DETERMINATION OF WATER RESOURCE CLASSES, RESERVE AND RQOS IN THE LIMPOPO (A5-A9) CATCHMENTS & OLIFANTS (B9) CATCHMENT PRESENTATION TITLE

Public meeting – Polokwane

Results for the Ecological Reserve, Water Resource Classes and the Resource Quality Objectives

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Date: 6th August 2025

WATER IS LIFE - SANITATION IS DIGNITY

water & sanitation

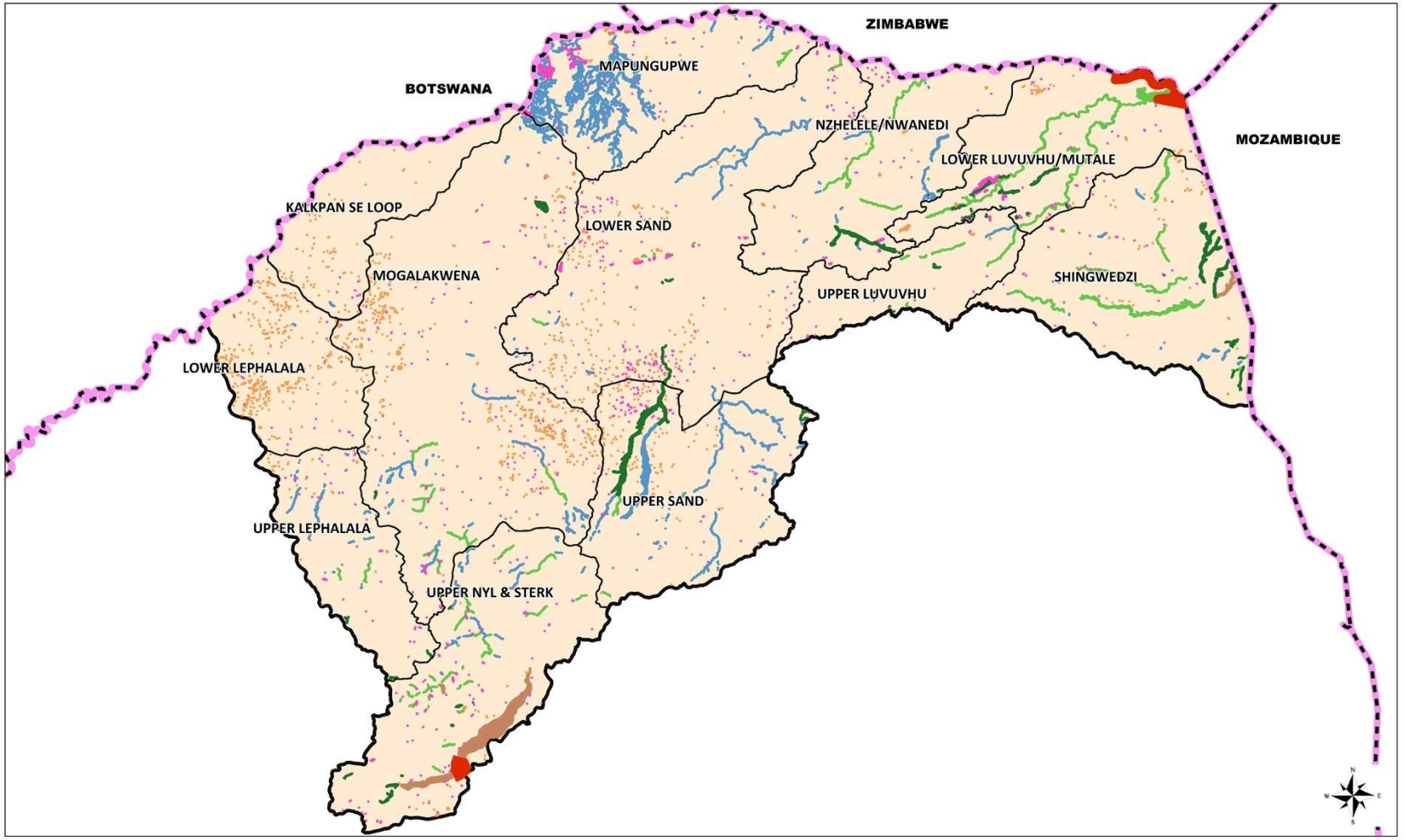
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

30 YEARS OF FREEDOM
South Africa 1994 - 2024

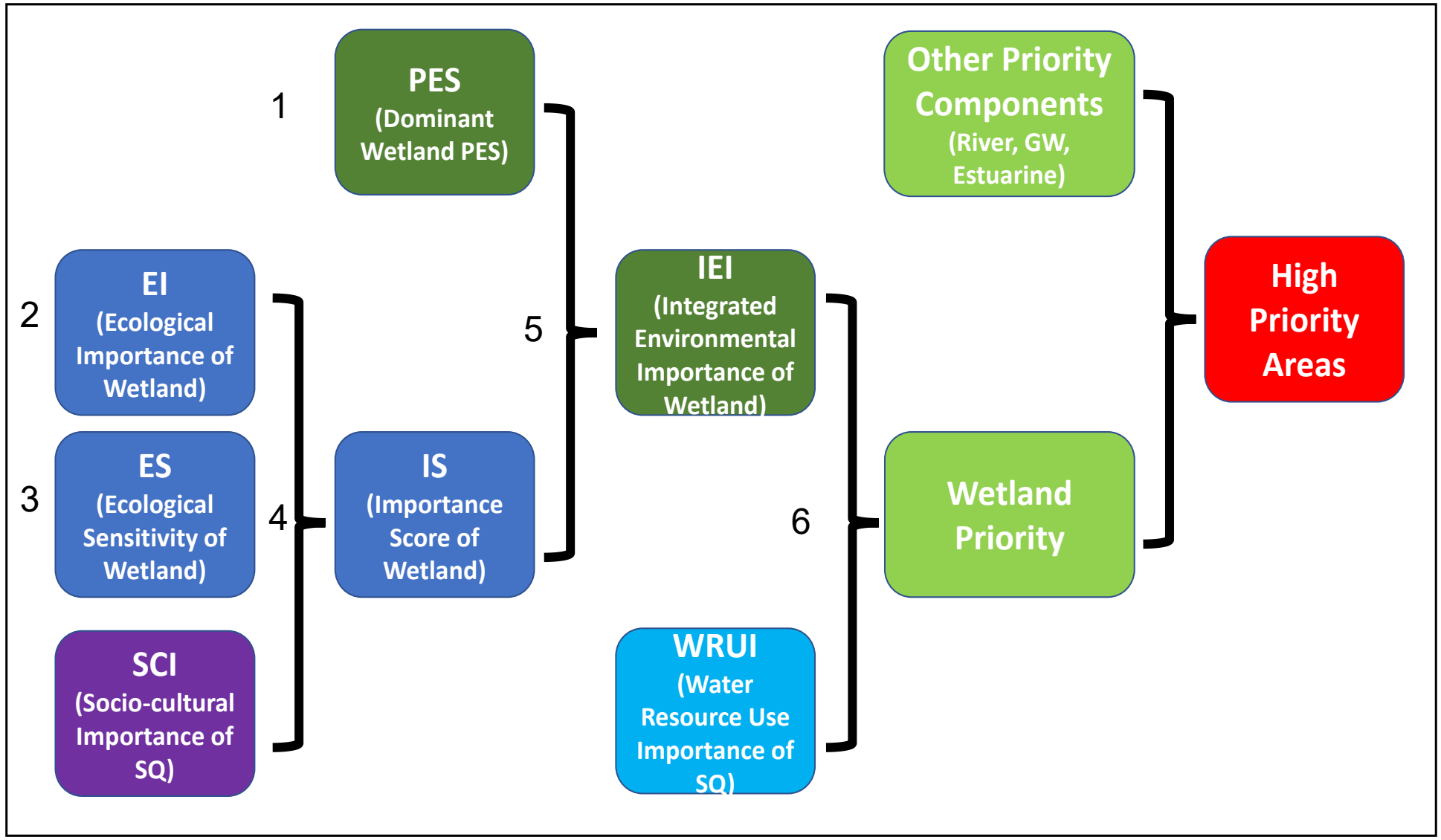
Wetlands in the Study Area

DWS definition: a wetland is defined as land that transitions 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. In normal circumstances, this land supports or would support vegetation adapted to life in saturated soil.



- Over 84 000 Ha
- Different HGMs

WETLAND APPROACH: 6-STEP PRIORITISATION



Ecological Importance

The determination of EI considered the following criteria from the following data sources:

- **National Biodiversity Assessment** (new wetland map, 2018)
  - Diversity of wetlands.
  - Overall extent of wetlands.
- **NFEPA** (2011)
  - RAMSAR
  - Wetland FEPA status
  - Wetland Clusters (proximity to other wetlands)
  - Habitats for rare and endangered species including:
    - Cranes
    - Amphibians
    - Water Birds

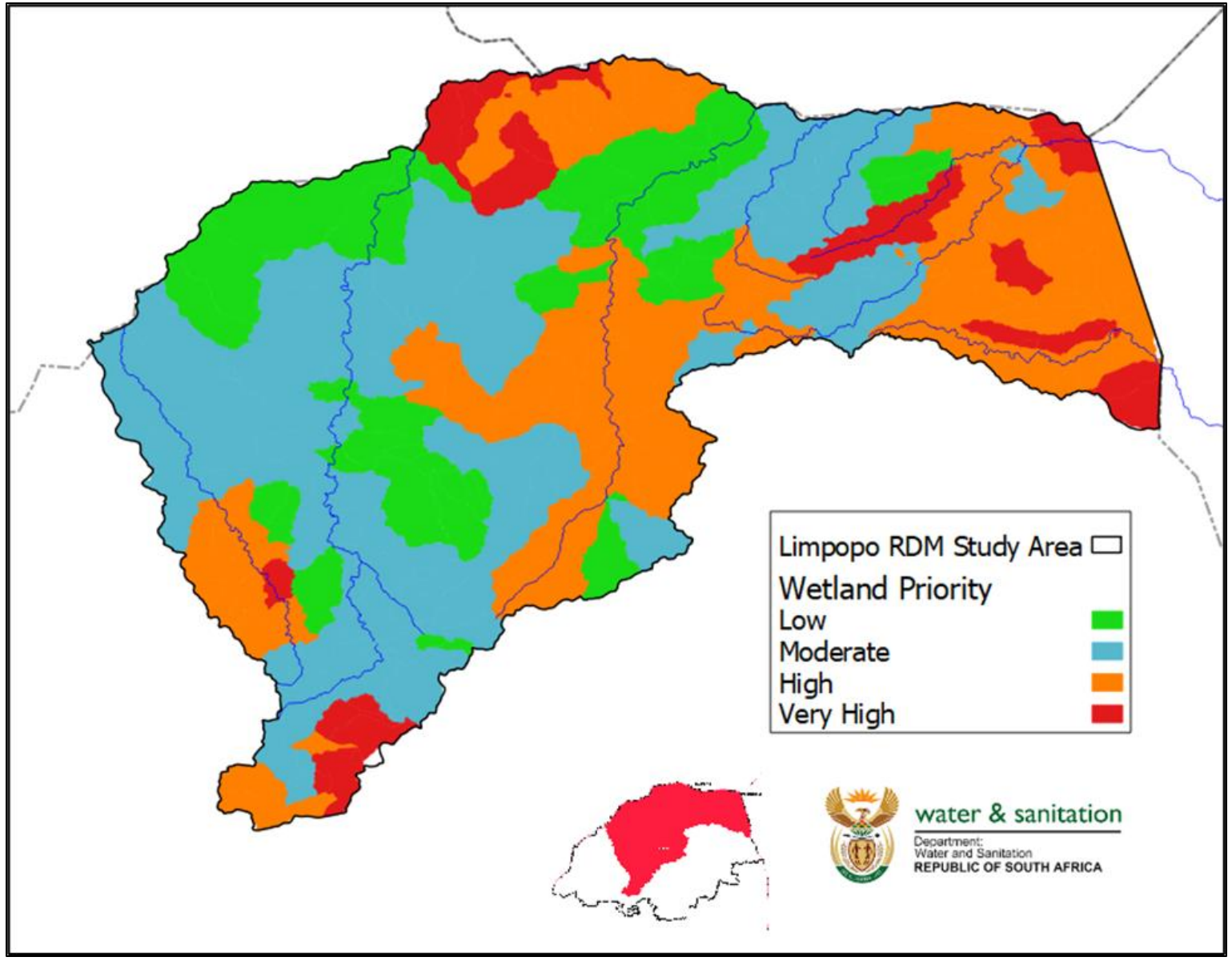
- Known important peatland sites.
- Important Birding Areas (2015) - BirdLife International Programme
- Regions / Centres of Plant Endemism (Van Wyk & Smith, 2001)
- Regional Conservation Plans including (eg):
  - Limpopo Conservation Plan, version 2 (2013)
  - KwaZulu Natal - Terrestrial Critical Biodiversity Areas (CBAs) in KZN developed 2010. This is an update to the 2007 terrestrial C-Plan (EKZNW, 2010)
  - Mpumalanga - Mpumalanga Biodiversity Conservation Plan (2006, 2014) comprising the Terrestrial Biodiversity and Freshwater Assessment (Lötter & Ferrar, 2006; Lötter, 2014; MTPA, 2014)

Ecological Sensitivity

The determination of ES considered the following criteria from the following data sources:

- National Biodiversity Assessment (new wetland map, Van Deventer *et al.*, 2018) -
  - Dominant protection level of wetlands
  - Dominant threat status of wetlands
- Threatened Ecosystems (SANBI, 2011, remaining extent of natural vegetation; NBA 2018 Technical Report Volume 1: Terrestrial Realm).
- Threatened Plant Species (SANBI, 2009).
- PES/EI/ES (DWS, 2014) – ES score (0 - 5)

WETLAND APPROACH: PRIORITY



WETLAND APPROACH: PRIORITY

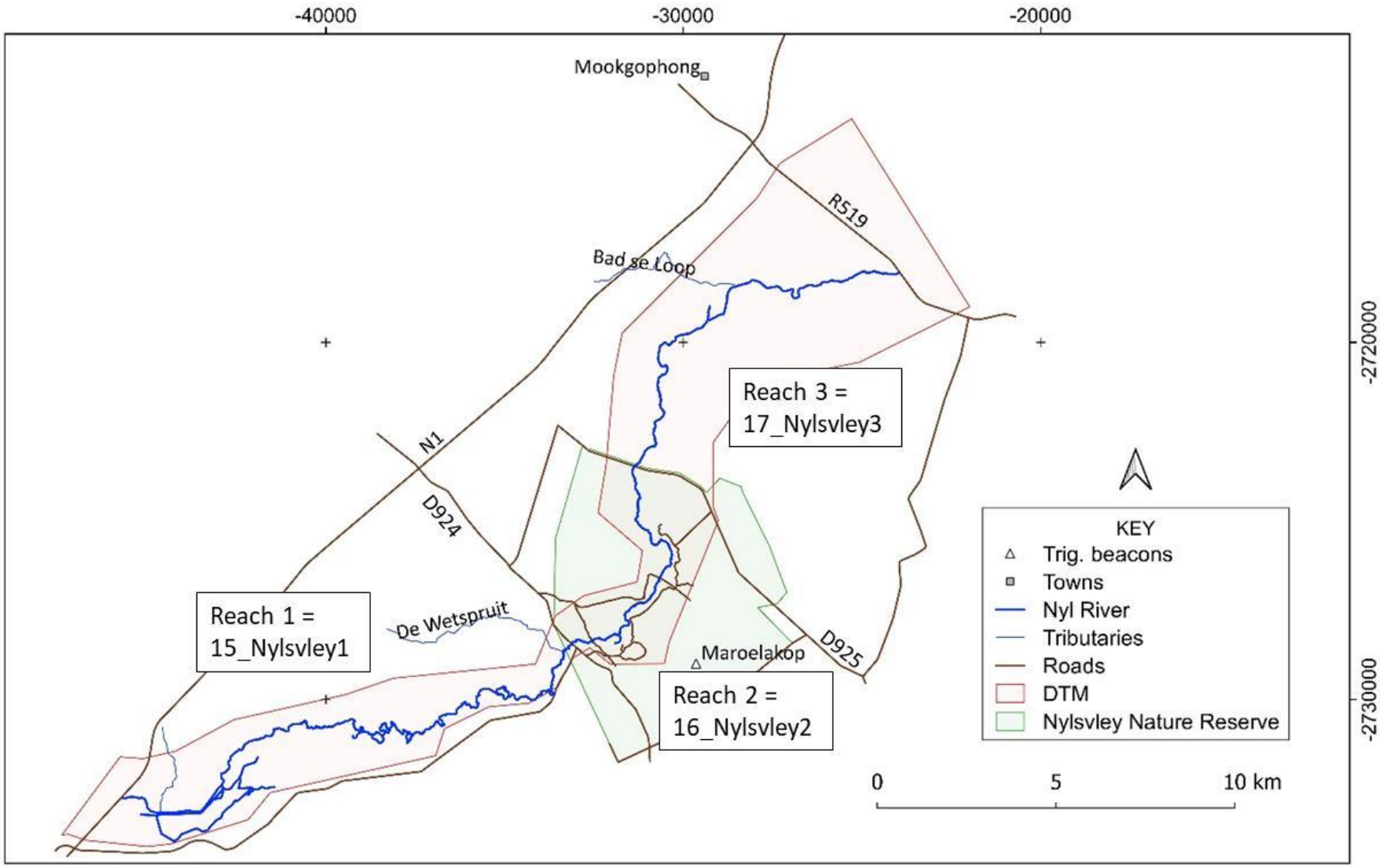
Very High priority wetlands comprised 9.7% of SQs and 37.7% of SQs had High priority wetlands with 52% of SQs with a Moderate and Low priority. The following high priority wetlands were assessed in the field for higher confidence validation / evaluation of the PES, EI and ES:

- Luvuvhu Floodplain (Makuleke)
- Nyl River Floodplain
- Wonderkrater
- Nyl Pans
- Maloutswa Floodplain (Mapungubwe)
- Kolope Wetlands
- Lake Fundudzi
- Mutale Wetlands
- Mokamole wetlands – a tributary of the Mogalakwena River
- Thermal spring / Peat domes in KNP (Malahlapanga; Mfayeni)
- Bububu wetlands – a tributary of the Shingwedzi River

WETLAND PES – EI - ES

High Priority Wetland	PES Score	PES Category	EI	ES	REC	TEC	Reason for REC
Luvuvhu Floodplain (Makuleke)	80	B/C	Very High	High	B	B	Very High EI supports half category increase
Nyl River Floodplain	65	C	Very High	High	B/C	B/C	Very High EI supports half category increase
Wonderkrater	80	B/C	Very High	Moderate	B	B	Very High EI supports half category increase
Nyl Pans	57	D	High	High	C/D	C/D	Improve water quality
Maloutswa Floodplain	66	C	Very High	High	B/C	C	Very High EI supports half category increase
Kolope Wetlands	90	A/B	Very High	Low	A/B	A/B	Maintain PES as already near natural
Lake Fundudzi	78	B/C	Very High	High	B	B	Very High EI supports half category increase
Mutale Wetlands	62	C/D	Very High	High	C	C	Very High EI supports half category increase
Mokamole (tributary of the Mogalakwena)	80	B/C	High	High	B/C	B/C	Maintain PES
Malahlapanga	78	B/C	Very High	Moderate	B	B/C	Very High EI supports half category increase
Bububu wetlands (tributary of the Shingwedzi)	97	A	Very High	Moderate	A	A	Maintain PES as already natural

HYDRODYNAMIC MODEL: Nyl



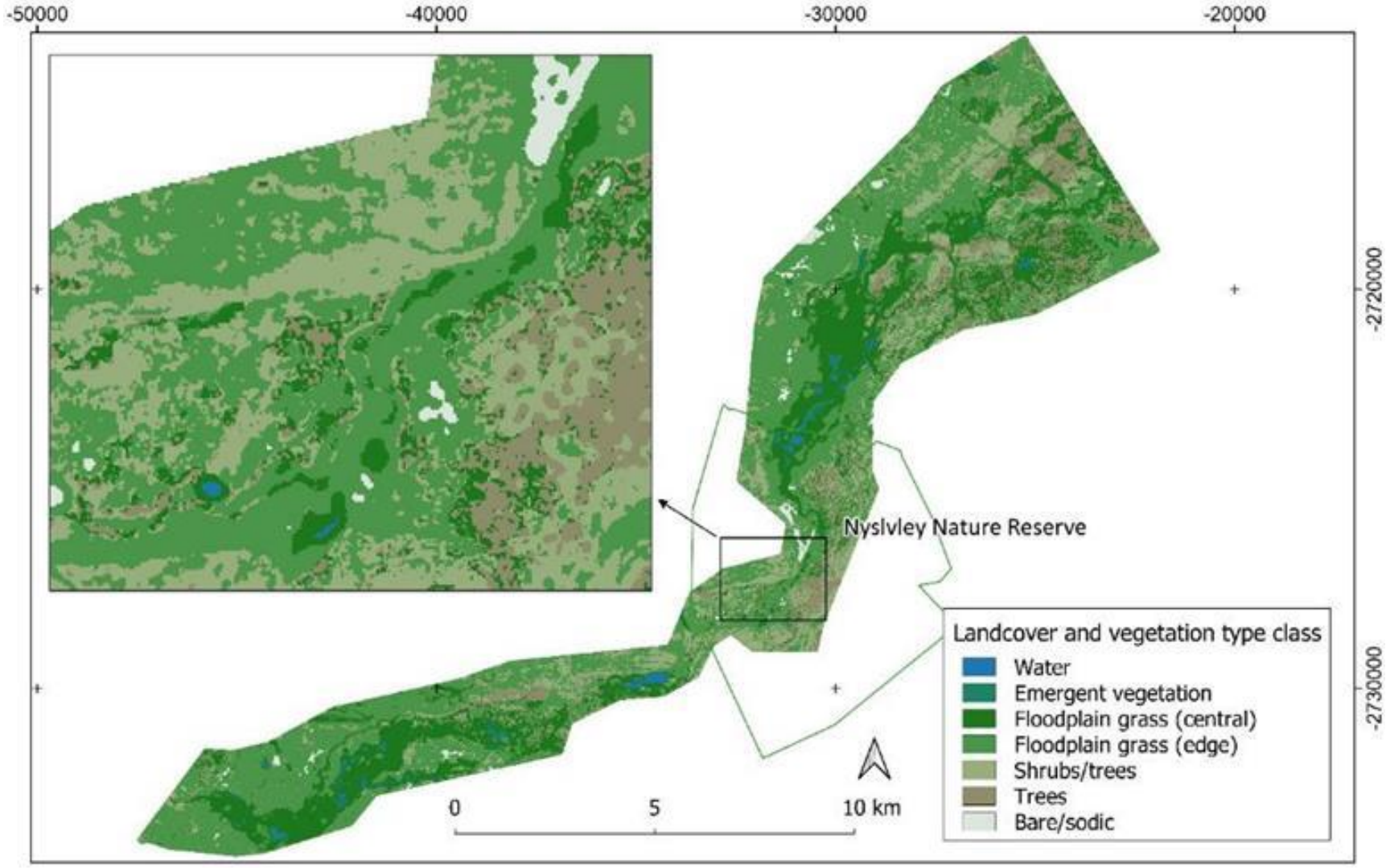
WETLAND EWR: Nyl Floodplain

As part of developing wetland-scale hydrodynamic models, it was necessary to link depth of inundation to the underlying landcover and distribution of vegetation types, which requires mapping or classification. The following vegetation types were identified and mapped:

- emergent vegetation (reeds)
- floodplain grasses (central)
- floodplain grasses (edge)
- shrubs and trees (floodplain)
- Trees (terrestrial)

WETLAND EWR: Nyl Floodplain

Landcover and vegetation types of the Nyl River floodplain



WETLAND EWR: Nyl Floodplain

Flood Requirements:

The objective of the flood requirements was

- to inundate 60-80% of central floodplain grasses with small floods
- 70 – 90% with a medium flood
- 80 - 100% with a large flood
- and that the return period of these floods would roughly match that described by Higgins *et al*. (1996): channel flows in 7 out of 10 years (small floods), floodplain inundation in 4 out of 10 years (medium floods) and large floods in 2 out of 10 years

WETLAND EWR: Nyl Floodplain

Flood requirements:

- 3 - 5 m^3/s annual flood
- 16 - 20 m^3/s flood every two years for a duration of 3 to 4 months
- 28 - 30 m^3/s flood every three years for 50* to 90 days
- 45 - 50 m^3/s flood every five years for 90 to -150** days.

*50 days is the minimum duration for successful bird breeding

**150 days being optimum for *Oryza longistaminata* to effectively complete its life cycle (Marneweck pers. comm. 2023)

Return period / flood frequency	Flood magnitude (m3/s)	15_Nyl 1		16_Nyl 2		17_Nyl 3	
		Central	Edge	Central	Edge	Central	Edge
		% area of floodplain grasses inundated					
1:1	3 - 5	30-39	10-19	50-59	40-49	30-39	30-39
1:2	16 - 20	60-69	50-59	80-89	70-79	90-99	70-79
1:3	28 - 30	70-79	60-69	80-89	80-89	90-99	80-89
1:5	45 -50	80-89	70-79	90-99	80-89	100	100

Based on PES (2022) scenario

WETLAND EWR: Nyl Floodplain

In addition the following EWRs were specified using DRIFT:

- Inflows from the Nyl River at the N1 to maintain the PES (2022) of a C for the Nyl River floodplain (shown in next slide as an example).
- Inflows from the Olifantspruit to maintain the PES (2022) of a C at the river EWR site 3_Olifantspruit and the PES (2022) of a C for the Nyl River floodplain.

WETLAND EWR: Nyl Floodplain

nMAR	61.871 MCM		
S.Dev.	2.659		
CV	0.043		
Q75	0.080		
Ecological Category	C		
	MCM	% nMAR	
Total EWR	43.963	71.055	Excludes floods with return period ≥1:2 years.
Maint. Lowflows	24.145	39.024	
Drought Lowflows	12.016	19.420	
Maint. Highflows	19.818	32.031	

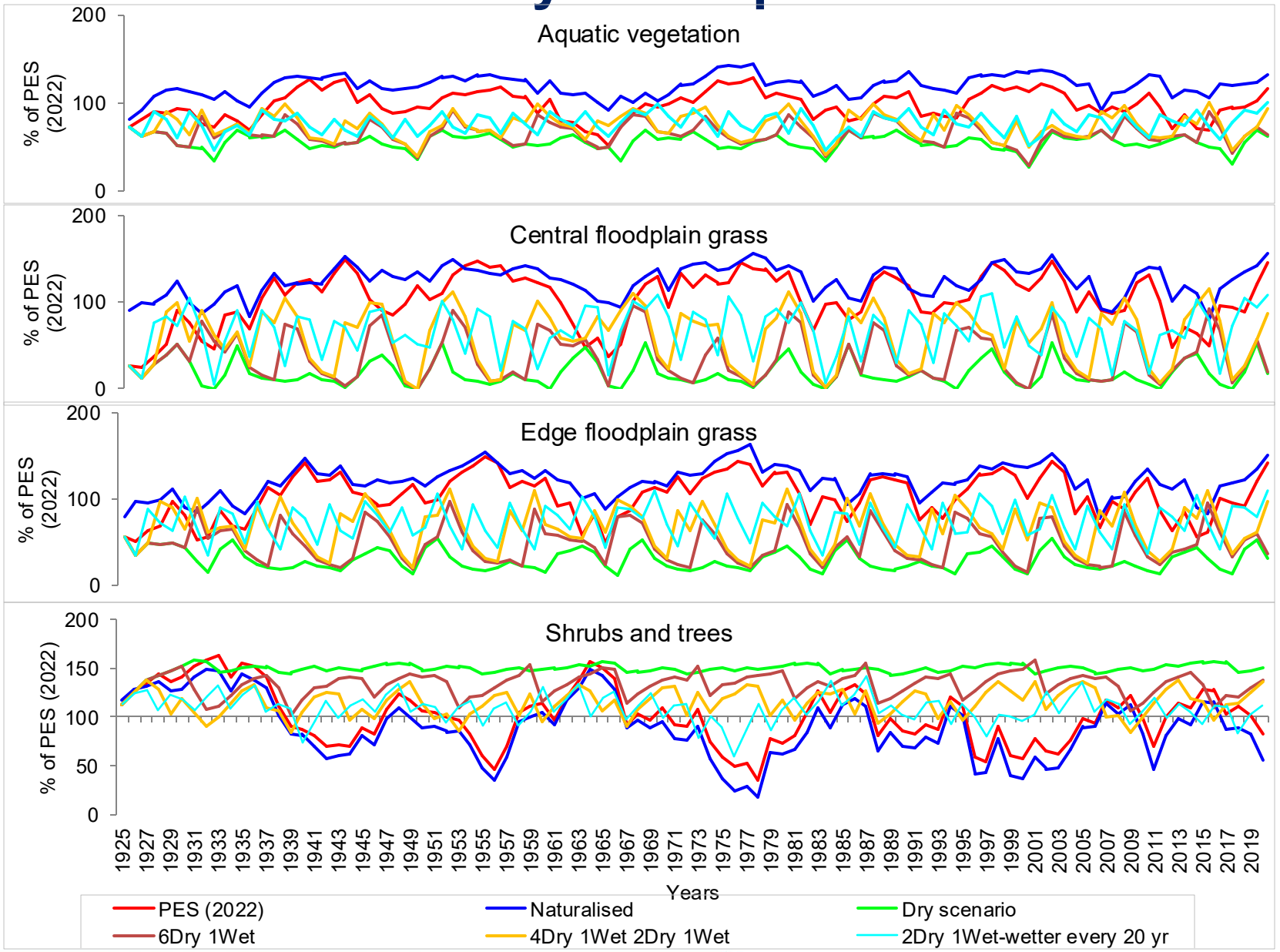
Monthly Distributions (MCM)

	Natural	Modified Flows (EWR)			
		Lowflows		Highflows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	1.622	0.552	0.526	0.202	0.754
Nov	4.513	1.462	0.865	2.116	2.876
Dec	7.585	2.163	1.163	4.314	5.113
Jan	9.294	2.544	1.272	5.631	6.380
Feb	11.553	3.513	1.541	7.202	7.449
Mar	9.212	3.330	1.418	5.202	6.884
Apr	5.944	2.817	1.178	2.621	5.319
May	3.845	2.369	1.030	0.990	3.299
Jun	2.734	1.948	0.901	0.303	2.251
Jul	2.243	1.601	0.817	0.096	1.698
Aug	1.836	1.108	0.712	0.053	1.161
Sep	1.491	0.739	0.593	0.040	0.778
Total	61.87	24.14	12.02	28.77	43.96

WETLAND EWR: Nyl Floodplain

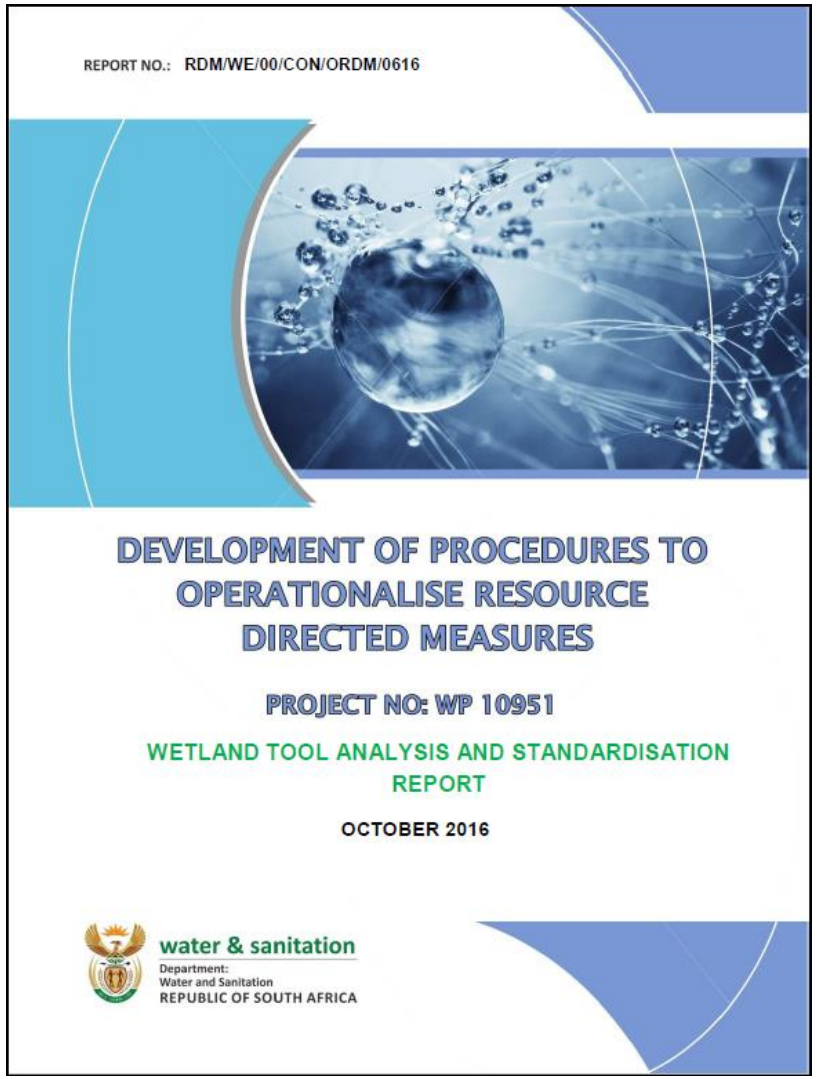
Floods. *Flood can occur in the month before or after the month indicated*								
	Within year floods <1:2 years				Inter annual floods >=1:2 years			
Flood Class	Class1	Class2	Class3	Class4	1:2	1:5	1:10	1:20
Ave peak discharge (m^3/s)	1.40	2.90	5.60	10.90	22	40	53	106
Ave duration (days)	8	8	10	10	10	18	8	15
Number	6	5	3	2				
Oct								
Nov								
Dec	1							
Jan	1	2						
Feb	1	1	1	1	1	1	1	1
Mar	1	1	1	1				
Apr	1	1	1					
May	1							
Jun								
Jul								
Aug								
Sep								
Vol ($10^6 m^3$)	2.73	3.64	4.99	5.69	6.01	10.87	9.42	22.93
% PES (2022) MAR	5.16	6.87	9.43	10.75	11.35	20.55	17.80	43.33

WETLAND EWR: Nyl Floodplain

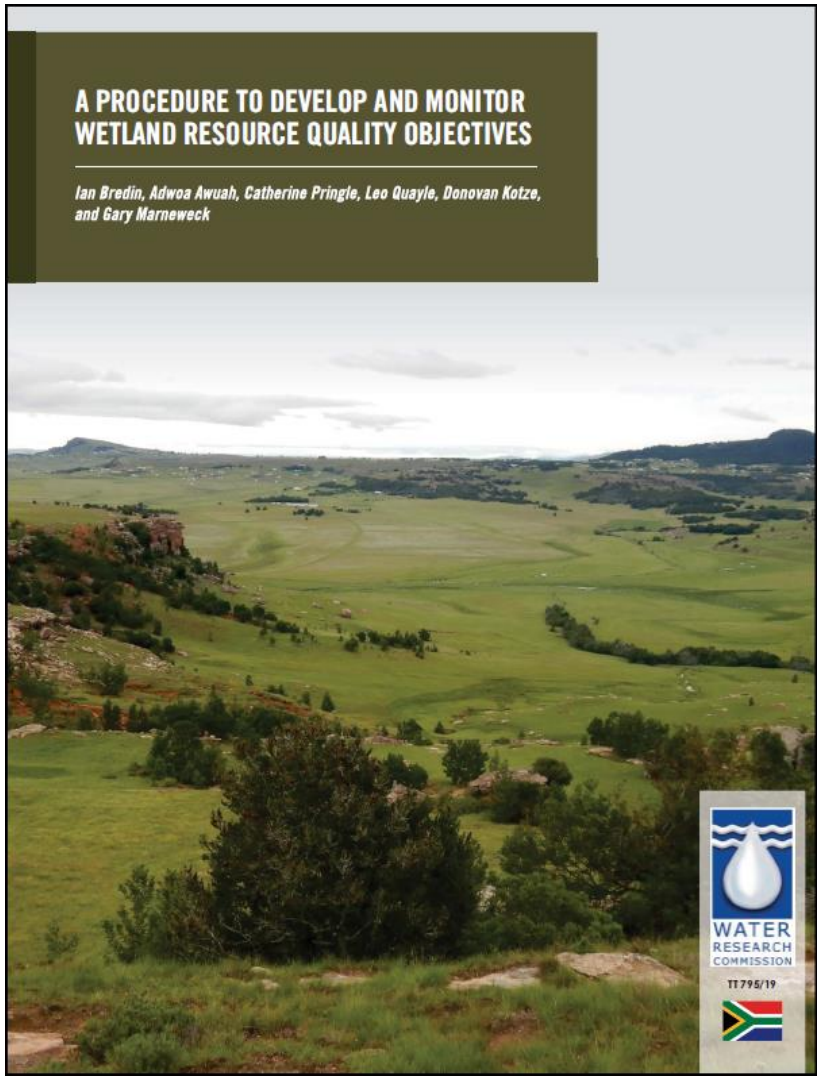


WETLAND RQOs

2016 - Ewart-Smith J, Rountree MW and MacKenzie J.



2019 - Ian Bredin, Adwoa Awuah, Catherine Pringle, Leo Quayle, Donovan Kotze, and Gary Marneweck



WETLAND RQOS: PROCESS

2019 (INR)

- Step 1: Identify potentially significant wetland resources;
- Step 2: Identify, verify and prioritize wetland resources to inform the delineation of Resource Units;
- Step 3: Desktop delineation, Present Ecological State and Importance and Sensitivity of Priority Wetland Resources to determine the Recommended Ecological Category and to inform the delineation of Resource Units;
- Step 4: Determine sub-components and indicators; and
- Step 5: Set Resource Quality Objectives, and numerical criteria, and provide implementation information

PROCESS: DEFINE NARRATIVE & NUMERIC RQOs

When setting RQOs for wetlands the underlying aim is to describe (narrative)and where possible quantify (numeric) the following:

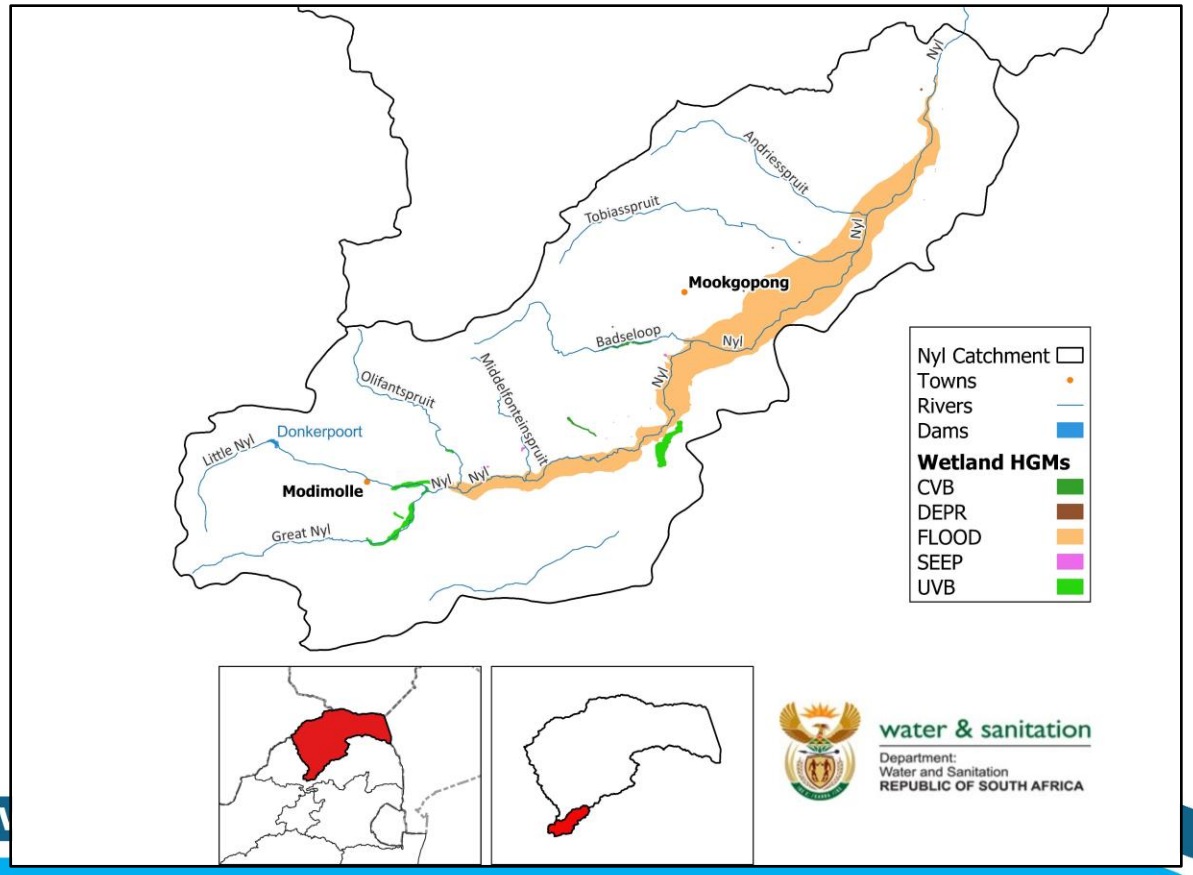
- What defines the wetland
- What drives the wetland
- What maintains the wetland
- What impacts the wetland
- What benefits does the wetland provide

WETLAND RQOS: COMPONENTS & SUB-COMPONENTS

Components	Sub-components
Quantity	Water inputs
	Water distribution and retention patterns
Quality	Nutrients
	Salts
	System variables
	Toxics
	Microbial determinands
Habitat	Present Ecological State (PES)
	Geomorphology
	Wetland Vegetation
Biota	Fish
	Plant species
	Mammals
	Birds
	Amphibians & reptiles
	Periphyton
	Aquatic Invertebrates
	Diatoms

Wetland RQOs: e.g. – Nyl Floodplain

Components	Method used for assessment	PES% Score	Ecological Category
Hydrology PES	WET-Health Hydro Module	65 %	**C**
Geomorphology PES	WET-Health Geomorph Module	73 %	**C**
Water quality PES	Wetland-IHI WQ Module	79 %	**B/C**
Vegetation PES	WET-Health Veg Module	58 %	**C/D**
Overall Wetland PES	WET-Health default weightings	65 %	**C**



Wetland RQOs: e.g. – Nyl Floodplain

No.	Legend Colour	2018 NLC Class Name	Area (Ha)	Cover (%)
1		Contiguous (indigenous) Forest (*combined* very	0.0	0.0
2		Contiguous Low Forest & Thicket (*combined cla*	9.8	0.1
3		Dense Forest & Woodland (35 - 75% cc)	906.0	4.7
4		Open Woodland (10 - 35% cc)	10901.8	56.3
5		Contiguous & Dense Planted Forest (*combined*	1.6	0.0
6		Open & Sparse Planted Forest	2.0	0.0
7		Temporary Unplanted Forest	0.0	0.0
8		Low Shrubland (other regions)	0.0	0.0
9		Low Shrubland (Fynbos)	0.0	0.0
10		Low Shrubland (Succulent Karoo)	0.0	0.0
11		Low Shrubland (Nama Karoo)	0.0	0.0
12		Sparsely Wooded Grassland (5 - 10% cc)	0.0	0.0
13		Natural Grassland	1972.0	10.2
14		Natural Rivers	1.2	0.0
15		Natural Estuaries & Lagoons	0.0	0.0
16		Natural Ocean, Coastal	0.0	0.0
17		Natural Lakes	0.0	0.0
18		Natural Pans (flooded @ obsv time)	0.1	0.0
19		Artificial Dams (incl. canals)	23.5	0.1
20		Artificial Sewage Ponds	0.0	0.0
21		Artificial Flooded Mine Pits	0.1	0.0
22		Herbaceous Wetlands (currently mapped)	1445.7	7.5
23		Herbaceous Wetlands (previous mapped extent)	651.5	3.4
24		Mangrove Wetlands	0.0	0.0
25		Natural Rock Surfaces	0.0	0.0

No. L2	Legend Colour	2020 NLC Class Name (Level 2)	Area (Ha)	Cover (%)
1		Natural Wooded Land	11817.5	61.0
2		Planted Forest	3.6	0.0
3		Shrubs	0.0	0.0
4		Karoo & Fynbos Shrubland	0.0	0.0
5		Natural Grassland	1972.0	10.2
6		Natural Water bodies	1.3	0.0
7		Artificial Water bodies	23.6	0.1
8		Herbaceous Wetlands	2097.3	10.8
9		Woody Wetlands	0.0	0.0
10		Consolidated	0.0	0.0
11		Unconsolidated	5.8	0.0
12		Permanent Crops	0.6	0.0
13		Temporal Crops	2554.0	13.2
14		Fallow Lands & Old Fields	872.0	4.5
15		Residential	20.2	0.1
16		Village	0.4	0.0
17		Smallholding	0.0	0.0
18		Urban Vegetation	0.7	0.0
19		Commercial	0.0	0.0
20		Industrial	1.3	0.0
21		Transport	6.7	0.0
22		Surface Infrastructure	0.0	0.0
23		Extraction Sites	1.1	0.0
24		Mine Waste & Resource D	0.0	0.0
			19378.104	100.0

No. L1	Legend Colour	2020 NLC Class Name (Level 1)	Area (Ha)	Cover (%)
1		Forest Land	11821.1	61.0
2		Shrubland	0.0	0.0
3		Grassland	1972.0	10.2
4		Waterbodies	25.0	0.1
5		Wetlands	2097.3	10.8
6		Barren Land	5.8	0.0
7		Cultivated	3426.5	17.7
8		Built-up	29.3	0.2
9		Mines & Quarries	1.1	0.0
			19378.104	100

WETLAND RQOS: NYL FLOODPLAIN

Component	Subcomponent	Indicator	RQO Narrative	RQO Numerical	TPC
The RQOs outlined below for the Nyl River floodplain (including Nylsvley), are to maintain a B/C category (TEC), with a percentage score of at least 78%, and the EI should remain Very High and the ES High.					
Water quantity	Water Inputs	Hydrology (EWR)	Floods are necessary to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation and dependent biota. The quantity and timing of inputs, and the distribution and retention patterns within the wetland must be maintained to avoid the loss of wetland hydrological function. The EWR determined for the floodplain should be implemented.	The EWR determined for the floodplain should be implemented: The flood requirements are: · an annual flood of 3 - 5 m3/s · a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months · a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days · a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days.	Flood peaks beyond the specified range OR reduced return interval of occurrence for specified floods
	Water distribution and retention patterns	Flooding by damming with the wetland	The current extent of damming within the wetland complex should not be permitted to increase.	The extent of damming within the delineated wetland area should not exceed 23Ha.	The extent of damming within the delineated wetland area > 23Ha

WETLAND RQOS: NYL FLOODPLAIN

Component	Subcomponent	Indicator	RQO Narrative	RQO Numerical	TPC
Habitat	Wetland vegetation structure / composition	Extent of woody vegetation on the floodplain	Woody vegetation should not be permitted to encroach onto the floodplain	N/A	
		Extent of natural grassland within the wetland complex (land cover classes 12-13; NLC, 2020) together with the extent of herbaceous wetlands (land cover classes 22-23, 2020)	The current extent of natural grassland together with herbaceous wetland should not decline.	The current extent of natural grassland together with herbaceous wetland should not decline below 4070Ha.	The combined extent of natural grassland and herbaceous wetlands < 4070Ha (excluding water bodies)
	Habitat fragmentation with the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species should be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species should not exceed 5% of the wetland area.	Dense patches of alien invasive plant species > 5% of the wetland area
			Dense patches of alien invasive plant species should be prevented from establishing within the Ramsar site (Nylsvley Nature Reserve).	Dense patches of alien invasive plant species should not exceed 0% of the wetland area within the Ramsar site (Nylsvley Nature Reserve).	Dense patches of alien invasive plant species > 0% of the wetland area within the Ramsar site (Nylsvley Nature Reserve)
		Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments should not be permitted within the wetland complex*	The aerial extent of developments within the delineated wetland area shall not exceed 0Ha*	The aerial extent of developments within the delineated wetland area > 0Ha*
		Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73, 2020)	Wetland habitat loss due to direct agricultural activities, including grazing, and croplands should not be permitted to increase in extent within the wetland complex. *	The aerial extent of agricultural activities, including grazing, and croplands within the delineated wetland area shall not exceed 3430Ha. *	The aerial extent of agricultural activities, including croplands within the delineated wetland area > 3400Ha*

* - includes a 200m buffer

WETLAND RQOS: NYL FLOODPLAIN

Component	Subcomponent	Indicator	RQO Narrative	RQO Numerical	TPC
Biota	Birds	Threatened bird species (water / wetland-dependent)	Breeding populations of threatened species should be maintained. These include Rufous bellied Heron (Butroides rufiventris), Little Bittern (Ixobrychus minutus), Dwarf Bittern (Ixobychus sturmiz), Bittern (Botaurus stellaris), Pygmy Goose (Nettapus auritus), Baillon's Crake (Porzana pusilla), Striped Crake (Aenigmatolimnas marginalis) and Black Stork (Ciconia nigra) .	The number of threatened bird species that use the floodplain for breeding during the flood season should be at least 8	The number of threatened bird species that use the floodplain for breeding during the flood season < 8
		Waterbird species diversity	The number of bird species (includes residents and migrants) that utilise the floodplain should be maintained.	The number of bird species that utilise the floodplain should be at least 102 species.	The number of bird species that utilise the floodplain should < 102 species
	Fish	Species diversity in the floodplain during flooding	The number of fish species that occur on the floodplain during flooding should be maintained.	The number of fish species that occur in the floodplain during floods should be at least 10 species.	The number of fish species that occur in the floodplain during floods < 10 species
	Amphibians	Amphibian species diversity	The number of amphibian species that utilise the floodplain should be maintained.	The number of amphibian species that utilise the floodplain in the wet season should be at least 11.	The number of amphibian species that utilise the floodplain in the wet season < 11

WETLAND RQOS: NYL FLOODPLAIN

Component	Subcomponent	Indicator	RQO Narrative	RQO Numerical	TPC
Biota	Vegetation	Alian invasive plants	The wetland complex should be maintained by removal of perennial alien plant species.	Dense patches of alien invasive plant species should not exceed 5% of the wetland area.	Dense patches of alien invasive plant species > 5% of the wetland area
		Threatened plants species	The floodplain is the only location in South Africa where wild rice (Oryza longistaminata; VU) grows and provides an important breeding ground for frogs and toads after rain and during floods. As such, Wild Rice populations should be maintained within the floodplain.	The aerial extent of Oryza longistaminata on the floodplain should correspond to the flooding regime: · 50-59 % (area) of floodplain grasses inundated during an annual flood of 3 - 5 m3/s (at Nylsvley - central region) · 80-89 % (area) of floodplain grasses inundated during a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months (at Nylsvely - central region) · 80-89 % (area) of floodplain grasses inundated during a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days (at Nylsvely - central region) · 90-99 % (area) of floodplain grasses inundated during a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days (at Nylsvely - central region)	Reduced aerial extent of Oryza longistaminata flooding as follows: · < 50-59 % (area) of floodplain grasses inundated during an annual flood of 3 - 5 m3/s (at Nylsvley - central region) ·< 80-89 % (area) of floodplain grasses inundated during a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months (at Nylsvely - central region) · < 80-89 % (area) of floodplain grasses inundated during a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days (at Nylsvely - central region) · < 90-99 % (area) of floodplain grasses inundated during a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days (at Nylsvely - central region)
		Plant species diversity within the wetland complex	The number of plant species that occur within the floodplain and are water or wetland-dependent should be maintained.	The number of plant species that occur within the floodplain and are water or wetland-dependent should be at least 35.	The number of plant species that occur within the floodplain and are water or wetland-dependent < 35

WETLAND RQOS: NYL FLOODPLAIN

Component	Subcomponent	Indicator	RQO Narrative	RQO Numerical	TPC
Water quality	Salts	Electrical conductivity (mS/m)	Water quality in the Nyl River and the tributaries that feed the floodplain should maintain the TEC (C).	95th percentile EC < 85 mS/m	95th percentile EC > 85 mS/m
	System variables	pH		5.6 >=pH<= 9.2	pH >9.2 or pH < 5.6
	Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 2.24 mg/l	Median TIN > 2.24 mg/l
		Orthophosphate (mg/l)		Median PO4-P < 0.09 mg/l	Median PO4-P > 0.09 mg/l
		Ammonia (NH3-N) (mg/l)		Median NH3-N < 0.073 mg/l	Median NH3-N > 0.073 mg/l

THANK YOU!