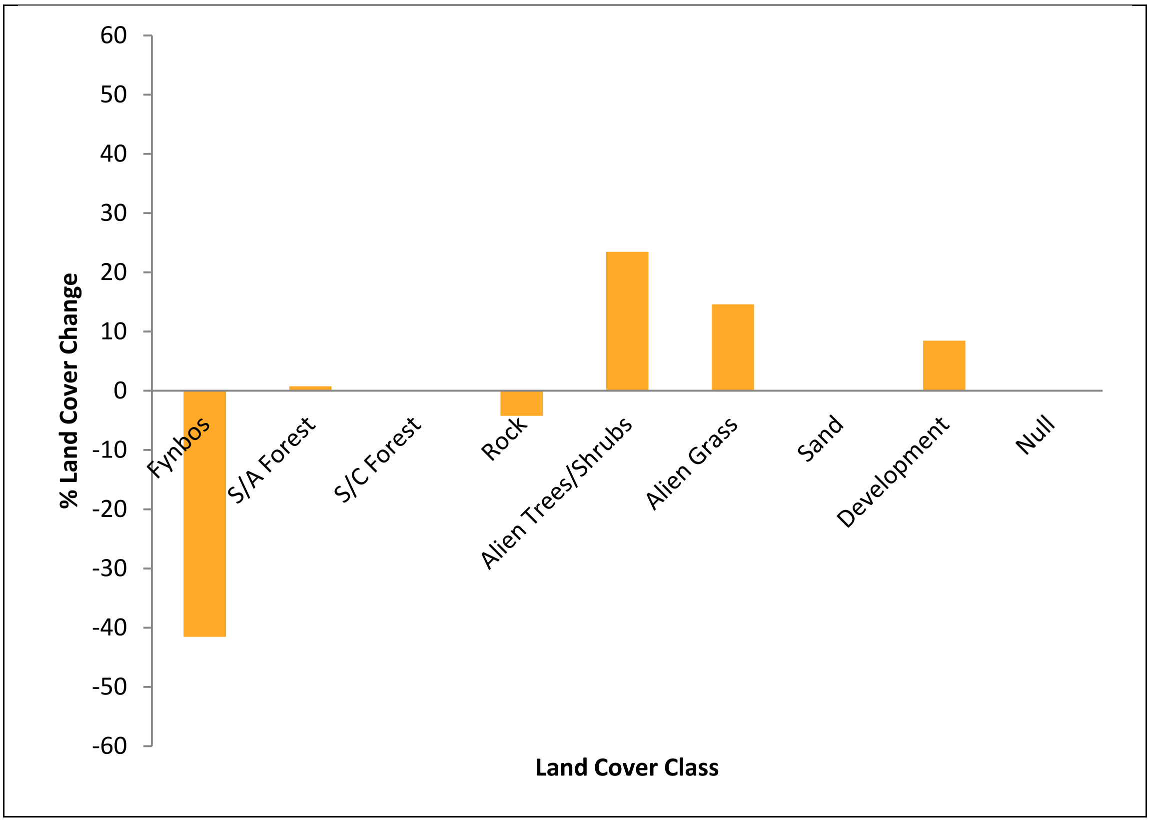

Figure 33.6: Percentage change in land cover classes between 1900 and 2011 and Site 994 Hout Bay Drive

995 LLANDUDNO:

Figure 34.1: Original image by Jurgens (c.1900)

Figure 34.2: Repeat image by Zoë C Poulsen (02/12/2011)

SITE INFORMATION

Site No: 995 **Date:** 02/12/2011 **Time spent on site:** 10:15pm

Concise Site Name: Llandudno

General description of location: View from 100m below Victoria road on granite boulders looking south towards Llandudno Beach, Little Lion's Head and the Karbonkelberg.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Simonstown **QDS:** 3418AB

Coordinates: **S** -34.001703 **Altitude (m):** 71m asl

E 18.342742

Original Photographer: Jurgens

Original number: Jurgens_05_003 **Original date:** c. 1900

Original site/photograph name: Llandudno

Notes on accuracy of repeat photo station location: Within 100m of original site

Location Map:

Figure 34.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 995 **PHOTOGRAPHIC INFORMATION** **Date:** 02/12/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	934	24mm	1/125	8	170°	10:30am
Canon 450D	Digital	935	24mm	1/100	8	170°	10:30am
Canon 450D	Digital	936	24mm	1/100	8	170°	10:31am
Canon 450D	Digital	937	24mm	1/100	8	170°	10:31am
Canon 450D	Digital	938	24mm	1/100	8	170°	10:32am
Canon 450D	Digital	939	24mm	1/125	8	170°	10:33am
Canon 450D	Digital	940	24mm	1/100	8	170°	10:33am
Canon 450D	Digital	941	24mm	1/100	8	170°	10:34am
Canon 450D	Digital	942	24mm	1/100	8	170°	10:34am
Canon 450D	Digital	943	24mm	1/100	8	170°	10:35am
Canon 450D	Digital	944	24mm	1/100	8	170°	10:36am
Canon 450D	Digital	945	24mm	1/100	8	170°	10:36am
Canon 450D	Digital	946	24mm	1/100	8	170°	10:37am
Canon 450D	Digital	947	24mm	1/100	8	170°	10:37am
Canon 450D	Digital	948	24mm	1/100	8	170°	10:38am
Canon 450D	Digital	949	24mm	1/100	8	170°	10:38am
Canon 450D	Digital	950	24mm	1/100	8	170°	10:39am
Canon 450D	Digital	951	24mm	1/100	8	170°	10:39am
Canon 450D	Digital	952	24mm	1/125	8	170°	10:40am
Canon 450D	Digital	953	24mm	1/100	8	170°	10:40am
Canon 450D	Digital	954	24mm	1/100	8	170°	10:41am
Canon 450D	Digital	955	24mm	1/100	8	170°	10:41am
Canon 450D	Digital	956	24mm	1/100	8	170°	10:42am

Notes on weather conditions: Sunny with scattered cloud

Site no: 995 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking south towards the gentle west-facing slopes above Llandudno Beach and the adjacent strip of Western Cape Milkwood Forest with the steeper north-west facing slopes of Little Lion's Head and the distant Karbonkelberg in the background.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest;

Description of major changes:

Figure 34.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Foreground west-facing slopes: Since the original image was taken there has been considerable housing development in Llandudno and much of the original fynbos is no longer present owing to habitat destruction from this development. In the vegetation adjacent to the new housing, there has been an increase in shrubby cover with *Searsia* spp. dominating the vegetation cover. There are several areas that have been highly disturbed and in these patches there has been an increase in alien grass cover.

Landform B: Western Cape Milkwood Forest adjacent to Llandudno Beach: There has been an expansion in coastal forest cover next to Llandudno Beach. In the original image there was only scattered shrubby vegetation with considerably less forest cover. Now the forest canopy has increased in height and coalesced so individuals are harder to define. There is also much more evidence of canopy rounding as a result of wind pruning.

Landform C: North-west facing slopes of Little Lion's Head (Klein Leeukop): There has been considerable expansion of housing development up the lower slopes of Little Lion's Head. On the upper mountain slopes there has been a slight increase in scattered shrubby cover.

Landform D: Background north-west facing slopes of Karbonkelberg: There has been some increase in cover from forest precursor species on the lower slopes of the Karbonkelberg since the original image was taken. There are also a few new erosion scars at mid level on the lower slopes. There is evidence of a recent fire in this area too. Aside from that, there has been little vegetation change.

Site no: 995 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Landform A: Foreground west-facing slopes (N/D: No data collected)

Landform B: Western Cape Milkwood Forest adjacent to Llandudno Beach

Landform C: North-west facing slopes of Little Lion's Head (Klein Leeukop) (N/D: No data collected)

Landform D: Background north-west facing slopes of Karbonkelberg (N/D: No data collected)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Cassine peragua*	*Cassine peragua*	N/D	0.1	N/D	N/D	N/A
2	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	0.5	N/D	N/D	N/A
3	*Euclea racemosa*	*Euclea racemosa*	N/D	5	N/D	N/D	N/A
4	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	N/D	N/D	N/A
5	*Olea europea africana*	*Olea europea africana*	N/D	0.5	N/D	N/D	N/A
6	*Olea exasperata*	*Olea exasperata*	N/D	0.5	N/D	N/D	N/A
7	*Colpoon compressum*	*Colpoon compressum*	N/D	0.5	N/D	N/D	N/A
8	*Phylica buxiifolia*	*Phylica buxifolia*	N/D	0.1	N/D	N/D	N/A
9	*Searsia glauca*	*Searsia glauca*	N/D	5	N/D	N/D	N/A
10	*Searsia lucida*	*Searsia lucida*	N/D	10	N/D	N/D	N/A
11	*Searsia tomentosa*	*Searsia tomentosa*	N/D	0.1	N/D	N/D	N/A
12	*Cassine maritima*	*Cassine maritima*	N/D	5	N/D	N/D	N/A
13	*Secamone alpini*	*Secamone alpini*	N/D	0.1	N/D	N/D	N/A
14	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	70	N/D	N/D	N/A
15	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	N/D	10	N/D	N/D	N/A

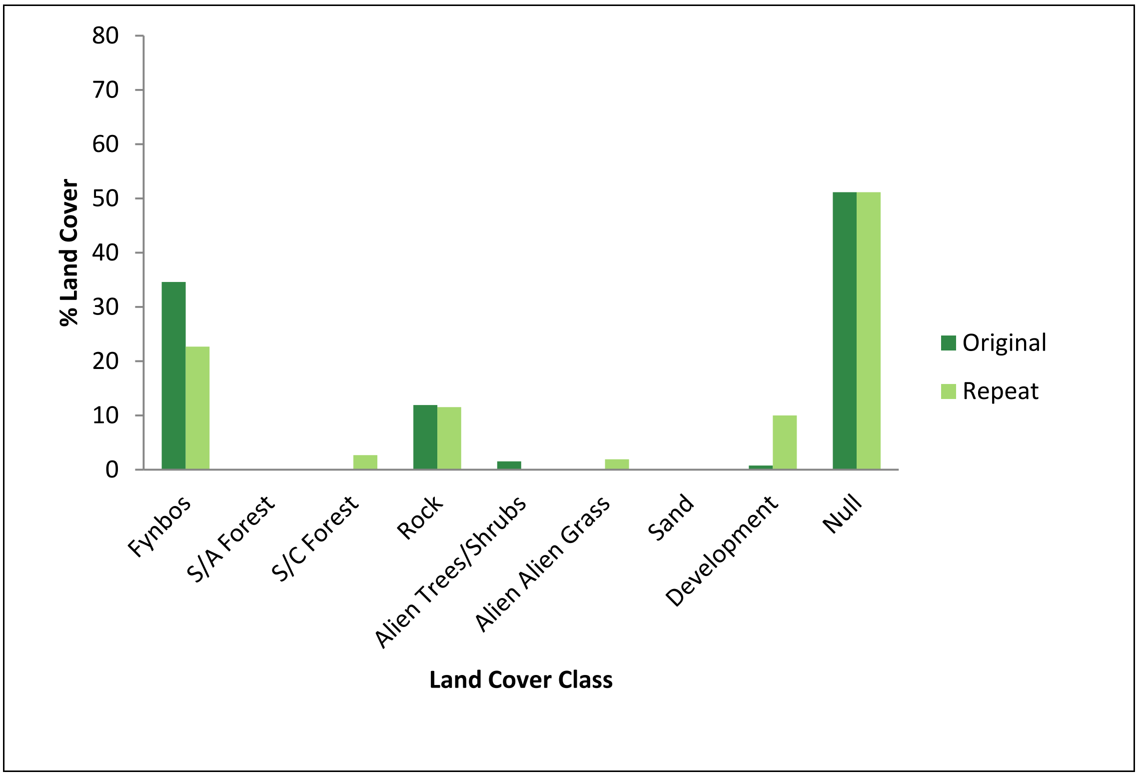

Figure 34.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 995 Llandudno

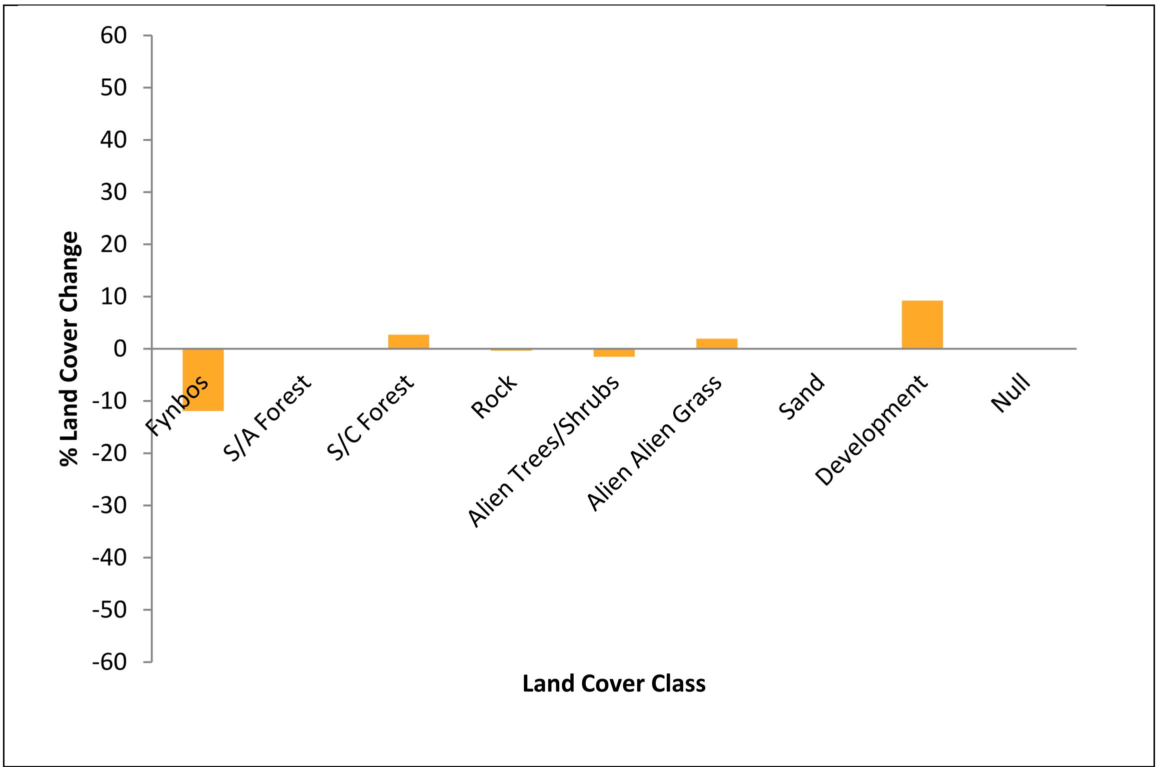

Figure 34.6: Percentage change in land cover classes between 1900 and 2011 at Site 995 Llandudno

996 CAMPS BAY SPORTS FIELD 2:

Figure 35.1: Original image by Lambert (c.1980)

Figure 35.2: Repeat image by Zoë C Poulsen (02/12/2011)

<u>**SITE INFORMATION**</u>

Site No: 996 **Date:** 02/12/2011 **Time spent on site:** 2:00pm

Concise Site Name: Camps Bay Sports Field 2

General description of location: In the centre of sports field next to Camps Bay Drive, looking south-east towards the Twelve Apostles, Table Mountain

Province: Western Cape

Bioregion: FF02 South-West Fynbos

Magisterial district: Cape Town

QDS: 3318CD

Coordinates: **S** -33.962238

E 18.378942

Altitude (m): 72m asl.

Original Photographer: Lambert

Original number: Lambert_A[TblMt]_095

Original date: c. 1980

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

Figure 35.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 996 **PHOTOGRAPHIC INFORMATION** **Date:** 02/12/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	958	24mm	1/100	8	135°	2:15pm
Canon 450D	Digital	959	24mm	1/100	8	135°	2:15pm
Canon 450D	Digital	960	24mm	1/100	8	135°	2:16pm
Canon 450D	Digital	961	24mm	1/100	8	135°	2:16pm
Canon 450D	Digital	962	24mm	1/100	8	135°	2:17pm
Canon 450D	Digital	963	24mm	1/100	8	135°	2:17pm
Canon 450D	Digital	964	24mm	1/100	8	135°	2:18pm
Canon 450D	Digital	965	24mm	1/100	8	135°	2:18pm
Canon 450D	Digital	966	24mm	1/100	8	135°	2:18pm
Canon 450D	Digital	967	24mm	1/100	8	135°	2:19pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 996 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Geology: Table Mountain Sandstone

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow nutrient poor soils derived from Table Mountain Sandstone.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking east from Camps Bay Sports Field towards the more gentle lower slopes and steep cliffs of the Twelve Apostles in the background.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos;

Description of major changes:

Figure 35.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Lower west-facing slopes in foreground of image: The foreground lower slope here was very disturbed and degraded at the time this image was taken, with scattered alien pine trees and *Eucalyptus* spp. Most of this lower section of the slope has now been developed with housing and some of the *Eucalyptus* spp. still remain present in the foreground of the repeat image.

Landform B: Lower west-facing slopes of Twelve Apostles (Table Mountain) in midground: On the left side of the original image there was a small clump of alien pine trees. Some of these have been cleared but a few still remain along the Pipe Track. Immediately above the pines there is a cluster of boulders and there has been an increase in shrubby cover here with less bare rock visible, dominated by the furry-leaved form of *Leucospermum conocarpodendron*. In the adjacent ravine of Kasteelspoort, there has been an increase in shrubby cover and increase in vegetation height, which is dominated by *Phylica buxifolia*. In the original image on the right side of this ravine there was a prominent erosion scar. This is no longer visible in the repeat image. In the original image there was a large clump of alien *Eucalyptus* spp. This population has now expanded to cover most of the slope.

Landform C: West-facing buttresses and cliffs of Twelve Apostles: On the upper slopes of the Twelve Apostles, there has been an increase in shrubby vegetation cover. As a result, there is now much less bare rock visible.

Landform A: Lower west-facing slopes in foreground of image (No data collected)

Landform B: Lower west-facing slopes of Twelve Apostles in midground (No data collected)

Landform C: West-facing buttresses and cliffs of Twelve Apostles (No data collected)

Landform D: N/A

Landform E: N/A

(No Species Data Collected)

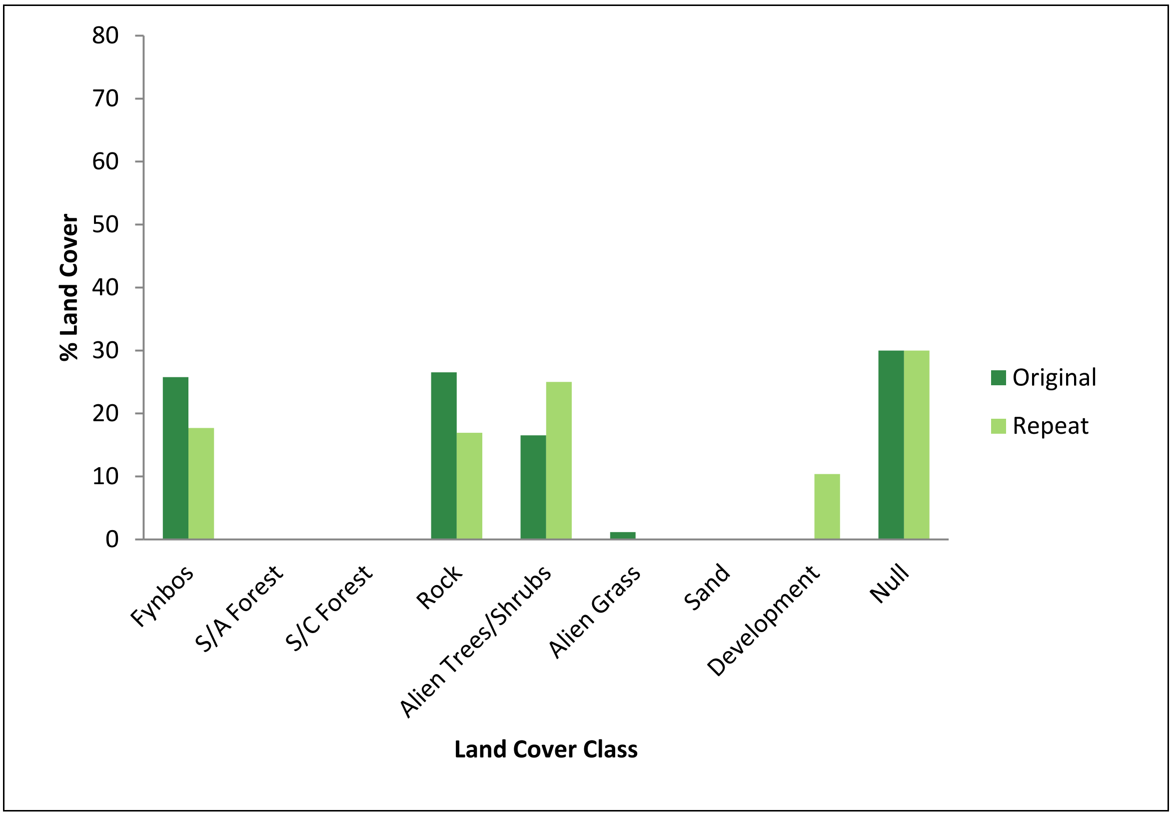

Figure 35.5: Percentages of land cover classes present in original (1980) and repeat image (2011) at Site 996 Camps Bay Sports Field 2

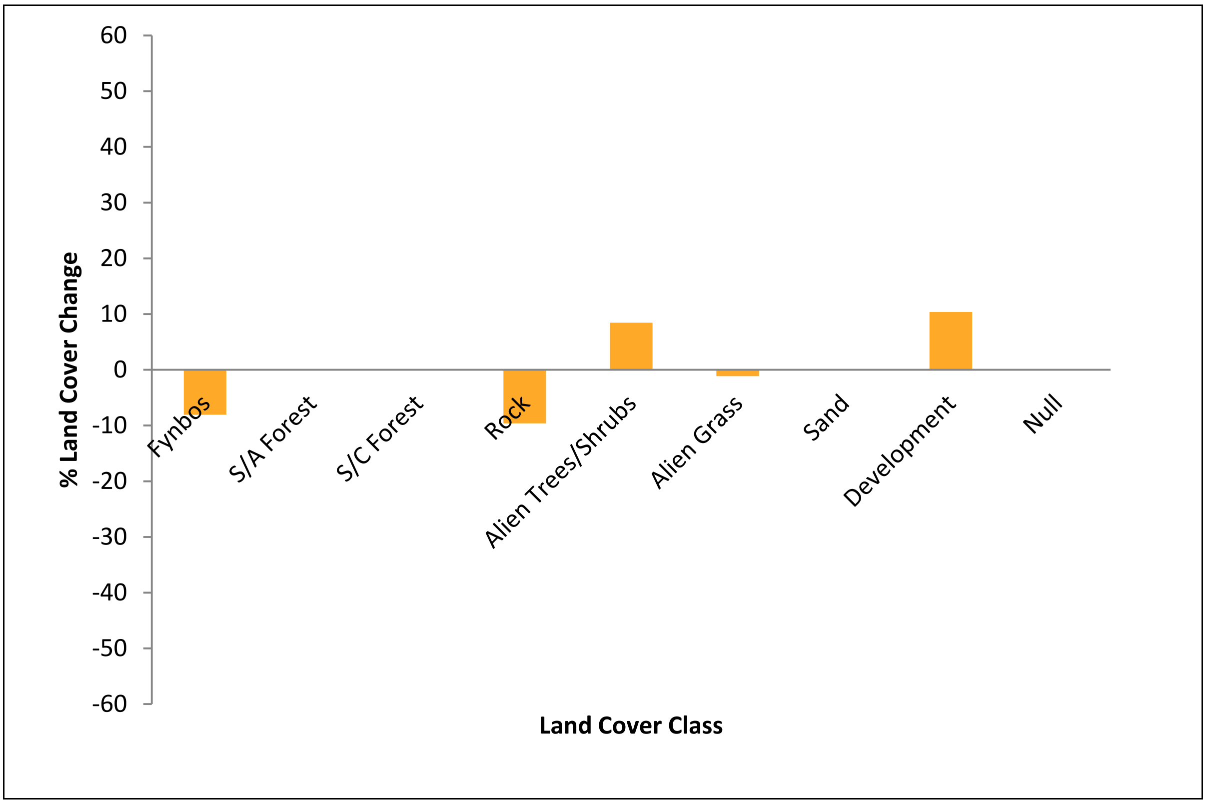

Figure 35.6: Percentage change in land cover classes between 1980 and 2011 at Site 996 Camps Bay Sports Field 2

997 CAMPS BAY:

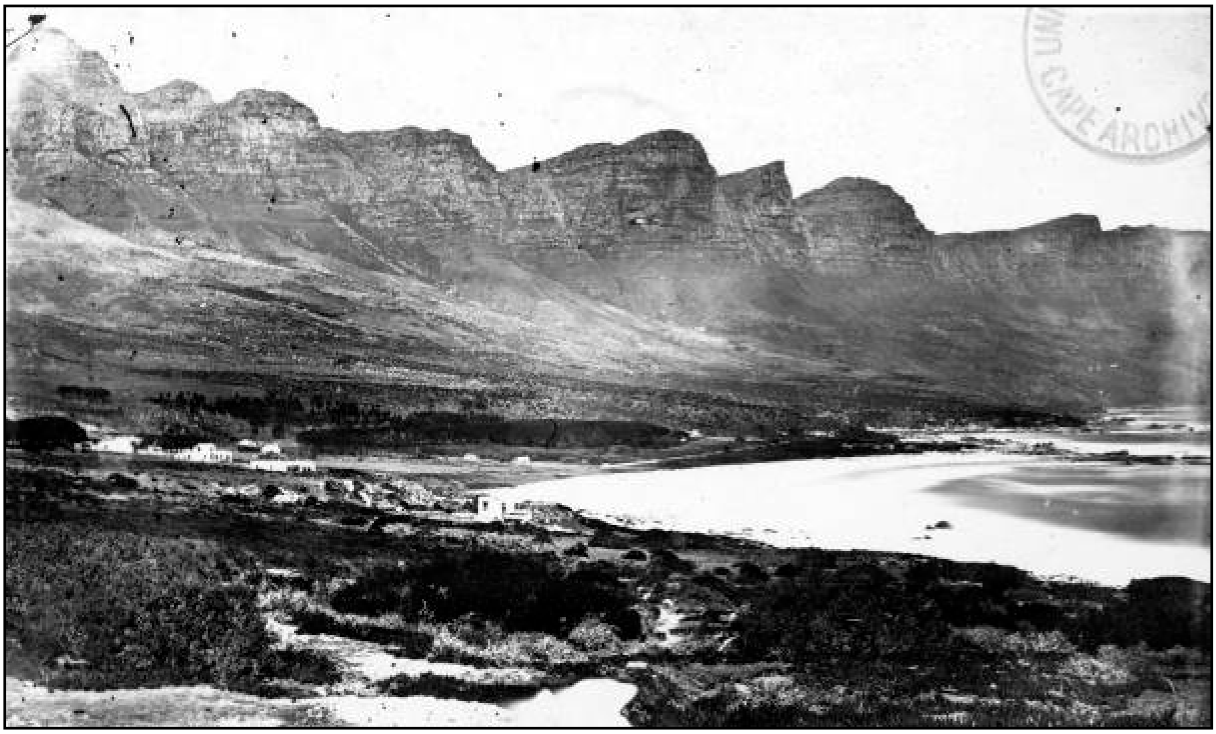

Figure 36.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 36.2: Repeat image by Zoë C Poulsen (02/12/2011)

SITE INFORMATION

Site No: 997 **Date:** 02/12/2011 **Time spent on site:** 2:30pm

Concise Site Name: Camps Bay

General description of location: On seaward side of Victoria Road looking south over Camps Bay

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3318CD

Coordinates: **S** -33.945585 **Altitude (m):** 22m asl.

E 18.377454

Original Photographer: Elliot Collection (National Archives)

Original number: E7660 **Original date**: c. 1900

Original site/photograph name: Camps Bay

Notes on accuracy of repeat photo station location: Within 20m of original site

Location Map:

Figure 36.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:	**River system**	**Grazing land (communal)**	**Grazing land (private)**	**Cultivated field**	**Settlement**	**Conservation area**

Keywords:	**Communal lands**	**Land reform**	**Development**	**Indicator species**	**Population dynamics**	**Climate change**

Site no: 997 **PHOTOGRAPHIC INFORMATION** **Date:** 02/12/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	968	24mm	1/80	8	170°	2:35pm
Canon 450D	Digital	969	24mm	1/80	8	170°	2:35pm
Canon 450D	Digital	970	24mm	1/80	8	170°	2:36pm
Canon 450D	Digital	971	24mm	1/80	8	170°	2:37pm
Canon 450D	Digital	972	24mm	1/80	8	170°	2:37pm
Canon 450D	Digital	973	24mm	1/80	8	170°	2:38pm
Canon 450D	Digital	974	24mm	1/80	8	170°	2:38pm
Canon 450D	Digital	975	24mm	1/80	8	170°	2:39pm
Canon 450D	Digital	976	24mm	1/80	8	170°	2:39pm
Canon 450D	Digital	977	24mm	1/80	8	170°	2:40pm
Canon 450D	Digital	978	24mm	1/80	8	170°	2:40pm
Canon 450D	Digital	979	24mm	1/80	8	170°	2:41pm
Canon 450D	Digital	980	24mm	1/80	8	170°	2:42pm
Canon 450D	Digital	981	24mm	1/80	8	170°	2:42pm
Canon 450D	Digital	982	24mm	1/80	8	170°	2:43pm
Canon 450D	Digital	983	24mm	1/80	8	170°	2:43pm
Canon 450D	Digital	984	24mm	1/80	8	170°	2:44pm
Canon 450D	Digital	985	24mm	1/80	8	170°	2:44pm
Canon 450D	Digital	986	24mm	1/80	8	170°	2:45pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 997 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Nutrient poor soils derived from Table Mountain Sandstone and Granite

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking south from Camps Bay over Camps Bay Beach and the west-facing cliffs and buttresses of the Twelve Apostles

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 36.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos vegetation lower west-facing slopes below Twelve Apostles: At the time the original image was taken, there were only a few scattered houses in Camps Bay. Now there is extensive housing development upslope from the beachfront towards the buttresses of the Twelve Apostles. On the slopes on the left of the image, there were extensive boulder screes but there is now much less bare rock visible owing to housing development on the lower slopes and increased shrubby vegetation cover on the upper slopes. In the original image there were large erosion dongas in the boulder screes at the base of Kasteelspoort, these are now almost fully vegetated predominantly by *Phylica buxifolia*. Adjacent to this, since the original photo was taken there is now a large area colonised by *Eucalyptus* spp. On the background lower slopes of the image there has been expansion of forest cover from within Slangolie Ravine onto the lower slopes of Slangolie Buttress. The majority of these lower slopes have now been colonised by forest precursor species.

Landform B: Western Cape Afrotemperate Forest in Slangolie Ravine: In the original image by Elliot, there was almost no forest visible in Slangolie Ravine as its past extent was only within the ravine itself. Now the forest has expanded out of the ravine onto the lower slopes of Slangolie Buttress. The margins of the forest are now far less well defined and forest precursor species have now colonised much of the surrounding area.

Landform C: Upper cliffs and buttresses of Twelve Apostles: There has been a considerable increase in vegetation cover on the upper cliffs and buttresses of the Twelve Apostles. There is now far less bare rock visible on the cliff faces.

Site no: 997 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Landform A: Fynbos vegetation lower west-facing slopes below Twelve Apostles (N/D: No data collected)

Landform B: Western Cape Afrotemperate Forest in Slangolie Ravine

Landform C: Upper cliffs and buttresses of Twelve Apostles (N/D: No data collected)

Landform D: N/A

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodytes dimidiata*	*Apodytes dimidiata*	N/D	0.5	N/D	N/A	N/A
2	*Canthium inerme*	*Canthium inerme*	N/D	5	N/D	N/A	N/A
3	*Cassine peragua*	*Cassine peragua*	N/D	10	N/D	N/A	N/A
4	*Cassine schinoides*	*Cassine schinoides*	N/D	0.5	N/D	N/A	N/A
5	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	10	N/D	N/A	N/A
6	*Clutia pulchella*	*Clutia pulchella*	N/D	0.5	N/D	N/A	N/A
7	*Cunonia capensis*	*Cunonia capensis*	N/D	0.5	N/D	N/A	N/A
8	*Curtisia dentata*	*Curtisia dentata*	N/D	10	N/D	N/A	N/A
9	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.5	N/D	N/A	N/A
10	*Diospyros whyteana*	*Diospyros whyteana*	N/D	10	N/D	N/A	N/A
11	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	0.5	N/D	N/A	N/A
12	*Halleria lucida*	*Halleria lucida*	N/D	0.5	N/D	N/A	N/A
13	*Kiggelaria africana*	*Kiggelaria africana*	N/D	5	N/D	N/A	N/A
14	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	N/D	N/A	N/A
15	*Maytenus oleioides*	*Maytenus oleioides*	N/D	0.5	N/D	N/A	N/A
16	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	5	N/D	N/A	N/A
17	*Olea europea africana*	*Olea europea africana*	N/D	10	N/D	N/A	N/A
18	*Olinia ventosa*	*Olinia ventosa*	N/D	10	N/D	N/A	N/A
19	*Colpoon compressum*	*Colpoon compressum*	N/D	0.5	N/D	N/A	N/A
20	*Phylica buxifolia*	*Phylica buxifolia*	N/D	5	N/D	N/A	N/A
21	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	N/D	N/A	N/A
22	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	10	N/D	N/A	N/A
23	*Searsia glauca*	*Searsia glauca*	N/D	0.1	N/D	N/A	N/A
24	*Searsia lucida*	*Searsia lucida*	N/D	5	N/D	N/A	N/A
25	*Scutia myrtina*	*Scutia myrtina*	N/D	0.5	N/D	N/A	N/A

26	*Secamone alpini*	*Secamone alpini*	N/D	0.5	N/D	N/A	N/A
27	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	N/D	0.5	N/D	N/A	N/A

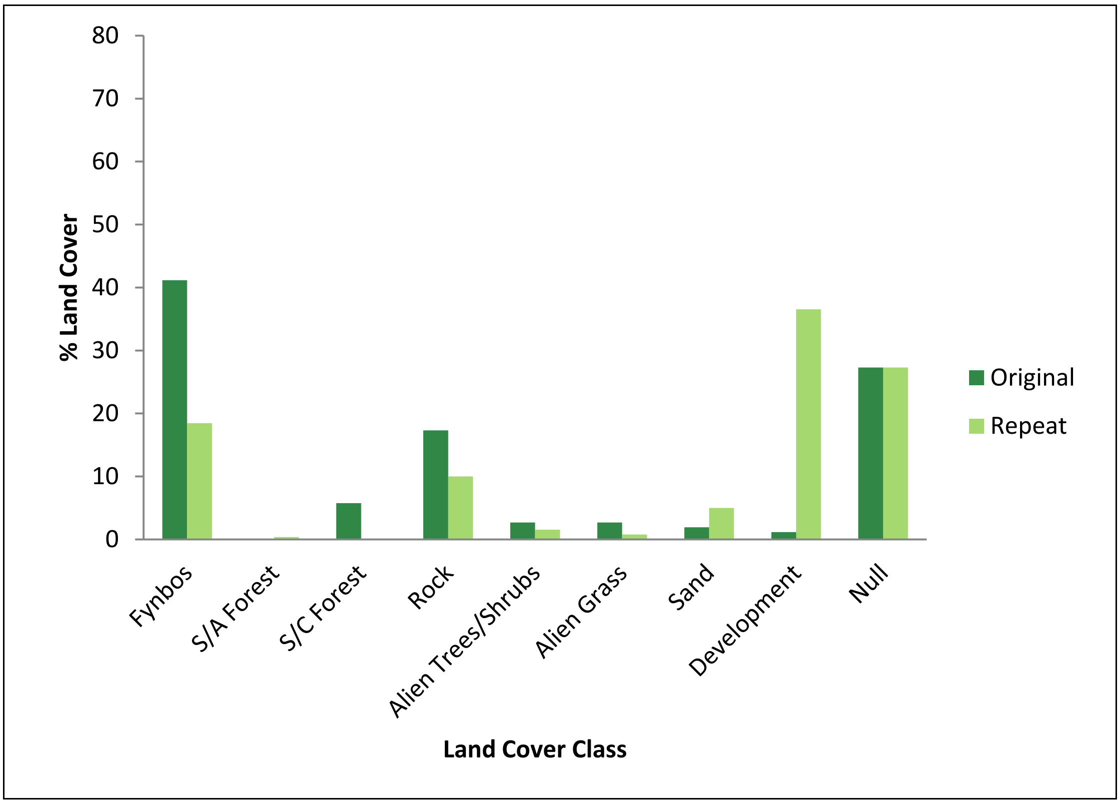

Figure 36.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 997 Camps Bay

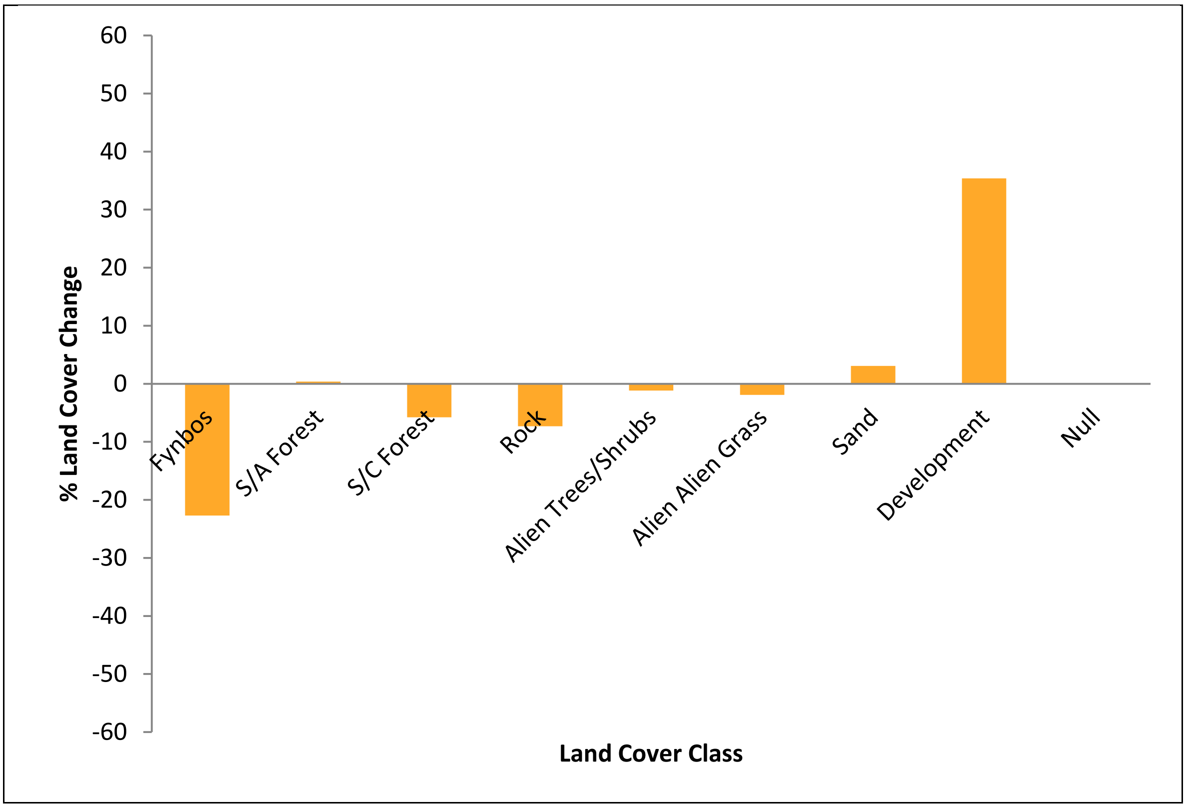

Figure 36.6: Percentage change in land cover classes between 1900 and 2011 at Site 997 Camps Bay

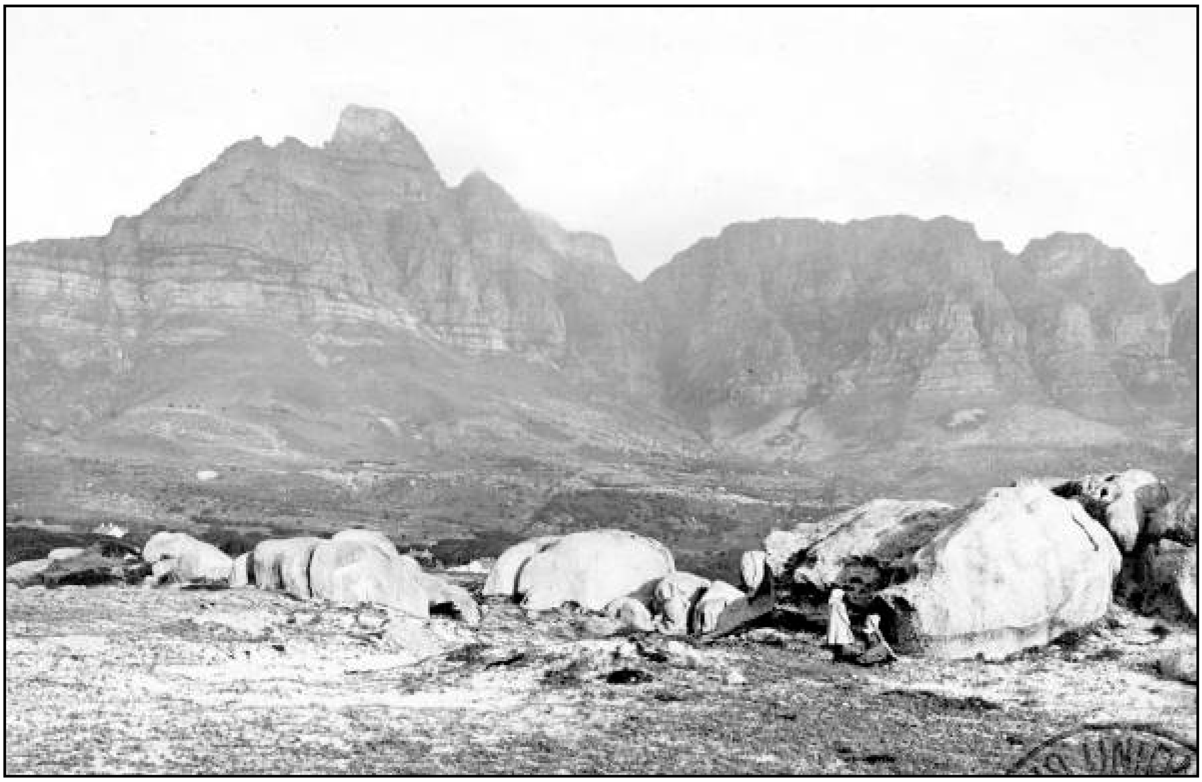

Figure 37.1: Original image from the Elliot Collection (South African National Archives) (c.1900)

Figure 37.2: Repeat image by Zoë C Poulsen (02/12/2011)

SITE INFORMATION

Site No: 998 **Date:** 02/12/2011 **Time spent on site:** 2:55pm

Concise Site Name: Twelve Apostles

General description of location: View looking from Camps Bay Beach looking south-east toward Blinkwater Ravine and the Twelve Apostles on Table Mountain

Province: Western Cape

Bioregion: FF02 South-West Fynbos

Magisterial district: Cape Town

QDS: 3318CD

Coordinates: **S** -33.952484 **E** 18.376696

Altitude (m): 1m asl.

Original Photographer: Elliot Collection (National Archives)

Original number: E5140

Original date: c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 100m of original site

Location Map:

Figure 37.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 998 **PHOTOGRAPHIC INFORMATION** **Date:** 02/12/2011

Camera Height: 165cm **Lens up/down** **How has the site been marked?** Not Marked

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	987	24mm	1/125	8	110°	3:00pm
Canon 450D	Digital	989	24mm	1/125	8	110°	3:00pm
Canon 450D	Digital	990	24mm	1/125	8	110°	3:01pm
Canon 450D	Digital	991	24mm	1/100	8	110°	3:01pm
Canon 450D	Digital	992	24mm	1/100	8	110°	3:02pm
Canon 450D	Digital	993	24mm	1/100	8	110°	3:02pm
Canon 450D	Digital	994	24mm	1/100	8	110°	3:03pm
Canon 450D	Digital	995	24mm	1/100	8	110°	3:03pm
Canon 450D	Digital	996	24mm	1/100	8	110°	3:04pm
Canon 450D	Digital	997	24mm	1/100	8	110°	3:04pm
Canon 450D	Digital	998	24mm	1/100	8	110°	3:05pm
Canon 450D	Digital	999	24mm	1/100	8	110°	3:05pm
Canon 450D	Digital	000	24mm	1/100	8	110°	3:06pm
Canon 450D	Digital	001	24mm	1/100	8	110°	3:06pm
Canon 450D	Digital	002	24mm	1/100	8	110°	3:07pm
Canon 450D	Digital	003	24mm	1/100	8	110°	3:07pm
Canon 450D	Digital	004	24mm	1/100	8	110°	3:08pm
Canon 450D	Digital	005	24mm	1/100	8	110°	3:08pm
Canon 450D	Digital	006	24mm	1/100	8	110°	3:09pm
Canon 450D	Digital	007	24mm	1/100	8	110°	3:09pm
Canon 450D	Digital	008	24mm	1/100	8	110°	3:10pm
Canon 450D	Digital	009	24mm	1/100	8	110°	3:10pm

Notes on weather conditions: Sunny and hot with no cloud

Geology: Table Mountain Sandstone and Granite

Soils ***(depth, texture, nutrient status, rockiness, litter, etc.)*****:** Shallow nutrient poor soil derived from Table Mountain Sandstone and granite.

Landscape description ***(including aspect, slope, catena characteristics, etc.)*****:** View looking east from Camps Bay Beach looking upwards towards the west-facing shallower lower slopes and steep upper cliffs and buttresses of the Twelve Apostles on Table Mountain.

Vegetation ***(biome, veld type, vegetation type, general description of dominant growth forms & species)*****:**

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 37.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Fynbos on midground lower slopes of Table Mountain: The lower slopes of Table Mountain behind Camps Bay beach are now transformed by extensive housing development. On the upper slopes there has been a considerable expansion in shrubby vegetation cover, leaving much less of the boulder scree on these slopes visible. There were a few small alien stone pine trees growing along the Pipe Track visible in the original image. Most of these are still present and are now large mature trees.

Landform B: Western Cape Afrotemperate Forest in Blinkwater Ravine: There has been a huge expansion of forest cover in Blinkwater Ravine since the original image was taken. This complex of forest patches now extends into several ravines where there is suitable shelter from fire including Fountain and Cairn Ravines. In the fynbos surrounding these forest patches there is a very poorly defined forest/fynbos boundary and forest precursor species have colonised the surrounding fynbos.

Landform C: Western Cape Afrotemperate Forest scree patch: There has also been expansion in forest cover at this scree patch. The forest patch margin has spread outwards and there has also been forest vegetation spread in towards the centre of the scree patch.

Landform D: Upper cliffs and buttresses of Twelve Apostles: There has been a substantial increase in overall vegetation cover on the upper cliffs and buttresses of the Twelve Apostles. There is now much less bare rock visible than was the case in the original image.

Site no: 998 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Landform A: Fynbos on midground lower slopes of Table Mountain (N/D: No data collected)

Landform B: Western Cape Afrotemperate Forest in Blinkwater Ravine

Landform C: Western Cape Afrotemperate Forest scree patch

Landform D: Upper cliffs and buttresses of Twelve Apostles (N/D: No data collected)

Landform E: N/A

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Canthium inerme*	*Canthium inerme*	N/D	10	X	N/D	N/A
2	*Afrocanthium mundianum*	*Afrocanthium mundianum*	N/D	25	25	N/D	N/A
3	*Cassine peragua*	*Cassine peragua*	N/D	5	X	N/D	N/A
4	*Clutia pulchella*	*Clutia pulchella*	N/D	5	10	N/D	N/A
5	*Cunonia capensis*	*Cunonia capensis*	N/D	0.1	X	N/D	N/A
6	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	0.1	10	N/D	N/A
7	*Diospyros whyteana*	*Diospyros whyteana*	N/D	10	X	N/D	N/A
8	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	5	10	N/D	N/A
9	*Halleria lucida*	*Halleria lucida*	N/D	5	25	N/D	N/A
10	*Kiggelaria africana*	*Kiggelaria africana*	N/D	10	25	N/D	N/A
11	*Maurocenia frangula*	*Maurocenia frangula*	N/D	10	25	N/D	N/A
12	*Maytenus acuminata*	*Maytenus acuminata*	N/D	10	25	N/D	N/A
13	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	0.1	X	N/D	N/A
14	*Olea europea africana*	*Olea europea africana*	N/D	10	25	N/D	N/A
15	*Olinia ventosa*	*Olinia ventosa*	N/D	30	25	N/D	N/A
16	*Phylica buxifolia*	*Phylica buxifolia*	N/D	0.5	X	N/D	N/A
17	*Podylaria calyptrata*	*Podylaria calyptrata*	N/D	0.5	X	N/D	N/A
18	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	0.5	X	N/D	N/A
19	*Rapanea melanoploeos*	*Rapanea melanophloeos*	N/D	10	X	N/D	N/A
20	*Searsia glauca*	*Searsia glauca*	N/D	0.5	X	N/D	N/A
21	*Searsia lucida*	*Searsia lucida*	N/D	5	0.5	N/D	N/A
22	*Searsia tomentosa*	*Searsia tomentosa*	N/D	0.5	0.1	N/D	N/A
23	*Scutia myrtina*	*Scutia myrtina*	N/D	5	X	N/D	N/A

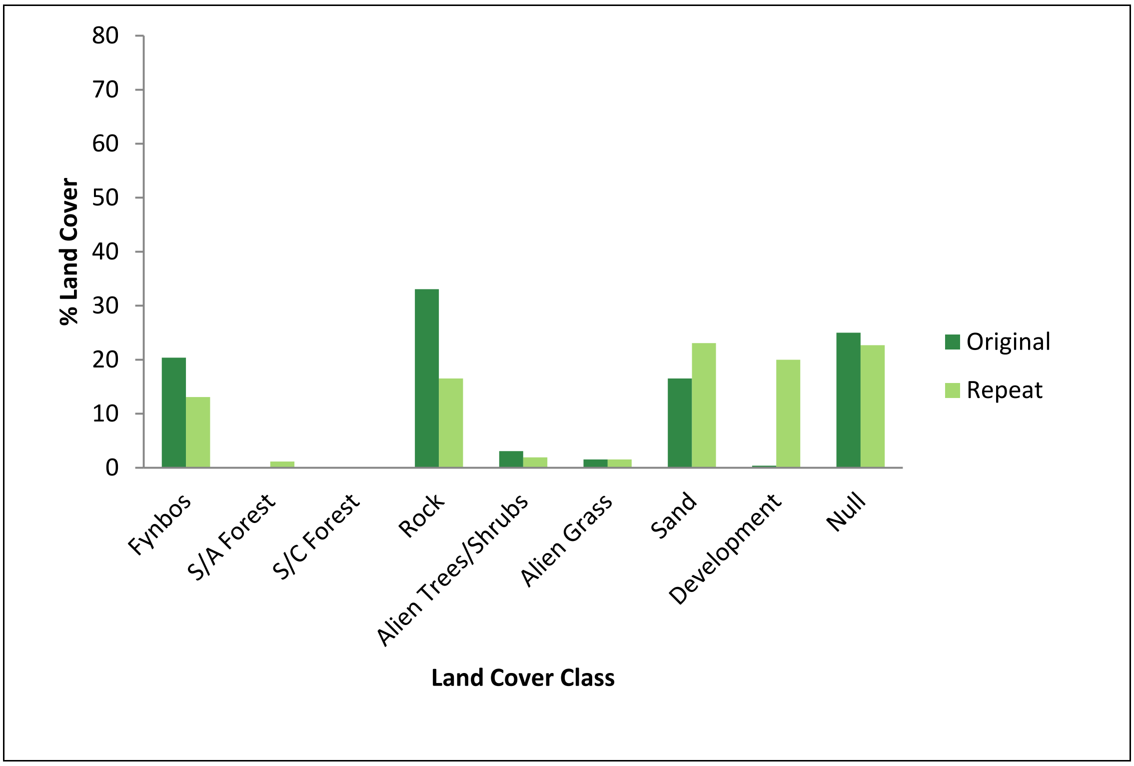

Figure 37.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 998 Twelve Apostles

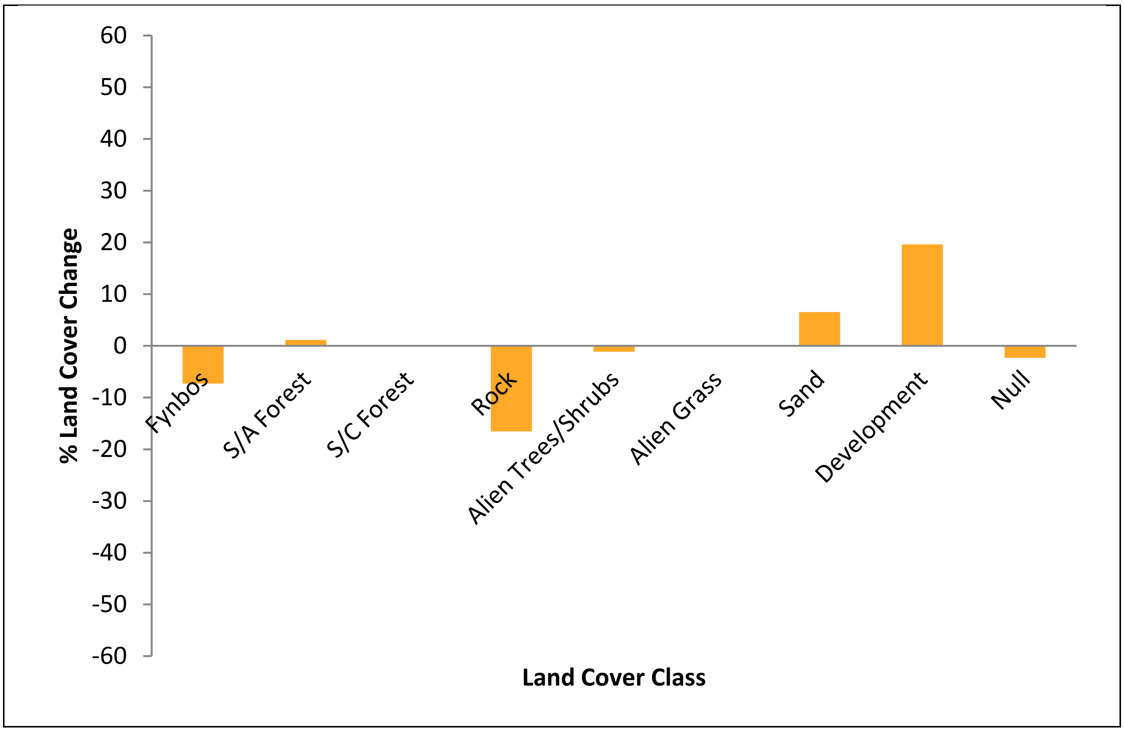

Figure 37.6: Percentage change in land cover classes between 1900 and 2011 at Site 998 Twelve Apostles

999 THERESA DRIVE:

Figure 38.1: Original image by Hall (c.1980)

Figure 38.2: Repeat image by Zoë C Poulsen (02/12/2011)

SITE INFORMATION

Site No: 999 **Date:** 02/12/2011 **Time spent on site:** 6:20pm

Concise Site Name: Theresa Drive – Camps Bay

General description of location:

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3318CD

Coordinates: S -33.967925 **Altitude (m):** 171m asl.

E 18.381872

Original Photographer: Hall

Original number: Hall_204 **Original date:** c. 1980

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 2m of original site

Location Map:

Figure 38.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Ellen Fedele

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 999 **PHOTOGRAPHIC INFORMATION** **Date:** 02/12/2011

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	007	24mm	1/80	8	90°	6:25pm
Canon 450D	Digital	008	24mm	1/80	8	90°	6:25pm
Canon 450D	Digital	009	24mm	1/80	8	90°	6:26pm
Canon 450D	Digital	010	24mm	1/80	8	90°	6:26pm
Canon 450D	Digital	011	24mm	1/80	8	90°	6:27pm
Canon 450D	Digital	012	24mm	1/80	8	90°	6:27pm
Canon 450D	Digital	013	24mm	1/80	8	90°	6:28pm
Canon 450D	Digital	014	24mm	1/80	8	90°	6:28pm
Canon 450D	Digital	015	24mm	1/80	8	90°	6:29pm
Canon 450D	Digital	016	24mm	1/80	8	90°	6:29pm
Canon 450D	Digital	017	24mm	1/80	8	90°	6:30pm
Canon 450D	Digital	018	24mm	1/80	8	90°	6:30pm
Canon 450D	Digital	019	24mm	1/80	8	90°	6:31pm
Canon 450D	Digital	020	24mm	1/80	8	90°	6:31pm
Canon 450D	Digital	021	24mm	1/80	8	90°	6:32pm
Canon 450D	Digital	022	24mm	1/80	8	90°	6:32pm
Canon 450D	Digital	023	24mm	1/80	8	90°	6:33pm
Canon 450D	Digital	024	24mm	1/80	8	90°	6:34pm
Canon 450D	Digital	025	24mm	1/80	8	90°	6:34pm
Canon 450D	Digital	026	24mm	1/80	8	90°	6:35pm
Canon 450D	Digital	027	24mm	1/80	8	90°	6:35pm

Notes on weather conditions: Sunny with scattered cloud

Site no: 999 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Geology: Table Mountain Sandstone and Granite.

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking east from Theresa Drive up a stream bed drainage line onto the more gently sloping lower slopes of Table Mountain onto the steep upper cliffs and buttresses of the Twelve Apostles.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos;

Description of major changes:

Figure 38.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: West-facing slopes below the Pipe Track: The original image shows the Twelve Apostles on Table Mountain immediately post fire. Since the original image was taken there has been an increase in shrubby cover, particularly *Leucospermum conocarpodendron* on these lower slopes. The pine trees adjacent to the Pipe Track have matured and their lower branches have been burnt by successive fires. There are slightly fewer pine trees present at the base of the Kasteelspoort ravine since the original image was taken. In the stream bed in the foreground of the image, there has been an increase in vegetation height and much of the stream bed has been colonised by forest precursor species, including *Kiggelaria africana*. However, some of the shrubby vegetation has been present since the original image was taken and resprouted after the fire, before increasing in maturity and extent of vegetation cover.

Landform B: West-facing slopes above the Pipe Track: There has been an increase in shrubby cover on these upper slopes below the Twelve Apostles since the original image was taken. This is dominated by *Leucospermum conocarpodendron*. Most of the original vegetation was destroyed by the fire in the Kasteelspoort Ravine. Since then the ravine is now covered with an extensive population of *Phylica buxifolia*, and the vegetation height has increased.

Landform C: West-facing upper cliffs and buttresses of the Twelve Apostles: Most of the vegetation was destroyed by the fire on the upper cliffs and buttresses on the Twelve Apostles. Since then there has been extensive re-growth of vegetation and an increase in shrubby vegetation cover.

Site no: 999 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 02/12/2011

Landform A: West-facing slopes below the Pipe Track (No data collected)

Landform B: West-facing slopes above the Pipe Track (No data collected)

Landform C: West-facing upper cliffs and buttresses of the Twelve Apostles; (No data collected)

Landform D: N/A

Landform E: N/A

(No Species Data Collected)

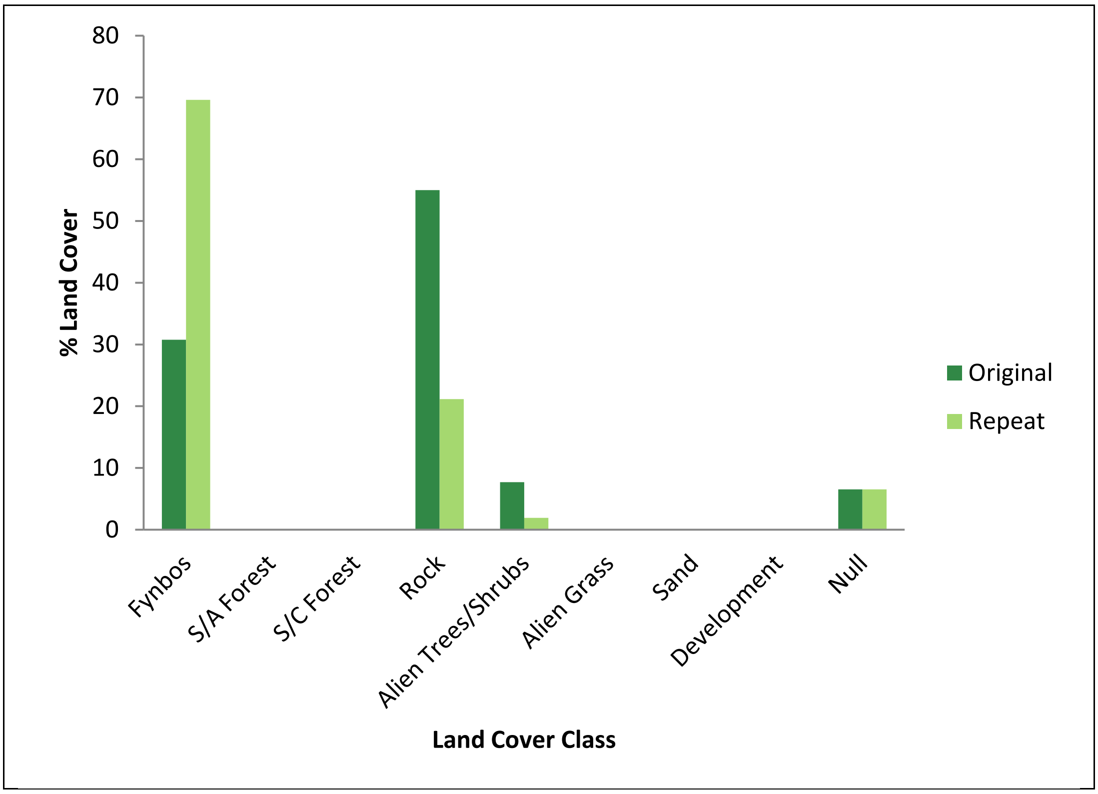

Figure 38.5: Percentages of land cover classes present in original (1980) and repeat image (2011) at Site 999 Theresa Drive

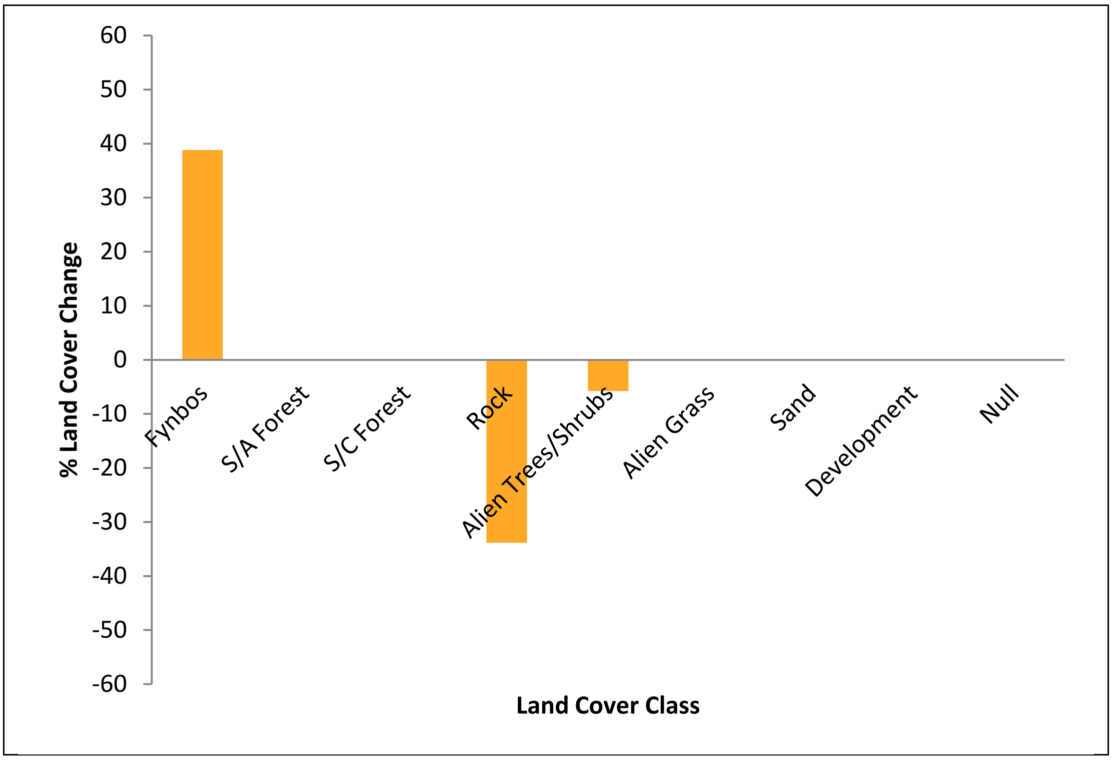

Figure 38.6: Percentage change in land cover classes between 1980 and 2011 at Site 999 Theresa Drive

1000 PLATTEKLIP GORGE:

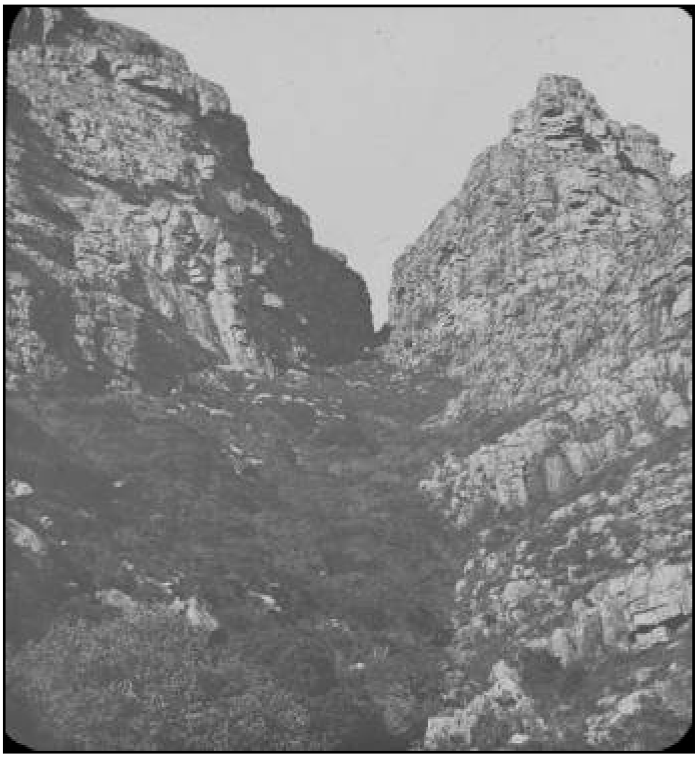

Figure 39.1: Original image by Cobern from the Mountain Club of South Africa Photographic Archives (c.1900)

Figure 39.2: Repeat image by Zoë C Poulsen (07/01/2012)

SITE INFORMATION

Site No: 1000 **Date:** 07/01/2012 **Time spent on site:** 7:00am

Concise Site Name: Platteklip Gorge

General description of location: Standing on rock 10m west of main path up Platteklip Gorge.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3418AB

Coordinates: **S** -33.959201 **Altitude (m):** 663m asl.

E 18.413707

Original Photographer: Cobern

Original number: Cobern A5_006 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 100m of original photo location. Original site was hard to find owing to changes in topography due to rock slides.

Location Map:

Figure 39.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 1000 **PHOTOGRAPHIC INFORMATION** **Date:** 07/01/2012

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	139	24mm	1/125	8	250°	7:05am
Canon 450D	Digital	140	24mm	1/125	8	250°	7:05am
Canon 450D	Digital	141	24mm	1/125	8	250°	7:06am
Canon 450D	Digital	142	24mm	1/125	8	250°	7:06am
Canon 450D	Digital	143	24mm	1/125	8	250°	7:07am
Canon 450D	Digital	144	24mm	1/125	8	250°	7:07am
Canon 450D	Digital	145	24mm	1/125	8	250°	7:08am
Canon 450D	Digital	146	24mm	1/125	8	250°	7:08am
Canon 450D	Digital	147	24mm	1/125	8	250°	7:09am
Canon 450D	Digital	148	24mm	1/125	8	250°	7:09am
Canon 450D	Digital	149	24mm	1/125	8	250°	7:10am

Notes on weather conditions: Hot and sunny with no cloud

Site no: 1000 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking southwards up Platteklip Gorge on the front face of Table Mountain from halfway up the summit path.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 39.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: North-facing slopes of Platteklip Gorge: In the foreground of the image most of the gorge has been infilled by rock falls that have taken place since the original image was taken. All of the original shrubby vegetation cover has been replaced by low growing restioid fynbos with occasional scattered shrubs.

Landform B: Western Cape Afrotemperate Forest on western rock face: In the original image there was no forest cover visible. Since the original image was taken a small forest patch has colonised the western face of Platteklip Gorge.

Landform C: Rock faces of Platteklip Gorge: Little Change: Less bare rock visible owing to rock falls and visible rock faces have become more vegetated.

Site no: 1000 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Landform A: North-facing slopes of Platteklip Gorge

Landform B: Western Cape Afrotemperate Forest on western rock face

Landform C: Rock faces of Platteklip Gorge

Landform D: N/A

Landform E: N/A

(No species data collected)

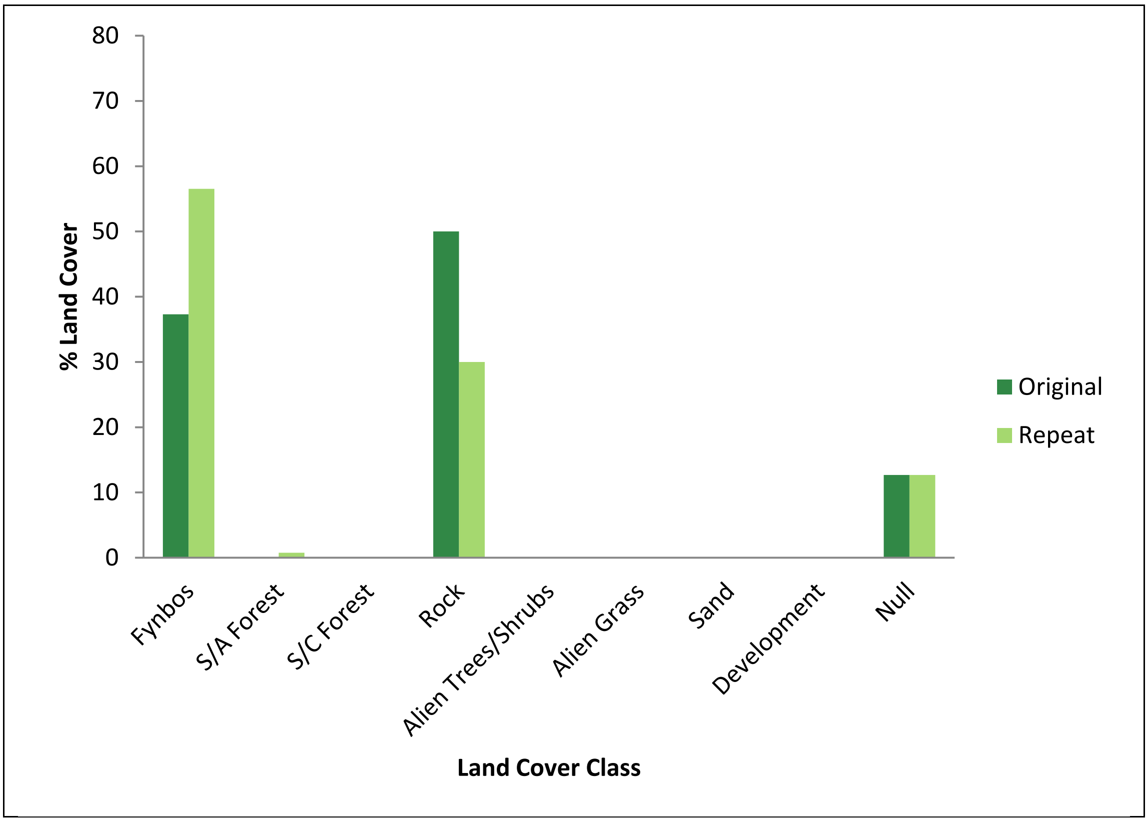

Figure 39.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 1000 Platteklip Gorge

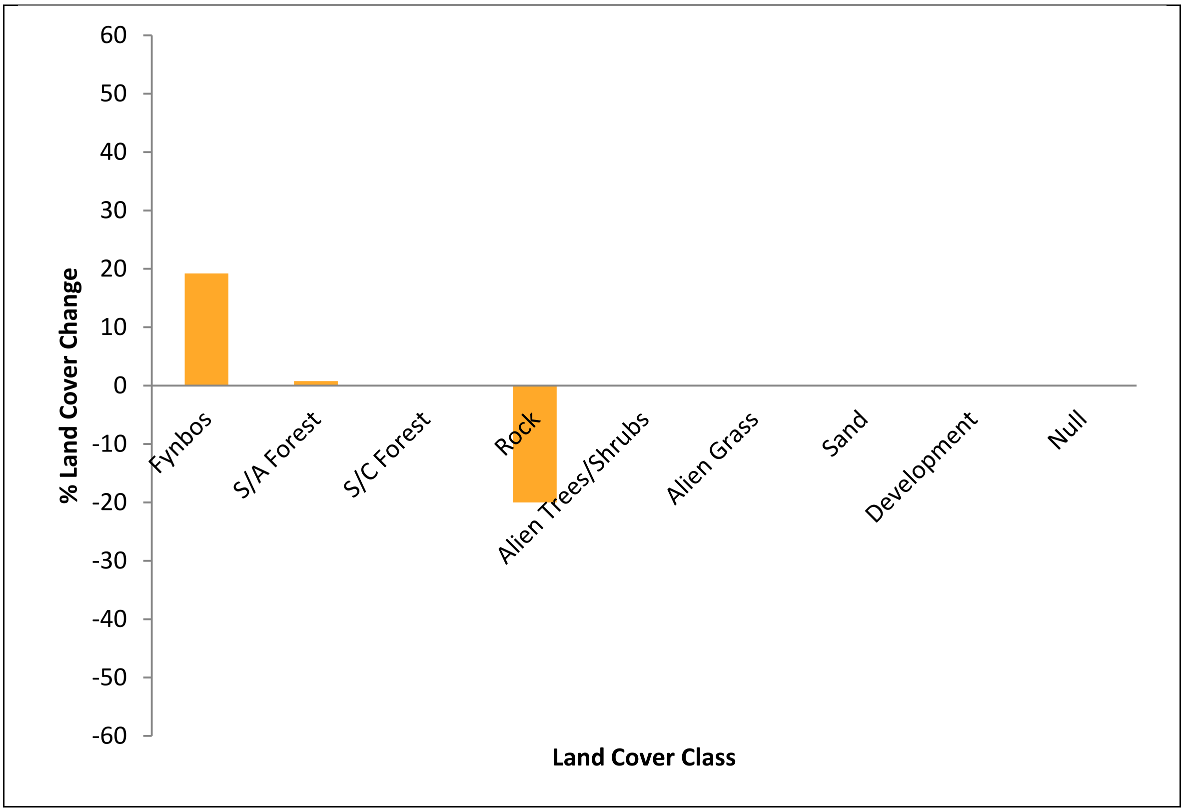

Figure 39.6: Percentage change in land cover classes between 1900 and 2011 at Site 1000 Platteklip Gorge

1001 WOODHEAD TUNNEL:

Figure 40.1: Original image from the Steer Collection (South African National Archives) (c.1900)

Figure 40.2: Repeat image by Zoë C Poulsen (12/02/2012)

SITE INFORMATION

Site No: 1001 **Date:** 12/02/2012 **Time spent on site:** 2:50pm

Concise Site Name: Woodhead Tunnel

General description of location: Halfway up steep path leading out of Disa Gorge from near the Woodhead Tunnel entrance.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3418AB

Coordinates: S -33.98106 **Altitude (m):** 618m asl.

E 18.38881

Original Photographer: Steer Collection (South African National Archives)

Original number: S35 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 50m of original location

Location Map:

Figure 40.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 1001 **PHOTOGRAPHIC INFORMATION** **Date:** 07/01/2012

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	197	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	198	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	199	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	200	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	201	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	202	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	203	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	204	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	205	24mm	1/125	8	135°	12:34pm
Canon 450D	Digital	206	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	207	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	208	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	209	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	210	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	211	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	212	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	213	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	214	24mm	1/125	8	135°	12:39pm

Notes on weather conditions: Hot and sunny with no cloud

Site no: 1001 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking south-east from ridgeway above Disa Gorge over Orange Kloof towards Vlakkenberg with Steenberg Peak visible in the far distance.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 40.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: South-facing slope of the Back Table above Orange Kloof: There is less bare rock cover visible and an increase in shrubby vegetation cover since the original image was taken.

Landform B: West-facing steep rocky slope of Constantia Corner above ring road: The original image was taken prior to the building of the Orange Kloof ring road. Since the original photo was taken the upper slopes above the ring road have become far more vegetated and there is far less bare rock visible. There has been an increase in shrubby vegetation cover. This is particularly apparent on the lower slopes of Eagle's Nest which did not burn in the most recent fire event.

Landform C: West-facing lower slope of Constantia Corner/Orange Kloof below ring road: Since the original image was taken there is a small area of alien pine and Eucalyptus plantation in the background below the ring road. Hout Bay Drive is now obscured by this alien tree growth. In the original image there are extensive boulder screes visible and these are now predominantly vegetated. There has been a significant increase in vegetation cover. Most of the slope below the ring road has now been colonised either by climax afrotemperate forest or afrotemperate forest precursor species.

Landform D: North-facing slope of Vlakkenberg: Since the original image was taken much of the lower slopes of Vlakkenberg have been transformed to vinyards and alien trees. On the upper slopes there has been an increase in vegetation cover and far less bare rock is visible.

Landform E: North-facing slope of Steenberg Peak and Muizenberg Peak: Poor quality of background of original image makes it hard to define changes in vegetation on background mountain slopes. But surrounding area has been transformed from agricultural land to housing development.

Site no: 1001 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Landform A: South-facing slope of the Back Table above Orange Kloof

Landform B: West-facing steep rocky slope of Constantia Corner above ring road

Landform C: West-facing lower slope of Constantia Corner/Orange Kloof below ring road

Landform D: North-facing slope of Vlakkenberg

Landform E: North-facing slope of Steenberg Peak and Muizenberg Peak

(No species data collected)

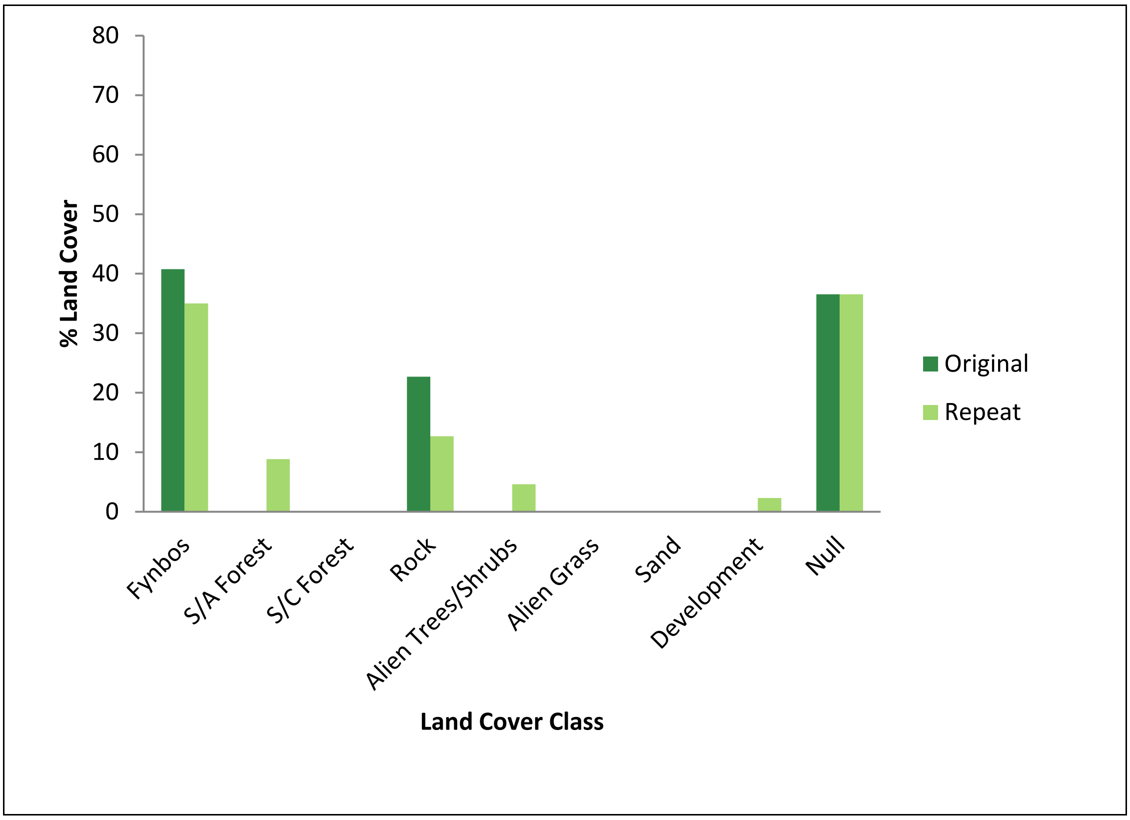

Figure 40.5: Percentages of land cover classes present in original (1900) and repeat image (2012) at Site 1001 Woodhead Tunnel

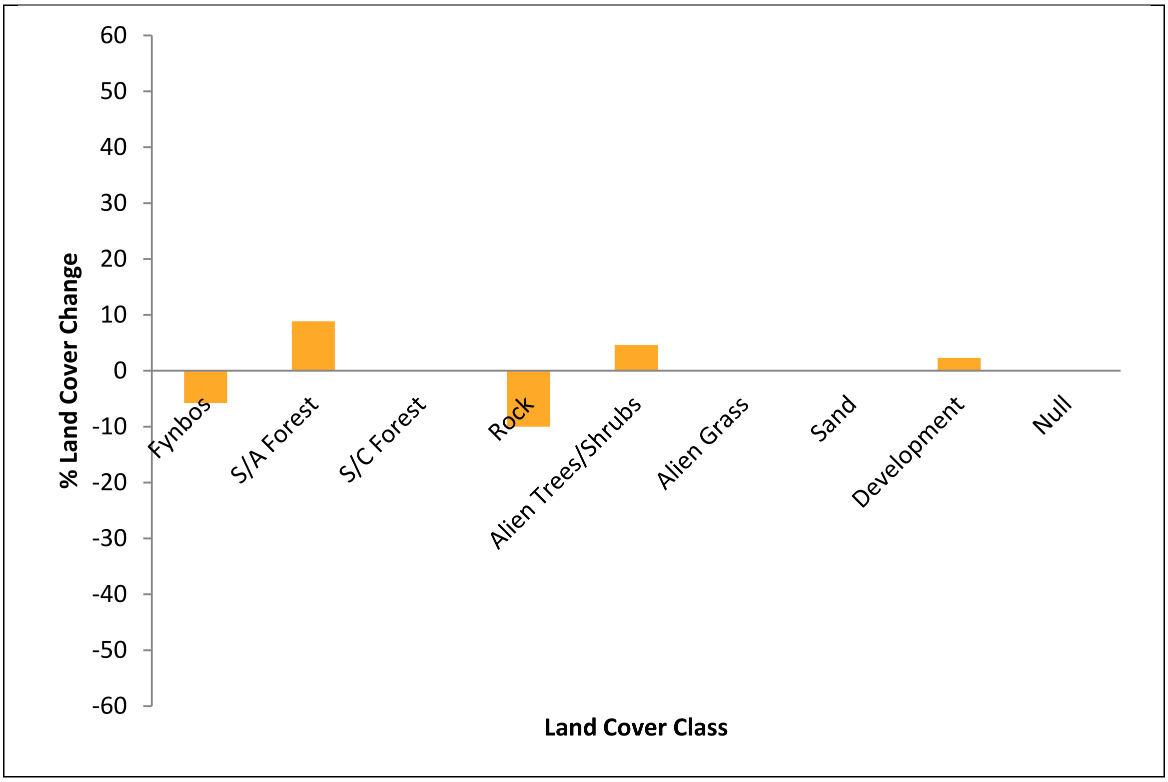

Figure 40.6: Percentage change in land cover classes between 1900 and 2011 at Site 1001 Woodhead Tunnel

1002 WYNBERG CAVES (BACK TABLE):

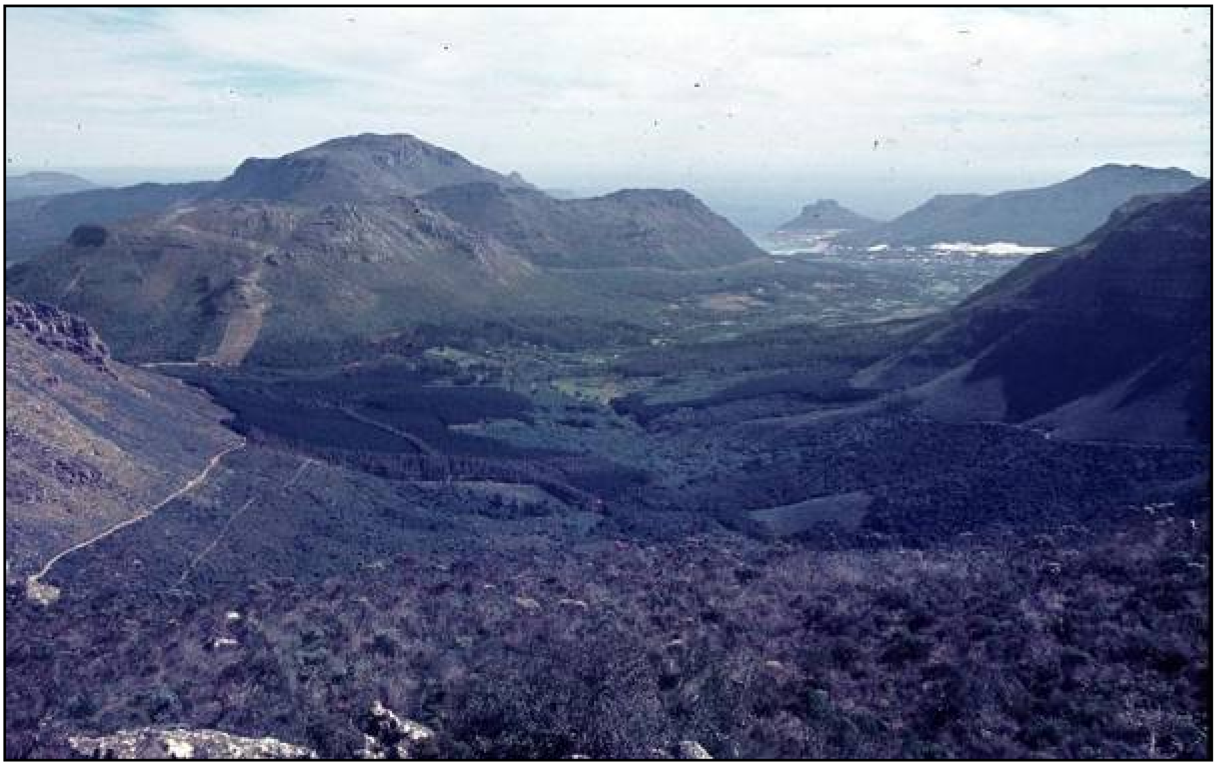

Figure 41.1: Original image by Eugene Moll (c.1970)

Figure 41.2: Repeat image by Zoë C Poulsen (12/02/2012)

SITE INFORMATION

Site No: 1002 **Date:** 07/01/2012 **Time spent on site:** 1:00pm

Concise Site Name: Wynberg Caves, Back Table

General description of location:

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3418AB

Coordinates: **S** -33.985644 **Altitude (m):** 713m asl.

E 18.400924

Original Photographer: Eugene Moll

Original number: Moll_685 **Original date:** c. 1970

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 10m of original location

Location Map:

Figure 41.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Stuart Hall

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 1002 **PHOTOGRAPHIC INFORMATION** **Date:** 07/01/2012

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	197	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	198	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	199	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	200	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	201	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	202	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	203	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	204	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	205	24mm	1/125	8	135°	12:34pm
Canon 450D	Digital	206	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	207	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	208	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	209	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	210	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	211	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	212	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	213	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	214	24mm	1/125	8	135°	12:39pm

Notes on weather conditions: Hot and sunny with no cloud

Site no: 1002 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View from in proximity to Wynberg Caves on the Back Table, looking south-west over Orange Kloof towards Vlakkenberg, Constantiaberg and Hout Bay.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 41.4: Repeat image with key landforms demarcated for analysis

Landform A: Plateau of the Back Table below Wynberg Caves: Since the original image was taken there has been a decrease in grassy vegetation cover and increase in shrubby vegetation cover.

Landform B: Orange Kloof: In the original image much of Orange Kloof was covered by alien plantations. Since then most of these have been cleared. These are now covered with degraded shrub-dominated fynbos (very species poor) and forest precursor species. There has been some expansion of Western Cape Afrotemperate Forest and there has been an increase in forest canopy height.

Landform C: Mountains of Vlakkenberg and Constantiaberg: The firebreaks on the lower slopes of Vlakkenberg and Constantiaberg are now far less well-defined. The lower east facing slopes of Vlakkenberg have been transformed to vinyards since the original image was taken. There has also been an increase in extent of alien vegetation.

Landform D: Lowland area of Hout Bay River Valley with Hout Bay, Karbonkelberg and Hangberg in the distance: There has been a significant increase in housing development in the Hout Bay Valley with agricultural fields being replaced with housing. The sand dunes on the lower slopes of the Karbonkelberg have become more extensively vegetated and more stable.

Site no: 1002 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Landform A: Plateau of the Back Table below Wynberg Caves

Landform B: Orange Kloof

Landform C: Mountains of Vlakkenberg and Constantiaberg

Landform D: Lowland area of Hout Bay River Valley with Hout Bay, Karbonkelberg and Hangberg in the distance

Landform E: N/A

(No species data collected)

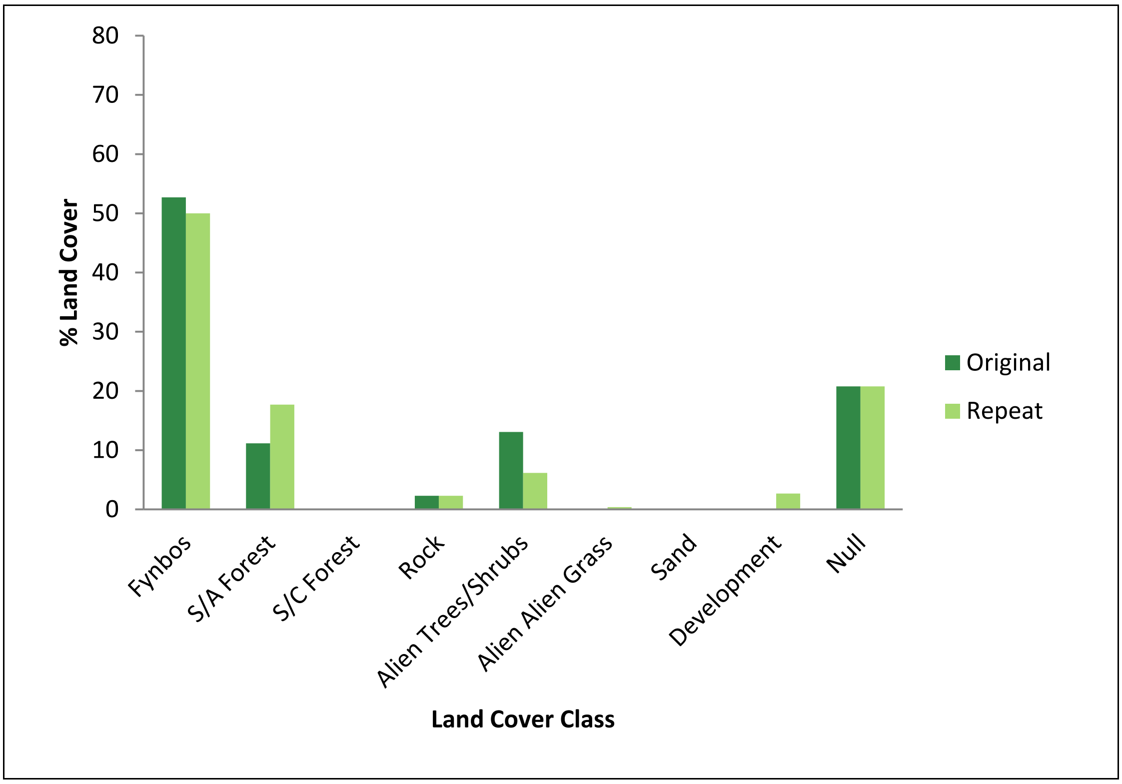

Figure 41.5: Percentages of land cover classes present in original (1970) and repeat image (2011) at Site 1002 Wynberg Caves (Back Table)

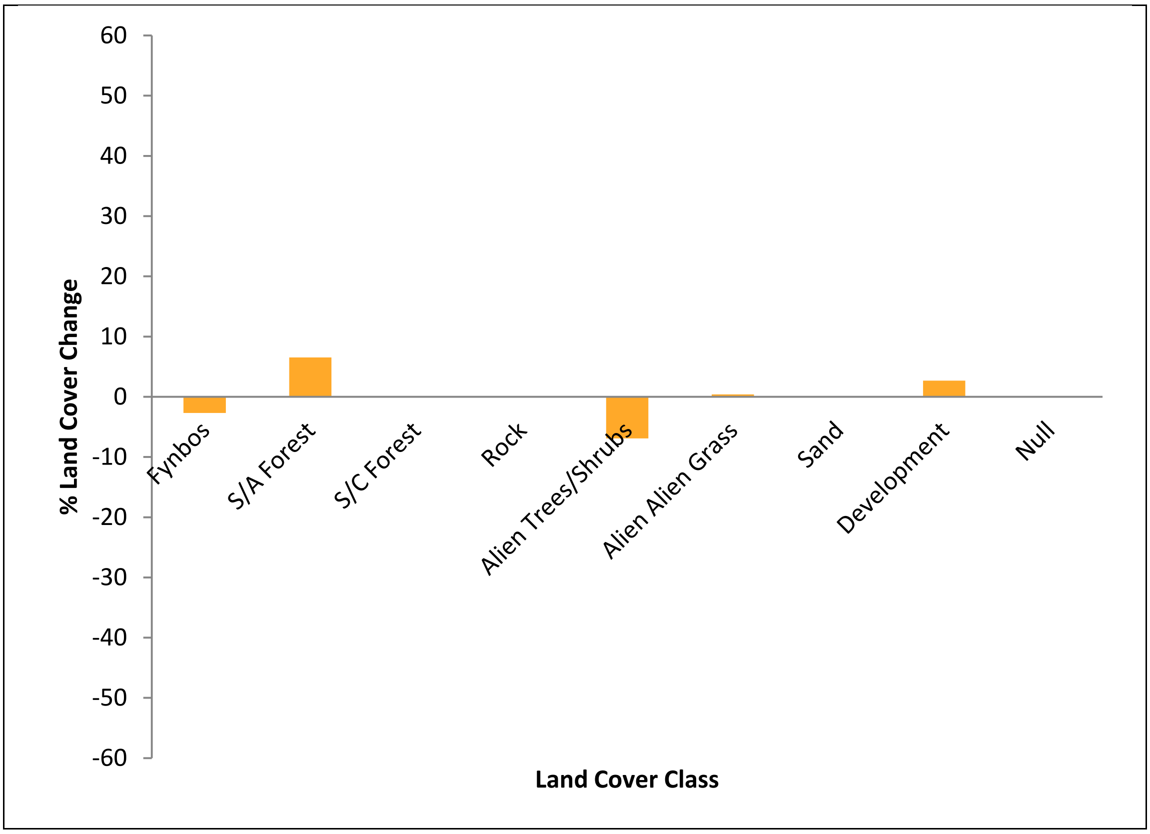

Figure 41.6: Percentage change in land cover classes between 1970 and 2011 at Site 1002 Wynberg Caves (Back Table)

1003 KLEIN KOGELBAAI

Figure 42.1: Original image from the Steer Collection (South African National Archives) (c.1900)

Figure 42.2: Repeat image by Zoë C Poulsen (07/01/2012)

SITE INFORMATION

Site No: 1003 **Date:** 07/01/2012 **Time spent on site:** 12:20pm

Concise Site Name: Klein Kogelbaai

General description of location: Standing on granite boulders below houses on Beta Street ("Lekkerhoekie") off Victoria Drive, looking SE across Klein Kogelbaai towards Twelve Apostles, Table Mountain.

Province: Western Cape **Bioregion:** FF02 South-West Fynbos

Magisterial district: Cape Town **QDS:** 3418AB

Coordinates: **S** -33.963446 **Altitude (m):** 7m asl.

E 18.372711

Original Photographer: Steer Collection (National Archives);

Original number: S87 **Original date:** c. 1900

Original site/photograph name: None

Notes on accuracy of repeat photo station location: Within 10m of original site

Location Map:

Figure 42.3: Aerial photograph (2008) showing location of repeat photo site

Names of team members present on site: Zoë Poulsen and Charmaine Lacock

Landscape type:

River system	Grazing land (communal)	Grazing land (private)	Cultivated field	Settlement	Conservation area

Keywords:

Communal lands	Land reform	Development	Indicator species	Population dynamics	Climate change

Site no: 1003 **PHOTOGRAPHIC INFORMATION** **Date:** 07/01/2012

Camera Height: 165cm

Photographer's Name: Zoë Poulsen

Camera make & model	Film Type	Frame No.	Lens FL	Exposure (Speed)	f-stop	Compass bearing (°)	Time
Canon 450D	Digital	197	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	198	24mm	1/125	8	135°	12:30pm
Canon 450D	Digital	199	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	200	24mm	1/125	8	135°	12:31pm
Canon 450D	Digital	201	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	202	24mm	1/125	8	135°	12:32pm
Canon 450D	Digital	203	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	204	24mm	1/125	8	135°	12:33pm
Canon 450D	Digital	205	24mm	1/125	8	135°	12:34pm
Canon 450D	Digital	206	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	207	24mm	1/125	8	135°	12:35pm
Canon 450D	Digital	208	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	209	24mm	1/125	8	135°	12:36pm
Canon 450D	Digital	210	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	211	24mm	1/125	8	135°	12:37pm
Canon 450D	Digital	212	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	213	24mm	1/125	8	135°	12:38pm
Canon 450D	Digital	214	24mm	1/125	8	135°	12:39pm

Notes on weather conditions: Hot and sunny with no cloud

Site no: 1003 **GENERAL ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Geology: Table Mountain Sandstone and Granite

Soils *(depth, texture, nutrient status, rockiness, litter, etc.)*: Shallow, nutrient poor soils derived from Table Mountain Sandstone and Granite.

Landscape description *(including aspect, slope, catena characteristics, etc.)*: View looking south-east from the granite boulders of Kogelbaai up towards the gentler lower sandstone slopes of Table Mountain up onto the steep buttresses and ravines of the Twelve Apostles.

Vegetation *(biome, veld type, vegetation type, general description of dominant growth forms & species)*:

FF02 South-West Fynbos Bioregion; FFs9 Peninsula Sandstone Fynbos; FFg3 Peninsula Granite Fynbos; F0Z6 Western Cape Milkwood Forest; F0Z1 Western Cape Afrotemperate Forest;

Description of major changes:

Figure 42.4: Image showing key landforms demarcated for analysis of repeat photo set

Landform A: Western Cape Milkwood Forest on Kogelbaai Coastline: Some of the forest along this stretch of coastline has been transformed in the building of coastal housing. Those trees remaining have increased in height. There has also been some soil erosion surrounding the remaining trees.

Landform B: Foreground west-facing lower slopes below Twelve Apostles: Since the original image was taken, some of this area has been transformed by housing development. There is now far more bare ground that is visible in the original image owing to extensive disturbance. There is evidence of a recent fire in the repeat image.

Landform C: Midground west-facing slopes below Twelve Apostles: Since the original image was taken there has been a drastic increase in shrubby vegetation cover. The vegetation shows evidence of there being a long term absence of fire on the lower slopes with there now being very high shrubby cover. On the more distant slopes there has been extensive colonisation by alien vegetation including *Hakea* and *Acacia*.

Landform D: Western Cape Afrotemperate Forest in Slangolie Ravine: Since the original image was taken there has been a substantial increase in forest cover in Slangolie Ravine with there now being significant forest expansion out of the kloof. There has also been an increase in forest canopy height.

Landform E: Upper cliffs and buttresses of Twelve Apostles: Since the original image was taken there has been a significant increase in vegetation cover on the upper buttresses with far less bare rock now visible.

Site no: 1003 **DETAILED ECOLOGICAL DESCRIPTION** **Date:** 07/01/2012

Landform A: Foreground west-facing lower slopes below Twelve Apostles (N/D: no data collected)

Landform B: Western Cape Milkwood Forest on Kogelbaai coastline

Landform C: Midground west-facing lower slopes below Twelve Apostles (N/D: No data collected)

Landform D: Western Cape Afrotemperate Forest in Slangolie Ravine

Landform E: Upper cliffs and buttresses of Twelve Apostles (N/D: No data collected)

No.	Working name	Species name	% cover in landform				
			A	B	C	D	E
1	*Apodytes dimidiata*	*Apodytes dimidiata*	N/D	X	N/D	0.5	N/D
2	*Canthium inerme*	*Canthium inerme*	N/D	X	N/D	5	N/D
3	*Cassine peragua*	*Cassine peragua*	N/D	X	N/D	10	N/D
4	*Cassine schinoides*	*Cassine schinoides*	N/D	X	N/D	0.5	N/D
5	*Chionanthus foveolatus*	*Chionanthus foveolatus*	N/D	X	N/D	10	N/D
6	*Clutia pulchella*	*Clutia pulchella*	N/D	X	N/D	0.5	N/D
7	*Cunonia capensis*	*Cunonia capensis*	N/D	X	N/D	0.5	N/D
8	*Curtisia dentata*	*Curtisia dentata*	N/D	X	N/D	10	N/D
9	*Cussonia thyrsiflora*	*Cussonia thyrsiflora*	N/D	X	N/D	0.5	N/D
10	*Diospyros whyteana*	*Diospyros whyteana*	N/D	X	N/D	10	N/D
11	*Maytenus heterophylla*	*Maytenus heterophylla*	N/D	5	N/D	0.5	N/D
12	*Halleria lucida*	*Halleria lucida*	N/D	X	N/D	0.5	N/D
13	*Kiggelaria africana*	*Kiggelaria africana*	N/D	X	N/D	5	N/D
14	*Maurocenia frangula*	*Maurocenia frangula*	N/D	5	N/D	10	N/D
15	*Maytenus oleioides*	*Maytenus oleioides*	N/D	5	N/D	0.5	N/D
16	*Olea capensis macrocarpa*	*Olea capensis macrocarpa*	N/D	X	N/D	5	N/D
17	*Olea europea africana*	*Olea europea africana*	N/D	X	N/D	10	N/D
18	*Olinia ventosa*	*Olinia ventosa*	N/D	X	N/D	10	N/D
19	*Colpoon compressum*	*Colpoon compressum*	N/D	5	N/D	0.5	N/D
20	*Phylica buxifolia*	*Phylica buxifolia*	N/D	X	N/D	5	N/D
21	*Polygala myrtifolia*	*Polygala myrtifolia*	N/D	X	N/D	0.5	N/D
22	*Rapanea melanophloeos*	*Rapanea melanophloeos*	N/D	X	N/D	10	N/D
23	*Searsia glauca*	*Searsia glauca*	N/D	X	N/D	0.1	N/D
24	*Searsia lucida*	*Searsia lucida*	N/D	5	N/D	5	N/D
25	*Scutia myrtina*	*Scutia myrtina*	N/D	X	N/D	0.5	N/D

26	*Secamone alpini*	*Secamone alpini*	N/D	X	N/D	0.5	N/D
27	*Tarchonanthus littoralis*	*Tarchonanthus littoralis*	N/D	10	N/D	0.5	N/D
28	*Euclea racemosa*	*Euclea racemosa*	N/D	10	N/D	X	N/D
29	*Maytenus acuminata*	*Maytenus acuminata*	N/D	10	N/D	X	N/D
30	*Sideroxylon inerme*	*Sideroxylon inerme*	N/D	50	N/D	X	N/D

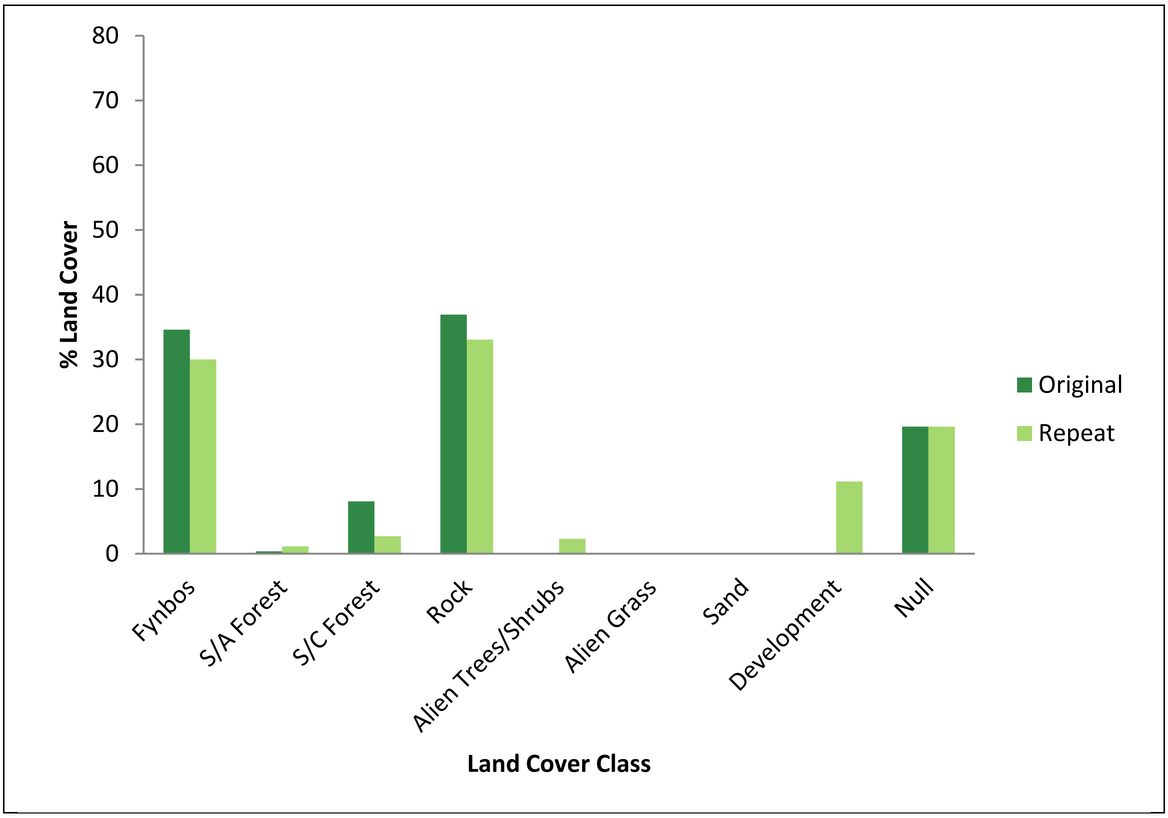

Figure 42.5: Percentages of land cover classes present in original (1900) and repeat image (2011) at Site 1003 Klein Kogelbaai

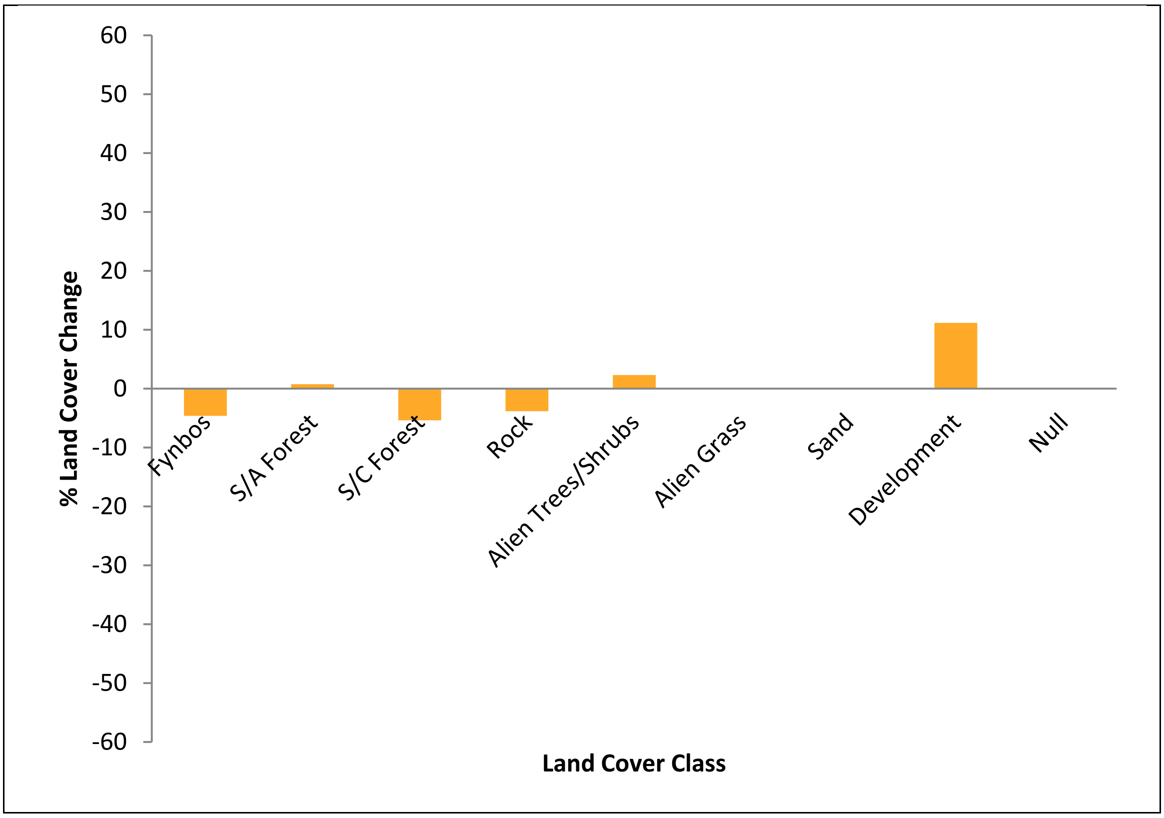

Figure 42.6: Percentage change in land cover classes between 1900 and 2011 at Site 1003 Klein Kogelbaai

Appendix III: Forest Trees & Shrubs of the Cape Peninsula

Taxonomy after The Plant List (Royal Botanic Gardens Kew) (www.theplantlist.org)

Genus & Species	***Family***	***Synonyms***	***Forest Type***	***Ecology***
Afrocanthium mundianum	Rubiaceae	*Canthium mundianum* *Plectronia mundiana*	Western Cape Afrotemperate Forest	Up to 1,500m in forest, often on rocky ridges or near rivers
Apodytes dimidiata	Icacinaceae	*Apodytes acutifolia* *Apodytes beddomei* *Apodytes benthamiana* *Apodytes cambodiana* *Apodytes curtisii*	Western Cape Afrotemperate Forest	Forest margins at medium altitude, often among rocks
Brabejum stellatifolium	Proteaceae	None	Western Cape Afrotemperate Forest	In sheltered valleys & along streams
Canthium inerme	Rubiaceae	*Canthium swynnertonii* *Canthium thunbergianum* *Canthium ventosum* *Lysioserissa capensis* *Lycium inerme* *Plectronia swynnertonii* *Serrissa capensis*	Western Cape Afrotemperate Forest	In patches of forest, scrub and among high altitude grasslands
Cassine maritima	Celastraceae	*Celastrus maritimus* *Gymnosporia apiculata* *Gymnosporia maritima* *Robsonodendron maritimum*	Western Cape Milkwood Forest	Coastal forest
Cassine peragua	Celastraceae	*Cassine capensis* *Cassine kraussiana* *Elaeodendron kraussianum*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Forest interior & forest margins, coastal forest & along streams
Cassine schinoides	Celastraceae	*Hartogiella schinoides*	Western Cape Afrotemperate Forest	Forest in ravines & rocky mountain slopes

Celtis africana	Celtidaceae	*Celtis burmanii* *Celtis henriquezii* *Celtis kraussiana* *Celtis lactea* *Celtis opegrapha* *Celtis vesiculosa* *Trema integrifolia*	Western Cape Afrotemperate Forest	Forest in kloofs & river banks in moister areas
Chionanthus foveolatus	Oleaceae	None	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal forest and Afrotemperate forest at medium to high altitudes
Clutia pulchella	Euphorbiaceae	None	Western Cape Afrotemperate Forest	Wide range of altitudes & variety of habitats
Culpoon compressum	Santalaceae	*Fusanus compressus* *Osyris compressa* *Thesium colpoon*	Western Cape Milkwood Forest	Coastal forest: on sand dunes & among rocks
Cunonia capensis	Cunoniaceae	*Oosterdyckia capensis*	Western Cape Afrotemperate Forest	On stream banks & in moist forest
Curtisia dentata	Curtisiceae (Cornaceae)	*Curtisia fagifolia* *Curtisia faginea* *Junghansia faginea* *Relhamia faginea* *Sideroxylon dentatum*	Western Cape Afrotemperate Forest	In climax forest up to 1,800m asl
Cussonia thyrsiflora	Araliaceae	*Cussonia thyrsoidea*	Western Cape Milkwood Forest	Dry coastal forest
Diospyros glabra	Ebenaceae	*Royena falcata* *Royena glabra* *Royena myrtifolia*	Western Cape Afrotemperate Forest	Forest margins
Diospyros whyteana	Ebenaceae	*Royena goetzei* *Royena lucida* *Royena nyassae* *Royena whyteana* *Royena wilmsii*	Western Cape Afrotemperate Forest	Climax forest understorey
Euclea racemosa	Ebenaceae	None	Western Cape Milkwood Forest	Coastal forest margins in low vegetation

Grewia occidentalis	Malvaceae	*Grewia chirindae* *Grewia microphylla* *Grewia obtusifolia* *Grewia trinervis* *Grewia ulmifolia*	Western Cape Afrotemperate Forest	Forest margins
Gymnosporia heterophylla	Celastraceae	*Cassine szyszylowiczlii* *Catha cymosa* *Catha decolor* *Catha heterophylla* *Celastrus angularis* *Celastrus cymosus* *Celastrus ellipticus* *Celastrus glomeratus* *Celastrus heterophyllus* *Celastrus hispanicus* *Celastrus multiflorus* *Celastrus rhombifolius* *Elaeodendron glaucum* *Gymnosporia acanthophora* *Gymnosporia andogenesis* *Gymnosporia angularis* *Gymnosporia beniensis* *Gymnosporia beqquertii* *Gymnosporia brevipetala* *Gymnosporia buxifolia* *Gymnosporia buxifolioides* *Gymnosporia condensata* *Gymnosporia glauca* *Gymnosporia lanceolata* *Gymnosporia nyassica* *Gymnosporia rhombifolia* *Maytenus brevipetala* *Maytenus cymosa* *Maytenus heterophylla*	Western Cape Afrotemperate Forest	Wide variety of habitats
Halleria lucida	Scrophulariaceae	*Halleria abyssinica*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Forest interior, Forest margins, ravines, rocky slopes & stream banks

Ilex mitis	Aquifoliaceae	*Ilex capensis* *Ilex monticola* *Sideroxylon mite* *Sideroxylon nigricans*	Western Cape Afrotemperate Forest	Forest interior along river banks & stream beds
Kiggelaria africana	Achariaceae	None	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal & afrotemperate forests: along streams & on koppies among rocks
Maurocenia frangula	Celastraceae	*Cassine maurocenia* *Maurocenia frangularia*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal forests & along rivers & streams in afrotemperate forest
Maytenus acuminata	Celastraceae	*Catha acuminata* *Catha rupestris* *Celastrus acuminatus* *Celastrus microphyllus* *Celastrus mucronatus* *Celastrus plectronia* *Celastrus populifolius* *Celastrus rupestris* *Ennepta atomaria* *Ennepta coriacea* *Gymnosporia acuminata* *Gymnosporia amanuensis* *Gymnosporia bukobina* *Gymnosporia lepidota* *Gymnosporia meruensis* *Gymnosporia populifolia* *Ilex livida* *Maytenus amanuensis* *Maytenus bukobina* *Maytenus lepidota* *Maytenus meruensis* *Maytenus rhodesica* *Prinos atomarius* *Prinos lucidus*	Western Cape Afrotemperate Forest	Forest interior & forest margins, among rocks near rivers or mountain slopes
Maytenus oleioides	Celastraceae	*Scytophyllum angustifolium* *Scytophyllum laurinum*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Forest margins & rocky slopes
Ocotea bullata	Lauraceae	*Laurus bullata* *Oreodaphne bullata*	Western Cape Afrotemperate Forest	Forest interior on deep soils in kloofs

Olea capensis ssp. *capensis*	Oleaceae	*Enaimon undulata* *Faulia verrucosa* *Ligustrum hookeri* *Ligustrum nepalensis* var. *glabrum* *Olea buxifolia* *Olea capensis* var. *coriacea* *Olea capensis* var. *undulata* *Olea concolor* *Olea intermedia* *Olea laurifolia* *Olea nigra* *Olea undulata*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal & afrotemperate forest
Olea capensis ssp. *macrocarpa*	Oleaceae	*Linociera urophylla* *Olea guineensis* *Olea hochstetteri* *Olea macrocarpa* *Olea madagascariensis* *Olea perrieri* *Olea urophylla* *Stegathus urophyllus*	Western Cape Afrotemperate Forest	Climax forest interior
Olea europea ssp. *africana*	Oleaceae	*Olea europaea* ssp. *cuspidata*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Occurs in a variety of habitats: stream banks, riverine fringes, open forest & among rocks
Olea exasperata	Oleaceae	*Olea glabella* *Olea humilis*	Western Cape Milkwood Forest	On sand dunes in coastal forest
Olinia ventosa	Oliniaceae	*Canthium ventosum* *Olinia cymosa* *Plectronia ventosa* *Sideroxylon cymosum*	Western Cape Afrotemperate Forest	Afrotemperate forest interior & margins
Phylica buxifolia	Rhamnaceae	*Soulangia buxifolia* *Soulangia cordata*	Western Cape Afrotemperate Forest	Occurs among rocks on lower mountain slopes
Podalyria calyptrata	Fabaceae	None	Western Cape Afrotemperate Forest	Forest margins below 1,000m along streams &

				seeps
Podocarpus latifolius	Podocarpaceae	None	Western Cape Afrotemperate Forest	Afrotemperate forest interior; Among rocks where moisture content is high and in fire refugia
Polygala myrtifolia	Polygalaceae	*Polygala pinifolia* *Psychanthus grandiflorus* *Psychanthus myrtifolius*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Forest margins, along streams, rocky slopes and coastal sand dunes
Pterocelastrus tricuspidatus	Celastraceae	*Pterocelastrus littoralis* *Pterocelastrus stenopterus* *Pterocelastrus tetrapterus*	Western Cape Milkwood Forest	Forest margins, sand dunes and rocky outcrops
Putterlickia pyracantha	Celastraceae	*Catha pyracantha* *Celastrus pyracanthus*	Western Cape Milkwood Forest	Forest margins and sand dunes
Rapanea melanophloeos	Myrsinaceae	*Chrysophyllum melanophloeos* *Heeria melanophloeos* *Manglillia melanophloeos* *Myrsine melanophloeos* *Myrsine simensis* *Rapanea boivinii* *Rapanea comorensis* *Rapanea seychellarum* *Rapanea simiensis* *Rapanea thomensis* *Roemeria melanophloeos* *Schleroxylum melanophloeum* *Sideroxylon laurifolium* *Sideroxylon melanophloeos*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Found in association with streams & seeps in afrotemperate forest & coastal forest
Rhoicissus tomentosa	Vitaceae	*Cissus tomentosa* *Rhoicissus capensis*	Western Cape Afrotemperate Forest	Afrotemperate forest interior, predominantly along drainage lines & riverine fringes
Scolopia mundii	Salicaceae	None	Western Cape Afrotemperate Forest	Occurs in small afrotemperate forest patches, often in association with streams and seeps

Scutia myrtina	Rhamnaceae	None	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	In coastal forest & in afrotemperate forest margins
Searsia glauca	Anacardiaceae	*Searsia glauca*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal sand dunes, inland on mountain slopes & along water courses
Searsia laevigata	Anacardiaceae	*Searsia laevigata*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal forest margins on sand dunes and afrotemperate forest margins where fires are relatively infrequent
Searsia lucida	Anacardiaceae	*Searsia lucida*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Afrotemperate forest margins where fires are relatively infrequent
Searsia tomentosa	Anacardiaceae	*Searsia tomentosa*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	Coastal forest margins on sand dunes and afrotemperate forest margins where fires are relatively infrequent
Sideroxylon inerme	Sapotaceae	None	Western Cape Milkwood Forest	In coastal forest predominantly on sand dunes in association with moisture seeps
Tarchonanthus littoralis	Asteraceae	*Tarchonanthus camphoratus*	Western Cape Afrotemperate Forest Western Cape Milkwood Forest	At margins of small patches of afrotemperate forest & in coastal forest
Virgilia oroboides	Fabaceae	None	Western Cape Afrotemperate Forest	Occurs in afrotemperate forest margins and in disturbed areas, particularly in association with rivers, streams & seeps