

The Impact of Humans and the Environment on Forest Distribution in the Southern Cape

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I. Introduction

According to studies, forests are found in areas that receive annual rainfall ranging between 525 mm and 1220 mm. If you look at the southern Cape forests, it can be noted that there is no relationship between rainfall and the distribution of forests in the area. This suggests, to some people, that humans changed the area through over-exploitation. It has been suggested that much of the forested area from the Cape Peninsula to Port Elizabeth has been cleared since 1652 (arrival of European settlers), and that destruction by humans is the reason for the fragmented nature of the forests today. Many people also believe that if an area's climate is ideal for forest growth (>500 mm annual rainfall), the whole area (coastal plateau and sea-facing mountain slopes) will be covered in forest, and that areas where human activities are currently taking place (agriculture, plantations etc.) were covered with forests originally.

The purpose of this article is to prove that the above statements believed by most people are false, and that the distribution of the southern Cape forests has not changed much since the arrival of settlers.

Note: The information in this paper is only based on the southern Cape forests. The forests on the east coast (KZN) were over-exploited drastically, and their distribution is not necessarily the same today as it was originally.

II. Description of the forests:

The Knysna forest is the largest forest complex in Southern Africa, and is found in the Southern Cape and covers an area of about 60,500 ha. The forest includes high (>20 m) and scrub (3 m) forest, and is found in fragmented patches on the seaward side of the coastal mountains (Geldenhuys, 1991). The largest forests can be found on the foothills of mountains, coastal platform, river valleys and coastal scarp. The Goudveld-Diepvalle-Harkerville forest is the largest single, continuous forest in southern Africa and covers all landscape zones except dunes (Geldenhuys, 1991). In contrast, the largest number of forests is found in the mountains but only cover a small area. It's the only forest in southern Africa that has been used for timber almost continuously since its discovery by settlers in the 1750's (Geldenhuys, 1991). This ecoregion represents the southernmost patches of Afrotropical forest in Africa. The predominant geology is quartzite, shale, schist, conglomerate and dune sand. The soils of these forests are generally acidic and nutrient-poor. Much of the Knysna forest occurs on gentle to moderate slopes, ranging from 5 m to 1,220 m above sea level with a mean of 240 m. Rain falls throughout the year in the region, with the most rain in early and late summer. Annual rainfall ranges from 525 mm to 1220 mm (Knysnawoodworkers, 2001).

Today most of the forests in the area are in formally protected areas like national parks and nature reserves, and tight control now ensures that only small amounts of timber are harvested for the furniture industry. Some larger forests are in the hands of private owners, such as Geo Parkes & Sons and PG Bison (formerly Thesen & Co.), who utilise the forests under very strict regulations.

1. Forest types:

Two national forest types occur in the Garden Route; the Southern Cape Afrotropical Forest and Western Cape Milkwood Forest.

1.1. Southern Cape Afrotemperate Forest (high and low forest)

This forest type occurs from sea level to altitudes of 1000 metres or more, and displays great variation in forest structure, species composition and species density due to the variations in topography, soils, microclimate and other factors. The forests occur in three distinct zones with distinct stand structure and species composition:

- The mountain forests (mostly wet forests) are typical Afrotemperate forest.
- Dry forests or scrub forests occur on the coastal scarp or on the steep slopes of the river valleys. These forests are species-rich and include many species of Indian Ocean Coastal Belt forests.
- The plateau forests are typically moist and medium-moist forests and include mainly species of Afrotemperate affinity (GRNP: State of Knowledge, 2014).

1.2. Western Cape Milkwood Forest (low forest)

Western Cape Milkwood Forest occurs as small patches at altitudes between 20 m and 340 m along the southern coast between Nature's Valley and the Cape Peninsula. In the Garden Route, patches occur inter alia at Nature's Valley, Keurbooms, Knysna, Goukamma and Groenvlei Forests in the Goukamma Nature Reserve, Sedgefield and Wilderness section of the Garden Route National Park. The forests are generally low, species-poor and often dominated by only one or a few canopy tree species with stunted or large stems and spreading crowns, usually *Sideroxylon inerme* and/or *Celtis africana* and/or *Apodytes dimidiata*. The under storey may be open, but is often a shrub layer with a diverse range of species (GRNP: State of Knowledge, 2014).

III. Historical Distribution of Southern Cape forests

Palaeontological evidence suggests that forests, woodland, grassland and fynbos have occurred in mosaics over the past 10 000 - 20 000 years (forests expanded during wetter periods, and shrank during drier periods). Nevertheless, fynbos, grassland, woodland and savanna have been more prominent the last couple of thousand years due to a drier climate as they are better adapted to arid conditions and fire. "*Fire plays a major role in determining the pattern of forest occurrence.*" (Stehle, 2007)

During the past 400 years written evidence from accounts of Europeans describing the country, portrays a situation not much different from the situation found today. This is further explained by **historical proof** and **scientific proof** later in the article. This does not mean that there hasn't been forest destruction by humans. It is just that the scale at which this took place is much smaller than is generally believed.

IV. Factors limiting forest occurrence and distribution

1. Environmental factors

The potential of an area to sustain forest growth is determined by rainfall, temperature and geology, but the actual occurrence and distribution patterns of forest in the area is determined by fire. (See *scientific proof* for a more in-depth explanation)

2. Human factors

2.1. Before the arrival of European settlers

The area was inhabited by Khoikhoi and San, who lived off the land for thousands of years before the arrival of Europeans. The extinct San (Bushmen) were semi-nomadic hunter-gatherers. They occasionally visited the forests, but did not dwell in or exploit the forests. Groups of San hunters occasionally smoked animals out of the forests during hunts, and this could have been the cause of some forest fires in the past (although fynbos was burned most of the time in order to drive animals to where they could kill them as forests don't burn easily). The Khoi people were pastoralists and frequently burned the veld to obtain grazing for their cattle.

The Nguni people, who still utilise the under-storey of forests more to the east (Transkei), are not known to have occupied the southern Cape forests.

They (Nguni) traditionally practised shifting cultivation as part of their culture for a very long time. The impact of this shifting cultivation was small enough to allow for forests to recover. The Nguni utilised and still utilise the under-storey of the forests for traditional purposes: Hut-poles, fence poles and kraalwood. Although the degradation isn't visible when looking at the forests superficially, the future generation of trees in the under-storey, needed to fill gaps when the canopy trees die or are removed, are slowly depleted and when the canopy trees eventually become senile and die, there is no replacement for them, and this has serious consequences. This form of degradation is therefore more damaging (Stehle, 2007).

2.2. Since the arrival of Europeans to the area during the 1700's

2.2.1. Forest exploitation and clearing

The Dutch knew about the Overberg forests by 1688 and the "Outeniqualand" (George and Knysna) forests by 1710. European settlement started in the middle 1700's when pioneer colonists moved into the "Outeniqualand" to farm, fish and cut timber. The Dutch East India Company (DEIC) extended its control over the forests in the 1770's and 1780's by establishing woodcutter posts at George and Plettenberg Bay (Joubert, 2019; Joubert, 2020).

The settlers exploited timber from the forest because they needed bulky timber for building purposes, carts and wagons, and later railway sleepers and mining struts. Portions of forest, bush and shrubland were cleared for crops and grazing. *"The clearing of forest would have been incidental and probably ate into the margins, by excessive cutting (not clearing) and then fires from adjacent fynbos may have burnt into some forests on the margins. But normally indigenous forest does not burn easily. Especially not in the olden days when the climate was colder and moister. Dry hot bergwinds in winter months did occur, and that could have here and there eaten slightly into the forest. The bush and shrubland would have been largely fynbos, which grows very high in this area. It is very difficult with manual labour to convert indigenous forest into farmland, and this is very unlikely to have occurred because there were enough open fynbos areas to farm, mainly for grazing. Cultivation was on a small scale more in the form of gardens to grow sweet potato maize and other crops for subsistence use."* (T. Stehle, personal comm., 5 April 2016)

The first attempts (policy) aimed to protect the forests were initiated in the 1780s, but the first adequate (scientific) system of conservation had only been introduced by 1882. This led to the single-tree selection system of Laughton (Joubert, 2020).

By 1876 the George forests west of Touw River were mostly worked out or damaged by fire (Geldenhuys, 1991). *"...It is true that forests had been worked out, that is, depleted of timber trees, especially the larger ones, but that did not mean they were destroyed. Such forests, if given a chance, would have recovered over time. Maybe smaller portions of low scrub forest that had been worked out, were subsequently damaged/destroyed by wildfires, but the latter, due to the damp and cool climate of this area, occurred at a very low frequency. Only in recent years, say the last twenty to*

thirty years, due to climate change, did the frequency of wildfires in this area increase.” (T. Stehle, personal comm., 5 April 2016)

Exploitation damage in the forest in the eastern Tsitsikamma (from Bluebelliesbush eastward) was common before 1856, but even by 1872 the western Tsitsikamma between the Soutrivier and the Storms River was relatively unoccupied (Joubert, 2020). Exploitation by the Europeans on the whole did less permanent damage to the forests because they intervened mainly in the forest canopy, which more closely resembles the natural dynamics. The reason is that the larger canopy forming trees, by allowing sunlight to penetrate lower into the forest, enable sub-canopy opportunist recruits to fill the gaps formed by their removal. As long as the forest soil is not destroyed, the forest will recover if allowed (Stehle, 2007).

Sections of forests were sold from 1846 to 1856, and again from the 1860's until the 1870's. The government sold portions of the forests (some were worked-out) as Forest Lots to private owners who used the land for farming (“mealie gardens”) and/or woodcutting purposes (Joubert, 2020). Some of the larger private forests in Knysna today were obtained during these sales (*Geo Parkes & Sons etc.*).

Clearing of forest still continues today, but only on a small scale for strategic purposes, e.g. the building of roads and dams, where there are no alternatives. A private company cleared about 140ha of forest (part of the Diepwalle-Fisanthoek complex) between 1958 and 1966 for conversion to plantations. Small portions of forest (218ha) were cleared for the building of roads, agriculture and dams during 1970 to 1980 in the southern Cape (Geldenhuys, 1991).

The Knysna forests have persisted in a moderately to densely populated rural environment, and, according to Scriba (1984), most of the George forests on the relatively dry coastal foreland had been cleared of forest by humans in recent historical times. However, Prof. Geldenhuys does not fully agree with Scriba's statement, he states that the area of George was never covered in forest: *“I think that even places like George were not covered in forest - there are valleys covered in forest which expand because of the wattle and pine...(exotic trees promote forest growth)”* (C. Geldenhuys, personal comm., 3 February 2016).

Important: Suggestions that all open areas adjacent to forest were forest previously, and were cleared during recent historical times must be viewed with caution. *“Clearing and conversion to agriculture land of large areas of forest with modern equipment and methods is a formidable task today. During the 18th and 19th centuries only relatively small areas of forest would have been cleared on the margins of forests to enlarge existing openings. Clearing for agriculture was confined to the foothills and coastal platforms and would not explain the intense fragmentation of the mountain forests.”* (Geldenhuys, 1991)

Generally, direct human impact on natural forests has been rather to degrade than to wipe out forest. However, forest degradation has made the forest more vulnerable to fire, as a secondary agent of destruction.

2.2.2. Grazing

According to Inskip (1987) the pattern of forest and open country around Plettenberg Bay existed before the exploitation of the forests began. A mosaic of grassland (fynbos), shrub, and forest, similar to the present, is pictured in the writings of survivors of the wreck of the ship San Gonzales during June 1630 and early travellers (Geldenhuys, 1991).

Pastoralists with herds of sheep and cattle inhabited the area around Plettenberg Bay for a very long time, and they used the open fields in the area of the Bay to graze their cattle and sheep.

Forest regulations issued in 1856 entitled each holder of a timber license to take 16 oxen to the forests and to graze them for ten days adjacent government or other lands under servitude of grazing (Geldenhuys, 1991; Joubert, 2020). *“This was on tracts of fynbos occurring inside the boundaries of*

Crown Forests (i.e. Crown or State land), which was burnt periodically to obtain some palatable grazing for trek oxen. These later became commonages associated with woodcutter allotments, where the trek oxen could be depastured on communal land.” (T.Stehle, personal comm., 5 April 2016)

Plenty of buffalo and elephant were still present by 1875, and both these animals occurred in herds and favoured more open vegetation such as woodland, shrubland, and grassland. They used the forests for shelter, and will also, at times, feed in the forest (Geldenhuys, 1991).

“This (elephants feeding in the forest) occurred only in much later years when the elephants were forced into forest by human habitation on the open areas around the forest. The forest is extremely unpalatable for herbivores, and only when forced to, they will browse forest tree leaves.” (T. Stehle, personal comm., 5 April 2016)

The area west of George was known amongst the farmers as “grassveld” (grassland), and was favoured in earlier times for seasonal grazing (Geldenhuys, 1991).

2.2.3. Fire (man-made)

Fire has been used by man for about a million years and for some form of veld management in the fynbos area for at least the last 100 000 years (long before pastoralism).

Some European farmers burned the forest margins in order to illegally extend farm land. Farmland and fynbos was sometimes burned by farmers to get pasture used for grazing or to make the land more fertile, accidentally eroding the forest margin (P. Caveney, personal comm., 23 February 2016).

2.2.4. Plantation forestry

The first exotic timber plantations were established in Concordia (north of Knysna) in 1880 with the goal of augmenting the timber from the indigenous forests, which could not meet the demand for timber any more (Joubert, 2020). Most of the plantations were established on areas that were covered with fynbos previously. A relatively small area of forest that had been seriously degraded during the woodcutter period in the Knysna area, was planted with exotic plantations. However, in that area there is, after many years, the tendency for indigenous forest to re-establish itself aggressively (Geldenhuys, 1991). An example of this is Bracken Hill.

The Great Fire of 1869 burnt large parts (mostly forest margins) of the indigenous forest in the Knysna and George districts. From that fire, “invader” trees like various species of pine and Eucalyptus, as well as Blackwood were planted by the large property owners and sawmillers like Thesen’s, Geo Parkes & Sons and PJ van Reenen. Some of the exotic trees were planted in areas that had burnt down and were cleared by the fire, but most were planted on fynbos islands that existed in these areas (G. Parkes, personal comm., 17 February 2016).

Some people think that plantations threaten the indigenous forests, but this is in fact not the case. Plantations actually protect the forest in the following ways:

- Provides protection from fire (only if the plantation does not catch fire and burn)
- Is an alternative timber source
- Forms a nurse stand for the expansion of forest (although only temporary as the plantation is situated in the fire-prone zone)
-

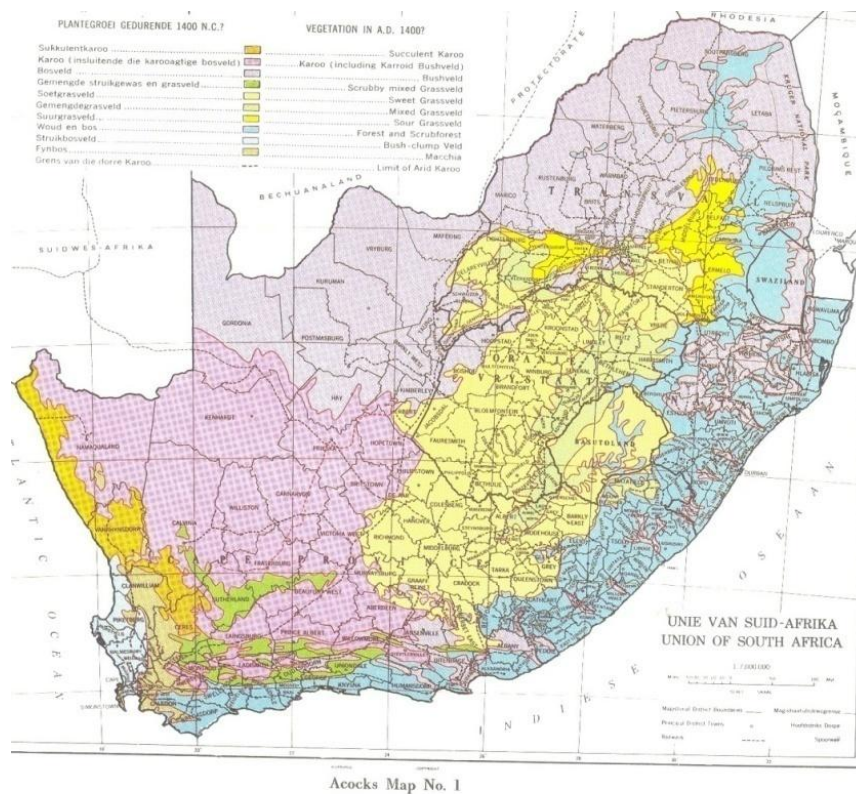
Plantations therefore provide us with indirect evidence that forest is limited in the area because of uncontrolled fires in the past (Geldenhuys, 1991).

V. Source of misperceptions about the distribution of forests

High rainfall and forests have always been connected with one another. Scientists of about 150 years ago believed that rainfall could be increased by forests. Today, we know that the occurrence and development of forests is determined by several habitat factors such as climate (of which rainfall is the main determinant), geology, fire and the sub-soil moisture regime.

Nevertheless, the potential for forests to exist has for a long time been (and still is being) determined by rainfall, without taking other habitat factors that restrict the development of forests, into consideration.

In recent years, the first complete vegetation classification for South Africa, attempted by J.P.H. Acocks in 1953 (“Veld Types of South Africa”), has probably contributed to the perception that the southern and eastern coastal belts were completely covered in forest in about AD 1400. His book included a map with the title “Vegetation in AD 1400?” (see map below – forest in blue). Sadly only a few people notice the question mark (at the end of the map title) and realise that both the book and map are based on assumptions. This assumption was, in all likelihood, based on the rainfall potential (Stehle, 2007).



This publication, revised in 1988, was, although based on agricultural potential, for decades the standard classification for vegetation in the country and has only recently (since the 1980's) been replaced by more modern scientific classifications. The area on the above map coloured in blue, is supposed to have been the extent of the indigenous forests before the advent of Europeans and the Black peoples, which suggests that large scale destruction of forests has occurred since then (Stehle, 2007).

VI. The truth (reality) about the forests

The situation depicted by Acocks is false, and is realised by very few people today. Even some of the top natural scientists have been misled.

The true facts are based on historical proof and scientific proof.

1. Historical proof

1.1. Early traveler descriptions

Even the most educated naturalists of the eighteenth and nineteenth centuries were not ecologists and had a limited knowledge of vegetation as units. They were mostly systematic botanists who collected plant specimens to preserve and name them. Some of them recorded their travels through South Africa in vivid terms, but the descriptions of vegetation were very primitive and scant (Stehle, 2007).

Nevertheless, two renowned Swedish scientists that travelled through the Cape in the late 1700's (about 100 years after Van Riebeeck established the first European settlement in Table Bay) described the vegetation of the southern Cape coastal areas in such terms that it can be interpreted by us today. They were Carl Peter Thunberg and Anders Sparrman. These two left descriptions behind that show that the area consisted of a mosaic of forest and fynbos, much like the area today. The descriptions by Sir John Barrow will also be used for the purpose of the research. He was an English statesman and writer who travelled through the Cape during the late 1700's and compiled various notes and sketches of the countryside that he was traversing. A description by Captain Jones of the Royal Navy will also be included.

People whose descriptions will be used:

- Carl Thunberg: Swedish naturalist
- Anders Sparrman: Swedish naturalist
- Sir John Barrow: English statesman and writer
- Captain Jones of the Royal Navy

1.1.1. Area around George

- *Descriptions by Carl Thunberg:*

An excerpt describing the countryside around George:

1772

“The country here, in general, consisted of extensive plains full of rich pasture, interspersed with hillocks, and valleys, that abounded in wood and water.” (Skead, 2009)

This is still the situation today. The rivers form forested valleys and between the rivers there are wide ridges that form “plains” on which the grazing farms are situated today. That the pasture was obtained by burning the generally inedible fynbos, is clear from the following description:

1772

“Divers plains here, produce a very high sort of grass (anyone that is familiar with the southern Cape fynbos, knows that it grows to a height of 2m or more when in its climax stage), which being of too coarse a nature, and unfit food for cattle, is not consumed and thus prevents fresh verdure from shooting up (again, this typically describes the grazing potential of mature fynbos)... Such a piece of land as this, therefore, is set on fire, to the end that new grass may spring up from the roots (this is what happens after a fynbos burn, sprouters, grasses and other pioneer vegetation form the first successional stage, and these are edible for grazers for some time after a fire).” (Skead, 2009)

- *Description by Anders Sparrman:*

1775

“Houtniquas land, which is a woody tract of country, is supposed to commence to the eastward of the Grootte Brakrivier (Great Brak River) and to extend to Keurebooms River (Keurbooms River) which empties itself into Algoa Bay (Plettenberg Bay). Along the side of these mountains runs a wood... On the western side of Keerom-rivier (Kaaimans River) or the hither side of the Houtniquas, between the wood just spoken of and the seashore, there are extensive plains of indifferent grass. There was likewise in the vales near the shore some woody tracts of land and streams of fresh water.” (Skead, 2009)

1.1.2. Area around Plettenberg Bay

- *Description by Carl Thunberg:*

In the area around Plettenberg Bay, the following description of habitat for buffaloes similarly indicates a mosaic of forest and fynbos:

1772

“The fields hereabouts were full of wild buffaloes, so that it was not uncommon to see a hundred or two of them in a herd (which wouldn’t have been possible if all was forest). They generally lie still in the thickets and woods in the day time, and in the night go out into the fields to graze.” (Skead, 2009)

- *Description by Sir John Barrow:*

1799

“The District of Plettenberg Bay is in fact a rich field for the naturalist... The greatest part of the forest trees still remain unexamined... The Plain of Hartebeests abounds with that noble species of the antelope tribe from which it takes its name ...” (Skead, 2009)

1.1.3. George, Knysna and Tsitsikamma areas

- *Description by Sir John Barrow:*

1799

“The extent of the forests, beginning at Mossel Bay and running eastward parallel to the sea coast is at least 250 English miles and the breadth from the feet of the mountains to the sea is ten,

fifteen, and in some places twenty miles. A great part of this tract is composed of large and beautiful plains intersected by numerous rivers, and abounding in lakes full of excellent fish..." (Skead, 2009)

- *Description by Captain Jones of the Royal Navy*

1812

"These forests are by no means so extensive as has been reported... They commence at some distance on this side of the Gouritz River, and extend eastwards to the Erate, or first river, situated directly under Pic Formosa, or the Grenadier's Cap, about 120 miles in a right line, and are confined between a chain of mountains parallel to the sea, and distant from it in a mean, between 8 and 9 miles. Between the Gouritz and Knysna Rivers they are generally no more than a belt at the foot of the mountains, from half a mile to a mile in breadth, and very large tracts of naked land often interpose. In some parts there are patches between the mountains and the sea, and along every river they continue for a small breadth on either side to the sea, which, as the timber approaches it, becomes less. They are very inconsiderable, either in extent or size of the timber, till near the Kaayman's River in Outeniqua land, between which and the Knysna River in Plettenberg Bay district nature has placed insurmountable barriers to the removal of heavy timber." (Brown, 1887)

1.1.4. Tsitsikamma area

- *Description by Sir John Barrow:*

1799

"It is chiefly covered with impenetrable forest, on the east of which however, there are extensive plains equally good for the cultivation of grain and the grazing of cattle." (Skead, 2009)

1.2. Historical maps, sketches and paintings

Early travelers, residents and the government drew maps, sketches and paintings of the surrounding area's landscape. By comparing historical maps and paintings with modern maps and photos, it can be noticed that the distribution of forests in the area did not change very much from the late 1700's onwards.

Some of the old maps and paintings are included in the appendices found later in the article. The following can be seen by looking at these artifacts:

- Area around the Garden of Eden:
Appendices D, E and L show that the strip of forest around the Garden of Eden and De Poort was always very narrow.
- Knysna estuary and town:
Appendices F and J prove that the area around the Knysna estuary and town was not covered in forests.
- The distribution of forests in Karatara and the Plettenberg Bay-Knysna districts:
Appendices H and I prove that the distribution of forests in Karatara, Knysna and Plettenberg Bay did not change very much since the 1850's/1870's onwards.
- Millwood:

Appendix K indicates that the surrounding hills around the town of Millwood were mostly covered in fynbos, and not forests (as believed by most people).

2. Scientific proof

Scientific studies done in the southern Cape over recent years by various scientists provide evidence about the occurrence and distribution of indigenous forests (past and present). There were also studies done on the occurrence of fynbos patches frequently found in between forests called ‘fynbos islands’.

2.1. Studies done on fynbos islands

An interesting feature of forest in the Garden Route, is the presence of fynbos islands (i.e. fynbos completely surrounded by forest). The earlier belief was that these islands were man-made and created by the clearing of forest. Geldenhuys (1991) believes that these islands were formed by fire caused by lightning. Phillips (1931) conducted that these islands originated by the use of fire by forest-dwelling parties of the now extinct San hunters. However, Inskip (1987) regarded the islands as an ancient and natural feature, kept open in part by the grazing of buffalo (Geldenhuys, 1991).

Here is an abstract from an article conducted by Theo Stehle on the presence of fynbos islands within the Garden Route forests:

“A scientific article by Bond and Midgley (1990) about studies done on the origins of the Knysna fynbos islands, reveals that, contrary to popular belief, the islands of fynbos inside the sea of natural forest are not the result of anthropogenic disturbances of forest, but are remnants of a once (very long ago) continuous expanse of fynbos, now isolated by expanding forest. Whereas some forest species are able, in the absence of fire, to colonise fynbos, fynbos species are not capable of invading forest. They concluded that fire was the major factor determining the forest/fynbos boundary.” (Stehle, 2007)

2.2. Studies done on the southern Cape forests regarding it’s original extent, and the interaction between the fires in the landscape and the location pattern of the forests and Fynbos

2.2.1) The work of John Frederick Vicars Phillips

J. F. V. Phillips was a South African forester, ecologist, conservationist and agriculturalist who went to Scotland to train in forestry and botany at Edinburg University (1919-1922). There he later obtained a DSc (1927) for his thesis entitled *Forest succession and ecology in the Knysna region*, later published as volume 14 of *Memoirs of the Botanical Survey of South Africa* (1931).

One of Phillips’ studies was based on the opinion of A. F. W. Schimper (a German botanist and phytogeographer who visited the southern Cape area on collecting trips in 1898) found in an article published in 1908.

Schimper was of the opinion that it was unlikely that the whole area was covered in forests previously, but no reasons were ever given for his opinion. He considered that areas of primitive fynbos existed near the forests, and that these were increased by man at the expense of the adjacent forests.

Phillips did careful and extensive research since 1922 with fynbos-clad soil situated near and far from the forests in the area of Knysna. Numerous examinations of soil strata and of vegetation

relicts were carried out, which culminated in his DSc. The results from these studies are summarized below:

- a) Areas of fynbos exist that show no signs of forest relicts in their soil strata. Such areas bear a shorter, less luxuriant type of fynbos (even where protected from fire, grazing and other disturbances) than the areas described below. This fynbos type is the most common, and has never been forest previously. This type occurs in upper mountain slopes, the whole of the summits of the range, portions of the foothills and certain lateritic portions of the plateau (Phillips, 1927).
- b) Extensive areas of fynbos exist where large numbers of forest relicts have been taken from the soil (in the form of ancient, and often charred, roots and stems, and charred resinous matter). Microscopic examination of these relicts has shown them to be composed of forest species found in the forests today. In addition to wood and resinous matter there were well-defined, incinerated layers in the soil, at depths of 12 to 18 inches; too deep to be the results of fire in the fynbos. The fynbos, wherever protected, grows tall, and shows the presence of scrub, bush and forest forms. The manner in which the areas of this fynbos type connect innumerable forest patches certainly supports the hypothesis that the forests covered them previously. Judging from the appearance of most of the relicts and from the depth of these below the surface, the forests to which they relate, must have disappeared from the ground centuries before the arrival of Europeans. But, it must be noted that some relicts belonged to forests that occupied the soil less than a century ago (Phillips, 1927).
- c) Actual relict trees or small relict communities occur at distances of several miles from the forests, in places where they receive protection from fire and other agencies of disturbance. The soil strata of the areas of fynbos linking up such relict patches, invariably show the presence of wood relicts (Phillips, 1927).

Phillips (1927) states: “*Were it possible to preserve strictly the Macchia (and the scattered scrub and bush relicts mingled with the latter) occurring on areas akin to types (b) and (c) described above, steady re-afforestation would take place by process of succession.*”

The above-mentioned point made by Phillips in 1927 was in fact correct, as most ‘cleared’ forest margins have developed back to indigenous forest, naturally, during the 1960’s, 1970’s and 1980’s.

2.2.2) The work of Coert J Geldenhuys

The most convincing work has been that of Coert Geldenhuys, who did his Ph.D. on the environmental and biogeographic influences on the distribution and composition of the southern Cape forests (1989), and has been actively involved in southern Cape forest research since 1969.

Prof. Geldenhuys states that fire determines the forest location patterns in the landscape, throughout South Africa and in the rest of Africa, including the tropics. The forest patterns depend on how long a person goes back in the past, but the departure point, for the purpose of this article, is the arrival of the settlers. His study of the fire patterns was done in the Tsitsikamma part of the Southern Cape. When the settlers arrived in the Tsitsikamma, there was already some form of control on the harvesting of indigenous forest.

Most people’s perception seems to be that the settlers cut down and clear the forests in order to practice agriculture. There were probably few such places, but by far in the minority. People had a lot of trees cut down, but the descriptions left behind by early settlers does not talk about the clearing of the forests, but rather over-exploitation of the forests. The patterns of the forests in the landscape are completely according to a specific natural and explicable pattern without

straight boundary lines, as would have been made by people. The places where people practiced agriculture, and where the plantations of forestry were established, lies completely within the fire zone (hence the need for expensive fire protection). According to Prof. Geldenhuys, before the settlers arrived around 1750 (George), the forests were much smaller than today, but with clear boundaries between forest and fynbos, and where the landscape's physiography effects could be seen more clearly in the forests, such as in the Southern Cape mountains currently. Methods used to manage fire in the area for agriculture, forestry and nature conservation that disturbed many of the patterns - also the spreading of invasive plants in these parts - had a positive effect on the wider distribution of forests (C. Geldenhuys, personal comm., 2 February 2016).

People can't assume that areas where there is cultivation taking place currently were forest previously. The withdrawal of fire from the landscape due to intensive agriculture, protection of timber plantations against fire, or a greater degree of fire management contributes to the establishment of more trees, mostly invasive alien plants. Many introduced tree species do not grow in shade and establishes in open fynbos areas or grassland adjacent to indigenous forests, and, on the other hand, indigenous forest trees prefer shade under the forest canopy to germinate and grow. The alien trees therefore act as a nurse stand for the indigenous trees to grow because of the shade. This is why there are forest species now in areas which were previously covered with grassland and fynbos. This leaves the impression that forest has occurred in many places which is not necessarily true.

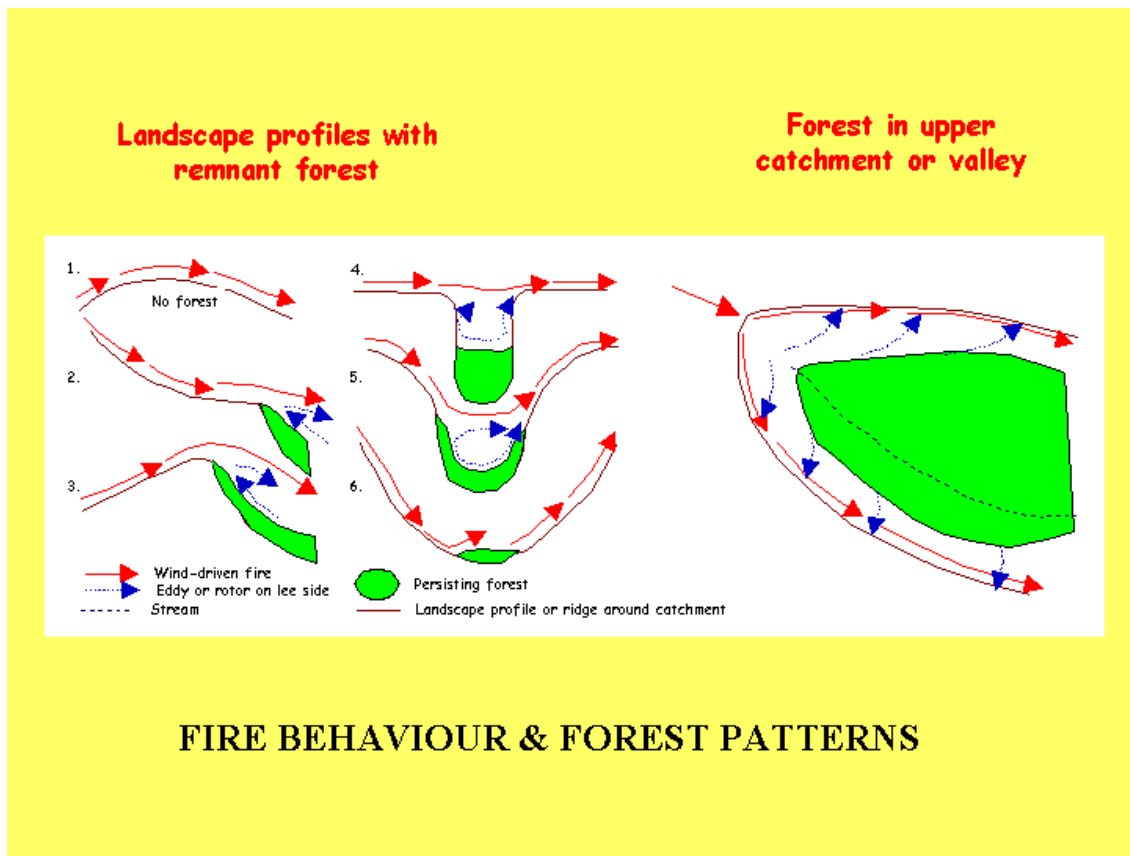
Prof. Geldenhuys has shown in his studies that the location pattern of forest patches is determined by fire (see illustrations on page 15). Although at least 525 mm of annual rainfall seems to indicate the lower limit of forest occurrence, higher rainfall doesn't necessarily mean that forest can expand unlimitedly, and persist. If one uses the average annual rainfall limit of 800 mm rain / year, where forest could potentially have grown, then the area covers about 7% of South Africa - but the reality is that the forest area in South Africa is less than 0.1% of the land area. The difference of at least 6.9% is primarily due to fire, and not suitable geology and deep soils. People must keep this in mind when looking at areas in the southern Cape where agriculture is taking place; the area has the potential to have forest, but it is absent due primarily to the role of factors as mentioned above (C. Geldenhuys, personal comm., 6 February 2016).

Prof. Coert Geldenhuys has shown that forests occur on all geological formations, but sandstones, shales and schists carry above-average forest cover, and granites, conglomerates and unconsolidated sands carry limited forest cover. Forests are found on steep slopes, well-drained slopes, slopes exposed to the salty winds of the sea, and on recently established sand dunes, although growth is rather slow. The soil and geology does not limit forest growth, but influences the floristic and structural composition of the forest (Phillips, 1931). The deep slopes of the valleys and the rocky, shallow soils of the coastal scarp support large areas of forest growth. Protection (river valleys etc.) provided by certain topographic features shelter the forest from fire. These sheltered areas where forests are found and protected from fire are called fire shadow areas (Geldenhuys, 1994).

The potential of forest growth in an area is determined by rainfall, and to a lesser extent, temperature and geology. Geology does not limit forest growth when there is enough rainfall in an area, but it determines the form of the landscape, which in turn determines the fire patterns. As research showed us, if an area has the potential for forests to grow, it does not mean that the whole area will be covered in forests, and where forest is actually found in the landscape is determined by the fire patterns. Forest is surrounded by fynbos, a fire driven ecosystem that requires fire to maintain itself. These fires also maintain the forest-fynbos boundary. The absence of fire results in forest expansion, while the opposite occurs during intense fires. With natural fire distribution patterns disrupted (e.g. where fire protection measures are in place, or where fire can't move naturally through the landscape anymore due to the different land uses (which is the reality, especially for low-land fynbos), forest will expand. Similarly, if the natural fynbos-forest ecotone is disturbed (e.g. covered by invader plants, creating a heavy fuel load) and under extreme weather conditions, fire can result in excessive

damage to forest. Fire patterns thus have a major impact on the distribution of forests and the shape of forest patches.

The facts stated above mean that fire, indirectly favoured by climate (rainfall), has played a dominant role in determining the mosaic of fynbos and forest that developed over very long times.



Detailed forest location pattern with fire pathways: Storms River



(With acknowledgement of Prof. Coert Geldenhuys)

VII. Attempted establishment of forest in grassland (fynbos) areas

Any attempts to try and establish natural forest in grassland or fynbos areas close to patches of natural forest, have been abortive. Even if the introduced tree plants grow, they never develop properly and only survive till the next fire wipes them out.

Small-scale reconstruction or establishment of natural forest in the southern Cape has been successful only where the local habitat conditions favour the development of natural forest. In cases where fynbos had been the natural vegetation before, the establishment of indigenous forest over larger areas had been unsuccessful. In cases where natural invasion of indigenous forest precursor species into adjacent fynbos took place because of an abnormal absence of fire, it did not develop into forest, either because of the absence of the optimal habitat conditions, or the forest margin having been set back to its original position by fire (Stehle, 2007).

VIII. Current status and harvesting of the forests

1. Current status

Both publicly owned and privately owned forests are now in an advanced state of recovery from past timber exploitation (large parts of the forests are of secondary nature, meaning it has re-grown after heavy exploitation. There is no evidence to suggest that some species are more or less common. The only significant change would be a change in size-class distribution of trees, with less old-growth. There is a section in the Gouna forest which has not (apparently) been exploited at all). Many of these forests are run by a policy to rehabilitate destroyed forests, consolidate existing forest patches by reconvertng abandoned plantations or forest margins to manageable boundaries, and to eliminate alien vegetation.

Sustainable timber harvesting is currently practiced according to a timber yield regulation system. Yield regulation is the science of determining *inter alia* what species and products you may harvest, where, when, and how much. Nature conservation remains the primary aim of management in the Garden Route forest areas, so a timber yield regulation system was developed that has minimum ecological impacts and mimics the natural turnover and disturbance mechanisms at work in the forests as closely as possible so as to ensure an optimal sustainable yield. The result was a single tree selection system based on natural mortality patterns. Timber harvesting may only take place in areas where it is compatible with other long-term management objectives. It is only carried out in accessible medium-moist and moist high forest types where harvesting is feasible. The other forest types are either ecologically too sensitive or do not have sufficient trees of marketable size. Approximately 9 200 ha of forest is zoned for sustainable timber utilisation. However, timber is not harvested in the ecologically sensitive parts of these areas, including areas that are too steep or too wet, so the area actually harvested is less than this, approximately 6 500 ha (SA Forestry online, 2010).

The indigenous forests, with their mixture of trees of various sizes, ages and species, are managed for timber production on a different system to exotic plantations. There is no clearfelling, but rather a selected removal of trees on a ten-year cutting cycle, ie. a number of trees are harvested from a particular area only once every 10 years. Each timber production compartment is scheduled for harvesting in a particular year so that approximately one tenth of the total effective area is harvested annually (600-650 ha/a). These timber production compartments are scattered throughout the area (SA Forestry online, 2010).

A crucial component of any timber yield regulation system is the method used to select trees for harvest. The system used in the Garden Route forests is a single tree selection system that was developed locally, known as the Senility Criteria Harvesting (SCH) yield regulation system. Harvest tree selection criteria have been compiled for each of the main canopy species. Visible signs of senility and decline, such as crown dieback, structural damage and stem decay, are used to identify trees for harvesting that are senile and have a short remaining life expectancy, ie. trees that are busy dying. A tree complying with one of the criteria for that species is identified as a candidate for harvesting. Severity of crown dieback is generally the best indicator of senility, but other parameters such as structural damage, degree of stem decay and incidence of epicormic shoots also tend to be related to senility, depending on the species. Trees displaying advanced signs of senility often have a low growth rate (SA Forestry online, 2010).

The harvest tree selection criteria were compiled after an intensive survey in a long-term research area at Diepwalle Forest, for which reliable increment, ingrowth and mortality data exists. Over 2 400 canopy trees of the main canopy species were evaluated for possible visible signs of senility, low vigour or reduced life expectancy. Species-specific harvest selection criteria were then compiled that provided harvests equivalent to the natural rate of mortality. The application of these criteria on a 10-year cycle should thus produce a harvest that is equivalent to the natural mortality over a period of 10 years for each species in that area. All of the monitored trees have been re-evaluated three times over a period of 15 years and the criteria refined to predict mortality more accurately (SA Forestry online, 2010).

Overall, the outlook for future protection and conservation of these forests is encouraging:

- South African National Parks (SANParks) and provincial authorities actively manage over 70 percent of the total indigenous forested area
- Nearly 20 percent is conserved in proclaimed nature reserves and parks managed privately

2. Harvesting

The forest is very sensitive to disturbance, in particular, soil compaction and drainage disturbance. Reduced-impact logging techniques were introduced into the southern Cape forests in the 1960s and have been applied consistently since the early 1980s, with a continuous development and improvement in techniques and equipment. Large crowns are removed before trees are felled, a procedure known as topping. Trees are felled carefully to reduce damage to surrounding trees. Logs are not cut to maximum length, but rather to facilitate handling and reduce damage within the forest. The extraction of the logs from the forest is only carried out when the soils are sufficiently dry, as wet soil is much more prone to disturbance and compaction. Heavy machines are only allowed to operate on permanent slipping paths, on which there is little further destruction to the organic soil layer possible. Inside the forest, slipping is done with heavy draught horses or by cable and winch from a machine on the slipping path (SA Forestry online, 2010).

IX. The Implications of enduring popular beliefs and how to rectify them

Popular beliefs are difficult to get rid of, especially if scientists attach themselves to them (through ignorance or established thinking patterns).

Nevertheless, unscientific opinions can often lead to misguided actions, which can lead to financial repercussions and wasted efforts. People have been encouraged over the years to plant more indigenous trees in order to re-establish the ‘destroyed’ forests of the area.

The following was written by Stehle (2007) about the planting of indigenous trees:

“It has become fashionable to plant indigenous trees. This has been promoted over a number of years for very good reasons, and is in itself commendable. However, the number of well meaning people wanting to “re-establish” indigenous forest where it never occurred, and at the expense of other natural vegetation types, is on the increase. It has even happened recently that a grandiose scheme under the slogan “Bringing back the Forest to the Garden Route” was promoted to form part of an IDP of a municipality, with the idea of job creation, restoration of destroyed forests and the earning of carbon credits to offset air pollution causing global warming.

It is expensive to propagate tree plants in nurseries, to transport and plant them out in the field, and then to lose them a few years later in a wildfire, just because they were planted where they could not survive.

The other aspect to bear in mind is that to plant indigenous trees on any scale doesn’t mean that you create an indigenous forest. An indigenous forest is much more than a stand of indigenous trees. It is a complex ecosystem comprising the forest soil with all its biological components, including microbes, and the forest macro and micro fauna and flora associated with the tree species. Anyone endeavouring to establish “forest” will in all likelihood be disappointed if after a lot of expense and effort, years later finds him or herself with a motley grove of dwarfed trees and shrubs, because of exposure to harsh climatic elements, and lacking the soil characteristics and underground moisture necessary for their development into forest. The required set of habitat conditions simply is not in place. Worse still, if it succumbs to fire some or other time.

[The]...planting of indigenous trees where they do not naturally grow, is an interference with natural patterns and processes similar to that of any artificial (simplified) ecosystem, like plantation forests, horticulture or agriculture. If people are interested in restoring or rehabilitating natural ecosystems, they should realise that our natural environment doesn’t comprise forests only, but other biomes are equally important. Efforts should be directed at rehabilitating whatever natural ecosystem has existed before. Anything else is artificial.” (Stehle, 2007)

It is possible to change misperceptions. The first place to start is with the scientific community and the conservation NGO’s. The correct information needs to be distributed in publications. False information needs to be confronted with the correct information at every opportunity.

“Education of the population starts with the younger generation. Educational materials can be distributed to schools and tertiary education institutions. Awareness raising needs to be done in all levels of society. Greening campaigns, Arbor Week, etc. are all vehicles of conveying the right information. The Forestry Branch of the Department of Water Affairs and Forestry has an obligation and a responsibility in this regard, as the lead agent in the country regarding forests and trees.” (Stehle, 2007)

X. Conclusion

By reading historical descriptions left behind by early travellers, studying maps from the 1800’s and focussing on the scientific work done by scientists, I came to the conclusion that the distribution of forests did not change much since the arrival of man to the area. Some areas of forest were worked-out (devoid of valuable wood) because of exploitation, but most areas have almost fully re-grown as

secondary forest today. People must understand that the potential for forest growth is determined by rainfall, but fire determines the occurrence of forest in a landscape. Southern Cape Forests occur in areas which are protected from the bergwind fires. Most of the farms and plantations we see today are situated on areas which were covered with grassland or fynbos previously. Small areas at forest margins would have been damaged in the past by illegal burning by farmers or by clearing in order to enlarge existing openings. Only tiny areas have been worked out to such an extent that one can say they were cleared, but some or probably most of them on the forest fringes (margins) have been rehabilitated back to indigenous forest, and as the forest complex is so large, it did not make a very big impact. The major difference in the forest of today compared with the forest of about 400 years ago, would be the size difference of the trees. Most of the big (older) trees were cut down in recent historical times, and it takes a few hundred years for some trees to reach maturity. Most of the forest today is of secondary nature, and is in the process of becoming fully grown again (since the forest has been closed from uncontrolled exploitation since 1939).

It is great news for us as South-Africans to know that these, near pristine, forests are still available for all to see and appreciate. The greed of man almost destroyed this beautiful, complicated and mysterious ecosystem. We must all take part in the protection of these forests to ensure that they will still be here to see for many future generations...

XI. Acknowledgements

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- Dr. Wessel Vermeulen (Science Operations Manager at SANParks)
- George Parkes (Former Director at Geo Parkes & Sons)
- Graham Durrheim (Scientist: Forest Ecology at SANParks)
- Izak van der Merwe (Forest scientist at DAFF Scientific services)
- Jolanda Julyan (Lived in Knysna for 20 years, and her father was a forester in the area for 47 years)
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XIII. Appendices

A

Opinions from experts and local people who know the area well

1. The Distribution and history of the forests

Izak van der Merwe:

*“In 1999 I was contracted by the then Department of Water Affairs and Forestry to develop a book titled *The Knysna and Tsitsikamma Forests: Their History, Ecology and Management*. At that time I also had a perception that at least some parts of the forest areas were decimated by woodcutters or claimed for land uses such as agriculture and forestry. This perception changed rapidly as I visited the archives of the George and Knysna museums, and the national archives in Pretoria and Cape Town. I read through many historic accounts, and gained valuable insights from historic maps and photographs. The openness of the landscape of Knysna and its surroundings as portrayed in a panoramic painting by Johannes Schumacher done in 1778 (Appendix J) fascinated me, I could clearly see that there were forest patches embedded in a matrix of open hills. Like many others I always thought, for example, that the Millwood village developed in the natural forest, but from the photographs of the developing village (Appendix K) I could clearly see the surrounding hills covered in fynbos. Almost all the photographs of the woodcutters I saw, show them working the timber in a closed canopy forest environment, with very localised damage.*

During that time I spent more than six months in the Knysna and Tsitsikamma forests, traversing most of the footpaths, and beyond. What impressed me was that apart from the old woodcutter slip paths still in use for the low level timber harvesting based on scientific criteria, I could find no sign of the destruction that was reported by historic visitors such as Governor van Plettenberg. He reported that there was much wastage and destruction by woodcutters, and while the layman might tend to interpret this as destruction that was common throughout much of the forests, I soon realised that this was not the case. The reason for the limited scale of destruction and why the forests recovered so well, soon became apparent to me. The woodcutters did not do clear felling of trees. They only targeted single trees of a select number of tree species, such as common yellowwood, white pear and stinkwood, the timber of which was in demand by various industries. Building an ox wagon would require various wood types for specific purposes, such as assegai for the spokes, yellowwood for the wagon floor etc.

The single tree selection done by woodcutters meant that only small gaps were created in the forests, and the recovery of these gaps were relatively fast due to young trees left standing, which competed to close the gaps. Forest gap dynamics therefore played a major role, which is a faster recovery process than the species succession required from the pioneer stage in clear-felled areas. Some sawpits are still visible today, and where you find them there is absolutely no way in telling timber was once felled there. Large forest trees stand all around these sawpits, under a high, closed canopy. I even searched for signs of the 35 km railway route that once linked Knysna with Diepwalle

(after removal of the tracks), but in less than a century the forest has completely reclaimed this route. Except for two spots pointed out to me, it was impossible to find any signs of the once considerable linear clearance along the rail servitude that existed from 1907 to 1949.

In my research for the book I came upon the work Prof Geldenhuys did on the wind-driven fire patterns and how this determines the location and shape of forest patches. This ground-breaking work greatly contributes to our understanding of why the forests occur where they do. That is apart from environmental factors like precipitation and aspect. I also witnessed first-hand how difficult it is for fire to penetrate forest, and the role of the fire adapted pioneers in the forest margins to absorb the fire impact and to ensure quick recovery of the main forest.

To conclude then, the evidence I found in my research for the book pointed to the following aspects that changed my perception that the Knysna and Tsitsikamma forests may once have occurred more widespread, but was decimated by human needs. The first is that I came to realise the importance of not only environmental factors like topography in the distribution of forests, but also wind-fire patterns, which ensured that fire-adapted fynbos covered a major part of the landscape matrix. Linked to that is the fact that fire seldom penetrates deep into natural forest, which is a commonly accepted fact mentioned in many scientific publications. I was also amazed that I could find almost no evidence of the former destruction wreaked by woodcutters, and found the answer in their single tree selection practice and the forest gap dynamics. Lastly I wondered why such small areas of natural forest made way for other land uses, and the answer appears to be that forest is difficult to remove, and that it only becomes viable where population pressure and land use competition becomes intense. That is the case with the Western Cape milkwood type that occurs in patches along the coast from Groenvlei southwards. The much lower milkwood forests are under pressure, and much easier to clear than the Southern Cape Temperate Forest. Even so, the area of coastal forest removed remains relatively small, but highly significant in the context of the rarity of the Western Cape Milkwood Forest type, and the important ecological and scenic function it fulfils.” (I. Van der Merwe, personal communication, 11 April 2016)

George Parkes:

"Knysna was founded around 1804 by George Rex, a Government employee from Simon's town who was looking for timber for the Naval Shipyard in Simons' town. All our indigenous forest that were indigenous, are still indigenous. The great fire of 1869 burnt large parts of the indigenous forest in the Knysna and George districts and from that fire, "invader" trees like various species of pine and Eucalyptus, as well as Blackwood were planted by the large property owners and sawmillers like Thesen's, ourselves and PJ van Reenen on areas that had burnt down and were cleared by the fire.

Some areas are still recovering from over exploitation that took place in the late 1800's and early 1900's. I can of course only speak for Geo Parkes & Sons and for whom I have no longer worked since 1998. I did however run the indigenous forest / plantations when I worked there. Geo Parkes & Sons work in close co-operation with the Knysna Forestry office of the Department of Agriculture, Forestry and Fisheries – DAFF (Cobrie Vermeulen and her team) and extract from only those compartments that the old Dept. of Forestry (in those days) identified that extraction may take place in. They have over the last 40 plus years worked out an extraction programme that the company follows.”(G. Parkes, personal communication, 17 February 2016)

Graham Durrheim:

“European settlers apparently arrived in the Garden Route area in about the 1750s. Before this the distribution and extent of the forests would have largely been determined by the occurrence of fires in the fynbos, ignited naturally or in some cases possibly by the Khoisan who lived in the area at the time. Forests occurred in areas relatively protected by terrain features and prevailing winds from the periodic fynbos fires.

The European settlers began exploiting the forests in about the 1750s and already in the 1770s the Governor of the Cape expressed concern about the destruction of the forests and appointed someone to oversee the timber exploitation. Some degree of control has been applied ever since, although with varying levels of success. Undoubtedly some areas of forest would have been cleared, although I doubt that it could easily be quantified. In about 1846 the state sold off various areas of worked out forest, at least some of which would have been converted to farmland, or never given the chance to recover to form healthy forest. However, most of the area converted to farmland was probably fynbos. Much of the remaining intact forests were declared state forest land and have probably remained relatively well protected to this day. In some cases where state forest land borders on private agricultural land the natural forest has a very abrupt and straight boundary, which suggests that the forest probably extended further in some places. The great fire of 1869 (and presumably other fires) apparently caused some forest destruction, although difficult to quantify. At least some of the destroyed forest would have recovered over time. A lot of the forest remaining on private land today is on the steeper slopes of the river valleys, which were probably always relatively protected from fires and are not really suitable for agriculture.

Plantation forests of exotic trees were established from the late 1800s. Most of these would have been on fynbos areas, although I have heard of some natural forest being cleared and replaced by plantation on private land. State forest maps dating back to the early 1900s show most natural forests having remarkably similar shapes and sizes as today. With the establishment of plantation forests and agricultural land, much effort has been made to exclude fires from many areas, which has allowed the natural forest to recover and expand in places.

In short, there has undoubtedly been some forest destruction since the arrival of the Europeans in the 1750s, with some areas replaced by farmland and human settlements, but the forests definitely did not cover the entire landscape when they first arrived. The amount of forest loss would be difficult to quantify.” (G. Durrheim, personal communication, 12 February 2016)

Riaan Stander:

“...I do not believe that the forest has changed much. The pine plantations were planted after the war for income and employment.

The only damage to the forest was in the old days, but then the state closed the forests, and as you know it is +/- 80 years ago.

Forestry is also very strict with the harvesting of forest wood. MTO is terribly strict on the harvesting of pine plantations along indigenous forest. If one pine tree, for example, lands on the indigenous forest area, the person responsible is asked to leave the forest, even if it's one of their own workers.” (R. Stander, personal communication, 17 February 2016)

Dr. Wessel Vermeulen:

"I believe that forest distribution did change since European settlement and that some forest areas were lost to other land-uses. However, it is a misperception that the large areas now covered by exotic plantations, agricultural crops and even fynbos, used to be forest.

- Whether an area is suitable for forest development (and the forest type that it can maintain) is determined by habitat. However, where forest is actually found in the landscape, is determined by fire regime and fire distribution patterns. Forest is surrounded by fynbos, a fire driven ecosystem that requires fire to maintain itself. These fires also maintain the forest-fynbos boundary. The absence of fire results in forest expansion, while the opposite occurs during intense fires. Fire and fire distribution patterns thus have a major impact on the distribution and shape of forests and forest patches. (Prof Coert Geldenhuys explains this well in his research).

- The natural climax vegetation in an area is thus not only determined by habitat, but also by fynbos-forest-fire dynamics. One thus cannot look at habitat in isolation to determine the natural climax vegetation type for a specific area.

- An interesting feature of forest in the Garden Route, that relates to the above, is the presence of fynbos islands (i.e. fynbos completely surrounded by forest). The earlier belief was that these islands were man-made and created by the clearing of forest. Research conducted in this field, though, showed that fynbos islands were created by the expansion of forest, isolation fynbos from the "mainland" fynbos.

- In terms of the present situation: With natural fire distribution patterns disrupted (e.g. where fire protection measures are in place, or where fire can't move naturally through the landscape anymore due to the different land type uses (which is the reality, especially for low-land fynbos), forest will expand. Similarly, if the natural fynbos-forest ecotone is disturbed (e.g. covered by invader plants, creating a heavy fuel load) and under extreme weather conditions, fire can result in excessive damage to forest." (W.Vermeulen, personal communication, 15 February 2016)

Dr. Tineke Kraaij:

"The general understanding is that the distribution of indigenous forests has not changed dramatically. Most commercial forestry plantations, farmland and housing developments occur in areas that used to be fynbos. Forests mostly occur in fire-protected sites that are protected from bergwinds, e.g. kloofs, steep south-facing slopes, etc." (T. Kraaij, personal communication, 15 February 2016)

Professor Josua Louw:

"There is a common belief amongst certain environmental activists that much more substantial areas were covered with forest in the 1700-1800's compared with what we see today. This is in my opinion a myth. It is difficult to guess what the extent of forests were before the Holocene (i.e. before the last 10 000 yrs). However, we are fairly certain that the forests were very fragmented in distribution and that the forests of today are close to the same size as during pre-colonial times. However, we must realize that large parts of the forests are of secondary nature, meaning it has regrown after heavy exploitation. There is no evidence to suggest that some species are more or less common. The only significant change would be a change in size-class distribution of trees, with less old-growth. Indigenous forests can be quite invasive if fire is excluded from the landscape. Coert Geldenhuys suggested that the natural appearance of this region was a mosaic

of fynbos and forests, which was primarily determined by wildfire occurrence, and not by soil conditions. The southern Cape landscape, according to old records and other scientific evidence, was a mosaic of mostly fynbos and forest. It is most likely that the open plateau areas were covered with fynbos, due to the reasons described by Geldenhuys. The ecological boundaries between forest and fynbos were determined by wildfire occurrence.” (J. Louw, personal communication, 5 February 2016)

Philip Caveney:

“The indigenous forests of the Cape Colony from Cape Town to Natal (Port Shepstone) were divided into 4 Conservancies, viz. Western (centered in Cape Town), Midland (centred in Knysna), Eastern (centered in King William's Town) and Transkei (centered in Umtata/ Mtata). The forests of each Conservancy suffered varying degrees of over-exploitation, some small sections of forest did not recover, others have, so there is not only one answer to your question. Not all forests suffered from over-exploitation. Some sections of indigenous forest were totally over-worked, mostly in those areas easiest to reach, work and easiest to get timber to the market. In the Midland Conservancy these were around George (east and north) and between Knysna and Plettenberg Bay (de Poort/ Harkerville). The Tzitzikamma Forests east of the Keurbooms River and the Knysna Forests got off relatively lightly due to the difficulty of access and getting timber to the market during the early days of timber extraction (before shipping became the solution for Knysna in 1825 and the Thomas Bain Tzitzikamma Passes opened up the forests there in the 1880's)).

The footprint of the indigenous forests was certainly eroded by deliberate burning, by farmers on the forest margins in order to illegally extend farm land, by early hunters creating 'brands' in the forest to assist hunting of game and also for planting crops, etc. Also by deliberate burning of farm land by the early colonial farmers which they believed would make the land more fertile, accidentally eroding the forest margin. But this was probably not a major contributor to the reduction of the footprints of the forests.

The Forest Reserve in the Midland Conservancy was formally demarcated in the mid 1880's (I don't know the actual date) which now allowed for better control of timber extraction out of the State (then Crown) Forests. The colonial foresters of that time attempted to limit over-exploitation by controlling timber extraction on a rotational basis. They divided the indigenous forests into sections which were then worked on a 40 year cycle, which would allow the forest to recover between each harvesting rotation. But the estimated 40 year rotation was inadequate to sustain the forests, which was exacerbated by the Cape Government's random intervention to extract for timber for railway building (sleepers), telephone communications (poles) etc resulted in more timber being extracted than was sustainable. This did not allow sufficient time to recover, also the forest rotation should have been longer, around 150 years. This activity would, however, not have reduced the forest footprint, the timber content certainly.

The little knowledge I have of the extent of the primeval Midland Forests has been extracted from maps and documents held at the Knysna offices of the Department of Agriculture, Forestry & Fisheries (DAFF). Unfortunately these only date from 1860 onwards but do they show the locations of the indigenous forests at that time.” (P. Caveney, personal communication, 23 February 2016)

Theo Stehle:

“All the areas currently under indigenous forests have fully recovered from past over-exploitation (i.e. before 1939 when the woodcutters were de-registered and the woodcutter system finally came to an end). Of course, there were very large old trees before the woodcutting started in the middle of the 1700s, which don’t occur now, and the number of very big Outeniqua yellowwoods that were cut for mass sleeper production at the turn of the 19th & 20th centuries haven’t been replaced yet, the younger ones (which are abundant) still have to grow up to those proportions. But nowhere in the world will you find exploited natural forests with the sizes of old growth trees having been restored to the same as they had been before they started felling them. By comparison with elsewhere in the world, the Knysna forests are in an excellent condition, near pristine.

Only tiny areas have been worked out to such an extent that one can say they were cleared, but some or probably most of them on the forest fringes have been rehabilitated back to indigenous forest during the 1960s, 1970s and 1980s. Most forest destruction, also only very limited areas, was on private land. It is not certain exactly where these areas were as it happened almost 200 years ago and there are no map records. The valuable main forests that were reserved for their importance as timber resource in the 19th century as crown forests, are basically the same as today. Forests are very resilient if their soils aren’t destroyed, and they will recover even when there was virtually total clearing. Some experimental clearings in the Knysna forest of almost a hundred years ago have recovered fully.” (T. Stehle, personal communication, 24 February 2016)

2. The reason for the narrow strip of forest in the area of Garden of Eden

Professor Coert Geldenhuys:

“If you go to Google Earth and look at the area between Harkerville forest and Knysna Heads, you will see that the Noetzieriver forms a reasonable deep canyon west of the Harkerville forest - it could have contributed to the Harkerville forest being preserved. This part is more than 30 km from the mountains, and the area between the coast and the mountains is much more hilly, so the patterns here are quite different than in the Tsitsikamma. Because of the town and the early settlement of people in this part, etc., the forest patterns are not necessarily natural anymore, but I think that fire contributed to the patterns of little forest in this part. But it is unlikely that the high-lying part of the coast between the Heads and the part before the road down to Noetzie ever had much forest - the northern face of the area is completely exposed to the full force of the bergwinds - one must feel it to can appreciate it.” (C. Geldenhuys, personal communication, 4 February 2016)

Dave Reynell:

"As for the “narrow” bit of forest at the Garden of Eden? It is not narrow at all. If one were to draw a line directly northwards of the Garden of Eden, it would be 10.7 kilometres before one stepped out of the forest into fynbos (Source: Google Earth). Going southwards towards the coast (from the GOE) one would be under the forest canopy for 3.5 kilometres. West to East there is a constriction (width about 1.6 kilometres at Die Poort) and this is probably what the

young man was referring to. The narrowing is dictated by the topography and possibly by historic fire patterns as the forest in this area was bordered by fynbos.

The entire George/Knysna/Tsitsikamma forest complex comprises 903 separate “patches”, these are spread (over +/- 200 kilometres) along the southern slopes of the Outeniqua and Tsitsikamma mountains and, in places of higher rainfall (local topography) out onto the coastal platform. Other tiny patches are found in sheltered hollows.

From the map of the forests in the immediate vicinity (within a radius of about 25 kilometres) of the town of Knysna one can see how the band of forest runs down to the Harkerville cliff coasts in an arc to the east of the town. Why there? If one drives between Knysna and Plettenberg Bay one traverses what geographers call an orographic barrier. In plain language this means that the elevation of the land mass rises a bit (probably about 100 metres) between Knysna and Brackenhill – this is enough to cool the eastward flowing air masses (cold fronts) which mean marginally higher local rainfall. Resulting in a change in the vegetation from fynbos to forest." (D. Reynell, personal communication, 25 February 2016)

Theo Stehle:

“The area of forest at Garden of Eden was always so narrow. Travellers like Le Vaillant in the 18th century describes it in his book, as well as accounts of the murders by roving bands of blacks and Khoi around 1800 where a party of white settlers was ambushed very close to Garden of Eden. No forest was cut back to make way for farming. There was enough open land available to farm without going to the extent to manually try and convert forest to farmland.” (T. Stehle, personal communication, 24 February 2016)

Dr. Tineke Kraaij:

“If you look at the area of Garden of Eden on Google Earth, you will see that it forms part of a much larger stretch of forest – to the south is the Harkerville forest and to the north, the forest complex of Fisantehoek and even linked to Diepwalle forest. It is currently all part of the Garden Route National Park. To the west and east of Garden of Eden, i.e. along the N2 main road, there seems to have been some transformation to farmland and alien plant jungles, but the scale of transformation of forest is small compared to the remaining forests.

Yes, it is quite correct that the current forest footprint is relatively close to the original forest footprint in the Southern Cape and Tsitsikamma. Most of the plantations, farmland and other developments were done in formerly fynbos areas. The forests have suffered to an extent in some places along their edges, been thinned out in some areas due to timber harvesting (but recovering for many decades already), and have small areas that were cleared, but no major destruction on a large scale compared to their current extent.” (T. Kraaij, personal communication, 18 February 2016)

3. Goudveld & Millwood (Goldrush and mining) – What effect did the goldrush have on the forest?

Theo Stehle:

“I know the area intimately having been involved over many years with the restoration and development of the mining relics for tourism. The area around the old Millwood mining town was never indigenous forest, but fynbos, which was planted up later to pine plantations. This I can say with 100% certainty.

In the Jubilee Creek area where alluvial gold digging started before the town of Millwood came into existence, there was limited degradation and destruction of indigenous forest, after which exotic trees were planted into gaps, and which has largely rehabilitated itself over the course of a century.” (T. Stehle, personal communication, 24 February 2016)

4. Woodcutter allotments (forestry villages) - Were these villages built on pieces of land that was forest previously?

Dr. Tineke Kraaij:

“The ‘bosdorpe’ or forestry villages were established when Department of Forestry relocated the wood cutters whom used to log the indigenous forests in order to stop harvesting in the indigenous forests. The state then got these people involved in plantation forestry – it was a job creation project in the 1930/1940s to provide employment to those wood cutters and this is when plantation forestry started at quite a large scale on state land. The other aim was timber production as the government realised that the extent of indigenous forests in South Africa was not sufficient to meet the demand for timber and related products. Again, the forestry villages and plantations were mostly established in former fynbos areas – in the Outeniqua Mountains, most of these villages and plantations occur above the indigenous forests, higher up along the mountain slopes.” (T. Kraaij, personal communication, 19 February 2016)

Jolanda Julyan:

“The area of Fisantehoek had plantations previously, and the area is dangerous. If it burns, the fire can easily get out of control, and pass on to the Little Karoo, and Baviaanskloof. The fire has spread previously from the Langekloof and Baviaans into the forest. Fisantehoek has been inhabited since the 1780s onwards. The wood was kept at Plettenberg Bay inside the old Timber Shed to export it to ships which anchored off-shore in the Bay. If you look at the vegetation in and around Plettenberg Bay, you would understand that trees were harvested at other places. The reasons for this are because the most common tree in the area of Plettenberg Bay was the Keurboom (it was not very useful), and the area around Plettenberg Bay was not forested, it consisted mostly out of open grazing fields for antelope. Fisantehoek was only a forestry station, and there is a hilltop which you can drive out to find the house of the forester which is still there. The formal station closed somewhere in the 1970’s.” (J. Julyan, personal communication, 17 February 2016)

With the strict regulations put in place for indigenous timber harvesting in the 1880’s, the Cape Forestry Department, as part of the woodcutter relocation scheme, started to relocate woodcutters who worked in the forests to pieces of land known as woodcutter allotments. The reason for this was to keep them from harvesting in the Crown forests. The area known today as

Bibbey's Hoek was set out in around 1880 by the Cape Forestry Department. The Sour Flats allotments were on the margins of the forest. Only Bone-fide woodcutters could apply for this land, for which they paid a quitrent. The land was sold at a much later stage. There was an Anglican Church on the premises who assisted with the baptism of children (The people who spoke Dutch lived too far from the town to register and to baptise their children in the NG church). Note: This is also the earliest listed information provided for property sales by the government.” (J. Julyan, personal communication, 20 February 2016)

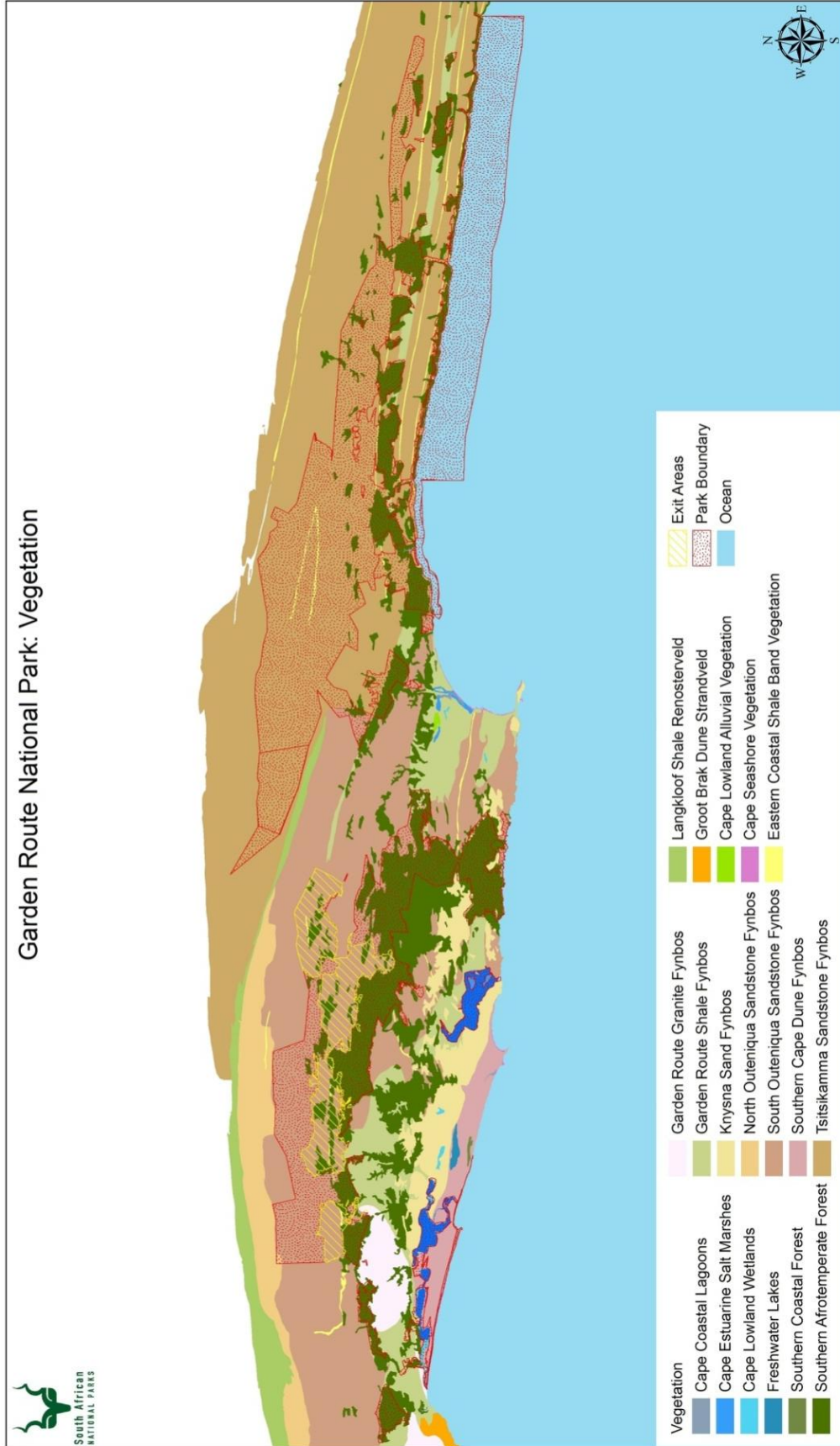
William Cooper:

“Old forest workers told me that settlements such as Rheenendal were open areas (not covered with forest) before people started to live there. The younger generation of foresters were lured to work on plantations after the government closed the indigenous forests. The foresters that were too old to work on plantations (people who previously harvested the indigenous forest) were moved to these areas. The state sold allotments of land in these areas at a later stage to the retired (older) foresters. There they started to cultivate the land and established vegetable gardens. It is a well-known fact that the forest floor has a very thin layer of fertile soil. When uncovered, the soil only stays fertile for a short time (about two seasons). Thereafter, lots of compost needs to be worked into the soil. Inside a forest, the leaves that fall onto the forest floor turns into compost and the trees then live from it.” (W.Cooper, personal communication, 18 February 2016)

B

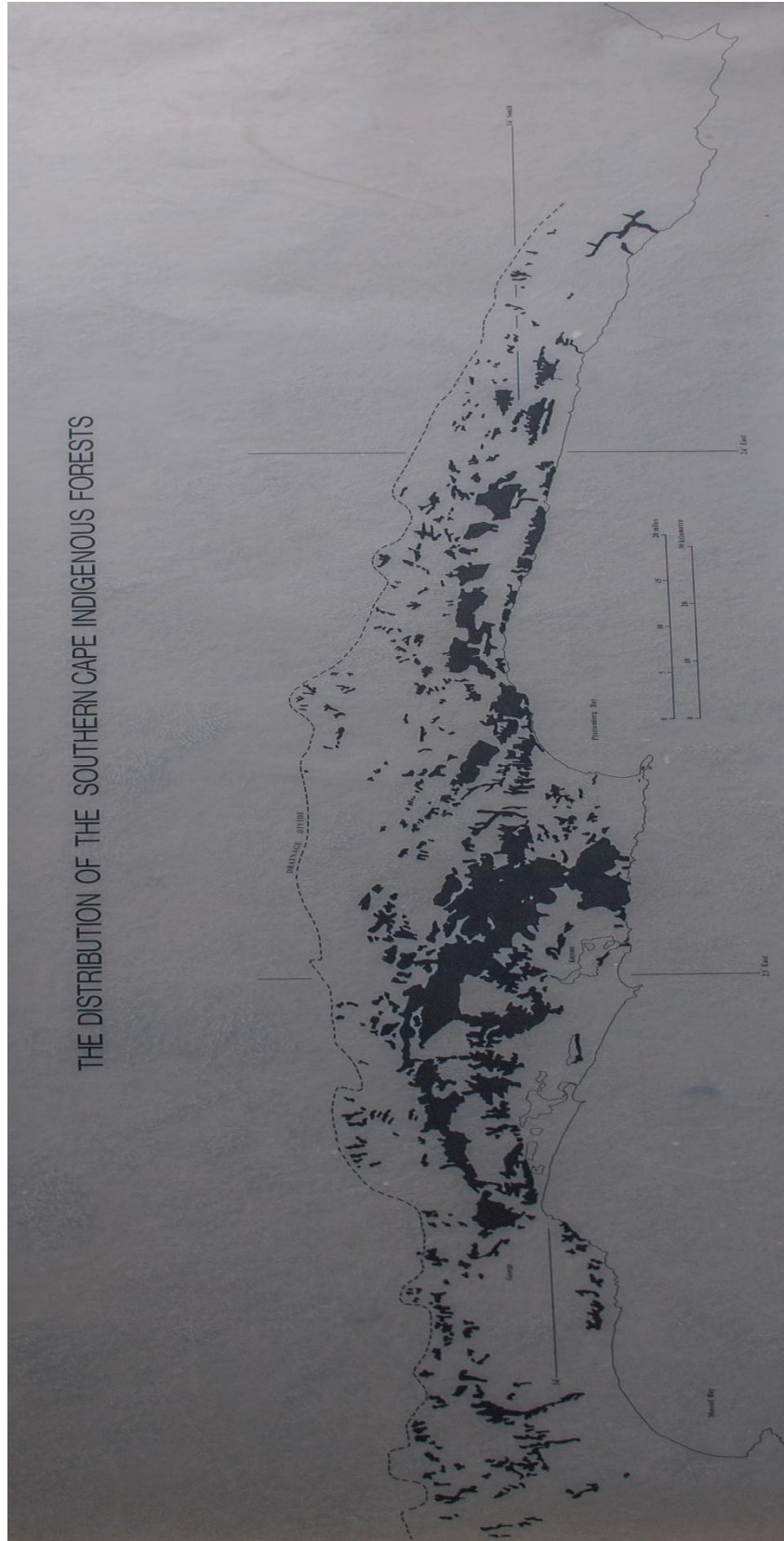
Vegetation map of the Garden route

Source: SANParks



C

Map drawn in 1985 by Dave Reynell

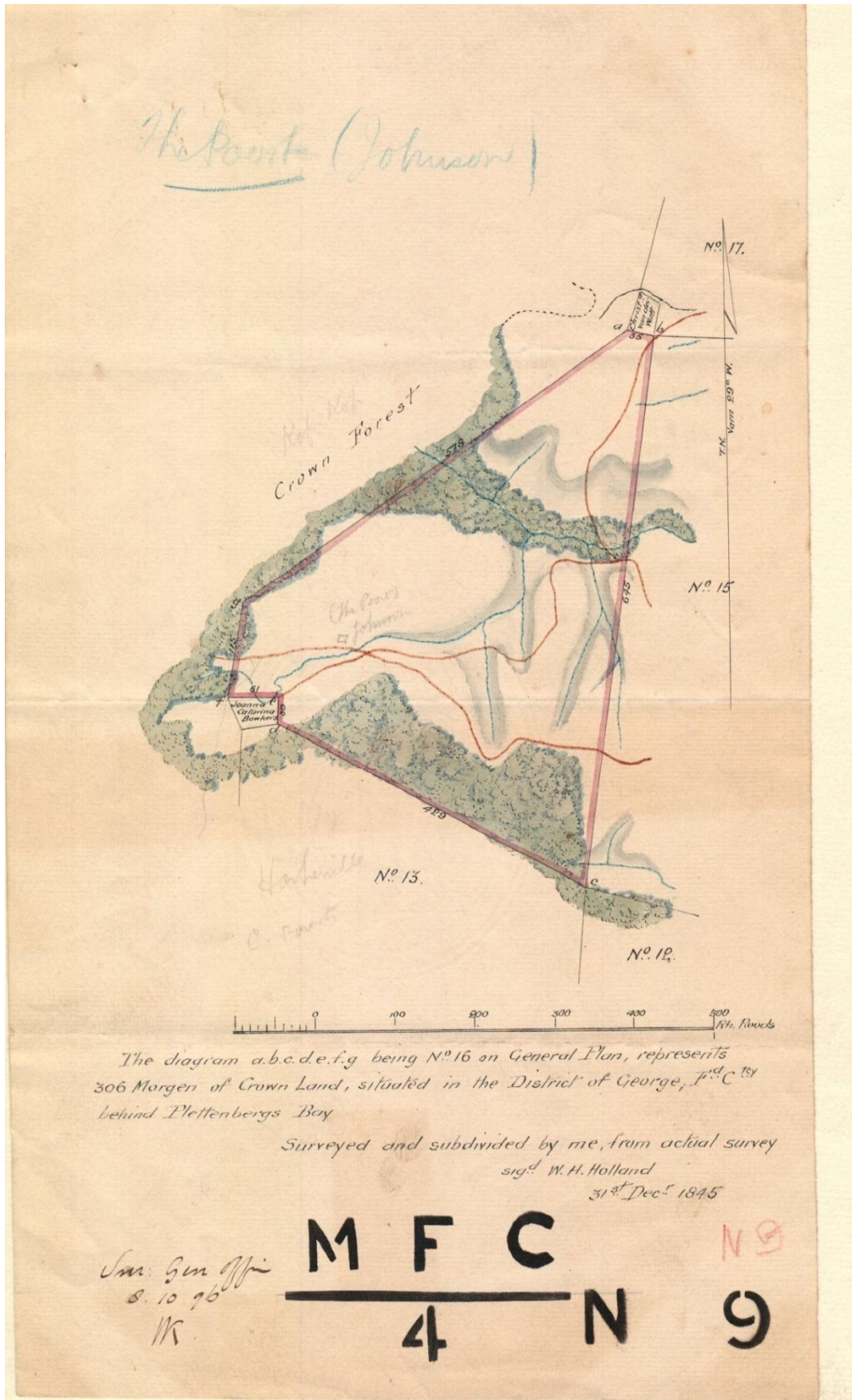


D

Map of De Poort (1845) drawn by WH Holland

Source: DAFF Knysna Archives

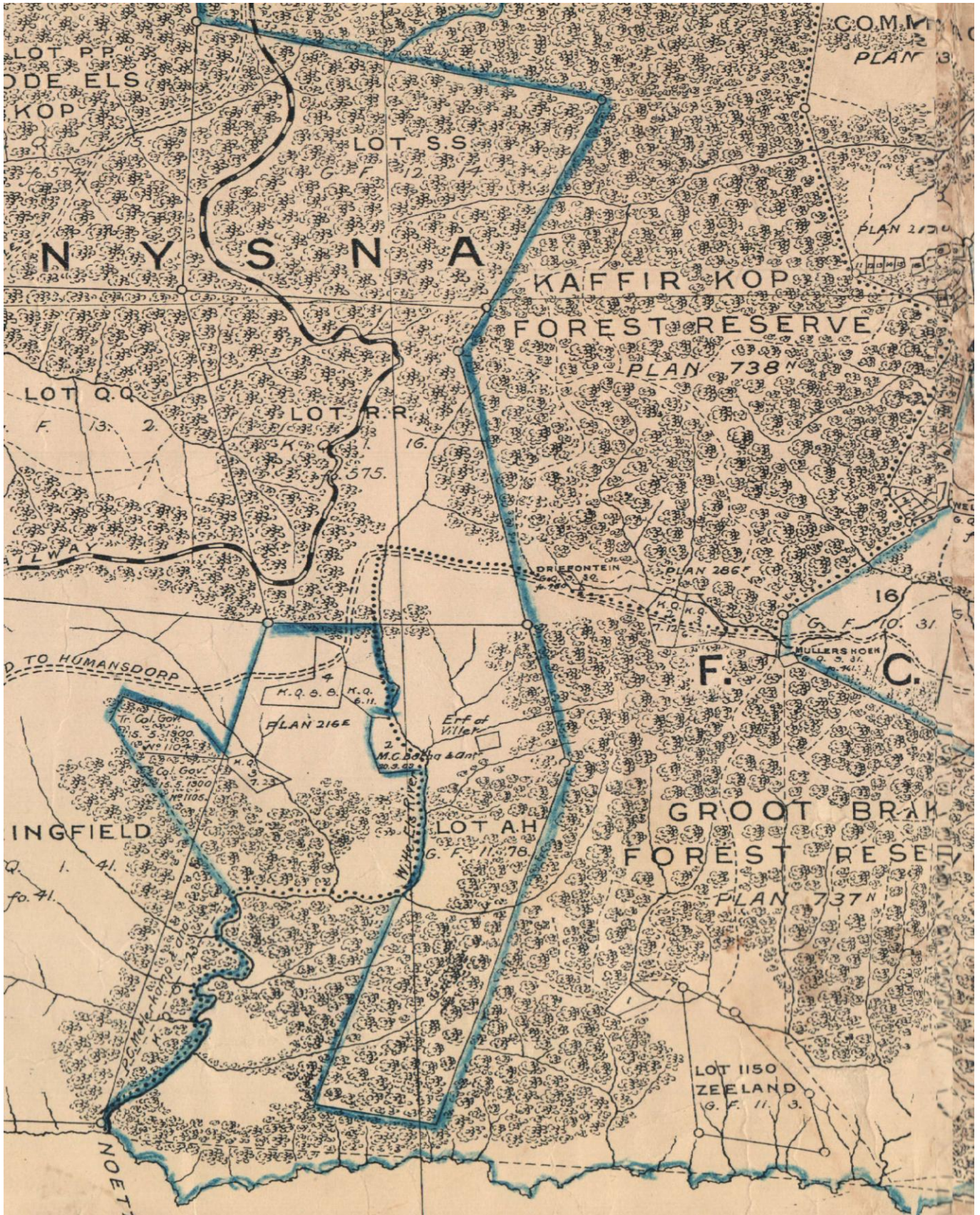
(Little square of land became Muller's Hoek at a later stage. The present Garden of Eden is 500 m west of this spot)



E

Harkerville and Garden of Eden drawing extract (circa 1910)

Source: DAFF Knysna archives

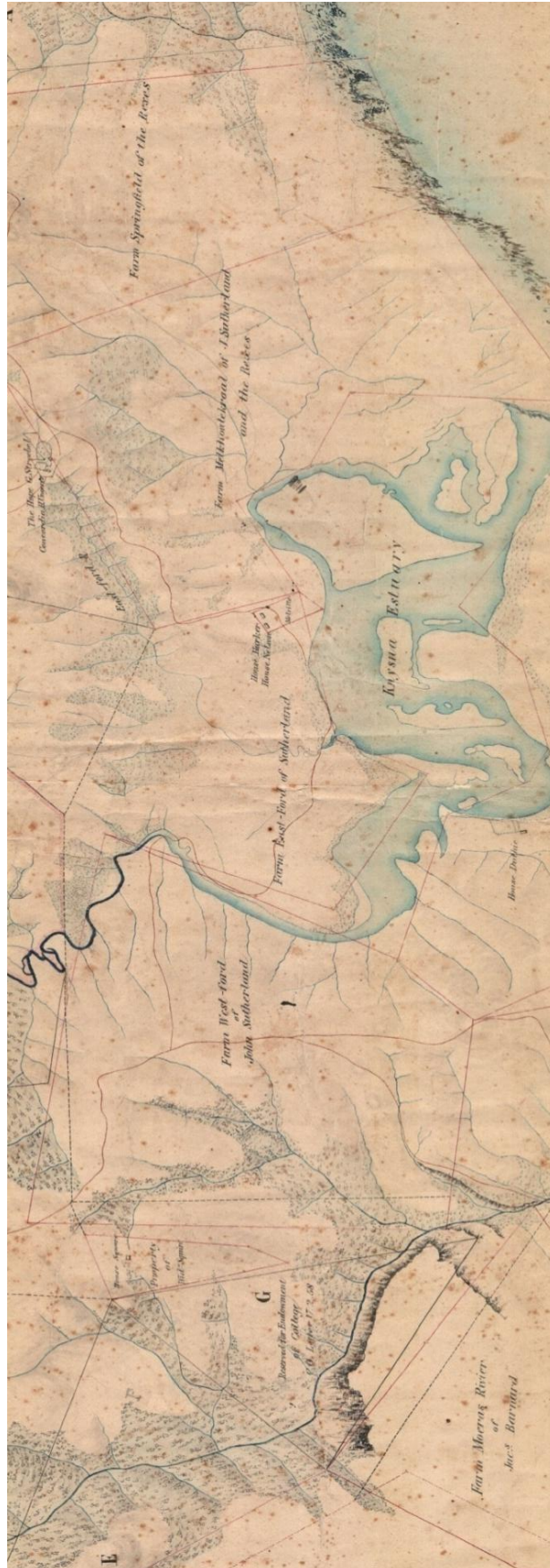


F

Knysna Forest Lots (circa 1860) by JH Ford (a)

Map showing that the area around the town and estuary almost had no forest

Source: DAFF Knysna archives



G

Knysna Forest Lots (circa 1860) by JH Ford (b)

Map showing private ownership of forests and dates of transfer

(Rolf Thesen bought Lot RR in 1876 (Modderhoek farm) now known as Bracken Hill)

Source: DAFF Knysna archives



H

Karatara (1874)

The map below was copied from the: "Plan of Forest Lands in the Divisions of George and Knysna prepared by Surveyor Hollands Compilation of Surveys by Surveyors Ford, Petersen and himself"

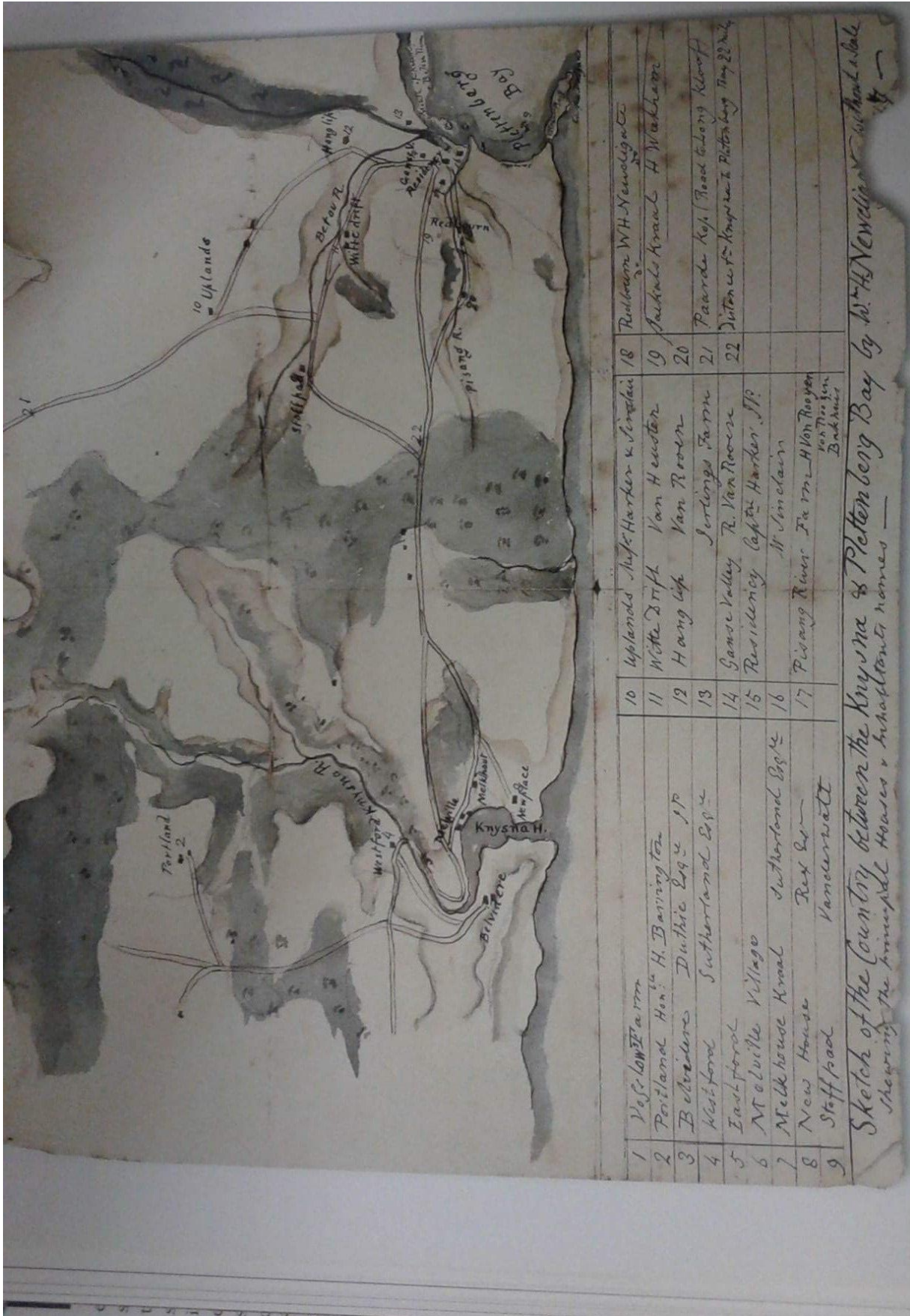
Source: DAFF Knysna archives



I

Map of the Plettenberg Bay-Knysna districts drawn by William Henry Newdigate (circa 1850's)

Source: (Storrar, 2001)



J

Painting by Johannes Schumacher, and writings on the painting by Col Robert Jacob Gordon
(1778)

Source: Rijksmuseum, Amsterdam





Das ist die Landkarte der Stadt und der umliegenden Gegenden. Die Stadt ist in der Mitte zu sehen. Die umliegenden Gegenden sind mit verschiedenen Farben und Zeichen versehen. Die Karte ist von der Hand des Verfassers gezeichnet.

K

The developing town of Millwood (circa 1870's)

Source: DAFF Knysna Archives



L

Fisanthoek Forest

Extract from James Rawbone's 1885 map showing the sections of the Fisanthoek Forest

Source: The Woodcutter Settlements of Knysna: A tale of forests, woodcutters and hardship (Caveney, 2018)

