



CITY OF CAPE TOWN
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2024

CAPE TOWN'S WETLANDS

REPORT ON THE CONDITION, IMPORTANCE AND
THREATS TO WETLANDS IN CAPE TOWN, WITH A FOCUS
ON SEASONAL WETLANDS

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CITY OF CAPE TOWN WETLAND REPORT

December 2024

Prepared for

City of Cape Town: Biodiversity Management Branch

Prepared by

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Cover photograph: *Paardevelei is Cape Town's largest seasonal wetland*. Photograph by Tiffany Schultz

All photographs by Liz Day unless otherwise specified.

FOREWORD



Alderman Eddie Andrews | Deputy Mayor and Mayoral Committee Member for Spatial Planning and Environment, City of Cape Town

Cape Town's wetlands are among the most vital, yet often overlooked, natural systems shaping the future of Cape Town. These ecosystems not only support extraordinary biodiversity but also perform essential functions that underpin our urban resilience. As the climate crisis intensifies, we are reminded that healthy wetlands are not a luxury but a necessity in a climate-adaptive and responsive city. The City of Cape Town's 2020 Water Strategy, *Our Shared Water Future*, calls for a fundamental shift in how we value and manage water, with a vision of a Water-Sensitive City that recognises the interdependence of the natural and built environments and invests in ecological intelligence as part of our urban planning approach. This vision is not just aspirational, but actionable. Our designation as a Ramsar Wetland City in 2022 is an international recognition of our progress, but more importantly, it is a reminder of the responsibility we continue to carry. That responsibility is shared. Wetlands can no longer be viewed as marginal or unused spaces but rather as working landscapes that require collective care. From government to civil society to residents, we all have a role to play in protecting these natural assets. Not only because it is the right thing to do, but also because our natural environment protects us from natural disasters and ensure our future resilience to climate change. This report represents an important step in that journey. It brings together data, insights, and expertise to inform this journey and assist in creating more awareness around the immense wealth our wetlands offer.

Lorraine Gerrans | Director: Environmental Management, City of Cape Town

Cape Town is one of the most biodiverse cities in the world and has a rich diversity of wetlands. Seasonal wetlands are especially important, are very threatened and are a unique management challenge for Cape Town. Restoring the balance and creating a deeper understanding of the integrated nature of wetlands and their essential eco-system services are essential for a sustainable City of Hope. Wetlands form a critical part of the water cycle that sustains our beautiful city and therefore require our utmost care and protection. This report embodies the informed appreciation we want to foster for our environment and wetlands in particular. In furtherance of this, we want to raise awareness around the sometimes-overlooked systems, such as wetlands, and the challenges facing them. We can only address the challenges if we fully acknowledge them and commit to working towards solutions. Let's collectively rise to the challenge!



Nancy Job | Ramsar STRP Focal Point for South Africa and Freshwater Programme Lead, South African National Biodiversity Institute

Wetland degradation is a pervasive challenge across South Africa, presenting significant societal risks such as compromised clean water, increased flooding, and threats to invaluable biodiversity and ecological infrastructure. The continued decline of wetlands imposes substantial costs on governments, economic sectors, and communities. This timely and important publication is an invitation to see our wetlands with new eyes, and to care for them more deeply. The City of Cape Town, as a designated Ramsar City, is leading by example in recognising the value of wetlands— for their ecological functions and the life these ecosystems support, the services they provide, and the human connections they sustain. This report shines a spotlight on one of the more remarkable and often overlooked features of the city's natural heritage: its seasonal wetlands. Often hidden in plain sight, they teem with life during the wet, winter season, and serve as critical habitat for a wealth of unique and threatened species. This report offers fresh knowledge on the ecology, diversity, and function of Cape Town's seasonal wetlands. It also highlights the very urgent need to protect what remains of these fragile systems in the face of growing urban and climate pressures.

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GLOSSARY

Anaerobic conditions	Environments with no free oxygen
Anthropogenic impacts	Negative changes to the natural environment and associated living organisms directly or indirectly, by humans
Biome	A geographic region with a specific climate and community of flora and fauna occupying a major habitat
Bioregion	A land and water territory, the limits of which are not politically bound, but which are defined by the geographical boundaries of human communities and ecological systems. Also a geographical space that contains one whole, or several nested, ecosystems characterised by landforms, vegetative cover, human culture and history (as identified by local communities, governments and scientists) (definition after Pool-Stanvliet et al. 2017)
Endemic	A plant or animal species, or a vegetation type, which is naturally restricted to a particular defined region. Endemism implies a level of restricted occurrence, i.e. found nowhere else but in that region (definition after Pool-Stanvliet et al. 2017)
Ephemeral wetlands	Wetlands that are intermittently saturated or inundated with water
Eutrophic waterbody	Waterbody that is enriched with nutrients (phosphorus and/or nitrogen nutrients), which result in highly productive ecosystems, sometimes with nuisance growth of aquatic plants including algae
Extant	Currently exists or is surviving
Hydroperiod	The duration and timing of inundation and/or saturation in wetlands
Hypertrophic waterbody	Highly nutrient-enriched ecosystems (in inland waters, with high phosphorus availability). These ecosystems are usually highly productive, and often associated with blue-green algal blooms and other nuisance emergent or floating plants
Mesotrophic waterbodies	Waterbodies (lakes, wetlands etc.) with moderate concentrations of nutrients (nitrogen and phosphorus)and often characterised by clear waters and/or high visibility, and submerged aquatic plants
Obligate wetland species	Obligate wetland biota have adaptations that mean that they require wetland conditions throughout most or all of their life cycle. Obligate wetland plants are also referred to as wetland indicators

Oligotrophic waterbodies	Waterbodies with low concentrations of phosphorus and nitrogen nutrients, not usually characterised by nuisance growths of algae and other plants
Phylogenetically distinct	Genetically different due to species isolation during evolutionary development
Wetland	Land which is transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (from National Water Act (Act 36 of 1998))

ABBREVIATIONS & ACRONYMS

BioNet	Biodiversity Network
BMB	Biodiversity Management Branch
CBA	Critical Biodiversity Area
CCT	City of Cape Town
CEC	Contaminant of Emerging Concern
CFR	Cape Floristic Region
cfu	Colony Forming Units
DEADP	Western Cape Department of Environmental Affairs and Development Planning
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMD	Environmental Management Development
ESA	Ecological Support Area
ETS	Ecosystem Threat Status
FBNR	False Bay Nature Reserve
ha	Hectare
HGM	Hydrogeomorphic unit
IUCN	The International Union for the Conservation of Nature
LUW	Liveable Urban Waterways
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NR	Nature Reserve
NWA	National Water Act (Act 36 of 1998)
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SoCC	Species of Conservation Concern
SDF	Spatial Development Framework
SSB	Scientific Services Branch
TIN	Total Inorganic Nitrogen
TMGA	Table Mountain Group Aquifer
WC PAES	Western Cape Protected Area Expansion Strategy
WWTW	Waste Water Treatment Works



Photograph 1.1. Seasonally inundated wetlands such as this wetland in the Kuils River catchment are increasingly rare. Alien vegetation surrounds it and is just one of the impacts affecting these wetlands.

1

INTRODUCTION

1.1 Background

Cape Town's municipal area includes some 11 263 hectares of wetlands. These include large permanent waterbodies such as Zeekoevlei, Rondevlei, Princessvlei, Little Princessvlei, Langvlei, Rietvlei, Zandvlei and Wildevoelvlei, some of which are used for recreational purposes. However, the city also has numerous smaller wetlands, some of which are of great biodiversity importance and most of which perform important ecosystem services in the city. Under natural circumstances, most of these wetlands were seasonal – that is, they were inundated or at least saturated in the wet season, but dried up during the hot Cape summers. Many of these wetlands were fed by a seasonally high water table, particularly in the sandy Cape Flats, while others were linked to seasonal rivers or were perched over shallow clay or rock horizons, above which rainwater pooled.

With urbanisation, many of these seasonal wetlands were lost or transformed to permanent and often highly polluted systems. Those that remain in a good condition are of great biodiversity importance.

1.2 Why this report ?

The City of Cape Town ("the City") monitors water quality in its rivers and major recreational wetlands, and these data are both publicly available via the City's [water quality dashboard](#) and described in its annual inland water quality reports (e.g. Day et al. 2024).

Little attention is however paid to the extent or condition of its other wetlands, with the last comprehensive report based on prioritising wetland conservation importance being compiled in 2009 (see Snaddon and Day 2009).

The present report has thus been commissioned by the City, to draw attention to the existence, importance, condition and level of threat of non-recreational, particularly seasonal wetlands within its boundaries. The intention of the report is to highlight these systems and recommend useful monitoring and/or other measures to allow long-term tracking of wetland condition and to inform conservation and other imperatives.

1.3 Report limitations and assumptions

This report has been prepared on the basis of available spatial and other data. No new data have been collected to inform it, other than by way of photographic illustrations. Recommendations are however made for more quantitative wetland monitoring going forwards.

1.4 Project team

The report was compiled with oral input and written contributions from a number of individuals and organisations, listed on page ii. Their input is gratefully acknowledged.

WETLAND FIRST PRINCIPLES

2.1 What are wetlands?

The term “wetland” includes a wide array of different ecosystems, all of which have one thing in common, namely the accumulation of water for long enough periods to characterise their soils and require special adaptations to waterlogged conditions in wetland plants that occur in them.

The reason for this is that when soils are saturated, the air that would normally surround the soil particles is replaced with water, completely changing the type of chemical reactions that take place in the soil. Plants that occur in areas with saturated soils need adaptations for these conditions. These include:

- **Floating plants**, sometimes with “air bags” to buoy the plants on the surface where they can gain access to air;
- **Emergent plants**, where portions of the plants extend above the water surface and access air, which can be transported throughout the plant, including its root zone;
- **Submerged plants**, which have adaptations that allow them to access dissolved oxygen in the water.

The National Water Act (NWA) (Act 36 of 1998) thus defines a wetland as follows:

“land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”

Survival strategies

Many wetland plant species have air channels in their leaves, stems and roots called **aerenchyma**. These channels allow oxygen from the air to be passed down to the roots and submerged parts of the plant, allowing such plants to thrive in places where other plants would die, due to lack of oxygen.



Photograph 2.1: Cross section through leaf of *Typha capensis*, showing aerenchyma channels that convey air to the roots during periods of inundation/ saturation.
Photo: Theo Stock

2.2 The complication of seasonal wetlands

Life in seasonal wetlands is more complex. Plants (and animals – see Section 5.5 for examples) in these habitats need adaptations to survive periodic inundation and saturation, followed by drought. In Cape Town, the dry season occurs in summer, and is accompanied by heat. Some plants set seed in the wet season and then die back entirely in these conditions, while perennial plant species persist all year round and can survive months of drier conditions. All of them need to be able to survive wet season saturation of the soil.

Summer drought and temperature are in fact important natural controls, preventing some fast-growing species like bulrush (*Typha capensis*) from dominating seasonal wetlands. Many of Cape Town's naturally seasonal wetlands now receive too much water from artificially raised water tables and have been over-run by bulrush as a result.

2.3 How do we identify wetlands?

Environments must possess one or more of the following attributes, if they are to be classed as wetlands:

- Hydromorphic soils (soils characterised by signs of prolonged or repeated saturation) – such signs include the presence of mottles in the soil (usually small, orange / yellow / red nodules), indicating a fluctuating water table; and “gleying” (leaching of dissolved minerals from the soil under anaerobic conditions, resulting in greyish, greenish or blueish soils);
- The presence (at least at times) of water-loving plants (hydrophytes), that may be limited only to aquatic habitats (obligate hydrophytes, such as water blommetjies and bulrush) or can survive in both wetland and terrestrial conditions (facultative hydrophytes, such as arum lilies); and
- A high water table that results in saturation at or near the surface, leading to anaerobic conditions in the top 50 cm of the soil, at least at times.

Wetland delineation requires specialist knowledge of wetland plants, soils and conditions, and should be carried out by a wetland ecologist, with input if necessary from a soil scientist.

Mottles

In saturated (anaerobic) conditions, iron and manganese dissolve in water. In seasonal wetlands, under dry conditions, these minerals are exposed to air and come out of solution, forming bright mottles in the soil. Mottles are thus signs of seasonal inundation. They are however often not present in leached ancient soils such as the sands of the Cape Flats.

Photograph 2.2: Light mottles in wetland soil.
Photo: Dean Ollis



2.4 Wetlands and the law

In South Africa, wetlands, as defined in South African legislation, also fall within the ambit of **watercourses** as defined in the National Water Act (NWA), where the term “**watercourse**” means -

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Watercourses themselves are identified in the same Act as part of the **water resource**. Section 21 of the NWA defines 11 different kinds of **uses** of water resources, namely:

- (a) taking water from a water resource;
- (b) storing water;
- (c) impeding or diverting the flow of water in a watercourse;
- (d) engaging in a stream flow reduction activity;
- (e) engaging in a controlled activity as contemplated in Section 37(1) or declared under Section 38(1) of the NWA;
- (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall, or other conduit;
- (g) disposing of waste in a manner which may detrimentally impact on a water resource;
- (h) disposing in any manner of water which contains waste from or which has been heated in any industrial or power generation process;
- (i) altering the bed, banks, course or characteristics of a watercourse;
- (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
- (k) Using water for recreation.

The above definitions are important, because activities that affect water resources are regulated by law, with the National Environmental Management Act (NEMA) (Act 107 of 1998) as amended and the NWA both being important pieces of legislation that relate to wetlands and their treatment. It is important to know when one is dealing with a wetland or other watercourse type, so that one does not accidentally fall foul of the law.

Aquatic ecologists, Environmental Assessment Practitioners, or officials in the City's Biodiversity Management Branch (BMB) or Catchment, Stormwater and River Management Branch (CSRM) should be consulted if there is any uncertainty about wetland designation or extent.

2.5 Why identifying wetlands matters

Correctly identifying wetlands is important, not only to keep within the law, but also because it provides information about conditions in an area or site; guides would-be land purchasers as to actual developable areas and the costs of development, including the need for expensive Environmental Impact Assessments (EIAs); and allows the biodiversity importance of the wetland to be evaluated.

Even when biodiversity conservation is not relevant, failure to identify wetlands on a site creates the following risks:

- Inappropriate design, that does not allow for adequate drainage or damp-proofing
- Difficult living conditions for residents in wet, marshy areas
- Subsidence and slumping of slopes, where excavation into slopes exposes groundwater near to the surface
- Downstream flooding issues, as a result of wetland drainage and channelling of water from inappropriately placed developments.



Photograph 2.3. Failure to identify a wetland seep through this area resulted in untenable damp and waterlogged conditions at this development in Sir Lowry's Pass Village.



Photograph 2.4. Seasonal wetlands in the dry season are particularly easy to miss, especially if one doesn't know which plant species are wetland indicators. This wetland in the Kulls River catchment supports important communities of aquatic invertebrates and wetland plants. Left: Wetland in the dry season. Right: Same wetland in the wet season.

2.6 The role of wetlands in our landscape

Generally, wetlands are areas through which water moves slowly or pools, creating the saturated conditions described in previous sections. In Cape Town, they are an integral but often under-valued part of the city's urban landscape. Some of these wetlands (natural as well as artificial) are, however, of crucial importance from a biodiversity perspective, contributing to the rich habitat diversity that makes up Cape Town's fynbos heritage. These are discussed in more detail in Section 3.

Natural and even some degraded wetlands can however contribute important ecosystem services that include:

- **Slowing down the force of floodwaters:** Some wetlands provide space for floodwaters to overtop and spread out – floodplain wetlands and floodplain areas as a whole are important for this function and wetland plants (particularly reeds, palmiet and other emergent plants) further help to slow down water, catching sediment and other flood-driven material as they do so. These processes reduce erosion and lessen danger to human life from fast, deep flood flows.
- **Maintaining stream flow:** Humic and organic soils, including peat in some wetlands, absorb water in wet conditions, holding it in pore spaces between particles and in organic material. This water can be released slowly downstream, extending the period of stream flow in seasonal streams. This can be important for plants and animals that rely on extended standing or flowing water for different lifecycle stages (e.g. tadpoles, that may be stranded and die if pools and puddles dry out).
- **Improving water quality:**
 - Anaerobic conditions in waterlogged wetlands make some wetlands very efficient in reducing the toxic effects of many heavy metals (e.g. cadmium, copper, lead and zinc), which in anaerobic conditions form insoluble (and thus biologically unavailable) metal sulphides and/or complexes with organic matter, or are adsorbed onto sediments with coatings of organic material, iron and manganese oxyhydrides.
 - Wetland plants take up nutrients for growth. Nitrogen is typically obtained from total ammonia and/or nitrates, and used by plants to make amino acids, which are important plant tissue building blocks. Some plants (e.g. blue-green algae/cyanobacteria) are able to access nitrogen in the air as well. Phosphorus (a problematic nutrient affecting many of Cape Town's watercourses) is also taken up in relatively small concentrations by plants. These nutrients are often released seasonally back into the wetland by wetland plants outside of their growth season or when they die. In wetlands where dead plant material accumulates in anaerobic (waterlogged) areas, these nutrients are stored and are no longer biologically available, until conditions change.

Note that not all wetlands perform all or any of the above functions and some wetlands, particularly small, artificial, low-diversity wetlands may have little conservation or other importance. Knowing that wetlands are present is still important as it indicates the presence of moisture near the surface. Their ecological and functional importance, context, and restorability need to be assessed carefully, and wetlands should never simply be dismissed as unimportant, without a clear understanding of their actual role.

2.7 Particular roles of wetlands in urban areas

Well-managed wetlands in urban areas can have wide-ranging positive impacts on local communities and economies. They can:

- Mitigate against urban heat islands in a context of climate change and global heating;
- Contribute to a sense of place and well-being;
- Provide recreational opportunities such as walking, bird-watching, experiencing nature, fishing, and water sports (in permanent wetlands);
- Where they are linked to rivers, contribute towards important ecological corridors through otherwise ecologically sterile urban spaces - these corridors can be important for terrestrial as well as aquatic biodiversity;
- Increase the value of adjacent properties; and
- Provide employment opportunities (e.g. alien control and solid waste collection - see section 6.2.2).

By the same token, poorly managed wetlands (e.g. wetlands that are polluted, invaded by alien vegetation, loaded with solid waste and/or infilled) can detract from local property value and may pose increased safety and security risks, as they are often less-utilised and increasingly attract criminal elements and are vulnerable to informal settlement.

Economic value of natural environments in Cape Town

A 2009 study (De Wit et al. 2009) found that for every R1 of expenditure on the environment by the City, between R8.30 and R13.50 per annum could be generated in benefits such as tourism investment; increased rates; and decreased maintenance costs such as wetland dredging and pollution abatement. Although the actual figures used in the study are now outdated, the study demonstrates the value to the City of adequate management of its environmental resources, which include terrestrial and aquatic natural assets, with the latter including extensive rivers and wetlands. More recently, Turpie et al. (2024) showed that, by rehabilitating rivers and wetlands in the City's Sand catchment, with measures such as expanding wetland areas for increased flood attenuation and water quality polishing, the City could gain between R30 million and R88.9 million rand annually in gained ecosystem services, excluding additional savings in averted flood and other climate change damages.

Photograph 2.5.
Rehabilitated Van Blommenstein
Park wetlands in the False Bay
Nature Reserve.
Photo: T. Smyth

Photograph 3.1. Floodplain wetland of the Eerste River in July 2024, highlighting the important function of floodplain areas for flood attenuation, and the need to retain them.
Photo: J. Rose.



Photograph 3.2. Humic wetland seeps in the City's Steenbras Nature Reserve release water slowly into the downstream catchment. Since these wetlands feed into the Steenbras Dam (one of the City's important water supply dams), the wetlands help to sustain water supply. September 2024.
Photo: T. Smyth.

3 NATURAL WETLANDS AND WATERCOURSES IN CAPE TOWN

3.1 Wetland drivers

Ecosystem drivers are factors responsible for differences between systems and for changing individual systems over time. For wetlands, the key natural drivers of wetland form and function are:

- **Climate** (rainfall timing and magnitude, temperature, wind and evaporation loss) – These factors determine how much water there is in a wetland, for how long, and when. Cape Town's climate varies from area to area, with conditions higher up mountain slopes often being cooler and wetter than those downslope, while areas such as the Cape Flats are prone to strong winds and higher temperatures;
- **Catchment geomorphology** (or topographical shape); and
- **Geology** – This has a direct impact on wetland soil type and chemistry. The sandstones of the Table Mountain range, for example, are old and well-weathered and thus leach out very few ions, making the soils in these parts of the catchment low in nutrients, salts and minerals. Unimpacted wetlands in these areas are similarly low in nutrients and salts, and support plants that are adapted to such conditions (e.g. wetlands in the upper Steenbras, Lourens, Silvermine, Sir Lowry's Pass and Liesbeek River catchments). By contrast, wetlands that form in soils derived from Malmesbury shales, for example, naturally have a higher concentration of nutrients and salts (e.g. wetlands in the Sout River catchment).

These major drivers in turn impact on other drivers of wetland condition, form and function, including:

- **Substrate** (soils or sediment);
- **Water sources and hydroperiod or hydrological regime** (the timing and duration of saturation and inundation) – these aspects directly affect wetland soils and chemistry, affecting the kinds of plants that occur in different wetlands;
- **Water quality** – Aquatic biota are adapted to different natural water quality conditions, with some adapted to the fresh (low salt) but highly acidic waters draining sandstone areas (e.g. wetlands on Table Mountain, Kenilworth Racecourse and at Cape Point within the Table Mountain National Park). Others are adapted to the sometimes highly alkaline waters of the Cape Flats, or the brackish waters of the Sout / Donkergat and other West Coast systems; and
- **Biota** – The plants and animals that occur in wetlands as a result of all of the above drivers in turn can influence wetland function. For example, plants growing in



Black waters of Cape Point

Many seasonal (and some permanent) natural wetland pools in Fynbos areas have black waters, sometimes with visibility to only a few centimetres. This is caused by humic acids (tannins), which leach out from slowly decomposing fynbos plants, making groundwater dark and acidic.

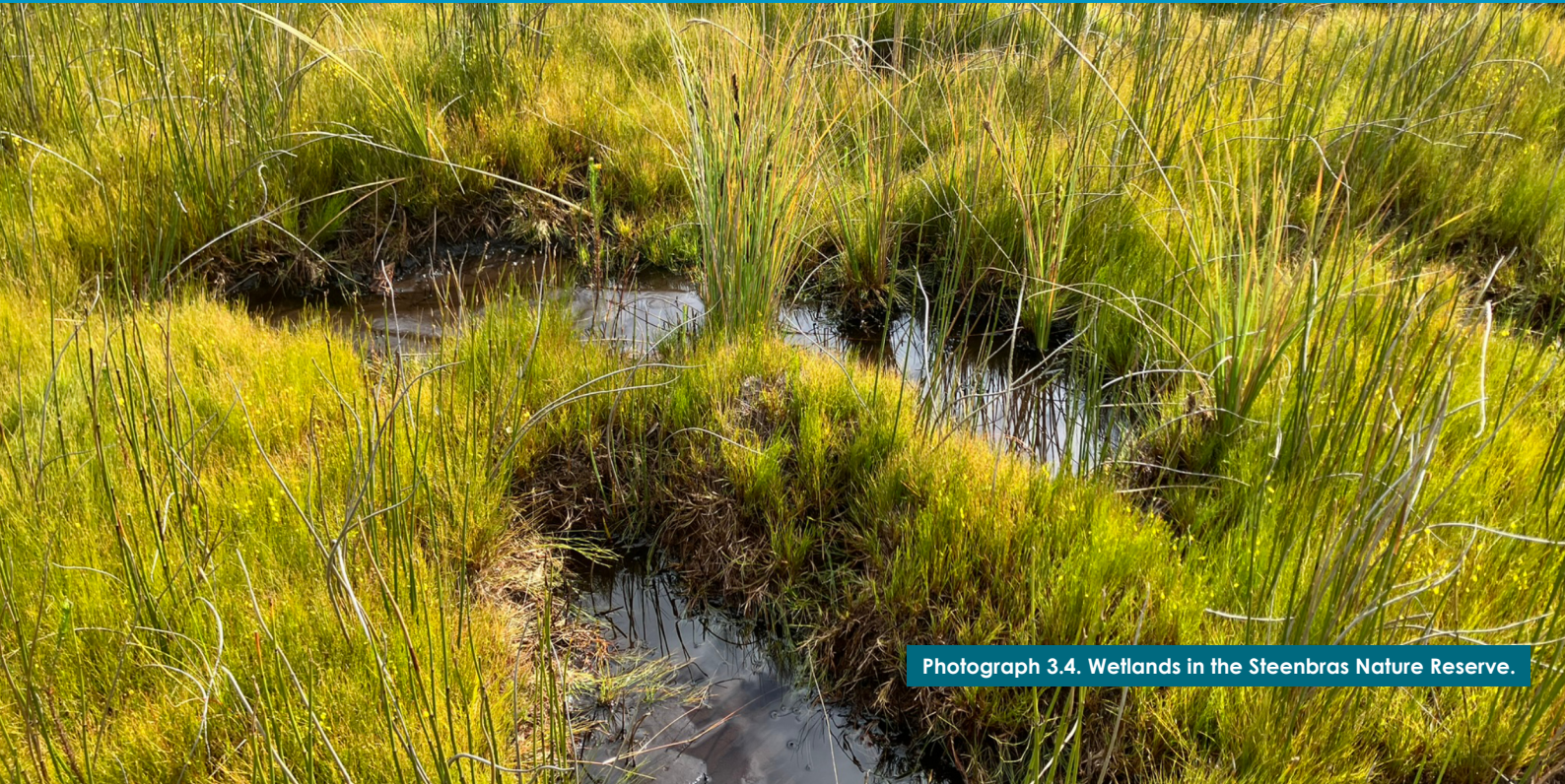
Photograph 3.3. Seasonal wetland pool in the Cape Point section of the Table Mountain National Park.

Organic soils and peat

Under saturated conditions, organic material builds up in topsoils, because decomposition is slow. It is further slowed by acidic conditions. Organic soils are soils that have more than 10% organic carbon. A special type of organic soil is peat. In South Africa, peat is defined as soils containing 20% or more organic carbon under conditions of long-term saturation.

Palmiet peatlands occur in the Cape Fold Mountains, with important peatlands near Cape Town including the Jakkals River and Onrus River, both of which have undergone immense erosion over the past two years, as well as wetlands associated with Vermont Pan.

Parts of the upper Steenbras Catchment may include organic soils, which store water and contribute to the slow, sustained release of water into the catchment below, providing important wetland habitat for wetland fauna and flora, including the endemic Montane Marsh Frog (*Poyntonia paludicola*).



Photograph 3.4. Wetlands in the Steenbras Nature Reserve.

permanently saturated wetlands may contribute to the slow accumulation of organic material in these wetlands, altering soil structure and making the wetlands more likely to retain moisture longer in dry conditions. Fynbos plants themselves can contribute to acidic water quality, through the leaching of tannins from decomposing plant litter. Tannins are an adaptation in low nutrient environments to make plants unpalatable to grazers. Larger indigenous grazers and browsers in natural fynbos habitats also contribute to wetland function, by trampling and opening up flow paths and removing plant mass. These herbivores, which historically would have included hippo and (in the dry season) eland and many smaller antelope and other fauna, would have influenced these systems.

3.2 Wetland classification

The previous section highlighted the many different kinds of wetlands that occur in Cape Town, in different areas, catchments and conditions, resulting in a great diversity of wetland types. The City uses a hierarchical classification system (the '*Classification System for wetlands and other Aquatic Ecosystems in South Africa*', see Ollis et al. (2013)) to differentiate between different wetlands, as well as other aquatic ecosystem types (rivers, estuaries and marine systems). The use of a classification system facilitates a structured approach to the conservation and management of the City's wetlands.

The Classification System has a six-tiered structure:

- **Level 1:** Systems (Marine versus Estuarine versus Inland systems);
- **Level 2:** Regional Setting (based on the Ecoregions of Kleynhans et al. (2005), which are based on broad-scale patterns of physiography, climate, geology, soils and vegetation across the country;
- **Level 3:** Landscape Units (the landscape setting of the aquatic ecosystem, four landscape units included, namely valley floor, slope, plain and bench);
- **Level 4:** Hydrogeomorphic units (HGM Units), which are differentiated into seven types, namely:
 - Rivers
 - Channelled valley bottom wetlands
 - Unchanneled valley bottom wetlands
 - Floodplain wetlands
 - Depressions
 - Seeps
 - Wetland flats
- **Level 5:** Inland Systems are distinguished on the basis of hydrological regime and inundation depth class (for open water bodies);
- **Level 6:** This includes six 'descriptors' to distinguish between aquatic ecosystems with different structural, chemical, and/or biological characteristics. The descriptors are:
 - Natural versus artificial
 - Salinity
 - Vegetation cover and type
 - Substratum type
 - Geology
 - pH



Photograph 3.5. Remnant seasonal wetland in the False Bay Nature Reserve

This report considers only wetlands, and focuses mainly on those that are seasonally or intermittently (i.e. occasionally) saturated to inundated (as per Level 5 of the Classification system).

Many of Cape Town's "rivers" were probably channelled and unchannelled valley bottom wetlands (such as the Keyzers River) or even wetland flats and depressions (e.g. Big and Little Lotus Rivers - Photograph 3.5) under natural conditions. They have since been channelised and/or canalised and now function as rivers rather than wetlands. They are not considered in this report, but are assessed in terms of their water quality in the City's annual [Inland Water Quality Report](#).



Photograph 3.6. The artificial Zeekoe River channel in the False Bay Nature Reserve
Photo: J. Rose

3.3 Cape Town's seasonal wetlands and biodiversity

3.3.1 Broad context in the Fynbos Biome

Located in the Fynbos Biome, and in the core (Core Cape Floristic Subregion) of the Greater Cape Floristic Region (formerly referred to as the Cape Floristic Region (CFR)) and a known biodiversity hotspot¹ with more endemic (plant) species per square meter than the Amazon rain forests (e.g. Manning 2007), Cape Town is considered one of the most biodiverse urban areas in the world (United Nation's City and Biodiversity Outlook Project 2023). Within the Core Cape Floristic Subregion:

- Aquatic invertebrates are more diverse per unit area than terrestrial fynbos plants (NBA 2018), and of these, 67 % of CFR aquatic invertebrates are endemic (NBA 2018) (that is, naturally occurring there and nowhere else in the world);
- Fish in the CFR are not particularly diverse; however, most of them are endemic, with 24 of the 27 indigenous CFR species being endemic to the CFR;
- Five amphibian genera are endemic to the CFR, representing 23 species. There are in total 39 CFR Core endemic frog species, which include:
 - The Critically Endangered Table Mountain ghost frog (*Heleophryne rosei*) which is found only on the slopes of Table Mountain;
 - The Critically Endangered micro frog (*Microbatrachella capensis*), found in sandy, coastal fynbos heathland; and
 - The montane marsh frog (*Poyntonia paludicola*), a species found in mountain fynbos heathland.



Photograph 3.7. Montane Marsh Frog
Poyntonia paludicola
Photo: C.Dorse

South Africa has **51 Critically Endangered terrestrial ecosystems** and 35 of these form part of the fynbos biome, most of which are located in the Western Cape. The **Western Cape supports more than 50% of South Africa's wetland types**, despite covering only 10.6% of the area of the country (Statistics South Africa 2016 in Cape Nature 2023).

Despite having a land area of only 2,500 square kilometres (0.2 percent of South Africa's total land area), **Cape Town supports 50 percent of South Africa's critically endangered vegetation types** and about 3,000 indigenous vascular plant species. Many of the plant species found in metropolitan Cape Town are endemic - found nowhere else on Earth (Secretariat of the Convention on Biological Diversity 2012).

¹ Conservation International defines a biodiversity hotspot as having at least 1,500 endemic plant species and having lost at least 70 percent of its original habitat area.

² https://resource.capetown.gov.za/documentcentre/Documents/Graphics%20and%20educational%20material/CCT_Nature_Reserves_book_2010-02.pdf.

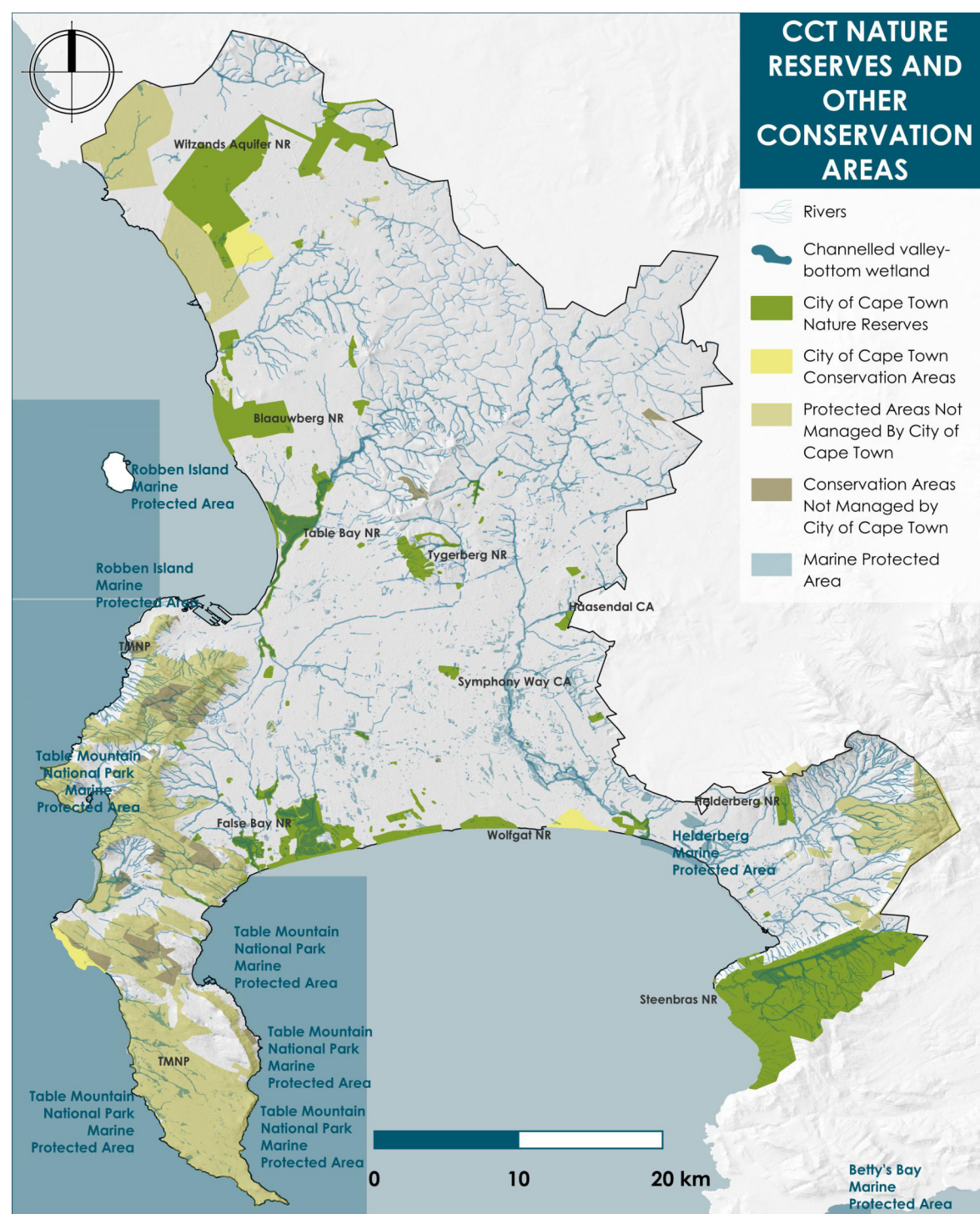


Figure 3.1. Nature Reserves and other conservation areas managed by the City of Cape Town.

3.3.2 Biodiversity complementarity

Many cities contain protected areas within or on their borders that provide important contributions to biodiversity. In Cape Town, Table Mountain National Park, an area that is extraordinarily rich in endemic plants and animals, is almost entirely surrounded by urban area. The City manages a total of 31 protected areas including 16 formal Nature Reserves, many of which include wetland habitat² (see **Figure 3.1**). These areas provide nodes of managed habitat diversity, many of which are important habitat remnants (see Section 4).

3.3.3 Wetland plants

Some 18.8% of all South African indigenous plant species (4256 species from 192 plant families) occur in wetlands. Of these, about 4.5% are obligate wetland species, in the sense that they do not occur outside of wetland habitats (Sieben et al. 2017).

The above study, carried out at a national level, showed that a number of plant families that are rich in species in South Africa are under-represented in South African wetlands. These include the Ericaceae (Ericas), which is one of the families that characterise fynbos areas.

Of interest, the study also showed that in naturally nutrient-poor fynbos habitats, where new wetlands appeared in the landscape historically, their plant assemblages evolved from families that were abundant in adjacent terrestrial areas, rather than from common wetland species in nutrient-rich areas elsewhere (Sieben et al. 2017). This means that wetlands in nutrient-poor fynbos areas tend to be phylogenetically distinct (i.e. having evolved differently) from more nutrient-enriched wetlands. Nutrient enrichment as an anthropogenic impact would be assumed to favour the establishment of more common wetland plants, some of which are clonal and form dense monospecific stands (e.g. bulrush *Typha capensis*).

The City's vegetation dataset, including reference to i-Naturalist data for the Cape Town area, does not however differentiate between terrestrial and aquatic/wetland habitat, and statistics for the number of obligate wetland plants that occur in Cape Town's seasonal wetlands were not available at the time of this study.

This report recommends that a study should be undertaken that specifically establishes a list of obligate wetland plants and their conservation status. Useful starting points would be liaison with the authors of the Sieben et al. (2017) study, and consideration of the plant lists for seasonal and perennial wetlands in the Western Cape, produced by Corry (2011).

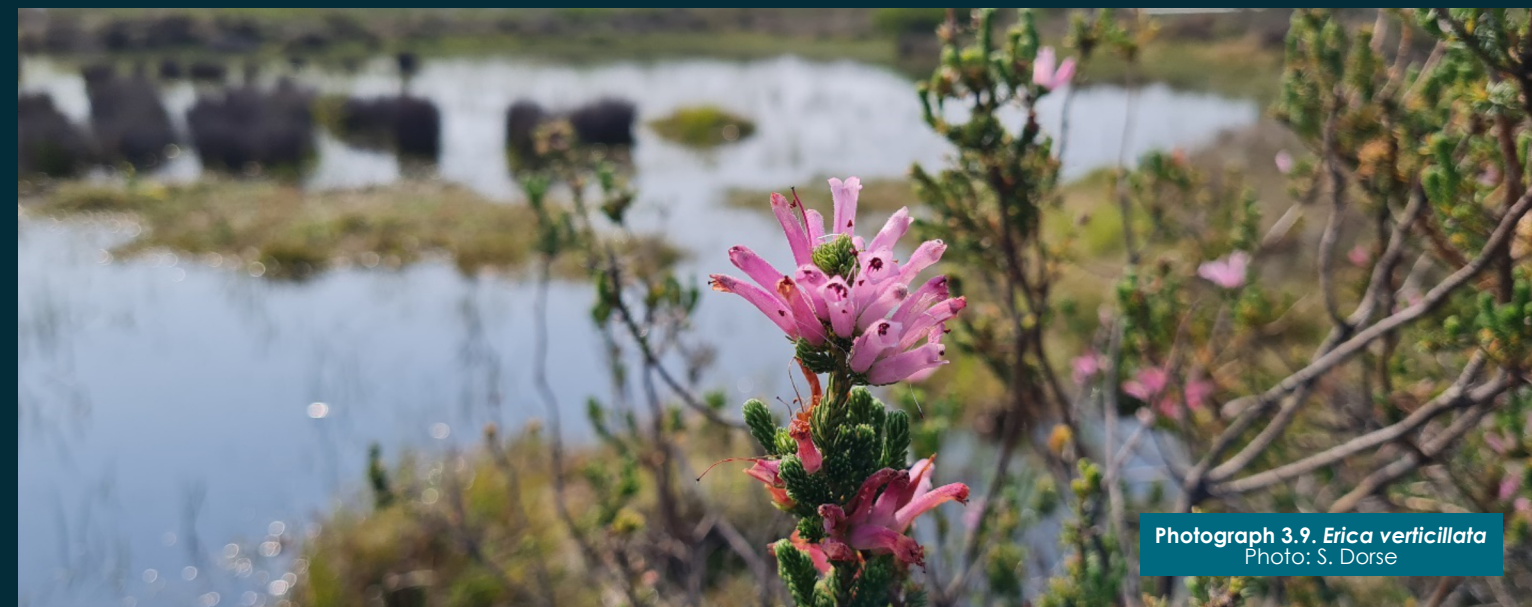
Nevertheless, Cape Town's seasonal wetlands are known to support many endemic plant species, some of which are now highly threatened, largely as a result of extensive habitat loss, changes in wetland hydrology and water quality changes (see Sections 4 and 5).

Some iconic examples of these are explored briefly in the sections below.

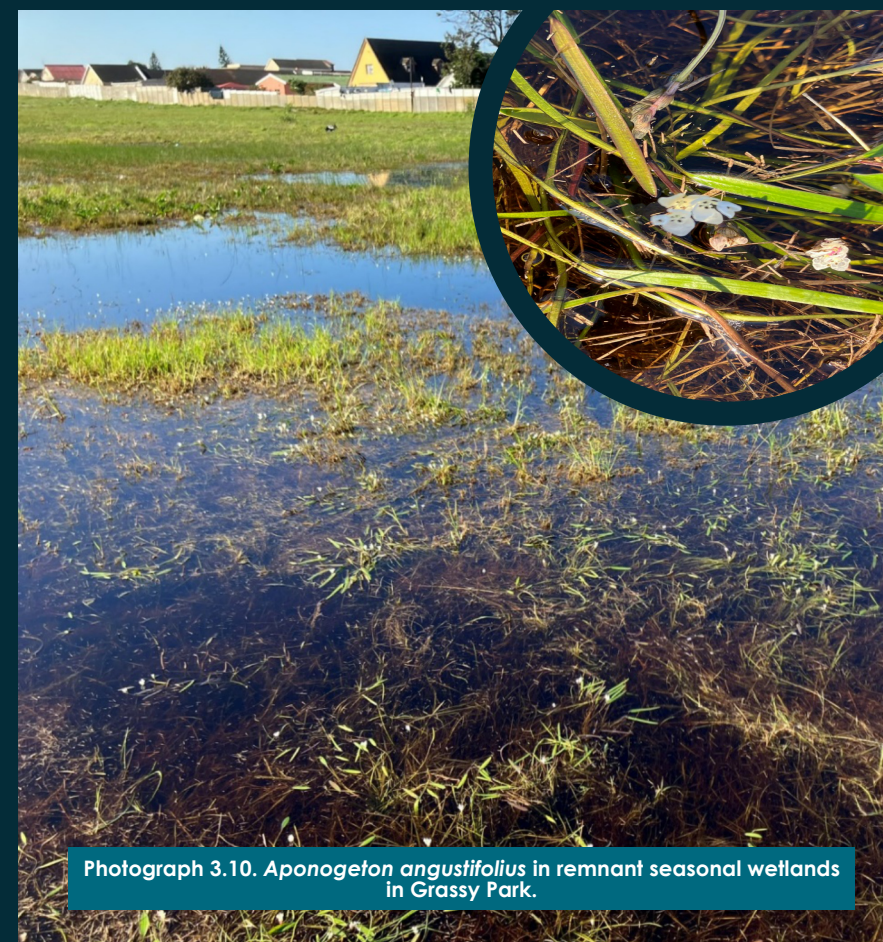


Photograph 3.8. Delicate flower of the Blouteebossie (*Psoralea glaucina*)
Photo: Cliff Dorse.

- **Blouteebossie** (*Psoralea glaucina*) has a tiny global distribution (CFR endemic). It was previously thought to occur only in wetland depressions to the east of Muizenberg. The few remaining plants in this area are within a residential development and another small population occurs in the vicinity. Several plants have subsequently been discovered in the wetlands near the Witzands Aquifer Nature Reserve near Atlantis – these are however not protected and are threatened by farming activities (City of Cape Town 2023). The species is IUCN listed as Critically Endangered.
- **Cape Heath** (*Erica verticillata*) was once abundant on the Cape Flats, where its showy pink flowers were picked for the cut-flower trade. This, coupled with large-scale loss of seasonal wetland habitat in the Cape Flats as surrounding urban and agricultural development expanded, led to the plant being extinct in the wild by 1950. Concerted efforts by a number of conservationists, including curators of overseas herbaria, led to the identification at last of viable remnant plants that had been maintained in various herbaria, including Protea Park in Pretoria and the Belvedere Palace Gardens in Vienna. Following several trial planting efforts, including the introduction of an additional clone at Rondevlei Nature Reserve, led by Dalton Gibbs, this species is now present in viable (albeit highly restricted) populations at Rondevlei and has been introduced to some other reserve areas. Following the removal of alien pines from the Lower Tokai Forest plantation, there has also been excellent establishment of this species in this area, highlighting the benefits of alien clearing to secure biodiversity benefits.
- The Critically Endangered **Salt Pan Daisy** (*Cotula myriophylloides*) was last officially recorded in Cape Town in 1926. Thought to have gone extinct, it was rediscovered in a new locality in 2024 by Cliff Dorse, in the saltpan wetlands of the Transnet railway reserve, near Century City, highlighting the biodiversity importance of these seasonal wetlands, and the need to protect them from impacts such as freshening from stormwater inflows and development pressures. Occurring only in seasonal wetlands, the plants flower as water level subsides in late spring.
- The Near-Threatened **delicate (or narrow-leaved) Cape pondweed / delicate waterblommetjie** (*Aponogeton angustifolius*) is a Western Cape endemic aquatic plant that occurs in seasonally inundated wetlands (and slow-flowing rivers) between Gouda, Worcester and Cape Town's Cape Flats (SANBI, 2024). This species is threatened by habitat loss and degradation, including changes in hydroperiod such as permanent inundation of naturally seasonally inundated areas, as a result of raised water tables and impoundments) as well as water quality impacts.
- The South African endemic **Cape star / vlei blommetjie** (*Pauridia aquatica* (formerly *Spiloxene aquatica*)) is one of Cape Town's seasonal geophyte (bulb) species, which occurs in seasonally shallowly inundated wetlands. The bulbs sprout once the wetland is inundated, producing delicate white flowers which, once pollinated, produce seeds in capsules. The flower stalk bends towards the ground as the capsules open, making it more likely that seeds will be dropped into the wetland, rather than being blown away.



Photograph 3.9. *Erica verticillata*
Photo: S. Dorse



Photograph 3.10. *Aponogeton angustifolius* in remnant seasonal wetlands in Grassy Park.



Photograph 3.11. Salt Pan Daisy (*Cotula myriophylloides*) in flower, 2024.
Photo: C. Dorse

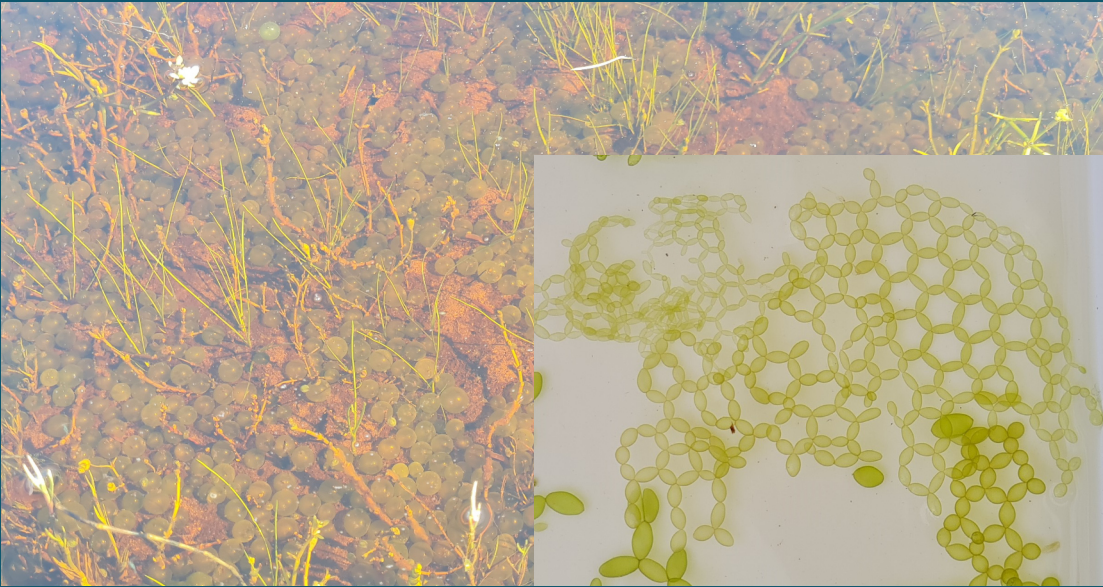


Photograph 3.12. Delicate flowers of *Pauridia aquatica* in a seasonally inundated wetland.

The wonderful world of algae within Cape Town's seasonal wetlands

Photos and text by Suretha Dorse, CCT

Most people might associate the word 'algae' with something unpleasant, but Cape Town's seasonal wetlands have some breath-taking species that would persuasively counter that perception. Three of these freshwater algal species include two Water Net algae (Hydrodictyaceae) *Hydrodictyon africanum*, *Hydrodictyon pateniforme* and one Stonewort (Charaphyceae), *Nitella praeclara*.



Photograph 3.13. *Hydrodictyon africanum* as loose spheres (background) and net-like structure (inset).



Photograph 3.14. *Hydrodictyon pateniforme*.

What makes these algal species so noteworthy in Cape Town?

Besides the fact that these species are large and easily obvious to the naked eye, they are truly beautiful and fascinating. The Water Net algae have a life-cycle phase where the cells are combined in a net-like pattern (hence the common name) in the early stages of development. As the algal cells develop and expand, they break free of this net structure and the single cells swell into beautiful, glossy grape-like spheres (in the case of *H. africanum*) or long, sausage-shaped cells that twist around one-another (in the case of *H. pateniforme*).

The stunning *Nitella praeclara*, on the other hand, could easily be described as resembling 'a little underwater succulent-like plant'. Their attractive, light-coloured calcium bands and striking red oospores simply adds to the special appearance of this Charaphyte. To quote James Groves & Edith L. Stephens' (1925) verbal account of the species: 'its stoutness, transparency, and turgidity give it the appearance of pale green blown Venetian glass'.



Photograph 3.15. *Nitella praeclara*

These species occur in limited sites within the City - currently, no more than three locations are known for any of these special organisms. All require seasonal wetland habitat on the lowlands, a habitat type that is poorly conserved and has been significantly transformed. The suitable habitat that remains is fragmented and subject to continued development pressure and degradation, mainly due to eutrophication from a variety of sources. Conservation action to ensure that these algal species are protected is of critical importance.

Arguably the most significant of these is *Nitella praeclara*, a Fynbos Biome endemic, which is only known from Cape Town and the Overberg. It was first found in 1912 and described in 1926 (Groves & Stephens) but never photographed until the species was identified in wetlands at the Goodwood Prison by Cliff Dorse in 2021.

The two Water Net algae have wider distributions, but were both originally described from Cape Town localities. *Hydrodictyon africanum* occurs in Cape Town and the Eastern Cape (also likely a Fynbos Biome endemic), while *H. pateniforme* has been found across South Africa, as well as in Peru, Cuba, Uruguay and the United States of America. Despite the challenges seasonal wetlands face in urban areas, it is imperative that the remaining wetlands within Cape Town that still contain these species be adequately protected. This is where these three species were described from and this is where future generations should have the ability to see all three.

3.3.4 Cape Town's seasonal wetland fauna

Under natural conditions, seasonal wetlands both support and rely on the influence of complex communities of wetland fauna that range from micro-crustaceans through to large mammals. While in Cape Town, large mammals have long been eliminated from most wetland (and other) habitats, seasonal wetland fauna remain an intrinsic part of how these remnant wetlands function.

The following sections highlight some aspects of particular groups (Classes) of seasonal wetland fauna.

3.3.4.1 Invertebrates

No comprehensive assessments appear to have been carried out on the extant aquatic invertebrate fauna of Cape Town's wetlands, although some studies have been carried out on some wetlands.

Bird (2012) assessed aquatic invertebrate species diversity across some 140 temporarily to seasonally inundated wetland sites in the Western Cape, including some in Cape Town (Moddervlei (False Bay Nature Reserve), Koeberg Nature Reserve (Atlantis Catchment), Kuils River catchment and Grassy Park wetlands in the Zeekoe Catchment), and found strong correlations between the presence of branchiopod crustaceans (an invertebrate group including anostracans (fairy shrimps), conchostracans (clam shrimps) and cladocerans (water fleas)) and dry season moisture levels. In assessed wetlands, seasonal taxa from these important invertebrate groups occurred only in seasonally inundated habitats where soils dried out in summer to moisture levels of below 20 percent. Studies by Visser et al (2013) in seasonal pans in the Koeberg Nature Reserve further showed high levels of endemism amongst crustacean fauna inhabiting these systems, while highlighting how little is actually known about these taxa, with several taxa being as yet undescribed.

Day and Bird (2005) assessed the invertebrate fauna of Moddervlei, and noted that (mainly insect) taxa from permanently inundated sections of this rehabilitated wetland influenced wet season invertebrate community predator-prey relationships, by allowing insect predators (mainly hemipterans, coleopterans and odonates) to expand into newly inundated areas before seasonal crustacean fauna had time to expand their populations. By comparison, in the wholly seasonal wetlands assessed (Grassy Park area), insect taxa appeared in seasonal pools later in the wet season, allowing crustacean fauna to cycle through their life cycles.

These studies illustrate the high sensitivity of these systems to changes in hydroperiod, particularly extended saturation or inundation. Naturally seasonal to ephemeral wetlands that are subjected to artificially raised water tables or impoundment lose their natural plant and animal diversity and are generally dominated by a few hardy species such as bulrush (plants) and insects (invertebrate fauna) at the expense of seasonally-adapted endemics. Such changes in seasonal inundation patterns often result from urban stormwater runoff and inflows of treated sewage effluent into naturally seasonal rivers.



Photograph 3.16. Seasonal ground-water fed wetlands at Koeberg Nature Reserve.



Photograph 3.17. Invertebrate fauna from seasonal wetlands in Cape Town. A: Fairy shrimp (Brachiopoda: Anostraca); B: Copepods; C: Damselfly nymph (Family Coenagrionidae). Photos: Suretha Dorse.

The City's last seasonal salt pans

Very few areas of natural salt pan remain in Cape Town today, with most having been lost to development or inundation (e.g. Salt pans of the Noordhoek wetland that gave way to the residential development of Lake Michelle).

The Rietvlei Nature Reserve area does still include extensive salt pans, which lie roughly east of the permanent open water bodies. These pans are set in a mosaic of dense saltmarsh sedges and reeds, and support sparse to dense patches of *Sarcocornia* sp. within broad unvegetated expanses that dry to salt-encrusted silty pans in the summer.

Strong summer winds blow the surface salt and silt crusts off the pans, resulting at times in severe dust in abutting residential areas. Wind action on the salt pans is assumed to be one of the natural drivers of pan function, reducing salt levels and preventing the build-up over time of organic sediments in the pans.



Photograph 3.18. Remnant salt pans in Rietvlei Nature Reserve.

During the wet season, the pans are shallowly inundated, and support large numbers of wading birds, including palearctic migrants. Although no data were sourced in this study regarding the actual aquatic invertebrate community structure of the pans during the wet season, it is assumed that their ecology is today broadly similar to that of other temporary to seasonal pans along the west coast and interior of the Western Cape, the Northern Cape and Namibia. Such systems support communities of mainly crustacean invertebrate species, many of which have highly specific adaptations that allow them to persist through periods of extreme drought, followed by inundation and, during inundation, salinities that can range from near-fresh to hyper-saline conditions over a single season. **Dry season irrigation and stormwater inflows threaten these important wetlands.**

3.3.4.2 Amphibians

Cape Town provides habitat for 27 amphibian species, of which four (and possibly five³) are endemic to the city (City of Cape Town 2023), namely:

- Table Mountain Ghost Frog (*Heleophryne rosei*) – **Critically Endangered** (associated with fast-flowing perennial streams on the eastern side of Table Mountain (Du Preez and Caruthers 2009) and thus not linked to seasonal wetlands);
- Flat Caco (*Cacosternum platys*) – **Near Threatened** (habitat includes seasonal wetlands (Du Preez and Caruthers 2009));
- Rose's Mountain Toadlet (*Capensibufo rosei*) – **Critically Endangered** (habitat includes seasonal mountain fynbos pools);
- Cape Peninsula Moss Frog (*Arthroleptella lightfooti*) – **Near Threatened** (breeds in mountain seeps and streamside areas (Du Preez and Caruthers 2009)).

Other threatened species that occur within the city include:

- Micro Frog (*Microbatrachella capensis*) – **Critically Endangered**
- Western Leopard Toad (*Sclerophrys pantherina*) – **Endangered**
- Cape Platanna (*Xenopus gilli*) – **Endangered**
- Cape Rain Frog (*Breviceps gibbosus*) – **Near threatened** (but not a seasonal wetland species)
- Cape Caco (*Cacosternum capense*) – **Near threatened**
- Montane Marsh Frog (*Poyntonia paludicola*) – **Near threatened**.



Photograph 3.19. Habitat of Montane Marsh Frog (*Poyntonia paludicola*) in Steenbras Nature Reserve.

³ City of Cape Town (2023) notes that the recently described *Cacosternum aggestum* is currently only known from the Cape Town area, but its distribution may be more widespread.

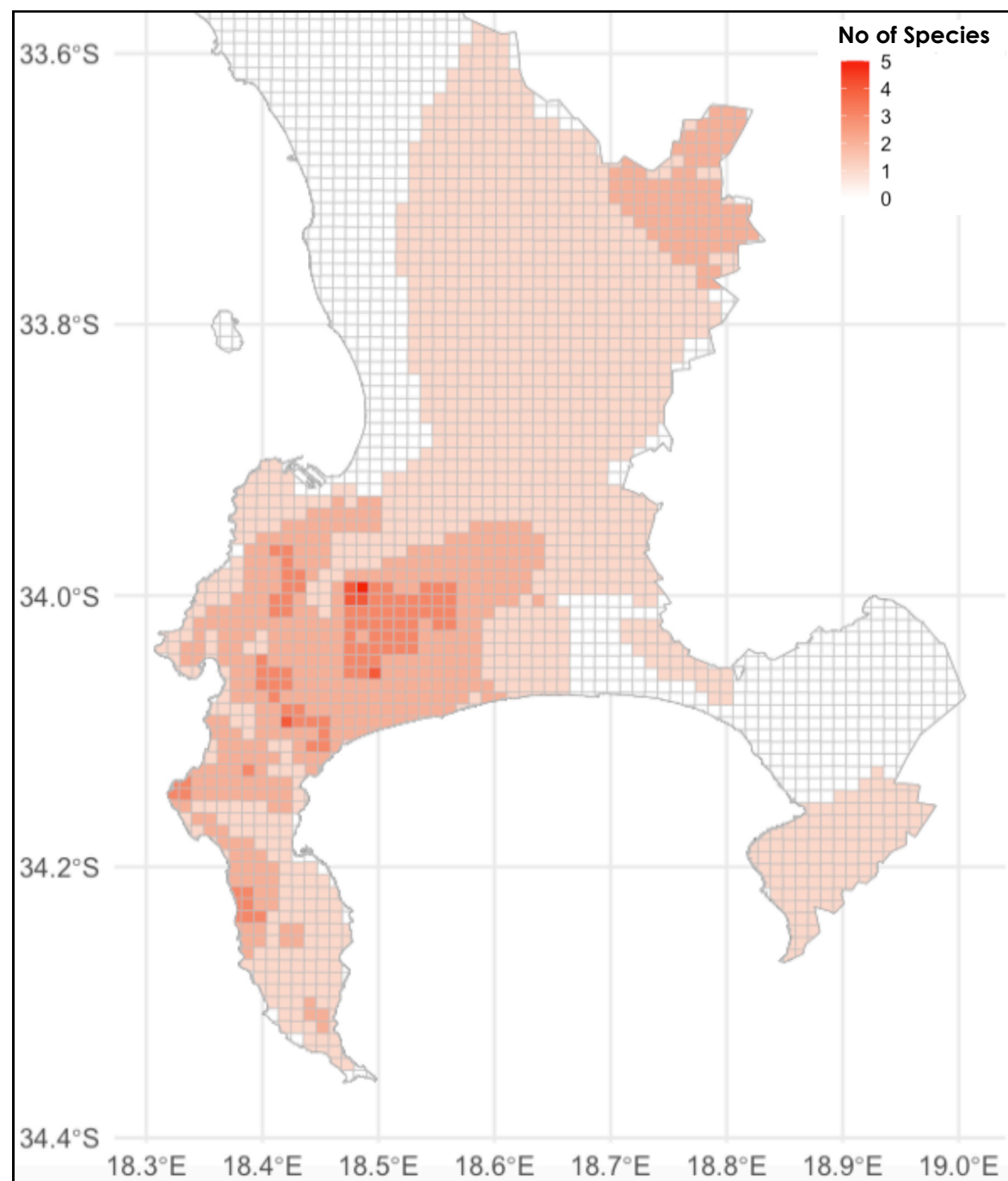


Figure 3.2. Heat map showing overlays of distributions of Cape Town's endemic and threatened frog species.
Provided by J. Bell (CCT: BMB).

Western Leopard Toad life cycles and habitats

The Endangered Western Leopard Toad is one of Cape Town's flagship wetland species. It breeds in seasonal wetlands that retain standing water into early December. During the non-breeding season, adults disperse into terrestrial habitat, including suburban gardens and agricultural areas. Breeding usually occurs in late winter (July to August), when adults migrate towards their breeding ponds. Males establish large choruses at night to attract females, who lay their eggs in the water bodies, after mating.

During the breeding season, these animals are highly vulnerable to fatalities from road traffic, as they migrate *en masse* towards their breeding grounds. In the False Bay Nature Reserve, toad tunnels have been constructed under roads within a major migration route, while in areas such as the Noordhoek wetlands, migrating toads are "funnelled" along the roadside towards collection points, from where volunteers move them safely over the road towards their desired location. These volunteer groups play an important role in raising awareness about the plight of these frogs and in trying to bring about changes in road user behaviour over breeding periods.

In late November/early December, toadlets leave the breeding ponds and migrate into terrestrial areas – again, these mass migrations are periods of high risk for toadlets, many of which are killed by traffic and predators en route.

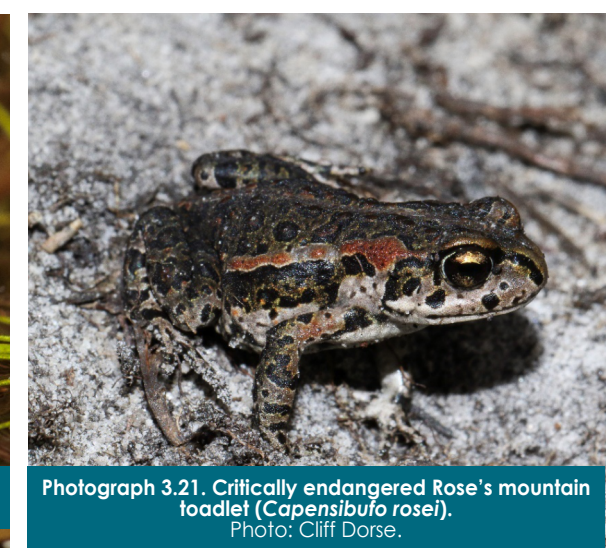
Western Leopard Toads are further threatened by the introduction, over the past ten years, of the Guttural Toad (*Sclerophrys gutturalis*). This species derives from the north-eastern parts of South Africa, but was introduced to Cape Town and now threatens the survival of Western Leopard Toads through competition for resources (City of Cape Town 2018).



Photo: Marius Burger



Photograph 3.20. Flat caco (*Cacosternum platys*).
Photo: Cliff Dorse.



Photograph 3.21. Critically endangered Rose's mountain toadlet (*Capensibufo rosei*).
Photo: Cliff Dorse.

3.3.4.3 Fish

The only indigenous fish species associated with Cape Town's seasonal wetlands is the Cape galaxias (*Galaxias zebratus*), although recent research suggests that there may in fact be many more species than originally envisaged, and the species is now regarded as a species complex (Waters and Cambray 1997; Wishart et al. 2006; Chakona et al. 2013).

Of importance in this report is that the species as defined at present is capable of facultative air-breathing, allowing fish to survive at least for some time during periods when seasonal wetlands are not inundated (see above reference). During wet periods, they extend their range into inundated wetlands, and are assumed to survive outside of these periods by retreating into permanent waterbodies, such as excavated ponds or deeper natural depressions. During the 2024 wet season, for example, galaxiads were observed in the Kenilworth Race Course seasonal wetlands, and are assumed to survive extended dry periods in the irrigation ponds in the conservation area.



Photograph 3.22. Cape galaxiad (*Galaxias zebratus*).
Photo: Suretha Dorse.

Rehabilitation of Van Blommenstein Park, FBNR, by way of removal of alien gum trees and the installation of toad corridors under Peninsula Road (see Section 5.2), allowed for the re-creation of extended connected seasonal wetland habitat in the park. Cape galaxiads were observed in these wetlands in the wet season of 2024, highlighting the ecological benefits of alien plant clearing and physical reconnection of wetland areas with culverts/toad corridors.

3.3.4.4 Mammals

Cape Town was once home to numerous wild mammals, from small rodents to large herbivores and predators, including lions, leopards, spotted hyena and wild dogs (Boshoff et al. 2016). The largest herbivore species likely to have frequented Cape Town's wetlands would have been the hippopotamus. Hippo are likely to have played a crucial role in maintaining the function and structure of Cape Town's wetlands, by trampling vegetation, grazing, opening up flow pathways and wallowing, to create and maintain pools and pans.

Today, large herbivores and predators have virtually been eliminated from Cape Town (and most of its hinterland). Hippo were however re-introduced to the Rondevlei Nature Reserve in 1979, in order to control alien invasive vleigras (*Paspalum vaginatum*), which was smothering parts of the wetland, preventing wading birds from accessing the underlying mudbanks for food (Brown and Magoba 2009). A resident pod of hippo remain at Rondevlei today, where they play an important ecological role in wetland maintenance.

Smaller wetland-associated mammals such as Cape clawless otter, water mongoose, vlei rat and Cape porcupine still occur in and near many of Cape Town's wetlands and rivers. They play important roles in maintaining food chains and contributing to ecosystem complexity. Managing the city's watercourses and wetlands needs to ensure that there is enough space for these fauna to live and reproduce, and that there is connectivity between habitats, so that populations are not isolated. This means ensuring that adequate buffers are provided between developed areas and rivers and wetlands, so that these and other fauna can move between aquatic and other natural habitats. Walls and fences also need to be designed so that they do not block off connectivity – this can potentially be achieved by providing 30 cm square open blocks within fencing, at intervals along the base of fences through or along wetlands. Electric fences can be particularly lethal, and a rule of thumb would be to lift electrical fencing strands at least 30 cm above the base of the fence line.

Caracal and Water Quality

Although most of Cape Town's large carnivores have long disappeared, the city still provides habitat for smaller carnivores, including caracal (*Caracal caracal*). These predators occupy a wide range of habitats, and in Cape Town, in addition to natural and near-natural habitats in the Table Mountain National Park and other mountain reserves, they have also adapted to transformed landscapes within the city, such as vineyards, green belts and wetland areas. Leighton et al. (2022) found that they are in fact preferentially attracted to wetlands, where prey is often abundant. However, many of Cape Town's wetlands are highly polluted (Day et al. 2024). Leighton et al. (2022) found that caracals occupying these areas bioaccumulate toxic chemicals, putting them at risk of significant toxicological effects.



Photograph 3.23. *Caracal caracal*.
Photo: Marius Burger.

3.3.4.5 Birds

Cape Town's wetlands support large numbers and numerous species of birds. Permanent wetlands provide habitat for many species of waterfowl, of which the Great White Pelican (*Pelecanus onocrotalus*) is the largest species, and thrives in nutrient-enriched permanent waterbodies such as Zeekoevlei, where it feeds mainly on alien carp (*Cyprinus carpio*). Seasonal wetlands offer a different habitat type, with deeper areas providing swimming habitat for birds such as indigenous Yellow-billed Duck (*Anas undulata*) and others, while shallow standing water habitat provides feeding areas for wading birds. Greater and Lesser Flamingo (*Phoenicopterus roseus* and *P. minor*); African Spoonbill (*Platalea alba*); Grey Heron (*Ardea cinerea*), Purple Heron (*A. purpurea*), Goliath Heron (*A. goliath*), and other Heron species; Pied Avocet (*Recurvirostra avosetta*); and Little Egret (*Egretta garzetta*) are just a few of the species commonly occurring in Cape Town's seasonal wetlands during the wet season. During the dry season, the inundated portions of the wetlands shrink, and may dry out altogether, and the birds move on to other foraging areas. However, the seasonal drought is important for maintaining wading and swimming habitat in these systems – without it, the shallow wetlands would quickly be invaded by dense bulrush (*Typha capensis*) and other reedbed types, at the expense of the shallow wading areas required for feeding by these iconic birds.

The 2 300 ha False Bay Nature Reserve, a Ramsar Wetland Site, is the fifth most important habitat for wetland birds in southern Africa, providing habitat for up to 250 bird species, with at times up to 30 000 birds making use of the wetlands. Rietvlei wetlands, within the Table Bay Nature Reserve, and including the permanent waterbodies of Flamingo Vlei, also offer a rich variety of aquatic habitats. These support some 196 species, including northern hemisphere migrants, which arrive in spring and summer. The recently rehabilitated Paardevlei wetland is Cape Town's largest seasonal wetland. During the wet season, it supports numerous bird species including waders.



Photograph 3.24. Shallow, seasonally inundated wetlands such as the Bamboesvlei wetlands, in Ottery, provide wet-season feeding grounds for many water fowl and wading birds including African Snipe.



Photograph 3.24. Lesser Flamingos (*Phoeniconaias minor*) and other waterbirds at Paardevlei.
Photo: T. Scholtz

Cape Town's declining migratory shorebirds

Text by C. Dorse

Every year, vast numbers of migratory birds leave their breeding grounds in the high latitudes of the northern hemisphere and head south, to avoid the looming boreal winter. They include many species of shorebird, several of which come all the way to the southern tip of Africa. Historically, the most numerous species to reach the Cape included Curlew Sandpiper (*Calidris ferruginea*), Little Stint (*C. minuta*), Sanderling (*C. alba*) and Common Ringed Plover (*Charadrius hiaticula*). Several other species were also represented, but in much lower numbers. These birds frequented our rocky and sandy coastlines as well as the edges of our inland water bodies. Tragically, in recent years there has been a catastrophic decline in the numbers of these shorebirds that visit Cape Town's waterbodies. For example, in comparative coastal counts, it was found that both Curlew Sandpiper and Sanderling have declined by over 90% in a 30-year period.

These startling numbers reflect a global decline in migrant waterbirds and the population declines can be attributed to numerous factors. In Cape Town however there has certainly been a decrease in the habitat suitability of many of our freshwater waterbodies for shorebirds. This is primarily due to the lack of shallow water and natural muddy and sandy edges, which are required for feeding. Eutrophication (i.e. severe nutrient enrichment) has resulted in extensive plant growth along the shorelines of many waterbodies, eliminating the shallow shoreline habitat used by wading birds. This, in addition to the accumulation of pollutants, sludge, hydrological changes and physical habitat manipulation have all contributed to a decrease in the densities and diversity of the aquatic macroinvertebrates that used to support high diversities of wader species.

Two of the most significant waterbodies remaining in Cape Town for migrant shorebirds are Flamingo Vlei, at the Table Bay Nature Reserve and Paardevlei Wetland, near Strand. Both these systems dry out in late summer, which creates good habitat for shorebirds while hampering the establishment of reeds and other vegetation. Paardevlei's water levels are managed artificially, via an outlet system, from which water is released in spring each year.



Photograph 3.25. Curlew Sandpiper (*Calidris ferruginea*).
Photo: C. Dorse.

Cape Town's threatened indigenous fauna

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened

Photos: C. and S. Dorse



4 CAPE TOWN'S WETLANDS TODAY

4.1 National status of wetlands

The 2018 National Biodiversity Assessment (NBA) found that, compared with the 2011 NBA, the number and extent of threatened wetland ecosystem types increased significantly at a national level, with a major rise in the percentage of Critically Endangered types in that dataset. The study (Van Deventer et al. 2018) showed that:

- 79% of South Africa's wetland ecosystem types were threatened (Critically Endangered, Endangered or Vulnerable);
- Lowland wetland types were particularly vulnerable to development-related impacts, with 93% of valley-bottom and floodplains wetlands classed as Critically Endangered;
- Wetlands and estuaries are the most threatened of all South Africa's ecosystems, with 62% of wetland ecosystem types classed as Critically Endangered.

4.2 Provincial wetland status

The 2018 NBA also provided data for wetlands (and other ecosystems) at a provincial scale (summarised from Skowno et al. 2019). These data showed that, in the Western Cape:

- Changes in hydrological regime and poor water quality are the major pressures on biodiversity in inland aquatic ecosystems (i.e. rivers and wetlands);
- Biological invasions, especially by alien fish and woody plants, affect wetland condition and habitat quality for fauna, particularly amphibians;
- Inland wetlands, rivers and estuaries are predominantly heavily modified or worse, and are in poor condition, with only about 10% of inland wetland area considered to be in natural/near natural condition;
- 74 wetland ecosystem types occur in the Western Cape, of which 49 are Critically Endangered; 7 are Endangered; and 7 are Vulnerable.

With regard to the role of protected areas in wetland conservation, data from Cape Nature's 2023 Biodiversity Assessment showed that the percentage of wetlands in Cape Nature-protected and managed areas that were in a good or moderately modified condition was higher than in non-protected areas. This in part illustrates that many of these areas have been included in formal reserves or stewardships because of their good condition – but also highlights the importance of formal reserves as a conservation tool.

4.3 Wetland extent in the City of Cape Town

4.3.1 Mapping wetland extent

In 2007, the City embarked on a project to map and classify wetlands within the City of Cape Town. The final phase (Phase 4) of this project was completed in 2008, resulting in a GIS layer, mapped largely off orthophotos but with some ground-truthing, as presented in Ewart-Smith et al. (2008). Following this, wetlands were prioritised for conservation purposes, using a weighted rating system (Snaddon and Day 2009). This allowed wetlands of the same type to be ranked in terms of conservation importance, and to be included in the City's BioNet (see Section 4.5). The availability of these data marked a significant step forward in generating the kind of spatial data that are essential for the City to be able to manage and conserve its wetlands – “*you cannot manage or protect what you do not know is there*” (Brown and Magoba 2009).

Updating of the wetland layer occurred in 2014, using the revised aquatic ecosystem classification system of Ollis et al. (2013) (see Section 3.2). A further revised wetland layer was issued by the City in 2017, with updated wetland mapping, including ground-truthed wetland data derived from aquatic environmental impact assessment (EIA) reporting and other studies. At the time of writing this report, an updated wetland layer was in progress, as part of the City's BioNet 2024. A total area of 11 263.17 ha of natural and artificial wetland is mapped in this layer, representing some 8217 wetlands.

It should be noted that the City's wetland spatial data were not developed for the purposes of detailed site assessments required for Environmental Impact Assessment (EIA) input, but rather allow broad-scale identification of Cape Town's wetlands, to inform project planning and conservation strategies.

4.3.2 The BioNet

The Cape Town Biodiversity Network or BioNet is the fine-scale, systematic Spatial Biodiversity Plan for the municipality. The BioNet identifies a minimum set of priority areas for conserving ecosystems and species and maintaining ecological functioning at a landscape level.

Major revisions to the BioNet took place in 2009 (ground-truthing and Red List compilation); 2011 (climate change adaptation); 2016 (national wetland classification) and 2021 (extended planning domain inclusion). The extended planning domain includes a 10km buffer around the city, together with major water supply dams and associated sub-catchments, in recognition of the City's reliance on ecological infrastructure and ecosystem services from outside of its boundary.

Input layers to the 2024 BioNet include the 2018 National Vegetation Types, wetlands, estuaries, foredunes, coastal Critical Biodiversity Areas (CBAs), climate change corridors, fauna and flora occurrence data, endemic hotspots, Strategic Water Source Areas and Groundwater Protection Zones.

The 2024 BioNet (“BioNet 2024”) has also amended the CBA categories for terrestrial ecosystems, which are now aligned to SANBI's National Guideline for CBA Maps. The Terrestrial BioNet and Aquatic BioNet are moreover now represented on separate maps.

Table 4.1. outlines the CBA categories included in BioNet 2024 for terrestrial ecosystems. The aquatic ecosystem CBA layer is structured slightly differently, and includes only CBA1, CBA2, Ecological Support Area (ESA) 1, and ESA 2 categories . The aquatic ecosystem layer incorporates all wetland systems, including natural, artificial and “transformed” layers, with the latter not defined in the 2024 wetland metadata, but including wetlands that have been “farmed”, “developed” and/or have been created for/converted to stormwater systems. ESA 1 and ESA 2 wetlands are typically represented by artificial wetlands or natural wetlands in the lowest or second lowest quartiles for that type, with respect to their condition. ESA 1 and ESA 2 wetlands were previously categorised as Critical Ecological Support Areas (CESAs) and Other Ecological Support Areas (OESAs), respectively.

Table 4.1. Categories included in BioNet 2024 for terrestrial ecosystems. Note that the aquatic ecosystem CBA layer includes only CBA1, CBA2, ESA 1, and ESA 2 categories.

BioNet 2024	CBA Descriptors
PA	Protected Area
CA	Conservation Area
CBA 1a	Critical Biodiversity Area 1a (irreplaceable high and medium condition)
CBA 1b	Critical Biodiversity Area 1b (irreplaceable low condition, connectivity)
CBA 1c	Critical Biodiversity Area 1c (irreplaceable low condition)
CBA 2	Critical Biodiversity Area 2 (optimal)
ESA 1	Ecological Support Area 1 (natural or semi-natural ecological condition)
ESA 2	Ecological Support Area 2 (intensively modified ecological condition)
ONA	Other Natural Area (not required to meet biodiversity targets)

The BioNet is recognised locally (City of Cape Town policy: Bioregional Plan 2015); provincially (Western Cape Biodiversity Spatial Plan 2017 and EIA legislation); and nationally (Policy and Biodiversity Act 2004). The BioNet is also mainstreamed in the Municipal Spatial Development Framework and District SDFs. It informs actions to manage and conserve biodiversity through a range of mechanisms, including improved land-use decision making to avoid further loss; Protected Area expansion; monitoring of management effectiveness; and prioritisation and implementation of ecosystem restoration.

The BioNet is a key informant in all integrated spatial planning products and decision-making. It represents the least land-hungry option possible to meet national biodiversity targets, and the best option to keep Cape Town sustainable into the future.

Figure 4.1. presents the draft outputs of the 2024 wetland layer, showing artificial and natural wetlands across the city, in the context of Cape Town's 20 stormwater reticulation catchments, some of which in fact include the catchments of several small systems (e.g. the South Peninsula Catchment) or which are fed by diffuse flows and multiple minor drainage lines (e.g. Muizenberg Catchment). The figure illustrates that:

- Numerous wetlands extend across the entire extent of the city;
- Many of these are associated with rivers;
- The Diep River, Eerste/Kuils River and Zeekoe catchments are associated with the most prominent wetlands. These comprise the Diep River Estuary, with Milnerton Lagoon and Rietvlei all included in the wetland layer; extensive floodplain wetlands along the lower Kuils River; and Zeekoevlei, Rondevlei and Princess Vlei in the Zeekoe catchment;
- The upper Lourens, Steenbras and Sir Lowry's Pass Rivers are all associated with extensive mountainous wetlands in their source areas; and
- Numerous artificial wetlands also occur in the city, including one major supply dam (Steenbras Dam, in the east), as well as various smaller supply dams, reservoirs, stormwater retention and detention ponds, waste water treatment maturation ponds and farm dams.

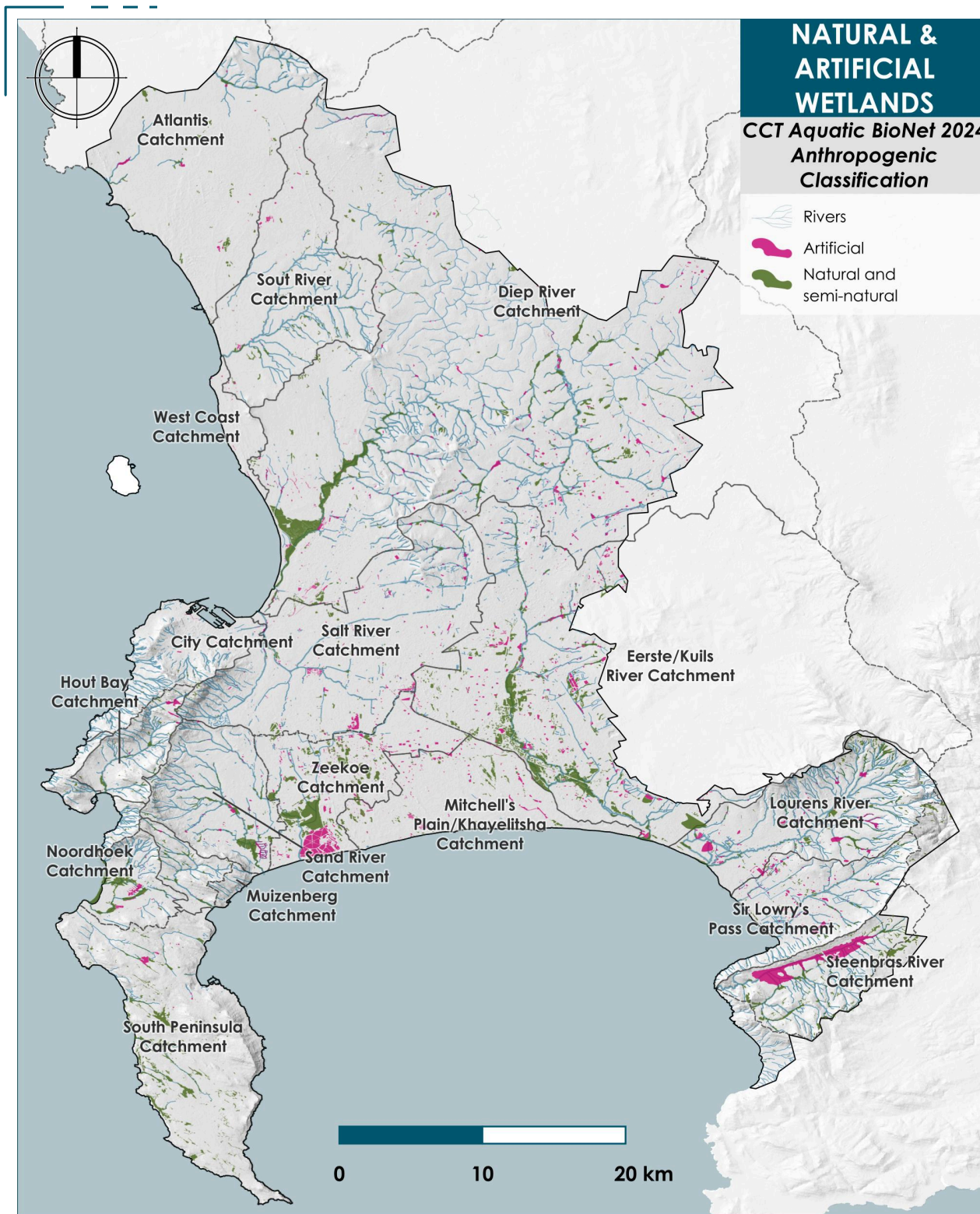


Figure 4.1. Outputs of the City's 2024 BioNet aquatic layer (draft), showing artificial and semi-natural / natural wetlands across the city. Only wetlands in the City of Cape Town's boundaries are shown.

4.3.3 Wetland vegetation

Figure 4.2. plots (graphically) the same wetland data shown in **Figure 4.1.** but this time categorises the data in terms of **wetland vegetation**, at a catchment level. Wetland vegetation as shown here is based on the vegetation type in which the wetland is located. These vegetation types were derived from specialist botanical input during the 2008 and 2014 iterations of the wetland layer. Although they are based on terrestrial vegetation types, wetland vegetation is more similar across broader areas than terrestrial vegetation. Hence the derivation of broader categories at the time.

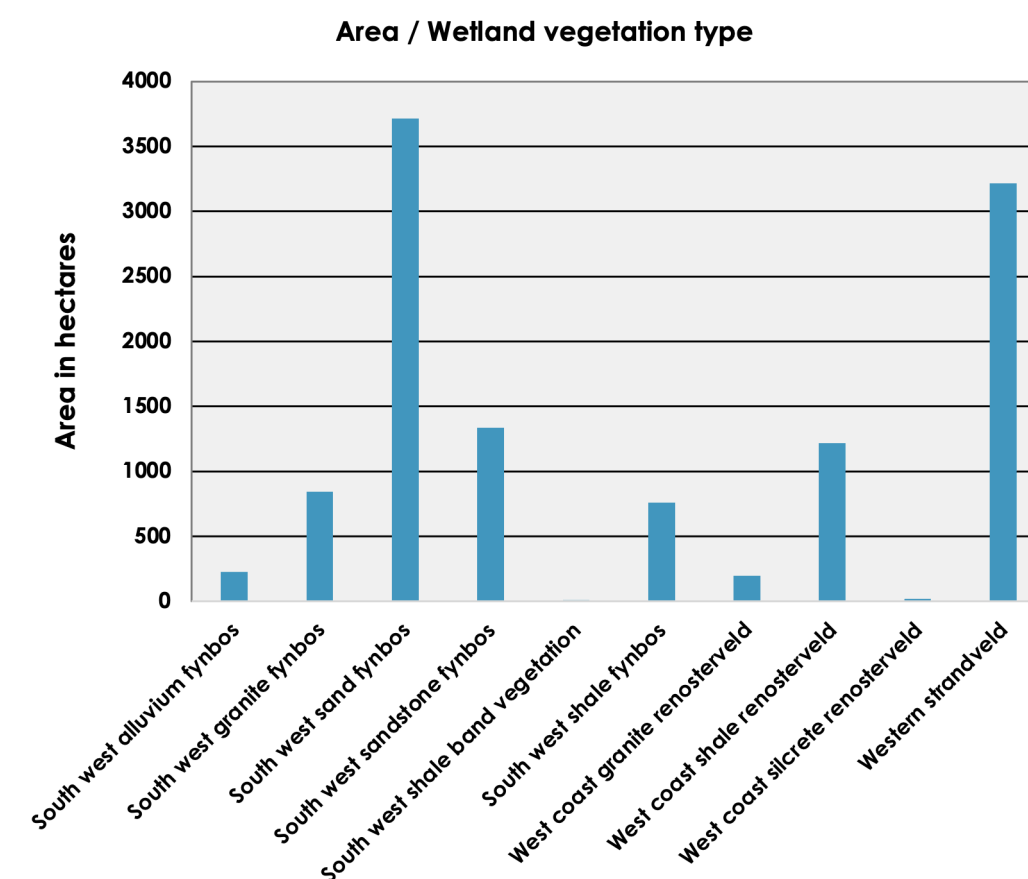


Figure 4.2. Cape Town's wetlands classified in terms of wetland vegetation.

The data shown in **Figure 4.2.** indicate that:

- South west sand fynbos and Western strandveld vegetation account for the greatest areas of wetland in the City.
- The smallest areas of wetland are those in the South west shale band vegetation type (a mere 1.14 ha mapped in the Sir Lowry's Pass catchment); South west alluvium fynbos (in the Diep, Lourens and Sir Lowry's Pass catchments) and West coast granite renosterveld (in the Atlantis, Sout, Diep and Eerste/Kuils catchments).

No further analysis of these data is provided in this report. This is because in practice today, wetland reporting usually references **wetland bioregion** data, derived from the 2018 update of terrestrial bioregions (Van Deventer et al. 2018). A recommendation from this report is for wetland types to be re-looked at, as a multi-partner exercise between aquatic specialists, City of Cape Town ecologists and the SANBI freshwater programme leads.

4.3.4 Wetland bioregions

A bioregion is defined as a level between the biome and national vegetation type on the vegetation atlas of South Africa and it reflects similarities in landscape, biota and ecosystem functioning on a regional level (Van Deventer et al. 2018).

Unfortunately, the aquatic BioNet data do not however include wetland bioregion data for all of the mapped wetlands, with bioregions for 4 293 wetlands (56.7 % of the total mapped wetland area) not having been assigned bioregion data.

This limits statistical analysis of the dataset, and should be addressed in final iterations of the aquatic BioNet. It also means that wetland type and associated Ecosystem Threat Status (ETS) cannot be assigned to these wetlands, since "type" derives from a combination of HGM unit (Level 4A of the wetland classification system) and bioregion. ETS data can currently only be derived from the National Wetland map (Van Deventer et al. 2019).

Figure 4.3. does however show the distribution of different wetland types within the city, for wetlands for which bioregions have been assigned. The figure indicates that, excluding wetlands mapped as "seashore" systems, Cape Town overlies three bioregions, namely the:

- Southwest fynbos bioregion;
- West coast renosterveld bioregion; and
- West Strandveld bioregion.

Of these:

- Southwest fynbos bioregion seeps are classified in the BioNet as Vulnerable;
- Southwest fynbos bioregion depressions are classified as Endangered; and
- All other wetland types are classified as Critically Endangered.⁴**

Assignment of Bioregion data to all mapped aquatic ecosystems and coupling of NWM and BioNet aquatic ecosystem data is strongly recommended, to allow for reporting on ecosystem threat status and level of protection, and to ensure that the NWM and City wetland layers are both compatible and complementary.

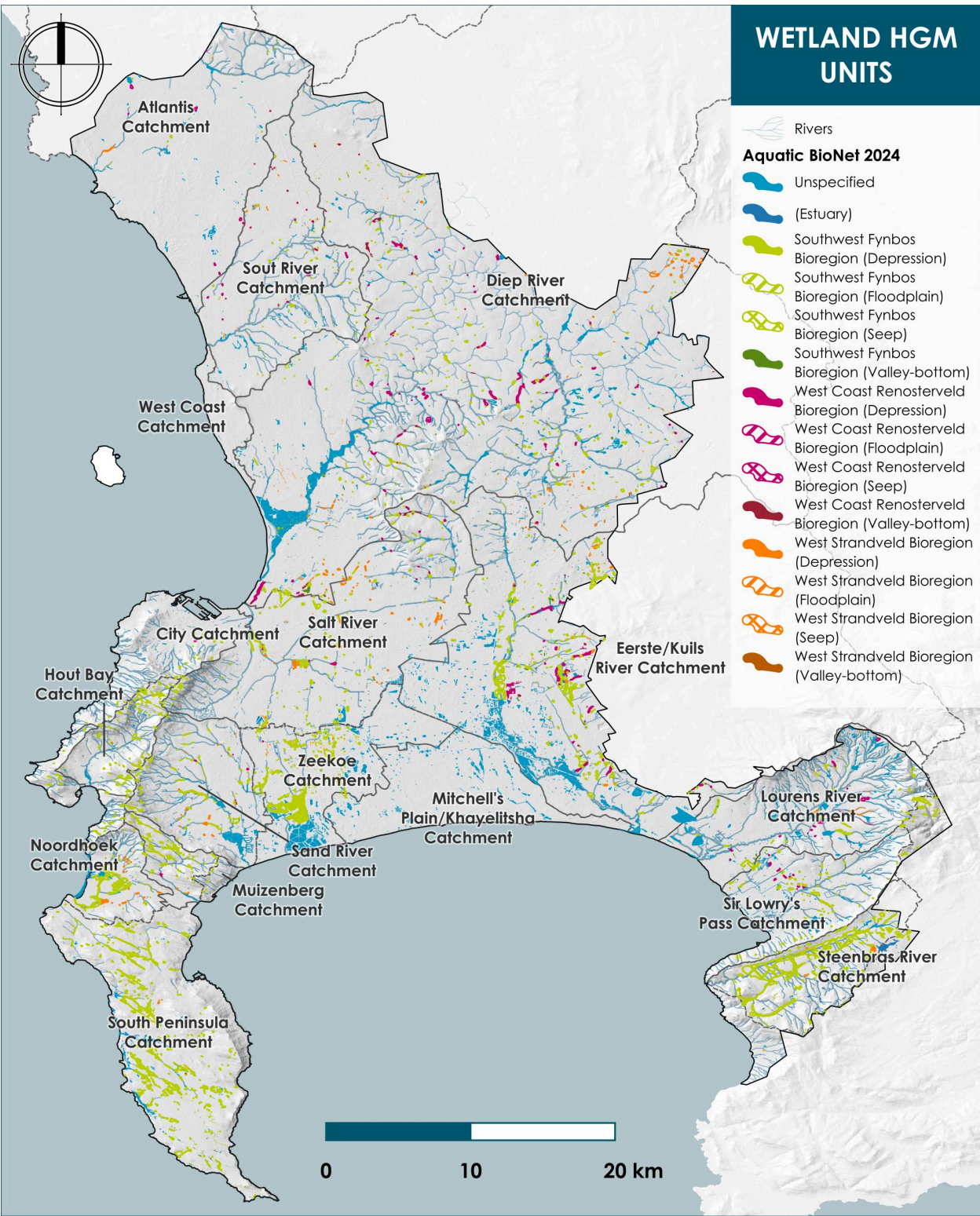


Figure 4.3. Distribution of different wetland types (using bioregion and HGM Unit data to derive type) in Cape Town, also showing the extent of wetlands for which such data have not been assigned.

⁴ Note that, unlike in the NWM, ETS data in the BioNet currently do not differentiate between natural and artificial wetland types, with the result that artificial dams, which are classified as depressions, are assigned the same ETS rating as natural depressions in the same bioregion. This issue should ideally be addressed in an updated version of the Aquatic BioNet, to differentiate between natural pans / depression wetlands, wholly artificial dams / ponds and those that were originally natural wetlands but have been impounded or otherwise altered.

4.3.5 Wetland hydrogeomorphological type

In the absence of comprehensive data for wetland type (see above), **Figure 4.4.** shows the extent of different wetland HGM types in Cape Town (as per Level 4A HGM Units - see Section 3.2). **Figure 4.5.** plots the data by area per catchment, for clearer quantification, while **Figure 4.6.** presents wetland area per catchment as a percentage of total catchment area, to indicate the most wetland-dense catchments. Note that the Diep and Eerste/Kuils catchments extend well outside of Cape Town's municipal boundary and these data are thus under-represented in this graph.

The data show that:

- The most extensive wetland type in the city by area comprises depression wetlands, accounting for about 45% of total mapped wetland area. Of these, more than half are artificial systems (mainly in- and off-channel dams, stormwater ponds and waste water treatment works (WWTW) ponds);
- Seep wetlands are the second most extensive wetland type, with many seeps occurring on steep upper mountain slopes, and this wetland type makes up some 28% of total wetland by area;
- Transformed wetlands (assumed to have been transformed from near-natural to highly altered conditions, for example by agriculture, infilling and manipulation of water levels to allow for stormwater attenuation) are mostly applicable to depression and seep wetlands; note that some ambiguity exists in the current assignment of the term "transformed" to wetlands, with wetlands that have been wholly lost to development sometimes also considered "transformed", along with those that have been degraded / altered;
- Floodplain wetlands account for some 16% of total wetland area, with most floodplain wetlands in the city having historically been lost to development;
- Valley-bottom wetlands account for about 11% of mapped wetland area, with many of these wetlands having been historically channelised or canalised;
- Wetland flats and unchanneled valley-bottom wetlands account for just over 1% of total wetland in the City, by area;
- At a catchment scale:
 - Catchments with the greatest area of wetland per ha of catchment within the City (**Figure 4.6.**) comprise the Steenbras and Zeekoe catchments, with the former including the large artificial Steenbras Dam, while the Zeekoe catchment includes both Zeekoevlei and Rondevlei – two large permanent urban wetlands, transformed from naturally mainly seasonal systems and mapped as depression wetlands;
 - Just over 8% of the Noordhoek catchment comprises wetlands, reflecting the extensive surface- and groundwater fed wetlands on the base of the Noordhoek basin, including Wildevoelvlei, the Pick'n Pay reedbeds, Lake Michelle and the extensive seasonally inundated mosaic Papkuilsvlei wetland;
 - Both the Diep and the Eerste/Kuils catchments are shown with relatively low densities of wetland – this is because the wetland data do not extend outside of the City's boundaries, whereas the catchments themselves do. These data should thus be disregarded for both these catchments, both of which include extensive floodplain,

depression and seep wetlands, as shown in **Figure 4.5.**

- Catchments with few to no mapped wetlands are the small coastal catchments, most of which are highly urbanised, at least in low-lying areas, with high levels of historical catchment hardening (City, Llandudno, Muizenberg catchments) and no natural drainage lines (West Coast catchment). Mapping of small seeps on mountain slopes in the upper reaches of these catchments may however also be under-represented, as such seeps are difficult to map off aerial photography when they are small mosaic systems only;
- The small West Coast catchment includes very small total areas of wetland (**Figure 4.5.**), but these assume greater proportional areas of the catchment (**Figure 4.6.**) and in fact include extensive areas of near-natural seasonal wetland in the Koeberg Nature Reserve (see **Photograph 3.15.**);
- Floodplain wetlands have been severely impacted by past (and present) development. **Figure 4.7** shows that the only catchments in which significant areas of floodplain wetland still occur comprise the Diep and Eerste/Kuils catchments, and to a much lesser degree, the Sand catchment;
- Catchments with extensive seep wetlands comprise the Eerste/Kuils and Diep catchments, with the upper reaches of the Lourens, Sir Lowry's Pass, and Steenbras catchments and the multiple smaller catchments grouped in the South Peninsula catchment all including areas of seep wetland;
- Mapped seeps in the Zeekoe catchment comprise mostly groundwater-fed seasonal wetlands in the Phillippi Horticultural area – it is arguable that these could also be classified as depression wetlands, with movement of water into and out of the wetlands being largely vertical; and
- Depression wetlands include numerous artificial systems, with the artificial Steenbras Dam and numerous stormwater ponds throughout the city increasing the extent of mapped depression wetlands in most catchments (see **Figure 4.8.**). Separation of wholly artificial wetlands (e.g. dams and WWTW wetlands from natural depressions is recommended, and would better align the BioNet with the National Wetland Map.

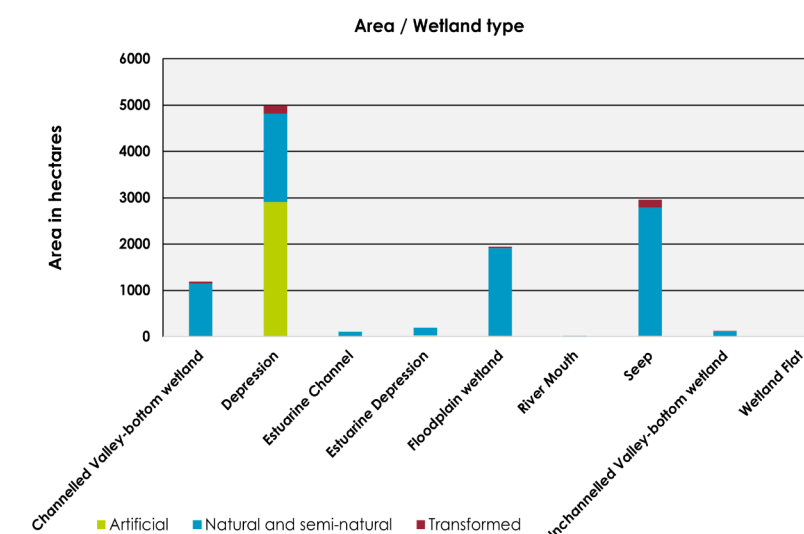


Figure 4.4. Extent of different wetland HGM Units (Level 4A of Ollis et al's 2013 classification system) in Cape Town. Data from the City's 2024 Aquatic BioNet. "Transformed" wetlands not defined in the 2024 wetland metadata, but include wetlands that have been "farmed", "developed" and/or have been created for / converted to stormwater systems.

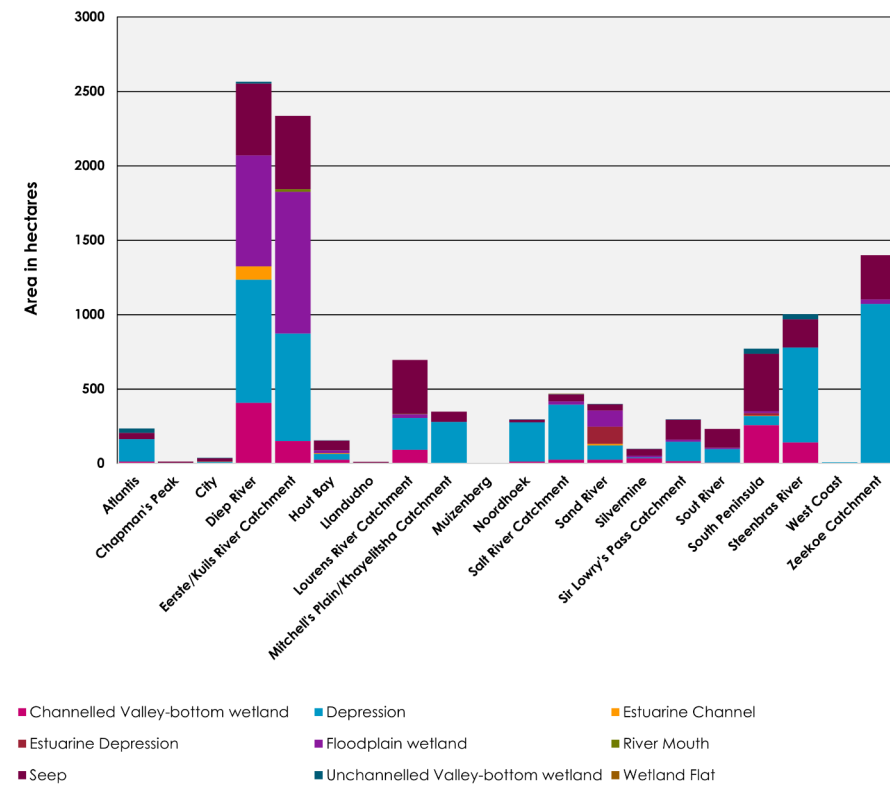


Figure 4.5. Summary wetland data showing mapped extent of different wetland type (Level 4A HGM units) per catchment.

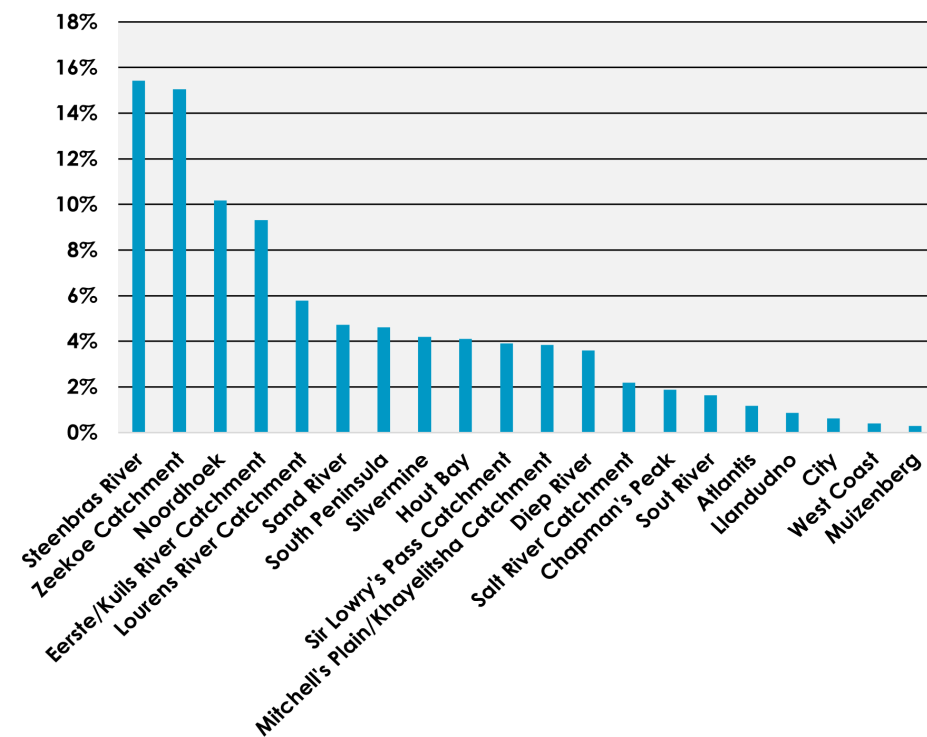


Figure 4.6. Wetland extent per catchment as a percentage of total catchment area. Note that the Diep and Eerste catchments extend well outside of Cape Town's municipal boundary and these data are thus under-represented.

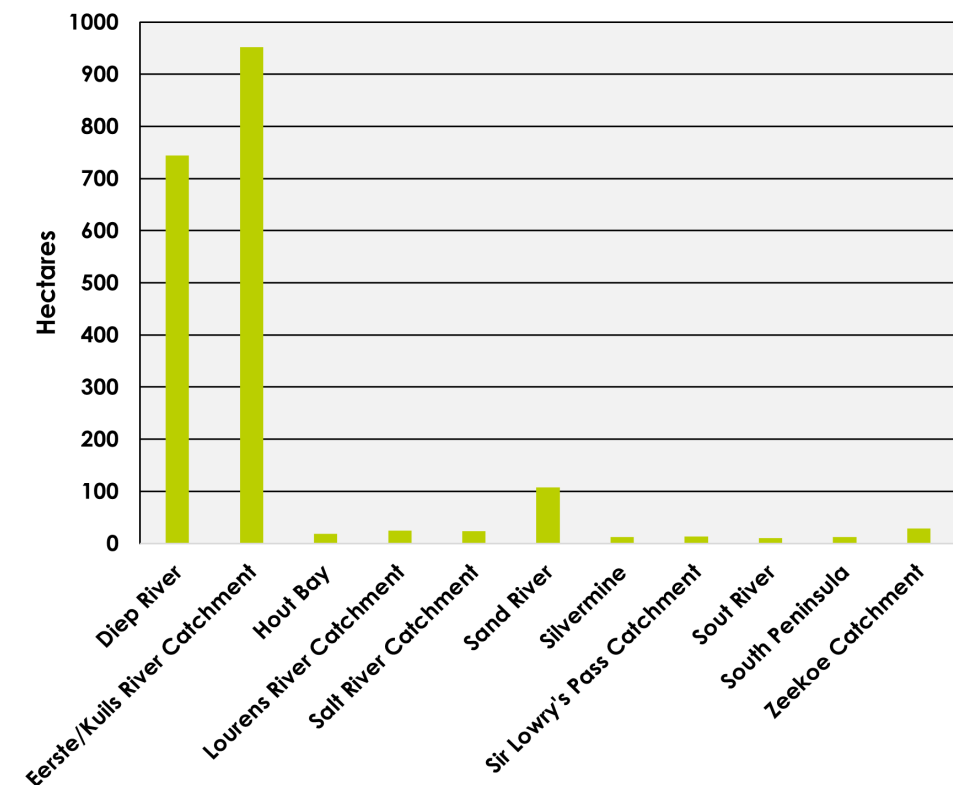


Figure 4.7. Remaining mapped floodplain wetlands per catchment.

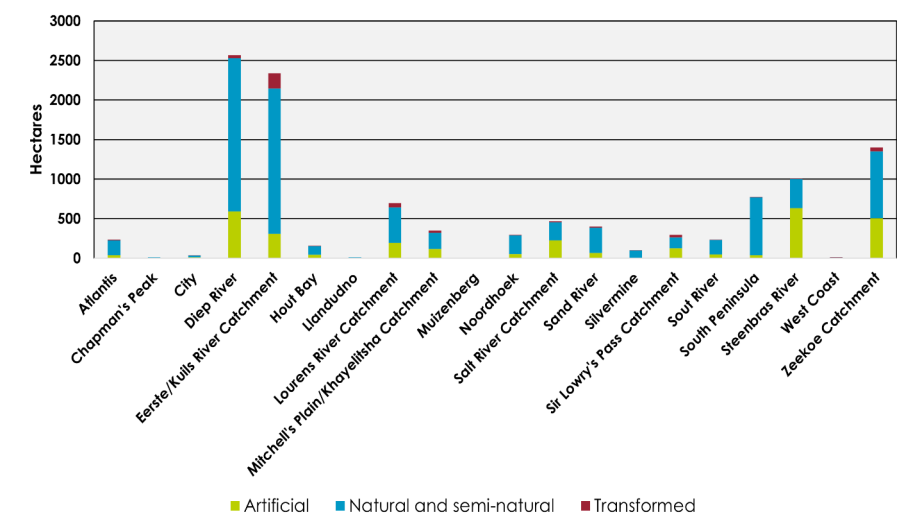


Figure 4.8. Depression wetlands per catchment, showing artificial versus natural/ semi-natural and transformed systems. Note that data do not indicate wetland condition, and impacts such as contamination and solid waste accumulation cannot be derived from the aquatic Bionet 2024 data. In addition, many of these are likely within historical or degraded/disconnected valley-bottom/floodplain wetlands, which gives a potentially skewed understanding of what function has been lost and transformed within the catchment

4.3.6 Wetland Condition

Although the 2024 wetland dataset includes attributes for wetland condition (Present Ecological State), most of these data are missing or highly outdated (mainly 2002 to 2008 desktop data). The inclusion of artificial wetlands among natural depressions further complicates the use of condition data.

Wetland condition data are thus not considered in this report, although it is noted as a gap that should be considered in wetland monitoring going forward, for at least “Natural and semi-natural wetlands”.

4.3.7 Ranking of Cape Town's wetlands in the BioNet 2024

Figure 4.9. presents the distribution of wetlands in the City in terms of their allocated CBA or other rank. The proportional and actual areas of each ranking are summarised graphically per catchment, in **Figure 4.10.**

Prioritisation of conservation importance is based on the methodology outlined in Snaddon and Day (2009), which considered, for each wetland type (Level 4A HGM Unit coupled with allocated wetland vegetation type, as described in Section 4.3):

- Wetland condition;
- Wetland size;
- Sensitivity and importance (in terms of contribution to local, regional and national biodiversity, but also in terms of the provision of ecosystem goods and services) and level of threat;
- Location with regard to springs, groundwater recharge or discharge areas;
- Proximity to other wetlands, estuaries and rivers in good condition;
- Surrounding land-use, and condition of terrestrial vegetation;
- Presence of fish or amphibian species;
- Location with regard to the City's Biodiversity Network;
- Rehabilitation potential;
- Practicality of actively protecting / conserving wetland (e.g. in a reserve);
- Condition of wetland buffer; and
- Location with regard to special features, (i.e. biological or geomorphological)

Note that CBA data are also in many instances likely to be outdated, and do not reflect infilling, pollution and other impacts, since the (largely desk-top based) original prioritisation work of Snaddon and Day (2009).

The need for updating wetland condition data

Wetland condition is poorly mapped in the aquatic Bionet. This means that remaining wetlands in good condition cannot readily be identified and prioritised for protection. This issue is highlighted in the photographs below, showing two wetlands within the city's boundaries, both mapped as wetland depressions, but in very different condition, with the wetland on the right being naturally seasonal but now contaminated and hydrologically altered with sewer overflows and solid waste, while the wetland on the left is in good condition.



Photograph 4.1. CBA wetlands include the extensive seasonal wetlands in the conservation area at Kenilworth Race Course support numerous endemic and threatened plant and animal species, including the highest diversity of frog species at any assessed site in Cape Town. Five threatened frog species have ranges that overlap in these wetlands (see Section 3.3.4).

The CBA data show that:

- CBA1 and CBA2 wetlands are concentrated along the lower Diep River and its remnant floodplain, including the seasonal wetlands and salt marshes of the Table Bay Nature Reserve; at Milnerton Racecourse; in the least-disturbed South Peninsula, including the Cape Point section of Table Mountain National Park; in the Noordhoek wetland basin; in the lower Kuils Eerste/Kuils River catchment, including extensive extant floodplain wetlands; in the upper Steenbras and Lourens River catchments; in the upper Sout catchment (upper reaches of the Donkergat Tributary through the City's Woodlands Conservation Area south of Atlantis); in the Koeberg Nature Reserve (Atlantis Catchment); and in the upper reaches of the Mosselbank River (sub-catchment of the Diep);
- Catchments with the largest areas of CBA1 and CBA2 wetlands comprised the Diep, Eerste/Kuils, South Peninsula, Steenbras and Lourens River catchments;
- Transformed to modified wetlands that still have high biodiversity value (e.g. the Cape Flats WWTW pans in the Zeekoe catchment; Paardevlei in the Lourens River catchment; and Flamingo Vlei in the Diep Catchment) were generally rated as ESA 1 wetlands. Of these, Paardevlei has been rehabilitated as a seasonal wetland, while the others are all permanently inundated to saturated;
- Low-lying, mainly natural wetlands in the Philippi farmlands (Zeekoe catchment), Mitchell's Plain, and eastern end of the Kuils River sub-catchment were mostly also rated as ESA 1 wetlands, reflecting high levels of disturbance in areas readily accessible for formal development, road and sewage infrastructure, agriculture and, increasingly, informal settlement;
- The highly urbanised Salt River catchment, characterised in many parts of the catchment by high levels of pollution and solid waste, nevertheless includes some very important CBA wetlands, such as mountain seeps in the upper Liesbeek River sub-catchment; the Raapenberg Bird Sanctuary, Oude Molen and Rondebosch Common wetlands in the lower Salt catchment (CBA 1 and CBA2 respectively); the Rondebosch East wetland, currently undergoing rehabilitation; the critically important section of wetlands in the conservation area of Kenilworth Race Course (**Photograph 4.1**) and a small wetland in the upper Elsieskraal sub-catchment, downstream of Tygerberg Nature Reserve. For the rest, wetlands in the catchment comprise mainly hard-working artificial or degraded ESA 2 wetlands. However, the presence of so many iconic wetlands in the lower catchment highlights the importance of catchment-level management, to ensure protection, rehabilitation and management of these important systems.

These issues are discussed in more detail in **Section 5**.

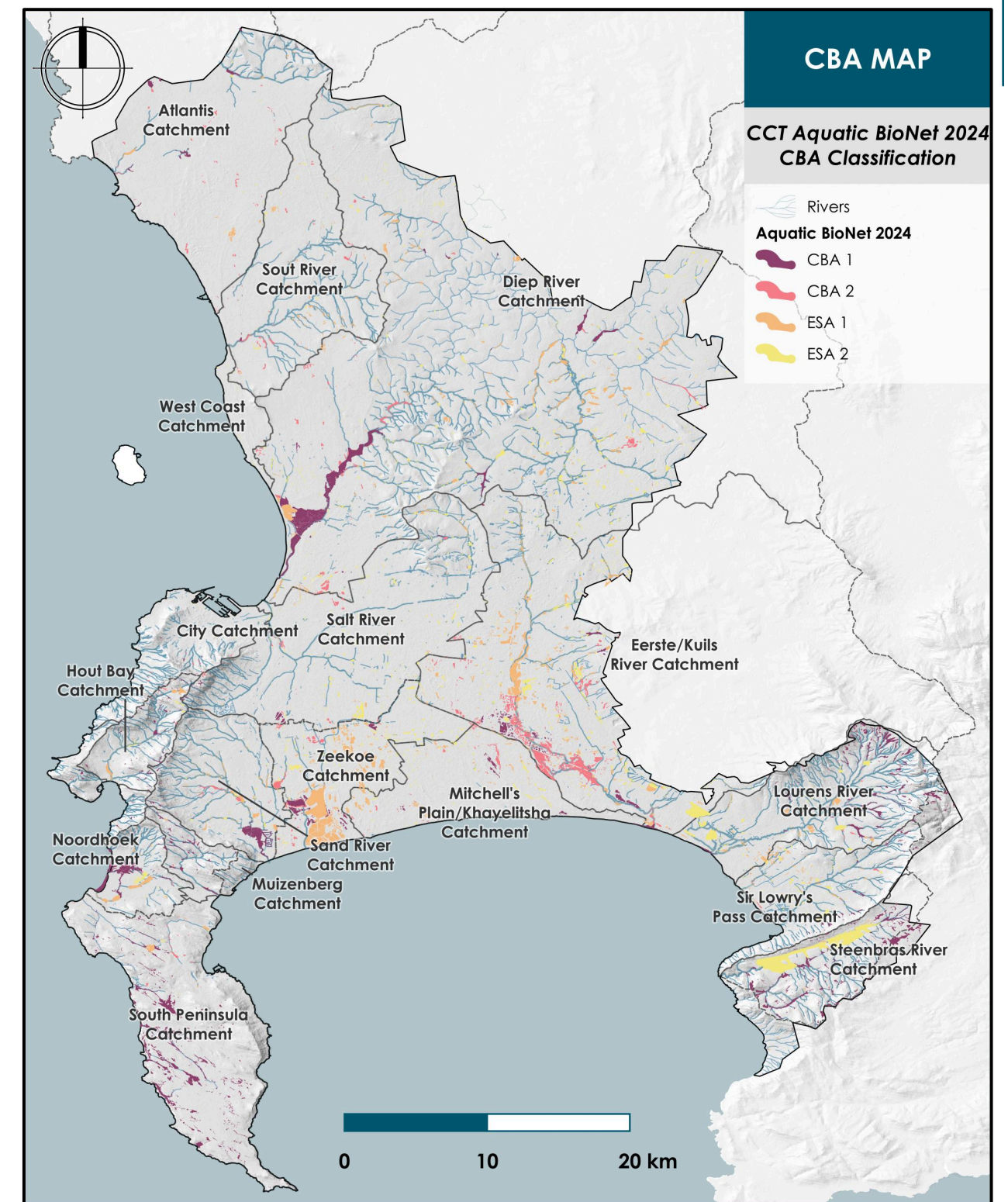


Figure 4.9. Distribution of ranked CBA and other wetlands in Cape Town. Data: Draft 2024 BioNet for aquatic ecosystems.

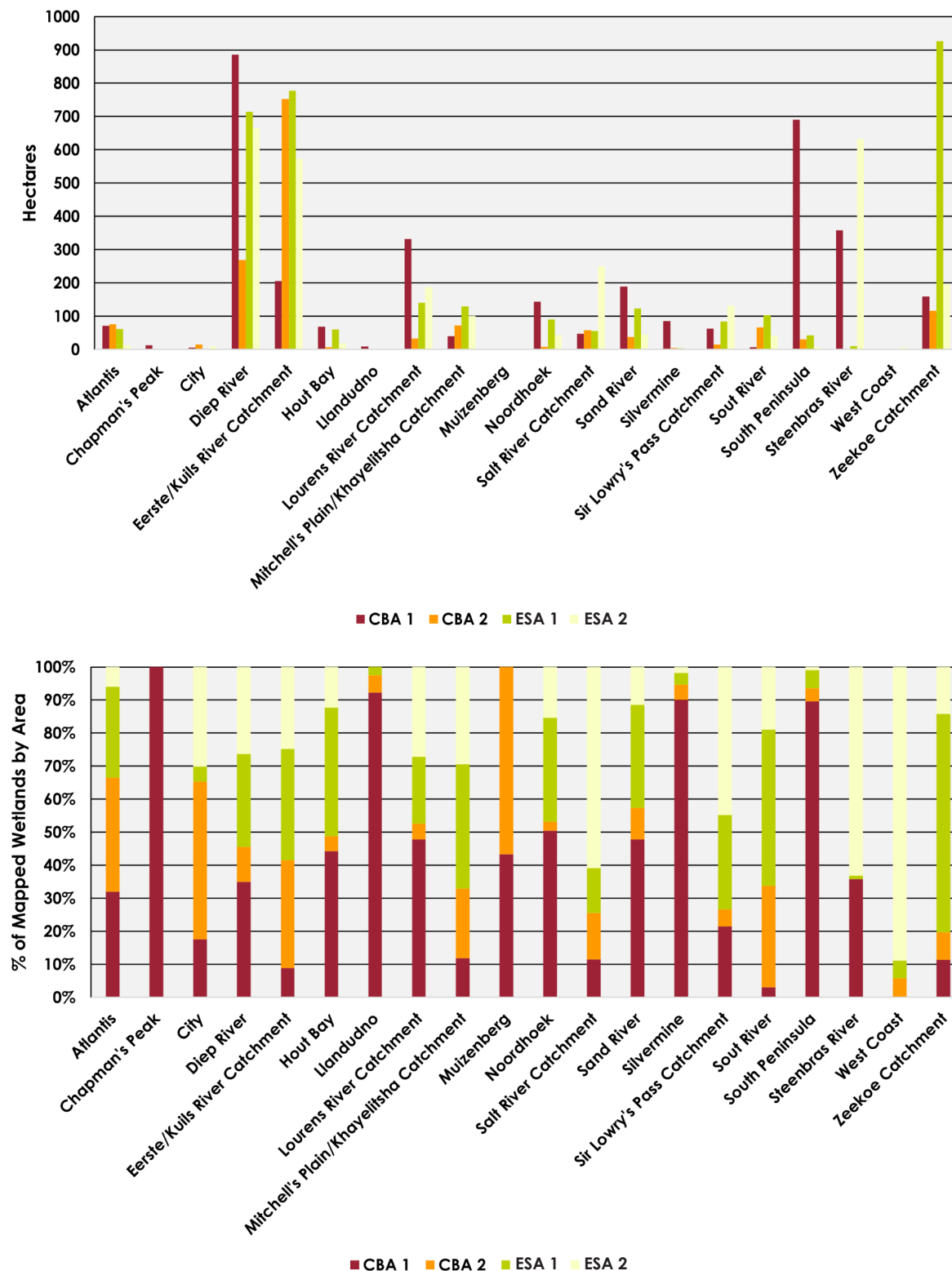


Figure 4-10. Areas per catchment comprising different ranked CBA wetlands (top) and proportion of total wetland area per catchment comprising different ranked CBA wetlands (bottom). Data: Draft 2024 BioNet for aquatic ecosystems.

Micro frogs in major trouble



The Kenilworth Racecourse wetlands provide the only remaining habitat on the Cape Flats for the **micro frog** (*Microbatrachella capensis*). As its name implies, this is one of the smallest frog species in South Africa, with a length of about 1.8 cm when fully grown. It breeds in the dark, acid waters of seasonal wetlands but today its known global distribution is restricted to only five localities (Kenilworth Race Course, Groot Hagelkraal Private Nature Reserve, Kleinmond Coastal and Mountain Nature Reserve, Greater Betty's Bay Nature Reserve and Nuwejaars Wetlands Special Management Area). These fragmented and greatly reduced populations reflect the widescale loss, fragmentation and water quality contamination of seasonal wetlands, particularly in urban areas, and as a result, the micro frog is IUCN rated as Critically Endangered.

Re-introduction of this frog to rehabilitated seasonal wetland in Rondebosch East is being planned by the City of Cape Town's BMB. Photo credit: S. Dorse.

4.4 Challenges with the Aquatic BioNet

The aquatic BioNet is a strong and critically important tool for strategic conservation and development planning and for guiding wetland management and monitoring efforts in the city. Nevertheless, the use of the draft 2024 data in this project highlighted a number of problems, the rectification of which would substantially improve the accuracy and useability of the data. These are:

- The data need to be updated to reflect changes in wetland extent since the 2017 dataset was produced – Section 4.5 highlights the issue of wetland loss in many of the City's catchments and these should be reflected as "transformed" or "lost" wetland categories, so that original extent is clear but that the issue of wetland loss can be highlighted;
- Although the BioNet data include the 2018 NBA wetland bioregion data, there are many data gaps, with less than half of Cape Town's wetlands having been linked to bioregions;
- Many wetlands have not been assigned to catchments in the dataset – this was rectified manually for the present project but needs to be addressed in the master aquatic BioNet data;

- Ecosystem Threat Status needs to be adjusted to exclude artificial wetland types that are included in the BioNet and which have status in the assigned CBA data included in the BioNet, but which should not be included in the ETS data;
- Updating of hydroperiod data should be undertaken, to allow for clearer identification of seasonal wetlands within the dataset;
- Wetland condition data should be assessed and updated, particularly for CBA wetlands; and
- The aquatic BioNet Metadata should be updated/clarified so that all data attributes are clearly described and their derivation/links unpacked.

The above could be achieved - at least in part - through the workshopping of issues and available data with wetland specialists with local knowledge.

4.5 Wetlands lost

4.5.1 Overview

Mapped wetland extent in the aquatic Bionet 2024 does not reflect changes over the last seven years, and relies on 2017 data. Observed, on-the-ground experiences suggest that there has been significant wetland loss over this period – including the loss of the Cape Nature-controlled Driftsands Nature Reserve and its associated wetlands, following land invasions during the Covid pandemic. Other areas that have been exposed to wetland loss through land invasion include:

- The Noordhoek wetlands, affected by expansion of informal settlements from the Masiphumelele residential area;
- The Diep River and Kleine Stink River floodplain wetlands, impacted by expanding Dunoon and Doornbach informal settlement – to the extent that the City is considering diversion of the Kleine Stink River from its natural course, to reduce downstream pollution of the Diep River;
- Seasonal wetlands in the Slangetjebos section of the False Bay Nature Reserve;
- Depression and floodplain wetlands in the lower Kuils River, impacted by major expansion of informal settlements.

While land invasion is possibly the most significant recent cause of wetland loss within the city, other activities have also resulted in wetland loss or threats to important wetlands. These include water quality impacts, usually associated with sewer manhole and pump station overflows; dumping of solid waste; and the manipulation of flood plains to accommodate local residents - the latter includes the (unauthorised) construction of berms along the lower Eerste River, to protect sports fields within the floodplain from flooding. Such activities are likely to have long-term deleterious impacts on downstream river and wetland condition and function.

The Kuils River case study below looks at changes in actual wetland extent in this area, as an example of the degree of wetland loss in recent years.



Photograph 4.2 Berm created along the edge of the Eerste River, to protect adjacent sports field and higher-lying Residences from flooding. The berm is however likely to increase flood impacts on important downstream wetlands, and its (unauthorised) construction highlights the problem of allowing settlements in riverine floodplains and the importance of understanding that so-called benign floodplain uses such as sports fields need to take cognisance of the fact that floodplains are by definition periodically flooded.

4.5.2 Kuils River catchment case study

The Kuils River catchment is one of Cape Town's catchments in which visible wetland loss has occurred over the past few years. In order to quantify this, in relation to the 2024 BioNet layer, mapping of wetland loss was carried out for this catchment, comparing the 2017 wetland dataset with 2023 Google Earth imagery. **Figure 4.12.** illustrates the pervasive expansion of existing areas of informality and the creation of many areas of new informality, not least of which is the expansion of informal settlement into and almost throughout the Driftsands Nature Reserve, leading to its de-proclamation as a Nature Reserve in 2023, by Cape Nature.

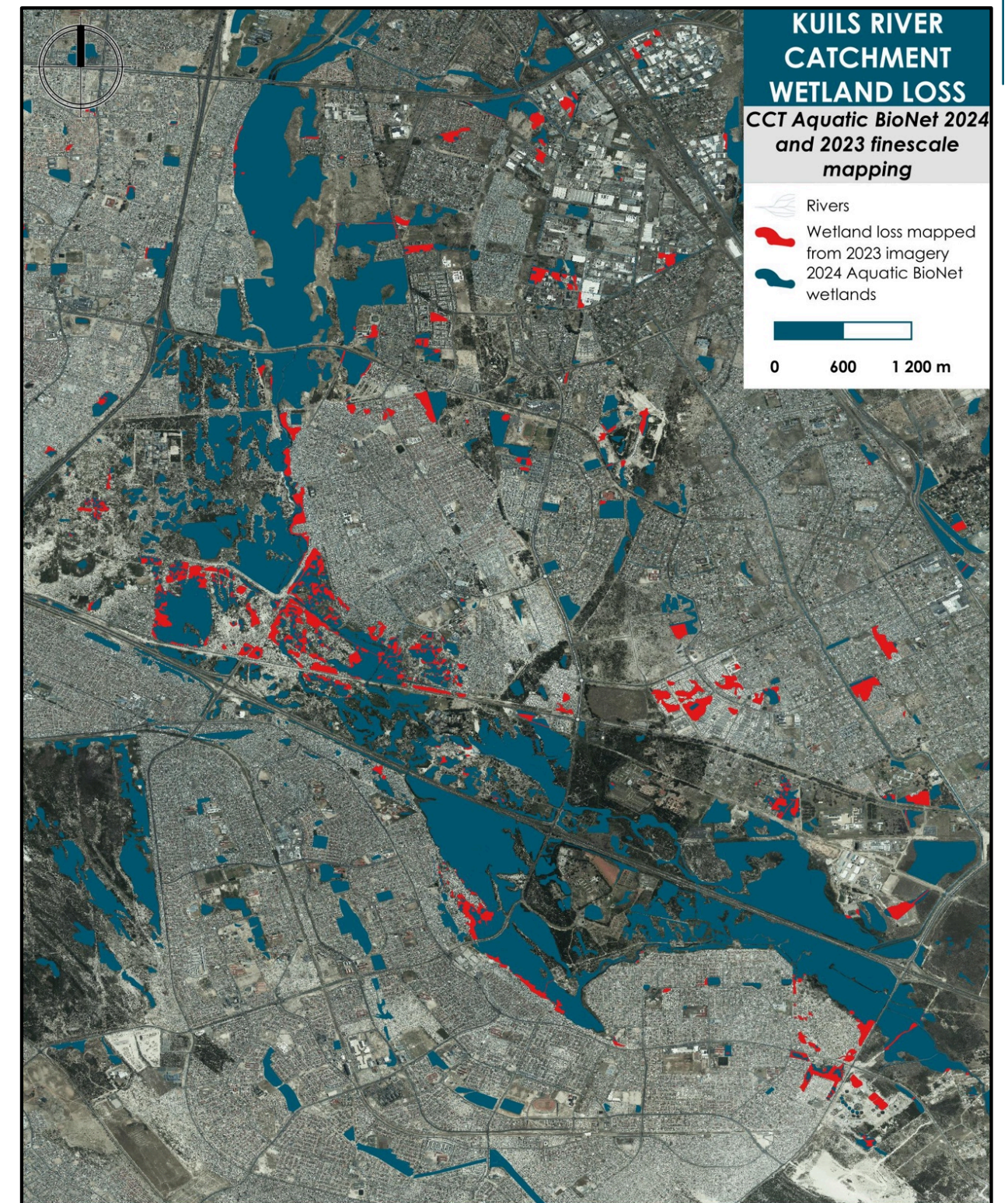
The mapped areas of lost wetland in the Kuils River catchment indicate substantial wetland losses, including into CBA2 wetlands along the Kuils River south of the N2.

A total area of 251.4 ha of wetland habitat were infilled between 2017 and 2023, based on the data presented here.

4.5.3 Implications of wetland loss

Wetland losses in the Kuils River catchment, also echoed (but currently unquantified) in the Diep and Zeekoe catchments at least, have much bigger implications than just the loss of wetland habitat and its associated biodiversity. These include:

- Loss of ecosystem services – in particular, flood attenuation services, which are likely to be increasingly required with ongoing and mounting climate change effects, as well as loss of provisioning services – the wetlands in the Kuils River provide grazing for livestock; sources of medicinal plants; and recreational / amenity value (e.g. the Khayelitsha Canoe Club and the Khayelitsha Wetland Park, both of which have been impacted by land invasions) (see **Photographs 4.2. and 4.3.**);
- Delays in authorisations for development applications in these areas – numerous formal, low cost housing developments are currently being proposed for roll-out in the lower Kuils/Eerste River catchments, as well as many other catchments (e.g. Sir Lowry's Pass River Catchment). Where such developments might impact unavoidably on extant wetlands, there will often be requirements for the establishment of wetland offsets – that is, the protection, creation, conservation and/or rehabilitation of additional wetlands, such that the loss of wetland functionality and biodiversity on one site can be offset in another. Such sites would generally need to have formal conservation status to be acceptable as offset receptor sites (Macfarlane et al. 2016 and GN 3569 of 2023). In the Kuils River catchment, rehabilitation of wetlands in protected areas such as Driftsands Nature Reserve was considered, in some cases, an acceptable and even desirable potential wetland offset receptor site. However, with the de-proclamation of Driftsands Nature Reserve and the uncontrolled expansion of informal settlement into wetlands elsewhere in the catchment, the acceptability of such offset receptor sites is considerably reduced, as a result of low confidence in their conservation in perpetuity. This means that development planning is likely to be significantly delayed in the future, as the number of acceptable receptor sites dwindle;
- Reduced ability to offset biodiversity loss - The increasing need to rely on out-of-catchment offsets, often in different vegetation and wetland habitat types, means that biodiversity losses will not necessarily be addressed by offsets;
- Increasing water quality pollution, affecting rivers, wetlands and downstream ecosystems including estuaries and marine systems – Day et al. (2024) highlighted the high levels of pollution associated with runoff of grey and black water from poorly serviced informal settlements and non-compliant WWTW discharges, as well as sewer infrastructure failures. Where these are established on low-lying floodplains or wetlands, the City's reactive ability to divert such runoff into sewers is often also seriously constrained.



Section 5 explores some of the most pervasive factors underlying wetland loss and degradation in Cape Town.

Figure 4-11. Wetland loss in the Kuils River catchment. Data as mapped off 2023 Google Earth imagery, overlain over BioNet 2024 imagery, which does not show wetland loss.



Photograph 4.2. Flooded informal settlements in the Diep River floodplain, June 2023.
Photo courtesy of Caroline Marx.



Photograph 4-3. Extensive infilling of the Kuils River floodplain post 2017.

5

WETLAND MANAGEMENT CHALLENGES

In order to manage our seasonal wetlands, we need not only to know where they are, but also to understand what their main threats are, and what are the key challenges limiting their management, rehabilitation and protection. This section aims to explore some of these issues.

5.1 Wetland infilling and drainage

Seasonal wetlands are very vulnerable to infilling and drainage, mainly because they are only inundated-to-saturated over a few months of the year, making them seemingly accessible and available for settlement/other land uses during the dry season. In many cases, by the time the wet season arrives and the unsuitability of the land for settlement becomes apparent, it is too late and the wetland habitat has already been destroyed. Raising of the levels of informal housing platforms with rubble and sand infill often thus follows, while in some areas, the creation of drainage channels and subsurface drains provides an effective means of addressing a drainage problem, while destroying wetland function and ecosystem services.

5.2 Loss of floodplain wetlands

Expansion of informal settlements into river floodplains, past development and a perceived need to “protect” floodplains from flooding all contribute to ongoing loss of floodplain wetlands and, importantly, floodplain function, putting pressure on rivers and wetlands elsewhere in the catchment, as they receive larger flood peaks, contributing to further flooding and erosion.

5.3 Water quality

Pollution is a pervasive issue affecting nearly every facet of Cape Town's watercourses, and seasonal wetlands are no exception. However, since many seasonal wetlands are isolated depressions rather than on-channel wetlands, they are possibly less impacted than the large, on-channel perennial wetlands such as Zeekoevlei, Zandvlei and Wildevoelvlei, all of which are connected to channels that actively convey polluted waters at a catchment scale into these wetlands (see Day et al. 2024).

Nevertheless, since off-channel seasonal wetlands are effectively pollution sinks, which do not get flushed out as in-channel systems do, they are vulnerable to long-term build-up of pollutants, potentially from even minor but repeated pollution events. Day et al. (2024) noted that increased load-shedding frequency over the October 2022 to September 2023 period for example resulted in an increased frequency of overflows from sewage pump stations and sewer manholes. Many seasonal wetlands are in areas that are vulnerable to such impacts, which are associated with elevated phosphorus and nitrogen nutrients; high loads of organic solids with high chemical oxygen demand; often high concentrations of



Photograph 5.1. Inappropriate and possibly unauthorised construction of a flood protection berm along the edge of the Eerste River to prevent flooding of the adjacent sports field puts increasing pressure of erosion and flooding on wetlands downstream.



Photograph 5.2. Algal growth in a seasonal, groundwater-fed wetland in the Zeekoe catchment is a likely indicator of nutrient-enriched groundwater

Fresh water as a pollutant

Even clean drinking water can be a pollutant in some cases. The passage of fresh water (that is, with few dissolved salts) into naturally saline wetlands can cause severe harm to fauna and plants that have evolved to tolerate saline conditions, and can result in tissue and organ rupture as sensitive salt/water balances and barriers are interrupted.



Photograph 5.3. Saltmarsh species require seasonal drought and saline conditions

(toxic) ammonia; solid waste and sediments that smother wetland plants; and heavy metals and various contaminants of emerging concern (CECs), including pharmaceuticals, personal care products, microplastics, per- and polyfluoroalkyl substances (PFAS), and endocrine disrupting chemicals found in sewage.

It is not just sewage overflows that impact on seasonal wetland condition. Raw sewage and domestic waste water from poorly serviced informal settlements and backyard dwellings impact on many seasonal wetlands, along with hydrocarbons and heavy metals in stormwater flows from roads and parking areas; illegal swimming pool discharges into stormwater systems; nutrient-enriched seepage from irrigated, fertilized suburban gardens; polluted groundwater flows; and contaminated seepage from landfill sites and illegal solid waste dumps all contribute to the pollution of Cape Town's seasonal (and other) wetlands.

Pollution can affect seasonal aquatic ecosystems by changing the plant and animal communities that occur there, sometimes shifting from complex, species-rich ecosystems to simple ecosystems, comprising only a few, hardy taxa. Such ecosystems are often less resilient to other kinds of ecosystem disturbance (e.g. drought and floods) than more complex ones, resulting in further ecological degradation over time. Such degraded systems also offer reduced ecosystem services.



Photograph 5.4. Polluted flows from mainly industrial effluent into the seasonal floodplain wetlands of the Diep River, Cape Town.

5.4 Solid waste

Dumping of solid waste is rife in Cape Town and affects many of its rivers and wetlands. In seasonal wetlands, even small volumes of solid waste can have major effects on wetland habitat, because many of the wetlands are shallow and easily fragmented and infilled by waste.

When solid waste includes organic material (e.g. carcasses, rotting food and used nappies) or other material that is washed or seeps into the adjacent wetland, it can impact on water quality as well.

An indirect but important impact of solid waste accumulation in seasonal wetlands is that it further reduces the perceived value of the wetland for local communities, making it less likely to be conserved or managed going forwards.

5.5 Invasion by alien plants

Invasion by alien vegetation is a significant threat to many of Cape Town's seasonal wetlands. Woody alien plants are particularly problematic, because many have high water demands compared with indigenous vegetation, and result in drying up and/or shrinkage of wetland areas over time.

Shading also reduces understorey (wetland) vegetation, and in some species can change soil characteristics too. Eucalypts, for example, can change nutrient properties in fynbos soil and many eucalypt species also release allelopathic substances (that is, substances that limit the growth of other plants in their vicinity) into the soils. These can directly affect understory growth (Gaertneretal 2011). Invasion by alien *Acacia* trees also cause alterations in nutrient cycles, in fynbos soils, as a result of their capacity of to fix nitrogen (Froeschlin et al. 2022).

Less obvious than invasion of wetlands by woody alien species is their invasion by alien creepers and grasses, including kikuyu grass (*Pennisetum clandestinum*) and *Commelina benghalensis*, as well as other garden escapees that form dense stands in seasonal wetlands and other watercourses, at the expense of indigenous plant communities. These dense stands do not provide the cover, shelter and longitudinal linkages that indigenous plant assemblages do, within and between seasonal wetlands. By smothering indigenous plants, they further reduce biodiversity and habitat quality. Invasion by kikuyu grass, for example, is encouraged by irrigation and nutrient enrichment in suburban areas. Other serious garden escapees, especially in the Rooi Els and Pringle Bay areas include Weeping Red Bottlebrush (*Callistemon vimilanis*), which has invaded extensive areas of wetland habitat.

5.6 Changes in hydrology

Changes in wetland hydrology are a major threat to Cape Town's seasonal wetlands. Infilling and drainage, as well as invasive alien vegetation, all considered in Sections 5.1 through to 5.5, are major contributors to hydrological change. Other drivers of hydrological change include:

- Surface and groundwater abstraction; and
- Artificial inundation and extended saturation due to an artificially increased water table in some areas, usually due to the discharge of large volumes of treated or untreated sewage into naturally seasonal catchments, with effluent derived from distant catchments (e.g. the Berg River and Theewaterskloof Dams).



Photo 5.5. Dumping of solid waste in seasonal wetlands in the Kuils River catchment.



Photo 5.6. Removal of alien eucalyptus trees from this seasonal wetland in the False Bay Nature Reserve (Van Blommenstein Park) resulted in re-hydration of extensive wetland areas in the 2024 wet season, providing habitat for endemic fauna such as Cape galaxiads and Western Leopard Toads as well as endemic vegetation including *Aponogeton angustifolia*.

Of the above, groundwater abstraction is an increasing but seemingly unquantified threat to Cape Town's seasonal wetlands, with numerous boreholes and well-points having been sunk in multiple privately and City-owned properties during and in response to the 2015-2018 drought, throughout the city. These boreholes include the large-scale Table Mountain Group Aquifer (TMGA) and Cape Flats Aquifer borehole abstraction and recharge programmes, overseen by the City of Cape Town. The former could potentially impact on groundwater-dependent wetlands of extremely high conservation importance, and changes in aquifer level of even a few centimetres could have significant impacts on wetland condition and ecosystem sustainability.

5.7 Mining impacts

Quarrying and mining are issues affecting seasonal wetlands in some parts of Cape Town. The natural extent of important seasonal wetlands in the Witzand area of Cape Town's Donkergat River catchment, for example, have been encroached into by quarrying for clay to support a local brickyard, resulting in loss and degradation to mainly perched seasonal wetlands in the area.

Legal and illegal sand mining is also prolific in parts of Cape Town, particularly in the dunes of the Cape Flats. Sand mining can have profound impacts on seasonal wetlands, not only through its physical impact, but by removing the sand dunes that act as giant sponges, feeding interdune (or duneslack) wetlands. Removal of these dunes can interfere with wetland hydrology. More importantly, excavation of sand below the water table can create deep, permanent wetlands in place of seasonally inundated systems, impacting on biodiversity.

At the same time, it should be remembered that careful attention to mining depth and the inclusion of requirements for post-mining landscaping, with shaping and planting, could prove a mechanism to re-establish seasonal wetlands in some areas.

5.8 Wetland fragmentation and isolation from other natural areas

Even where natural wetlands remain within urban areas, fragmentation from other wetlands and natural terrestrial areas can make them unsustainable in the long-term, if natural pollinators, seed dispersers and wetland fauna that would naturally have migrated in and through them, are disrupted by expansive development. For this reason, proposed new developments should be assessed not only in terms of their footprints, but also in terms of their impacts on ecological and hydrological connectivity. The City's terrestrial BioNet proactively identifies important terrestrial corridors, which in many cases include or provide linkages for wetlands. Rivers can also provide ecological corridors through otherwise ecologically sterile urban landscapes.

5.9 Unintended consequences of poor maintenance / management practices

Urban wetlands usually need some level of maintenance and management, as their natural disturbance drivers such as fire and grazing are often missing. This means that clearing of invasive (often indigenous) reeds and aquatic weeds are among the activities that are required to keep them functional and maintain biodiversity. When this work is carried out on sensitive wetlands by poorly trained or unsupervised work-teams, serious biodiversity damage can occur (e.g. mowing of indigenous veld in seasonal wetland rehabilitation sites). Close liaison between different line departments working on wetland sites is required to address this issue.



Photo 5.6. Seasonal wetland in the Kuils River catchment, showing dry season conditions (top) and wet season inundation (bottom). Both cycles are critical to conservation of this wetland habitat, which supports multiple endemic plants and aquatic invertebrate fauna – that is, biota that occur in this region and nowhere else in the world. Changes in hydro-period (including increases in water availability) would fundamentally change and destroy these ecosystems.

5.10 Climate change

Climate change models for Cape Town predict (e.g. One World 2017) that climate change over the next decades is likely to include:

- A decrease in the number of rainfall/wet days;
- An increase in dry spells;
- A decrease in annual precipitation; and
- An increase in rainfall intensity.

From the perspective of Cape Town's seasonal wetlands, such predictions suggest the following implications:

- Reduced groundwater recharge, if rainfall events become more intense and less frequent, potentially leading to reduced frequency and duration of daylighting of groundwater to create seasonal wetlands, and potentially affecting the ability of wetland biota to complete the aquatic phases of their life cycles;
- Increased risk of erosion of watercourses including seasonal wetlands along seasonal watercourses, as a result of periodic major flood events; and
- Loss of seasonal wetlands as a result of extended drought periods, which might also encourage expansion of invasive alien plants.

5.11 Funding and logistics

Wetlands in urban areas are largely deprived of natural disturbance drivers (e.g. fire, small floods, large herbivores) and thus, outside of near-natural areas such as the Steenbras Reserve, their maintenance is often dependent on artificial implementation of disturbance regimes. Such measures may need to take the form of clearing of senescent (dead) vegetation; removal of sediment; and opening up of wetland flow paths. In addition, alien plant clearing and ongoing removal of solid waste is required in many areas. Monitoring of wetland biodiversity, condition and extent should furthermore be an essential requirement to inform ongoing management and conservation efforts.

All of these interventions require financial input and logistical management, and in many cases are beyond the existing capacity of the City's BMB to deliver. Furthermore, many of Cape Town's seasonal and other wetlands lie in private or non-City ownership, and these entities do not necessarily have the will or means to manage wetlands as required (e.g. alien clearing and solid waste removal).

Political and public awareness is essential to ensure that behaviours are changed, and that the prioritisation of resources, education and management of these systems are adapted to allow for their preservation for future generations and a more sustainable city.

The above all pose significant threats to the sustainability of Cape Town's seasonal wetlands. Efforts by the City's BMB to address some of these issues are outlined in the following section.

6 FUTURE-PROOFING CAPE TOWN'S WETLANDS

This section illustrates some of the work / interventions that the City has undertaken with a view to protecting and managing its wetlands, in a time of climate change, burgeoning development, and increasing pressure on infrastructure.

6.1 Climate change and wetlands

The City of Cape Town, through its Liveable Urban Waterways (LUW) Programme (see Section 7.6.3) partnered with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to undertake a study on green infrastructure options for improved waterway and catchment management in the city. The main outputs of the project, completed in 2024 (see Turpie et al. 2024), were masterplans for the Zeekoe and Diep River (Sand) catchments. These included recommendations for seasonal floodplain wetland rehabilitation and creation in strategic parts of both catchments, intended to increase flood attenuation, water quality polishing and groundwater recharge. These recommendations took cognisance of the likely increased flood risks associated with climate change in the city. Their implementation would play a valuable role in improving the resilience of these two catchment areas, as climate change impacts such as flooding, drought and heat become more evident.

6.2 Invasive alien plant clearing⁵

6.2.1 The Invasive Species Unit

Invasive species control within the city is coordinated by the City's Invasive Species Unit within the Biodiversity Management Branch, in consultation with other line departments. In response to the numerous threats posed by invasive plant and animal species, the City has implemented a variety of projects to combat these, including ongoing terrestrial and wetland alien clearing; an Early Detection and Rapid Response programme; biocontrol; aquatic weed clearing; and Invasive Animal projects.

6.2.1.1 Alien plant clearing

A total of 15 catchment systems (rivers, wetlands etc.) were cleared of invasive aquatic plant species during the 2023/24 financial year. This included initial clearance of 59.30 ha; and follow-up clearance of 398.04 ha. Overall, approximately 11 649.29 ha of terrestrial and wetlands / riverine areas were cleared in protected and conservation areas, as well as 5 292.19 ha from public open spaces, road verges, and greenbelts, in collaboration with various City line departments.

⁵ Text supplied by Biodiversity Management Branch, City of Cape Town

6.2.1.2 Biocontrol

On average, 30 000 biological control agents are released each year under the biocontrol programme. These agents target the four most threatening aquatic weeds currently found within the City's waterways, namely, water hyacinth (*Pontederia crassipes*), Kariba weed (*Salvinia molesta*), parrot's feather, (*Myriophyllum aquaticum*) and water lettuce (*Pistia stratiotes*).

6.2.1.3 Early Detection and Rapid Response Programme

The Early Detection and Rapid Response Programme (EDRR) targets 16 listed invasive plant species, namely Category 1a species listed under the National Environmental Management: Biodiversity Act (NEMBA) for control across Cape Town, inclusive of all water bodies. The priority for this project is to detect, identify and control these target species in order to prevent them from expanding and invading large areas.

6.2.1.4 Aquatic weed clearing

The City implements a long-term control programme to combat the problem of aquatic weeds, using a combination of different control methods:

- Manual control – the deployment of trained teams to remove aquatic weeds manually, including prescribed ecological burns, used to control reedbed invasions;
- Mechanical control – the use of heavy machinery such as long-boom excavators;
- Chemical control – involves the use of registered herbicides; and
- Biological control – the introduction of a plant's natural enemies to its habitat, to effect control.

6.2.2 The Green Jobs Project

The City's invasive species management programme is also an important job creator, through its Green Jobs Project. Green jobs are jobs that focus on enhanced environmental quality, improved living environment and the restoration and/or protection of municipal green infrastructure and ecosystem services; with a specific focus on skills development and social upliftment. In 2023/2024, 3 643 temporary employment opportunities and 156 096 person days (678.67 full-time job equivalents) were created through implementation of invasive species control, green jobs and skills development projects.

Through the above, the Green Jobs Project has also made significant strides in conserving and maintaining the city's seasonal wetland systems, with a focus on restoring biodiversity, improving ecosystem resilience, and engaging local communities.

Key environmental achievements to date include clearing **122.2 hectares** of invasive plants across both terrestrial and aquatic environments; promoting the recovery of indigenous species; and enhancing the health of aquatic ecosystems. In addition, **162.8 hectares** of aquatic habitats have been cleared of aquatic weeds, leading to improved water quality and healthier aquatic ecosystems. Biomass removal efforts have led to the clearing of **934.24 tons** of biomass, which has reduced fire hazards and restored natural landscapes.

Solid waste management efforts by the city have also had a profound impact, with the removal of **89,219 black bags** of waste from key wetland and urban canal sites. This not only improves the aesthetic and health quality of these environments but also reduced pollution, contributing to cleaner ecosystems and public spaces. Ongoing clearing of solid waste is however a requirement for such benefits to be retained.

Empowering communities and restoring ecosystems: The River Warden Programme Skills Development Programme

Text supplied by BMB

The River Warden Skills Development Programme is an initiative run by the Nature Conservation Special Projects Unit within the Biodiversity Management Branch of the City of Cape Town. The programme was developed to address key components of urban sustainability and is part of the Mayor's Priority Program (MPP), building social, economic and ecological resilience within targeted percentages of the population that are disadvantaged. With a focus on residents, particularly youth, from communities surrounding city wetlands, rivers, and estuaries, the programme provides its incumbents with training and employment experience over a fixed period of three years. Participants gain practical skills in ecological restoration, invasive species management, waste removal, water quality monitoring, and biodiversity conservation, as well as exposure to the conservation industry, with the goal of providing a progressive platform for future employment in the environmental sector.

A total of 45 River Wardens, based at False Bay, Table Bay, Zandvlei and Edith Stephen's Nature Reserves, are tasked with monitoring, protecting, and enhancing the health of rivers, wetlands, and associated ecosystems within the Sand, Zoekoe and Diep River Catchments. Over the last 6 months, some 90 tonnes of ecologically destructive invasive alien vegetation was cleared and removed from protected areas and international stewardship sites. In addition to this, the wardens successfully removed over 66 tonnes of solid waste, made up of organic matter and litter.

The River Warden Skills Development programme was also developed to cultivate relationships with vulnerable communities, promoting collaboration through outreach and targeted learning, fostering greater public awareness and encouraging collective responsibility for local waterways. With over a thousand hours of dedicated environmental education and conservation training up to date, wardens are given the tools to inform their families and peers on sustainable use of environmental resources and good practice, shifting the perspective and empowering neighbourhoods from within. By combining conservation work, skills development, and public engagement, the River Warden Skills Development Programme empowers participants to become lasting advocates for Cape Town's natural environment.



6.3 Protected area expansion and stewardship⁶

6.3.1 Context in the Western Cape Protected Area Expansion Strategy (WC PAES)

The Western Cape Protected Area Expansion Strategy (WC PAES) has five primary themes/objectives to achieve multiple biodiversity outcomes as the highest priorities for Protected Area expansion.

1. Critically Endangered ecosystems
2. Under-protected ecosystems and strategic landscapes
3. Essential habitat for selected species
4. Marine, estuarine, and coastal systems
5. Freshwater ecosystems

Objective 5 of the Strategy focuses on freshwater (i.e. aquatic) ecosystems, with the aim to secure at least one 'special' (i.e. unique, threatened and under-protected) freshwater ecosystem per District Municipality within the next five years.

The WC PAES focuses on four particular suites of systems of special conservation concern due to their uniqueness, vulnerability and poor protection status, namely:

- Peat wetlands;
- Vernal Pools embedded into Critically Endangered Renosterveld vegetation;
- Critically Endangered terrestrial ecosystem types, mostly associated with wetlands and river systems (i.e. Cape Lowland Alluvial Vegetation and Swartland Alluvium Fynbos); and
- Strategic Water Source Areas, which produce disproportionately greater volumes of water per unit area and are generally located in high rainfall areas.

In addition, the aim is to seek better designed protected areas that are able to accommodate more wetlands, river reaches and freshwater ecosystems that represent high-value ecological infrastructure and critical ecosystem services such as water purification and flood regulation. Delivery of these services requires protecting whole, functional systems.

6.3.2 Cape Town context

Historically, many of the City's Nature Reserves have been established around freshwater ecosystems (e.g. FBNR (declared a Ramsar site in 2015), Zandvlei; Edith Stephens wetlands, Harmony Flats wetlands, Witzands Aquifer wetlands and Uitkamp Wetlands). Many of these have expanded in size and influence over the past few years. The Witzands Aquifer Nature Reserve, for example, was proclaimed in 2008 as a 2 700 ha area, but by 2023 had been expanded to over 6 000 ha, protecting the Witzands Aquifer Strategic Water Source Area and its catchment areas.

⁶ This section has been adapted from text supplied by the Biodiversity Management Branch, City of Cape Town



Photograph 6.1. Cape Vernal Pool, Nieuwepost Conservation Area. Photo: B. Sutherland.



Photograph 6.2. Seasonal wetland in Muldersvlei Conservation area, Klipheuwel Corridor. Photo: S. Dorse

More recently a number of private stewardship agreements have been signed around freshwater ecosystems such as:

- Franco Three Fountains NR (Cape Vernal Pools);
- Joostenbergskloof Conservation Area (Swartland Alluvium Fynbos);
- Summervale Conservation Area (Lourensford Alluvium Fynbos);
- Kenilworth Nature Reserve (freshwater wetlands in Critically Endangered Cape Flats Sand Fynbos);
- New World Foundation Conservation Area (freshwater wetlands in Endangered Cape Flats Dune Strandveld);
- Manning Family Conservation Area (freshwater wetlands in Critically Endangered Swartland Shale Renosterveld); and
- Quantum Foods Fynbos Conservation Area (freshwater wetlands and streams in Endangered Atlantis Sand Fynbos).

Working within the buffer of the City, a number of new protected/conservation areas are also being established, such as the Rooi-Elis corridor, which protects pristine valley-bottom wetlands adjacent to the Kogelberg Nature Reserve (a World Heritage site). In the Dassenberg Coastal Catchment, efforts have gone into protecting and restoring vernal pools at Nieuwepost and freshwater wetlands on Burgherspost. In the Cape Winelands, a new initiative is gathering momentum in the Muldersvlei area to protect the vernal pools and seasonal freshwater wetlands and streams in this Renosterveld vegetation, with three new conservation areas established in the past two years.

6.3.3 Protecting wetlands with ecological buffers

The City's Floodplain and River Corridor Management Policy (2009) specifies requirements for the establishment of ecological buffers around all wetlands and other watercourses. These are intended to protect wetlands from disturbance and other impacts associated with surrounding landuse. Depending on the sensitivity and importance of the wetland and the type of impact anticipated, buffers for wetlands in Cape Town vary between 10 and 70m in width.

7 CAPE TOWN AS A RAMSAR WETLAND CITY

7.1 The Ramsar convention

The Ramsar Convention on Wetlands of International Importance is an international treaty for the conservation and wise use of wetlands. South Africa became a signatory to this convention in 1971, and now has 31 designated Ramsar sites.

Cape Town's False Bay Nature Reserve was declared a Ramsar wetland site on 2 February 2015, one of ten in the Western Cape and the only truly urban Ramsar site in the country.

7.2 Ramsar Wetland Cities

In June 2015 at Ramsar COP12 in Punta del Este, Uruguay, Resolution XII.10 was adopted, allowing for Wetland City Accreditation in terms of the Ramsar Convention. The stated purpose of such accreditation is to encourage cities that are close to and depend on wetlands to nurture a positive relationship with their wetlands through promoting wetland awareness and consideration in local planning and decision making, and to promote their conservation and wise use, through local, regional and international co-operation. In return, and in addition to deriving benefits from these activities in terms of ecosystem services and other benefits, Ramsar Wetland Cities that can demonstrate strong and positive relationships with their wetlands are also provided with positive branding opportunities, through their Ramsar accreditation.

7.3 What is a Ramsar Wetland City ?

The framework for Wetland City accreditation of the Ramsar Convention (Annex to the above resolution) lists six criteria that have been set out to identify eligible Wetland Cities. These require that the city in question should:

1. Include one or more Ramsar sites (fully or partially) or other wetlands of importance in its jurisdiction;
2. Have adopted measures for the conservation of wetlands and their associated ecosystem services including biodiversity and hydrological integrity;
3. Have implemented wetland restoration and management measures;
4. Recognise the importance of wetlands in integrated spatial/land-use planning;
5. Include, empower and educate local stakeholders about the importance and functions of wetlands; and
6. Establish a local committee with appropriate knowledge and expertise to support preparation work for, and maintenance of, Wetland City Accreditation status.



Cape Town's Ramsar Wetland site

The 1,542 ha False Bay Nature Reserve (FBNR) comprises about 50% permanent and seasonal wetland and 49% terrestrial vegetation, including the critically endangered Cape Flats Sand Fynbos and Cape Flats Dune Strandveld vegetation types, and some sandy beaches. The reserve includes two vleis, of which Rondevlei is surrounded by intact terrestrial vegetation and seasonal wetlands, while Zeekoevlei is situated between a residential area and the Cape Flats WWTW and provides for recreational use including yachting, rowing, canoeing and wind-surfing.

The Reserve as a whole supports vulnerable, endangered, and critically endangered plant species (Cape Flats Sand Fynbos and Cape Flats Dune Strandveld vegetation types), with some 256 species of indigenous plants occur in the reserve, including two endemic plant species currently listed as extinct in the wild, namely *Erica turgida* and *Erica verticillata* (Cape Flats erica).

The Reserve also supports various threatened faunal species (African Marsh Harrier, Cape Gannet and Cape dwarf chamaeleon), as well as several Palaearctic migratory bird species, which spend the summer at the site, at the southernmost extent of their migration routes. These include the Little Stint, Curlew Sandpiper, Greenshank, Common Tern and Ruff.

Rondevlei and Zeekoevlei and their associated seasonal wetlands are also important in the breeding stages of various animal species (Western Leopard Toad, Cape Sand Frog, Arum Lily Frog) and plants (Cape flats erica).

More than 10 waterbird species are recorded as having 1% or more of their population found at the reserve. Common species include (invasvie) Egyptian Goose, Cape Shoveler, African Black Oystercatcher, Black-Winged Stilt, Kelp Gull, Hartlaub's Gull, Southern Pochard, Maccoa Duck, White-Breasted Cormorant, Greater Flamingo, Spur-Winged Goose, Black-Necked Grebe, Pied Avocet and Swift Tern.

[Information adapted from https://rsis.ramsar.org/sites/default/files/rsiswp_search/exports/Ramsar-Sites-annotated-summary-South-Africa.pdf]

7.4 Cape Town's eligibility

The City meets all of the criteria for Ramsar Wetland City status, in that:

- It is recognised as a global hotspot of biodiversity;
- It includes 40 different types of wetland (11407.54 ha) as categorised in the BioNet. These translate into 16 Ramsar inland wetland categories (8 natural and 8 artificial). Some of Cape Town's marine areas are also classified as wetlands in the Ramsar wetland definition;
- These wetlands include one existing Ramsar wetland site (False Bay Nature Reserve) as well as a Natural World Heritage Site in its vicinity (Table Mountain National Park);
- Its wetland habitats support numerous threatened species and important ecosystems;
- The importance of wetlands is recognised in the City's policies, for example the City's 2009 policy for flood-prone areas (City of Cape Town 2009), which includes requirements for ecological buffers between wetlands and development, and its 2017 Environmental Policy,⁷ which includes a number of aims, including the following, (to):
 - "Protect, invest in and proactively work towards rehabilitation of ecosystems and ecological infrastructure, with the aim of restoring the functioning of these systems and the ecosystem goods and services they provide;
 - Clearly define, map, manage and rehabilitate ecological infrastructure that provides ecosystem goods and services to the communities of Cape Town;
 - Consider all development, including municipal infrastructure development, and land use changes in terms of the potential impacts on ecological infrastructure and ecosystem goods and services, and ensure that negative impacts are prevented, or where they cannot be prevented, minimised or mitigated;
 - Recognise the interconnectedness and interdependence of ecosystems and their associated goods and services, and ensure that negative cumulative and downstream impacts are prevented, or where they cannot be prevented, minimised or mitigated; and
 - Compare life cycle costs of ecological infrastructure and hard engineering infrastructure and promote the use of ecological infrastructure in place of hard engineering infrastructure where cost-effective and appropriate;
- The City has implemented numerous wetland rehabilitation projects (see **Section 7.6**);
- The BioNet ensures that wetlands are considered in spatial planning;
- City Nature Reserves include extensive education programmes that include education and awareness about wetlands and their associated ecosystem services; and
- A local Ramsar Wetland Committee has been established, including numerous City and external specialists with multi-disciplinary knowledge that can contribute towards, or raise concerns around, meeting the requirements for ongoing Ramsar Wetland City accreditation.

Based on these and other contributing factors, the City of Cape Town was accorded Ramsar Wetland City Status in November 2022, becoming one of 43 cities globally and just five in Africa that held this accreditation at the time of this report (June 2024).

⁷ <https://resource.capetown.gov.za/documentcentre/Documents/Bylaws%20and%20policies/Environmental%20Strategy.pdf>

7.5 Implications and responsibilities

Ramsar Wetland City accreditation carries significant marketing and environmental positioning advantages for the City. However, it also comes with a number of responsibilities and requirements, if this status is to be retained. These are outlined in the Ramsar Operational Guidance documentation, which stresses that the objective of the Wetland City Accreditation is to promote the **conservation and wise use of wetlands and regional and international co-operation**, as well as to **generate sustainable socio-economic benefits for the local populations**, and that accredited cities must deliver on these objectives, if they wish to retain their status. Specific requirements include the following:

- A wetland monitoring and evaluation programme must be prepared and implemented;
- Accredited cities should produce at least one brief report on activities relevant to the Wetland City Accreditation;
- City leaders or Mayors are requested, where possible, to produce short videos describing the activities undertaken and explaining how wetland wise use and Wetland City Accreditation has benefitted the citizens of the city; and
- Accredited cities are requested to produce single-page case studies for compilation and electronic distribution to other accredited cities, to ensure knowledge and experiences are shared.

This means that active and meaningful conservation and rehabilitation of wetlands needs to inform all City planning and budgeting cycles, and specific case-study based reporting on wetland rehabilitation needs to form part of annual reporting by the City.



Photograph 7.1. Re-creation and planting of seasonal wetlands near Zandvlei – project by City of Cape Town

7.6 Recent and planned wetland rehabilitation or new conservation projects

This section provides a general overview of Cape Town's wetlands, focusing on seasonal wetlands, and does not try to provide a complete listing of all wetland rehabilitation projects undertaken in the city to date. Ramsar Wetland City accreditation does however require annual reporting on progress in wetland rehabilitation and conservation (see previous). This should take place annually going forwards (see **Section 10**). Only a few examples are highlighted in this report, to illustrate the City's intent in meeting its obligations.

7.6.1 Rehabilitation of Van Blommestein Park seasonal wetlands (FBNR)

In 2023/2024, the City's Biodiversity Management Branch (BMB) cleared alien gum trees from the Van Blommenstein Park portion of the FBNR. This area is a popular community walking area, bounded on its southern boundary by the Zeekoevlei shoreline. Western Leopard Toads breed both along the vlei margins and in the Van Blommestein seasonal wetlands themselves. Clearing of gums led to significantly deeper, longer lasting wetland pools throughout the park in winter and spring of 2024. Importantly, low tunnels or underpasses had also recently been constructed under the road in 2023, as a joint project between the City and Nature Connect (an environmental education organisation). The tunnels allow the safe passage of Western Leopard Toads under the road, particularly during their breeding season (see Section 3.3.4). Given the high wet season water table in 2024, some of the tunnels also coincidentally allowed direct linking of wetland surface waters between wetlands in the adjacent Rondevlei section of the Reserve and Van Blommestein Park. In spring 2024, populations of galaxiid fish were observed in the park wetlands. These endemic fish (*Galaxias capensis*) are known to occur in Rondevlei but have not been found in Zeekoevlei for some time. Their passage into the rehabilitated wetlands highlights the value of undertaking holistic restoration of wetland ecosystems and their associated services to maximise conservation gains.

7.6.2 Planned dredging of Zeekoevlei (FBNR)

Zeekoevlei itself is the largest permanent wetland in the FBNR. It has high recreational value and its permanent waters support numerous waterfowl. During its annual managed draw-down, large populations of wading birds including both Lesser and Greater Flamingo, African Spoonbill, Pied Avocet and many other species are attracted to the shallower waters created. The wetland is however subject to ongoing pollution. Its poorly serviced upstream catchment discharges large volumes of solid waste, raw sewage and domestic waste water into the vlei via the Big Lotus River. Periodic overflows of sewage also occur from the adjacent Cape Flats WWTW. Decades of this ongoing pollution have resulted in the build-up of organic sediments in the vlei, to levels that threaten wetland function and recreational and other uses of the wetland. The City has procured a contractor to dredge up to 750 000 m³ of organic sludge from the vlei, with commencement planned for 2025. In parallel with this measure, construction of a new weir to allow deeper managed draw-downs is also planned, and in its environmental authorisation phase. These plans include construction of a new weir for Rondevlei as well, and the inclusion of a series of fish ladders, to allow estuarine fish to move up from the sea, into both vleis.

The above measures, which must be coupled with catchment-scale improvement in solid waste and water quality management, should improve wetland ecosystem resilience and ecosystem services.



Photograph 7.2. Rehabilitation of Van Blommestein Park, FBNR. Park shown in foreground, with fenced Rondevlei portion of FBNR shown in background, beyond the road. Toad tunnels between the two circled (2 of 6 tunnels). Photo: T. Smyth



Photograph 7.3. Dredging will target these thick organic sediments, visible here during annual draw-down. When inundated, the anaerobic sediments release methane and hydrogen sulphide gases.

7.6.3 Creation of off-channel wetlands on the Sand/Langvlei Canals (Coniston Park)

The City's Liveable Urban Waterways (LUW) programme plans to rehabilitate waterways across Cape Town, using water-sensitive design, nature-based solutions and green infrastructure. It was developed in response to the City's Climate Change Strategy, Water Strategy, Resilience Strategy and Environmental Strategy.

Forty-four river and/or wetland rehabilitation projects have been identified by the LUW programme, and if implemented, should result in the rehabilitation / creation of over 200 ha of wetland across 11 of Cape Town's catchments. One project that is nearing its implementation phase is the Sand/Langvlei Canal wetland project, which aims to:

- Rehabilitate the lower sections of the confluent Sand and Langvlei canals, by removing the concrete walls and canal base along some 550 m of river length, and creating more natural-looking river banks and extensive seasonal wetlands between the two systems (some 6000 m² of new treatment wetlands and some 2500 m² of new duneslack wetland habitat, creating habitat for wetland flora and fauna, including the (IUCN Endangered) Western Leopard Toad (*Sclerophrys pantherina*) and Critically Endangered Barbers Cape Flats Ranger butterfly (*Kedestes barberae bunta*));
- Replace existing litter traps with better-performing structures;
- Remove problematic invasive alien plants and sediments, and replace these with appropriate indigenous wetland plants; and
- Improve footpaths, bridges, seating and signage, to provide improved local amenity and security in an otherwise under-resourced area.

7.6.4 Planning for the conservation of Paardevlei Wetland

Paardevlei wetland is among the largest of Cape Town's seasonal wetlands. After over a century of pollution and management as a reservoir for permanent water storage, rehabilitation of the wetland commenced in the early 2000s, with dredging of polluted sediment and removal of a berm built around the naturally shallow vlei, to increase its storage capacity. This was followed by a detailed rehabilitation design phase, and then the 2011 installation of a sluice system, to allow draw-down of the wetland in summer, thus emulating natural conditions. The above measures were carried out by private landowners but the vlei and surrounding area were purchased by the City in 2015. By 2024, the vlei had recovered to the point where it is an important birding area, supporting at least 373 bird species (as recorded in i-Naturalist), of which at least ten are IUCN listed as Vulnerable or Near Threatened. The wetland and surrounds also support various frog species as well as mammals such as the Near Threatened Cape clawless otter (*Aonyx capensis*) and other fauna.

Amidst growing concerns as to the fate of the wetland in a development context, at the time of this report, the City's Human Settlements and Housing and Environmental Management Departments had entered into a collaborative engagement, with a view to setting aside both Paardevlei and an extensive area of terrestrial habitat, linking with the coast, and working to proclaim these areas as a formal nature reserve, to be managed by the City's BMB.

If successful, this would be a significant conservation gain for wetlands, particularly in the Helderview area, where extensive past and planned development has eliminated a large proportion of natural wetland.



Photograph 7.4. Confluence of the Sand (right) and Langevlei (left) canals – the canal sidewalls and area between the canals would be targeted in this LUW rehabilitation project.



Photograph 7.5. The extensive Paardevlei wetland, comprising reedbed and wetland flats, seen here under dry season conditions.

7.6.5 Rehabilitation of Skilpadsvlei seasonal wetland ⁸

The Skilpadsvlei wetland, once the only breeding site in the Kommetjie area for the endangered Western Leopard Toad, was filled in during the 1940s. In 2012 the City of Cape Town, in partnership with local community interest groups, rehabilitated the seasonal wetland and its adjacent terrestrial areas, which lay in an area of open space just inland of Kommetjie beach.

Extensive earthworks allowed for removal of fill and the shaping of shallow wetland depressions, designed to be seasonally inundated at a range of depths to support a variety of wetland biota, including Western Leopard Toad during their breeding and tadpole phases.

Earthworks were followed by planting of appropriate indigenous wetland and terrestrial plants and ongoing controlling of alien invasive species. The City also added signage and two boardwalks to allow public access; replaced old bollards; and upgraded a pathway along the edge of the wetland.

Within three months of its creation, the project saw the first successful breeding event for Western Leopard Toads in the rehabilitated wetland. Successful breeding has taken place there every year since, and Skilpadsvlei has grown into one of the most significant breeding sites for Western Leopard Toads in the City of Cape Town.

7.6.6 Impacts of planned sewage reticulation and treatment infrastructure upgrades on wetland condition

Many of Cape Town's wetlands have been impacted by the receipt of polluted runoff, stemming variously from inflows of untreated sewage and greywater from poorly serviced formal and informal settlements; raw sewage from failed sewage pump stations and sewer reticulation systems; and variously treated effluent outflows from the City's WWTWs. These outflows affect both seasonal and permanent wetlands, mainly influencing those that are on-channel, but also affecting groundwater-fed off-channel seasonal wetlands, particularly on the Cape Flats, where groundwater contamination has occurred.

The City's planned capital expenditure on sewage reticulation and waste water treatment works over the next three financial years should, if implemented and managed according to specifications, also contribute towards reduced impacts on downstream wetlands.



Photograph 7.6. Rehabilitated Skilpadsvlei (2024). Photo: S. Dorse



Photograph 7.7.Theo Marais channel downstream of inflows from the Koeberg pump station (March 2024). Upgrading of the pump station and Potsdam WWTW will reduce these polluted flows into the Diep River and its wetlands.

⁸ Text adapted from <https://www.capetown.gov.za/departments-city-initiatives/environmental-resource-management/skilpadsvlei-rehabilitation-project>

8

WETLAND MONITORING

8.1 Current monitoring

The City's Environmental Management Department (EMD):BMB currently undertakes quarterly water quality monitoring at 33 wetland sites within its nature reserves and other conservation areas (see **Figure 8.1**). Of these, 19 sites, from eight nature reserves and conservation areas, are located in seasonal wetlands, while the remaining sites are located in permanent wetlands, including the City's major vleis (Zeekoevlei, Rietvlei and Rondevlei), where BMB undertakes additional monitoring to that undertaken by CSRM in its routine Inland Water Quality monitoring Programme. BMB's monitoring is however severely constrained by limited resources within BMB for sampling, and limited laboratory capacity at the City's Scientific Services Branch (SSB). Monitoring is carried out by BMB, in addition to needing to meet the legislated operational and management activities included in Management Plans for each of its reserves.

Figure 8.1 shows the number of samples and date of sampling commencement, while the locations of the monitored seasonal wetlands are shown in **Figure 8.2**. The number of seasonal wetlands monitored has increased substantially over the past four years, while data for the Uitkamp Nature Reserve and Edith Stephens Nature Reserve date back to 2008 and 2014, respectively. Seasonal wetlands are monitored in the wet season, on a quarterly basis. Data from site monitoring are presented in **Figures 8-3 to 8-8**. The following wetland elements are assessed in these samples:

- Algal species identification and enumeration (this is carried out on an ad hoc basis only);
- Water quality (chlorophyll-a, major nutrients and physico-chemical parameters (pH and electrical conductivity (EC) only), with all variables measured in the laboratory, due to a lack of suitable equipment for in situ measurements (e.g. pH, EC, dissolved oxygen) within BMB);
- *Escherichia coli* bacteria, as a measure of sewage pollution; and
- Periodic measurements of microcystin toxins in waters with visible algal blooms.

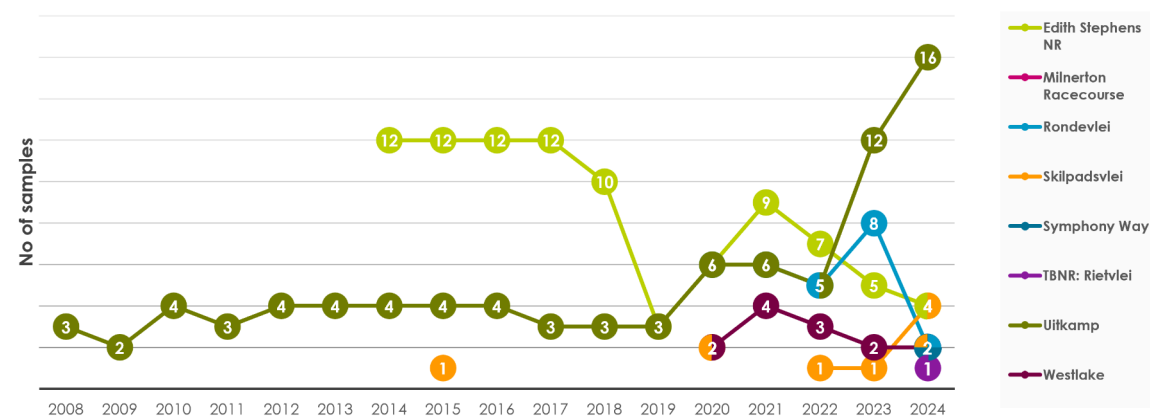


Figure 8.1. Number of samples and date of sampling commencement for water quality and phytoplankton monitoring in seasonal wetlands in the City's reserves and conservation areas.

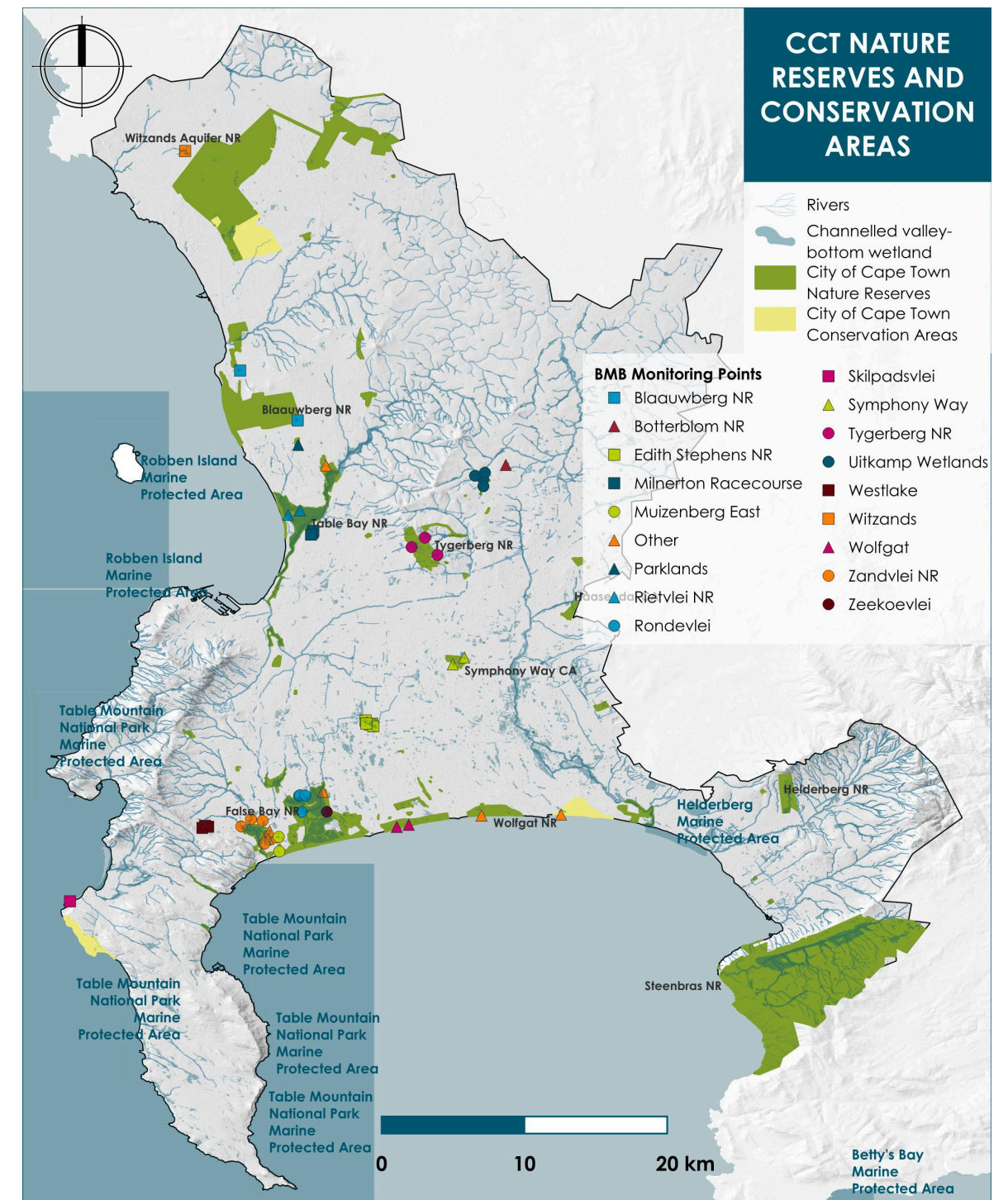


Figure 8.2. Locations of the City's BMB's monitoring points in seasonal wetlands in the City's reserves and conservation areas.

Note that monitoring of other wetlands is also carried out by other City Directorates (e.g. in the Steenbras Nature Reserve, as part of monitoring of potential impacts of the planned Table Mountain Group Aquifer (TMGA)).

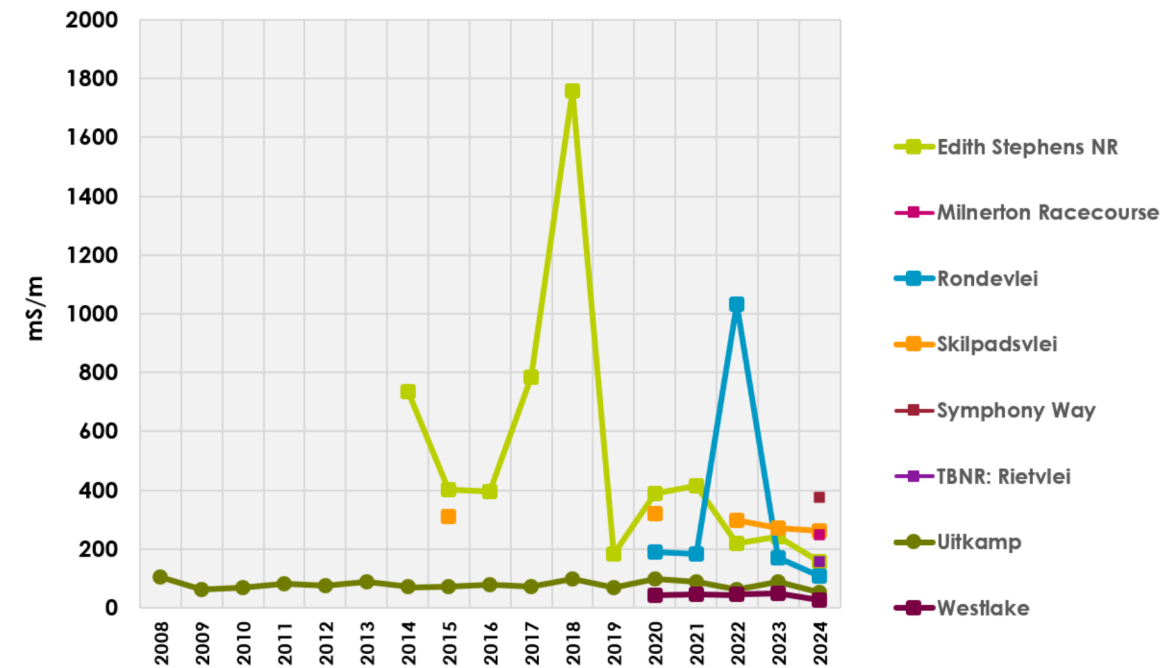


Figure 8.3. Mean annual electrical conductivity monitoring data for assessed seasonal wetland sites in the City's Reserve and Conservation sites.

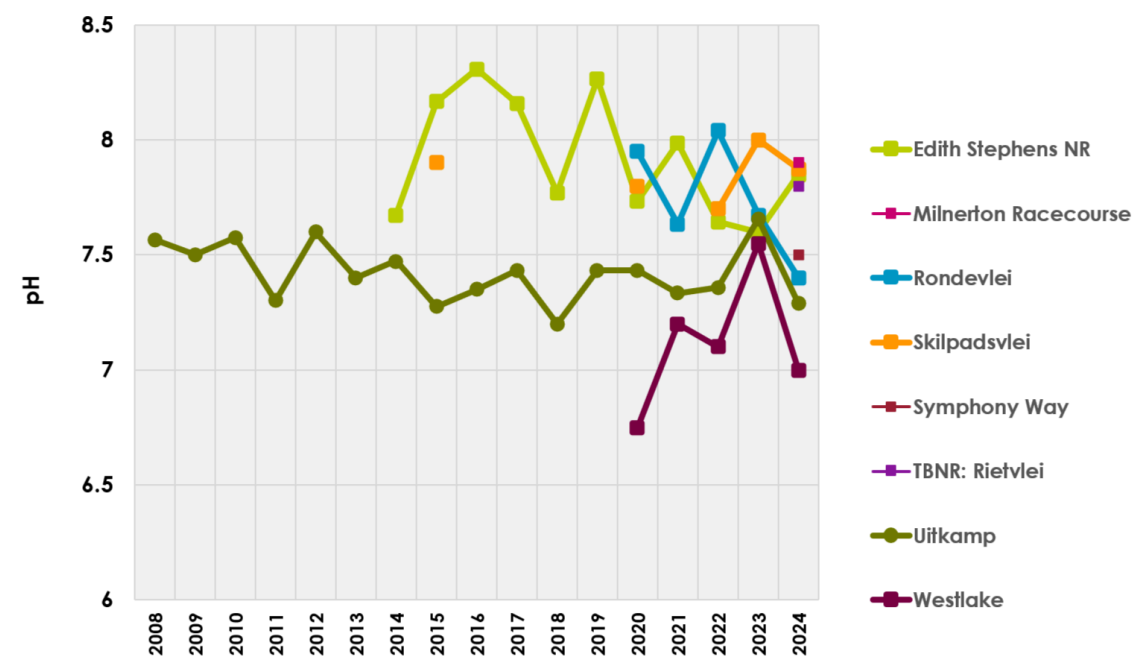


Figure 8.4. Mean pH monitoring data for assessed seasonal wetland sites in the City's Reserve and Conservation sites.

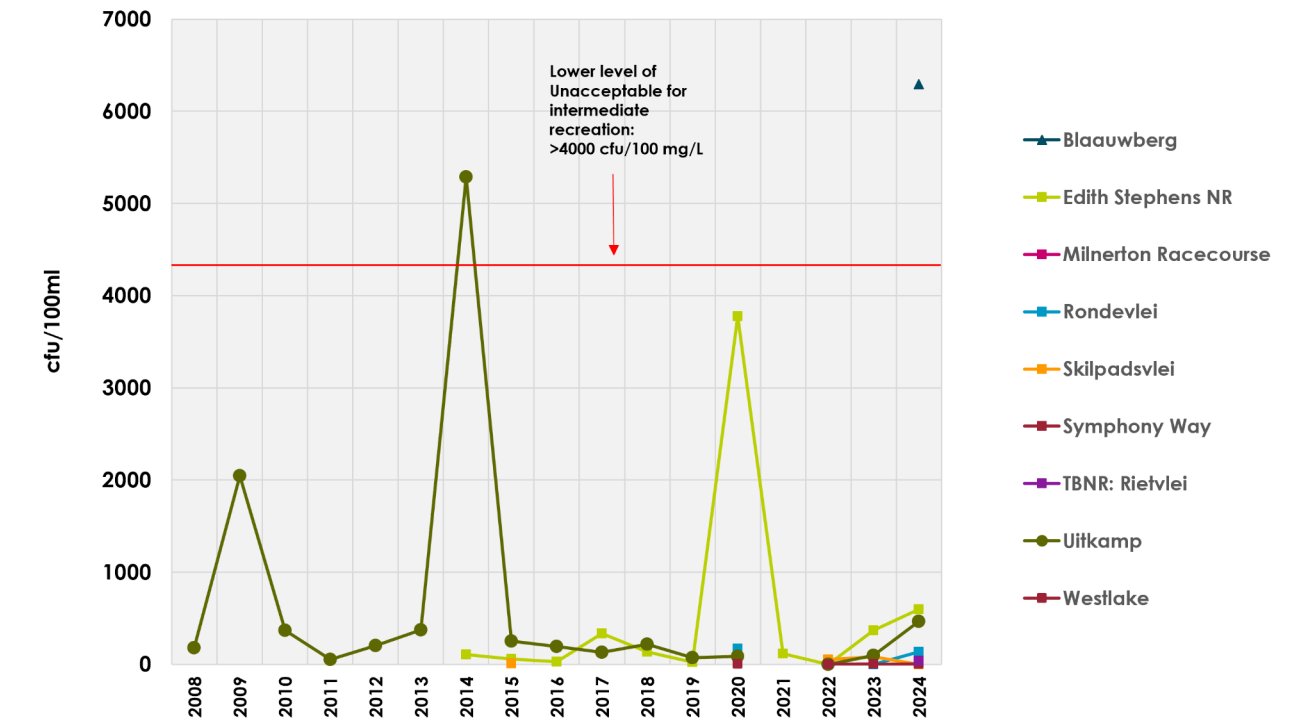


Figure 8.5. Mean (geometric) annual *Escherichia coli* monitoring data for assessed seasonal wetland sites in the City's reserve and other conservation areas.

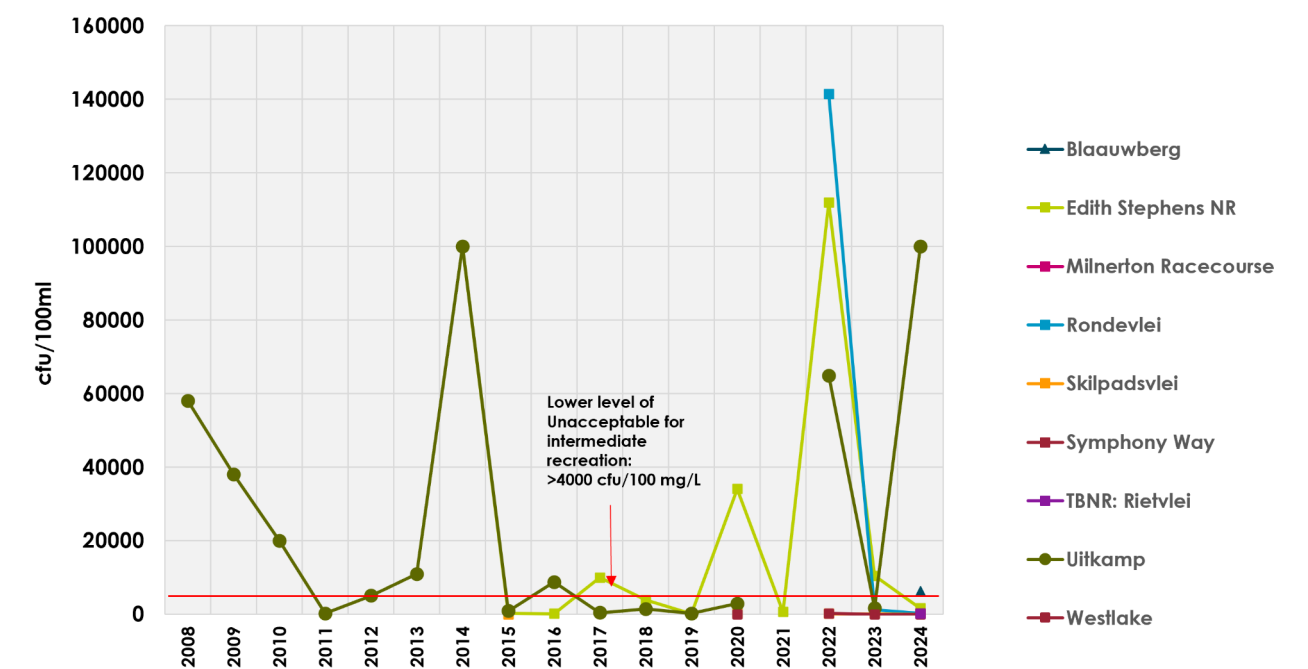


Figure 8.6. Maximum annual *Escherichia coli* monitoring data for assessed seasonal wetland sites in the City's reserve and other conservation areas.

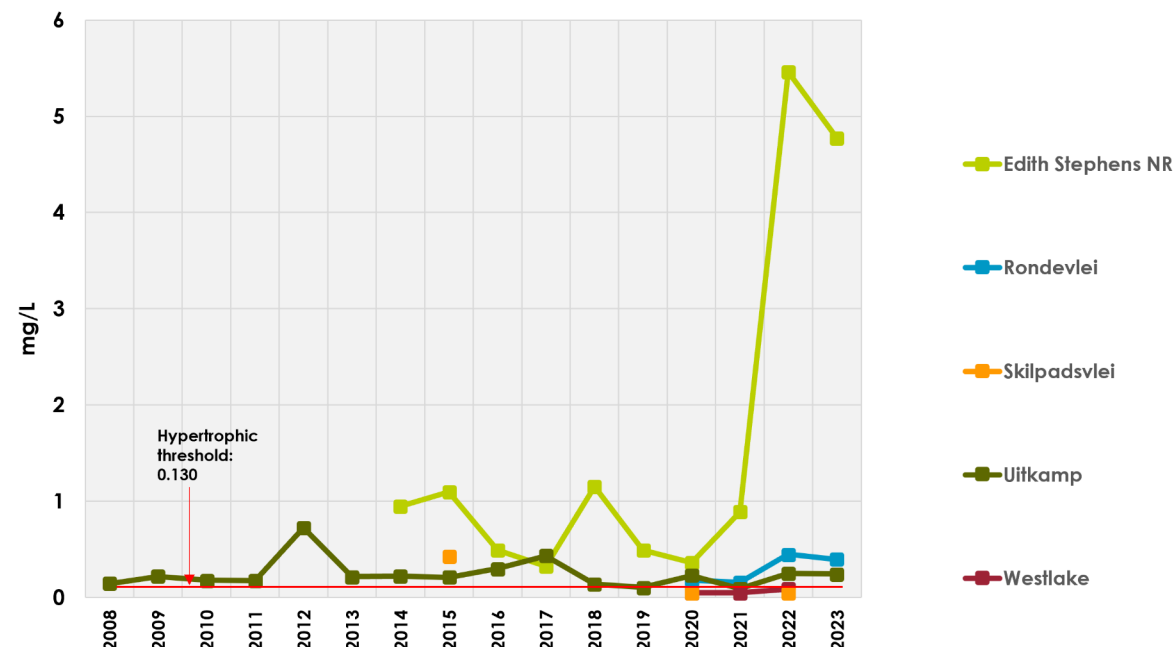


Figure 8.7. Mean total phosphorus data for assessed seasonal wetland sites in the City's reserve and conservation sites, showing the City's hypertrophic threshold for wetlands/vleis (Day et al. 2024).

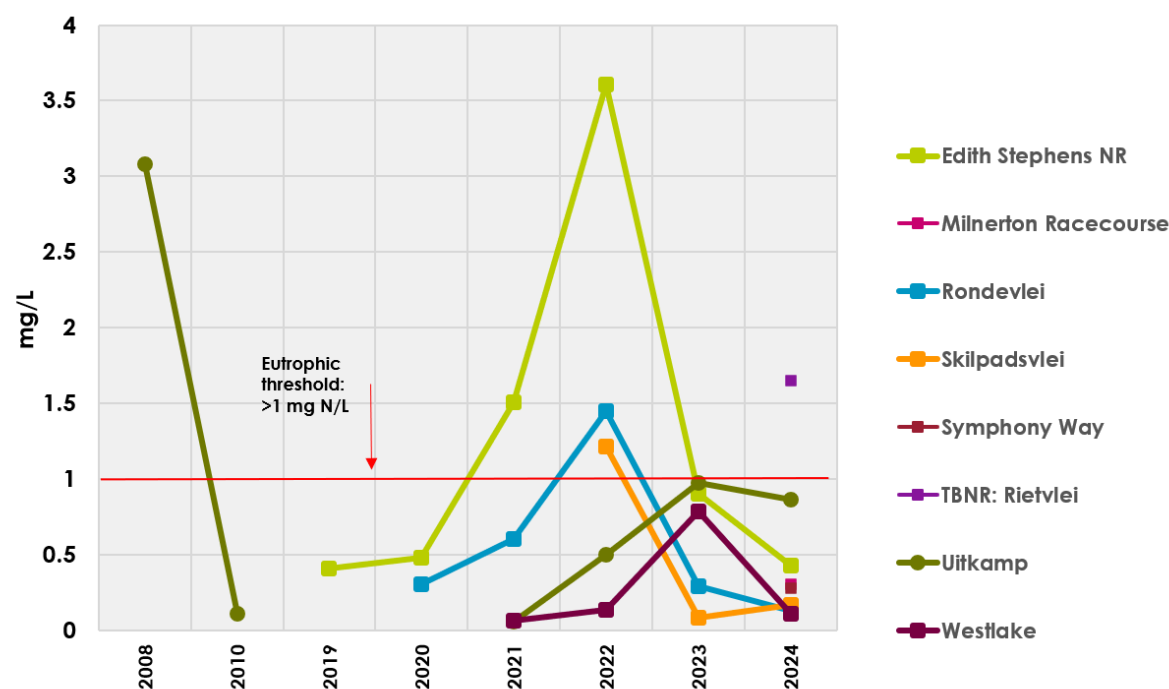


Figure 8.8. Mean total inorganic nitrogen (TIN) data for assessed seasonal wetland sites in the City's reserve and conservation sites, showing the City's eutrophic threshold for wetlands/vleis (Day et al. 2024 and DWAF 1996).

8.2 Results of monitoring

Data from site monitoring are presented in **Figures 8-3 to 8-8**, and discussed briefly below. Note that *Escherichia coli* data for the period April 2021 to February 2022 have been excluded, as these data are not reliable (see Day et al. 2024).

In addition, no total phosphorus analyses were carried out by the City's Scientific Services Branch (SSB) from December 2022 to date.

The above data, albeit limited to just a few sites and, in most cases, just a few samples, indicated that monitored wetlands exhibit often major variations between sites. This is expected, given their different locations; exposure to different natural influences such as geology, soils and hydrology; and different anthropomorphological influences.

That said:

- The seasonal wetlands of the **Edith Stephens Nature Reserve**:
 - Showed relatively high salinity through the monitoring period, with mean EC often above 400 mS/m (upper limit of fresh systems), and during the 2017 and 2018 drought years, when wet season dilution would have been low, mean (wet season) EC values increased well into the range for brackish conditions (DWAF 2005);
 - Like Rondevlei, also located on the Cape Flats, were characterised by alkaline pH, with mean pH always above 7.5 and often above 8;
 - Were impacted directly by at least one major sewage inflow in 2022 (*Escherichia coli* maximum 111 990 cfu/100 ml) – assumed to have come from overflows from a frequently overflowing sewage manhole in the vicinity of the wetlands; and
 - Were generally nutrient enriched, with orthophosphate concentrations well above hypertrophic thresholds for this nutrient, but particularly so in 2022, when mean concentrations were more than 50 times higher than the lower hypertrophic threshold – spikes in both total inorganic nitrogen and orthophosphates are assumed to stem largely from the major 2022 sewage ingress. Since off-channel seasonal wetlands are largely nutrient sinks, the impacts of nutrient enrichment on phosphorus concentrations are expected to be long-lasting – as shown by the elevated 2023 mean orthophosphate concentrations. TIN concentrations dropped rapidly, however, with 2023 concentrations lying close to 2020 and previous concentrations, highlighting the fact that wetland plants and microbial biota in particular can effectively process (limited) nitrogen nutrients through uptake, nitrification and de-nitrification, but may be permanently negatively impacted by phosphorus enrichment. These impacts are evident in changes in the macrophyte component of the seasonal wetlands. Note that the wetlands do still support populations of the macro-algae *Nitella praeclara* and the Critically Endangered plant, *Lachenalia arbuthnotiae*.
- **Uitkamp seasonal wetlands** have the longest monitoring record, extending back as far as 2008. These data suggest that:
 - EC is generally low (< 100 mS/m) and indicative of fresh (rather than brackish) systems (Ollies et al. 2013);
 - pH was generally in the neutral range, varying between 7.2- and 7.6 over the monitoring record;

- Nitrogen enrichment was variable but mean TIN fell below the eutrophic threshold in all monitored years outside of 2008;
- Total phosphorus concentrations were elevated just above hypertrophic thresholds, indicating nutrient enrichment;
- The link between nutrient enrichment and sewage inflows was less clear in these wetlands than in the Edith Stephens wetland data, in part because the Uitkamp wetlands include various sample sites throughout the area, all potentially subject to different influences including sewage overflows; and
- In both the 2022 and the 2024 wet seasons, the Uitkamp wetlands were subject to significant inflows of raw sewage. This issue highlights why development infrastructure (e.g. sewers) should not be located in conservation areas.

- **Milnerton Racecourse wetlands** have only been included in the BMB monitoring programme's water quality monitoring records since 2024, although *ad hoc* plant and faunal assessment has taken place in these systems previously (see Section 3.3.3 – the site supports amongst other iconic species the endemic *Hydrodictyon africanum* algal species). The limited water quality monitoring data suggest that:

- EC lay in the range of 181-316 mS/m (mean = 250 mS/m) reflecting a coastal influence and underlying Malmesbury shales;
- pH was slightly alkaline, varying between 8.0 and 7.8, consistent with Malmesbury shale influences;
- Orthophosphate concentrations suggested mildly eutrophic concentrations – no total phosphorus data were available from the City's SSB in 2024;
- TIN concentrations were low and well within the City's targets for nitrogen enrichment (Oligotrophic to mesotrophic conditions); and
- The data show no major sewage inflows into the wetland, at least at the time of sampling.

- **Overall, the data suggest that water quality impairment was not a major issue in these wetlands over the current reporting period, but bearing in mind the limited datasets. Periodic blue-green algal blooms in the permanently inundated portion of the wetland do suggest more water quality impairment than is shown by the very limited water quality sampling programme.**

- **Rietvlei seasonal wetlands** were also only included in the BMB's monitoring programme in 2024. These very limited data suggest that:

- At least at the time of sampling, *E. coli* concentrations (39 cfu/100 ml) were well within the City's target range and potentially attributable to bird activity in these wetlands – note however that this does not indicate any precedents in *E. coli* contamination;
- TIN and orthophosphate concentrations lay within the City's thresholds for eutrophic and hypertrophic conditions for these nutrients respectively (noting that in fact the City's thresholds are for total phosphorus, for which no data were available in 2024);

- pH was 7.8, and sufficiently low to reduce the threat of ammonia toxicity potentially associated with elevated total ammonia concentrations; and
- EC of 156 mS/m was consistent with seasonal wetlands in this area, but would be likely to increase considerably as the wetland dries out.

- **Rondevlei seasonal wetlands:** Limited water quality monitoring data suggest that:

- The wetlands are generally neutral pH to mildly alkaline, as expected in this part of the Cape Flats;
- The wetlands were impacted by a major sewage overflow during 2022 (**Figure 8-6**) – these data are assumed to reflect overflows from a pump station located close to the wetlands, which overflowed in 2022. The management response was to divert the sewage into the nearby wetlands – an issue that was strongly deplored at the time by FBNR staff and the community Friends of Zeekoevlei and Rondevlei;
- Generally, these wetlands do not appear to be exposed to raw sewage (**Figure 8-5**), however even infrequent events can add significantly to nutrient and toxin loading over time, in such wetlands;
- The above point is born out by total phosphorus concentrations in the wetland, which show a marked increase after the 2022 pollution event, which were sustained into 2023, **again highlighting the potential long term impacts of episodic sewage overflows;**
- As in the case of the Edith Stephens wetlands, TIN concentrations also showed high concentrations in 2022, in response to the sewage inflow event, but dropped in the 2023 monitoring period, suggesting effective denitrification and nitrification processes;
- This issue is highlighted by the fact that the macroalgae *Hydrodictyon pateniforme* has since disappeared from the impacted wetland.

- **Skilpadsvlei wetland:** Monitoring data for this rehabilitated wetland suggest that:

- The wetland is characterised by neutral to mildly alkaline conditions, consistent with its location on marine sediments;
- There have been no recorded incidents of sewage inflows into the wetland, with *E. coli* data showing no levels of concern during the snap-shots afforded by monitoring. Pumpstation overflows are diverted by pipe away from the wetland, by design.
- Phosphorus nutrient concentrations place the vlei in a hypertrophic condition – this is however an artefact of the relatively high laboratory limit of detection for total phosphorus, which is 0.1 mg P/L (reflected in the data, by convention, as 0.05 mg/P/L) – both concentrations that already lie well above the hypertrophic threshold for this nutrient in wetlands; and
- Measured nitrogen nutrients were always below the hypertrophic threshold (4 mg N/L) for this nutrient and generally also below the eutrophic threshold.

- **Symphony Way:** Water quality data for this site are limited to a few samples only, that suggest:
 - Generally neutral to mildly alkaline pH;
 - Low exposure to *E. coli* spills, at least at the times of sampling;
 - TIN concentrations below eutrophic thresholds, suggesting low levels of nutrient enrichment; and
 - Orthophosphate phosphorus concentrations were below laboratory detection levels of 0.1 mg P/L – but on the basis of the above, unlikely to be associated with significant phosphorus enrichment.
- **The data suggest that water quality impairment was not a major issue in this wetland over the current reporting period, but bearing in mind the limited datasets.**
- **Westlake Wetlands:** These wetlands have been monitored by the BMB since 2020. The data to date suggest that:
 - The wetlands are neutral to mildly acidic, and characterised by low EC, reflecting their source areas in low-nutrient, acid Table Mountain streams;
 - The wetlands appear to have low exposure to *E. coli* spills, at least at the times of sampling; and
 - Nutrient enrichment was relatively low, with total phosphorus concentrations lying below hypertrophic thresholds, while TIN concentrations lay below eutrophic concentrations.
- **These data suggest that water quality impairment was not a major issue in these wetlands over the current reporting period, but bearing in mind the limited datasets.**

8.3 Monitoring gaps and limitations

Routine, seasonal wetland monitoring is currently carried out only by the City's BMB, and confined only to a few seasonal wetlands in some of its conservation areas and reserves.

While seasonal water quality data do provide interesting snapshots of wetland conditions at the time of sampling, on their own, they are of limited value. In many cases, water quality data are limited to single samples only, and provide little information about natural seasonal changes in water quality and its links to hydroperiod (e.g. increasing salinity towards the end of the wet season) and /or biodiversity (e.g. changes in invertebrate species dominance with time over periods of inundation).

Tracking of changes in wetland extent and condition is also a critically important aspect of wetland monitoring, which is currently only available through external specialist aquatic ecosystem assessments. These usually relate to proposed developments, and are thus largely confined to seasonal wetlands outside of reserve areas, and the data generated are not centrally collated.

8.4 General comments

More useful information about wetland function, condition and biodiversity importance could however be gained by more intensive monitoring, which could include aquatic invertebrate assessment at multiple intervals throughout the wet season; repeated water quality sampling (even if only in terms of *in situ* measurements of EC and pH); measurement of water depth; measurement of dry season soil moisture changes; links to frog breeding patterns, in wetlands where this is relevant. This kind of detailed assessment and monitoring could be of great value in improving scientific understanding and knowledge of different seasonal wetland types; aiding in predicting and monitoring responses to climate change; and adding to our understanding of wetland function and structure.

Another important aspect is the need for mapping of infrastructure in the vicinity of BMB monitoring sites, that could cause pollution (e.g. sewers and pumpstations). This would aid in data interpretation and designs for preemptive measures.

The above notwithstanding, it is recognised that the BMB is constrained with regard to both human and financial resources, and it would be unrealistic to expect the above studies to be carried out at all of the seasonal wetlands under its management. It is thus recommended that seasonal wetland monitoring approaches be adapted, to allow detailed monitoring of a few, strategically selected seasonal wetlands only, with coarser scale monitoring of more numerous seasonal wetlands with regard to their extent, condition and management requirements over time.

Monitoring/measurement of wetland loss or transformation is also an important aspect, of great relevance to the management of wetlands at a City-wide scale, and not simply with regard to seasonal wetlands within the City's reserves.

8.5 Recommendations

8.5.1 Monitoring by the Biodiversity Management Branch

Given the BMB's limited time and financial resources for wetland monitoring, it is recommended that:

- Geo-referenced drone imagery should be used to allow tracking of changes in seasonal wetland extent and condition within reserve and other conservation areas, with images taken in wet and dry conditions, ideally annually but at least on a three yearly basis. These data would inform management requirements (burns, alien clearing, reedbed management); and allow long-term tracking of wetland extent, particularly in response to climate change;
- A few seasonal wetlands of different types in good condition, ideally associated with wetland plant and/or animal Species of Conservation Concern (SCC), should be selected, and monitored more rigorously, including the following measures if possible:
 - Identify/describe wetland reference conditions;
 - Identify key wetland driving processes;
 - Present Ecological State assessment of wetland condition, in relation to natural reference conditions;
 - Wet season monitoring of micro- and macroinvertebrate communities as well as

algae, through repeat sampling (two to four weekly intervals, depending on capacity) throughout the wet season;

- *In situ* measurement of water depth, EC, pH and dissolved oxygen during each sampling session, and once-off collection of samples for analysis of orthophosphate phosphorus, total phosphorus, ammoniacal nitrogen and TIN; and
- Include dry season soil moisture assessments in February and April of each year;
- Close collaboration with other wetland monitoring programmes taking place in the City's reserve areas (e.g. TMGA wetland monitoring in and near the Steenbras Reserve) should also be sought, allowing the findings of these studies and their implications for wetland conservation to be clear to the BMB (e.g. the implications of aquifer abstraction for groundwater dependent wetlands); and
- Collation of existing datasets covering many of Cape Town's seasonal wetlands, including comprehensive wetland plant and invertebrate data in Corry (2012) and Bird (2009).

8.5.2 Other monitoring

Ramsar Wetland City status has been accorded to Cape Town as a whole, and not simply to the wetlands included in its reserves. Given this, it is recommended that the City should:

- **Update the existing wetland layer** (Bionet 2024) through mapping/remote sensing exercises, to allow tracking of wetland loss/transformation – known areas of rapidly increasing informal settlement should be prioritised for this exercise (Lower Diep, Mosselbank, Kuils/Eerste, Sir Lowry's Pass, and Zeekoe catchments);
- Update the aquatic Bionet 2024 dataset to indicate wetlands that are likely to be **seasonal** – only a few of the seasonal wetlands are annotated as such in the data;
- Align the Aquatic BioNet data with the national and provincial wetland mapping and monitoring initiatives to standardise, co-learn, and allow the City's wetlands to be contextualised within the greater region, as well as contribute in a standardised way to national and global reporting;
- Undertake representative mapping of **wetland condition** on a ten year cycle by selection of 10-20 % of seasonal wetlands per catchment for assessment of wetland PES – in order to make this task manageable, it is recommended that only one or two catchments should be addressed annually, starting with the current Priority Catchments included in the Mayoral Priority Programme; and
- **Heavy metal issues:** A separate City-wide study is recommended, including perennial and seasonal wetland systems, to identify the extent to which bioaccumulation of heavy metals in these systems is a concern, from an ecological or human health perspective.

Note that monitoring on its own is not helpful. The City needs to take cognisance of data that point to sources of pollution, and take urgent action to address these.

It is recommended that the steps taken to date to address the action items highlighted in the City's annual Inland Water Quality Reports be independently audited.

9 KEY RECOMMENDATIONS AND CONCLUSIONS

9.1 General

This report provides a broad overview of Cape Town's seasonal wetlands, highlighting their biodiversity importance; the ecosystem services that many can provide; their sensitivity to changes in hydroperiod and water quality in particular; the kinds of impacts that affect their condition and extent in our city; and suggestions for monitoring so as to improve management and conservation understanding and responses.

9.2 Recommendations

Key recommendations stemming from the report include:

- The need to meet the requirements for Ramsar Wetland City reporting, including:
 - Compilation of a wetland monitoring programme, initially focusing on the City's Nature Reserves – recommendations for such monitoring have been outlined in Section 8.5;
 - Compilation of a brief video, ideally featuring Cape Town's executive mayor, and show-casing wetland biodiversity, management or rehabilitation efforts; and
 - Reporting (assumed to be annual) including brief case studies of wetland rehabilitation, management and conservation efforts affecting Cape Town's wetlands and including, but not limited to, those wetlands under the City's direct management;

This document is intended to meet the above requirements for the 2024 and 2025 reporting year.

- The need to update the aquatic portion of BioNet 2024 to include:
 - More accurate representation of lost/transformed wetlands as a result of formal and informal development and other impacts over the last 7 years;
 - Better alignment with the NBA (2018) wetland data (NWM v5), to include aquatic Bioregions and thus allow ecosystem Threat Status to be tracked and highlighted;
 - Updating of various parts of the dataset as outlined in Section 4.6;

The report notes that the above could be achieved through workshopping of issues and data with wetland specialists with local knowledge.

- The need for pragmatic monitoring that is structured so as to allow for:
 - Focused, detailed monitoring of a few selected wetlands in good condition, so as to allow expansion of scientific knowledge/understanding of seasonal wetland function, structure and likely response to climate change (and other factors);
 - Broader monitoring to inform management interventions, including mapping and monitoring of extant wetland **extent** and **condition** at a city scale;
- Collation of existing data relating to Cape Town's seasonal wetland flora and fauna (e.g. Bird 2012 and Corry 2011).

9.3 Conclusions

In conclusion, Cape Town has numerous seasonal wetlands, some of which remain in good condition and support diverse plant and animal communities, and many of which have high conservation value and are irreplaceable. Seasonal wetlands are however increasingly threatened systems. The City's policies and approaches to their management, particularly in the face of expanding formal and informal development, should thus include close scrutiny of development proposals, to identify and respond appropriately to potential impacts to downstream or otherwise impacted wetland systems as a result of changes in hydrology (both increases and decreases); changes in water quality; and threats posed by the increasing proximity of developments to seasonal wetland habitats. Cape Town's Ramsar Wetland City status provides strong motivation to support these recommendations.

Finally, it is further recommended that the City engage in a wide-reaching awareness campaign, including city residents, political leadership and all City line functions, with the aim of educating them as to the value of wetland ecosystems – particularly seasonal wetlands - and the responsibility on each individual to effect positive change in their management and condition.

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