



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



Determination of Ecological Water Requirements for Surface Water (Rivers, Estuaries and Wetlands) and Groundwater in the Lower Orange WMA: WP10974

7 June 2017

ORANGE ESTUARY ECOLOGICAL CONSEQUENCES

Lara van Niekerk: CSIR

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ECOLOGICAL CLASSIFICATION

Ecological status described in terms of
Ecological Categories:

- A – near natural,
- B – largely natural
- C – moderately modified
- D – largely modified
- E – seriously modified
- F - critically modified.



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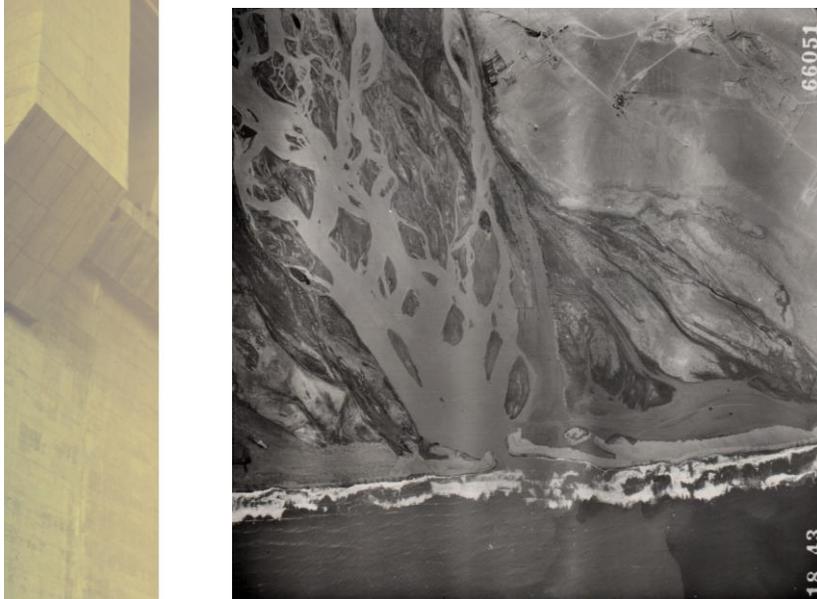
ESTUARY FUNCTIONAL ZONE



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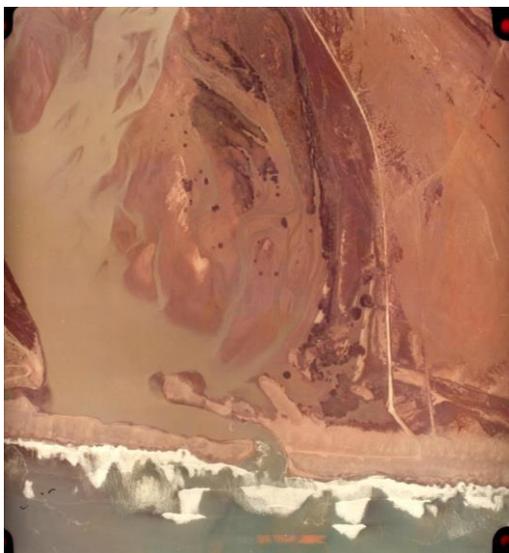
ORANGE ESTUARY 1943



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ORANGE ESTUARY 1979



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ORANGE ESTUARY 2004



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Old Causeway to the mouth



Photos: CSIR

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Saltmarshes are a barren salt desert

Ramsar site on the Montreux record – threatened SA ensure ecological character restored

1994



May 2003

Story of the Orange River Estuary

1929	Mouth management & mining started
1968	Dam development regulated flow
1960's	Beach access road, loss of tidal exchange, connection
1974	Diversion of flood channels & levees
1980	Disposal of north sieve wastewater, increased salinity
1986	Increase in dust from slime dams
1988	Large flood - silt deposition & standing water kills vegetation
1993 & 1995	Mouth closes & causeway prevents drainage - backflooding, standing water & die-back

PES, IMPORTANCE AND REC

	PES
Hydrology	D
Hydrodynamics	C
Water quality	D
Physical habitat	B/C
ABIOTIC HEALTH	C/D
Microalgae	D/E
Macrophytes	D
Invertebrates	D
Fish	D
Birds	E/F
BIOTIC HEALTH	D/E
ESTUARY HEALTH	D

Largely modified – Category D

ESTUARY IMPORTANCE

HIGH

- Ramsar site
- Priority for Protection in National Estuary Biodiversity Plan
- High Estuarine Biodiversity Importance

REC: A!!!!

BUT

ATTAINABLE C

REC
D
B
C
B
B/C
D
C
B
C
D
D/E
C

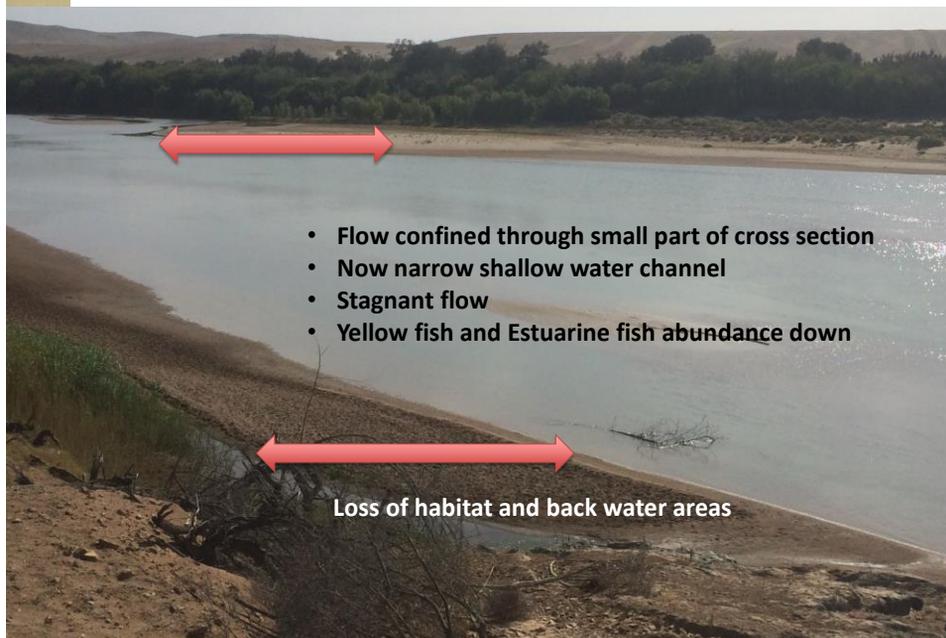
Moderately modified – Category C

Future Scenarios

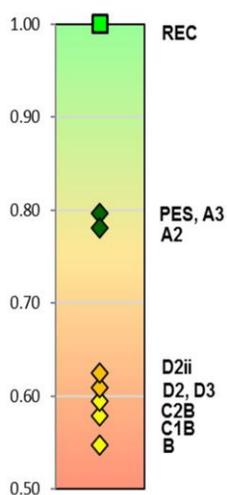
	REC	Present	A2	A3	B	C1B	C2B	D2	D3
Hydrology	D	D	D	D	E	D/E	D	D	D
Hydrodynamics	B	C	C	B	D	D/E	D/E	D/E	D/E
Water quality	C	D	C/D	C/D	D	D	C/D	D	D
Physical habitat	B	B/C	C/D	C/D	E	E	E	D/E	D/E
ABIOTIC HEALTH	B/C	C/D	C/D	C/D	D/E	D	D	D	D
Microalgae	D	D/E	D/E	D	E	E	E	E	E
Macrophytes	C	D	D	D	D/E	D/E	D/E	D/E	D
Invertebrates	B	D	D	D	E	E	D/E	D/E	D/E
Fish	C	D	D/E	D/E	E	E	E	E	E
Birds	D	E/F	E/F	E/F	E/F	E/F	E/F	E/F	E/F
BIOTIC HEALTH	D/E	D/E	D/E	D/E	E	E	E	E	E
ESTUARY HEALTH	C	D	D	D	E	E	E	D/E	D/E
Achieve REC?		x	x	x	x	x	x	x	x

Future scenarios don't achieve C Category

Emerging Concern – DAFF Oct 2016



ENVIRONMENTAL CONSEQUENCES: ESTUARY



A Scenarios = D Category (Sc A3 some improvement on PES - redistribution of flow)

D scenarios = D/E Category (12% decline)

B & C Scenarios = E Category (13 to 16% decline).

Ecological Recommendation:

- A3 preferred scenario
- D Scenarios - preferable dam development
- C Scenarios - barrier effect on large dam cannot be mitigated

D scenario must be further optimised to achieve the C/D

REMEDIAL ACTIONS NON-FLOW ESTUARY MANAGEMENT PLAN

TO IMPROVE HALF A CATEGORY, THE FOLLOWING NON-FLOW RELATED ACTIONS ARE REQUIRED

- Control fishing effort on SA & Namibian side through increased compliance and law enforcements. Alignment of the fishing regulations (size and bag limits).
- Remove remnant causeway that still transects the saltmarshes - improve circulation during high flow and floods.
- Decrease nutrient input from catchment downstream of Vioolsdrift, through improved agricultural practises.
- Control wind-blown dust & wastewater from mining.
- No grazing of saltmarshes (cattle & goats) & no hunting

THIS, WITH FLOW MITIGATION MEASURES, COULD ACHIEVE THE C REC.

REMEDIAL ACTIONS : FLOW

- Ensure mouth closure: Decrease flows below $< 2\text{m}^3/\text{s}$ for 1 - 2 months in winter 2 - 4 times in 10 years to allow for mouth closure and related back flooding of the saltmarshes
- **BUT flow can not be low for months on end → leads to flow going through only part of cross section → loss of habitat → loss of ecosystem function and loss of fisheries production (DAFF 2016 survey).**



FLOW REQUIREMENTS OF THE SEA???

Water flowing into to sea is not wasted!!!!

It provides:

- Queuing effects for nursery
- Sediment supply to beaches and nearshore habitat
- Nutrient supply

Orange is important for:

- Maintaining the northern beaches and somewhat off setting the impact of the mining activities on this coast.
- Biodiversity
- Flatfish which is bottom dwellers and dependant on the habitat for shelter.

21st Jan 2011

FLOW REQUIREMENTS OF THE SEA???



RECOMMENDATION: Flow requirements of the nearshore Orange Marine Environment (a declared Biologically Significant Marine Area (EBSA)) important. The impact of the proposed Vioolsdrift Dam development on the provision of sediments, organics, nutrients and freshwater fronts to the beaches and nearshore marine environment need to be quantified.

QUESTIONS FOR CLARIFICATION



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