water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

The purpose of the meeting is to present and workshop the draft resource quality objectives (RQOs) determined for the Berg catchment

Technical Task Group meeting 2: Presentation and workshopping of draft Resource Quality Objectives

Wetlands

Presented by: Louise Lodenkemper

30 - 31 May 2018
El Lions Venue, West Coast Road (R304), Dassenberg

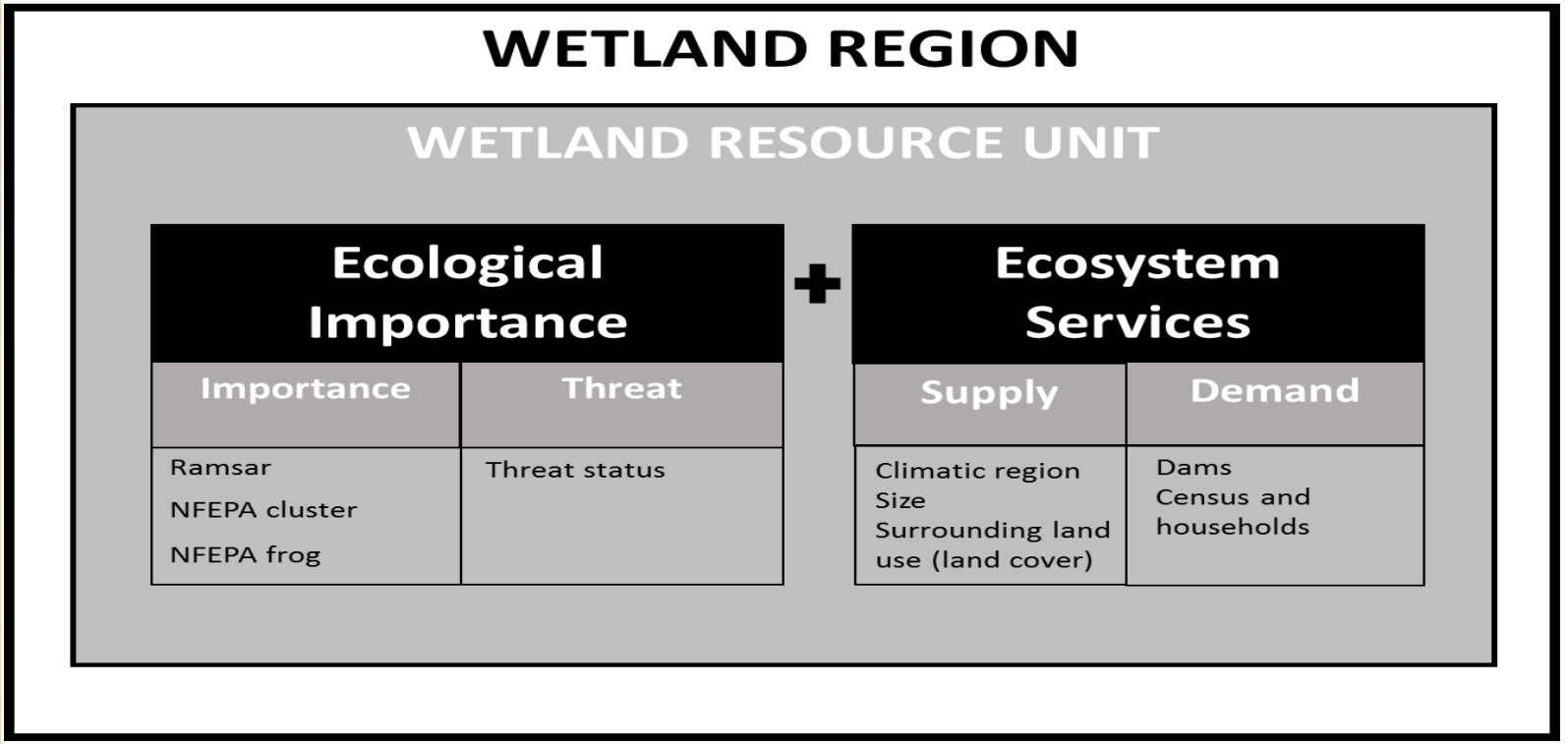
Wetlands

Overview of process

- **Prioritised Wetland Resource Unit per IUA, using GIS based approach**
- **Evaluated Resource Unit per IUA and determine indicators and subcomponents**
- **Determine RQOs and Numerical Limits**

Identification of Priority Wetlands

- Important wetlands include those that have ecological importance for maintenance of biodiversity ecosystem integrity, as well as those that provide ecosystem services.



Ecologically Important Wetlands

		Threat	
		High	Low
Ecological Importance	High	Implement restoration and rehabilitation to conserve ecologically important areas that are under threat.	Retain low current threat and possible future threat in ecological important areas.
	Low	Areas of least concern	Areas of least concern

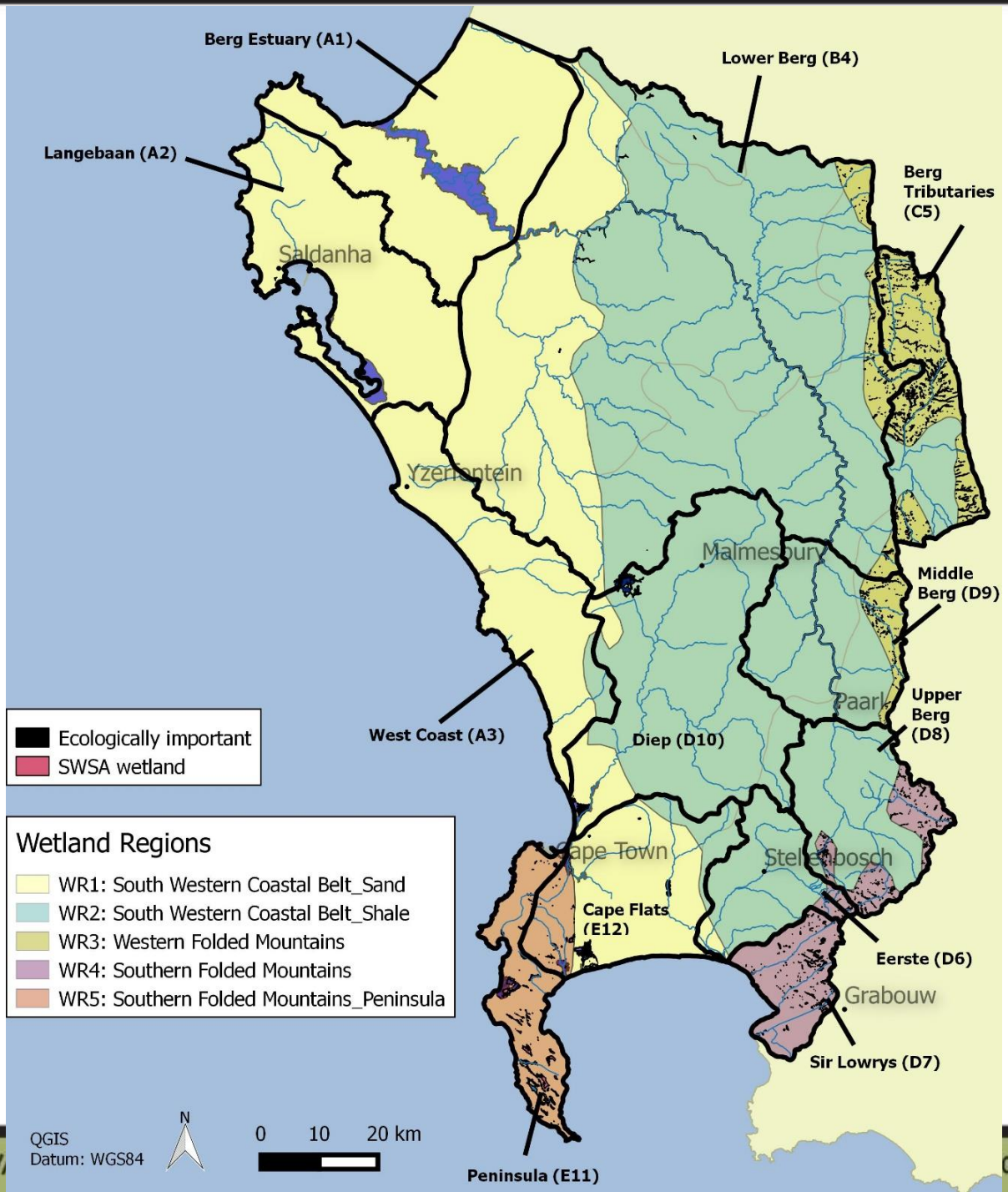
Different high scores for different Wetland Regions

Wetland Region	NFEPA cluster	NFEPA frogs	Ramsar	Critically endangered	Endangered	Vulnerable	Least Threatened	Score
South Western Coastal Belt_Sand (WR1)	x	/x		x				1.25
	x	x				x		1.10
	x	/x	/x		x			1.05
South Western Coastal Belt_Shale (WR2)		x		x				1.25
	x	x			x			1.10
Western Folded Mountains (WR3)				x				1.00
	x					x		0.85
Southern Folded Mountains (WR4)				x				1.00
Southern Folded Mountains_Peninsula (WR5)		x		x				1.25
	x	/x			x			1.05

Provision of Ecosystem Services

- Identifying supply and demand for ecosystem services broadly identifies “hotspots” for regulating and supporting services provided by wetlands across the study area.

- The location and extent of different land cover types may also affect the capability of a wetland to supply ecosystem services. Some land cover types, such as commercial annual crops, may occur within a wetland and considerably diminish the ecological condition of the wetland and its ability to supply certain ecosystem services (Kotze, 2016). Other land cover types may occur in the upslope catchment of a wetland with less direct impacts.


Berg Estuary (A1)
Lower Berg (B4)
Langebaan (A2)
Berg Tributaries (C5)
Saldanha
Yzerfontein
Malmesbury
Middle Berg (D9)
Paarl
Upper Berg (D8)
West Coast (A3)
Diep (D10)
Cape Town
Stellenbosch
Cape Flats (E12)
Eerste (D6)
Grabouw
Sir Lowrys (D7)
Peninsula (E11)
Ecologically important
SWSA wetland
Wetland Regions
WR1: South Western Coastal Belt_Sand
WR2: South Western Coastal Belt_Shale
WR3: Western Folded Mountains
WR4: Southern Folded Mountains
WR5: Southern Folded Mountains_Peninsula
QGIS
Datum: WGS84
N
0 10 20 km

Priority Wetland Resource Units

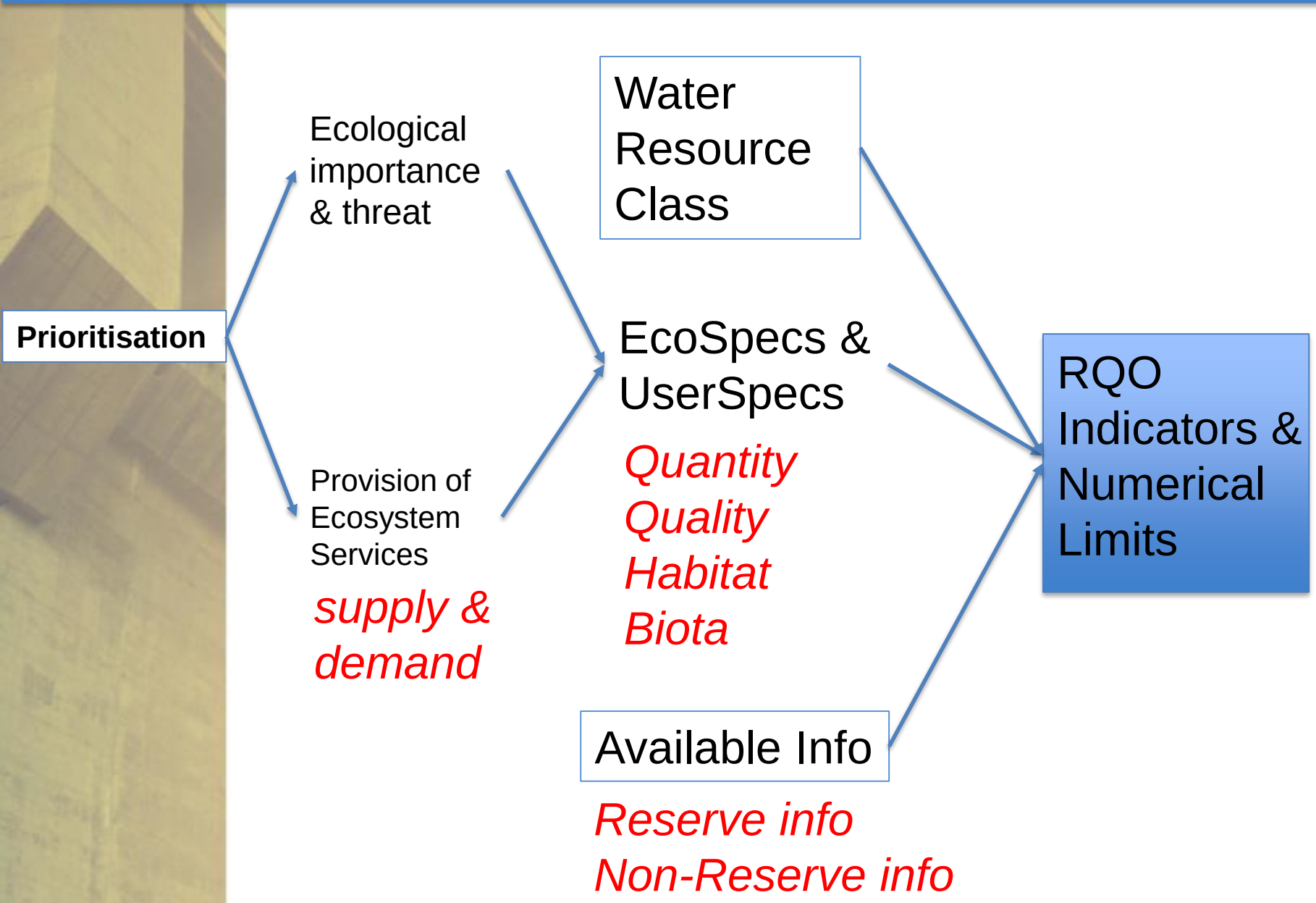
IUA	Wetland Region	Wetland Resource Unit	Name	Ecol NB	Supply	Demand
A1 Berg Estuary	South Western Coastal Belt_Sand (WR1)	Western Strandveld_Unchannelled valley-bottom wetland and valleyhead seep	Berg	x	x	
		Southwest Sand Fynbos_Floodplain and Unchannelled valley-bottom wetland	Berg	x	x	
A2 Langebaan	South Western Coastal Belt_Sand (WR1)	Western Strandveld_Unchannelled valley-bottom wetland		x		
				x		
B4 Lower Berg	South Western Coastal Belt_Sand (WR1)	Southwest Sand Fynbos_Floodplain and Unchannelled valley-bottom wetland	Sout	x		
		West Coast Shale Renosterveld_Depression				
	South Western Coastal Belt_Shale (WR2)	West Coast Shale Renosterveld_Floodplain	Berg	x		
		Northwest Sandstone Fynbos_Seep		x		
C5 Berg Tributaries	Western Folded Mountains (WR3)	Southwest Alluvium Fynbos_Seep and Channelled Valley-bottom		x	x	x
D7 Sir Lowrys	Southern Folded Mountains (WR4)	Southwest Sandstone Fynbos_Depression, Seep		x	x	x
		Southwest Sandstone Fynbos_Channelled valley-bottom and Floodplain		x	x	x
D8 Upper Berg	Southern Folded Mountains (WR4)	Southwest Sandstone Fynbos_Flat, Seep		x	x	x
D9 Middle Berg	South Western Coastal Belt_Shale (WR2)	West Coast Shale Renosterveld_Floodplain	Berg	x	x	
D10 Diep	South Western Coastal Belt_Shale (WR2)	Depression	Riverlands	x		

sample of wetlands whereby further information is required, or where information is available to ensure that monitoring occurs.

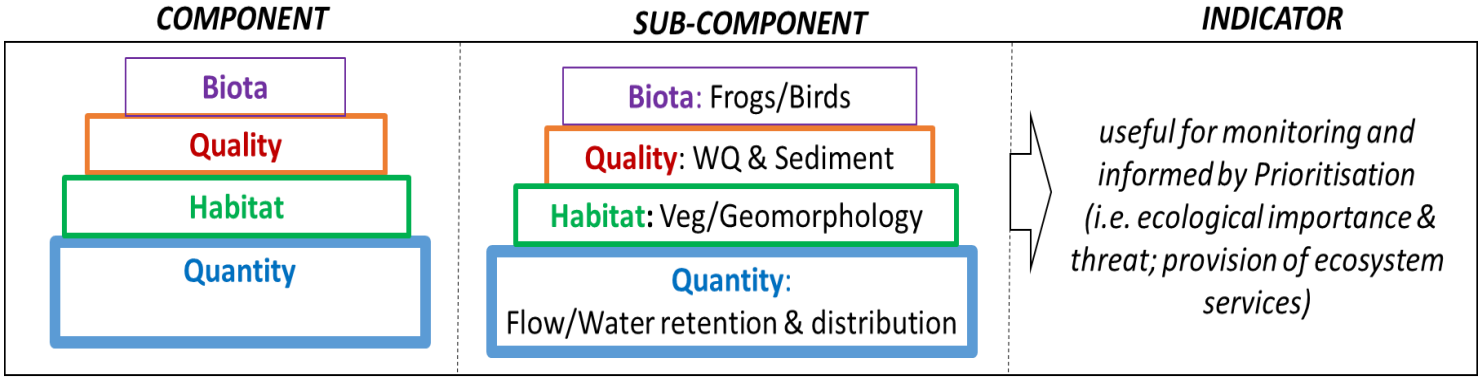
Priority Wetland Resource Units

IUA	Wetland Region	Wetland Resource Unit	Name	Ecol NB	Supply	Demand
E11 Peninsula	Southern Folded Mountains_Peninsula (WR5)	Southwest Sandstone Fynbos_Unchannelled valley-bottom, flat	Skulpadsvlei	x		
		Southwest Sandstone Fynbos_Unchannelled valley-bottom, flat	Cape Point Wetlands	x		
		Southwest Sandstone Fynbos_Flat	Sirkelsvlei	x		
		Southwest Sandstone Fynbos_Floodplain, Channelled Valley-Bottom	Groot-Rondevlei	x		
		Southwest Sandstone Fynbos_Unchannelled valley-bottom	Pick and Pay Reedbeds	x	X	x
		Southwest Sandstone Fynbos_Unchannelled valley-bottom	Noordhoek wetlands	x	x	X
E12 Cape Flats	South Western Coastal Belt_Sand (WR1)	Western Strandveld_Floodplain, Depression, Flat		x		
		Southwest Sand Fynbos_Floodplain, Flat		x		
		Depression	Rondevlei	x	x	X
		Depression	Zeekoievlei	x	X	x
		West Coast Granite Renosterveld_Channelled valley-bottom	Nooiensfontein	x	x	X
		Southwest Sand Fynbos_Floodplain	Blouvlei	x	x	X
		Southwest Sand Fynbos_Floodplain	Rietvlei	x	X	X
	Southern Folded Mountains_Peninsula (WR5)	Depression	Princess Vlei	x	X	X
		Depression	Little Princess Vlei	x	X	x

RQO determination overview



Sub-components and Indicators



- Generally most important driver is hydrology (Water quantity), followed by geomorphology (Habitat) and water quality.
- Vegetation (both driver and responder) is the next highest, with other ecosystem responses coming after.
- Understanding this relationship allows for an understanding of the important components and sub-components of wetland systems, in order for effective indicators to be developed.
- Indicator selection relates to the prioritisation process, which means that an indicator may be related to monitoring an important ecological characteristic, threat or provision of an important ecosystem service of the wetland.

Evaluation

The steps for evaluation were as follows (with steps 2-3 being conducted as part of developing a baseline)

1. Develop a conceptual model of:
   - Wetland hydrological functioning and geomorphology
   - Wetland vegetation
   - Wetland water quality amelioration
   - Wetland BIOTA

2. Validation and site selection (Required as part of monitoring)

3. Monitoring should take account of the relevant RQO and if required develop a baseline of Wetland Health

Water Quantity and wetlands

Quantity

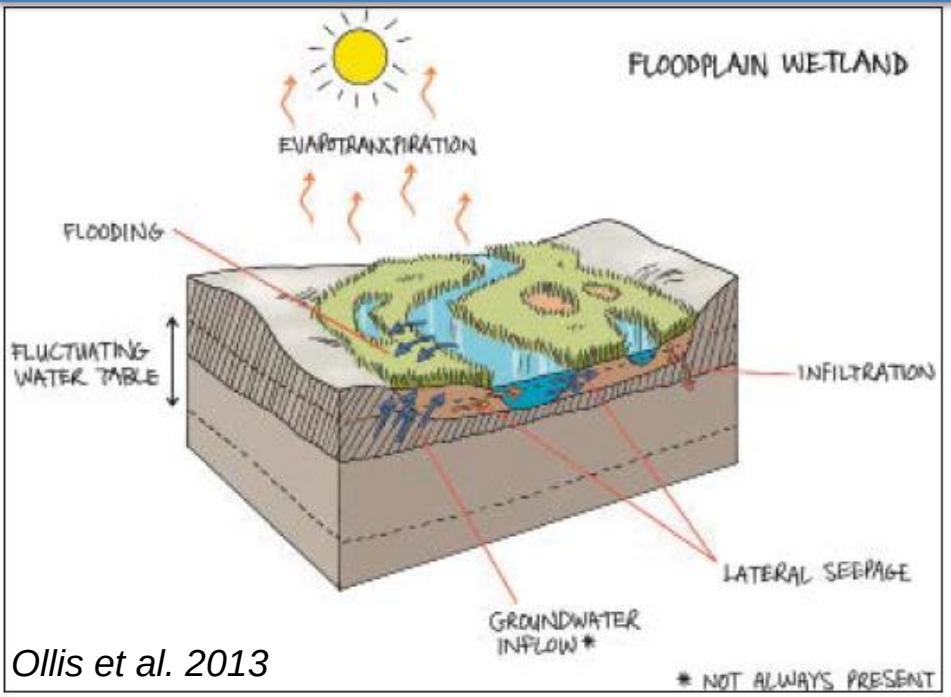
- Flow
- Water retention & distribution

Type	High flows	Baseflow	Surrounding runoff
Floodplain	x	x	x
Channelled Valley-Bottom		x	x
Unchannelled Valley-Bottom		x	x
Seep		x	x
Depression		x	x
Flat		x	x

Maintain high flow events

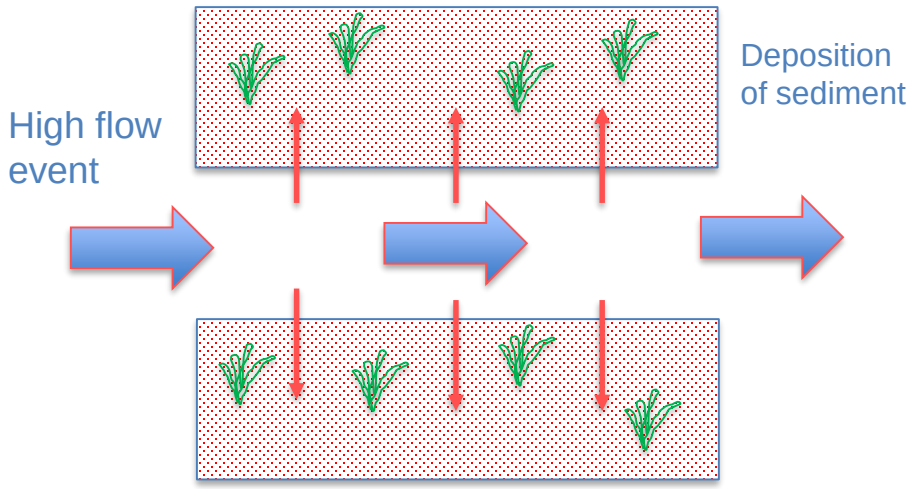
Maintain water levels

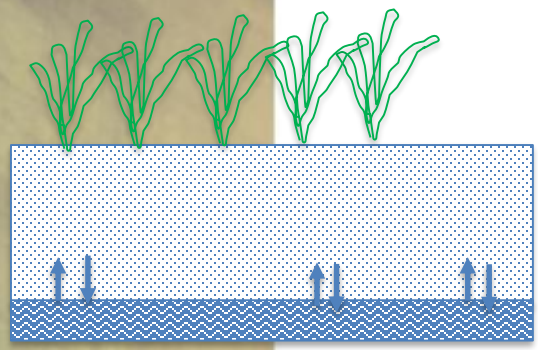
High flow events: FLOODPLAINS



Ollis et al. 2013

Movement of flood longitudinally



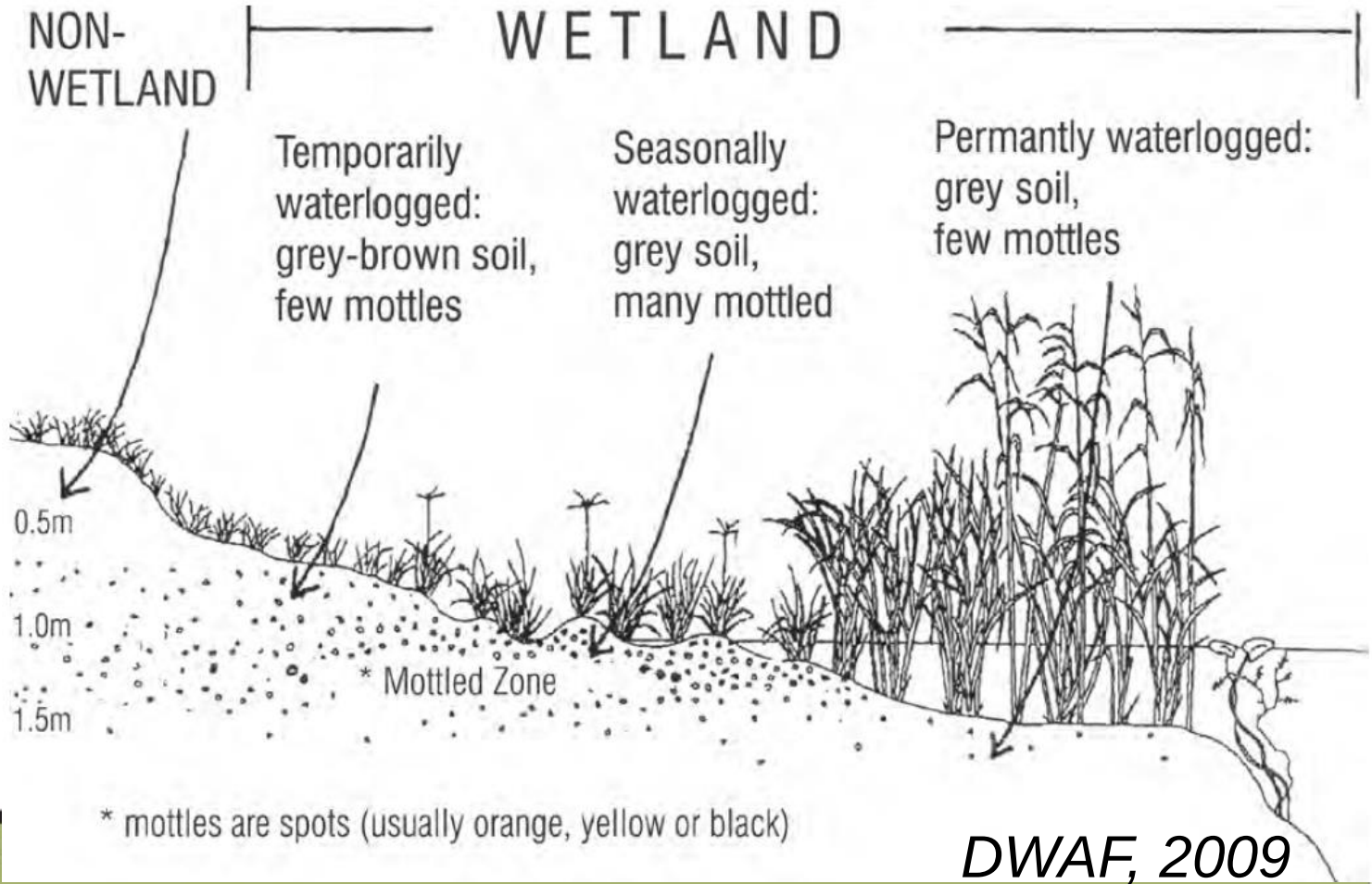


Limited infiltration/groundwater inflow (Baseflow)

- Generally receive most water during high flow events when waters overtop the streambank.
- NB flood attenuation because of the nature of vegetation and topographic setting. Flood attenuation is likely to be high early in the season until the floodplain soils are saturated, whilst in the late season flood attenuation is reduced.
- As flood waters overtop streambanks the waters drop sediments, and nutrient bound sediments, which are left behind to accumulate.
- The nature of clayey soils in floodplains means that soils retain water, thus limiting contribution to streamflow and groundwater recharge.

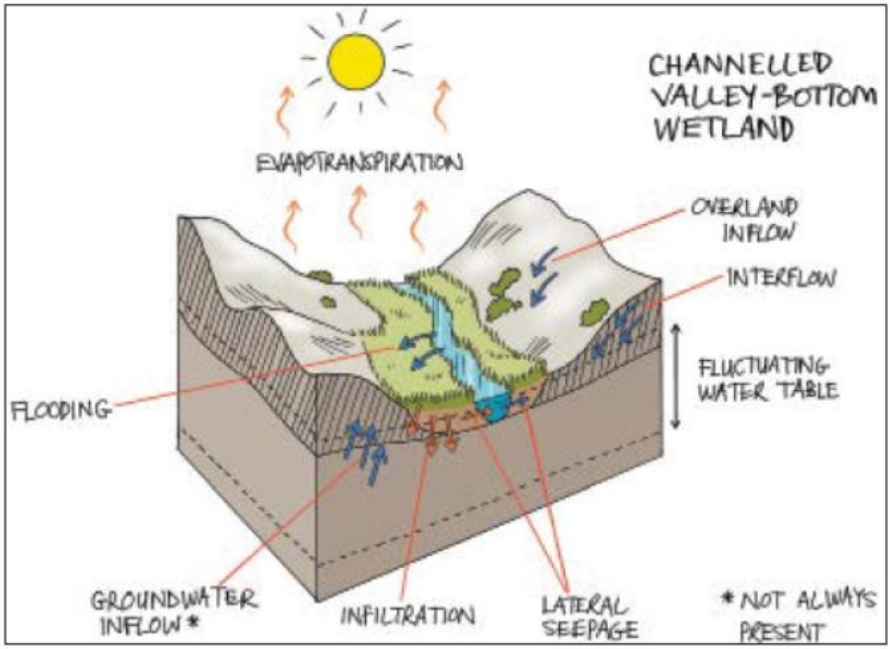
Water retention & distribution: ALL

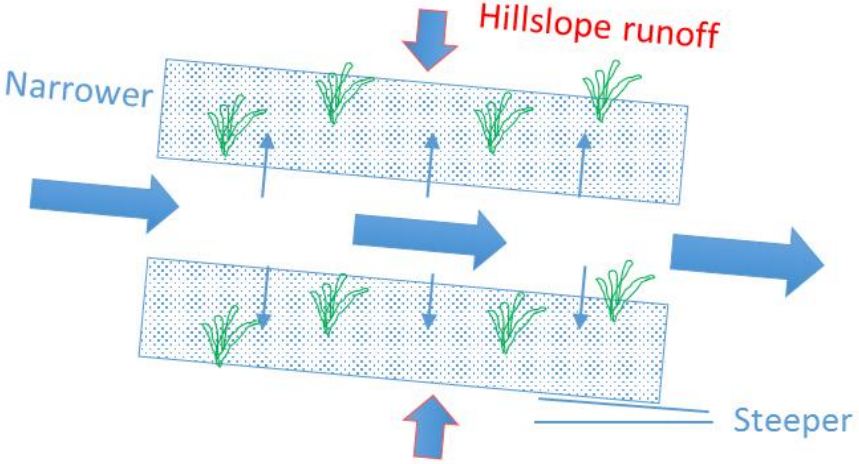
Quantity: Flow/Water retention & distribution

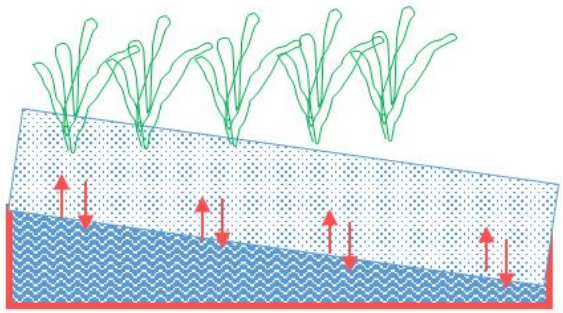


DWAF, 2009

Channelled valley bottom: water retention





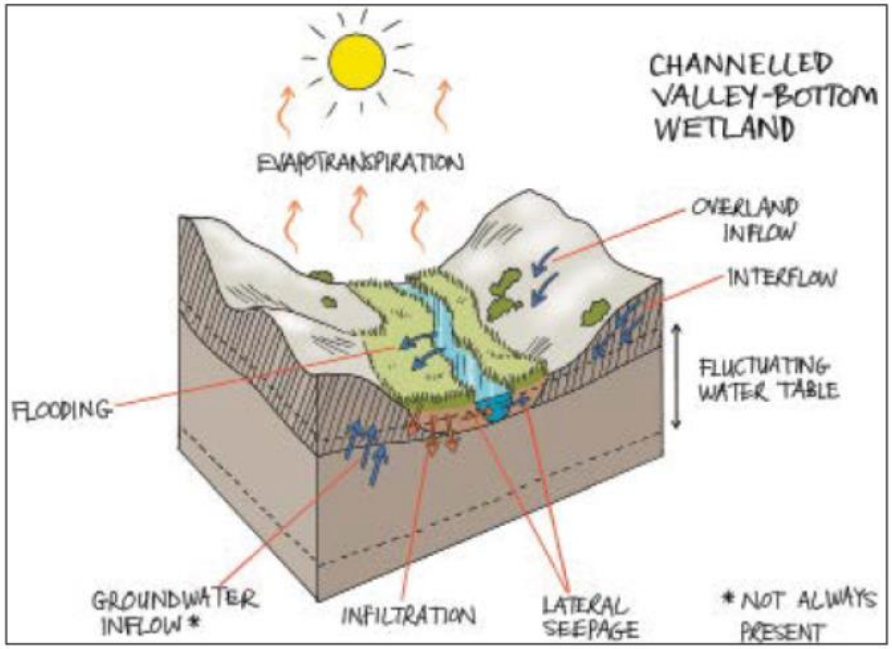


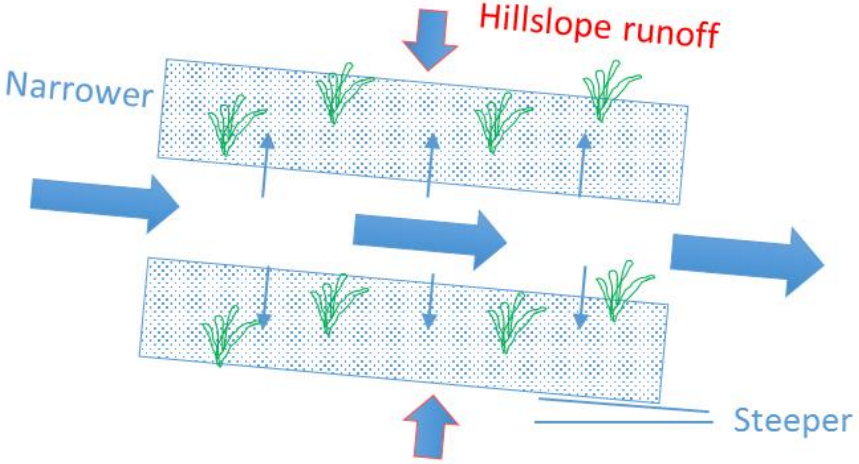
Greater infiltration/groundwater inflow (baseflow)

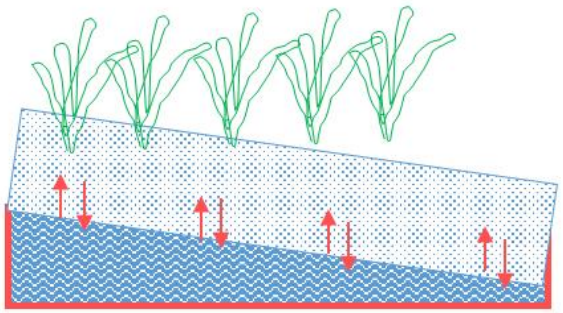
Less active deposition than floodplains and tend to be narrower with steeper gradients. Groundwater input to the main stem channel is also generally greater.

THREATS: Consumptive usage impacts related to changes to baseflow which will reduce saturation of vegetation. Channel straightening and infilling are the greatest impacts. Changes in runoff characteristics and erosion/depositional features also important

Unchannelled valley bottom: water retention







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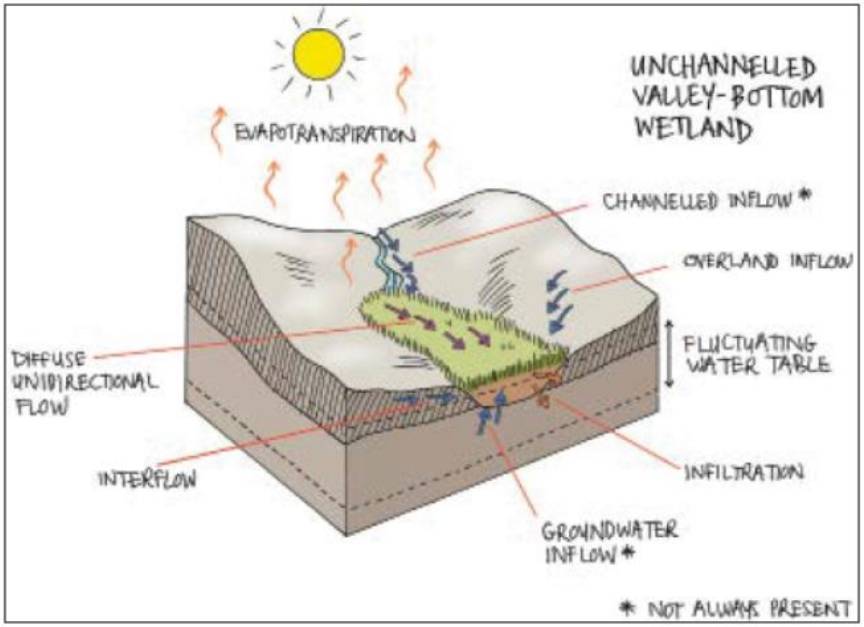
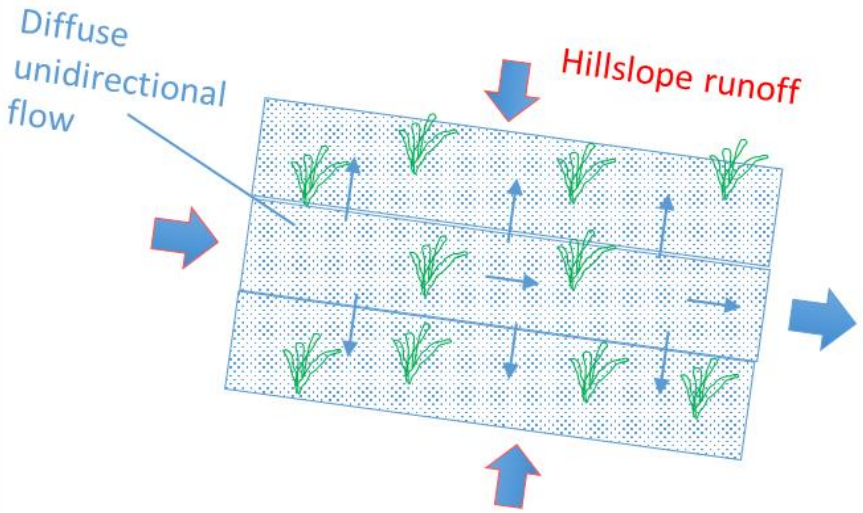
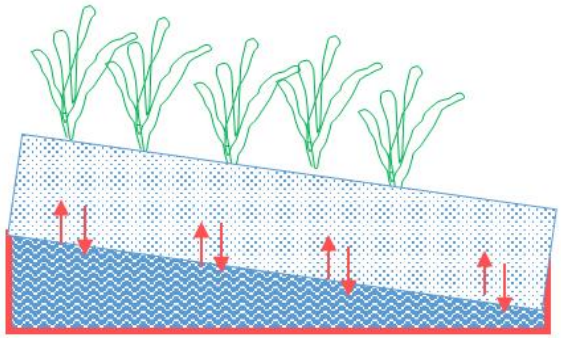






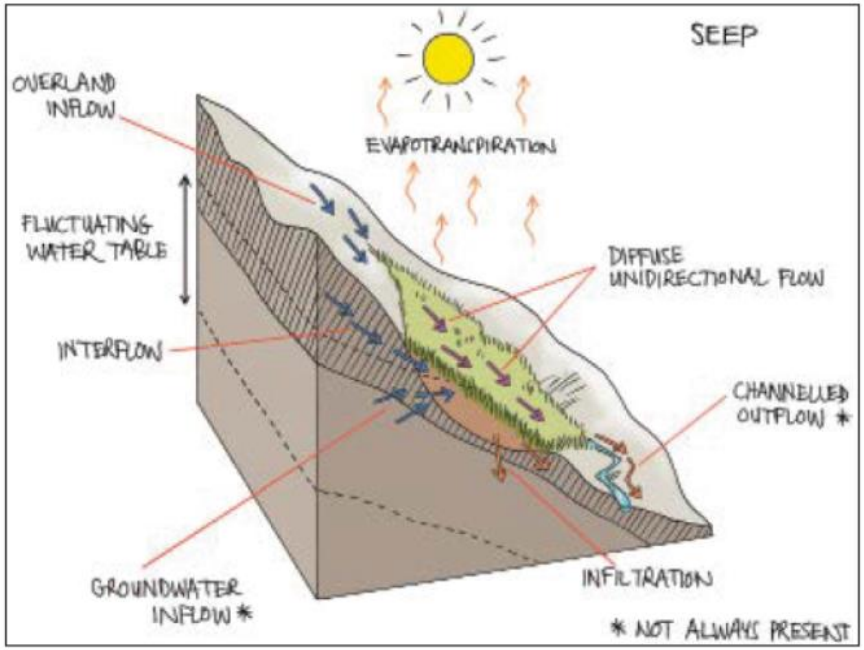
Greater infiltration/groundwater inflow (baseflow)

Stream channel inputs are spread diffusely across the wetland even at low flows, resulting in high levels of soil organic matter.

PRIORITY: This aids nitrate and toxicant removal, particularly if there is groundwater contribution.

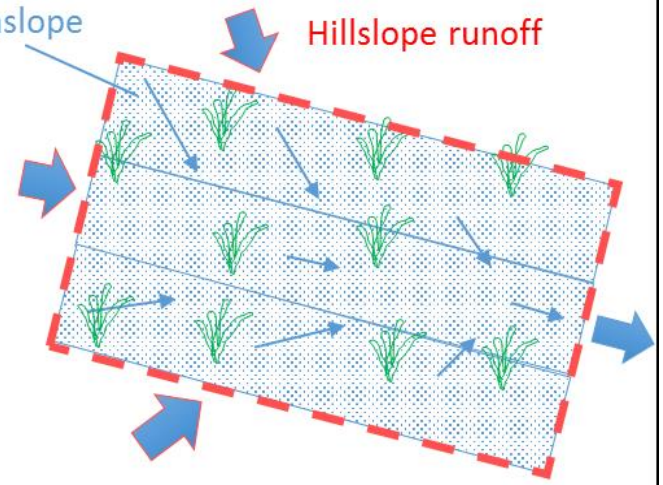
THREATS: Consumptive usage impacts related to changes to baseflow which will reduce saturation of vegetation. Changes in runoff characteristics (increased stormwater inputs) and erosion/depositional features are threats.

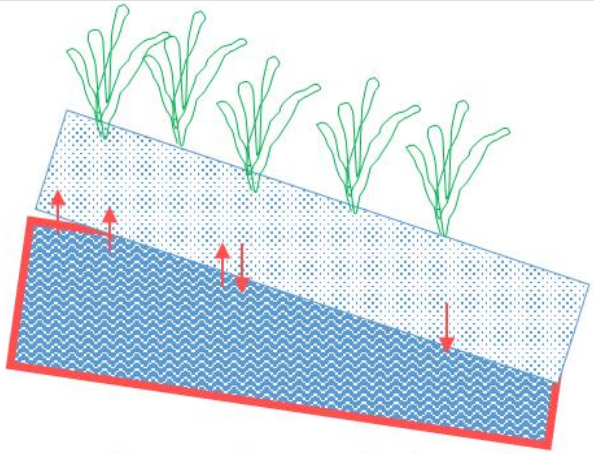
Seep: water retention



Diffuse unidirectional flow downslope

Hillslope runoff





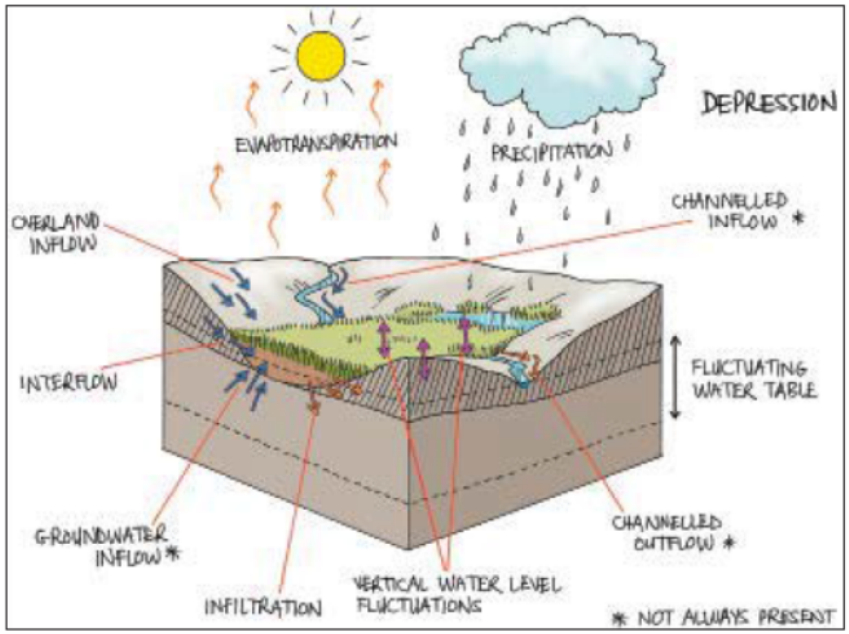
Mainly groundwater discharge (baseflow)

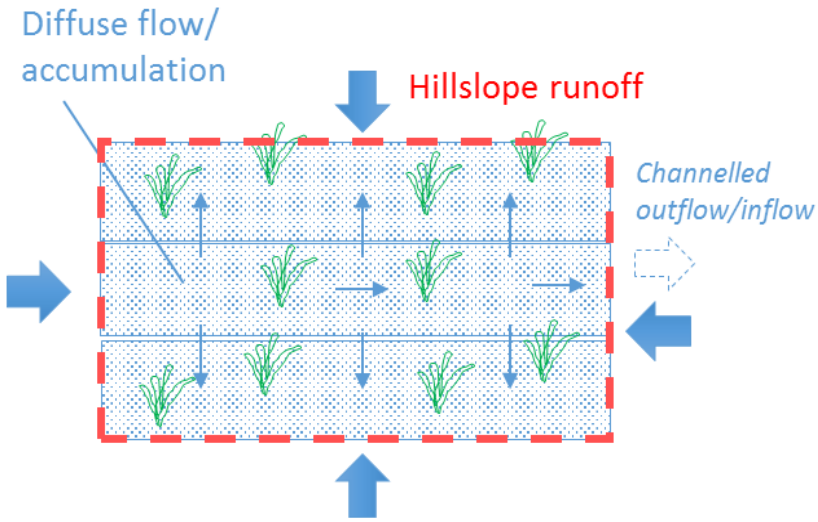
Normally associated with groundwater discharge, although there are additional contributions from surrounding runoff.

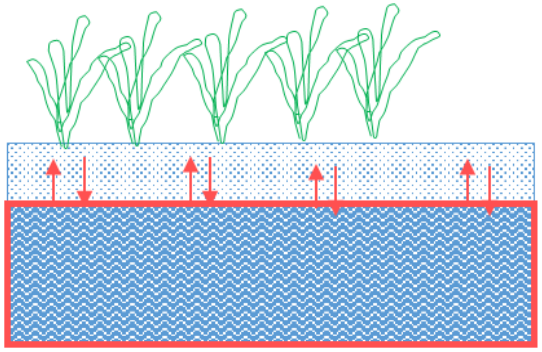
PRIORITY: Contribute streamflow regulation early in the season, until soils are saturated. Good provision of nitrate removal, but poor at erosion control owing to location on steep slopes.

THREATS: The location on slopes means that hillslope seeps are sensitive to erosion. Habitat transformation through agricultural use is also likely.

Depression: water retention





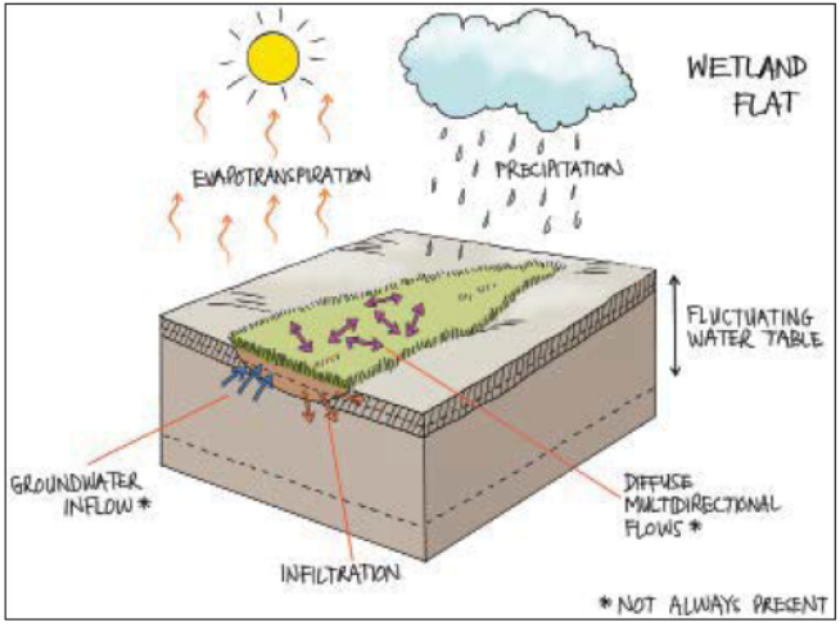


Infiltration/groundwater inflow (baseflow)

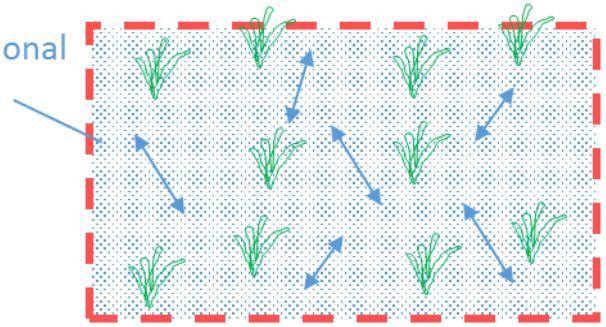
Can receive both surface and groundwater flows, which accumulate in the depression.

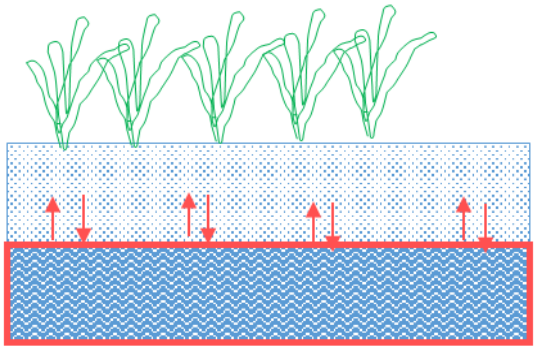
THREATS: Depression wetlands are sensitive to increased stormwater inputs as this impacts the seasonality of the wetlands. Habitat transformation is also likely.

Flat: water retention



Diffuse, multidirectional flow



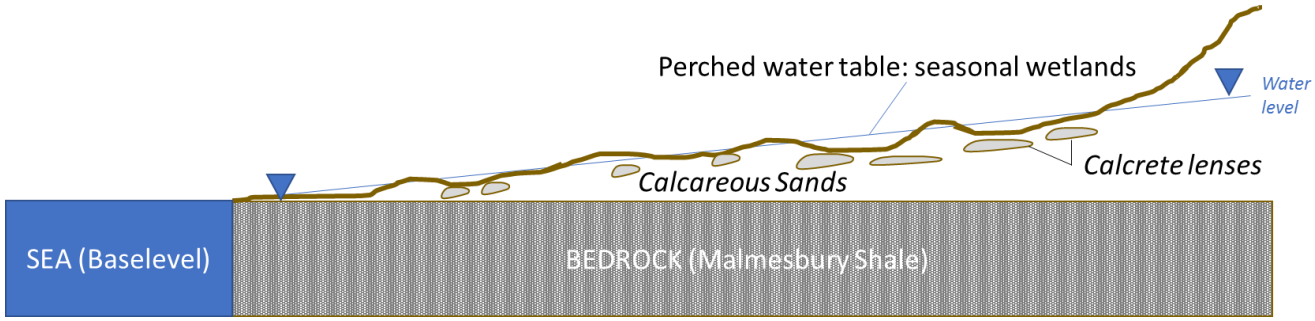


Infiltration/groundwater inflow on coastal plains (baseflow)

Not fed by water from a river channel, and is typically situated on flat land (often on a coastal plain). The primary source of water is precipitation, although on coastal plains groundwater may rise to or near the ground surface. Water typically exits via evapotranspiration and infiltration.

THREATS: Flats are sensitive to increased stormwater inputs as this impacts the seasonality of the wetlands. Habitat transformation is also likely.

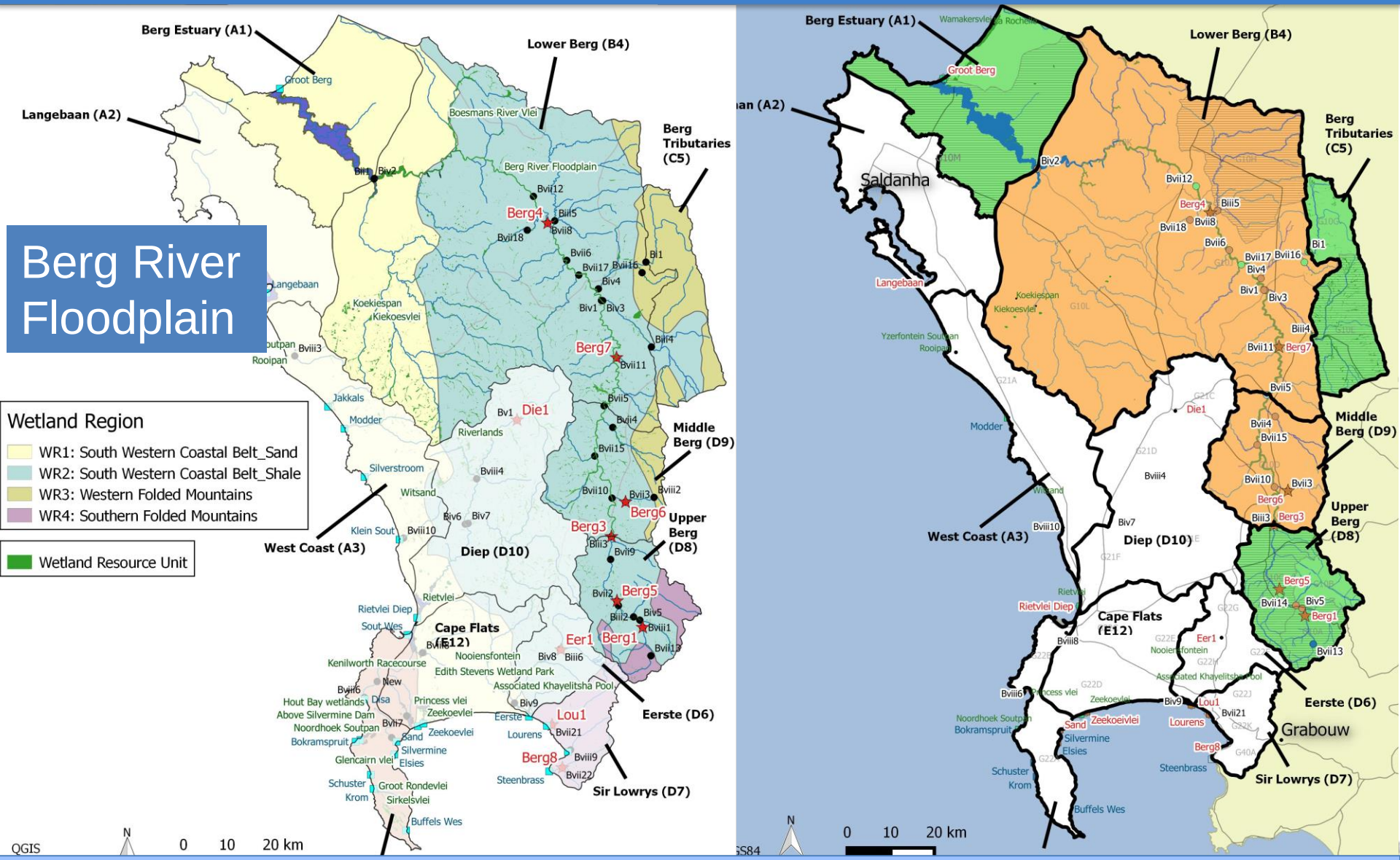
- The Cape Flats is characterised by an expansive low-lying plain of tertiary to recent deposits comprising calcareous sands of the Sandveld Group overlying basement rocks of the Malmesbury Group.
- The transition between sands and the Malmesbury rocks is characterised by a clay layer, a product of weathering of the shale.
- The Sandveld Group deposits constitute the Cape Flats Aquifer which is regionally unconfined and is essentially free of geological boundaries which may influence regional behaviour.
- This influences the occurrence and seasonality of wetlands in this Wetland Region as it allows for perched water tables and temporary flooding during the winter months.



Component	Sub-comp	Reason for selection	Example of indicator
QUANTITY	High flows	Floodplain wetlands require high flow events in order to overtop banks.	River flow RQOs are given as monthly average volumes (MCM) that include maintenance low and high flows combined.
	Water retention and distribution patterns	In certain wetlands channelized flow is not as important as the retention of water. In order to maintain wetland functioning water needs to be retained and distributed, often with seasonal fluctuations.	Wetlands have a dynamic hydrology varying daily, seasonally and annually. Due to this dynamic nature it is difficult to define the frequency and duration of water retention and distribution. An approach to define prolonged saturation up to the temporary zone relies on defining the wetland plants and wetland soils. This is defined through the WET-Health module.
WATER QUALITY	Nutrients	Nutrients affects primary productivity and the growth of free-floating algae (phytoplankton). Algae is a food source for biota, both aquatic invertebrates and vertebrates such as fish. High nutrient concentrations promote excessive algal growth which causes taste and odour problems in drinking water, and cause obstructions in irrigation equipment.	Phosphate (PO_4-P), Total Inorganic Nitrogen (TIN-N), Phytoplankton (Chl-a)
	Pathogens	Pathogens cause waterborne diseases in humans such as diarrhoea, cholera, dysentery, etc. Although human pathogens in general don't affect aquatic biota they are often associated with high organic loads (untreated or partially treated sewage) which affects the dissolved oxygen concentration of the water.	E coli
	Salts	Salts affects the osmoregulation of aquatic organisms. Seasonal fluctuations of water level and lack of outward drainage patterns may concentrate salts in certain wetlands.	Electrical conductivity, measured during dry season
	System variables	pH, temperature, and dissolved oxygen are important for the maintenance of ecosystem health.	pH, measured during dry season
HABITAT	Geomorphology	The relationship of water and sediment creates a stable equilibrium for a wetland. Any change to this equilibrium will push a wetland into a vulnerable state of either aggradation (sediment deposition) or degradation (sediment removal).	Sediment accumulation. This is defined through the WET-Geomorphology module.
	Vegetation	Wetland vegetation is an important indicator of a wetland boundary. Alien invasive vegetation encroachment into a wetland may result in reduction of water distribution and push the wetland into a vulnerable state geomorphically.	Extent of natural vegetation versus alien invasive vegetation. This is defined through the WET-Vegetation module.

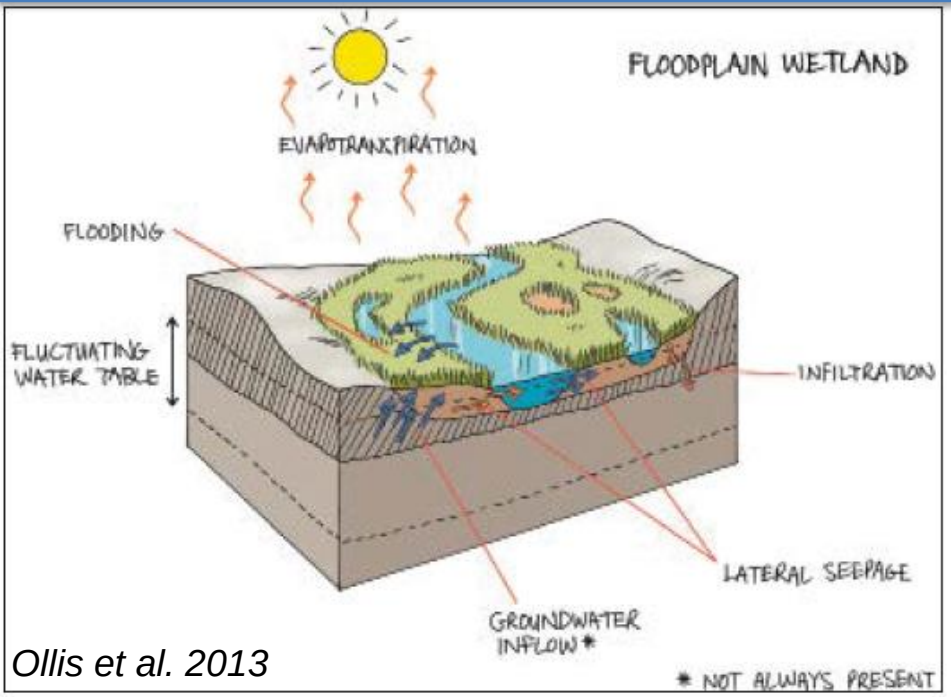
Component	Sub-comp	Reason for selection	Example of indicator
BIOTA	Frogs	NFEPA frogs are of conservation importance.	Frog sample.
	Fish	Indigenous fish are of conservation importance.	Catch per Unit Effort (CPUE) of fish species present. Frequency of occurrence (FROC) of key fish species.
	Birds	Ramsar sites in particular relate to relationship of important bird species with wetland habitats.	Bird count.

South Western Coastal Belt_Sand Wetland Region stretches along the coast and is associated with Aeolian sedimentary deposits of the Kalahari Group. The Berg Estuary occurs here, with associated wetlands occurring along the Berg River. There are also priority NFEPA wetland clusters in the riparian area of the Berg River Estuary. Alluvial floodplains are highly threatened by water abstraction, which is threatening the seasonal inundation of the floodplain, and the persistence of floodplain vegetation.



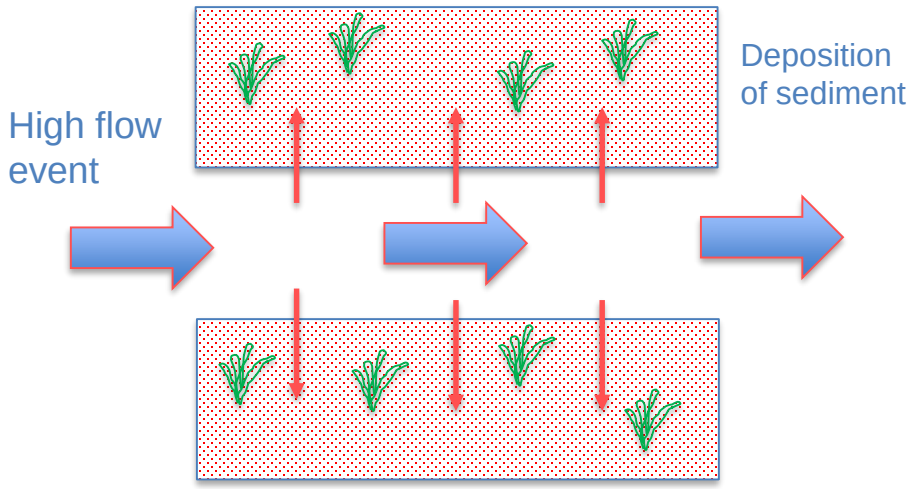
South Western Coastal Belt_Shale Wetland Region

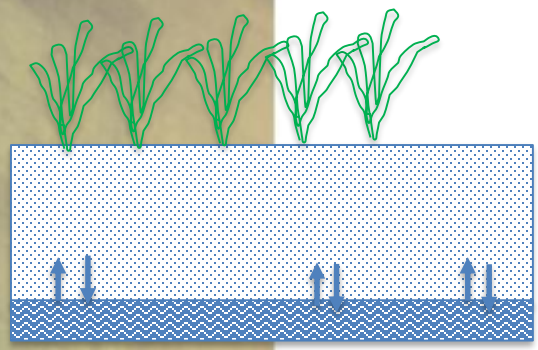
High flow events: FLOODPLAINS



Ollis et al. 2013

Movement of flood longitudinally





Limited infiltration/groundwater inflow (Baseflow)

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- NB flood attenuation because of the nature of vegetation and topographic setting. Flood attenuation is likely to be high early in the season until the floodplain soils are saturated, whilst in the late season flood attenuation is reduced.
- As flood waters overtop streambanks the waters drop sediments, and nutrient bound sediments, which are left behind to accumulate.
- The nature of clayey soils in floodplains means that soils retain water, thus limiting contribution to streamflow and groundwater recharge.

Conceptual understanding: Berg floodplain

IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual functioning		Prioritisation	Baseline monitoring
						Literature review			
						HGM	Vegetation		
A1, B4, and D9	South Western Coastal Belt_Sand (WR1) and South Western Coastal Belt_Shale (WR2)	Berg Western Strandveld seep; Southwest Sand Fynbos Floodplain; West Coast Shale Renosterveld Floodplain	QUANTITY	Flow	High flow; alien invasive and wetland vegetation	Floodplain: requires overbank flooding in order to inundate floodplain vegetation. Quat: River: Berg River associated with		x	Berg River Improvement project relates to the water quality management of the river. This includes riparian zone rehabilitation and management by 2042, lead department: DEA&DP.
				Water distribution and retention patterns				x	
			HABITAT	Geomorphology		Alien invasive vegetation causes erosion of river banks.	Critically endangered Swartland Shale Renosterveld	x	
				Vegetation				x	
			QUALITY	Water quality amelioration					
			BIOTA	Fish					
				Frogs				x	
				Birds					

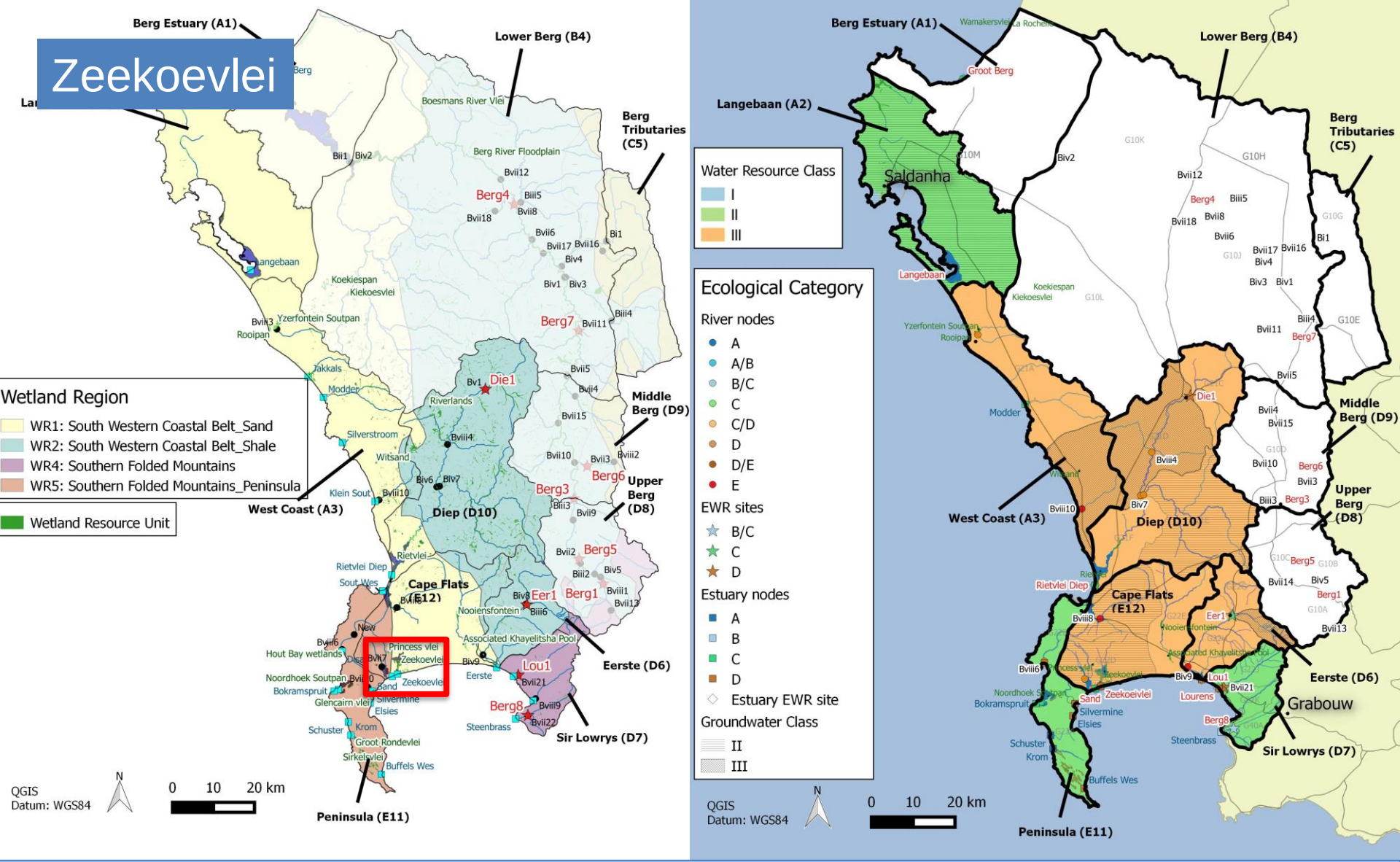
Sub-component and indicator selection: Berg floodplain

IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual functioning		Prioritisation	Baseline monitoring
						Literature review			
						HGM	Vegetation		
A1, B4, and D9	South Western Coastal Belt_Sand (WR1) and South Western Coastal Belt_Shale (WR2)	Berg Western Strandveld seep; Southwest Sand Fynbos Floodplain; West Coast Shale Renosterveld Floodplain	QUANTITY	Flow	High flow; alien invasive and wetland vegetation	Floodplain: requires overbank flooding in order to inundate floodplain vegetation. Quat: River: Berg River associated with		x	Berg River Improvement project relates to the water quality management of the river. This includes riparian zone rehabilitation and management by 2042, lead department: DEA&DP.
				Water distribution and retention patterns				x	
			HABITAT	Geomorphology		Alien invasive vegetation causes erosion of river banks.	Critically endangered Swartland Shale Renosterveld	x	
				Vegetation				x	
			QUALITY	Water quality amelioration					
			BIOTA	Fish					
				Frogs				x	
				Birds					

Berg floodplain RQO

IUA	Wetland Region	RU	Wetland Name	Component	Sub-component	Indicator/ measure	RQO	Numerical limits
A1, B4, and D9	South Western Coastal Belt_Sand (WR1) and South Western Coastal Belt_Shale (WR2)	A1-W1; B4-W1; D9 - W1	Berg Floodplain and riparian wetlands (Western Strandveld seep; Southwest Sand Fynbos Floodplain; West Coast Shale Renosterveld)	QUANTITY	Flow	High flow	High flows need to be maintained in order to overtop banks and inundate the current extent of floodplain vegetation.	Conduct the WET-Hydrology module to determine baseline. The frequency and size of floods to achieve bank overtopping and vegetation inundation needs to be defined.
				HABITAT	Geomorphology	Alien invasive plants on floodplain banks	Alien invasive vegetation on floodbanks need to be maintained in order to limit erosion features.	Conduct the WET-Geomorphology module to determine baseline. The impact of alien invasive vegetation needs to be defined.
				HABITAT	Vegetation	Wetland vegetation versus alien invasive plants	Critically endangered vegetation to be maintained and alien invasive plants managed.	Conduct the WET-Vegetation module to determine baseline. The extent of alien invasive vegetation versus natural vegetation needs to be defined.

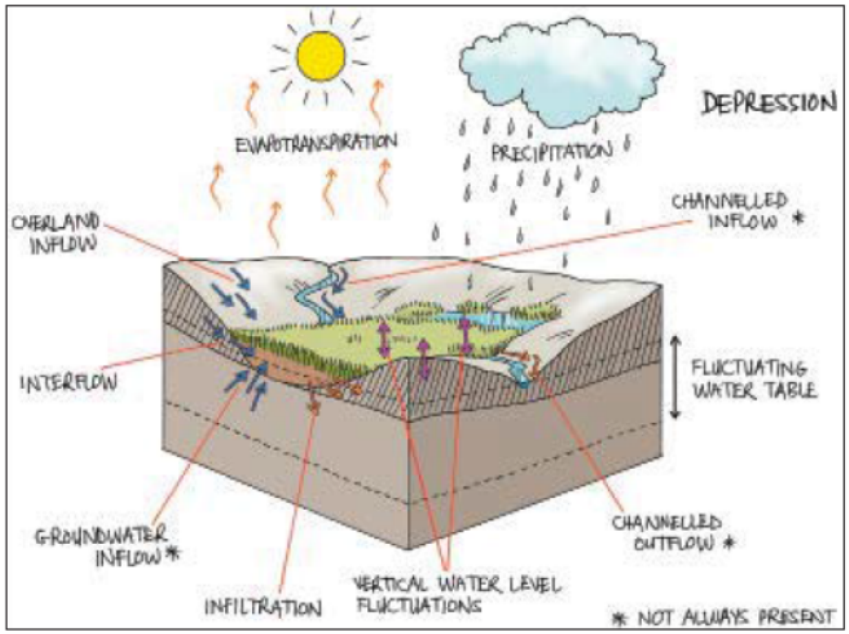
Zeekoevlei

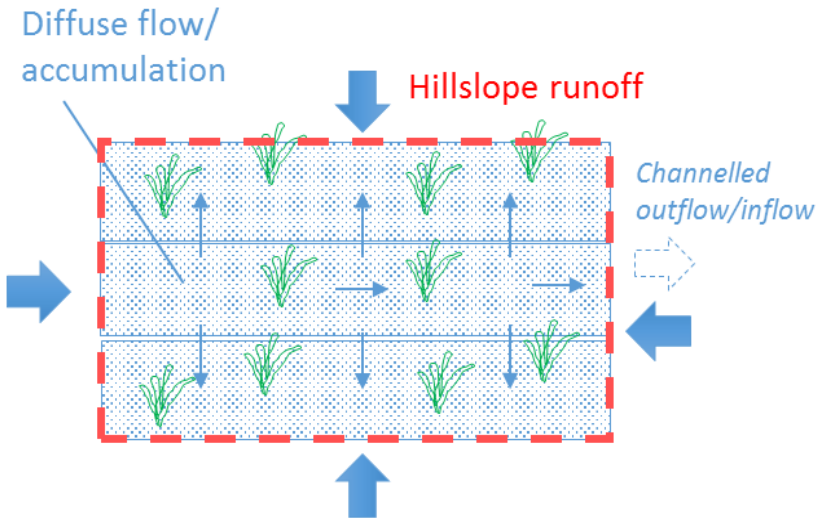


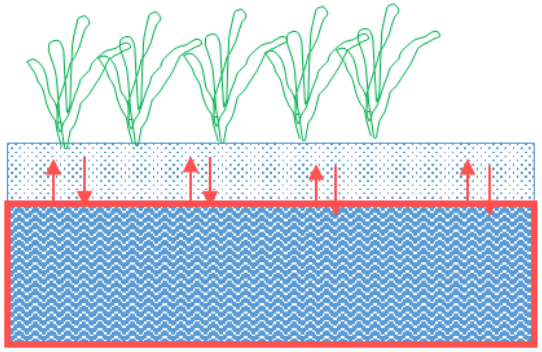
South Western Coastal Belt_Sand Wetland Region stretches along the coast and is associated with Aeolian sedimentary deposits of the Kalahari Group. A number of regulated, shallow freshwater wetland systems (termed vleis) are located on the Cape Flats coastal plain near Cape Town. These vleis have undergone significant change from reference condition owing to the increased urbanisation and water level regulation. Zeekoeivlei is the largest of the Cape Flats wetlands.

These wetlands form part of the False Bay Nature Reserve (Ramsar site). The importance stems from endemic vegetation type and important bird species. Water hyacinth has also invaded some of the settling ponds at the WWTW, impacting the biodiversity. Zeekoevlei is a Depression

Depression: water retention







Infiltration/groundwater inflow (baseflow)

Can receive both surface and groundwater flows, which accumulate in the depression.

THREATS: Depression wetlands are sensitive to increased stormwater inputs as this impacts the seasonality of the wetlands. Habitat transformation is also likely.

Conceptual understanding: Zeekoeivlei

IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual understanding: Literature review: HGM	Conceptual understanding: Literature review: Vegetation	Prioritisation	Baseline monitoring
E12	South Western Coastal Belt_Sand (WR1)	Zeekoeivlei Depression wetland	QUANTITY	Flow	Wetted perimeter; and water quality.	Inputs to the wetland is from surrounding stormwater and Big and Little Lotus Rivers.			City of Cape Town manages the wetland through the False Bay Ecology Park. Zeekoeivlei is surrounded by private homeowners and is used for recreation.
				Water distribution and retention patterns				X	
			HABITAT	Geomorphology		Accumulated sediment changes the geomorphology. Zeekoevlei has had significant changes in terms of sediment inputs and outputs, which has impacted erosion and deposition features in the wetlands	Sand Fynbos with Typha capensis and Schoenoplectus sp.		
				Vegetation					
			QUALITY	Water quality amelioration		Zeekoevlei is managed with water quality in mind, not seasonality of water flows. Subsurface discharge from WWTW into wetland.		X	
			BIOTA	Fish					
				Frogs					
				Birds				X	

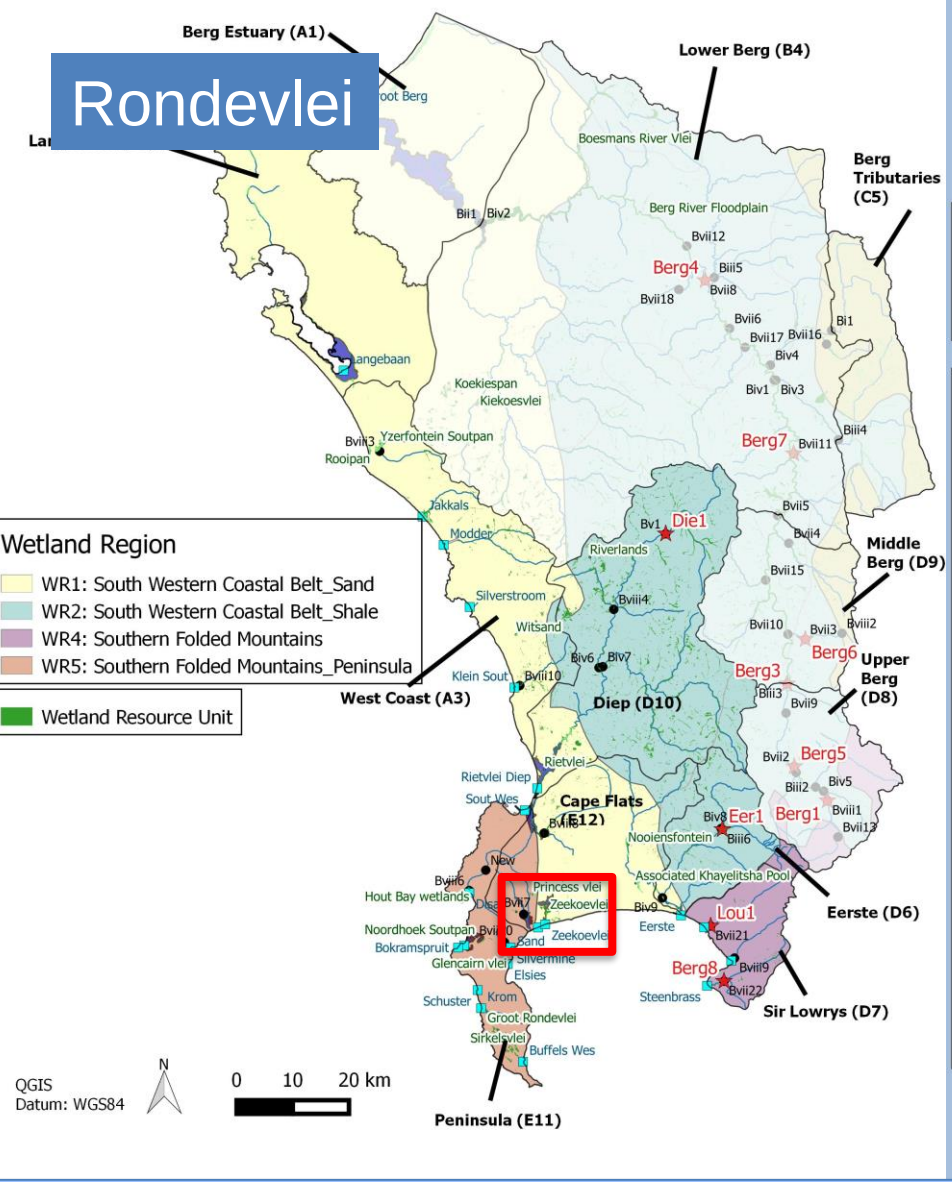
Sub-component and Indicator selection: Zeekoeivlei

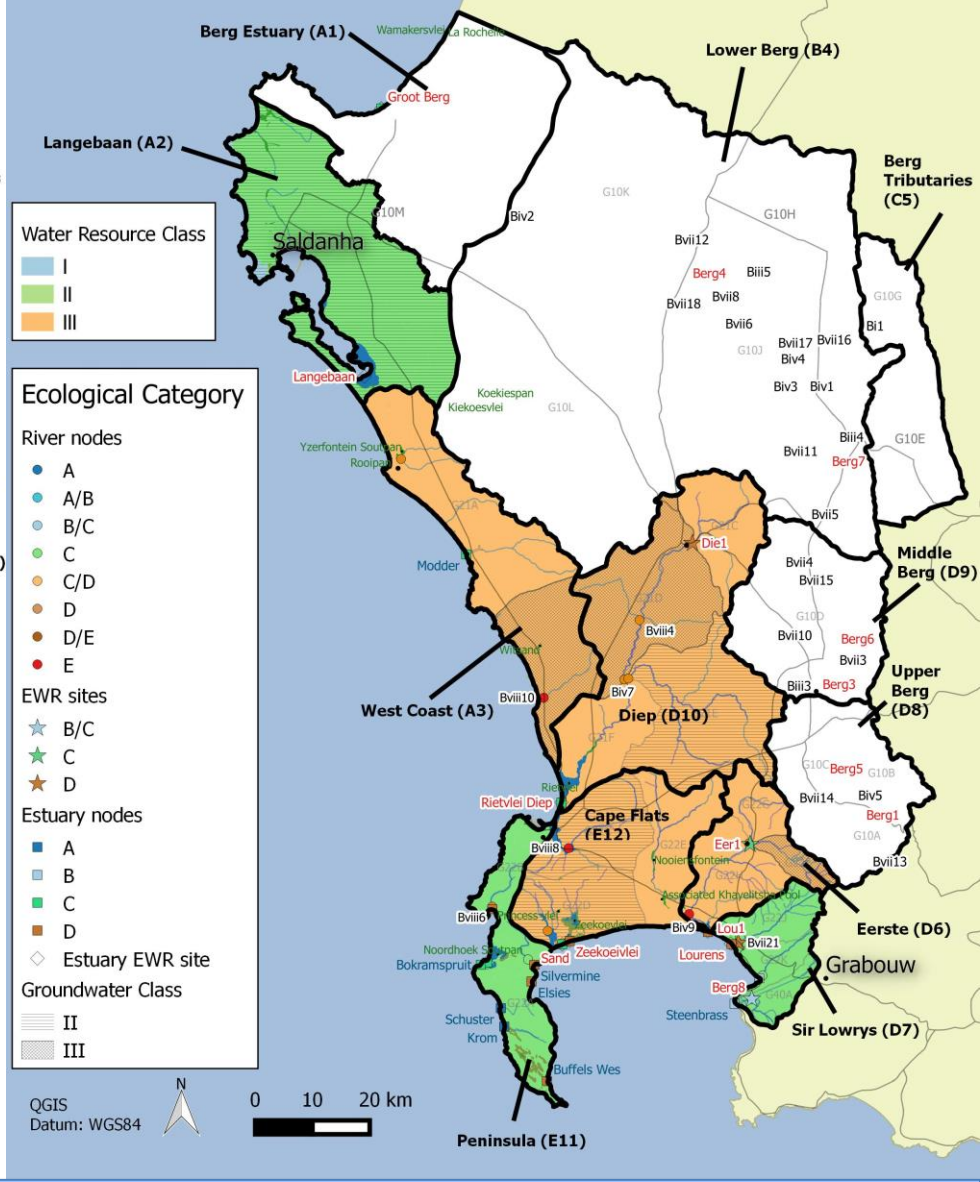
IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual understanding		Prioritisation	Baseline monitoring
						Literature review			
						HGM	Vegetation		
E12	South Western Coastal Belt_Sand (WR1)	Zeekoeivlei Depression wetland	QUANTITY	Flow	Wetted perimeter; and water quality.	Inputs to the wetland is from surrounding stormwater and Big and Little Lotus Rivers.		X	City of Cape Town manages the wetland through the False Bay Ecology Park. Zeekoeivlei is surrounded by private homeowners and is used for recreation.
				Water distribution and retention patterns					
			HABITAT			Accumulated sediment changes the geomorphology. Zeekoevlei has had significant changes in terms of sediment inputs and outputs, which has impacted erosion and deposition features in the wetlands	Sand Fynbos with Typha capensis and Schoenoplectus sp.		
				Geomorphology					
				Vegetation					
			QUALITY	Water quality amelioration		Zeekoevlei is managed with water quality in mind, not seasonality of water flows. Subsurface discharge from WWTW into wetland.		X	
			BIOTA	Fish					
				Frogs					
				Birds				X	

Zeekoivlei RQOs

IUA	Wetland Region	RU	Wetland Name	Component	Sub-component	Indicator/ measure	RQO	Numerical limits
E12	South Western Coastal Belt_Sand (WR1)	E12-W2	Zeekoeivlei Depression	Quantity	Water distribution and retention patterns	Wetted perimeter	Water levels and water retention to be maintained.	WET-Hydrology to develop baseline. Maintain water levels for vegetation and recreation.
				Quality	Water quality	Nutrients	PO4-P (mg/L)	Acceptable: 0.015-0.025, not above 0.125
							TIN-N (mg/L)	Acceptable: 0.70-1.0, not above 4.0
							Phytoplankton Chl-a (µg/L)	Acceptable: 15-20, not above 30
						Pathogens	E. coli	Acceptable: 600, not above 2000
				Habitat	Vegetation	Wetland vegetation versus alien invasive plants	Critically endangered vegetation to be maintained and alien invasive plants managed. Water weed to be managed.	WET-Vegetation to develop baseline. The extent of alien invasive vegetation versus natural vegetation needs to be defined.

Rondevlei





South Western Coastal Belt_Sand Wetland Region stretches along the coast and is associated with Aeolian sedimentary deposits of the Kalahari Group. Rondevlei is a Depression wetland within the False Bay RAMSAR delineation. It is therefore important ecologically, as well as in terms of ecosystem services as it provides important flood amelioration, groundwater recharge, water quality amelioration and educational benefits. Rondevlei has been managed to maintain a level of seasonality, which allows for the removal of sediments and water.

Conceptual understanding: Rondevlei

IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual understanding		Prioritisation	Baseline monitoring
						Literature review			
						HGM	Vegetation		
E12	South Western Coastal Belt_Sand (WR1)	Zeekoeivlei Depression wetland	QUANTITY	Flow	Wetted perimeter; and water quality.	Inputs to the wetlands are from surrounding stormwater and Big and Little Lotus Rivers, with Rondevlei also receiving input from Princessvlei.		X	City of Cape Town manages the wetland through the False Bay Ecology Park. Rondevlei is protected.
				Water distribution and retention patterns					
			HABITAT	Geomorphology		Accumulated sediment changes the geomorphology. Rondevlei has had significant changes in terms of sediment inputs and outputs, which has impacted erosion and deposition features in the wetlands.	Sand Fynbos.		
				Vegetation					
			QUALITY	Water quality amelioration		Zeekoevlei is managed with water quality in mind, not seasonality of water flows. Subsurface discharge from WWTW into wetland.		X	
			BIOTA	Fish					
				Frogs					
				Birds				X	

Sub-component and Indicator selection: Rondevlei

IUA	Wetland Region	Wetland Resource Unit	Component	Sub-component	Indicator	Conceptual understanding		Prioritisation	Baseline monitoring
						Literature review			
						HGM	Vegetation		
E12	South Western Coastal Belt_Sand (WR1)	Zeekoeivlei Depression wetland		Flow	Wetted perimeter; and water quality.				City of Cape Town manages the wetland through the False Bay Ecology Park. Rondevlei is protected.
			QUANTITY	Water distribution and retention patterns		Inputs to the wetlands are from surrounding stormwater and Big and Little Lotus Rivers, with Rondevlei also receiving input from Princessvlei.		X	
			HABITAT	Geomorphology		Accumulated sediment changes the geomorphology. Rondevlei has had significant changes in terms of sediment inputs and outputs, which has impacted erosion and deposition features in the wetlands.	Sand Fynbos.		
				Vegetation					
			QUALITY	Water quality amelioration		Zeekoevlei is managed with water quality in mind, not seasonality of water flows. Subsurface discharge from WWTW into wetland.		X	
			BIOTA	Fish					
				Frogs					
				Birds				X	

Rondevlei RQOs

IUA	Wetland Region	RU	Wetland Name	Component	Sub-component	Indicator/ measure	RQO	Numerical limits
E12	South Western Coastal Belt_Sand (WR1)	E12-W3	Rondevlei Depression	Quantity	Water distribution and retention patterns	Wetted perimeter	Water levels and water retention to be maintained.	WET-Hydrology to develop baseline. Maintain water levels for vegetation and biota.
				Quality	Water quality	Nutrients	PO4-P (mg/L)	Acceptable: 0.015-0.025, not above 0.125
							TIN-N (mg/L)	Acceptable: 0.70-1.0, not above 4.0
							Phytoplankton Chl-a (µg/L)	Acceptable: 15-20, not above 30
						Pathogens	E. coli	Acceptable: 600, not above 2000
				Habitat	Vegetation	Wetland vegetation versus alien invasive plants	Critically endangered vegetation to be maintained and alien invasive plants managed. Water weed to be managed.	WET-Vegetation to develop baseline. The extent of alien invasive vegetation versus natural vegetation needs to be defined.

Thank you, Any discussion?