

Session 3: Functional Approach to Environmental-Economic Accounting

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Forum of Experts in SEEA EEA

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The South Africa I know, the home I understand



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA



United Nations
Statistics Division



Convention on
Biological Diversity



NORWEGIAN MINISTRY
OF FOREIGN AFFAIRS

Overview

- Functional Ecosystem Units
 - Great concept
 - Need not rely on detailed phyto-sociological data
- Linking FEUs to ecosystem services
- Ecological condition and ecosystem services

Functional Ecosystem Units (FEUs)

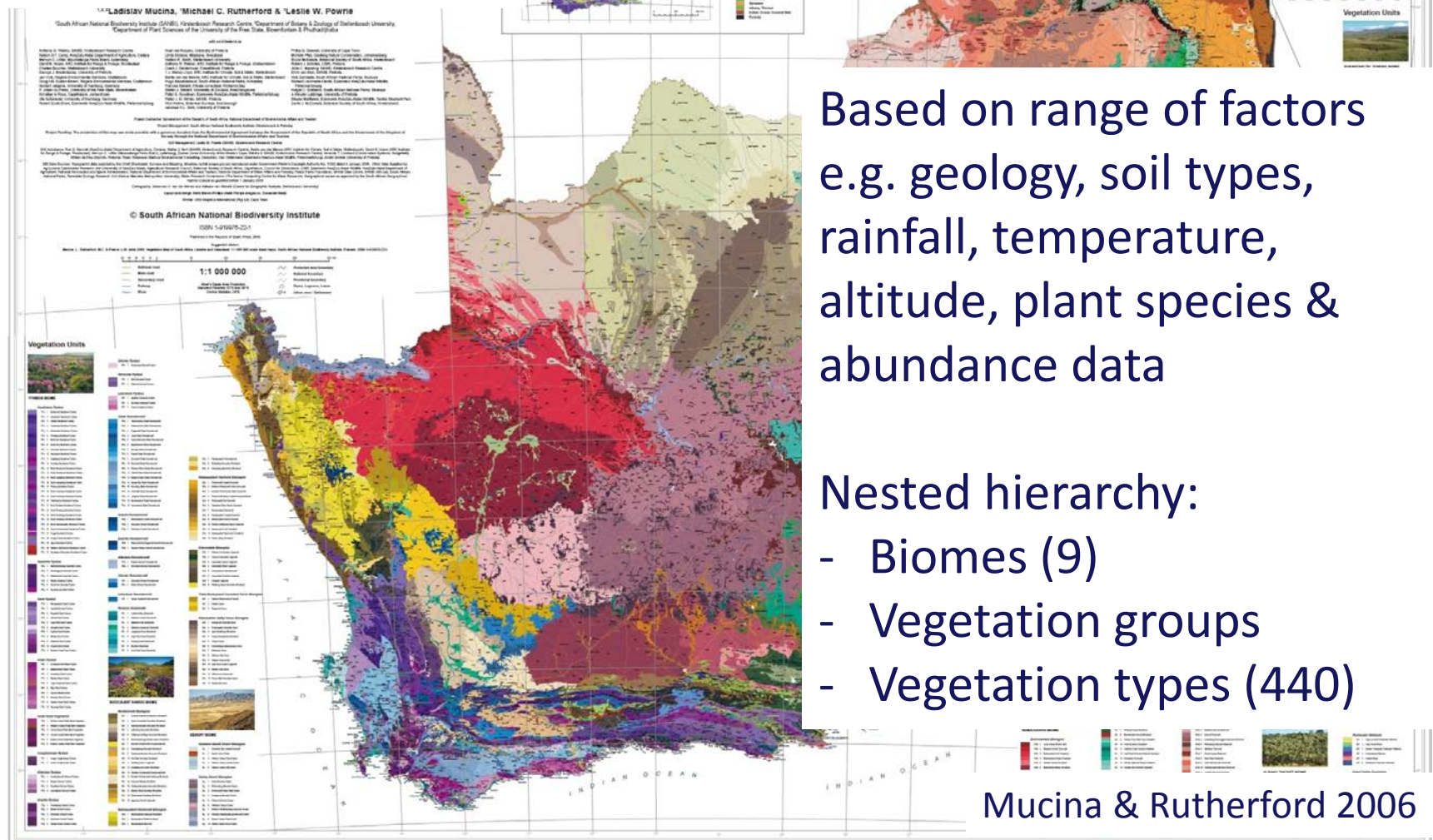
- Agree fully that we need ecosystem units that are classified and delineated based on ecological principles
- These units represent our ecosystem assets
- LCEUs as currently conceptualised do not play this role effectively
- Need to break natural land cover classes into ecologically meaningful units (finer than e.g. “shrubland”, “grassland”)
- For non-natural land cover classes, helps to know the original/potential/pre-development ecosystem type

- “Ecosystems of the same type are expected to share broadly similar ecological characteristics and functioning. This allows for ‘rules’ to be set up for ecological models that apply to individual ecosystem types or groups of ecosystem types.”

From SANBI 2013 **Concept Note on National Ecosystem Classification System**

Example of FEUs from South Africa

440 vegetation types
– terrestrial FEUs



Based on range of factors
e.g. geology, soil types,
rainfall, temperature,
altitude, plant species &
abundance data

Nested hierarchy:

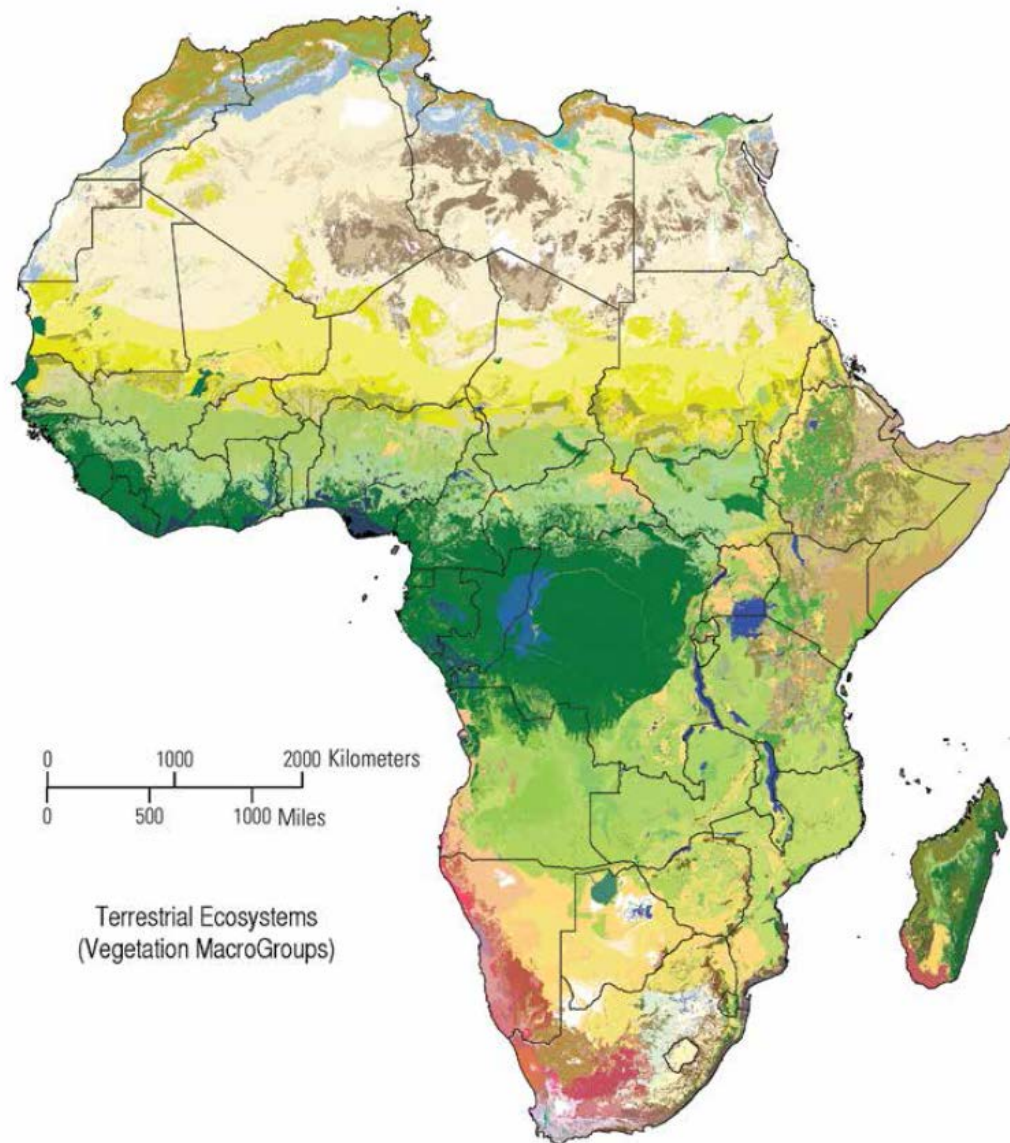
- Biomes (9)
- Vegetation groups
- Vegetation types (440)

Mucina & Rutherford 2006

- Mapping and classifying FEUs need not require detailed phyto-sociological data from the field

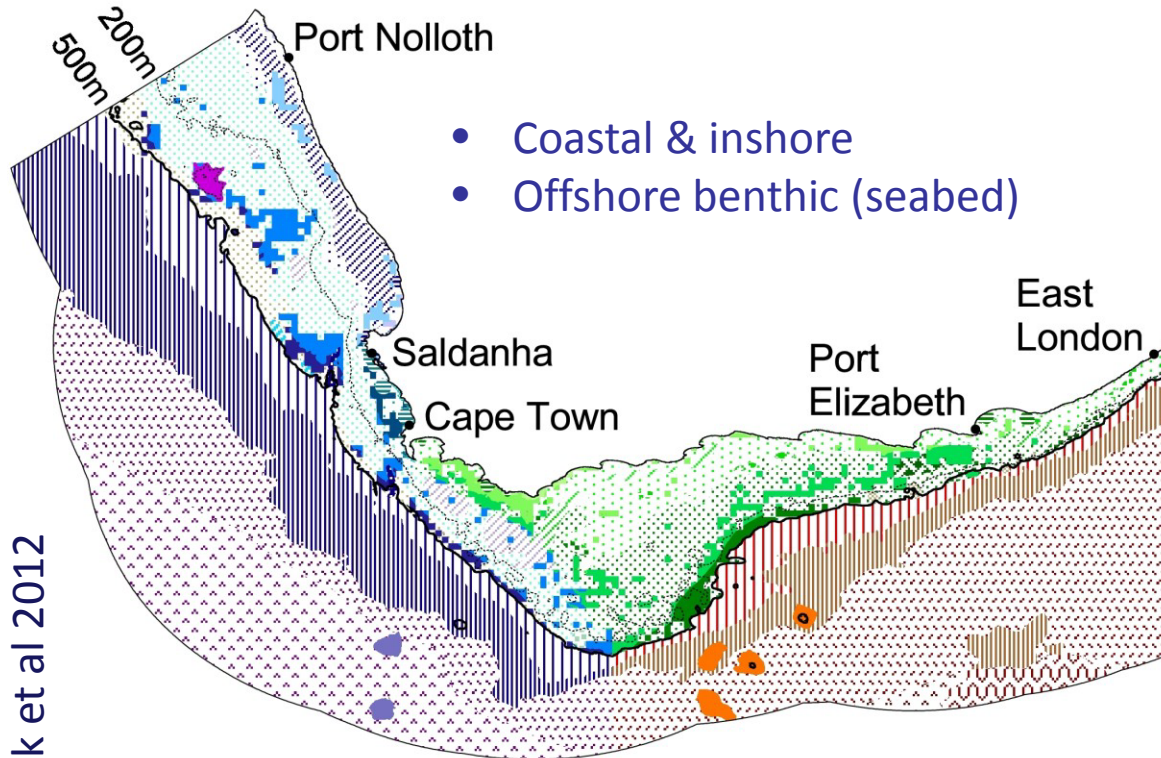
Standardized terrestrial ecosystems of Africa

Sayre et al 2013

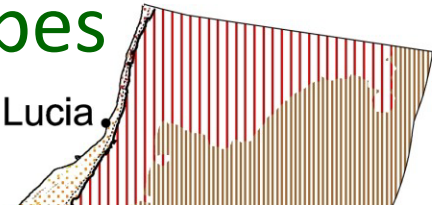


- Based on biophysical data layers e.g. landforms, lithology, temperature, rainfall, phyto-geographic regions
- Modelled using multiple regression analyses
- Scale 90m

South African marine & coastal habitat types



St Lucia



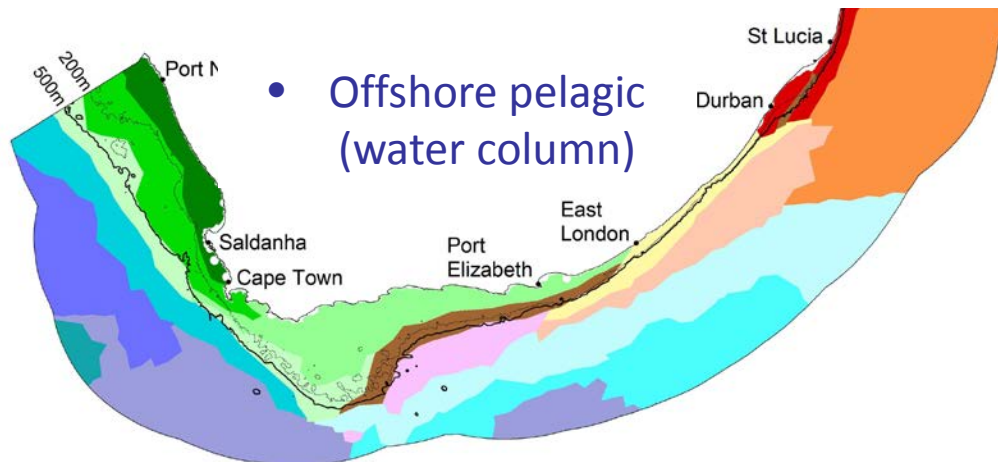
Coastal & inshore types based on:

- substrate and grain size
- wave exposure
- biogeography

Offshore benthic types based on:

- depth and slope
- substrate (e.g. hard or unconsolidated)
- geology (e.g. sandy, muddy, gravel, reef)
- biogeography

Sink et al 2012



Offshore pelagic types based on:

- sea surface temperature
- primary productivity & chlorophyll content
- depth
- turbidity
- frequency of eddies

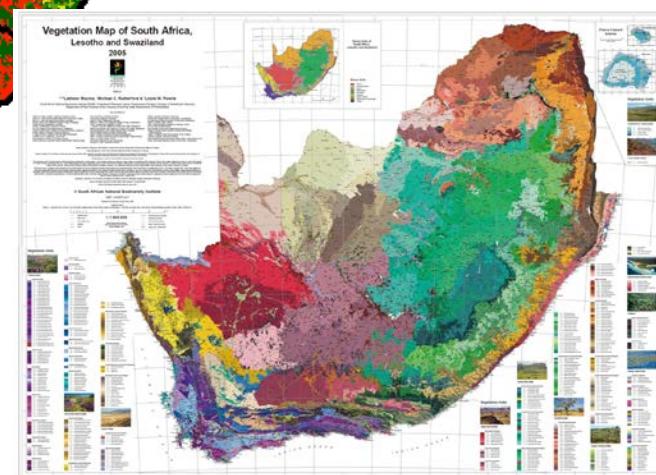
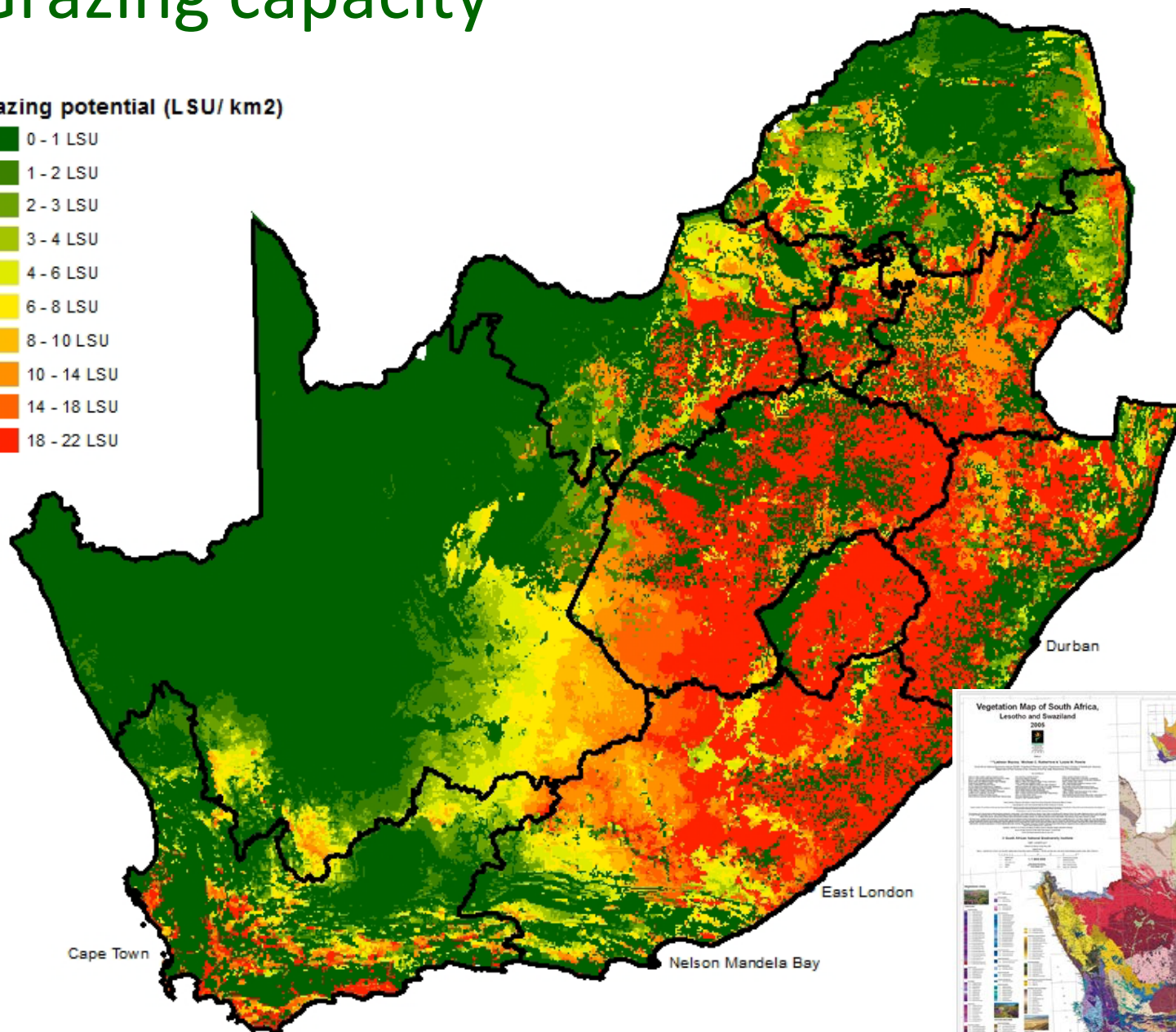
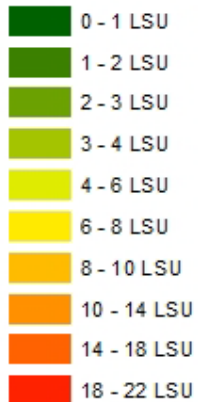
Approaches to classifying and mapping ecosystem types / FEUs

- “Top-down” approaches that use environmental variables as proxies
- “Bottom-up” approaches that use site-specific field data
- Combinations of these
- Ecosystem classification systems can focus on structural aspects or functional aspects, or a combination
- Ideally hierarchical (rather than single-level)

Linking FEUs to ecosystem services

Grazing capacity

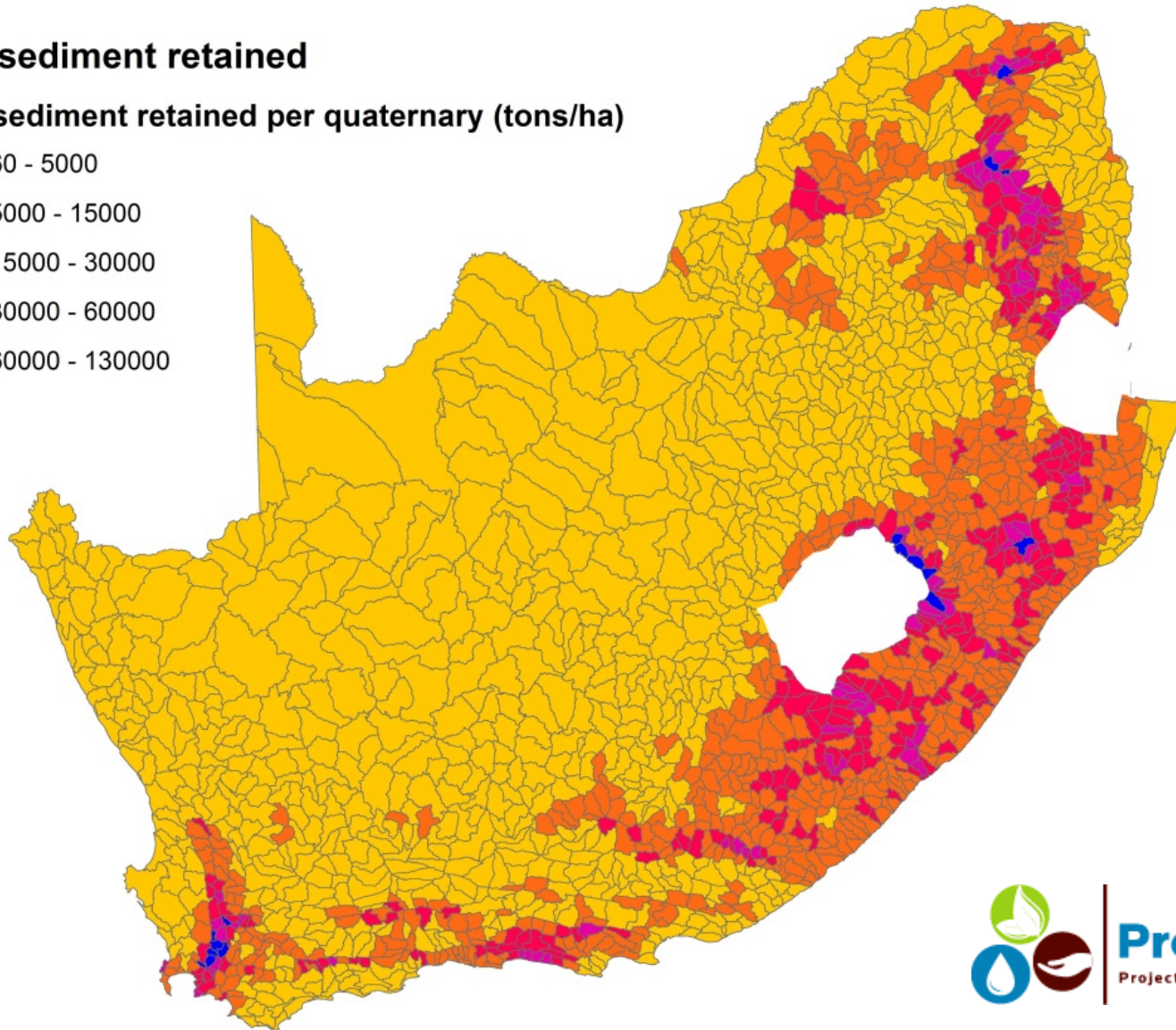
Grazing potential (LSU/ km2)



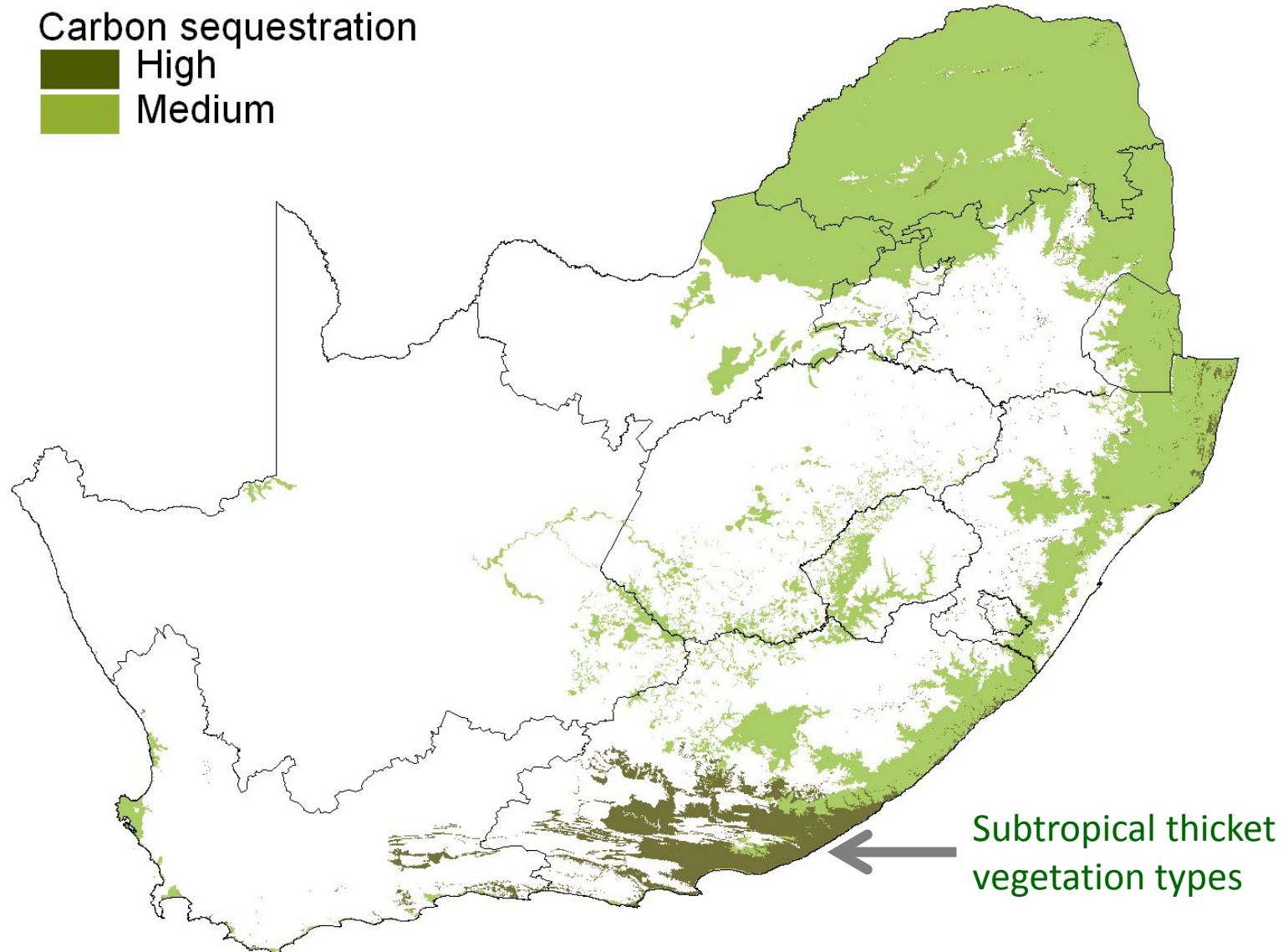
Sediment retention in the landscape

Total sediment retained

Mean sediment retained per quaternary (tons/ha)

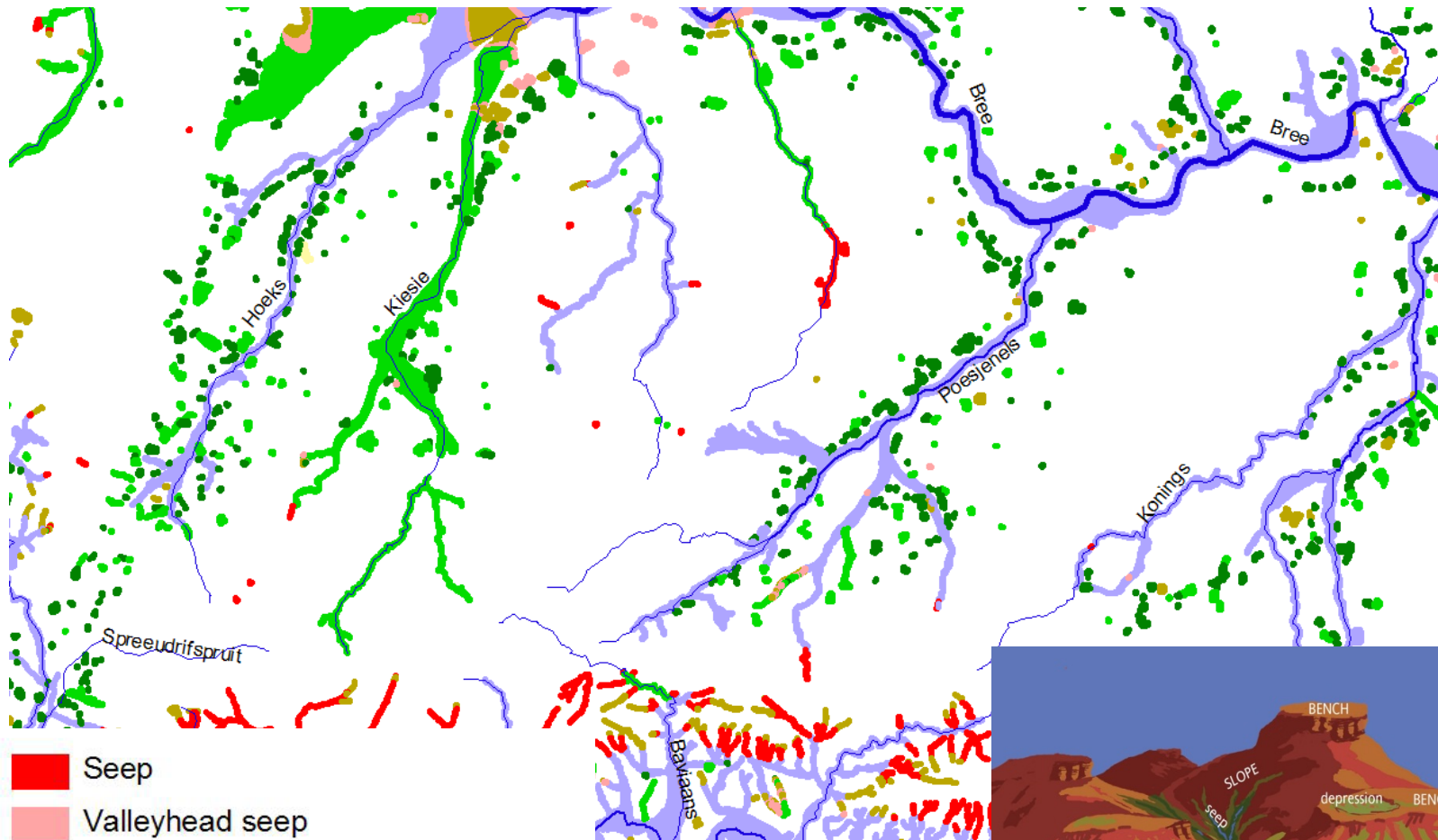


Carbon sequestration



From National Spatial Biodiversity Assessment 2004

Wetland hydro-geomorphic types



- Seep
- Valleyhead seep
- Unchannelled valley-bottom wetland
- Channelled valley-bottom wetland
- Floodplain wetland
- Depression
- Flat

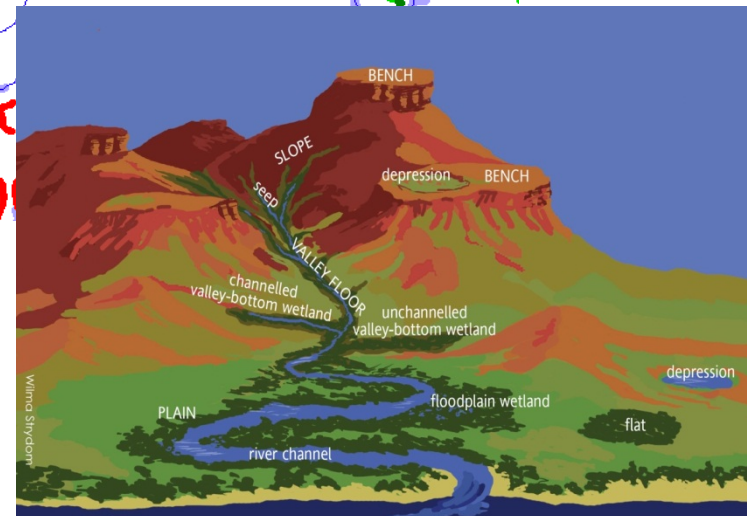


Table 9: Rating of the hydrological functions likely to be performed by a wetland given its particular hydrogeomorphic type (Kotze *et al.*, 2005).

WETLAND HYDRO- GEOMORPHIC TYPE	HYDROLOGICAL FUNCTIONS POTENTIALLY PERFORMED BY THE WETLAND								
	Flood attenuation		Stream flow augmentation		Erosion control	Enhancement of water quality			
	Early wet season	Late wet season	Early wet season	Late wet season		Sediment trapping	Phos- phates	Nitrates	Toxicants ¹
1. Floodplain	++	+	0	0	++	++	++	+	+
2. Valley bottom – channelled	+	0	0	0	++	+	+	+	+
3. Valley bottom – unchanneled	+	+	++?	++?	++	++	+	+	++
4. Hillslope seepage feeding a stream channel	+	0	+	+	++	0	0	++	++
5. Hillslope seepage not feeding a stream	+	0	0	0	++	0	0	++	+
7. Pan/ Depression	+	+	0	0	0	0	0	+	+

Note: ¹Toxicants are taken to include heavy metals and biocides

Rating: 0 Function unlikely to be performed to any significant extent
 + Function likely to be present at least to some degree
 ++ Function very likely to be present (and often performed to a high level)

Ecosystem condition & ecosystem services

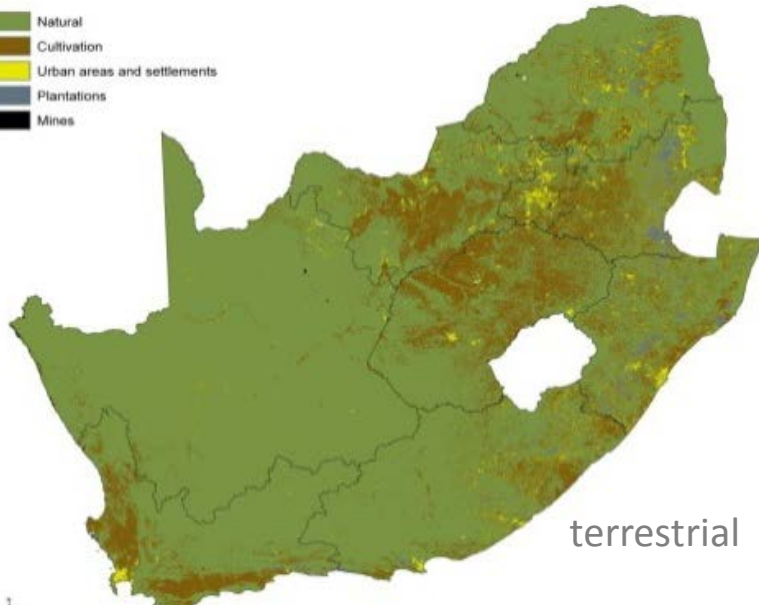
- Provisioning services – often inversely related to ecosystem condition
 - Water abstraction ↑ – condition of river ↓
 - Harvesting of fish ↑ – condition of marine ecosystem ↓
 - Overgrazing ↑ – condition of terrestrial ecosystem ↓
- Regulating services – often positively related to ecosystem condition
 - Many regulating services require the ecosystem to be in at least fair condition – ecological functioning intact

Ecosystem condition categories

- Simplest level: Good/Fair/Poor
- Based on degree of modification from natural reference condition
- Often using land cover as a proxy or key indicator of condition
 - e.g. for river reaches: proportion of natural land cover within the riparian zone and sub-catchment
 - e.g. for wetlands: proportion of natural land cover in and around the wetland
 - e.g. for terrestrial ecosystems: natural vegetation irreversibly modified

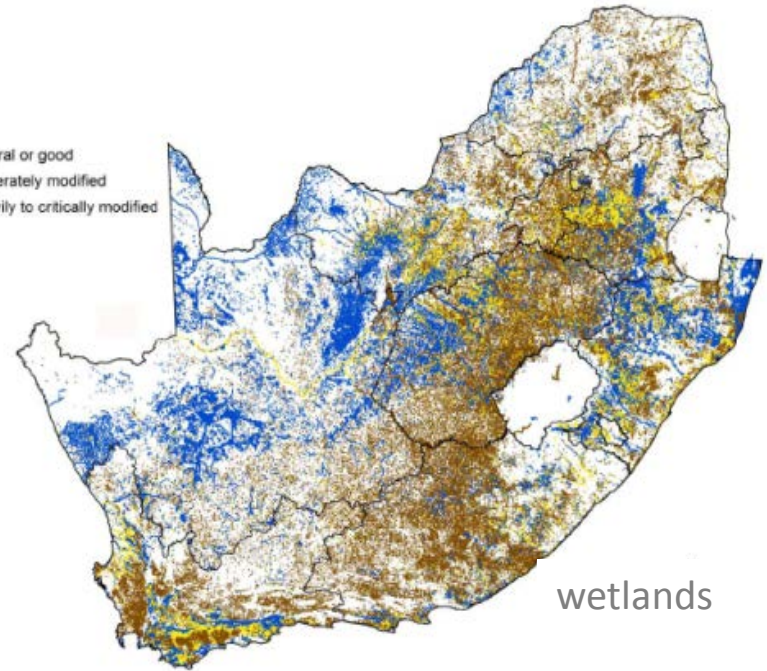
Maps of ecological condition

- Natural
- Cultivation
- Urban areas and settlements
- Plantations
- Mines



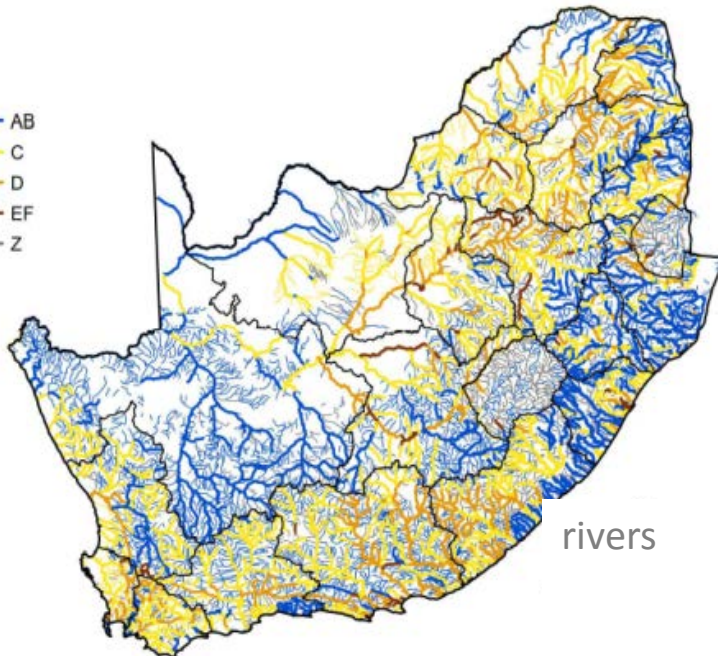
terrestrial

- Natural or good
- Moderately modified
- Heavily to critically modified



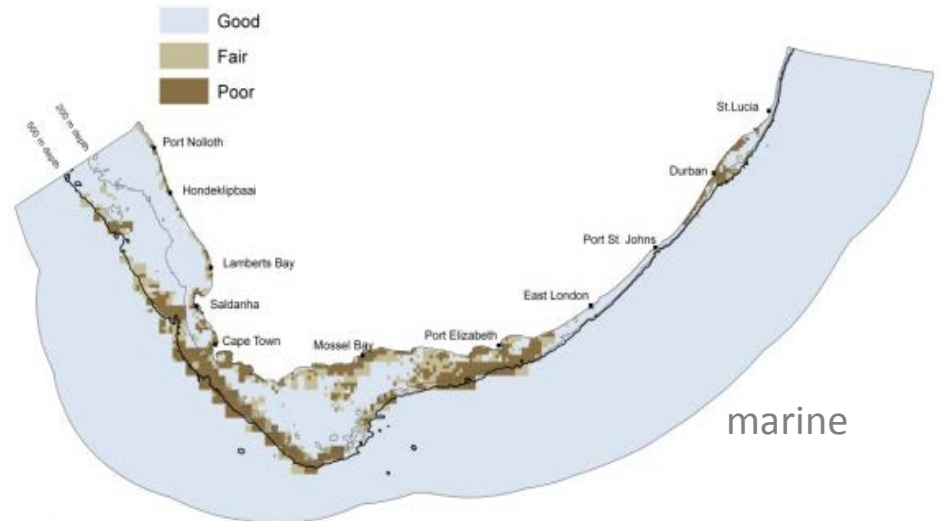
wetlands

- AB
- C
- D
- EF
- Z



rivers

- Good
- Fair
- Poor



marine