Strengthening the ties between people, water and ecosystems through the restoration and management of ecological infrastructure

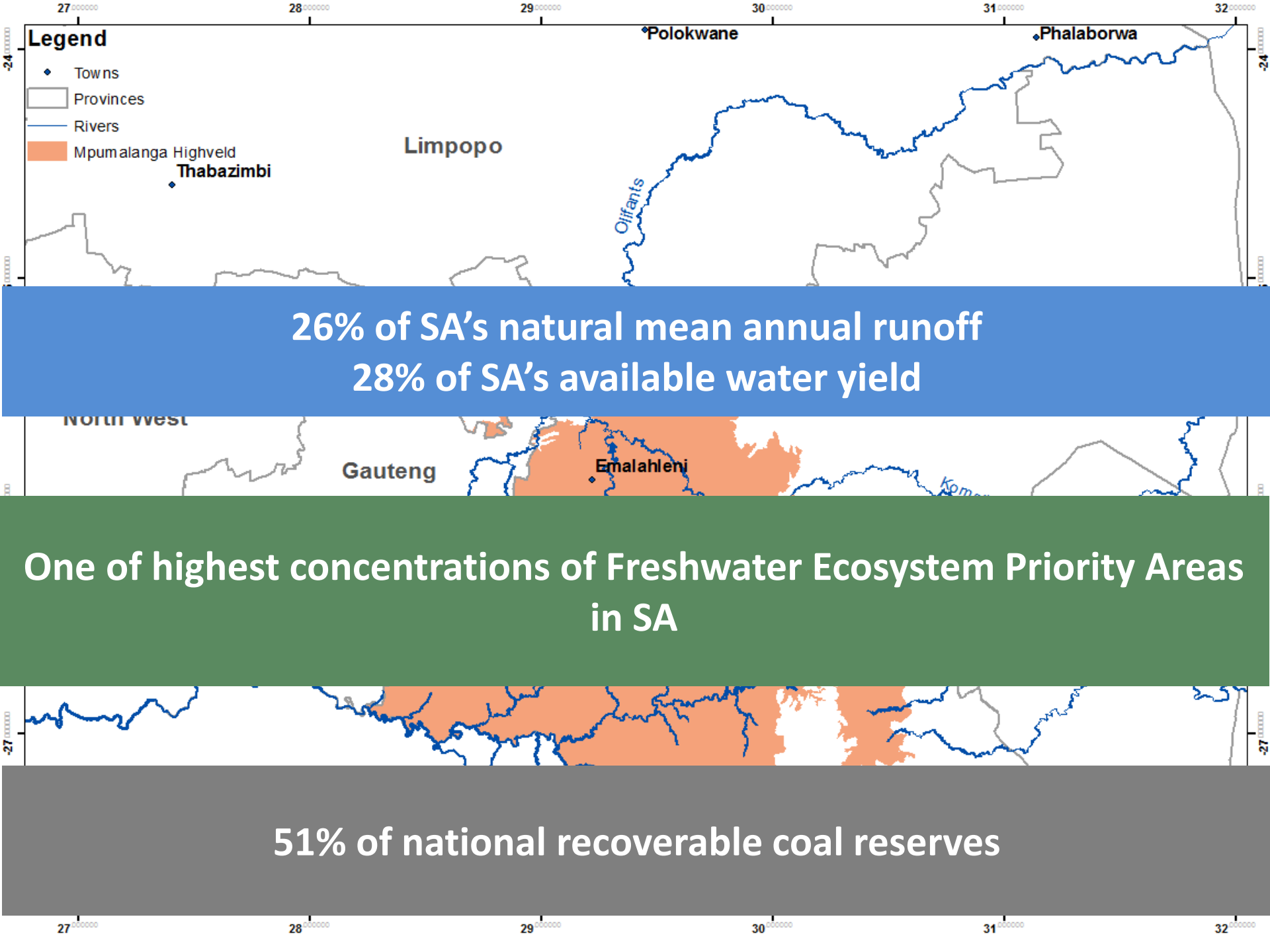
John Dini and Arno de Klerk

SANBI
Biodiversity for Life
South African National Biodiversity Institute

CSIR
our future through science

Ecological infrastructure =

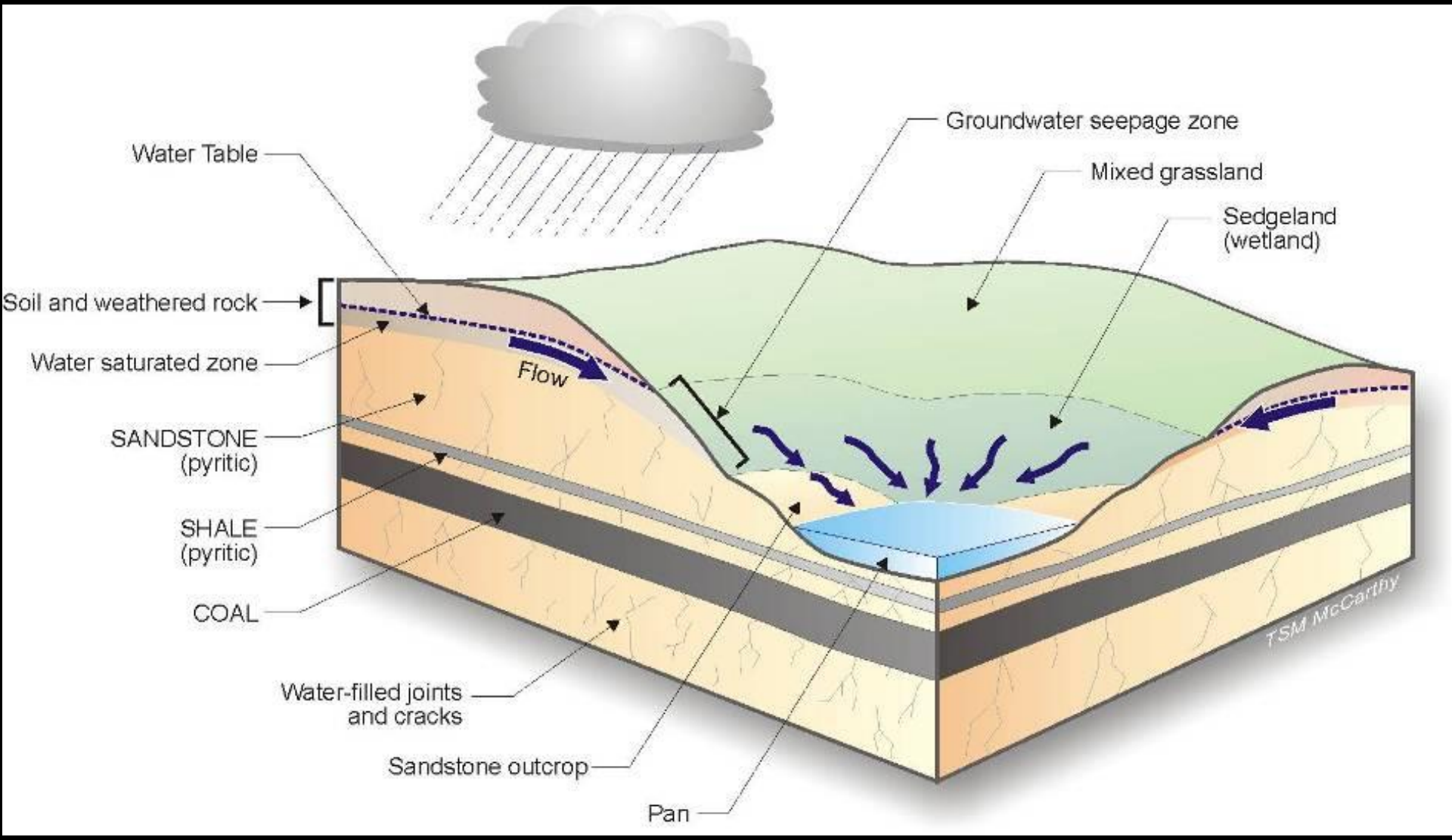
Naturally functioning ecosystems that generate and deliver valuable services to people



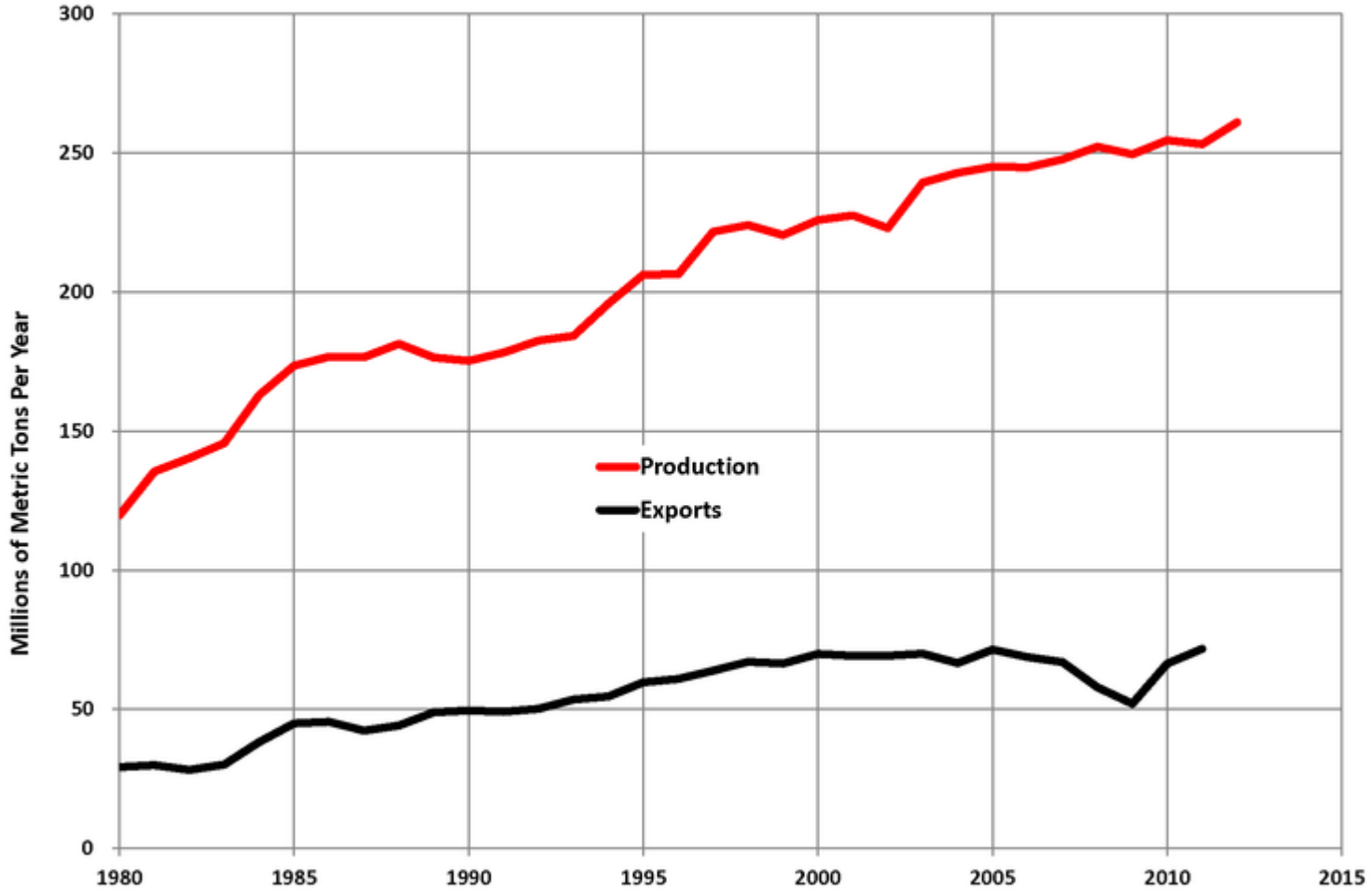
26% of SA's natural mean annual runoff
28% of SA's available water yield

One of highest concentrations of Freshwater Ecosystem Priority Areas in SA

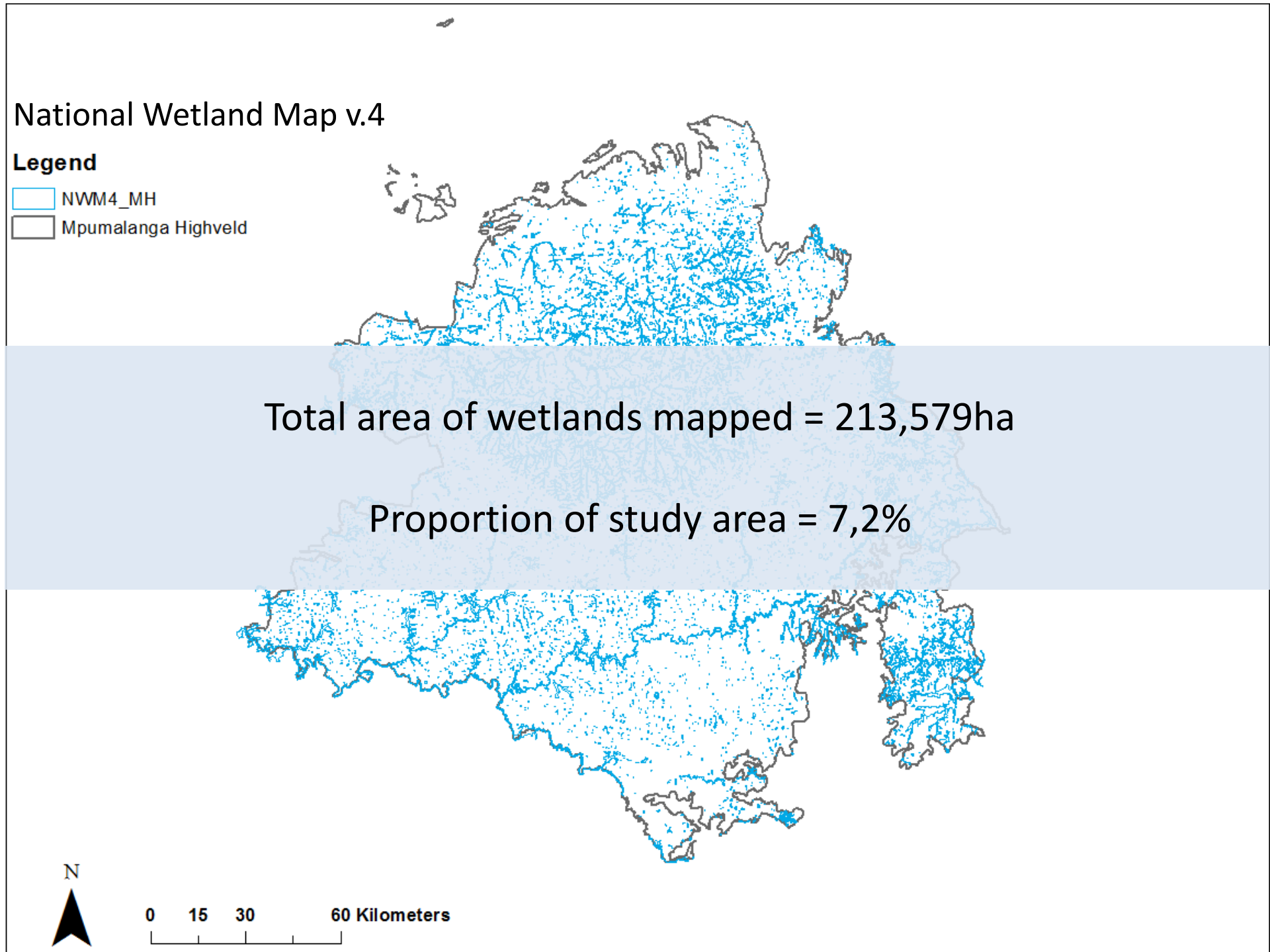
51% of national recoverable coal reserves


Water Table
Groundwater seepage zone
Mixed grassland
Sedgeland
(wetland)
Soil and weathered rock
Water saturated zone
Flow
SANDSTONE
(pyritic)
SHALE
(pyritic)
COAL
Water-filled joints
and cracks
Sandstone outcrop
Pan
TSM McCarthy

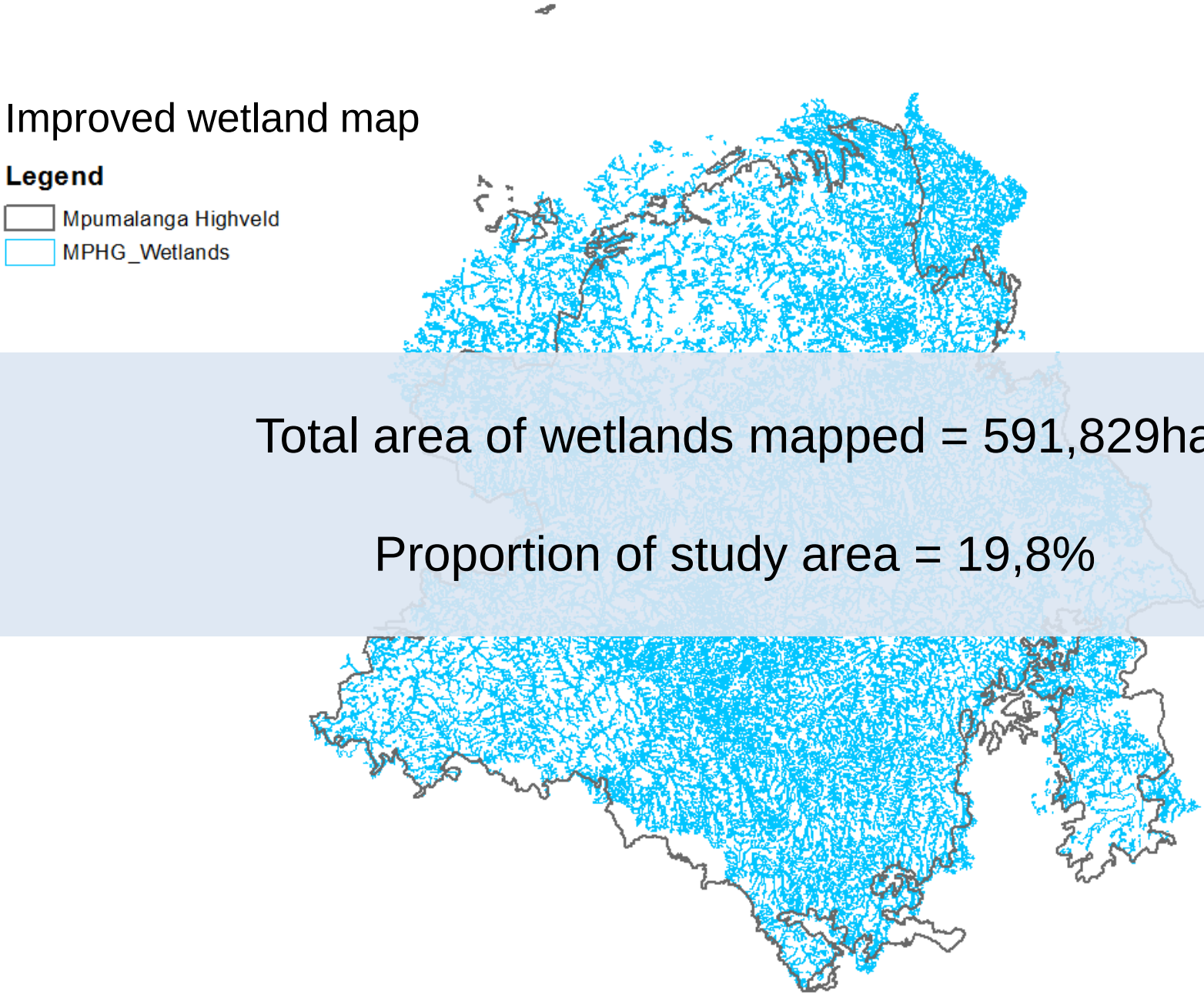
The end result...


Millions of Metric Tons Per Year
300
250
200
150
100
50
0
1980
1985
1990
1995
2000
2005
2010
2015
Production
Exports

Improving wetland spatial data in the Mpumalanga Highveld coal belt


National Wetland Map v.4
Legend
NWM4_MH
Mpumalanga Highveld
Total area of wetlands mapped = 213,579ha
Proportion of study area = 7,2%
N
0 15 30 60 Kilometers

Improved wetland map



Total area of wetlands mapped = 591,829ha

Proportion of study area = 19,8%

Limiting and mitigating the impact of coal mining on wetlands

Mining and Biodiversity Guideline

Mainstreaming biodiversity into the mining sector

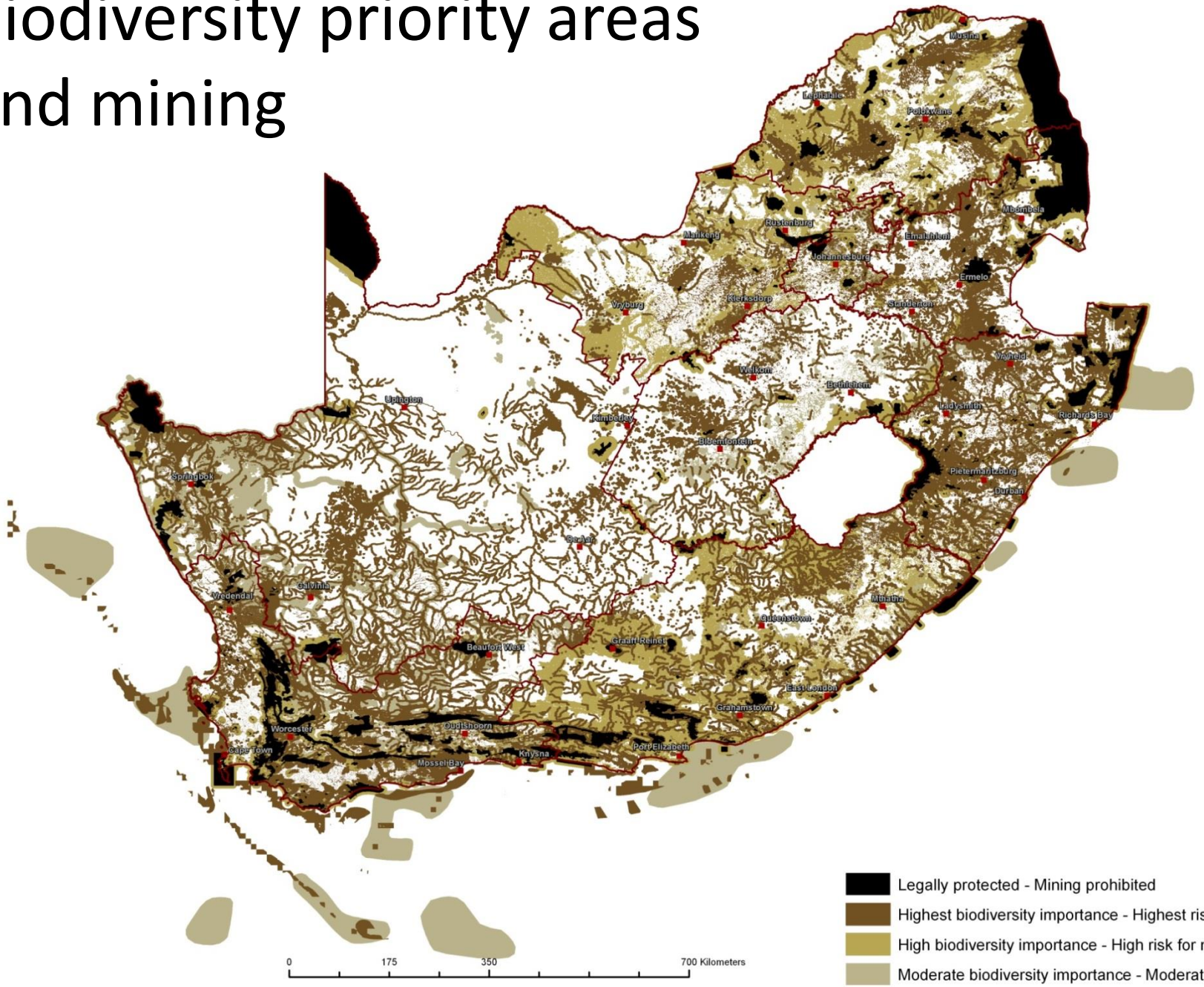
Environmental Affairs
Mineral Resources

CHAMBER OF MINES OF SOUTH AFRICA

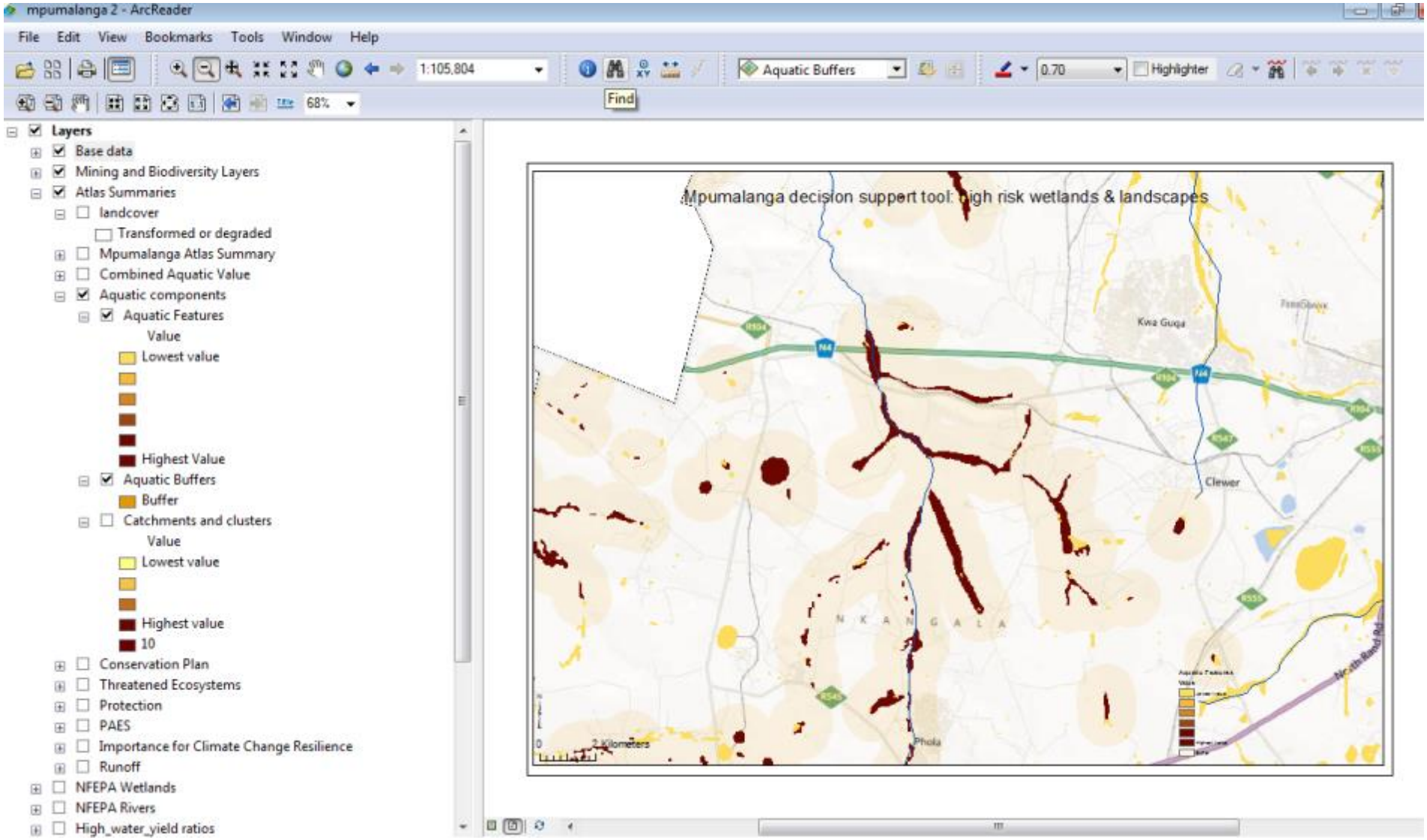
SANBI
Biodiversity for Life

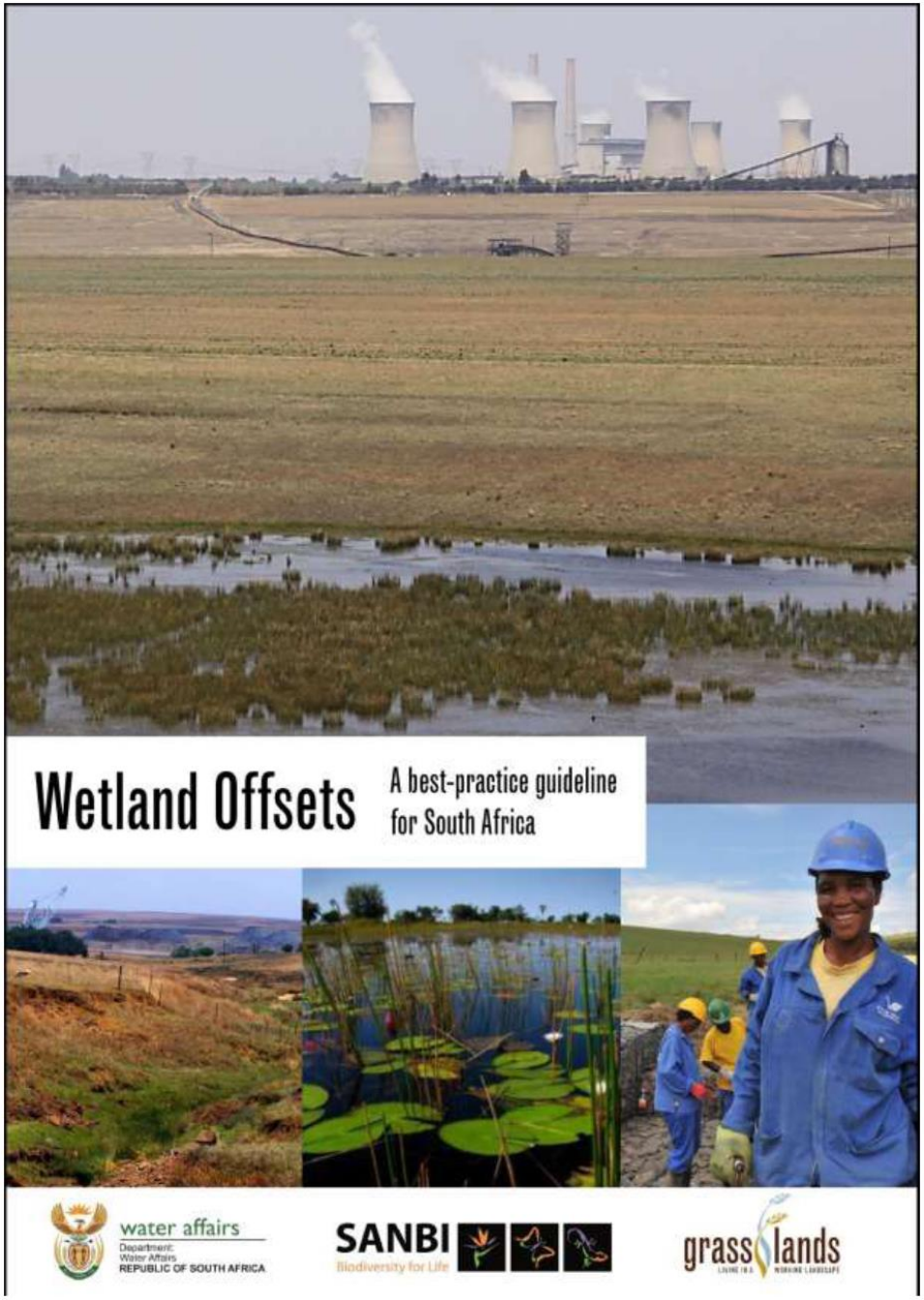
grasslands

Biodiversity priority areas and mining



Identification of high risk wetlands





Residual impact at development site

Gains at offset site

Water Resources & Ecosystem services

Habitat/ecosystem conservation

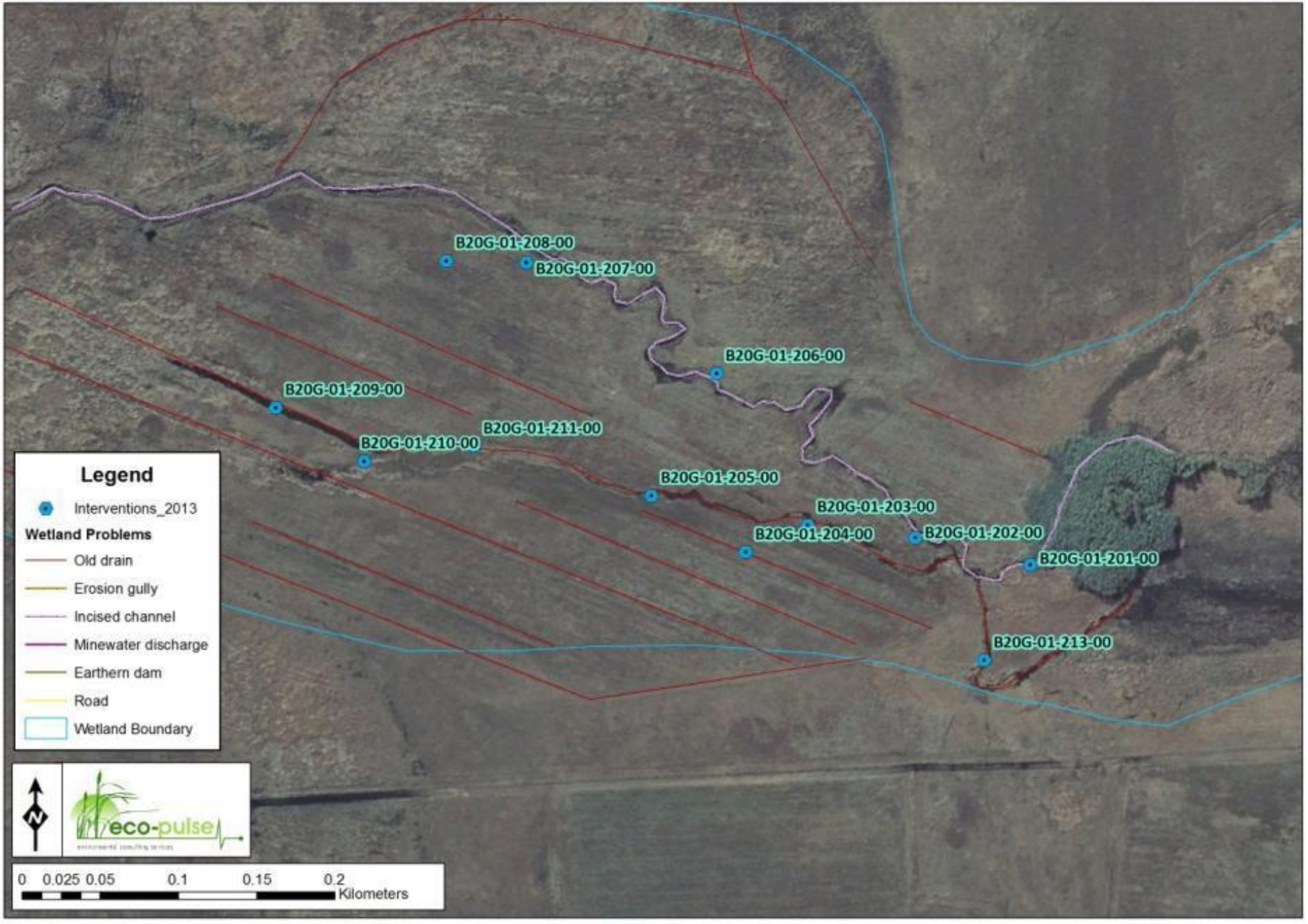
Species of conservation concern

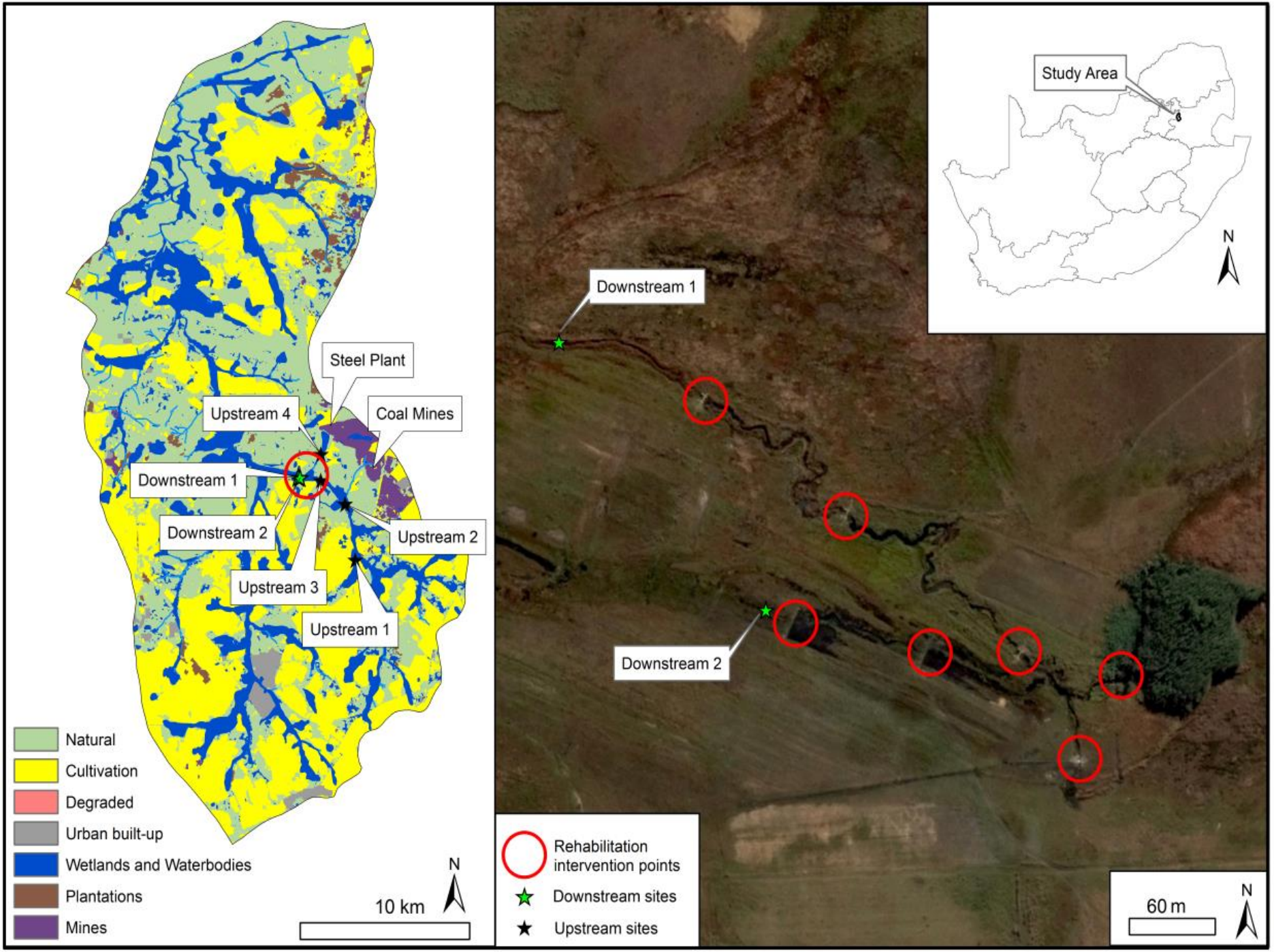
Water Resources & Ecosystem services:

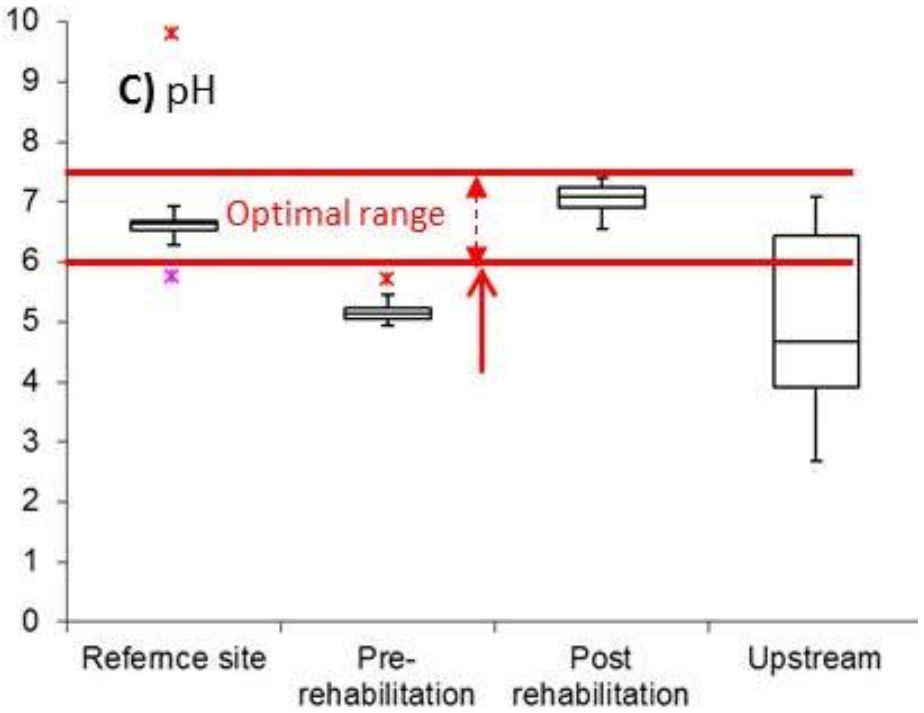
Habitat/ecosystem conservation

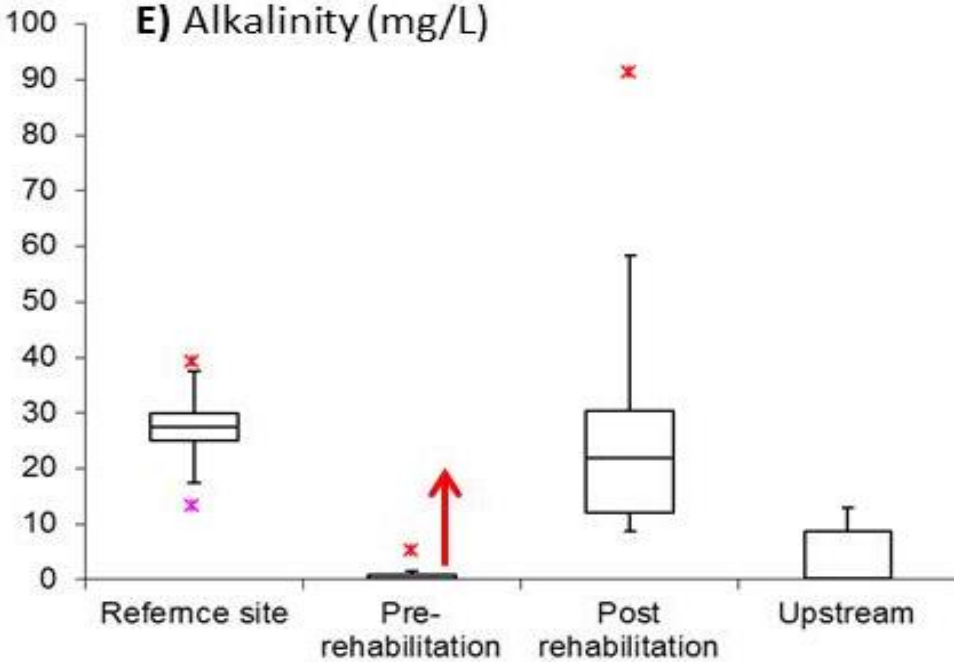
Species of conservation concern

Rehabilitation case study


B20G-01-208-00
B20G-01-207-00
B20G-01-206-00
B20G-01-209-00
B20G-01-211-00
B20G-01-210-00
B20G-01-205-00
B20G-01-203-00
B20G-01-204-00
B20G-01-202-00
B20G-01-201-00
B20G-01-213-00
Legend
Interventions_2013
Wetland Problems
Old drain
Erosion gully
Incised channel
Minewater discharge
Earthern dam
Road
Wetland Boundary
N
eco-pulse
0 0.025 0.05 0.1 0.15 0.2
Kilometers

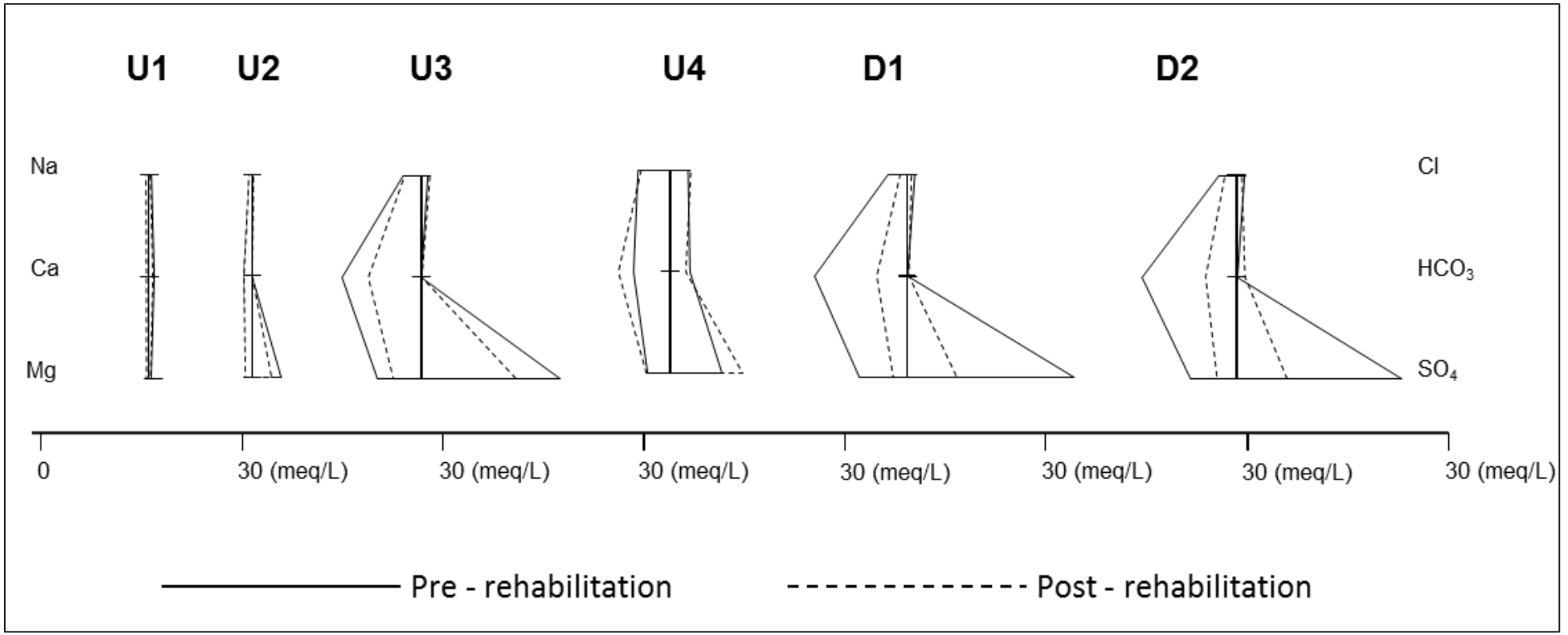

Steel Plant
Upstream 4
Coal Mines
Downstream 1
Downstream 2
Upstream 2
Upstream 3
Upstream 1
Natural
Cultivation
Degraded
Urban built-up
Wetlands and Waterbodies
Plantations
Mines
10 km
N
Study Area
N
Downstream 1
Downstream 2
Rehabilitation intervention points
Downstream sites
Upstream sites
60 m
N

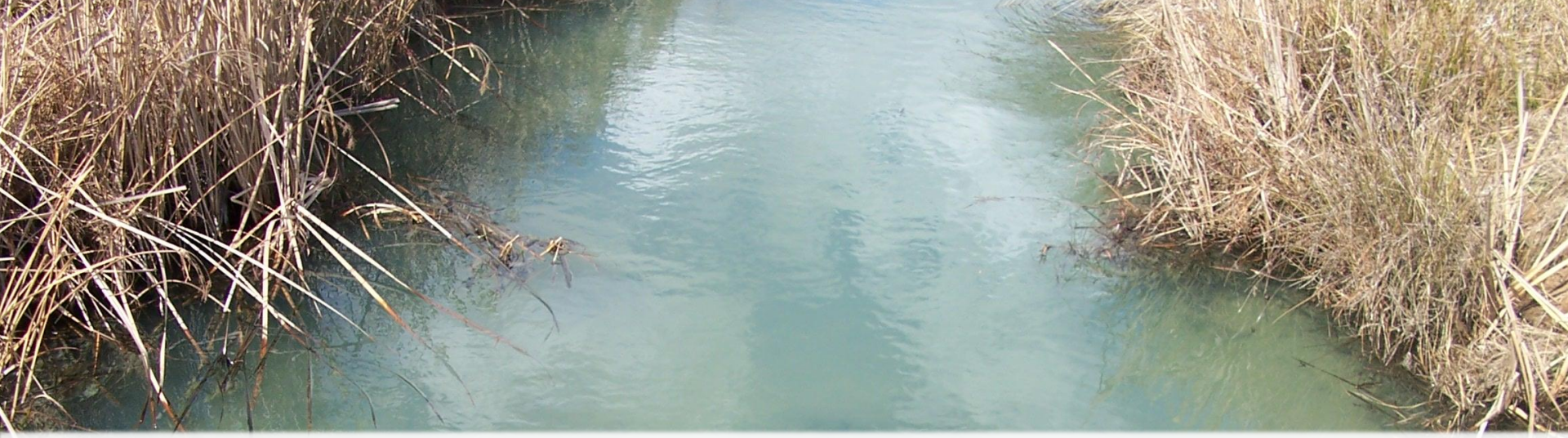

C) pH
Optimal range
10
9
8
7
6
5
4
3
2
1
0
Refernce site
Pre-rehabilitation
Post rehabilitation
Upstream


E) Alkalinity (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Refernce site
Pre-rehabilitation
Post rehabilitation
Upstream

Sulphate concentration ↓ by 65%

Total dissolved solids ↓ by 50%





Value of improved water quality enhancement service* =
R20 000 - R85 000/ha/annum or
R2.6 - R11.4 million per year.

Substantial return on the initial capital investment of
R1.7 million in rehabilitation

* Initial results

Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands

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WATER RESEARCH COMMISSION

TT 614/14