Fifty years of land use change in the Swartland, Western Cape, South Africa:

characteristics, causes and consequences

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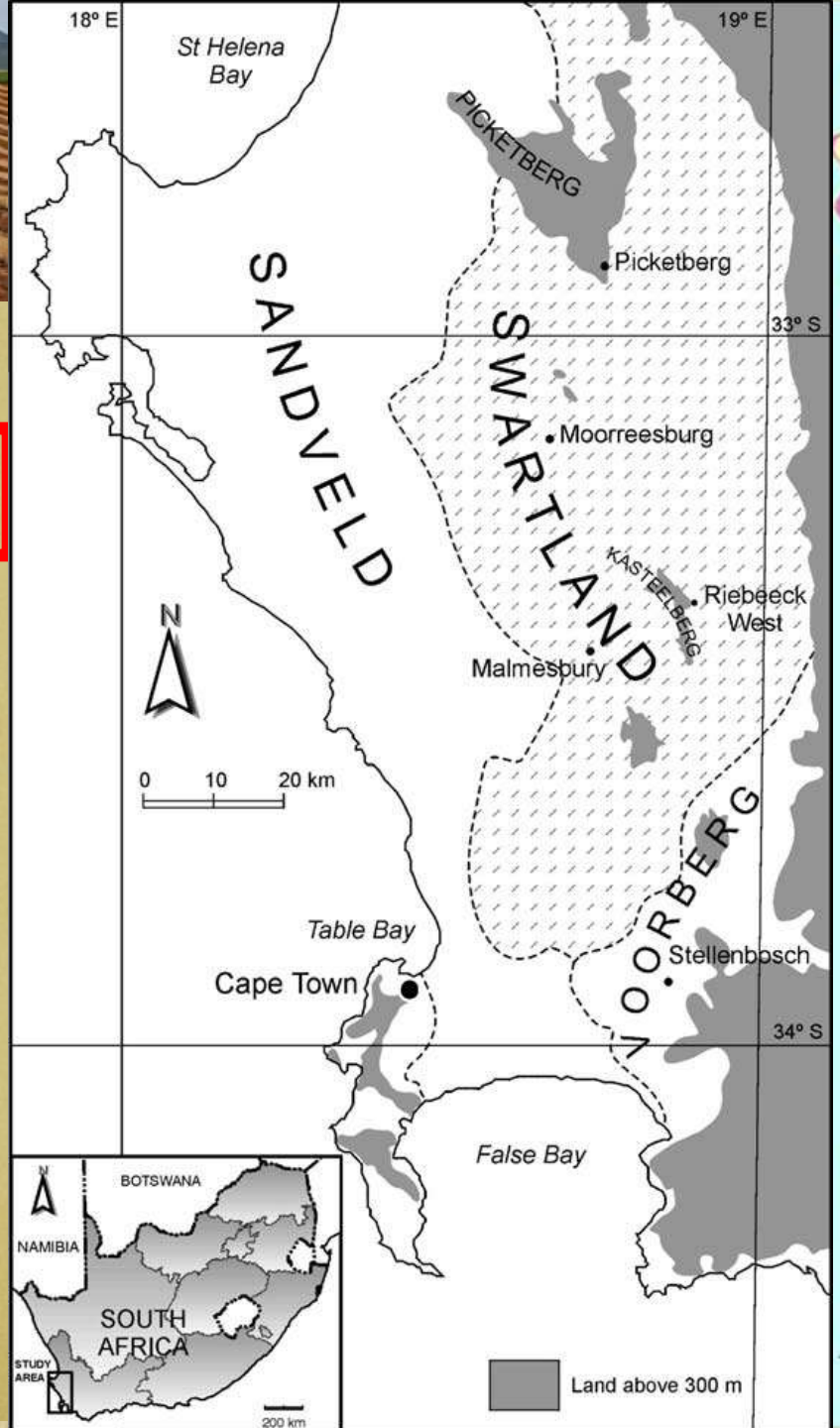
Swartland in context

Methods

Land use change 1960-2010

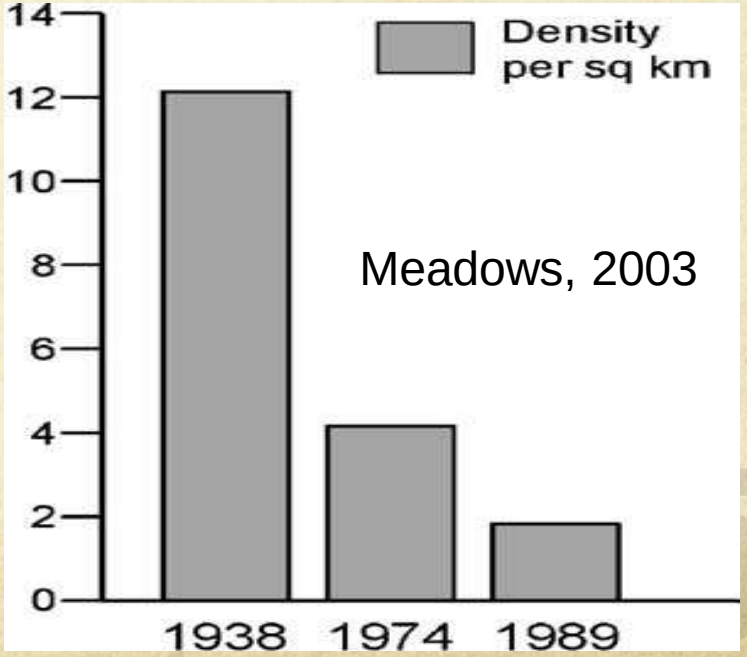
Causes and consequences



Swartland in context

- Uniformity of geology, soils, climate, geomorphology, land use.
- Suitability for agriculture has led to almost complete transformation in the post-colonial period.
- Major loss of natural vegetation formation (only 5% of original extent of *renosterveld* now remains: Newton & Knight, 2005)
- Wheat farming traditionally the major form of agriculture – intensification in 1930s led to significant soil loss (Talbot, 1947; Meadows,

Area has been subject to extreme soil erosion problems, which have largely been mitigated over the past 70+ years



Meadows, 2003

Aim

- Describe, quantify and account for the characteristics of land use change in the southern part of the Swartland during the last fifty years.

‘From grain to grape’

Methods

- Based on sequential aerial photogr

Date	Season	Approx. scale
December 1960	Summer	1:36000
March/April 1977	Autumn	1:50000
August 1988	Winter	1:50000
September 2001	Spring	1:32000
November 2010	Summer	1:10000

Obtain aerial photographs/satellite images

↓

Create photomosaic of entire study area

↓

Georeference the photomosaic onto 1:50000 maps

↓

Classify each image into different land use types and create shapefiles

↓

Quantify the area of each shapefile

↓

Plot, analyse and interpret the results

Swartland in context

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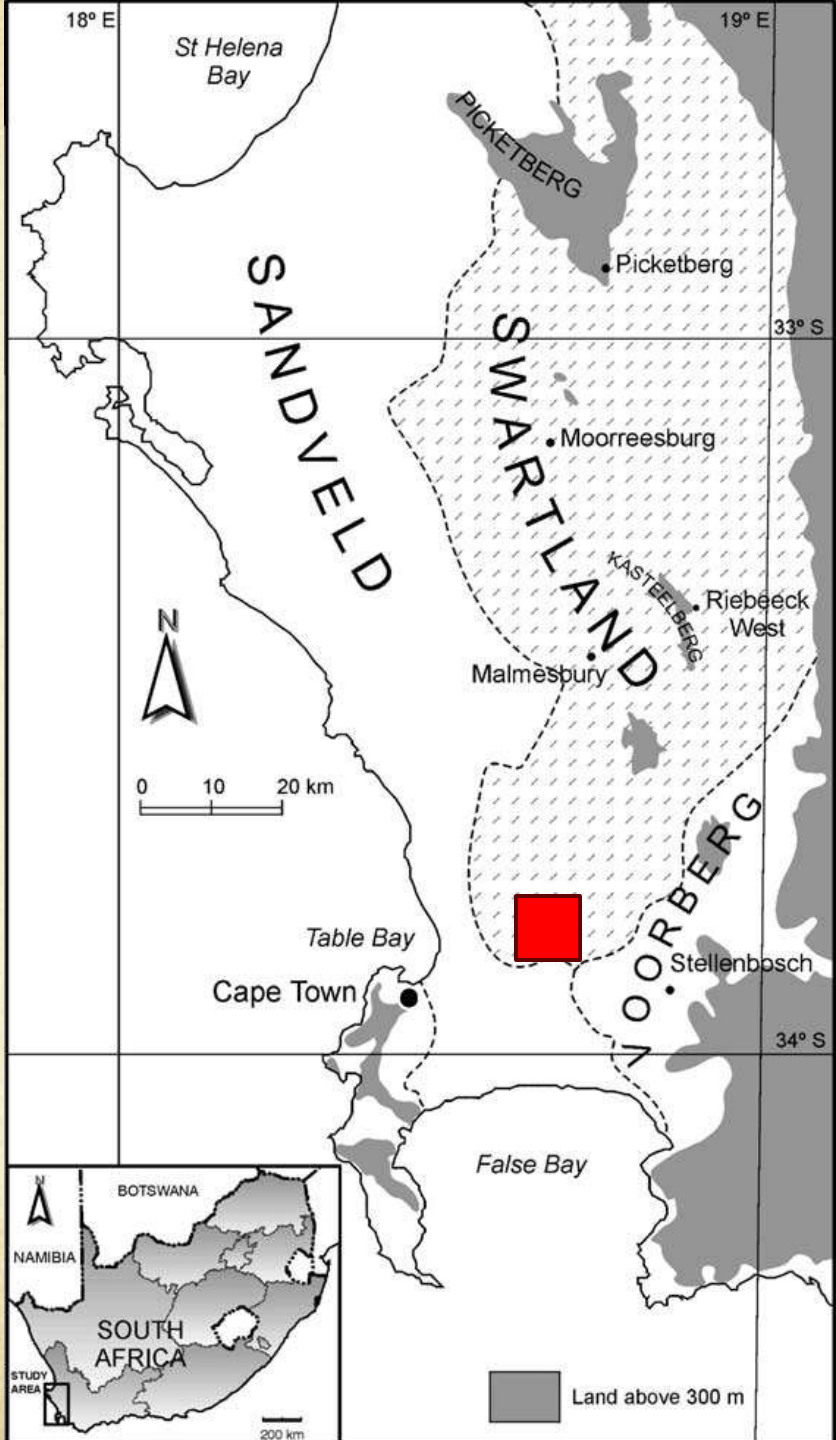
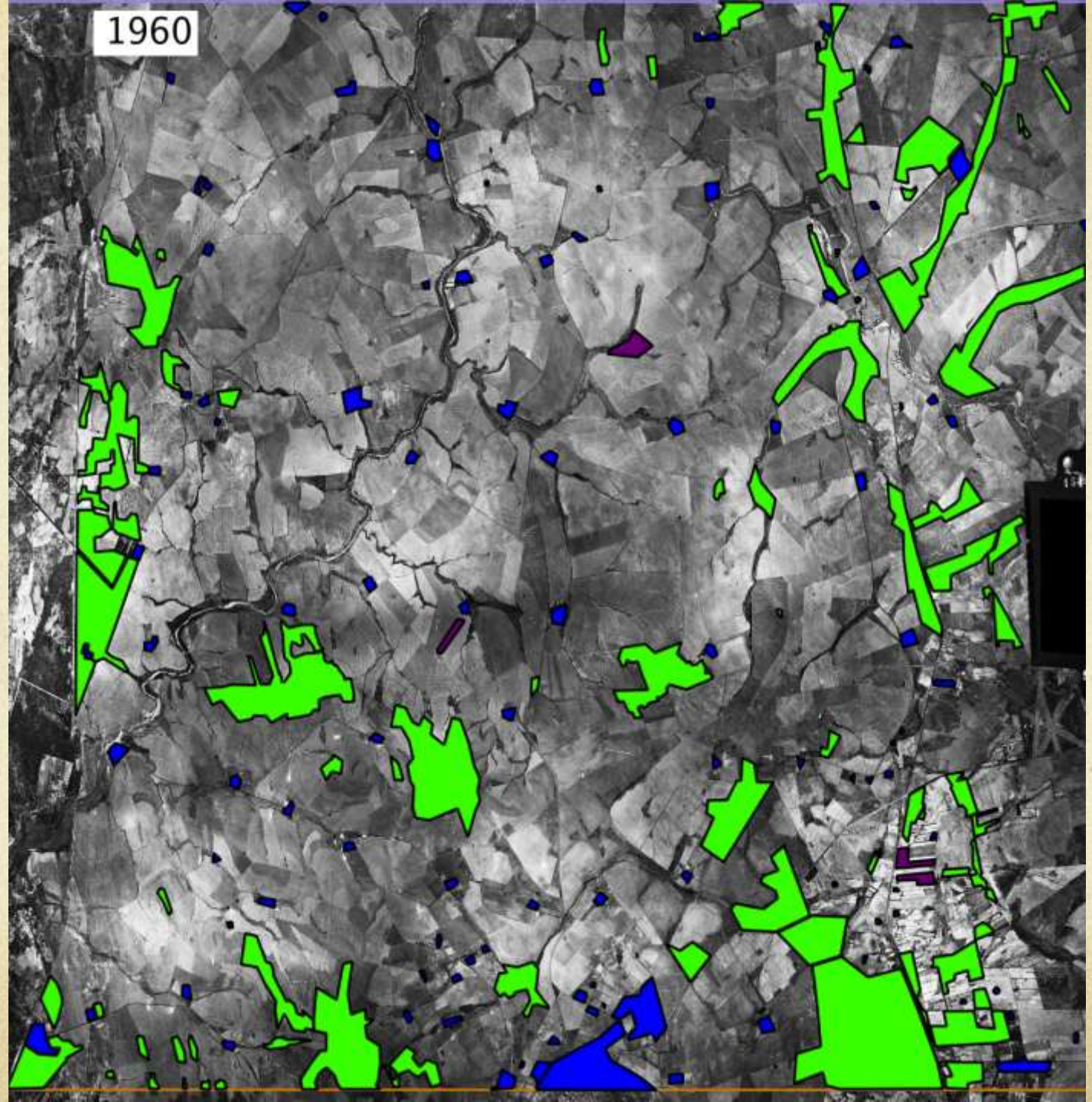
Description of Results

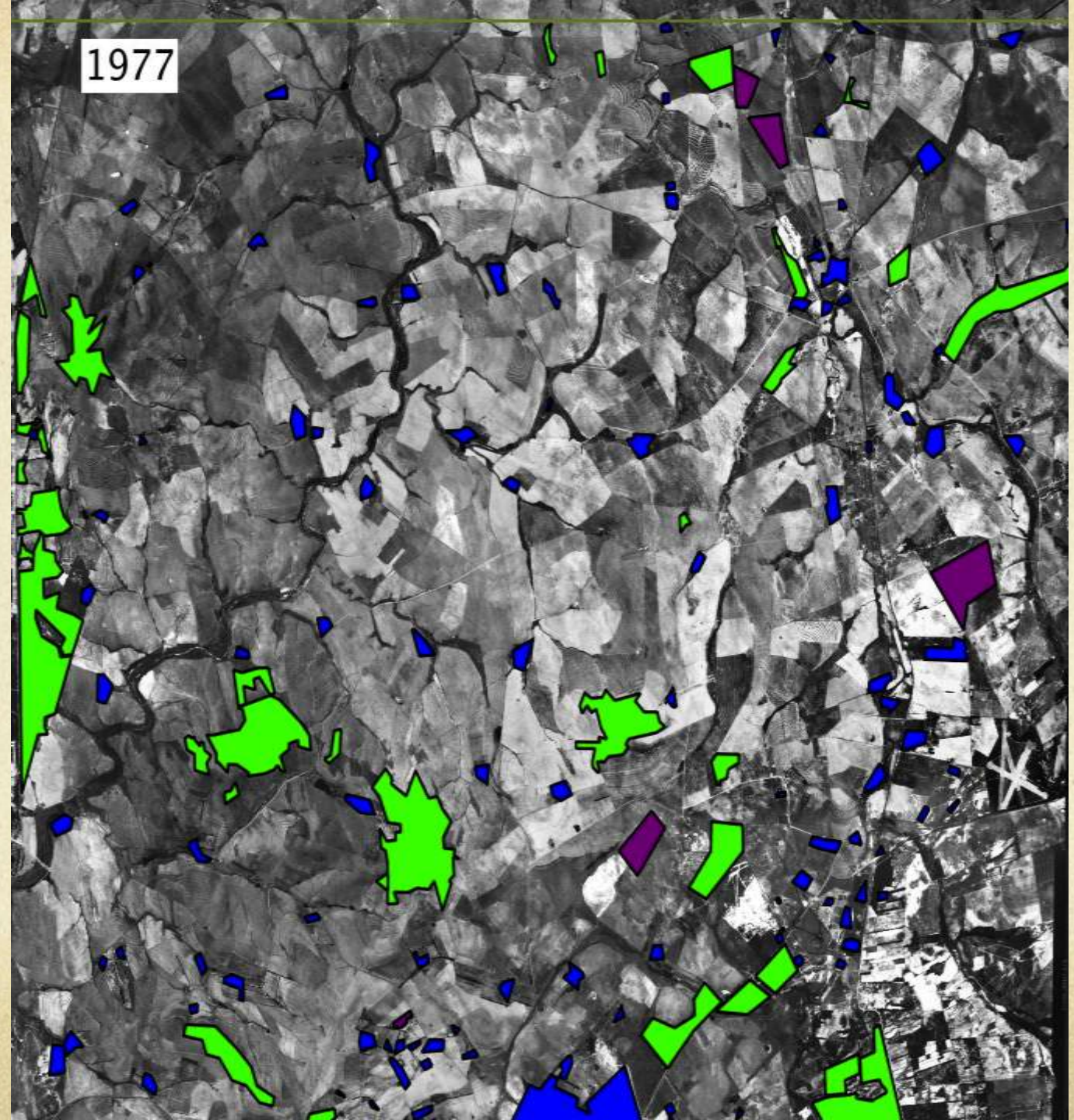
- Study area was defined as a specific 260 square kilometer region, marked by clear geographical features.

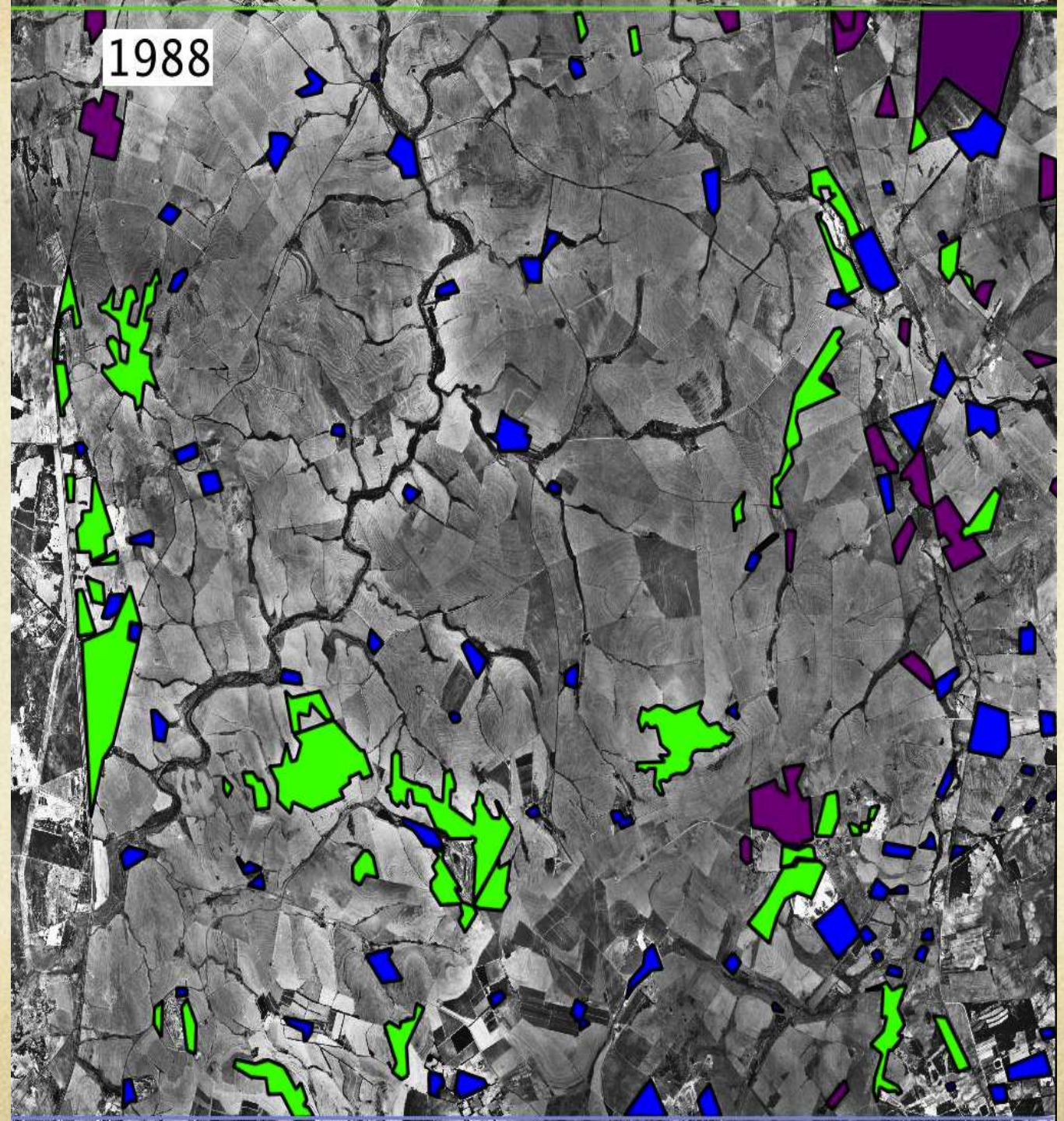
- Study area was divided into the 4 major land use types: Natural Vegetation, Urban, Wheat, and Grapes

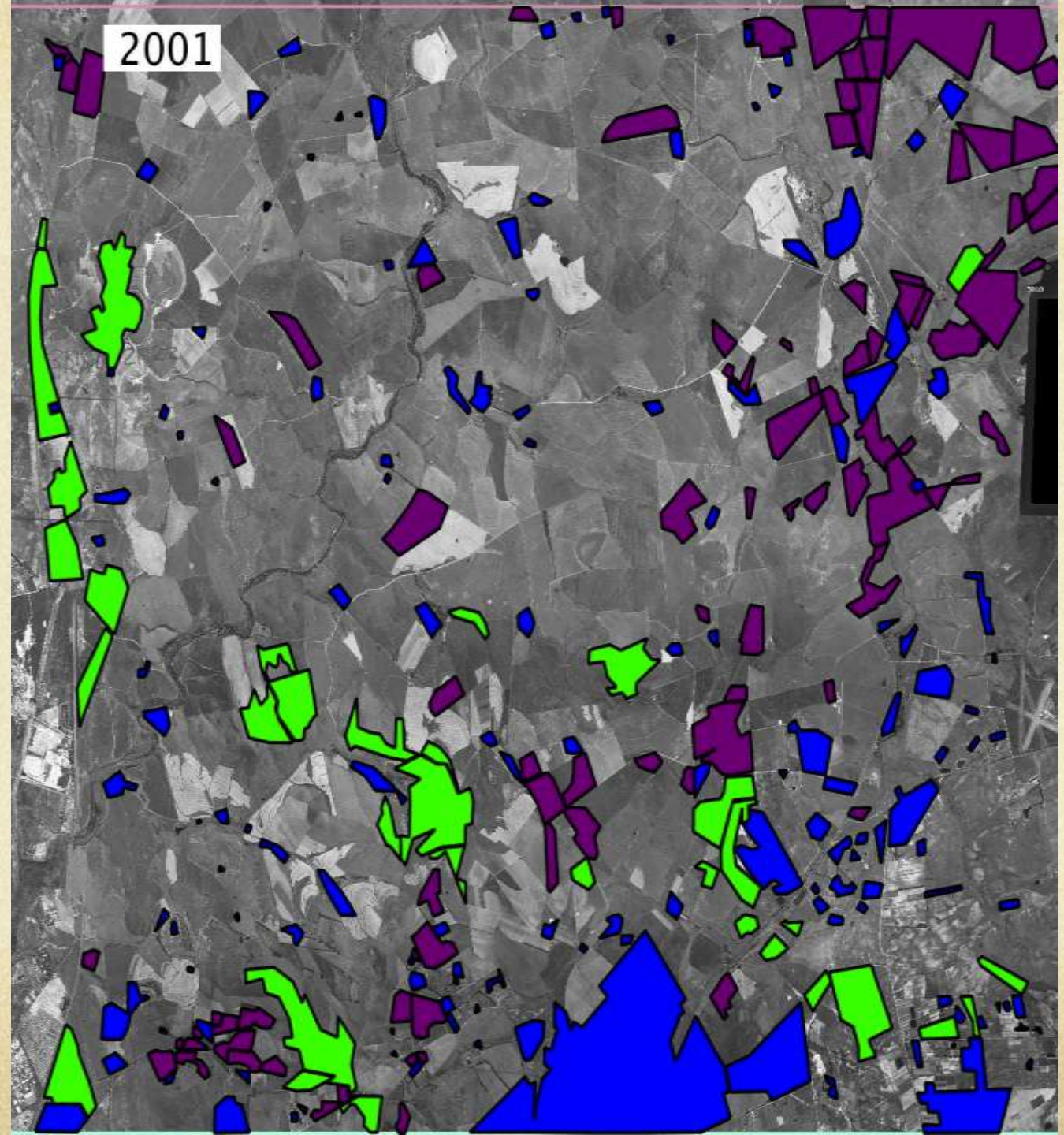
- The results overestimate the amount of wheat, as the wheat fields were indistinguishable in the aerial photographs from fallow or unused land.

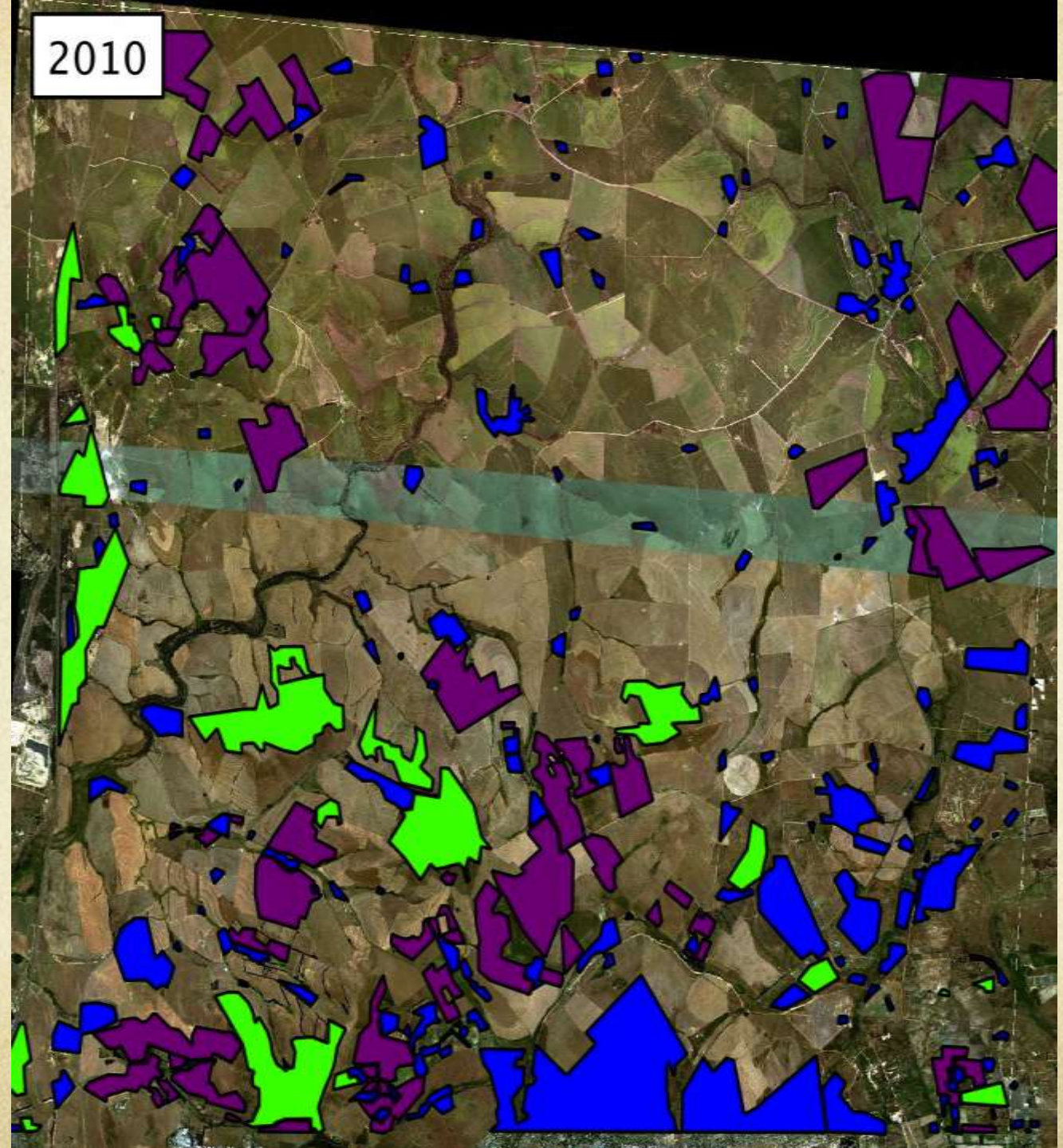


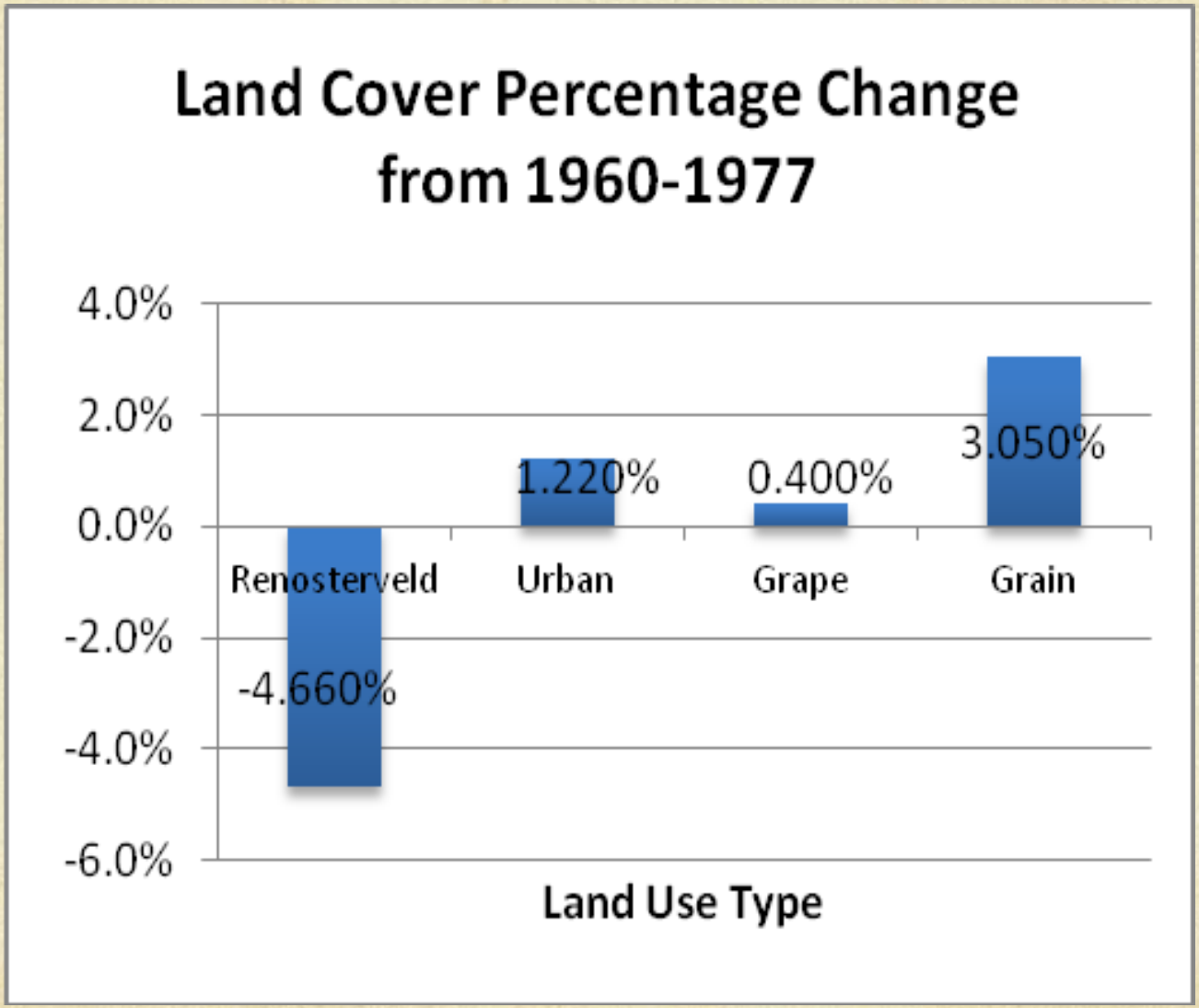

1960

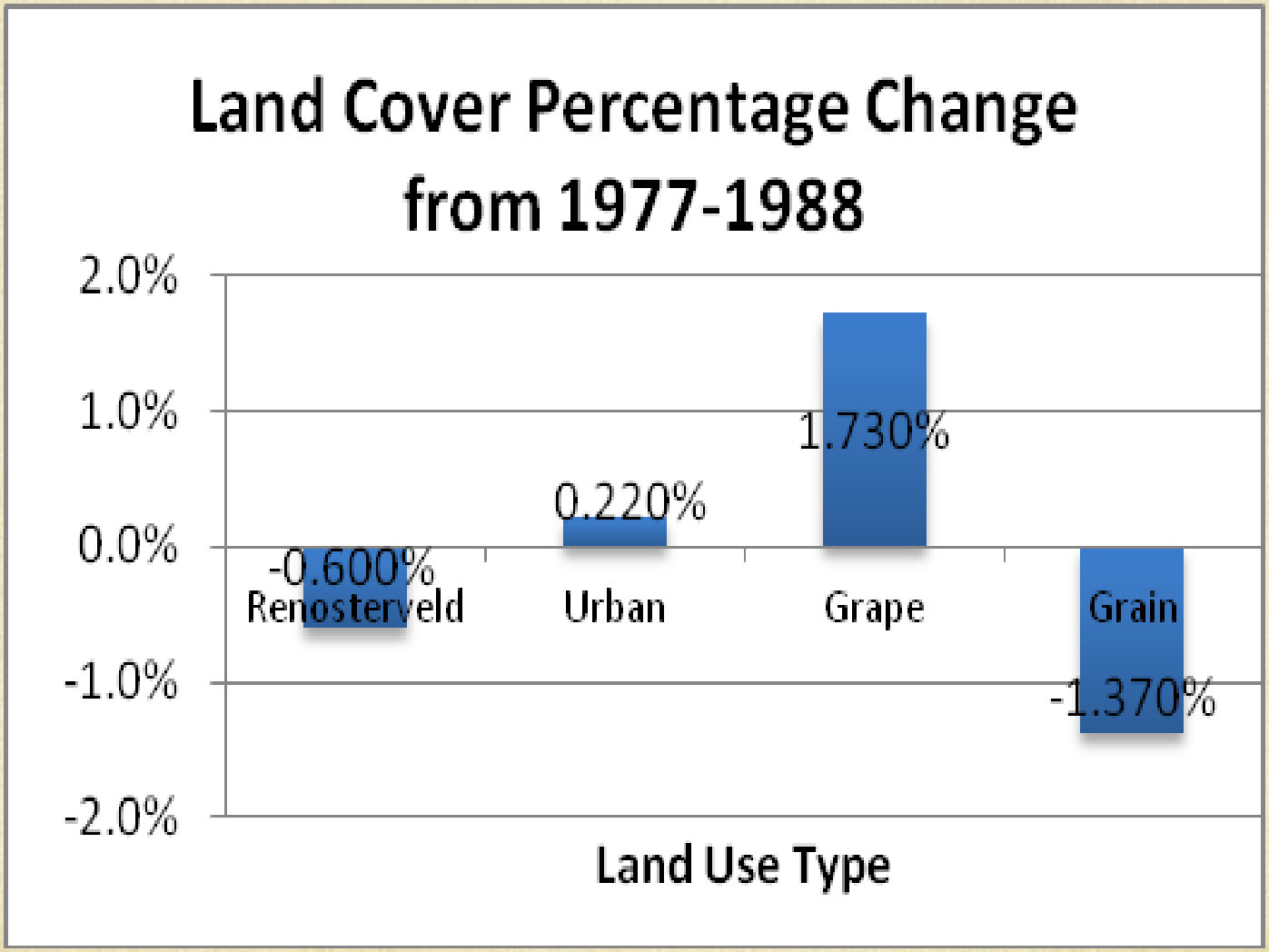

1977

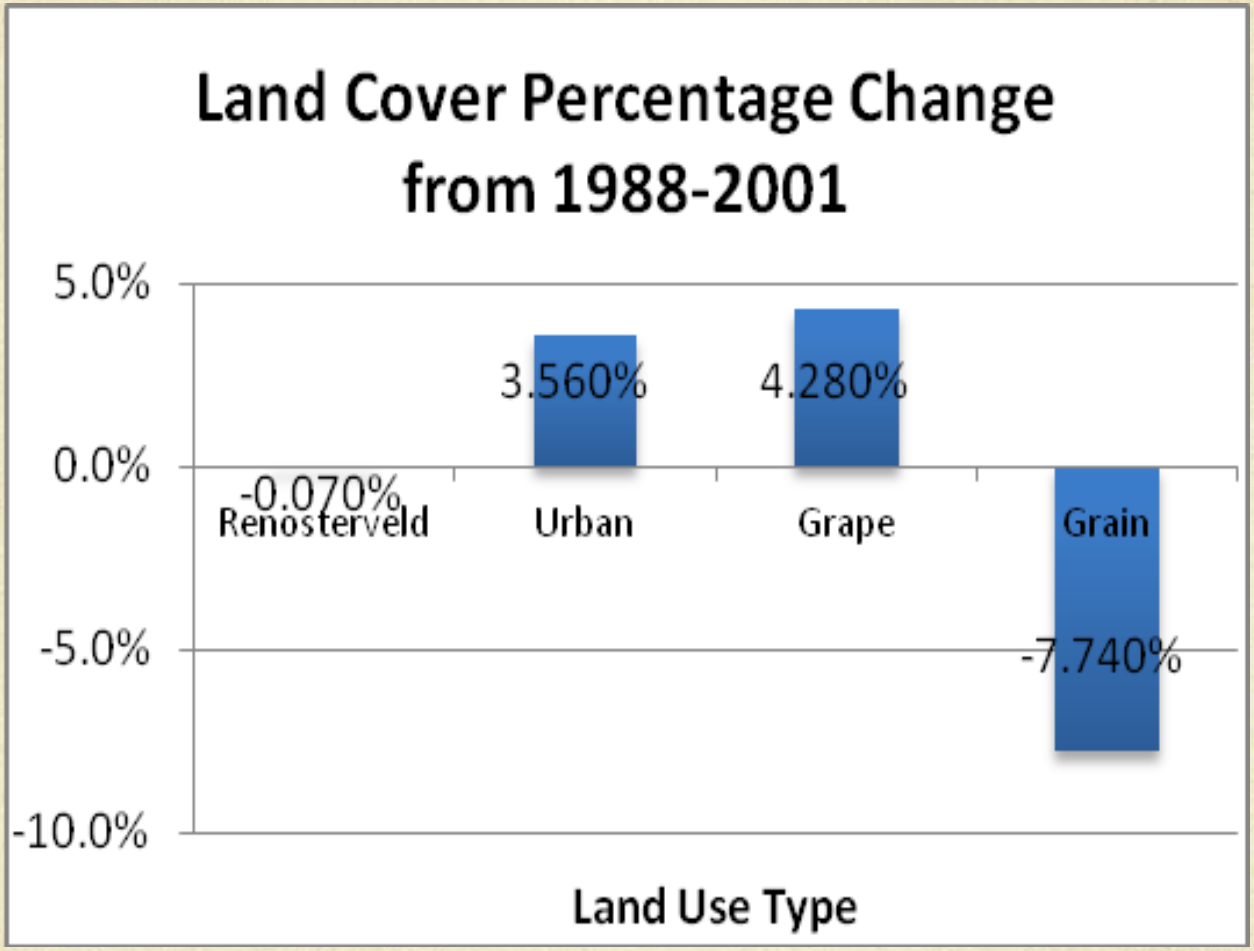

1988

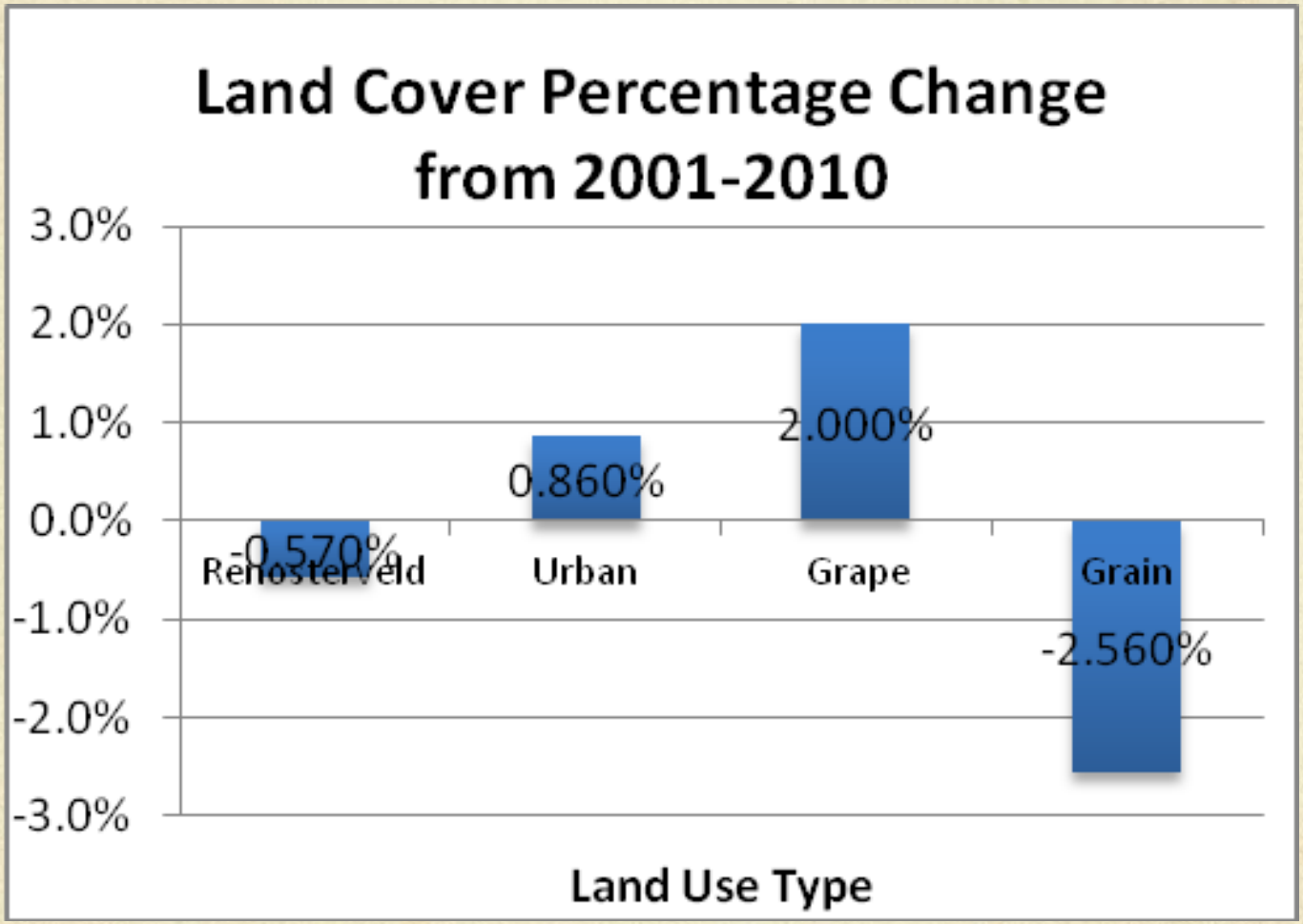

2001


2010


Land Cover Percentage Change from 1960-1977
4.0%
2.0%
0.0%
-2.0%
-4.0%
-6.0%
-4.660%
1.220%
0.400%
3.050%
Renosterveld
Urban
Grape
Grain
Land Use Type


Land Cover Percentage Change from 1977-1988
2.0%
1.0%
0.0%
-1.0%
-2.0%
-0.600%
0.220%
1.730%
-1.370%
Renosterveld
Urban
Grape
Grain
Land Use Type


Land Cover Percentage Change from 1988-2001
5.0%
0.0%
-5.0%
-10.0%
-0.070%
3.560%
4.280%
-7.740%
Renosterveld
Urban
Grape
Grain
Land Use Type


Land Cover Percentage Change from 2001-2010
3.0%
2.0%
1.0%
0.0%
-1.0%
-2.0%
-3.0%
-0.570%
0.860%
2.000%
-2.560%
Reforested/Veld
Urban
Grape
Grain
Land Use Type

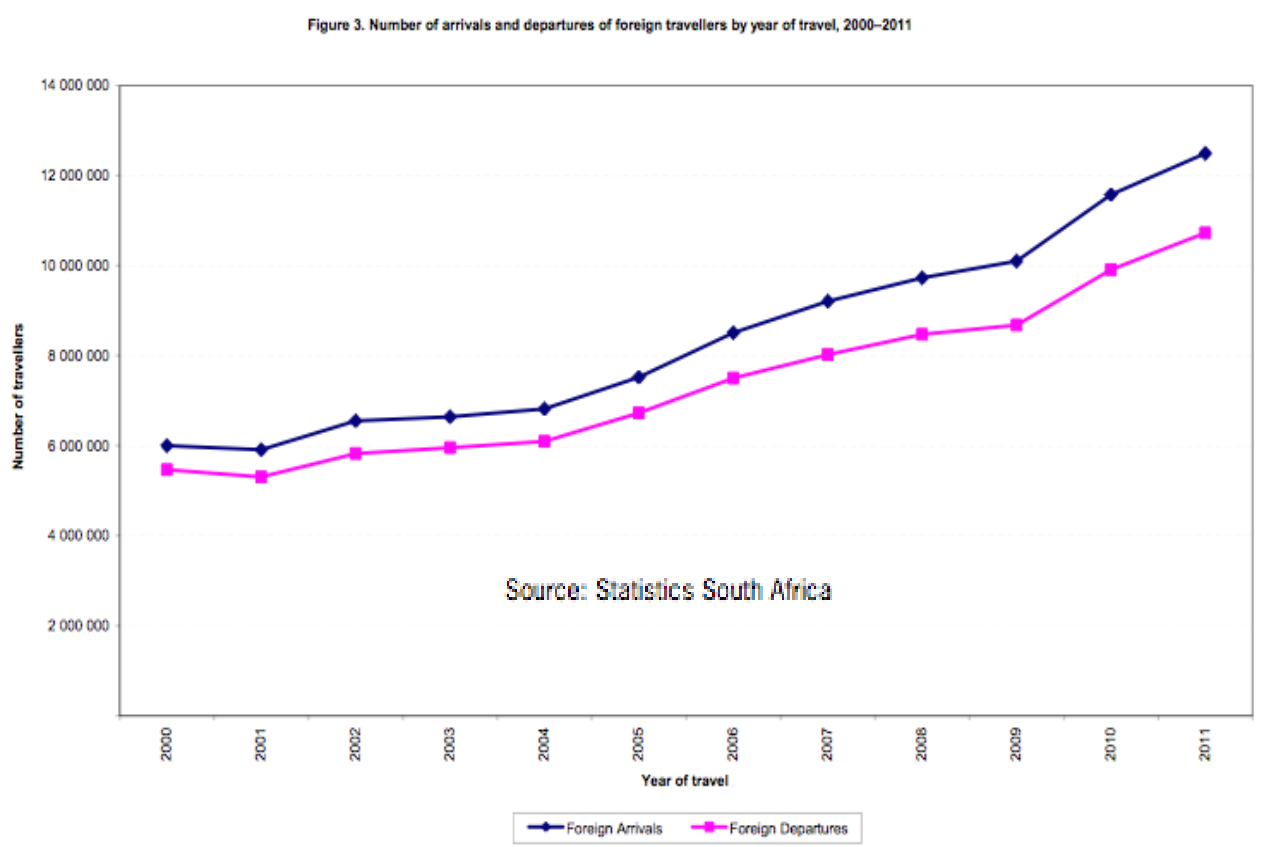
Summary of main land use changes

- Main form of agriculture (grain crops) declines from 92% in 1977 to <80% by 2010
- Vines covered <0.2% in 1960; 8.55% in 2010 (an increase of some x400 in area)
- Urban land increases from c1.5% to 7.5%
- Natural vegetation (*renosterveld*) declines from 10% in 1960 to less than 4% in 2010, although most of this decrease predates 1977
- Period of greatest land use turnover is 1988-2001
- 3.5x rise in SA wine exports from 1991-2001 mirrored by a rise in land used for grape farming in the Swartland from c2% in 1988 to >6% in 2001.

Underlying factors

- Apartheid area government regulation of wheat market supported by subsidies that peaked at R276.6m in 1984 (NDA 2004)
- Return of South Africa to the global wine market after 1994 following lifting of sanctions (globalisation)
- Natural population increase supplemented by in-migration, particularly from 1980's onwards
- Wine growing itself supplemented by significant increases in tourist numbers (the wine estate as 'destination' rather than simply 'farm')

Tourism Trends



- Tourism has steadily increased in South Africa and Cape Town since the democratic transition.

Swartland:
50 years of land use change

- Pattern accords with previously recorded observations in respect of:
  - Decrease in natural vegetation
  - Increase in urbanisation

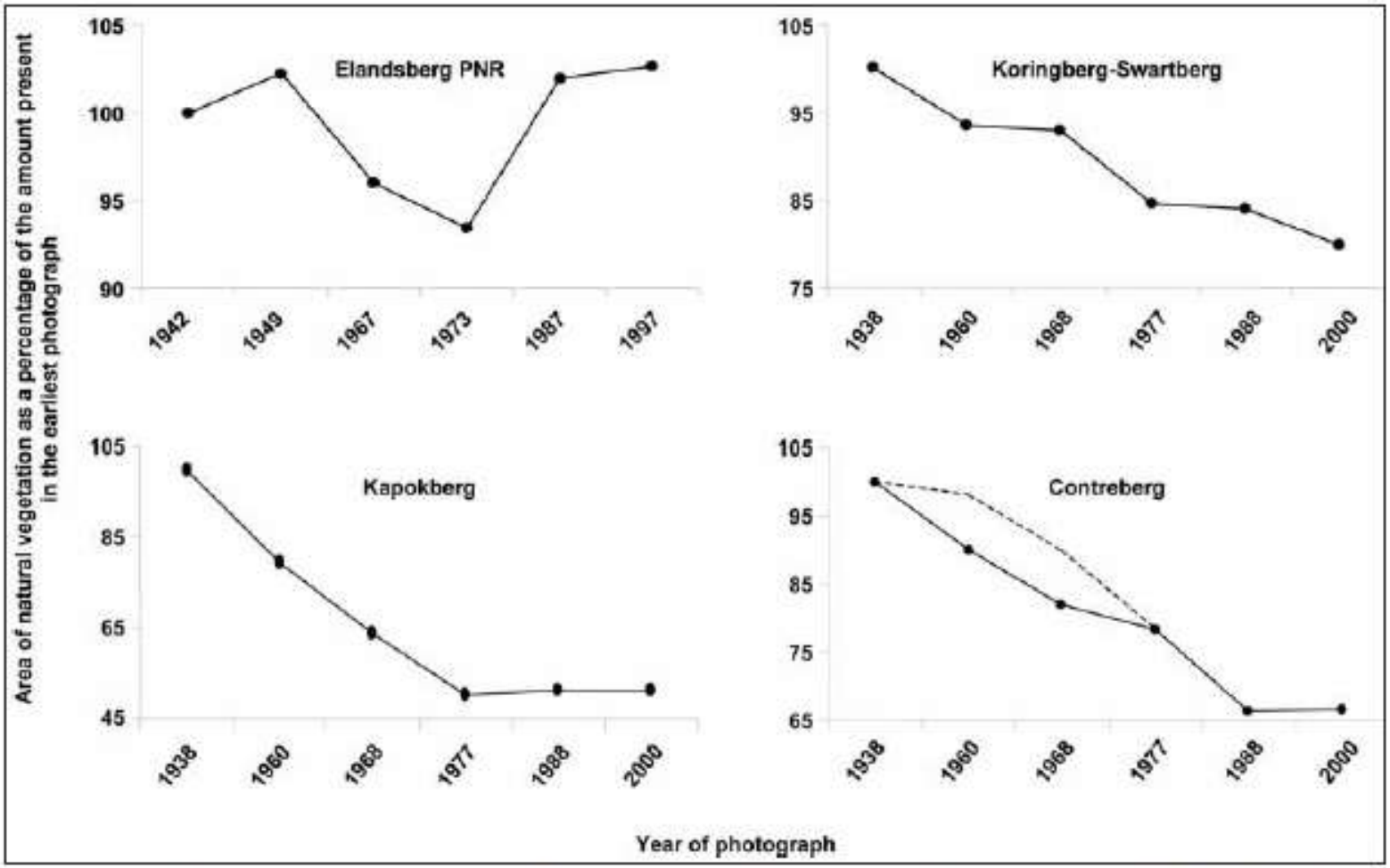
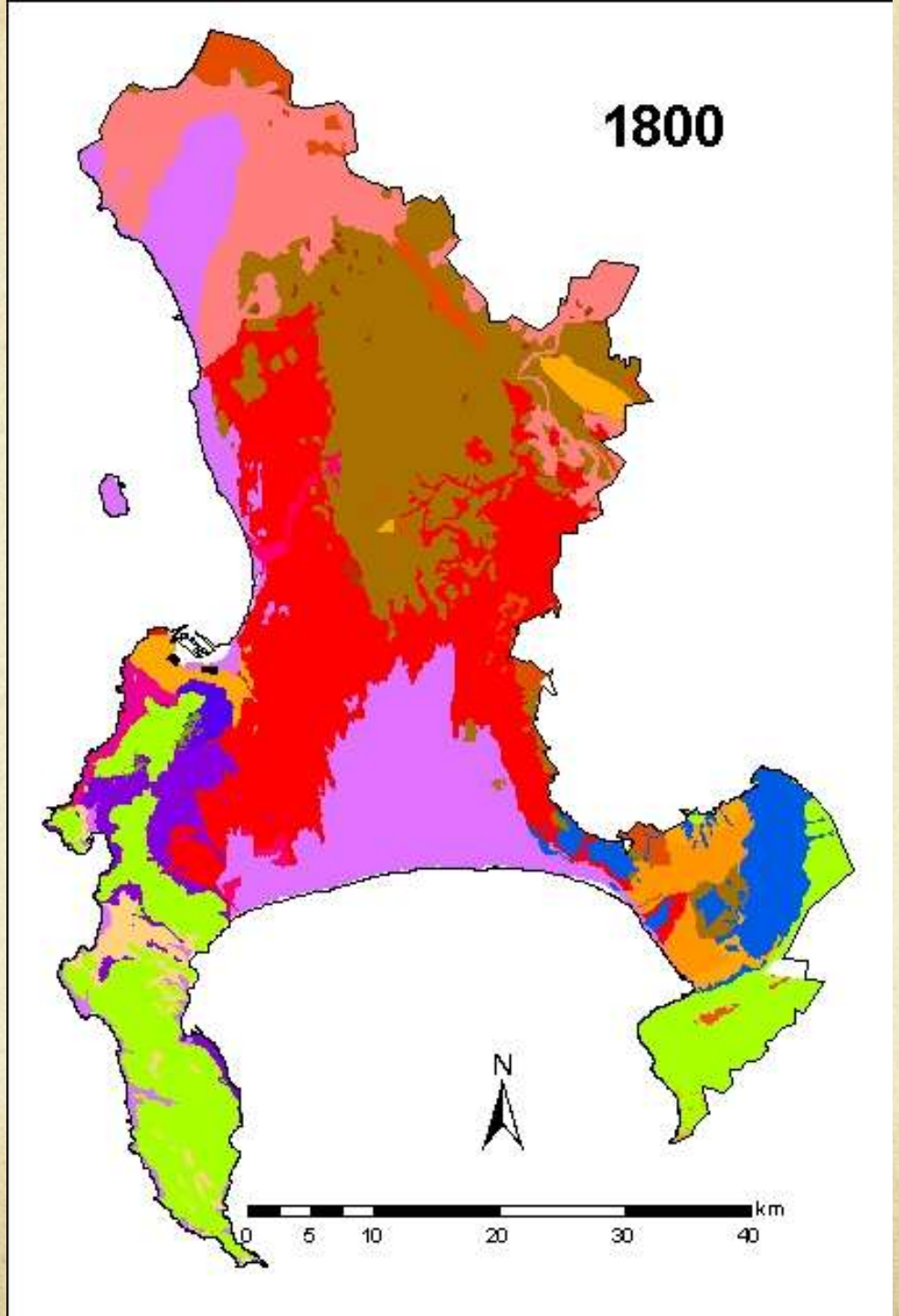
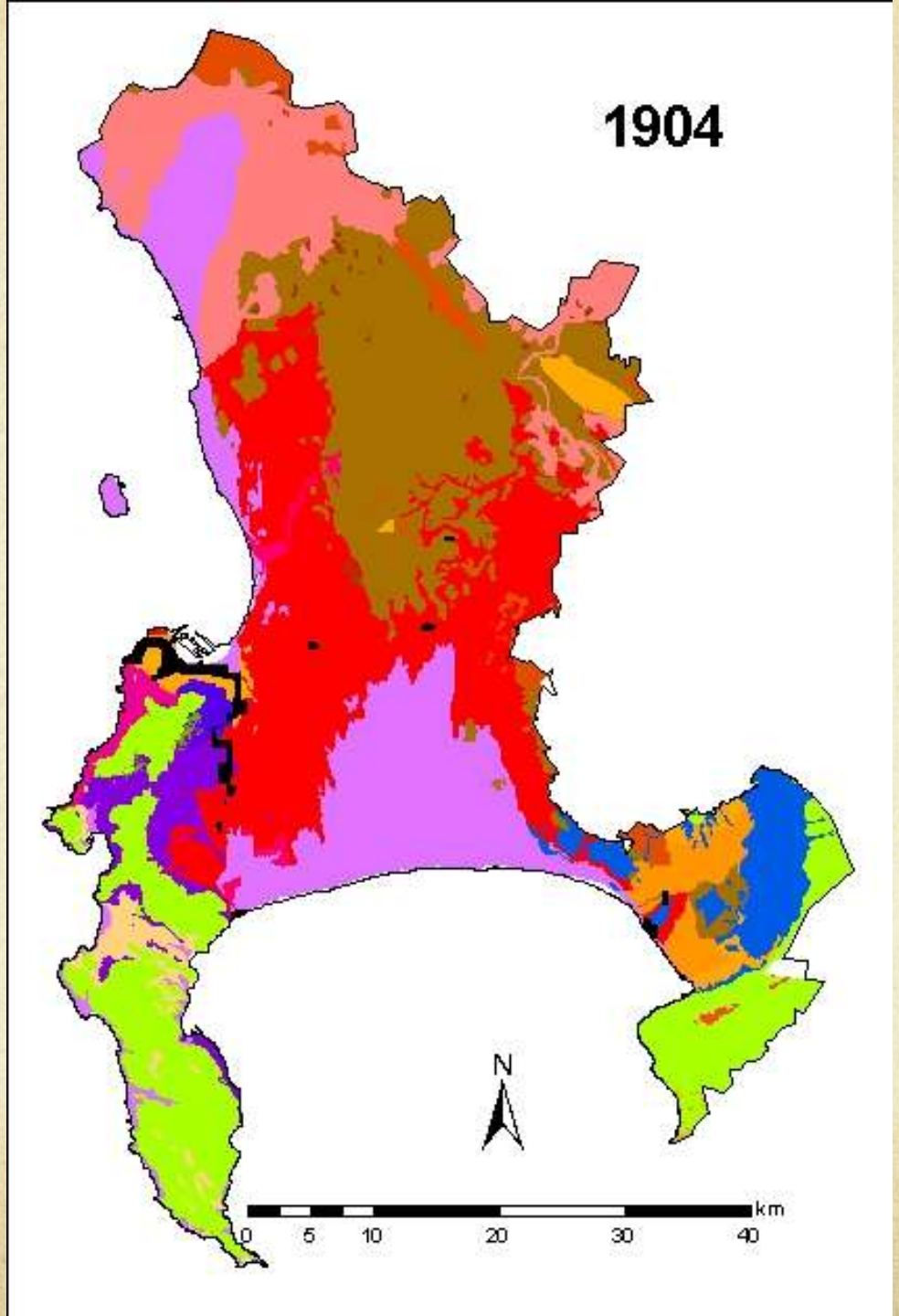
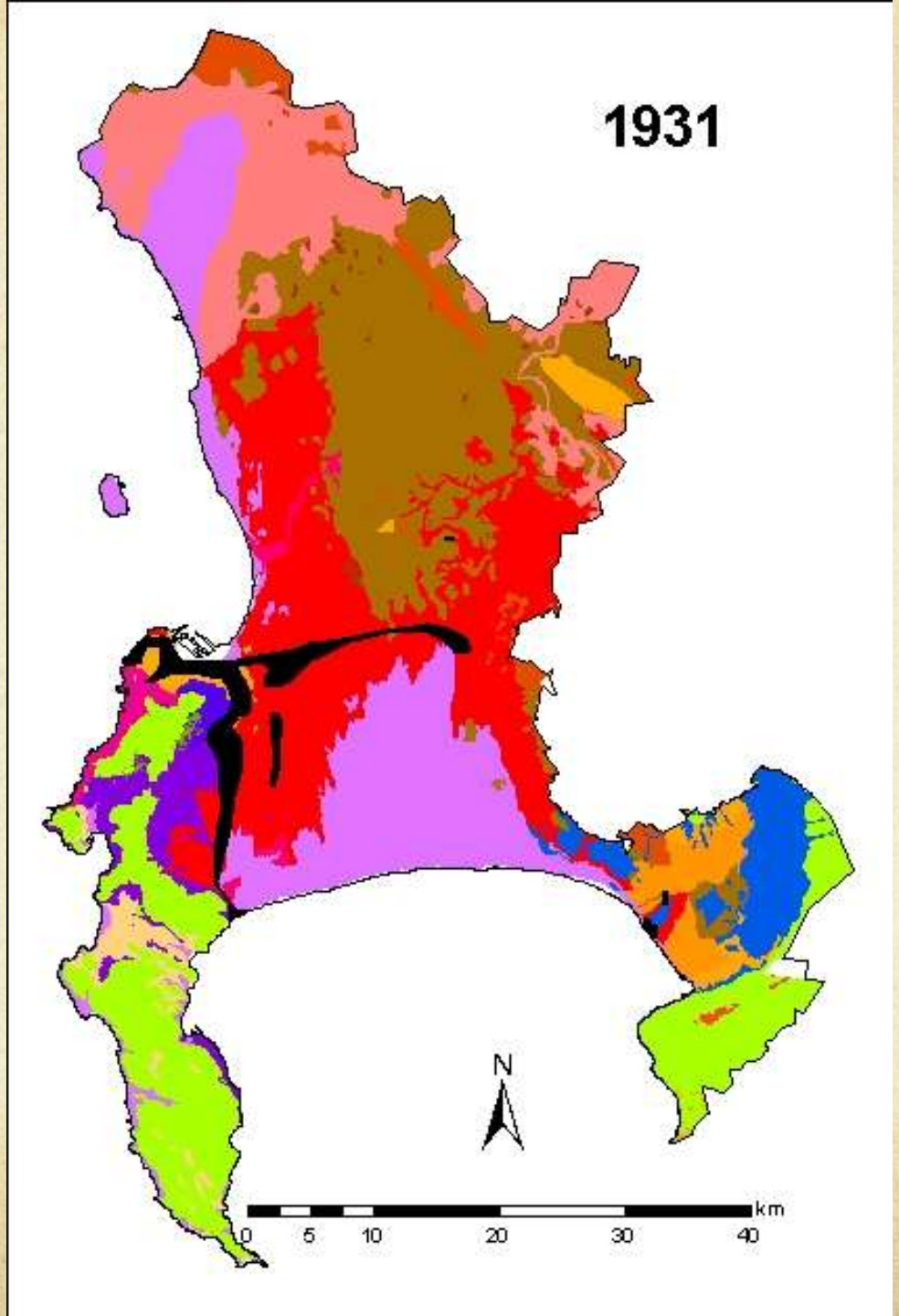


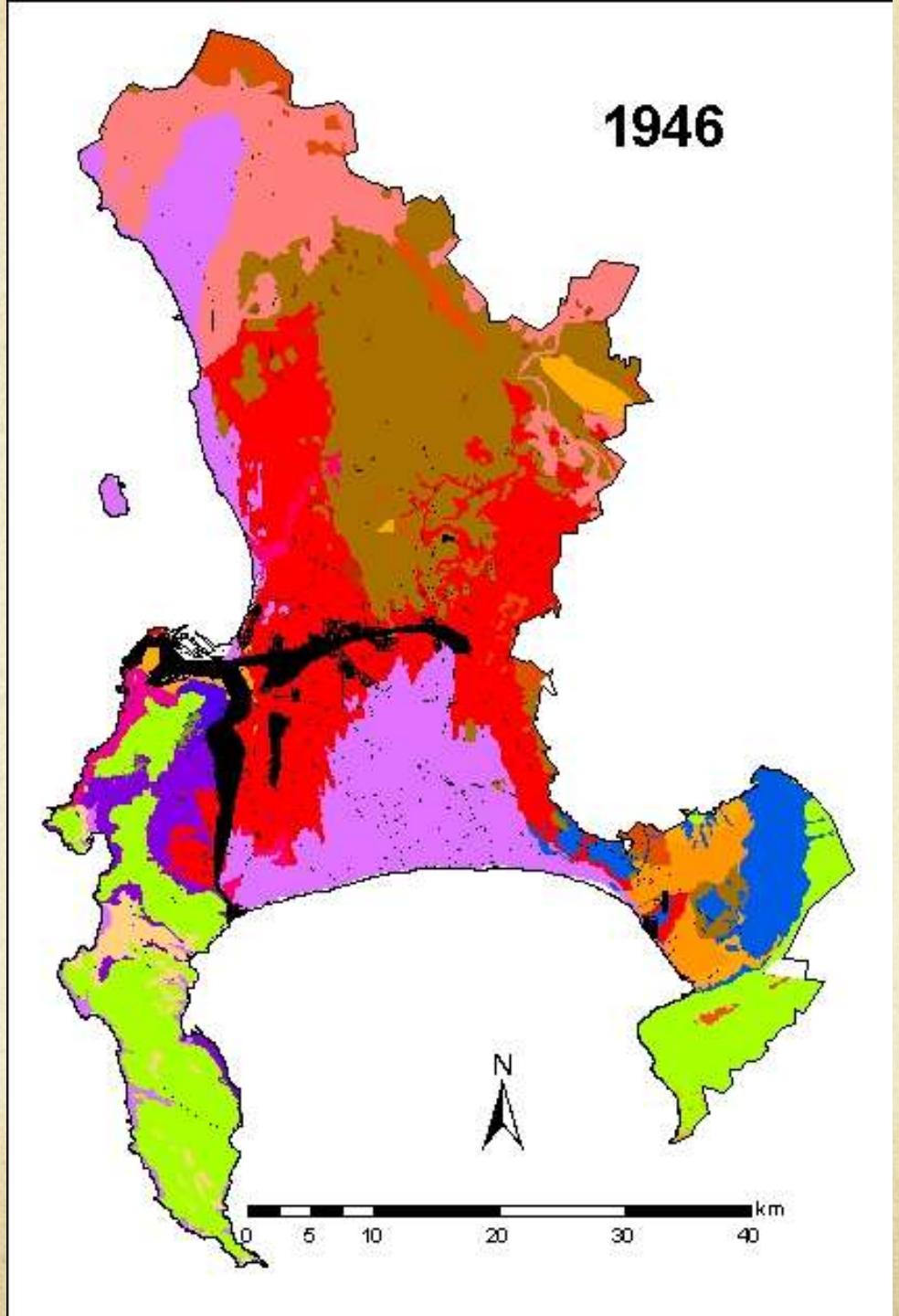
Figure 4. Graphs showing the transformation to agriculture of the natural vegetation at each of the study sites. The area of natural vegetation existing in 1938 has been set at 100%. The dotted line in the Contreberg graph indicates the change rate had the "Long-term fallow" area (see text for details) been recorded as natural vegetation in 1938.

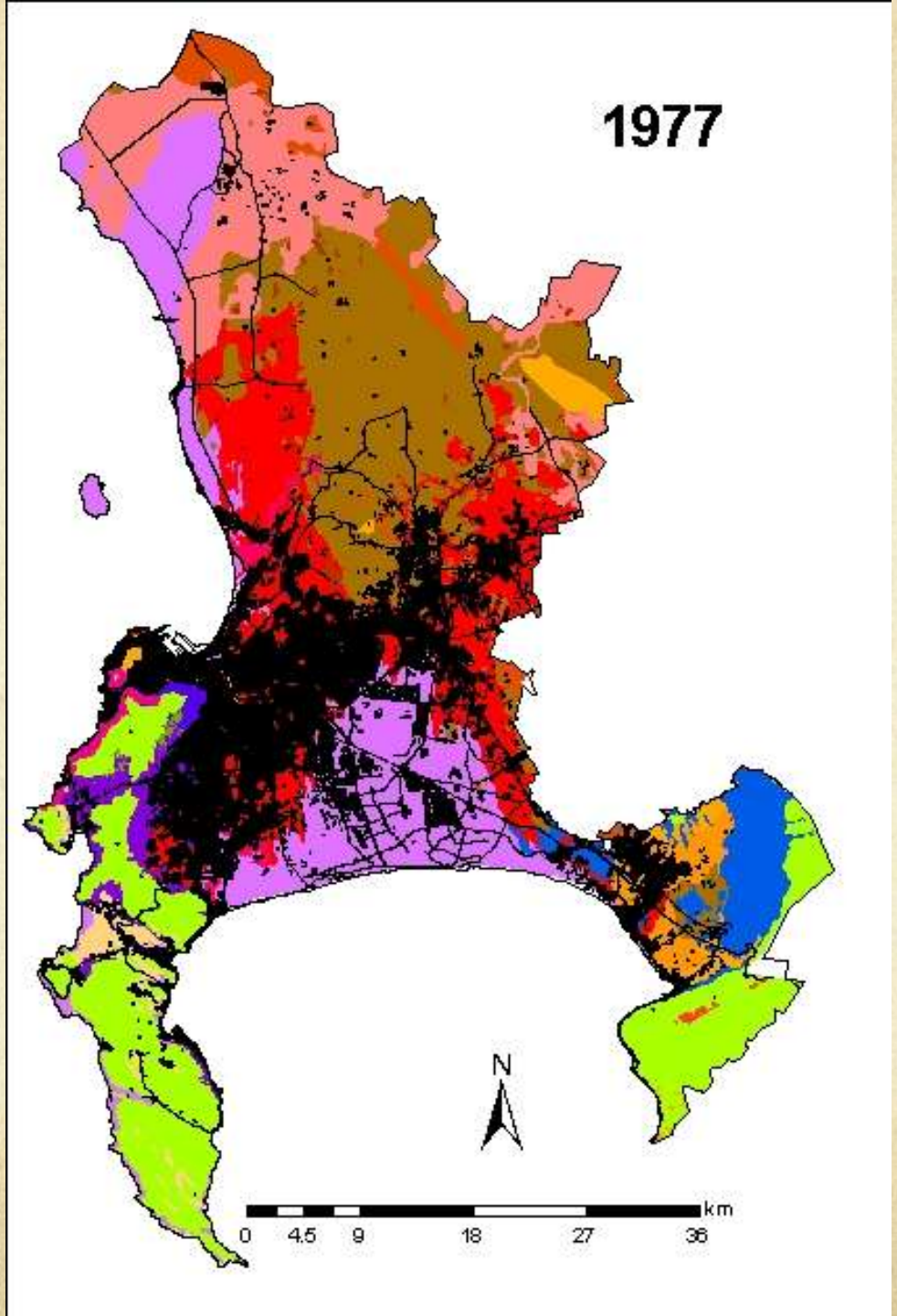
Source: Newton & Knight, 2005

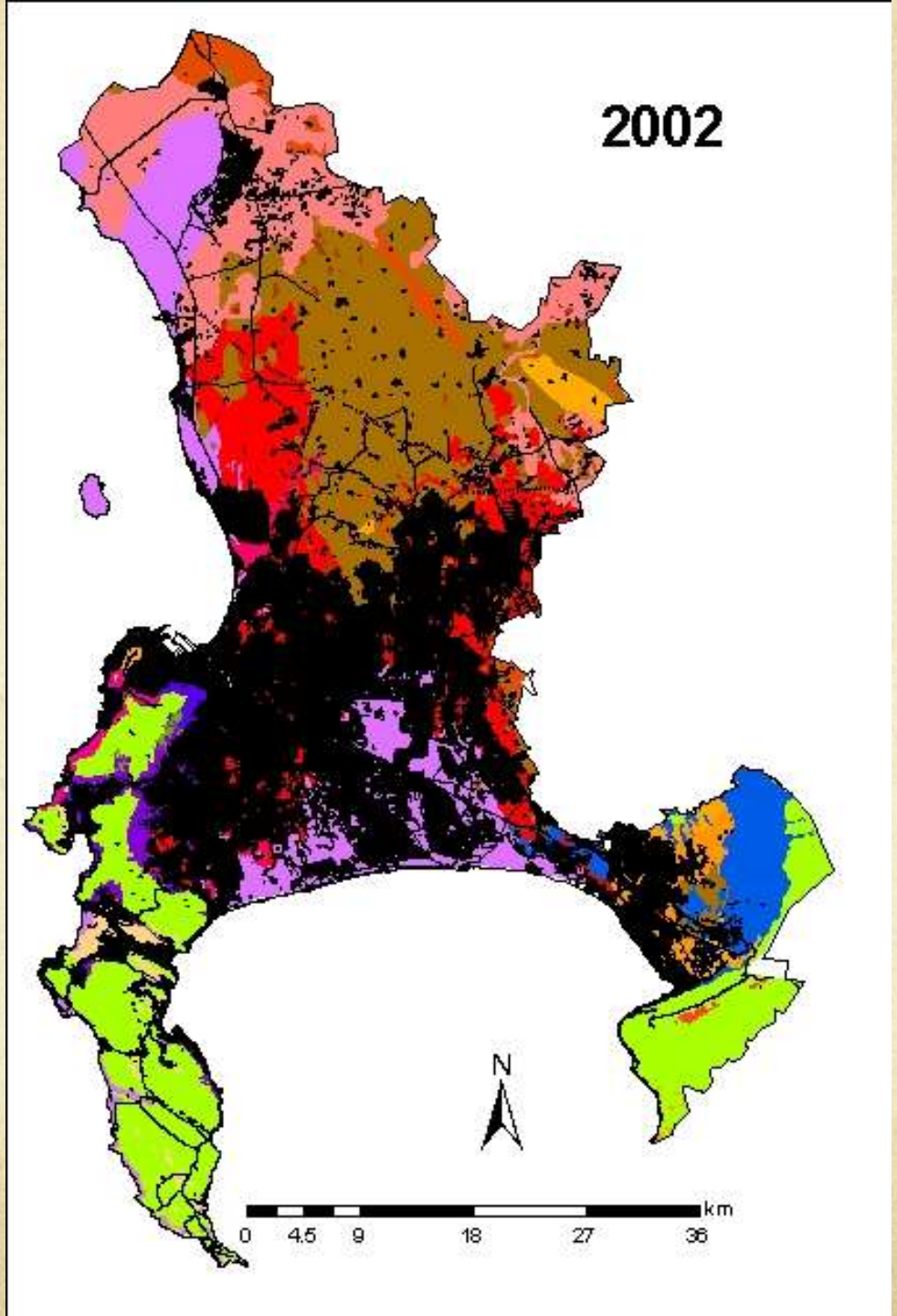

1800
N
km
0
5
10
20
30
40


1904
N
0
5
10
20
30
40
km


1931
N
km
0
5
10
20
30
40


1946
N
km
0
5
10
20
30
40


1977
N
0
4.5
9
18
27
36
km


2002
N
0
4.5
9
18
27
36
km

Implications for the future?

- *Renosterveld* continues to be highly threatened under the combined onslaught of agriculture and urbanisation
- Changes in the global wine market may make wine production unprofitable (“wine lake”)
- Environmental implications of grain-to-grape not studied (increased use of water; increase/decrease in soil erosion?)
- Impact of urbanisation on hydrology and other aspects of the physical environment not well known
- Effects of climate change?


Thank you