

# Shale Gas SEA: a systematic spatial approach

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# The challenge

“I am not convinced that a systematic conservation planning approach is the only, or best approach to this problem. Efficiency is not the goal.” Bob Scholes

# What is the problem? (1)



- Where is the critical biodiversity?
- Where is the stuff moderately important stuff and the stuff that can be lost?
- High choice environment
  - 2-3% transformed and few known key sites
- Reasonable number of important species and features
- Critical processes esp. aquatic

## What is the problem? (2)



- Probably not likely, but there is potential for landscape level change
- Potential for system changing ecological impacts (e.g. trophic cascades through impact keystone species)
- Much of the important biodiversity is sensitive to fragmentation
- A lot is poorly known

High choice & basically intact

- But poor knowledge



New large scale impact

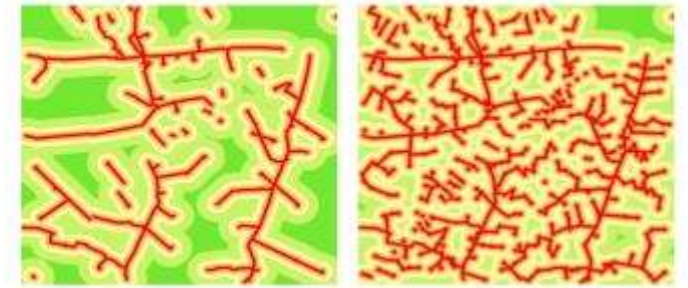
- Potentially game changing
- Major unknowns i.t.o. impact
- Can't extrapolate from current threat levels



The next grasslands??


- Fragmented
- Not properly protected & few good opportunities
- Death by a thousand cuts

Or could we be a bit more strategic and protect enough of the Karoo in a sustainable configuration that ensures long term persistence?



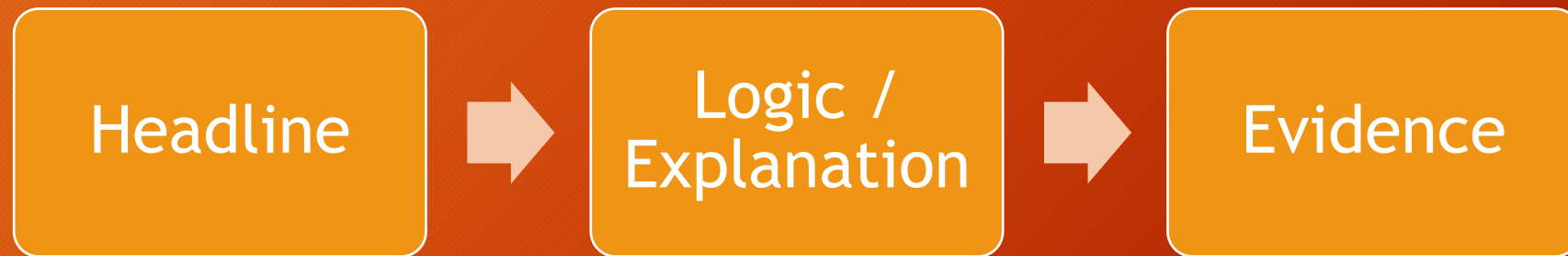
# The challenge

- My position:
  - An SCP approach is definitely not the only approach, but I will argue that in many circumstances (e.g. the Karoo) it is the best as it can deal with choice
  - Efficiency is not the only goal, but one of a few:
    - Representation & Persistence of all biodiversity
    - Ecological processes & Connectivity
    - Efficiency & Conflict avoidance

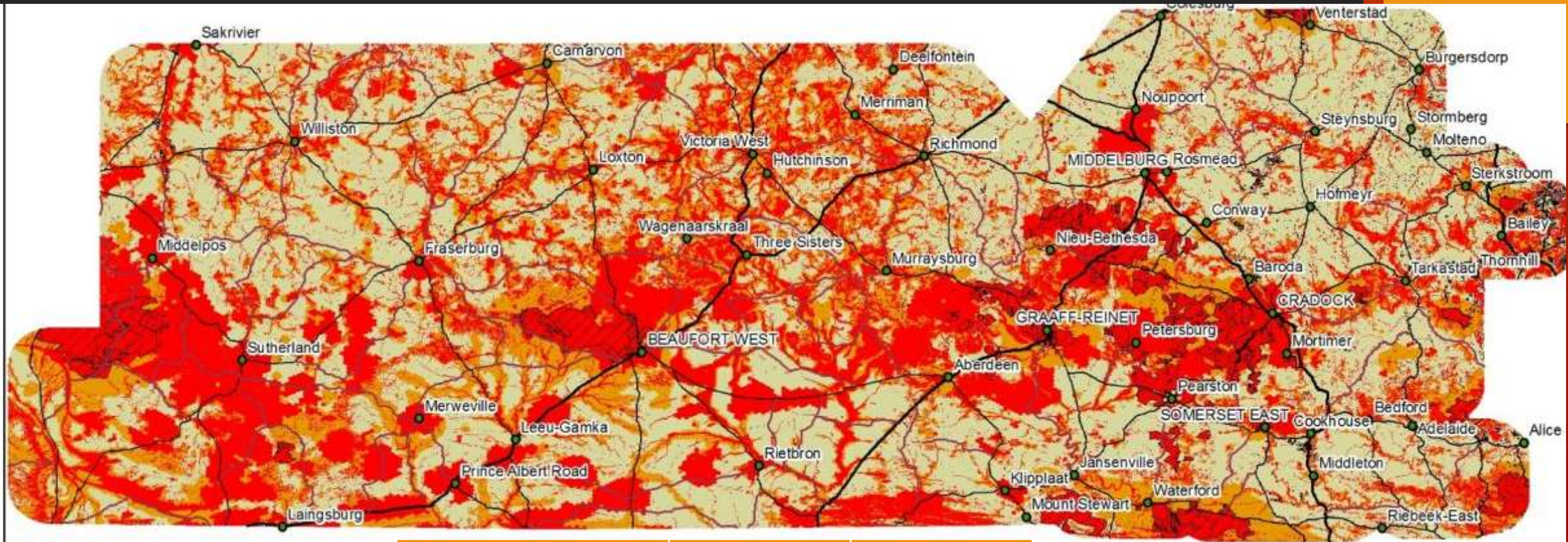


Surely this is the basket of stuff we want to strategically secure?

We usually end with a map...but lets start with one



# Ecologically important and sensitive areas



	Extent (Hectares)	Extent (%)
Very High - existing protected areas	810226	5
Very High - not currently protected	5161678	30
High	3487973	20
Medium-Low	7565897	44
Low	155364	1
<b>Total</b>	<b>17181138</b>	<b>100</b>



# 4 categories

## Very High ecological importance

- Unique habitats and critical areas that serve as key habitat for rare, endemic and endangered species, or perform critical ecological functions.
- These sites are irreplaceable (i.e. no alternatives exist and there is no exchangeability between sites).
- Impacts in these areas would undermine the ecological integrity of the Karoo.
- Ideally these areas should be secured through appropriate zoning, development controls, and protected area expansion through stewardship and other mechanisms.

## High ecological importance

- Natural areas with a high biodiversity value, sensitivity or important ecological role in terms of ecological processes or ecosystem services/service/process.
- These areas represent the optimal configuration for securing the ecosystems, species and ecological processes of the Karoo.
- Impacts in these areas is undesirable, and any impact would need to be offset and alternative areas identified to secure the same suite of biodiversity features that were impacted.

# 4 categories

## Moderate to Low ecological importance

- Other natural and semi-natural landscapes without specifically identified important features or sensitivities.
- For aquatic systems they play an insignificant ecological role in moderating the quality and quantity of water in the region.
- So long as the Very High and High Importance sites had been secured, loss in the Moderate-Low Importance sites should not compromise our ability to meet biodiversity targets in the Karoo.
- However, if any impacts occur in High Importance areas, additional areas from this category may be needed as alternative sites.

## Very Low ecological importance

- These are areas that are not intact and are not supporting some other important ecological need, e.g. urban, larger scale highly degraded areas, large arable intensively farmed lands.
- So long as impacts are limited to these sites there should be minimal biodiversity loss associated with activities on these sites.

Impact	Location	Scenario	Without mitigation			With mitigation		
			Impact	Likelihood	Risk	Impact	Likelihood	Risk
Ecological and biodiversity impacts	In Very High areas	Baseline (S1)	Slight	Likely	Very low risk	Slight	Likely	Very low risk
		Exploration (S2)	Severe	Very likely	High risk	Moderate	Likely	Low risk
		Low (S3)	Extreme	Very likely	Very high risk	Extreme	Very likely	Very high risk
		High (S4)	Extreme	Very likely	Very high risk	Extreme	Very likely	Very high risk
	In High areas	Baseline (S1)	Slight	Likely	Very low risk	Slight	Likely	Very low risk
		Exploration (S2)	Moderate	Likely	Low risk	Slight	Likely	Very low risk
		Low (S3)	Severe	Very likely	High risk	Moderate	Very likely	Low risk
		High (S4)	Extreme	Very likely	Very high risk	Severe	Very likely	High risk
	In Medium-Low areas	Baseline (S1)	Slight	Likely	Very low risk	Slight	Likely	Very low risk
		Exploration (S2)	Slight	Likely	Very low risk	Slight	Likely	Very low risk
		Low (S3)	Moderate	Likely	Low risk	Slight	Likely	Very low risk
		High (S4)	Substantial	Very likely	Moderate risk	Slight	Very likely	Very low risk
	In Very Low areas	Baseline (S1)	Slight	Extremely unlikely	Very low risk	Slight	Extremely unlikely	Very low risk
		Exploration (S2)	Slight	Extremely unlikely	Very low risk	Slight	Extremely unlikely	Very low risk
		Low (S3)	Slight	Very unlikely	Very low risk	Slight	Very unlikely	Very low risk
		High (S4)	Moderate	Very unlikely	Low risk	Slight	Very unlikely	Very low risk

# Protected areas & buffers



- 5 national parks (Karoo, Tankwa Karoo, Mountain Zebra, Camdeboo and Addo Elephant National Parks)
- 17 nature reserves (Commandodrift, Oviston, Somerset East and Tsolwana etc)
- Three Protected Environments (Compassberg, Noorsveld, and the newly declared Mountain Zebra-Camdeboo Protected Environment)

# Habitats



- Existing one not good enough
- Veg map, landtypes, catchments to give a habitat proxy
- The map includes 350 distinctive habitat types and 7047 separate mapped units.
- Targets for each type set linked to national targets
- Also used for species

# Aquatic features



- Rivers, wetlands and springs
- Improved mapping
- Buffers based on type, threat status, FEPA etc.
- 100% target



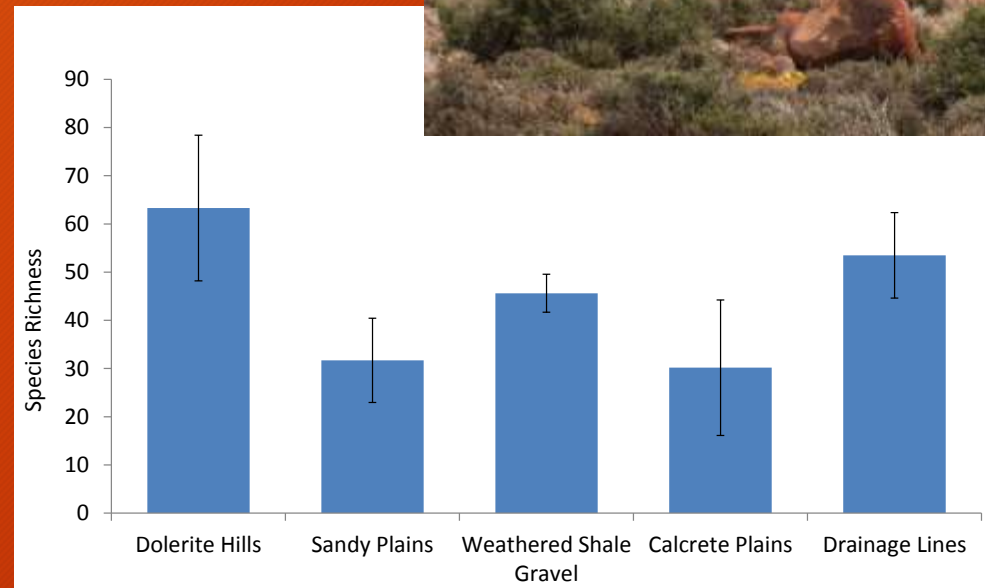
# Threatened and endemic species

- Major mapping exercise
- 119 priority plant species
- 11 threatened animal species plus more of interest
- Occurrence sites plus priority habitat
  - Specific sites important for threatened species and for range-restricted endemic or near-endemic species
  - Too much to explain now



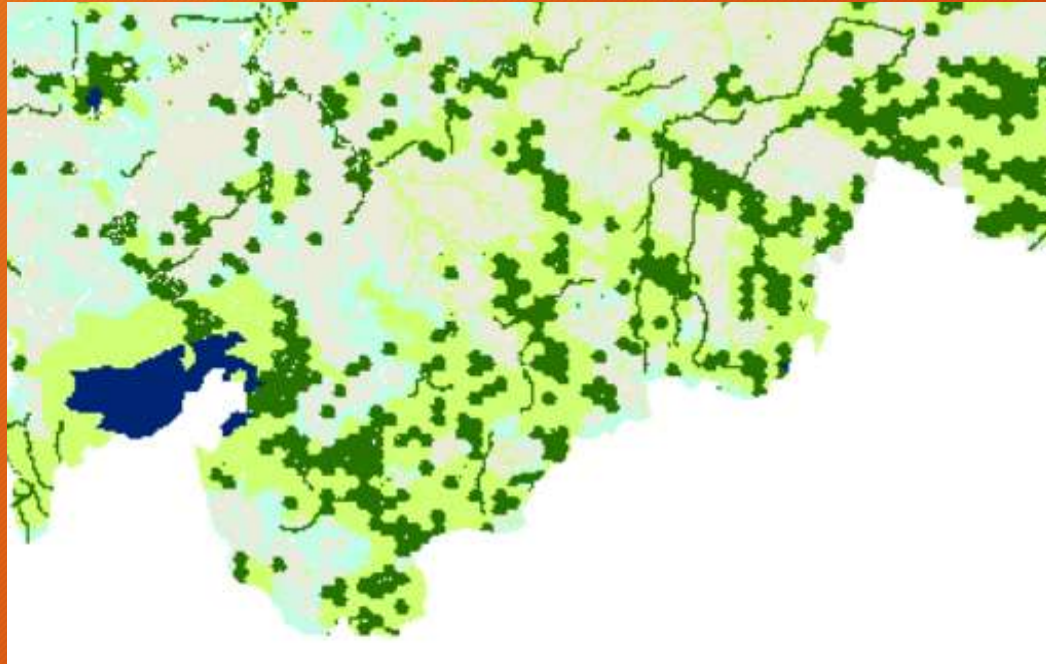
# Special habitats

- Special habitats
  - rocky outcrops
  - koppies
  - dolerite dykes
  - boulder fields
  - woody vegetation on outwash plains
- Critical habitat for many threatened species and often support key local ecological processes
- Backscatter from synthetic aperture radar





# CBAs etc.



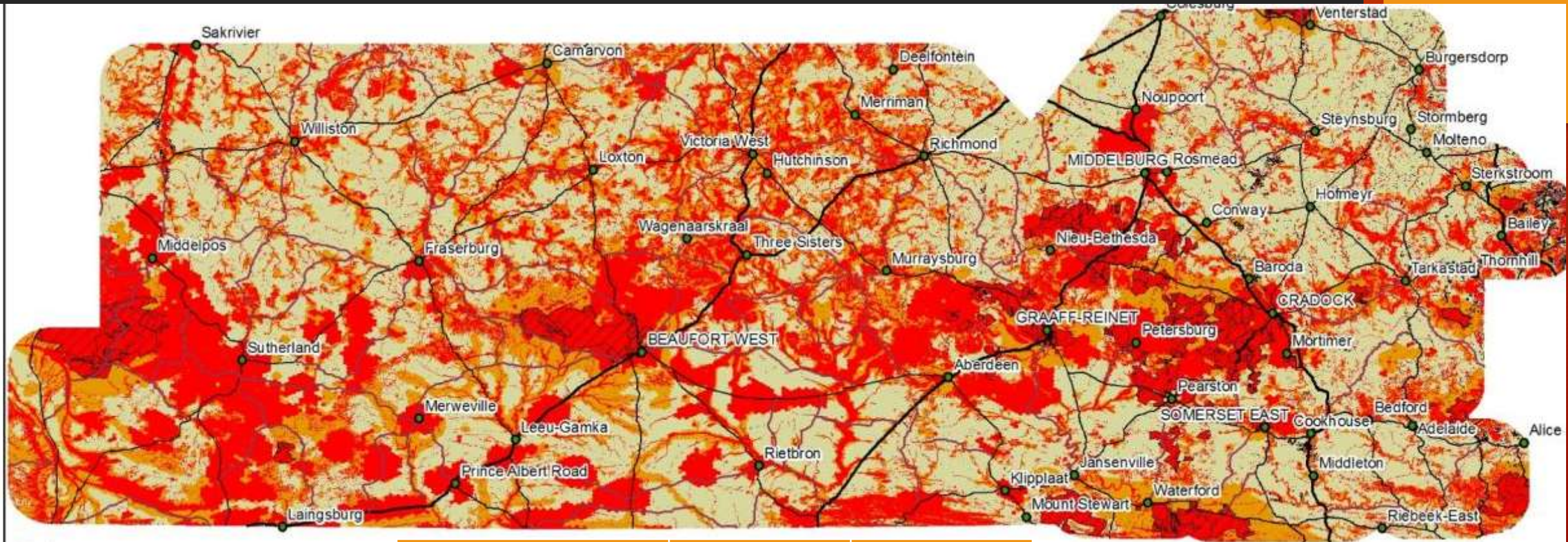
- CBA etc. from the three ☺ provincial plans



# Integration

- Pretty standard Marxan process
- Dual scale:
  - Irreplaceable features included at a fine scale
  - Larger habitat planning units
- Categories approximately align with CBA1 (irreplaceable), CBA2 (optimal)
- The major difference is for fracking lots of aquatic stuff that could have been ESA needs to be in the critical basket
  - slightly bigger basket

# Ecologically important and sensitive areas



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Features included	Ecological importance and sensitivity			
	Very High Irreplaceable sites (no choice exists)	High Optimal sites (some choice exists)	Medium-Low Other sites with some specific biodiversity importance	Very Low No site-specific biodiversity importance
Protected Areas	<ul style="list-style-type: none"> <li>• Areas which are currently legally protected (declared or recognized in terms of Protected Areas Act)</li> </ul>	<ul style="list-style-type: none"> <li>• Buffers around protected areas</li> </ul>		--
Biodiversity features	<ul style="list-style-type: none"> <li>• Wetlands, rivers, springs (including intact buffers)</li> <li>• Special habitats e.g. rocky outcrops, escarpment areas, riparian vegetation.</li> <li>• Specific sites important for threatened species and for range-restricted endemic or near-endemic species.</li> </ul>	<ul style="list-style-type: none"> <li>• Sites selected to meet ecosystem targets for terrestrial and aquatic ecosystems</li> <li>• Sites selected to meet habitat targets for threatened species and for range-restricted endemic or near-endemic species</li> </ul>	<ul style="list-style-type: none"> <li>• Severely modified areas (e.g. agricultural fields) within buffers around rivers and wetlands which retain some importance for ecological processes</li> <li>• Natural habitat which is not irreplaceable and has not been selected as part of the optimal sites</li> </ul>	<ul style="list-style-type: none"> <li>• Areas that have been severely or irreversibly modified and that are not important for supporting provision of ecosystem services</li> </ul>
Other biodiversity priority areas	<ul style="list-style-type: none"> <li>• Incorporates all Freshwater Ecosystem Priority Areas (FEPAs), both rivers and wetlands</li> </ul>	<ul style="list-style-type: none"> <li>• Includes or aligned with Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) from relevant provincial biodiversity plans or Biodiversity Sector Plans</li> </ul>	--	--

# Why we had to go systematic:

- It is a landscape of choice, but we need to actually choose
- The impacts are potentially large enough that whole systems could become endangered
  - but we cannot extrapolate much from current patterns of threat
  - we don't really know what the actual impacts could be at a site
- We need a set of areas, which if secured, would ensure the long term persistence of Karoo biodiversity
  - Precautionary approach to ensure that whatever the impacts are we have a sensible set of areas secured
- We needed to integrate a lot of data at a variety of scales
- We need the basis for full implementation of the mitigation hierarchy & strategic protection of Karoo ecosystems, species and processes

# Cautionary concluding tale



- Riverine Rabbit - 250 breeding pairs & fragmented habitat
- This is what happens when:
  - A new impact (farming of deep riparian soils) occurs at large scale across the full extent of a previously “boring” feature that is more sensitive than we thought
- We need enough of each biodiversity feature secured in a way that ensures persistence
- We need to keep impacts out of the really sensitive stuff
- To do this we really need to systematically identify a set of areas and secure them