CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATHUZE CATCHMENTS (WP11387)

WETLAND RESOURCE QUALITY OBJECTIVES

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water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

NDP 2030

1

Wetland Resource Quality Objectives

James MacKenzie

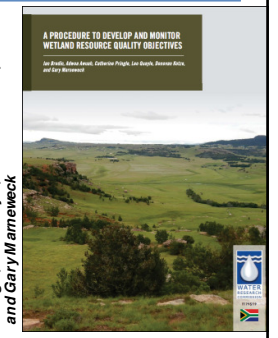
- Outline current literature covering wetland RQOs methodology
- Recap of completed steps, especially prioritisation
- Examples of priority wetland RQOs

2

LITERATURE

2016 - Ewart-Smith J, Rountree M W and MacKenzie J.

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



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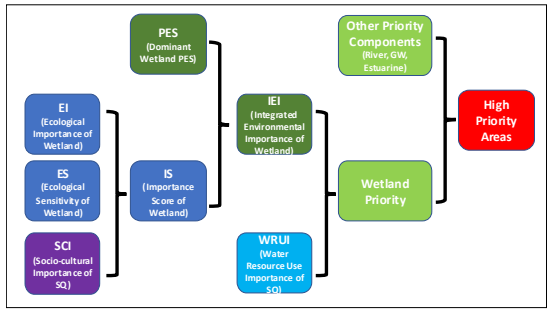
WETLAND PRIORITISATION



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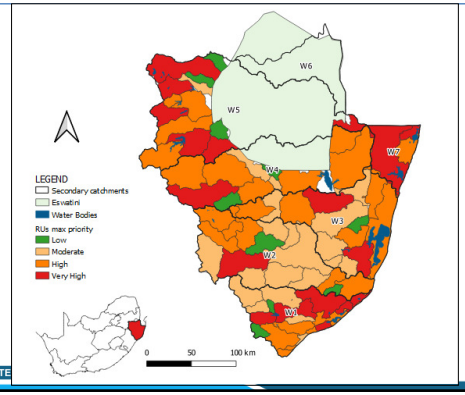

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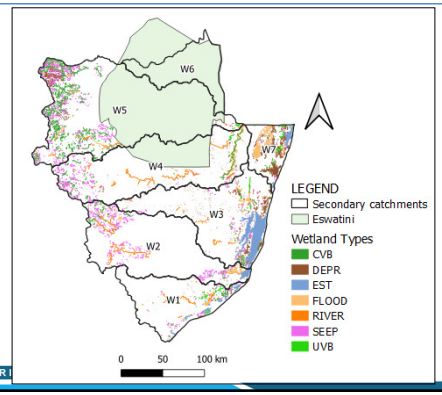

6

PROCESS: 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

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7

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**

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8

W1: Mhlathuze

RU	Wetland Name	Includes SQs	PES	EI	ES	Trajectory	REC	How to achieve the REC	TEC
			W1 Mhlatuze						
W12-8	Mhlathuze Floodplain	W12H-03459 W12F-03494	E	VERY HIGH	VERY HIGH	↓	D	Reduce / control sugarcane cultivation	D
W12-9	Nlabane Wetlands	W12J-03411	D	VERY HIGH	VERY HIGH	↓	C/D	Reduce / control forestry (by 10%)	C/D
W12-10	Lake Mzingazi	W12J-03489	D/E	VERY HIGH	VERY HIGH	↓	D	Control expansion of forestry and residential development, improve water quality, reduce / control gill netting (fish & birds), mitigate upstream / downstream connectivity (fish ladder).	D
W12-10	Mzingazi (CVB)	W12J-03392 W12J-03493 W12J-03403 W12J-03450	C	VERY HIGH	VERY HIGH	→	C	Control expansion of forestry and residential development.	C

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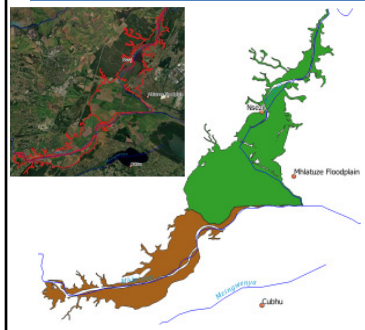
9

W1: Mhlathuze Floodplain



HGM 1: Floodplain	
Ecological Integrity Score:	43.5
Ecological Category:	D
Area (Ha):	3147.8
HGM 2: Floodplain	
Ecological Integrity Score:	21.8
Ecological Category:	E/F
Area (Ha):	1661.2
WETLAND PES	
Ecological Integrity Score:	36.0
Ecological Category:	E
Area (Ha):	4809.0
WETLAND REC	
Ecological Integrity Score:	42.0
Ecological Category:	D

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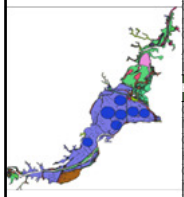
10

W1: Mhlathuze Floodplain Impacts



HGM 1: Floodplain (2018 NLC Class Name)	Cover (% wetland area)
Cultivated Commercial Sugarcane Non-Pivot (all other)	34.8
Herbaceous Wetlands (previous mapped extent)	17.8
Cultivated Commercial Sugarcane Pivot Irrigated	16.1
Natural Grassland	8.3
Contiguous Low Forest & Thicket (combined classes)	6.0
Natural Lakes	3.8
Contiguous (indigenous) Forest (combined very high, high, medium)	3.7
Contiguous & Dense Planted Forest (combined classes)	3.4
Artificial Dams (incl. canals)	1.6
Dense Forest & Woodland (35 - 75% cc)	1.4
HGM 2: Floodplain (2018 NLC Class Name)	**Cover (% wetland area)**
Cultivated Commercial Sugarcane Non-Pivot (all other)	59.8
Mines: Waste (Tailings) & Resource Dumps	9.9
Contiguous Low Forest & Thicket (*combined classes*)	6.8
Herbaceous Wetlands (previous mapped extent)	6.4
Cultivated Commercial Sugarcane Pivot Irrigated	5.3
Natural Grassland	4.5
Dense Forest & Woodland (35 - 75% cc)	2.4
Contiguous & Dense Planted Forest (*combined classes*)	1.3
Subsistence / Small-Scale Annual Crops	1.0
Herbaceous Wetlands (currently mapped)	0.7

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11

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Wetland Inventory	Wetland classification	HGM type	Both wetland HGMs should remain floodplains, one along the Nseleni River and one along the Mhlathuze River at their confluence.	N/A
	Wetland extent	Wetland area (Ha)	Pending more detailed review of the current wetland delineation (NWM5, 2018), the total extent of the wetland complex should not decrease.	Pending more detailed review of the current wetland delineation (NWM5, 2018), the total extent of the wetland complex should be maintained at 4809 Ha.

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12

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Water quantity	Water Inputs	Hydrology	Floods are necessary to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation. 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 upstream Nseleni and Mlhathuze rivers should be implemented.
	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 shall not exceed 51 Ha.

13

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Habitat	Wetland vegetation	Extent of natural grassland within the wetland complex (land cover classes 12-13; NLC, 2020)	The current extent of natural grassland within the wetland should not decline.	The current extent of natural grassland within the wetland should not decline 7% (335 Ha).
		Extent of natural wooded land within the wetland complex (land cover classes 1-4, 2020)	The current extent of natural wooded land within the wetland should not decline.	The current extent of natural wooded land within the wetland should not decline below 10% (508 Ha).
		Extent of herbaceous wetlands (land cover classes 22-23, 2020)	The current extent of herbaceous wetlands should not decline.	The current extent of herbaceous wetlands should not decline below 38% (98Ha).

14

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Habitat	Habitat fragmentation with the wetland delineation	Land cover classes denoted to mines and quarries (classes 68-72, 2020)	Wetland habitat loss or fragmentation due to mining activities should not be permitted to increase in extent within the wetland complex.	The aerial extent of mining activities within the delineated wetland area shall not exceed 3.6% (170 Ha).
		Land cover classes denoted to cultivated areas (classes 32-46 & 73, 2020)	Wetland habitat loss due to direct agricultural activities and croplands should not be permitted to increase in extent within the wetland complex.	The aerial extent of agricultural activities and croplands within the delineated wetland area shall not exceed 56% (PES) or 50% (TEC).
		Land cover classes denoted to built-up areas and infrastructure (classes 47-67, 2020)	Wetland habitat loss or fragmentation due to infrastructure and built-up areas, including canals, furrows and trenching should not be permitted to increase in extent with the wetland complex. Additional development of infrastructure should not be permitted within the wetland complex.	The aerial extent of built-up areas and infrastructure, including canals, furrows and trenching, within the delineated wetland area shall not exceed 1% (36 Ha).

15

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Habitat	Present Ecological State (PES)	Wetland PES score and category	The overall wetland PES should be improved from an E (PES) to a D (TEC).	The overall wetland PES score should be improved to at least 42%.
Habitat / Biota	Ecological sensitivity (ES)	Species/ habitats sensitive to flow	The ES of the wetland complex should be maintained as "Very High".	An ES score >=4 should be maintained
	Ecological Importance (EI)	Threatened, endangered or endemic species; threatened habitat types	The EI of the wetland complex should be maintained as "Very High".	An EI score >=4 should be maintained

16

RQOs: Mhlathuze Floodplains

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Biota	Endangered crane species	Counts of the number of breeding pairs of crane species.	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any population decline.	The number of breeding crane pairs within the wetlands should be >0
	Waterbird species	Wetland is within 500m of a threatened waterbird point locality.	Water quantity, quality, vegetation condition and land use practices must be maintained so as to not cause any decline in waterbird population/s.	N/A
Water quality	River sub-components from the Nseleni and Mhlathuze rivers apply	River indicators from the Nseleni and Mhlathuze rivers apply	River RQOs from the Nseleni and Mhlathuze rivers apply	

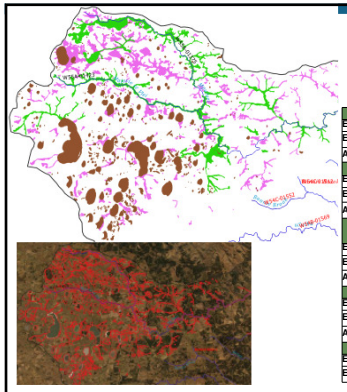
17

EWR: Measures to achieve the REC

Name	Includes SQs	Size (Ha)	PES	Trajectory	REC	How to achieve the REC
W5 Usuthu						
Assegaai Floodplain	W51C-01981 W51C-02011 W51C-02022 W51C-02067 W51C-02074 W51C-02109 W51D-02044 W51D-02151 W51D-02160 W51D-02171 W51D-02177 W51D-02193	886.4	C	→	C	Control expansion of forestry and informal farming
Sandspruit Wetlands	W53A-01757 W53A-01804 W53A-01853	1676.8	C	→	C	Control expansion of commercial annual crops and dry-land agriculture
Upper Usuthu Wetlands	W54A-01534 W54A-01630	767.2	B/C	→	B/C	Control expansion of commercial annual crops and dry-land agriculture
Seganagana Wetlands	W54B-01569 W54B-01623	1264.7	A	→	A	Preventative conservation: Control expansion of forestry and dry-land agriculture
Pans District	W55A-01375 W55A-01423 W55C-01395	21348.2	A/B	→	A/B	Preventative conservation: Control expansion of forestry and commercial annual crops, rain-fed
Lower Usuthu (Ndumo)	W57J-01923 W57K-01929 W57K-02025	1310.0	A	→	A	Preventative conservation: prevent expansion of nearby slash & burn agricultural activities

18

W5: Pans District



HGM 1: Depression (includes Pans)	
Ecological Integrity Score:	97.0
Ecological Category:	A
Area (Ha):	8347.7
HGM 2: Valley-bottom with a channel	
Ecological Integrity Score:	89.2
Ecological Category:	A/B
Area (Ha):	5843.0
HGM 3: Hillslope seepage linked to a stream channel	
Ecological Integrity Score:	85.3
Ecological Category:	B
Area (Ha):	7157.6
WETLAND PES	
Ecological Integrity Score:	90.9
Ecological Category:	A/B
Area (Ha):	21348.2
WETLAND REC	
Ecological Integrity Score:	90.9
Ecological Category:	A/B

19

W5:Pans District Impacts

Depression (includes Pans): (2018 NLC Class Name)	Cover (% wetland area)
Natural Pans (flooded @ obsv time)	49.3
Natural Grassland	36.5
Herbaceous Wetlands (currently mapped)	5.9
Dry Pans	3.8
Fallow Land & Old Fields (Grass)	2.4
Commercial Annuals Crops Rain-Fed / Dryland / Non-Irrigated	1.0
Contiguous & Dense Planted Forest (combined classes)	0.4
Fallow Land & Old Fields (Trees)	0.3
Fallow Land & Old Fields (Bush)	0.3
Open & Sparse Planted Forest	0.1

20

W5:Pans District Impacts

Valley-bottom with a channel : (2018 NLC Class Name)	Cover (% wetland area)
Natural Grassland	33.5
Herbaceous Wetlands (currently mapped)	28.8
Herbaceous Wetlands (previous mapped extent)	20.7
Fallow Land & Old Fields (Grass)	4.7
Fallow Land & Old Fields (wetlands)	3.3
Commercial Annuals Crops Rain-Fed / Dryland / Non-Irrigated	3.2
Contiguous & Dense Planted Forest (combined classes)	1.6
Artificial Dams (incl. canals)	1.3
Temporary Unplanted Forest	1.3
Dense Forest & Woodland (35 - 75% cc)	0.7

21

W5:Pans District Impacts

Hillslope seepage linked to a stream channel: (2018 NLC Class Name)	Cover (% wetland area)
Natural Grassland	50.6
Herbaceous Wetlands (currently mapped)	16.4
Herbaceous Wetlands (previous mapped extent)	9.8
Commercial Annuals Crops Rain-Fed / Dryland / Non-Irrigated	7.9
Fallow Land & Old Fields (Grass)	5.8
Fallow Land & Old Fields (wetlands)	3.3
Contiguous & Dense Planted Forest (combined classes)	3.1
Temporary Unplanted Forest	1.2
Dense Forest & Woodland (35 - 75% cc)	1.1
Natural Pans (flooded @ obsv time)	0.2

22

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Wetland Inventory	Wetland classification	HGM type	All three wetland HGMs should remain as such, pans, seeps and valley bottoms with a channel along the Majosiese Vlei and Mpuluzi river and their tributaries.	N/A
	Wetland extent	Wetland area (Ha)	Pending more detailed review of the current wetland delineation (NWM5, 2018), the total extent of the wetland complex should not decrease.	Pending more detailed review of the current wetland delineation (NWM5, 2018), the total extent of the wetland complex should be maintained at 21348Ha.

23

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Water quantity	Water Inputs	Hydrology	Water quantity (i.e. flow and inundation regime) must maintain wetlands in the present ecological state where practical.	N/A for pans and seepage wetlands. The EWR determined for the Mpuluzi River should be implemented.
	Water distribution and retention patterns	Flooding by damming with the wetland	Damming within the wetland complex should not be allowed to increase.	The extent of damming within the delineated wetland complex area shall not exceed 0.4% (86Ha).

24

RQOs: Pans District

Component	Sub-component	Indicator	RQO	
			Narrative	Numerical
Habitat	Wetland vegetation	Extent of natural grassland within the wetland complex (land cover classes 12-13; NLC, 2020)	The current extent of natural grassland within the wetland complex should not decline.	The current extent of natural grassland within the wetland complex should not decline below 40% (8621Ha).
		Extent of natural wooded land within the wetland complex (land cover classes 1-4, 2020)	The current extent of natural wooded land within the wetland complex should not decline.	The current extent of natural wooded land within the wetland complex should not decline below 0.7% (141Ha).
		Extent of herbaceous wetlands (land cover classes 22-23, 2020)	The current extent of herbaceous wetlands throughout the complex should not decline.	The current extent of herbaceous wetlands throughout the complex should not decline below 26% (5575Ha).

25

RQOs: Pans District

Component	Sub-component	Indicator	RQO	
			Narrative	Numerical
Habitat	Habitat fragmentation with the wetland delineation	Extent of planted forest within the wetland complex (land cover classes 5-7, 2020)	The current extent of planted forest within the wetland complex should not increase.	The current extent of planted forest within the wetland complex should not increase above 2.5% (538Ha).
		Land cover classes denoted to mines and quarries (classes 68-72, 2020)	Wetland habitat loss or fragmentation due to mining activities should remain absent within the wetland complex.	The aerial extent of mining activities within the delineated wetland complex should not exceed 0Ha.
		Land cover classes denoted to cultivated areas (classes 32-46 & 73, 2020)	Wetland habitat loss due to direct agricultural activities and croplands should not be permitted to increase in extent within the wetland complex.	The aerial extent of agricultural activities and croplands within the delineated wetland complex should not exceed 10% (227Ha).
		Land cover classes denoted to built-up areas and infrastructure (classes 47-67, 2020)	Wetland habitat loss or fragmentation due to infrastructure and built-up areas, including canals, furrows and trenching should not be allowed to increase within the wetland complex.	The aerial extent of built-up areas and infrastructure, including canals, furrows and trenching, within the delineated wetland complex should not exceed 0.1% (11Ha).

26

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Habitat	Present Ecological State (PES)	Wetland PES score and category	The overall wetland PES should be maintained in an A/B category.	The overall wetland PES score should be maintained to at least 88%.
Habitat / Biota	Ecological sensitivity (ES)	Species / habitats sensitive to flow	The ES of the wetland complex should be maintained as "High".	An ES score >=3 should be maintained
	Ecological importance (EI)	Threatened, endangered or endemic species; threatened habitat types	The EI of the wetland complex should be maintained as "Very High".	An EI score >=4 should be maintained

27

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Biota	Endangered crane species	Counts of the number of breeding pairs of crane species.	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any population decline.	The number of breeding crane pairs within the wetlands should be >0
		Number of crane species	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline in the number of crane species that occur in these wetlands.	The number of crane species found in the district should remain at 3. These are the Blue Crane (*Anthropoides paradiseus*), Grey Crowned Crane (*Balearica regulorum*) and Wattled Crane (*Bugeranus carunculatus*) (SANBI, 2014)
	Waterbird species	Wetland bird species	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline of diversity.	The number of wetland / waterbird species found in the district should remain >=83
		Wetland is within 500m of a threatened waterbird point locality.	Water quantity, quality, vegetation condition and land use practices must be maintained so as to not cause any decline in waterbird population/s.	N/A

28

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Biota	Wetland plants	Number of wetland plant species	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline in the number of wetland plant species that occur in these wetlands.	The number of wetland plant species found in the district should remain >=57*
	Herpetofauna	Number of reptile species	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline in the number of reptile species that occur in these wetlands.	The number of retile species found in the district should remain >=58**
		Number of amphibian species	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline in the number of amphibian species that occur in these wetlands.	The number of amphibian (frogs and toads) species found in the district should remain >=20**

* species list available, counts as at 2014

** species with high probability of occurrence, not necessarily measured in the field

29

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Biota	Mammals	Spotted-necked otter (*Lutra maculicollis*) – Near-Threatened	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline in the spotted-necked otter population.	The spotted-necked otter should remain within wetlands in the district.
	Taxon richness	Habitat condition is sufficient to maintain the current wetland species diversity.	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any decline of diversity.	N/A

30

RQOs: Pans District

Component	Subcomponent	Indicator	RQO	
			Narrative	Numerical
Water quality	Water chemistry and sediments	Water quality is sufficient to maintain the PES and TEC (A/B).	River RQOs from the Mpuluzi River can be applied to the channelled valley bottom wetlands only.	
Ecosystem Services	Eco-tourism	Important birding area	The pans and surrounds should be maintained as an IBA, especially for water and wetland birds.	N/A