PRINGLE BAY CONSERVATION MANAGEMENT PLAN

Strategic Goal 1

November 2022

Preamble

Towards the end of 2019 participatory workshops, involving broad community representation, were convened by the Pringle Bay Ratepayer's Association (PBRA) to assist in developing an appropriate strategy for the village. Thereafter, a strategy document was formulated by the Association's committee members. The following vision is presented in the document:

"Motivated by the unspoiled beauty of our village and surrounds, and the warm embracing spirit of its people, our aim is to grow and nurture a life-enriching community who live, work and play in Pringle Bay"

The following five Strategic Goals for making this Vision a reality were developed through this PBRA initiative:

- Goal 1: Preserve our community's distinctive cultural and natural heritage, and unique life-style
- Goal 2: Promote a sustainable local economy that supports the unique life-style of the village
- Goal 3: Influence orderly and sustainable growth and development supporting the uniqueness of the village
- Goal 4: Establish a partnership with the municipality to positively influence the provision of reliable and efficient services, to the benefit of the community
- Goal 5: Secure the village of Pringle Bay by developing and implementing a holistic safety and security solution, using best practices

This *Conservation Management Plan* addresses the first of these strategic goals (Goal 1).

CONTENTS

1 INTRODUCTION

Pringle Bay is located within the UNESCO-accredited Kogelberg Biosphere Reserve (KBR). The reserve, which measures approximately 103 000 hectares, is a reservoir of extra-ordinarily rich biodiversity. A number of towns and villages, including Pringle Bay, are incorporated within its boundaries, as are various economic activities - of which agriculture and tourism are most significant.

As for all biosphere reserves, the overarching management philosophy of the KBR is grounded in coupled social-ecological sustainability principles. While these principles are applicable across the entire KBR, their specific relevance to Pringle Bay requires a related management structure of a scale that is appropriate to the village. For this reason, an application was made for Pringle Bay to be declared a *Conservancy* - which was approved on 17 December 2005. This is significant in terms of how the village is differentiated, on the basis of its particular cultural and natural heritage attributes, from many other coastal villages. The general characteristics of Conservancies, and the philosophy behind coupling their key social and ecological elements, are described in Box 1.

With the above as context, the *Conservation Management Plan* presented here is designed and structured to address the related strategic goal: Strategic Goal 1.

Strategic Goal 1 is defined as follows:

"To preserve our community's distinctive cultural and natural heritage and unique life-style"

As expressed above, the goal comprises three elements:

- Preservation of the community's distinctive *cultural (including historical) heritage*;
- Preservation of the community's distinctive *natural heritage*; and
- Preservation of the *unique lifestyle* enjoyed by residents and visitors

Outline descriptions of the above elements are provided in Sections 2, 3 and 4 of this document. Related management objectives and implementation actions designed to achieve these objectives, are presented in Sections 5, 6 and 7. The document concludes with a series of *Implementation Plans*, which are presented as a set of Appendices. The first of these 2 year plans (Appendix 1.1) covers the period 2021/22.

Box 1: Conservancies - Recognizing the close coupling between human and natural systems

What is a Conservancy?

A conservancy is a vehicle and platform for community-based conservation. It is a voluntary association of environmentally conscious land-owners and land-users who choose to cooperatively manage their natural resources in an environmentally sustainable manner without necessarily changing the land-use of their properties (National Association of Conservancies and Stewardship, South Africa; www.nacssa.co.za).

Conservancies as coupled human and natural systems

Coupled human and natural systems (CHANS; or coupled social-ecological systems [Walker et al. 2004]) or coupled human-environment systems [Turner et al. 2003]) are integrated and complex systems in which humans and nature interact with one another (Liu et al. 2007a). Wildlife are important components of CHANS because they interact with humans in numerous complex ways in today's increasingly human-influenced world. Globally, the continuing conversion of natural ecosystems to areas used intensively by humans has greatly reduced wildlife habitat, leading to an "extinction crisis" (Hoekstra et al. 2005:23). The disappearance of wildlife and their habitats entails the degradation of life-sustaining ecosystem services such as the availability of medicines, control of pests and diseases, and provision of clean water and air (De Groot et al. 2002). Moreover, because people worldwide value nature for numerous reasons (e.g., aesthetic, cultural, religious, economic, educational), the loss of wildlife and their habitats diminishes humans' quality of life (Manfredo et al. 2009, Carter et al. 2012a).

Given these challenges, an integrated CHANS approach for understanding human-wildlife interactions is of utmost importance. Although interactions between people and wildlife have been examined for some time, most studies are compartmentalised within disciplines. There is little knowledge on how people and wildlife are interlinked, across space and through time, from combined social and environmental perspectives, together with the mechanisms that may weaken or strengthen those linkages. Thus, to reach broad, generalizable insights about wildlife dynamics, findings from sites with different ecological, socioeconomic, political, demographic, and/or cultural settings need to be synthesised. Such cross-site syntheses will have significant scientific value and facilitate knowledge exchange among multiple stakeholders, including local residents, managers of natural resources, policy makers, tourists, and researchers. This is critical for developing an array of policies and interventions that improve human wellbeing while sustaining wildlife populations and their habitats.

Worldviews differ markedly with respect to the way people understand the world, and particularly, what it is to be human and the role humans play in that world (Ingold 2000, Descola and Pálsson 2013). The CHANS approach is intended neither to perpetuate one worldview (e.g., people separate from nature) over another, nor to ignore the perceptions and knowledge of certain groups of people. Rather, it is intended to serve as a pragmatic, heuristic tool for analysing interrelationships between people and the environment, seeking to reunite the scientific traditions focusing on particular subsystems. The CHANS framework emphasises that the human and natural components are coupled rather than separate. Furthermore, it emphasises feedback between the components. Collaboration among a range of stakeholders helps CHANS projects build alternative hypotheses and understandings of complex issues.

The above is an extract from Carter et al. (2014)

2 PRESERVING THE COMMUNITY'S DISTINCTIVE CULTURAL HERITAGE

Schoeman (2017) provides a general overview of a number of cultural-historical attributes of the Overberg, including Pringle Bay. The author describes the steep coastal foreland that extends between Gordons Bay and Hangklip as a favoured escape route taken by slaves (drosters), with Drostersgat, situated close to the Buffels River mouth, reported as having been a popular hide-away for these escapees. Also described are the exploratory voyages and coastal surveys undertaken by Admiral Pringle, an 18th century commander of the Simon's Town Royal Navy base. The admiral is reported to have planned the establishment of an agricultural produce export harbour at Pringle Bay, but this never progressed.

The drosters are also mentioned by Smith (2019) who, in his account of the history of Pringle Bay, describes them as one of the earliest resident communities. The land in question, later owned by the Walsh brothers, was on-sold in the early 1930s, to Harold Porter, Jack Clarence and Arthur Youldon. Having prepared a village street map, surveyed a number of erven and built a small internal road system, these developers established the township of Pringle Bay in 1936. The outbreak of the 2nd World War in 1939 upset the development plans, and only a handful of properties were sold. At the conclusion of the war, the Springbok rugby player Jock van Niekerk built the village's first houses, which were clustered alongside Hangklip Road, at the base of Pringle Peak. These buildings now have heritage protection status under the Heritage Resources Act 25 of 1999.

Development of the village was slow initially, only accelerating during the 1990s when electricity was introduced. In 1998, the assignment of World Heritage status to the Kogelberg Biosphere Reserve also contributed to the pace of development.

A few modern-day personalities who have resided in Pringle Bay are mentioned by Schoeman (2017), including South Africa's ground-breaking heart-transplant surgeon, Christiaan Barnard, and respected Afrikaans film-maker, Dirk de Villiers.

Building on Schoeman's descriptions, differentiation is made in the following sections, between the heritage assets of Pringle Bay that date to three periods: pre-colonial, colonial/pre-democratic and modern democratic (Sections 2.1 - 2.3).

> *According to Wikipedia, cultural heritage is described as relating to 'tangible culture (such as buildings, monuments, landscapes, books, works of art and artefacts), intangible culture (such as folklore, traditions, language and knowledge) and natural heritage (including culturally significant landscapes and biodiversity)".*

2.1 Cultural heritage assets of pre-colonial time

Summary timeline for pre-colonial heritage assets

2,000 – 10,000 years ago Khoikhoi artefacts
1,660 AD Slaves hiding out in Drostersgat

There is abundant evidence of pre-colonial occupation of the Pringle Bay environment by Khoikhoi communities. For example, their shell middens are commonly distributed along the coastline, as are a number of rock fish traps. Within the general Hangklip precinct, there is also evidence that these communities occupied various caves.

In the 1600s Pringle Bay provided a refuge for runaway slaves, who used Drostersgat for shelter.


Khoikhoi rock fish traps at Maasbaai, a valuable heritage asset.

2.2 Drive

2.3 Cultural heritage assets of colonial/pre-democratic times

Summary timeline for colonial/pre-democratic heritage assets:

1800's Admiral Pringle looks to establish a harbour at Pringle Bay
1931 Early development in the area
1940 Prison established at Glen Craig
1941 Clarence Drive completed in order to establish coastal defence installations (radar) at Hangklip and Betty's Bay

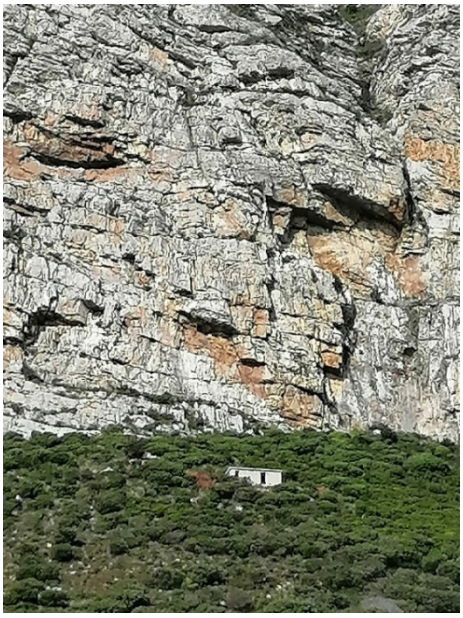
Schoeman (2017) describes the earliest records of exploration in the Hangklip area, the history of property (farm) demarcation, land-ownership transfers and general land-use dating to colonial/pre-democratic times. Arguably, the most interesting structures dating to this period are those associated with the 2nd World War. With the Hangklip precinct having been critical for maritime defence operations, the structures that remain as a record of this period are significant heritage assets for Pringle Bay[1].

An incident that served as the main catalyst for the maritime defence initiatives at Hangklip dates to 8 October 1942 when three German U-boats torpedoed six merchant ships at anchor in Table Bay. In the two years that followed a total of 158 vessels were sunk off the South African coast, mainly by German U-boats.

As a response to this threat, the country developed a novel Radio Detection and Ranging system (radar), which was largely untested technology at the time. This top-secret initiative was accompanied by the establishment of the *South African Special Signal Services* (SSS), which enabled South Africa to put a series of defence-oriented coastal radar stations into operation. Cape Hangklip and Betty's Bay were identified as priorities for the establishment of three such stations.

[1] This overview of WWII radar installations is based on an article authored by Wim Myburgh and Mike Burns, published in the December 2021 issue of the *Pringle Post*.

The first radar station at Hangklip was established in late 1942 in the vicinity of the present-day hotel. Operated by a team of SSS men, the station had a detection range for ships and aircraft of about 80 km. The transmitter comprised a steel tower with an antenna, set up alongside a technical hut, the floor slab of which can be found about 200 m north of the hotel. The receiver antenna was installed in a concrete facility built high on the slopes of Hangklip, where it is still visible tucked up against the base of the cliffs.



World War II Radar receiver hut, constructed beneath the Hangklip cliffs.

The SSS incrementally improved their radar capability at Hangklip, and in 1943 this resulted in the establishment of the Silversands facility. This radar station appears today more or less as it did during operational times. It included buildings that housed an integrated radar transmitter and receiver system and rooms for night shift change-overs. A substantial personnel base was established in the area, where a contingent of SSS women was also accommodated. In late 1943, a third radar station was established at Stony Point in Betty's Bay, with the aim of monitoring aircraft movements. Some of the station's buildings remain in a good state today, incorporated into the Brigadoon assisted living complex.

The *Women's Auxiliary Army Service* (WAAS) was established in 1940 in response to the mobilisation of a great number of the country's men into service in East and North Africa. The women held the status of front-line combatants, which was unique amongst the Allied forces. A number of WAAS personnel were recruited by the SSS, many of whom were posted to Hangklip during the war years.

2.4 Cultural heritage assets of democratic/modern times

Summary timeline for democratic/modern heritage assets:

1998 UNESCO World Heritage site (Kogelberg Biosphere Reserve)
1998 - 2010 Brodie Link established by Brodie Family

The Kogelberg Biosphere Reserve, measuring 103 629 hectares, was the first to be designated in South Africa by UNESCO in December 1998.

The Brodie Link corridor, situated between Pringle Bay and Silversands, at Betty's Bay, was established over a 12 year period between 1998 and 2010. It is the outcome of significant collaborative efforts, involving the Kogelberg Branch of the Botanical Society of South Africa, WWF-SA and Cape Nature (amongst other

parties).The land is owned by WWF-SA, who facilitated the land purchase process, and managed by Cape Nature. Its current designation as a conservation area is aimed at the preservation of its rich biodiversity and at providing a buffer against urban ribbon development, through which the villages of Betty's Bay and Pringle Bay might otherwise have merged. Dr Alan Heydorn, a highly respected resident of Betty's Bay and erstwhile Director of WWF-SA, has written a comprehensive account of how the Brodie Link materialised.

Structures

The most tangible heritage assets of democratic/modern times could include examples of residential, commercial and community buildings. However, there is no reference (or exceptional) style of architecture reflected within any of these structures to which heritage status could be attributed. Although there are examples of architecturally attractive residences, this attribute alone does not equate to heritage value.

There is no common style embedded within the suite of commercial buildings comprising the Central Business District (CBD). Few, if indeed any, have architectural significance or tangible heritage value. However, it is possible that a degree of nostalgic (i.e. intangible) value could be attributed to the names of some institutions rather than the buildings they once occupied.

The small collection of community buildings within the village, including the Community Hall, Fire Station, Church and public conveniences, have neither architectural merit nor heritage value.

2.4.1 Artworks and other artefacts

Whilst Pringle Bay has a reputation of attracting artists, there are no significant public artworks on display within the village. There are some buildings within Pringle Bay, such as La Galerie and Fynbos Enterprises, that reflect a degree of "artistic" touch and a "baboon mural" on the wall of @365, but these are all a reflection of their current or past tenants, rather than a community expression. In summary, there is little if anything within the village that would enjoy the distinction of being classed as culturally valued artefacts.

3 PRESERVING THE COMMUNITY'S DISTINCTIVE NATURAL HERITAGE

The environment in which Pringle Bay is situated is largely defined by the value of its extraordinary natural heritage. It is this value that represents the fundamental *raison d'etre* for the designation of the Kogelberg area (including Pringle Bay) as a UNESCO-accredited Biosphere Reserve.

An explicit aim of Biosphere Reserves is that they should be managed as reservoirs of ecosystem services for the sustained benefit of communities residing within them[2]. In advancing this aim for Pringle Bay, management priority is afforded to the ecosystem services and existence values described below.

[2] Within the discipline of Environmental Ethics arguments are offered that ecosystems should be afforded *intrinsic value*, independent of the services (instrumental values) they provide to humans. In this document, it is assumed that the dialectical tension between intrinsic and instrumental value philosophy does not need to be resolved one way or the other - if management is aimed at promoting environmental sustainability.

What are ecosystem services?

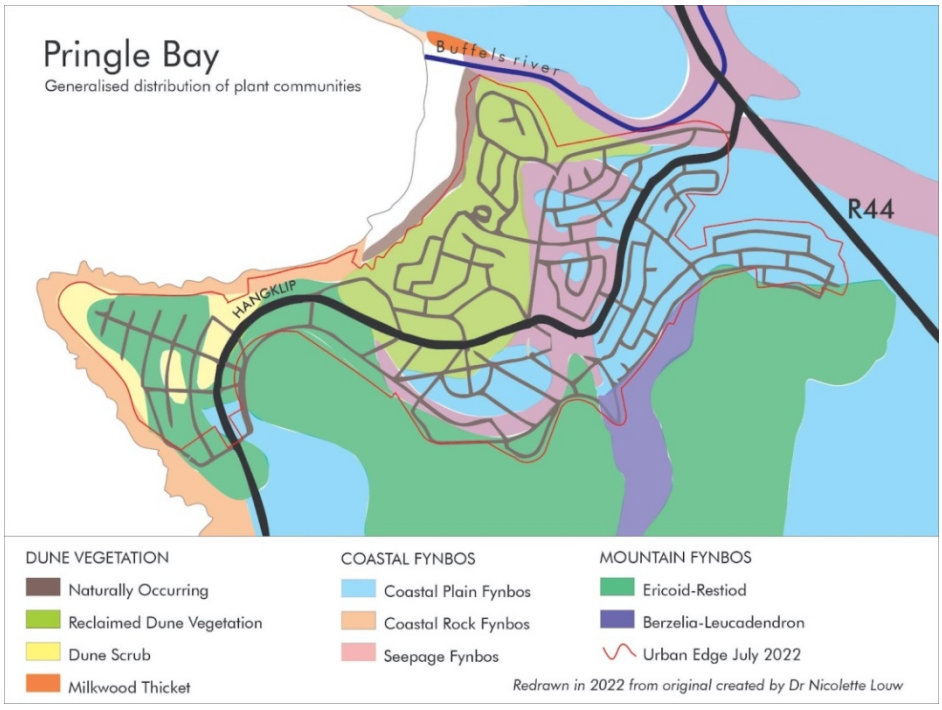
Ecosystem services are the direct and indirect contributions of ecosystems to human well-being. They support, directly or indirectly, human survival and quality of life. Provisioning services are the products obtained from ecosystems, such as food, fresh water, fibre, genetic resources and medicine. Regulating services are defined as the benefits obtained from the regulation of ecosystem processes such as climate regulation, natural hazard regulation, water purification and waste assimilation, pollination or pest control. Habitat services highlight the importance of ecosystems to provide habitat for migratory species and to maintain the viability of gene pools. Cultural services include non-material benefits that people obtain from ecosystems, such as spiritual enrichment, intellectual development, recreation and aesthetic values.

3.1 Habitat services/ecological existence values

It is assumed that the majority of residents, and a significant proportion of visitors, value the terrestrial and marine and littoral ecosystems included within, and encompassing, the village simply becaus they exist; i.e. their existence value. This is in addition to instrumental values associated with these ecosystems (water supply, aesthetic appreciation, recreation, etc.), as described later.

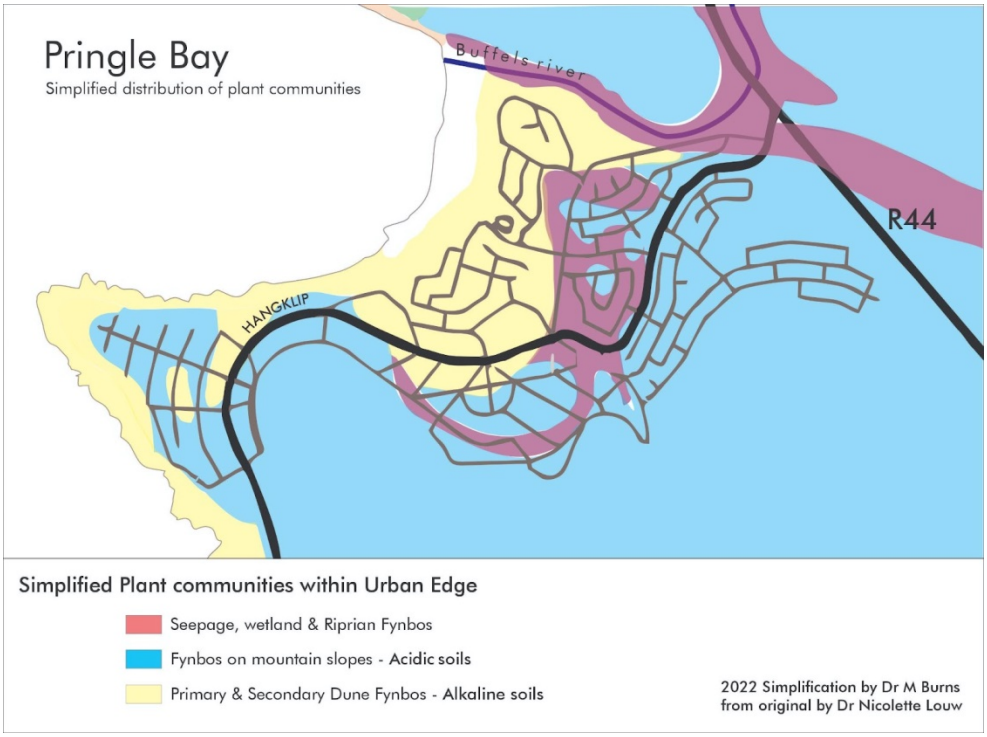
3.1.1 Terrestrial ecosystems

Boucher (1972) describes in detail the distribution and ecological characteristics of the different fynbos and other vegetation types that occur within and surrounding the village. Key environmental determinants in this regard include soil types, with their structural and chemical characteristics attributable to the different geological formations from which they originate (e.g. sandstone, shale, tillite, aeolianite), geological faulting, weathering effects and topography (e.g. slope and aspect, affecting drainage and temperature respectively, etc.).



Generalised distribution of vegetation and land-cover types at Pringle Bay

For the purposes of management, the complexity of the vegetation can be reduced to a simpler classification, including: Fynbos on mountain slopes and lowland rocky outcrops (moistly on acidic sandstone-derived soils; some on shale-derived soils); primary and secondary dune fynbos (on alkaline soils of marine and aeolian origin); wetland seeps (often on peaty soils above an impermeable rock layer); riparian mixed palmiet and *Metrosideros* thicket; Milkwood-dominated dune forest; and dense stands of alien invasive species.



Simplified map of fynbos and wetland vegetation types at Pringle Bay

Although some vegetation types could be perceived as ecologically more significant than others, for example on the basis of the relative diversity of species they contain, each of the vegetation types is considered equally significant in terms of their contribution to the complex whole. An obvious exception in this regard is the alien invasive vegetation that has been allowed to establish densely in many places. The anthropogenic origin of secondary dune fynbos places it in a category of ecological significance that could be ranked somewhat lower than other primary vegetation types.

Fynbos

All three of the fynbos vegetation types referred to above are maintained by fire and (*inter alia*) ecological interactions with the faunal communities that they support (e.g. pollination and seed distribution). Van Wilgen et al. (2010) describe fynbos as adapted to a fire regime with a return period of between 10 and 15 years. This allows populations of both seeding and re-sprouting species, for example belonging to the Proteaceae family, to propagate successfully. Critical symbiotic relationships (e.g. involving pollinators) also make contributions in this regard.

Where fires within fynbos occur too frequently, this leads to a loss of slow maturing re-seeding species, which has knock-on implications for birds, rodents, etc. Impacts also result where fires of considerable extent occur, such as the catastrophic Pringle Bay/Betty's Bay fire of January 2019 - coupled with the almost adjacent Highlands/Kleinmond fire of January 2022. In such instances, where mosaics of differently-aged stands of fynbos are absent, the feeding habitats, for example, of sugarbirds and sunbirds are compromised.

Although short return period fires are ecologically harmful, multi-decadal exclusion of fires from fynbos is just as problematic. In the absence of fire, species diversity (plants and animals) diminishes, associated with the transition to a low diversity woody shrub-thicket that develops. When this vegetation inevitably does burn, the intensity and severity of the fires, attributable to high fuel loads, present serious risks to human safety and the security of houses and other infrastructure (e.g. electricity and water supply). Some stands of this form of ageing fynbos occur within the village, including on public open spaces where fire has been excluded for security reasons (deferred, rather than actually mitigated risk).

Similar to fire, connectedness within tracts of fynbos is an important ecological determinant (e.g. enabling habitat-restricted pollinators to function optimally, to provide for safe faunal migration corridors, to reduce edge effects and the potential for encroachment of alien invasive species, etc.). Habitat fragmentation can have a severe ecologically compromising effect.

A good example of a vegetated road verge (eco corridor). In the absence of fire, the vegetation would need to be selectively cut back from time to time.

Fynbos cannot support herds of large mammals (www.whalecoast.info) since the nutrient-poor soils on which it grows do not provide enough nitrogen for the protein requirements of large mammals. However, a variety of smaller mammals are well adapted to fynbos, including the chacma baboon, Cape leopard, rock Hyrax, klipspringer, grysbok, mongoose, genet, badger, rodents such as the porcupine and striped mouse (to name just a few).

Examples of Pringle Bay wildlife

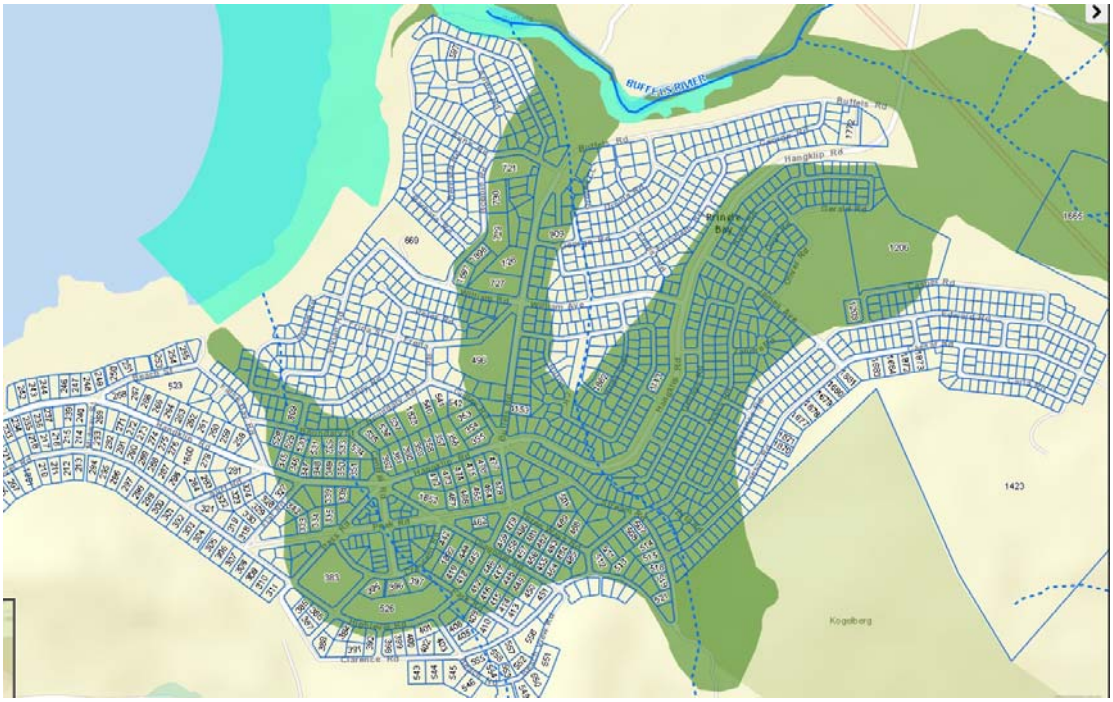
Fynbos does not support high numbers of birds, but all seven bird species endemic to the south-west Cape are fynbos species, e.g. the Cape sugarbird and orange breasted sunbird. These two birds are found only in fynbos and play an important role in pollinating flowers, including those of heaths (ericas) and proteas, from which they drink nectar. Another very common sunbird frequenting the fynbos biome, is the lesser double collared sunbird. The other endemic species are the Cape rockjumper, Victorin's warbler, Protea canary, Cape siskin and Fynbos buttonquail.

Cape Sugarbird, an important fynbos pollinator species. Photo credit: Jenny Parsons

Fynbos also supports large numbers of butterfly species. Many are at risk, however, especially the myrmecophilous (ant associated) butterflies from the family Lycaenidae. The early stages (larvae) of many of these butterfly species are entirely carnivorous and live on a diet of ant brood. The butterfly larvae actually live inside the nest of their host ant. Myrmecophilous butterflies are at threat because they require the presence of both host ant and host plant as well as optimal climatic conditions. Thus the disturbance of their preferred habitat, often not larger than a tennis court, could lead to the extinction of a rare species confined to a single location.

Although fynbos is not particularly rich in reptiles and amphibians, many of the species living there are both endemic and threatened. The very rare geometric tortoise is found in only a few surviving fynbos areas and is regarded as the world's second rarest tortoise.

The Cape has more than half of South Africa's frog species. Furthermore, of the 62 different frogs occurring here, 29 are endemic being found nowhere else on earth. With the widespread occurrence of alien invasive vegetation, which consumes more water than indigenous fynbos plants, and urban development many habitats are shrinking leading to local extinction of certain species.



Extent of officially mapped wetlands in Pringle Bay (Source: National Wetland Map, Captured August 2022)

Seeps and riparian shrubland and forest

Hydrology, more than fire, makes an essential contribution to the ecology of Pringle Bay's two main wetland vegetation types and their associated faunal communities, notably amphibia. These include wetland seeps and riparian shrub and forest habitat. The seeps on the coastal plain are hydraulically closely coupled with higher altitude seeps which, although vulnerable to invasion by alien invasive plants (e.g. pine species spreading into mountain habitats), exist in states that are relatively unaffected by development. Within the urban footprint of the village, however, there has been a very significant loss of seeps due to clearing of properties for construction.

Example of a seep (or peat bog) within Pringle Bay, which provides habitat to a number of endemic frog species.

There are a number of endemic animal species that occur in the local seeps, some of which are under threat. These include the micro frog and Cape platanna.

Modification of natural hydrological regimes (i.e. diminished total and especially summer seasonal flow), aggravated by high intensity wildfires and infestations of Australian acacias and eucalypts, are the main impact affecting the ecological integrity of riparian shrub and forest (e.g. established along the lower reaches of the Buffels River). The vegetation is relatively resilient against fire, including the dominant tree species, *Metrosideros*, which is able to regenerate through coppicing. Post-fire re-establishment is typically initiated through the emergence of *Psoralea* (fonteinbos) as a dominant pioneer species.

In the case of Milkwood-dominated forest, alkaline soils of marine origin, a slightly elevated average air temperature attributable to ocean proximity, and relative protection from fire (the open water of the Buffels estuary, rocky outcrops) are key determinants to which its establishment and persistence can be attributed. Although the forest canopy does not burn easily, fires of high intensity and severity can cause significant die-back of the above-ground biomass. However, most trees recover through coppicing, which produces a multi-stemmed thicket that advances towards forest again, over many decades. This cycle of die-back and coppicing creates forest trees that are likely several hundred years old.

Alien Invasive plants pose a number of threats to Pringle Bay's coupled natural and social environments. The local occurrence of alien invasive species can be traced to three main sources: (i) The introduction of Australian acacias (e.g. Rooikrans and Port Jackson) and other species (e.g. Spidergum) to the area in the mid-20th century for the purpose of dune stabilisation (discussed elsewhere); (ii) the escape, through the distribution of winged seeds, of pines (mainly Monterrey and cluster pine), Black Wattle and eucalypts from nearby State Forests (e.g. Highlands State Forest); and, (iii) the escape of species planted as garden ornamentals (e.g. Australian myrtle).

Pinus radiata (Monterey Pine) invading the catchment of the Buffels River in its lower reaches.

A number of significant impacts are attributable to alien invasive species. These include the loss of natural biodiversity (diminished ecosystem services provided by fynbos flora and fauna - discussed elsewhere) which is crowded out and replaced with dense monospecific stands of Australian acacias, for example, Rooikrans and Port Jackson. Alien invasive species reduce water yields from mountain catchments as a result of their high levels of transpiration, which is a function of their generally greater mass (mostly, they are leafy trees rather than low sclerophyllous shrubs) and deeper root systems (Le Maitre et al., 2016). In the case of wildfires, the increased loads of flammable fuel associated with alien invasive vegetation increases fire intensity and severity, posing risks to infrastructure and human safety and to post-fire environmental restoration (e.g. due to soil damage).

3.1.2 Marine and littoral ecosystems

The primary marine and littoral ecosystems of Pringle Bay include: rocky shores, kelp forests, deep water nearshore reefs, the Buffels River estuary and a remnant highly modified coastal dune system adjoining the sandy beach.

Rocky shores

As described by Branch and Branch (1981), the ecological characteristics of rocky shore communities are most directly determined by tidal influences. The distribution (zonation) of assemblages of plants (e.g. algae) and animals (e.g. barnacles, limpets, mussels) is determined by their relative exposure to water and air (including the effects of desiccation) in the course of rising and falling tides. Some assemblages thrive at higher elevations relative to tidal reach, others thrive at lower elevations.

Typical intertidal rocky shore ecosystem

As for terrestrial ecosystems, Pringle Bay's rocky shores have proved vulnerable to alien invasive species, with the Mediterranean mussel (*Mytilus galloprovincialis*) now dominant, at the expense of the indigenous black mussel (*Choromytilus meridionalis*).

Kelp forests

Kelp contributes significantly to the marine and littoral ecosystems of which they are part. As primary producers in marine food chains, kelp beds continuously shed small particles of plant material from their fronds, which are consumed by organisms, ranging from tiny bacteria to larger filter feeders such as mussels. At Pringle Bay, kelp forests of *Ecklonia maxima* occur within the sub-tidal reef environment up to approximately 15 m water depth. There is a host of species associated with the kelp, including other algae, corals, sponges, red-bait, octopus, mussels, starfish, sea urchins, sea cucumbers, whelks, anemones, limpets, alikreukel (turban shells), klipvis, abalone and rock lobster (to name just a few).

Reef-associated kelp forests, established along Pringle Bay's shoreline

Reimers et al (2014) describe the easterly spread of Kelp into habitats that it never previously occupied. As it is naturally a cold water species, this phenomenon might be explained by recent changes (decrease) in average seawater temperature. The phenomenon of expanding kelp beds can also be explained by major changes in the integrated ecological dynamics between sea urchins, abalone and rock lobster.

Although having been always present within the kelp beds of Pringle Bay, it is only during the last 40 years or so that rock lobster has occurred locally in relatively high numbers. Similar to kelp, they have extended their range towards the east from the Cape West Coast. Sea urchins, which feed on kelp sporelings, are a favoured food species of rock lobster, implying that, since the increase in the size of the rock lobster population, a reduction in the number of sea urchins has allowed juvenile kelp to grow in greater abundance than previously.

Juvenile abalone, which also graze on kelp sporelings, naturally benefit from the protection afforded them by sea urchins. In the absence of this protection, they are more exposed to predators and their population has likely decreased as a consequence, which might have favoured the growth of kelp (i.e. under decreased grazing pressure). Coinciding with the set of natural dynamics that have placed abalone under stress is the emergence of 'industrial scale' poaching. A likely consequence of this is the extinction of the species.

In ways that are similar to human impacts on abalone, overfishing of long-lived and slow maturing reef fish species has drastically depleted their populations locally.

Sandy beaches

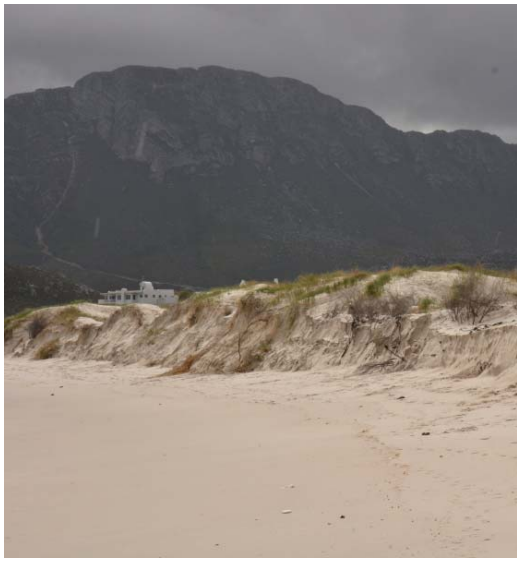
Pringle Bay's main sandy beach would have naturally been maintained by a set of dynamic interactions involving the back-and-forth transfer of a more or less fixed quantity of marine sediment between the nearshore breaker zone, the inter-tidal swash zone, the back beach environment and the adjoining coastal dune system. Aeolian processes accounted for the two-way exchange of sediment between the beach and dunes (described in more detail later).

The beach varies from gently sloping, along the most sheltered south-western section, to occasionally quite steeply sloping, along the central and north-eastern sections. Beach slope is directly correlated with wave energy, indicating that the central and north-eastern sections are the most exposed in this regard. The effects of wave refraction around Pringle Point account for this variation in wave energy.

Pringle Bay's main sandy beach ecosystem

The state of the beach, including its width and slope, varies considerably between seasons. Typically during winter, when the wave energy associated with frontal storms is greatest, the beach is subject to erosion and is generally narrower and steeper than in summer. Beach sediment that is eroded by winter storm waves is deposited in an offshore bar within the breaker zone, which has a buffering effect against continued beach erosion by absorbing much of the wave energy. Under low wave energy conditions, typically in summer, sediment that is brought into suspension off the bar by the breakers is moved slowly onshore. Here it is deposited to re-establish the original beach profile, which once again becomes wider and more gently sloping.

Under extreme conditions, the foredunes adjoining the beach may be exposed to erosion by high energy waves. The eroded dune sediment is also deposited in the offshore bar, together with the material that is temporarily lost from the beach.



Natural storm wave erosion of the foredune at Pringle Bay, August 2017

It has been calculated that approximately five percent of the volume of kelp fronds is shed as large pieces of plant debris, which includes the storm wrack deposited seasonally on Pringle Bay's beach (Branch and Branch, 1981). Here, as in the marine environment, kelp makes a number of very important contributions to the sandy beach ecosystem.

Kelp debris, including the heaped lines of storm-wrack that accumulate along the spring high tide mark, traps wind-blown sand, ensuring that this volume is held within the littoral active zone. Often, small ephemeral dunes form in this way, either to be eroded away later by wave action or to become naturally stabilised by pioneer dune plants, such as sea pumpkin and sea wheat. Where the natural dynamics of coastal dunes have been disrupted, for example, by artificial dune stabilisation using invasive Australian acacias (such as at Pringle Bay; see later), the contribution of stranded kelp to the physical dynamics of the affected beaches and dunes is particularly important.

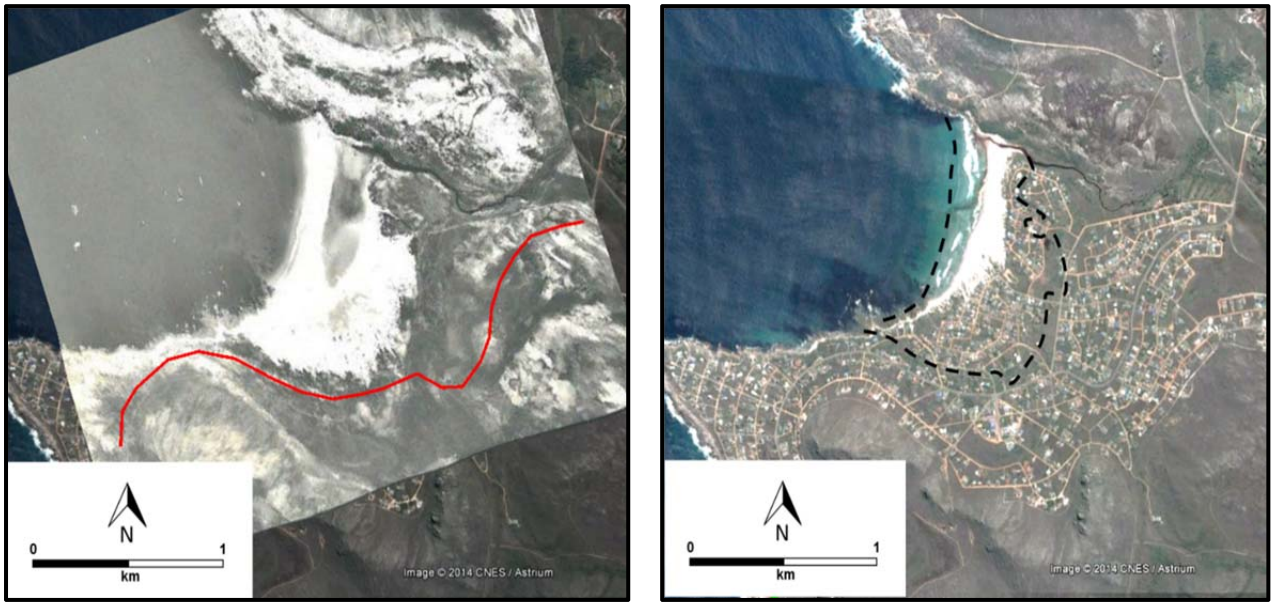
Kelp sustains very large populations of sand hoppers and amphipods, whose life-cycles are closely connected to the occasions when storm wrack accumulates on the shore, which is most commonly during winter. It has been calculated that sandhoppers consume up to 315 kg of dry kelp per linear metre of beach, annually. At this unit level of activity, they have been found to produce up to 151 kg of faeces, the nutrients of which drain back into the marine environment to contribute to a variety of nearshore ecological food chains. Sandhoppers are also a critical source of food for beach-associated birds such as Sand plovers and Sanderlings, which can individually consume up to 300 sandhoppers per hour (Branch and Branch, 1981).

The beach provides a resting, and occasional roosting, habitat for gulls and terns. The black oystercatcher, which nests along the kelp wrack line, is an iconic species whose breeding success can symbolise the sustainability of human-environment relationships pertaining to the Pringle Bay beach.

Coastal dunes

Pringle Bay's coastal dunes, established immediately landward of the main sandy beach, are highly modified remnants of what was once an extensive mobile dune system. In its natural state, it shared many characteristics with the mobile dunes that once linked the beach at Silversands (Betty's Bay) with Grootbaai (Maasbaai) and which also extended partly into Brodie's Link. Similar to the limited number of other mobile coastal dunefield of the Western Cape, these systems were unique in terms of their ecology.

During the 1960s the Pringle Bay and Silversands dune fields were artificially stabilised with Australian acacias, mainly *A. cyclops* (Rooikrans) and *A. saligna* (Port Jackson). Nationally, at the time, the rationale for the stabilisation of mobile coastal dunes was that they appeared to be wastelands of low value, for example, for agriculture. In the case of Pringle Bay, dune stabilisation was also aimed at expanding urban development potential beyond the original small footprint of the village (which was initially clustered towards the Point) to create what was called Beryl's Bay. Stabilisation of the dunes did indeed enable expansion of development; however, this was accompanied by a number of unintended consequences - additional to the obvious loss of a natural mobile dune ecosystem.

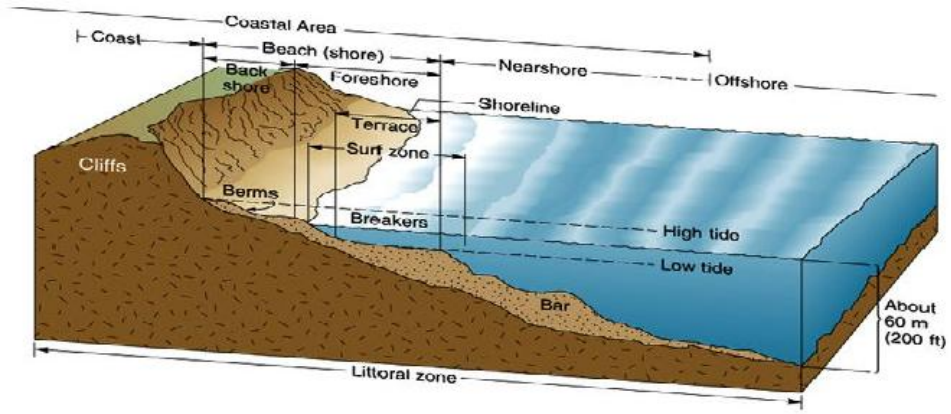


Left: 1938 aerial photograph of Pringle Bay draped over recent Google Earth imagery, showing the present-day Hangklip Road (red line) for reference. Right: The extent of the dune-field in 1938 (stippled line) overlain on a recent Google Earth image (The beach and remnant dunes now cover an area of only 20% of their previous extent; note the landward retreat of the high water mark). Graphics credit: Roger Parsons

The most dramatic environmental response to the stabilisation of the dunes has been the landward retreat of the mean high water mark and the adjoining beach by more than 100 m. An explanation of the post-stabilisation shoreline dynamics was first provided by CSIR in 1988. This CSIR study was commissioned by the Caledon Divisional Council, based on concerns relating to the risk to town infrastructure posed by the landward shoreline retreat. The findings of the 1988 study were confirmed in 2015, when a professional assessment was commissioned by the Overstrand District Municipality, in partnership with the PBRA. The study was deemed necessary due to unresolved concerns relating to the recreational value of the beach and risks to infrastructure attributable to the apparent continued landward retreat of the shoreline. The December 2021 edition of the Pringle Post provides a comprehensive overview of this environmental issue. The 2015 report has been accepted for implementation by both the PBRA and Overstrand Municipality (it can be viewed at www.pringlebayratepayers.co.za/BMP2015.pdf). Prior to the stabilisation of the mobile dunefield, beach sand that was blown into the system by north-westerly winds was returned to the beach by opposing south-easterlies. The stability of the shoreline was, therefore, maintained by these balanced aeolian sediment transport dynamics. However, once the dunefield was stabilised, sand blown by the north-westerly winds into, and trapped by, the Rooikrans thicket could no longer be entrained by the south-easterlies and returned to the beach. In this situation, the littoral active zone experienced a net sediment deficit, and the landward retreat of the high water mark, and a narrowing of the recreation beach, were the inevitable consequences.

As development proceeded, Rooikrans was eradicated across much of Pringle Bay's once mobile dune system. In its place, secondary dune fynbos became established, characterised by species such as blombos,

waxberry, bietou, gonnabos (*Passerina* species) and restios. Although Rooikrans still dominates much of the Silversands-Grootbaai corridor, secondary dune fynbos also now occurs there. In a situation where an increasing proportion of the lowland village environment is occupied by structures, this secondary vegetation is utilised as habitat by a variety of indigenous fauna.



Key features of the littoral zone

Deepwater reefs

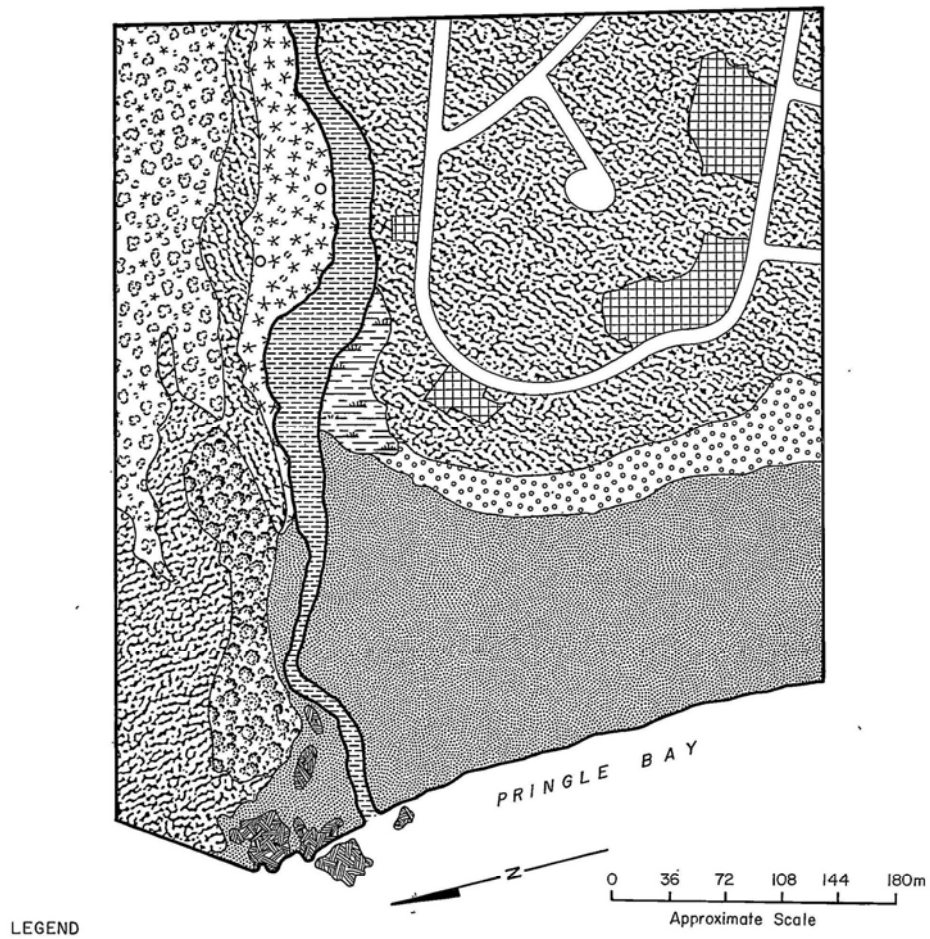
The deepwater (approx. 40m) nearshore reefs offshore of Pringle Bay, Hangklip and Betty's Bay support an extraordinary diversity of species, of which many are endemic (Bill Liltveldt, pers comm). In this regard, they are far more significant than equivalent nearby reefs, for example, offshore of Danger Point and Cape Agulhas.

Buffels River estuary

There has been only one comprehensive ecological study of the Buffels River estuary (CSIR, 1982). A review of this study and a qualitative assessment of the current state of the estuary is presented in the August 2021 edition of the Pringle Post. Influenced by tidal exchanges of seawater and a throughflow of freshwater originating from the Buffels River catchment, the estuary was previously considered to be in a healthy ecological state. Although the diversity of estuarine vegetation (e.g. sedges, salt-tolerant reeds) and aquatic fauna (e.g. bait organisms such as sand prawns) is quite limited, this is normal for a small system such as the Buffels. The estuary provides an important habitat for the Cape clawless otter (*Aonyx capensis*).

Changes to the hydrology of the Buffels River, following construction of the Buffels Dam in 1971, has transformed its estuary into a seasonally closed-mouth system, typically during late summer. Breaching of its mouth follows the onset of winter rains

The most significant change to the estuary over the past 50 years is its altered hydrology, attributable to the construction of the Buffels Dam in 1971. Prior to the construction of the dam, under a natural hydrological flow regime, the estuary would have had a near-permanent open mouth; i.e. fresh- and tidal sea-water flows through the system would have sustained estuarine conditions perennially. As a result of the abstraction of water from the dam, the estuary mouth now closes between mid/late summer and the onset of the winter rainy season. This will likely have triggered an as yet undetermined suite of ecological impacts and, possibly, deterioration in water quality, *inter alia* affecting recreational use of the estuary. This is one obvious consequence of an allocation not having been made to meet the river's ecological water demand.



In 2021 the reservoir facilities located above Caesar Road in Pringle Bay were recently increased in volume to meet increasing demand. This will no doubt compound the ecological impacts on the Buffels estuary.

Key physical and biotic features of the Buffels estuary mapped by CSIR (1982), using aerial photography dated April 1979. This provides a baseline against which future management outcomes can be gauged.

3.2 Provisioning services

3.2.1 Sustained supply of good quality water

Pringle Bay sources its water from the upper catchment of the Buffels River. With almost no development within the catchment, the water that is impounded within the Buffels Dam is of excellent quality. In terms of quantity, the dam's location and design features (e.g. its small area-to-depth ratio, which limits evaporation losses) has ensured a sustained supply of water for decades.

Buffels River dam, which supplies water of excellent quality to the Hangklip villages. Photo credit: Jenny Parsons.

Although there are no imminent risks to the quality of water sourced from the Buffels Dam, there are several variables that will increasingly affect the sustainability of supply. Amongst these, effects attributable to climate change, growth in the resident population, water losses through ageing infrastructure and alien invasive vegetation are most prominent.

Climate change: The prolonged drought that culminated in the 2018 "Day Zero" scenario for Cape Town provides an indication of what is likely to be repeated as climate change manifests through lower average rainfall and higher average temperatures across the Western Cape. Scientifically credible results of climate change modelling indicate a high probability of this. Over time, there will likely be less run-off available for impoundment within the Buffels Dam.

Population growth: The increase in water demand that can be expected over time, associated with an increase in the size of the resident population, will steadily impose constraints on water supply.

Water wastage: A significant volume of water that flows into the village reticulation systems is lost through pipe bursts attributable to ageing infrastructure. A comparison between the volume of water treated at the Buffels water treatment works for village consumption and the total metered volume of water that is used indicates that losses through pipeline failures exceed 50% of the total supply. This situation is expected to improve as progress is made replacing pipeline systems within the village and the main pipeline that supplies Rooiels with water.

Alien invasive vegetation: In the Western Cape, the encroachment of alien invasive plants into river catchments (basins) is known to seriously compromise water yields. Especially pine species, but also eucalypts and Black Wattle, which occur within Buffels River catchment, pose serious risks in this regard due to their much higher uptake of water than natural fynbos (Le Maitre et al., 2016).

The privilege of access by the Pringle Bay community to a reliable water supply, as an ecosystem service, currently imposes a degree of environmental cost affecting the estuary of the Buffels River (also the wetlands of the river's lower reaches), as described at the end of Section 3.2.1.

Food security

Although there is no agriculture practised within Pringle Bay, the nearby Elgin Valley, within the biosphere reserve's buffer zone, supports an economically very significant agricultural sector (fruit and wine production) that provides employment to many thousands of people. The industry is integrally dependent on bees for pollination, which are sustained by fynbos that flowers at times when the orchards and vineyards are not in blossom.

Largely surrounded by fynbos, the Elgin Valley should have a degree of pollination security. However, it is increasingly the case that extensive tracts of this fynbos are eliminated or are burnt too frequently as a result of wildfires resulting in a dearth of mature, flowering plants capable of sustaining the natural bee population. This impact can be appreciated considering the fact that the burnt area attributable to the Highlands/Kleinmond fire of January 2022, which will not reach flowering maturity for several years, must be added to the area burnt during the Pringle Bay/Betty's Bay fire of 2019, which must also still reach its own state of flowering maturity. The encroachment of human settlements and alien invasive vegetation aggravates this situation.

3.3 Regulating services

3.3.1 Climate regulation

Earth-atmosphere exchanges (energy, water vapour, etc.) play an important role in regulating the climate under which the global environment has evolved - to which humans have adapted and grown accustomed over millennia. These exchanges have, however, been dramatically altered as a result of high levels of greenhouse gases that have been released into the atmosphere since the industrial revolution. This has resulted in global warming, which is causing dramatic environmental change and, thereby, significant impact on human well-being.

Although impacts associated with the emission of greenhouse gases (CO_2, methane, etc.) resulting from the combustion of coal for electricity generation have near-field effects, for example, on the health of communities living in close proximity to power stations, it is the far-field global warming effects thereof that are most significant. These present extreme risks to the environment and the world's human population. The majority of countries have committed to reducing their emissions of greenhouse gases in order to slow down the rate of increase in average global temperature and, ultimately, stabilise this at a stated limit. As a major emitter of greenhouse gases, per unit of electricity generated, South Africa has significant challenges to turn this situation around.

In response to the above, the atmosphere is rapidly losing its capacity to assimilate greenhouse gases and, simultaneously, regulate the global climate within limits that promote human well-being. If current trends in

climate change continue, it is predicted that the Western Cape will become increasingly hotter and drier, and subject to extreme weather (drought, storms). This will negatively affect many spheres, including security of water supply and food production, human safety and security under conditions of more frequent wildfires, occasional extreme flash-flooding, etc.

3.3.2 Waste assimilation

The terrestrial, marine and atmospheric environments, both within the Pringle Bay precinct and beyond, provide an essential service for the assimilation of a range of human waste products. Through this regulatory service, a potentially healthy environment is provided for humans. The most significant classes of waste include: solid waste, domestic effluent and gaseous emissions.

Municipal vacuum tanker emptying a conservancy tank

Apart from the effects of climate change, the Pringle Bay community does not directly experience impacts associated with the waste that it generates. Rather, the externality costs thereof are experienced elsewhere. Solid waste is disposed of at Karwyderskraal, situated between Botrivier and Hermanus; domestic effluent is treated and discharged to sea through the Palmiet sewage treatment works, near Kleinmond; and, the majority of gaseous emissions attributable to the local consumption of electricity, generated by Eskom, is released into the atmosphere in Mpumalanga (e.g. to which human health effects can be attributed there).

Impacts that are experienced within the village include those associated with plastic waste that becomes stranded along the high water mark of the beach and rocky shores following onshore winds. Much of this waste, which is flushed or blown into False Bay, originates from Cape Town and its satellite residential areas. A proportion also originates from maritime transport, including the illegal discharge of waste to sea by ships and through the overboard loss of shipping containers (e.g. in the case of nurdles that strand regularly on the main beach).

3.3.3 Flood regulation

Pringle Bay is semi-enclosed by a set of mountains (Buffelstalberg, Spitskop, Pringle Peak, Hangklip) that form the catchment of the Buffels River. To the east, the extension of mountainous terrain contributes to a set of catchments that drain into the Betty's Bay lake system and the Disa and Palmiet rivers.

Established on the wave-cut coastal plain, at the base of the mountains, much of Pringle Bay is potentially vulnerable to flooding - which makes environmental flood regulating service extremely important. This service functions through a set of complex interactions between local geological features and associated vegetation including fynbos and a range of peaty wetland seeps that occur at different altitudes.

Wetland seeps, especially those at higher altitudes, temporarily retain a considerable proportion of the precipitation that they receive. Acting like sponges, they slowly release this water over time into the lower catchment, thereby reducing the risk of flooding which could occur if there was immediate run-off of surface water during high rainfall events. The fynbos vegetation cover of the mountain slopes contributes in a similar way, by limiting surface run-off and promoting the percolation of precipitation into the groundwater system.

The flood regulation process sustains the flow of water into the wetlands of the coastal plain and the Buffels estuary during the dry season, and thereby, their ecological functioning. Summer water-flow within the stream that drains the Hangklip valley is evidence of this flood-retarding and slow-release effect.

While the wetlands and fynbos at higher elevations continue to fulfil their flood-regulating function, more or less as in the past, there has been significant disruption of the functioning of the wetlands within the village precinct. This is attributable to two main developments: the transformation of naturally porous fynbos surfaces to ones that are now impervious, in particular associated with the roofs of houses and road surfaces; and, the destruction of wetland seeps on the coastal plain in order to create compact founding conditions for the construction of buildings. As a consequence of this disruption, as water drains onto the coastal plain it no longer percolates slowly into the groundwater system, but is directed into the village stormwater drains (mainly road drains) for rapid disposal away from higher ground towards the low-lying areas of the village. Consequences of this include the damage caused to the road system, which is not constructed to receive high volumes of surface run-off, and flooding of lower-lying properties that were never previously subjected to this impact. This situation was clearly illustrated during the winter of 2021 when many properties were flooded.

Much of the unsurfaced road network within Pringle Bay is unsurfaced and poorly drained. There is frequent flooding of low-lying areas of the village

3.4 Environment-determined cultural services: Recreation and aesthetic value

The majority of residents and visitors value Pringle Bay for the extraordinary quality of its recreation assets and the aesthetic appeal of the village precinct. In this regard, there is close coupling with the majority of habitat services, as previously described; i.e. recreation and aesthetic values are significant in proportion to the significance of available habitat services (existence values).

3.4.1 Recreation

The Pringle Bay beach and Buffels estuary are extremely popular recreation attributes (see Table below; note that some information is out-dated). Within the adjacent nearshore environment, activities such as surfing, board-sailing, sea-kayaking and diving are increasingly popular. Rock and surf angling has only limited attraction, *inter alia* due to the depletion, over decades, of stocks of slow-maturing reef fish species. The open season for recreational fishing for rock lobster attracts a massive influx especially of day-visitors to the area.

The mountain and much of the coastal environment surrounding Pringle Bay is relatively under-developed in terms of managed trails. However, hiking, trail running and mountain-biking are popular recreation activities, with Hangklip valley and the mountain summit being popular attractions. There is an informal MTB trail that originates at the municipal waste depot at the town entrance. Some of these activities are integrated with other, mainly nature-oriented, interests such as bird-watching, for example aimed at sightings of rock jumpers and ground woodpeckers, which are relatively rare birds that are encountered within the Pringle Bay precinct.

LAND USE	DESCRIPTION
Open Space Zone 1: Nature Reserve	The beach and Pringle Bay dune field and part of the southern bank of the estuary are deemed nature reserve
Residential	Numerous residential and holiday establishments of the town of Pringle Bay are located on the southern bank
Transport	Numerous residential roads, R44 coastal road bridge
Agriculture	Land on either side of the estuary from the middle reaches upward is zoned as agriculture
Undetermined / Kogelberg Biosphere Reserve (KBR): Buffer Zone	Land on the northern bank, above and around the estuary has no determined land use type
	The estuary, the agricultural land on the southern bank, and undetermined land fall within the KBR Buffer Zone (CapeNature, 2012)
Community Zone 1: Community facility	The Glen Craig Conference Venue is located above the estuary, eastward of the R44 coastal road
ACTIVITIES	**DESCRIPTION**
Fishing	Limited recreational angling
Swimming	Limited swimming directly related to property owners
Paddling/canoeing	Limited paddling directly related to property owners
Bait collection (marine mussels)	Intensive use of mussel bank at estuary mouth during peak holiday seasons
Beach-based recreational activities	Sunbathing, picnicking etc. at the mouth

Source: Western Cape Government Environmental Affairs and Development planning
Buffels (Oos) River Estuarine Management Plan Final October 2019

3.4.2 Aesthetic value

A high level of environmental aesthetic quality is achieved through the enclosure of the village by False Bay, to the west, and the chain of near pristine fynbos-clad mountains elsewhere (e.g. Hangklip, Voorberg, Pringle Peak, Buffelstalberg, Two Sisters, Klein Hangklip).

Unusually so, compared to most other coastal settlements, the appreciation of these geo-ecological-aesthetic attributes extends beyond daylight hours into the night-time as well. This is attributable to the absence of street lighting in Pringle Bay, which allows for clear views to be had of the mountain silhouette juxtaposed, on occasions, against the clear night sky.

4 PRESERVING THE COMMUNITY'S UNIQUE LIFESTYLE

Lifestyle: A style of living that reflects the attitudes and values of a person or group (Wikipedia)

THIS SECTION WILL STILL BE PREPARED THROUGH A PARTICIPATORY PROCESS.

5 CULTURAL HERITAGE: MANAGEMENT OBJECTIVES AND IMPLEMENTATION INITIATIVES

Section 2 provides a general description of the village's main cultural heritage assets. In this section, management objectives are stated for each of these, accompanied by a suite of implementation actions aimed at the achievement of the objectives.

The statutory basis upon which local heritage assets are protected is the Heritage Resources Act 25 of 1999. However, to practically advance their conservation there must be community interest in 'taking ownership' thereof. It is, therefore, a management objective to stimulate interest amongst residents and visitors regarding the area's history and to make the assets easily accessible (and, thereby, appreciated). Implementation actions to achieve this objective are listed below:

- Manage local heritage assets in an integrated way that assigns equal significance to all categories (pre-colonial, colonial/pre-democratic, democratic/modern).
- Present key information pertaining to the assets in an appealing infographic located in the Village Centre
- Develop an historical trail and integrate this into a broader system of hiking and mountain-biking trails that exposes users to the variety of the area's heritage assets. Here, supplementary graphical displays must be provided to explain the history of important sites (Note, that permission to do this will be required from the affected land-owners).
- Identify which assets require restoration and take the necessary actions.

6 NATURAL HERITAGE: MANAGEMENT OBJECTIVES AND IMPLEMENTATION INITIATIVE

Section 3 provides a general description of the village's main natural heritage assets. In this section, management objectives are stated for each of these assets, accompanied by a suite of implementation actions aimed at the achievement of these objectives. The structure that is used to present this information follows that used in Section 3, which differentiates between Habitat Services (existence values), Provisioning services, Regulating Services, etc..

6.1 Habitat services

Under Habitat Services, differentiation is made between the various elements that contribute to Pringle Bay's suite of terrestrial and marine and littoral ecosystems respectively. For both ecosystem complexes, the plan's emphasis is directed largely towards the management of the physical environment and the vegetation component of the contributing habitats. The assumption made is that if these components are managed effectively, the conservation of the faunal communities associated with these habitats will also be achieved.

6.1.1 Baboon conservation

An exception to the above approach to habitat management relates to the conservation of the chacma baboon - a keystone species that requires extra-ordinary management attention. In terms of the conservation of this species, success will largely be determined by how the urban environment and human behaviour are managed in relation to interactions with this species (as much as the focus is on managing its natural habitat). In this regard, the objective is to promote the well-being of the species *in its natural habitat*, protected from potential harms to which it may be exposed within the urban environment and through human interactions. The main implementation action to achieve this objective is as follows:

- Develop a Baboon Management strategy and related management guidelines that are specific to Pringle Bay. Whilst the implementation thereof currently remains the responsibility of the Overstrand Municipality, the community must be involved in this - rather than be subjected to an imposed, generalised and potentially unworkable policy that benefits neither the species nor the community.

THIS SECTION OF THE *CONSERVATION PLAN* WILL BE EXPANDED ONCE THERE IS CLARITY PROVIDED BY OVERSTRAND MUNICIPALITY AND CAPE NATURE REGARDING BABOON MANAGEMENT WITHIN THE VILLAGE PRECINCT.

6.1.2 Fynbos (on mountain slopes, lowland rocky outcrops and coastal dunes) and Dune forest

Fynbos

Management of ecological fire regimes, habitat connectedness and alien invasive plant species is critical for ensuring the integrity of Fynbos within the village and its surrounds.

Fire is an essential ecological determinant of Fynbos vitality. Research and analysis of fire history indicate that a return period of between 10 and 15 years is the fire regime to which the Western Cape's fynbos ecosystems have been exposed and become adapted over time. Fynbos that is burnt more frequently than this becomes depleted in terms of its biodiversity, with slow-maturing plant species and their symbiotically

associated fauna (e.g. sunbirds, sugarbirds) most affected. The exclusion of fire from fynbos - both primary and secondary (in the case of Dune Fynbos) - over multi-decadal intervals, has similar deleterious ecological impacts, whilst simultaneously increasing fire risk associated with the accumulation of highly flammable dead and semi-moribund biomass.

While fire is an essential determinant of the ecological integrity of Fynbos, habitat connectedness is equally important. Fragmentation of Fynbos, for example caused by urban development, can create ecologically sub-optimal sized 'islands' of vegetation/habitat within which species diversity tends to diminish. This occurs, for example, as a result of disrupted regenerative processes and edge-effects that enable higher levels of encroachment of alien invasive species.

With the above as context, it is a management objective that tracts of municipal- and, where possible, privately-owned Fynbos, including undeveloped municipal properties and public open spaces, should be subject to controlled burning on a rotation of between 10 and 15 years and conserved in the most connected state possible. Implementation actions to achieve the above objective are listed below:

- The practice of minimal clearing of Fynbos on private land will be encouraged[3].
- Fynbos corridors, for example contained within the village road reserve network, must be optimally conserved.
- The EMOZ map of burns must be kept updated to provide a basis from which to determine the post-fire age of different tracts of fynbos within the village precinct.
- A motivation must be prepared for controlled burning to be undertaken of Fynbos that is older than 15 years, also with the aim of achieving a range of post-fire vegetation age-classes.
- In meeting a statutory requirement, Cape Nature should be consulted to contribute in this regard (e.g. to conduct ecological assessments to inform decision-making regarding controlled burns).
- The motivation should be submitted to the lead agency responsible for controlled burning, which is Overstrand Municipality.
- Procedural and operational experience should be gained through a request for observer status for the controlled burn that is planned for Silversands, probably in autumn 2023. In the course of this involvement, information should be sourced from Cape Nature regarding the in-principle plan for controlled burns to be carried out within: (i) the Blesberg-Hangklip valley, and (ii) the Hangklip mountain fynbos blocks – approximately five and 10 years following the planned Silversands burn.
- Since the seeds of many locally problematic alien invasive plant species (e.g. Rooikrans, Port Jackson, Myrtle, Black Wattle and pine species) are adapted to fire and germinate rapidly following a burn, there must be coordination regarding the management of the seedling re-growth.

[3] Tim Attwell's book, *My Place in the Kogelberg*, provides excellent advice for residents regarding the management of fynbos on their properties.

- Where it is practically impossible to burn tracts of ageing Fynbos (e.g. including road reserves and private erven), consideration must be given to selective cutting of the vegetation, also on a 10 to 15-year rotation.
- Properties within the village should, ideally, remain unfenced (or only partially fenced - e.g. in the case of pet-owners) to allow the free movement of fynbos-associated fauna.
- Plan for a connected corridor to permit the movement of fauna between the remaining large stands of Fynbos.

Alien invasive plant species have significant detrimental ecological impacts on Fynbos, for example, by reducing species diversity (crowding out) and, thereby, compromising a range of ecosystem services. Increased and highly flammable fuel loads associated with alien invasive vegetation increases risk to human safety and structures in the case of wildfires. It is, therefore, a management objective to bring under control the current aggressive spread of alien invasive species within the Pringle Bay precinct through clearing and on-going follow-up programmes.

A group of volunteers (*Pringle Bay Hack Group)* meet on one Saturday per month to control alien invasive vegetation in and around the village, at locations determined by the organizing Convenor. The objectives are to: Clear public spaces within the village of alien invasive plant species, with special focus on Rooikrans, Port Jackson and Myrtle; for strategic reasons, clear privately-owned land, in consultation with owners; and to raise awareness of the threat to Fynbos and other indigenous vegetation types posed by alien invasive plant species

In addition to the above initiative, volunteers from Pringle Bay, Betty's Bay and Rooi Els (to a limited extent) meet for hacking activities every Wednesday (*Kogelberg Hack Group*). Targeted sites are determined by the organizing Convenor. The objective of this group is the eradication of alien invasive vegetation mostly outside the village boundaries, to prevent its encroachment into the Core Zone of the Kogelberg Biosphere Reserve. The strategy followed is to: Initiate projects that can be completed in a reasonable time-frame; prioritize species and sites to be targeted; prioritise low-density infestations over high density infestations, to prevent minor infestations becoming major infestations; apply best practice methods for clearing; and to plan for and implement follow-up to control the re-infestation of cleared areas. Implementation actions to achieve the key objective are listed below:

- Employ the expertise and resources of the long-established *Kogelberg Hack Group* as the foundational basis for managing alien invasive plant species.
- Participation by the PBRA in the groups' strategic planning initiatives to achieve insight and alignment regarding priorities and plans, aimed at maximising ecological and social gains (e.g. to reduce fire risk).
- Gauge whether additional resources need to be employed to more aggressively manage the local situation regarding alien invasive plant species, for example, by employing an operational model such as the one currently used by the *Hangklip Conservancy* (Landcare and other grant funding, used to create employment opportunities for environmental benefits).
- Using all available communication channels, to encourage property-owners to clear alien invasive species from their land and to not plant any scheduled invasive species as garden ornamentals.
- Arrange for the municipality to approach the Department of Forestry and Fisheries and the Environment (DFFE) to issue Warning Letters, Pre-Directives and Directives to land-owners who fail

to bring alien invasive species under control on their properties, to monitor responses, and report situations where there is failure to act on the warnings and directives.

- Explore opportunities for instituting a system to raise funds to support teams of unemployed residents within the district to clear alien invasive plants.

A controlled fire (or prescribed burn) in action

Milkwood dominated dune forest

Although there are small patches of stunted Milkwood thicket scattered along the coastline between the southern end of Pringle Bay's beach and the point, the main block of this forest type occurs along the north bank of the Buffels River estuary, close to its mouth. Here, the Milkwood trees are likely to be several hundred years old. Milkwoods, and the forest units of which they are part, are protected under the National Forests Act of 1998.

The management objective is to ensure the protection of Milkwood forest. Implementation actions to achieve this objective are listed below:

- The community must be made aware of the special protection status assigned to Milkwoods and that it is against the law to cut or disturb trees and the forests/thickets of which they are part (there are published guidelines applicable to trees on private property).
- Similar to the riparian *Metrosideros* forest, Milkwoods are able to withstand the impact of wildfires, within certain limits of fire intensity. Under natural conditions only the forest edges are scorched by fire; however, where high biomass loads accumulate against the forest (e.g. associated with alien invasive vegetation or where fire has been excluded for many decades) extremely hot fires will penetrate quite deeply into the forest. In such cases, the coppice shoots that develop from the base of severely burnt trees must be protected by excluding human access to the affected forest for at least five years following a fire (e.g. using fencing and signage).
- Alien invasive vegetation must be cleared from the forest perimeter in order to reduce the standing biomass in this zone (i.e. to reduce fire fuel loads).

6.1.3 Freshwater wetlands.

Emphasis on wetland management is on the wide range of seeps that are scattered across the village and on the Palmiet, reedswamp and riparian thicket of the Buffels River.

Wetland seeps

The wetland seeps of Pringle Bay are ecologically very significant, for example, providing habitat services to a number of endemic amphibia. The seeps established on the coastal lowland are vulnerable to a number of perturbations. The greatest threat that they face is their elimination as a result of construction activities on land that should never have been designated for this purpose in the original town plan. As for Fynbos, they are also subject to infestation by alien invasive species, which impact upon their natural biodiversity and hydrology through the considerably greater uptake of water by most woody invasive species, compared with indigenous wetland sedge- and shrub-land. The management objective is to protect the eco-hydrological functioning of the village's remaining wetlands. Implementation actions to achieve this objective are listed below:

- Compile a fine-scale map of all remaining wetland/seeps within the village. For the purposes of ground-truthing, species such as *Berzelia lanuginosa*, *Osmitopsis asteriscoides*, Psoralea spp, the reeds *Typha capensis* and *Phragmites australis* and various sedges can be used as wetland indicator species.
- Press for the regulatory regime to be strictly applied regarding development that could potentially impact upon all mapped wetlands (e.g. that environmental authorisation, based on a professional impact assessment and impact mitigation plan, is a requirement ahead of development approval).
- Where wetlands/seeps exist on municipal land, arrange for the exclusion of these areas from all future development (e.g. that they are assigned conservation area status).
- Plan for alien invasive species to be cleared from wetlands/seeps and nearby catchment areas in order to sustain natural hydrological processes.

Palmiet, reedswamp and Riparian Metrosideros thicket

This vegetation type occurs as a narrow strip following the course of the Buffels River, in its lower reaches downstream of the R44 river crossing. Occasional patches of this vegetation type also occur along the lower reaches of the Hangklip valley stream, close to its confluence with the Buffels River, where *Typha* and *Phragmites* reed swamp intermingles with other wetland species. Invasions by *Acacia longifolia* (golden or long-leaved wattle), Black Wattle and other alien invasive species pose the greatest risk to the ecological integrity of this quite scarce vegetation/habitat type. As invasive species become dominant, there is a loss of natural biodiversity due to the coupled effects of indigenous species being 'crowded-out' and an altered hydrological regime (reduced streamflow) due to the greater uptake of groundwater by alien invasive tree species, in particular.

Although *Metrosideros* is generally able to coppice and regrow after fire, the species appears less well adapted to fires that burn at high intensities attributable to high fuel loads associated with alien invasive species. In such instances, their rootstock (i.e. from where coppicing occurs) appears to be vulnerable to fire damage. Palmiet and the main reed swamp species are well-adapted to fire.

The management objective is to protect the eco-hydrological functioning of the affected corridors of stream- and river-course vegetation. Implementation actions to achieve this objective are listed below:

- Ensure that there is no physical interference to established hydrological regimes, for example through the interruption or diversion of natural water flows.
- Employ the expertise and resources of the Hangklip Hardcore Hackers and monthly Pringle Bay hack groups to clear the alien invasive species from the affected stream- and river-courses.
- Ultimately, the entire course of the Buffels River must be cleared downstream of the Buffels Dam (also the Hangklip Valley stream); however, priority must be given to the lower reaches, downstream of the destroyed (now decommissioned) R44 bridge, from where the diagnostic *Metrosideros* riparian forest species first appears amongst the palmiet and reed swamp.
- Gauge whether additional resources need to be employed to manage the very dense Black Wattle and Spider gum infestations at Glen Craig.
- See previous implementation actions relating to the control of alien invasive species.

6.1.4 Marine and littoral ecosystems

Rocky shores

No specific management objectives or related implementation actions currently identified

Kelp forests

The kelp forests are currently in a phase of expansion and/or densification. However, it is likely that aspects of their ecological dynamics are in a state of transition towards uncertain end-points as a result of the disappearance of abalone from the natural mix of species (due to rampant poaching). With kelp forest making significant ecological contributions to the nearshore marine and littoral environment (i.e. in terms of productivity and its broad contribution to nutrient cycles, etc.), the management objective must be to eliminate the threat of poaching to the local abalone stocks. The main Implementation action to achieve this objective is listed below:

- Report all poaching activities to the relevant authorities

Sandy beaches

The integrity of Pringle Bay's main sandy beach, both in terms of its ecology and recreational value, is controlled by a number of factors. Foremost in this regard is the set of physical processes (wave and wind effects) that influence the back-and-forth exchange of sediment across the littoral active zone.

The management objective is to maintain the physical structure of the beach in a dynamic state of equilibrium and, thereby, promote the conservation of its natural biota. Implementation actions to achieve this objective are listed below:

- Implement the approved beah and dune maintenance management plan (see below), which has the conservation of the beach as its foundational aim.
- At the earliest opportunity, exclude Pringle Bay's beach from commercial kelp-harvesting operations, to allow the kelp wrack to trap and hold windblown beach sediment and to promote the cycling of nutrients from decomposed kelp through the beach sediments into the nearshore marine environment. Alternatively, press for a limit to be set on the frequency and location of kelp that is harvested, either in consultation with DFFE or with the permit-holder.

- Press for the enforcement of the regulations requiring dogs to be on leashes when on the beach, with the aim of protecting breeding shorebirds (black oystercatchers and white fronted plovers) and promoting the safety of beach users.
- Use the breeding success of black oystercatchers (number of juveniles raised to adulthood, annually) as an indicator of sustainable human-environment relationships relating to beach use.

Coastal dunes

Active management of Pringle Bay's remaining coastal dune system is essential to halt the landward retreat of the inter- and supra-tidal beach zones, thereby, protecting its ecological functioning and recreational asset value.

The management objective is to ensure that beach sediment that is blown into the coastal dune system is available to be returned to the beach through wind and wave action; i.e. to maintain the dynamic stability of the beach. Implementation actions to achieve this objective are listed below:

- The approved beach and dune maintenance management plan must be implemented according to stated specifications.
- In the absence of the municipality taking the lead, the community must be encouraged to enter into a cooperative arrangement to implement the plan.
- Arrange for coordination between the hacking groups, to provide the branches for strategically informed dune stabilization, and the municipality to arrange transport of the branches to the beach.
- Arrange for an ongoing initiative to educate the community about the dune management programme, *inter alia*, through the use of signage requesting pedestrians to keep off the dunes, to stick to the designated beach access paths, etc.

Deep water reefs

The extraordinary species diversity associated with the deepwater reefs (approx. 40 m depth) offshore of the point, Hangklip and Betty's Bay is a relatively unknown attribute of the local marine ecosystem. The management objective is to ensure the ecological integrity of the reefs. Implementation actions to achieve this objective are listed below:

- Drawing from expert knowledge, prepare an inventory of the main threats to which the reef ecosystems are exposed.
- Commercial fishing would likely be a key threat. Here, there must be liaison with the Department of Forestry, Fisheries and the Environment (DFFE) regarding the conditions attached to fishing permits and the policing thereof (specifically in the context of the deep-water reefs).
- As for many other elements of the Kogelberg Biosphere Reserve, conservation of Pringle Bay's deep water reefs will be effective in proportion to the community's curiosity, knowledge thereof and interest therein. There must be a concerted communication effort in this regard.
- Opportunities must be explored regarding the promotion of specialist deep-water diving experiences.

Buffels River estuary

Subsequent to the last scientific assessment of the Buffels River estuary, which was carried out 40 years ago, the system appears to be in an ecologically well-functioning state. However, in response to the

construction of the Buffels Dam, it is likely to have changed from having a permanently open mouth to being a seasonally closed system. As water demand increases in response to urban development, the estuary mouth can be expected to close for longer periods, which could be the tipping point towards altering its ecological character (e.g. caused by increases in average salinity levels). Extended mouth closure could also result in compromised water quality for recreation.

A management plan, which specifies a number of environmental targets, has been prepared for the Buffels River estuary (Western Cape Government, 2019). Amongst these, a key management objective is to ensure its eco-hydrological health, focused on ensuring sustained freshwater flow through the system. Implementation actions to achieve the targets, and specifically relating to hydrology, are listed below:

- The municipality is the implementing agency (on behalf of Cape Nature) responsible for achieving the environmental targets specified in the Buffels River estuary management plan, and there must be close liaison with the municipality to ensure that there is compliance in this regard.
- A particular emphasis must be placed on water quality monitoring and comparison of measured data against regulated health standards.
- Following the disruption of the system's hydrology caused by the construction of the Buffels Dam, there are three main spheres of action through which the flow of freshwater into the estuary can be optimised in order to sustain its ecological functioning and recreational value: (i) community water demand-side management; (ii) technical/engineering intervention aimed at providing for the system's ecological water demand; and (iii) increasing catchment water yield through the eradication of alien invasive vegetation.
- Management of the lower catchment of the Buffels River is the responsibility of the various property owners, under the jurisdiction of the municipality. There is extensive infestation of alien invasive species, in particular, Black Wattle, Spider gum and pines. The situation likely exceeds the limit of what can be cleared by the local hacking groups and it needs to be gauged, therefore, whether additional resources must be employed (e.g. through a similar model used by the *Hangklip Conservancy*).
- Complementing the above, DFFE must be approached to issue Warning Letters, Pre-Directives and Directives to the relevant property owners to clear their alien invasive vegetation. The authority must be encouraged to follow up in cases of non-compliance by property owners.
- The Buffels dam was constructed before environmental protocols came into force that require dam design and operations to accommodate the ecological water demands of affected rivers (including estuaries). The municipality must commission a study to determine the ecological water demand of the lower Buffels River and to then establish and implement the technical water release options to achieve (retro-) compliance in this regard.

6.2 Provisioning services

6.2.1 Sustained supply of good quality water

The Pringle Bay community is unlikely to enjoy the level of security in water supply that has been the case historically. The two main variables that account for this situation include: the effects of climate change, where average annual rainfall is predicted to decrease for the Western Cape, and increased demand for water associated with a rapidly growing population.

Water supply to the dam can be secured to some degree by maintaining its catchment in a state that is free of alien invasive vegetation (which consumes considerably more water than natural fynbos).

In the context of a lead adaptation strategy, relating to both climate change and increasing population size, reducing the level of household water demand/use is likely to be most successful.

The objective is to optimise catchment water yield for the Buffels dam, while reducing unit water demand within the Hangklip villages. Implementation actions to achieve this objective are listed below:

- There must be continued priority given to replacement of the village water reticulation (pipeline) system.
- Cape Nature is responsible for managing the river's upper catchment. In this area, there is currently a light infestation of invasive pines, which will be relatively easy to eradicate now. Cape Nature must be approached to act immediately in this regard.
- As an alternative to what would be a financially and environmentally costly engineering solution, which would be to increase the capacity of the Buffels dam, an intensive campaign must be launched to make Pringle Bay and its neighbours water-wise communities. Drawing from lessons learned from Cape Town's 'Day Zero' water crisis, the campaign should focus on, for example: technologies that reduce domestic water use (dual-flush toilets, high pressure low-flow showers and taps, etc.), a sliding scale for water-pricing, and household rain-water harvesting (Jojo tanks).
- In order to manage the above, water-use reduction targets must be specified (e.g. a progressive five percent reduction in household water-use per year).
- There must be a 'dashboard' graphic published on the village website, Facebook page, Pringle Messenger and Pringle Post, which compares metered consumption of water within the village against set targets.

6.2.2 Food security

There is minimal food production within the immediate precinct of Pringle Bay. However, the production of fruit and wine within the nearby Elgin Valley (part of the Kogelberg Biosphere Reserve), is a vitally important agricultural activity. Bees are essential for the pollination of both fruit trees and vines; however, the viability of bee colonies is dependent on the availability of flowering vegetation outside of the agricultural production seasons.

The objective is to manage fynbos tracts within the village precinct and gardens to the optimal benefit of the local bee populations. Implementation actions to achieve this objective are listed below:

- If controlled burning is undertaken within the village precinct, ensure that there is a mosaic of different-aged vegetation, ensuring that a proportion of mature fynbos is available as a flowering food source for bees (also sunbirds, sugarbirds, etc.).
- Promote the establishment of fynbos gardens within the village, for the same reasons as above.
- Promote the consumption of locally grown agricultural produce.

6.3 Regulating services

6.3.1 Climate regulation

Globally, the aim is to reduce emissions of greenhouse gases in order to stabilise rising average temperatures. It is anticipated that if this is not immediately addressed, the processes that regulate climate will be unable to maintain an environment suitable for human habitation.

While it is the responsibility of every community to mitigate the effects of climate change, this applies more so in the case of a biosphere reserve village such as Pringle Bay.

Given the extremely high concentrations of CO_2 emissions that are associated with Eskom's fossil fuel-based electricity generation in South Africa, the management objective for the village is to become independent of this supplier and to transition to renewable energy systems. Implementation actions to achieve this objective are listed below:

- Based on metered electricity consumption data, calculate the village's carbon footprint. Publish this statistic (also in graphic format) on the village website, Facebook page, Pringle Messenger and Pringle Post.
- Set a target aimed at decreasing this footprint by 10% annually and graphically reflect progress made on a regular basis, using the above social media platforms.
- Provide easy to interpret guidelines (technical options, cost estimates, etc.) to assist businesses and households to make the transition to renewable energy systems.
- Apply 'economies of scale' principles to fast-track the transition of the CBD to become a renewable energy user hub.

6.3.2 Flood regulation

Pringle Bay's natural flood regulating capacity has been significantly compromised as a result of development. Rainfall that once percolated into the groundwater system for slow release into the Buffels River, Hangklip Valley stream, low-lying wetlands and the general littoral zone is now rapidly drained off rooftops and impermeable paved surfaces and directed into the road drain system. Many of the drains do not have the capacity to carry the run-off loads to which they are exposed and their failure causes considerable damage to affected roads.

Aggravating this situation is the elimination of the flood regulating function of natural wetlands, which are being infilled and compacted to enable construction. Natural drainage that previously percolated in situ into the groundwater system now becomes surface run-off directed into the road drains.

Additional to the environmental consequences of the above, is the increased tendency for the low-lying parts of the village, not previously prone to flooding, to become flooded; i.e. the affected areas essentially now function as flood detention ponds. In this regard, the higher-lying parts of the village impose externality costs on lower-lying areas.

The management objective is to maximise the degree of individual on-site percolation of rainfall into the natural groundwater system and the minimisation of surface flow via the road drain system. Implementation actions to achieve this objective are listed below:

- Through reference to the map of the village wetlands (see previous) all proposed developments that could impinge on this environment/habitat type must be subjected to

formal environmental impact assessment. Assuming that biotic ecological considerations can be accommodated, development approval must be contingent upon the viability of interventions that can be taken to mitigate impacts on the environment's flood regulation services.

- A technical study must be commissioned to: (i) establish the development-related flood risk to which the lower lying areas of the village are exposed; and, (ii) design impact mitigation measures that fully account for environmental considerations.

6.3.3 Waste assimilation

In order for the environment to maintain its capacity for waste assimilation, attention must be directed at the three main classes of waste associated with the Pringle Bay community: Solid waste, domestic effluent and emissions of greenhouse gases. The objective for managing the bulk of the village's emissions of greenhouse gases is addressed in the preceding section, which relates to climate regulation as a key ecosystem service. Management of the other two classes of waste is addressed here.

The management objective relating to solid waste generated within the village is to ensure commitment to the four popular sustainability principles relating to waste: avoidance, re-use, re-cycling and responsible disposal. Implementation actions to achieve this objective are listed below:

- Based on municipal solid waste disposal data (e.g. the average number of loads of waste trucked out of the village), calculate the total volume of solid waste that is generated within the village monthly and annually. Publish this statistic (also in graphic format) on the village website, Facebook page, Pringle Messenger and Pringle Post.
- Set a target aimed at decreasing this volume by 10% annually and graphically reflect progress made on a regular basis, using the above social media platforms.
- Provide easy to interpret guidelines to assist households to avoid, re-use and re-cycle potential waste, with the aim of achieving the above waste-reduction target.
- Audit the municipality's waste management chain to ensure that it complies with best practice principles and that environmental externality costs incurred at the Karwyderskraal site are minimised.
- Repeat the above for waste that is managed for *re-cycling*.
- Monitor the planned upgrade of the Kleinmond sewage treatment facility, which receives Pringle Bay's domestic effluent for treatment and disposal. Establish whether the quality of the treated effluent is monitored by the municipality at the point of its discharge to sea and that it complies with relevant environmental standards, on a sustainable basis.
- Encourage community involvement in beach clean-up initiatives (collection and re-cycling of stranded plastic waste, etc.).

6.4 Environment-determined cultural services: Recreation and aesthetic value

6.4.1 Recreation

Many of Pringle Bay's environment-determined recreational assets are not currently managed satisfactorily. For example, beach access paths and signage relating to access and beach usage were designed and installed decades ago and currently show little evidence of either maintenance or upgrading to account for contemporary recreational pressures. There is no formal, managed network of hiking and cycling trails in

place that can, simultaneously, cater for recreational demands and bring residents and visitors into a closer experienced relationship with the environment. In this situation, an *ad hoc* coastal footpath has evolved while embryonic mountain bike trails are being created in the absence of any formal design and maintenance plans.

The management objective is to cater for contemporary recreation demands through well planned, installed and maintained facilities that optimise environmental experiences for residents and visitors in environmentally sustainable ways. Implementation actions to achieve this objective are listed below:

- Modern signage of appropriate design and messaging must be provided at all beach access paths and associated parking areas (keep to the paths, dogs on leads, stay clear of nesting birds, no littering, etc.). Similar signage must be in place to keep beach users off the vegetated dunes and the artificial foredune system that is being created for beach nourishment purposes.
- Similar communication approaches must be adopted for all other environmentally significant recreation sites (eg. along the informal coastal path, at the Point, at the Buffels River estuary, the fire-damaged Milkwood forest, etc.).
- Expert input must be sourced to design an integrated hiking, mountain biking and heritage trail system for the village. Ideally, this should be linked into other recreational trail systems in the area (e.g. those that might be established by the *Hangklip Conservancy*).
- The *ad hoc* development of informal, un-maintained mountain bike and motorised off-road bike trails must be strongly discouraged. There are precedents in the area where such developments have resulted in significant environmental degradation.

6.4.2 Aesthetics

Proper management of Pringle Bay's habitat services and the maintenance of their ecological existence values will guarantee, to a considerable extent, the sustainability of the village's environmental aesthetic attributes. The extended human experience thereof, into the night time, as a result of the absence of street lights, is an important differentiating feature that significantly elevates the aesthetic appeal of Pringle Bay.

The management objective is to optimally manage the full suite of Pringle Bay's habitat services, as described in the preceding sections, in order to sustain the village's aesthetic appeal. A number of implementation actions to achieve this objective have been described already. Additional actions are listed below:

- There must be no deviation from the 'no street-light' policy.
- Home owners must be strongly encouraged to minimise the night time illumination of their properties, in line with existing and future guidelines.

7 UNIQUE LIFESTYLE - MANAGEMENT OBJECTIVES AND IMPLEMENTATION INITIATIVES

There is currently no universally agreed definition as to what the Unique Lifestyle characteristics are for Pringle Bay. It is planned to implement a focus group to draw out, from a cross section of residents, what this is perceived to be.

8 SUMMARY OF IMPLEMENTATION INITIATIVES 2022 – 2023

9 REFERENCES

Attwell, T. 2015. *Your Place in the Kogelberg*. Botanical society of South Africa.

Boucher, C. 1972. *The vegetation of the Cape Hangklip area*. MSc thesis, University of Cape Town.

Branch, G and Branch, M. 1981. *The Living Shorelines of Southern Africa*. Struiik Publishers, Cape Town.

Carter, N. H., A. Viña, V. Hull, W. J. McConnell, W. Axinn, D. Ghimire, and J. Liu. 2014. Coupled human and natural systems approach to wildlife research and conservation. *Ecology and Society* 19 (3): 43. http://dx.doi.org/10.5751/ES-06881-190343

CSIR, 1982. *Estuaries of the Cape, Part II. Synopses of available information on individual systems*. Report No12. Published by the National Research Institute for Oceanology, CSIR.

Le Maitre, D.C., Forsyth. G., Dzikiti, S. and Gush, M. 2016. Estimates of the impacts of invasive alien plants on water flows in South Africa. *Water SA* Vol 42 (4). http://dx.doi.org/10.4314/wsa.v42i4.17

Heydorn, A. 2015. *The Hangklip Eco Corridor: The untold story*. http://kogelberg-botsoc.co.za/Blog/index.php/2015/09/04/the-hangklip-eco-corridor-the-untold-story/

Reimers, B., Griffiths, C.L. and Hoffman, M.T., 2014. Repeat photography as a tool for detecting and monitoring historical changes in South African coastal habitats. *African Journal of Marine Science*, 36 (3): 387-398.

Schoeman, C., 2017. *The Historical Overberg*. Zebra Press.

Smith, R. 2019. Heritage Statement: Stoney Ridge, Pringle Bay. HWC Case No. 19010801.

Van Wilgen, B.W., Forsyth, G.G., de Klerk, H. et al. 2010. Fire management in Mediterranean-climate shrublands: a case study from the Cape fynbos., South Africa. *Journal of Applied Ecology* 47: 6312-38.

Western Cape Government, 2019. *Buffels (Oos) River Estuarine Management Plan*. Environmental Affairs and Development planning.

www.pringlebayratepayers.co.za/BMP2015.pdf

Annex 1.1: Cultural Heritage Action Plan, 2022 - 2023

Annex 1.2: Natural Heritage Action Plan, 2022 - 2023