



Land cover change in the Central Lowveld and Surrounding Areas

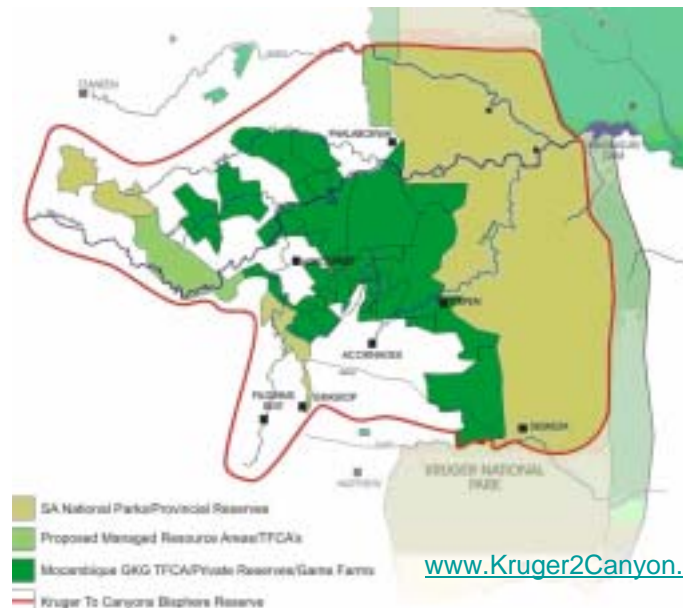
Kaera Coetzer

Dr BFN Erasmus

Prof ETF Witkowski

Background to the Study

- Conservation planning exercise for the subregion
- Kruger to Canyon Biosphere Reserve
- “...continue with conservation in the already protected areas; to improve conservation awareness...Biosphere Communities and attempt to coordinate conservation activities ...amongst the different land uses.” (Central Lowveld LEAP: Final Report, 2000, pg 68)



Background to the Study

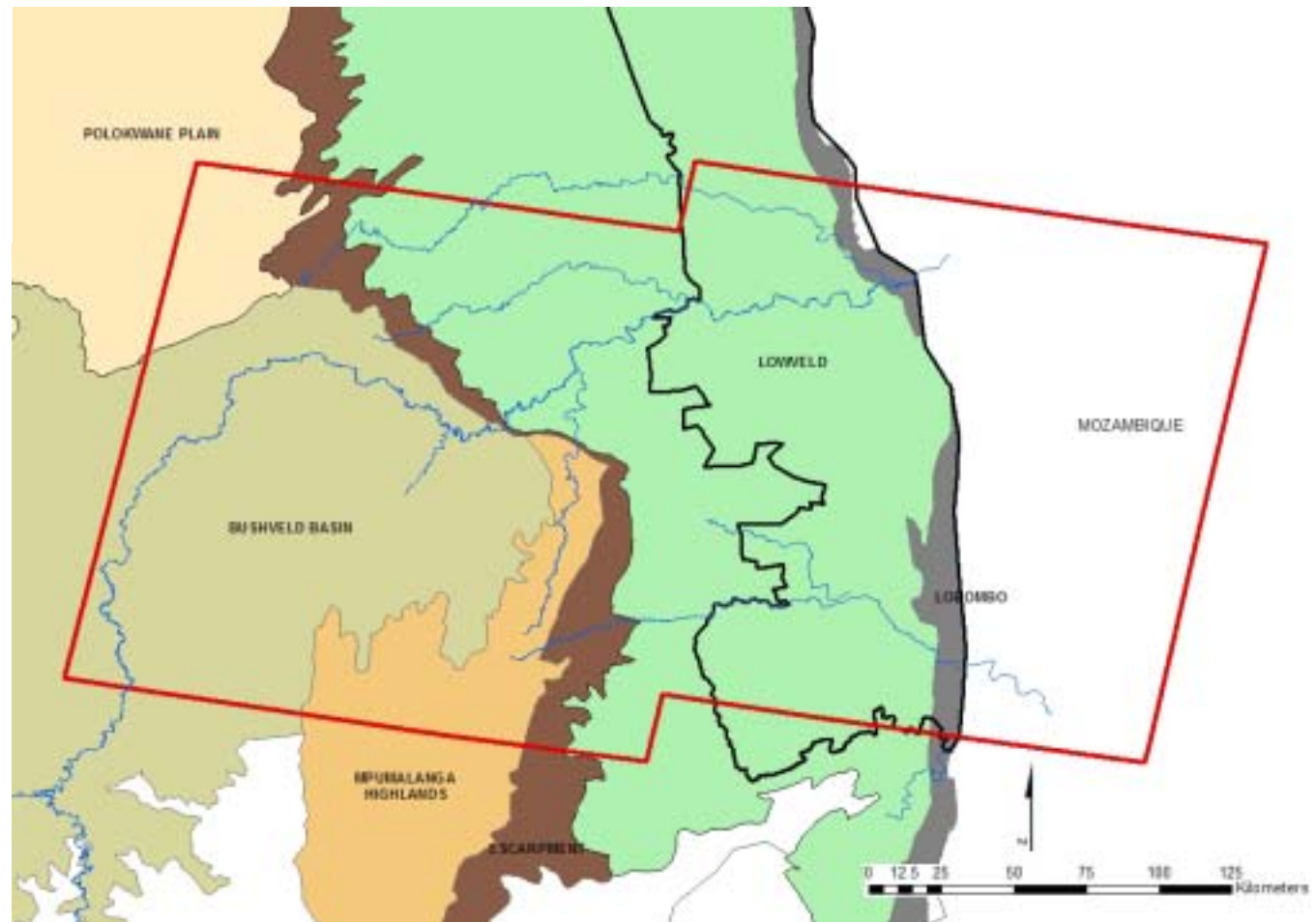
- Conservation planning exercise for the subregion
- Kruger to Canyon Biosphere Reserve
- Systematic Conservation Planning
- MARXAN & MARZONE application
- Base layers:
 - **Land cover data: *status quo*, past change & transition probabilities**
 - Land cover trends predicted into the future
 - Economic data: Cost Surface development with plans to model / predict into the future

Available Data & Methodology

- Study period: 1993-2006
- 8 winter LANDSAT image pairs (4 missing images: 1995, 2001-2003)
- OSSIM preprocessed (Meraka Institute)
- Classification (Supervised) prior to mosaicking
- 18 cover classes, post classification combined = 15 classes (~ NLC categories)
- Ground truthing: *Ad hoc* historical aerial photo's + site visitation
- Today's presentation:
 - Years: 1994, 1996, 1998, 2000, 2004, 2006
 - Focusing on Classes: settlement, natural vegetation, degraded vegetation

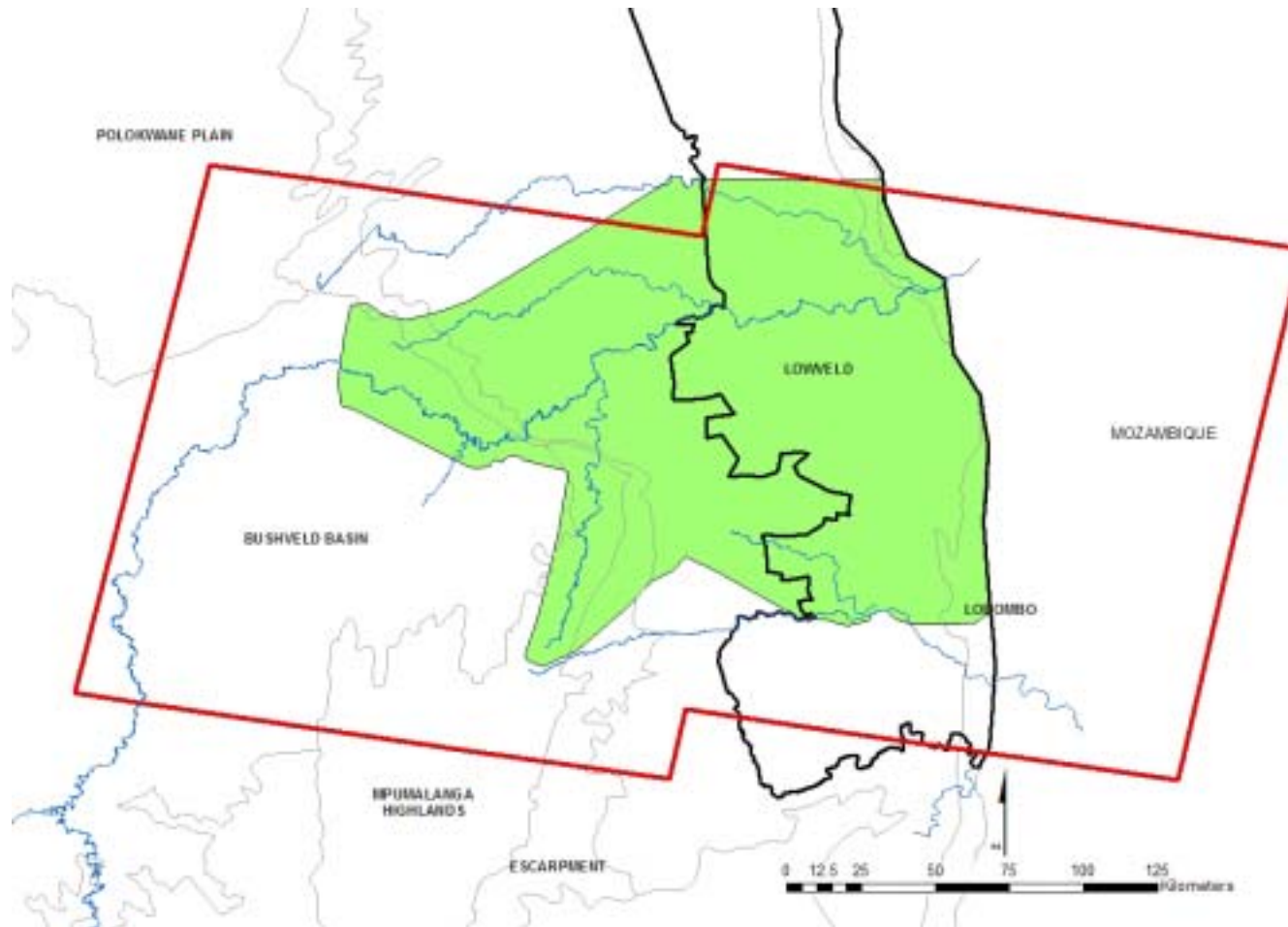
Satellite Imagery: Footprint

Biogeographical regions



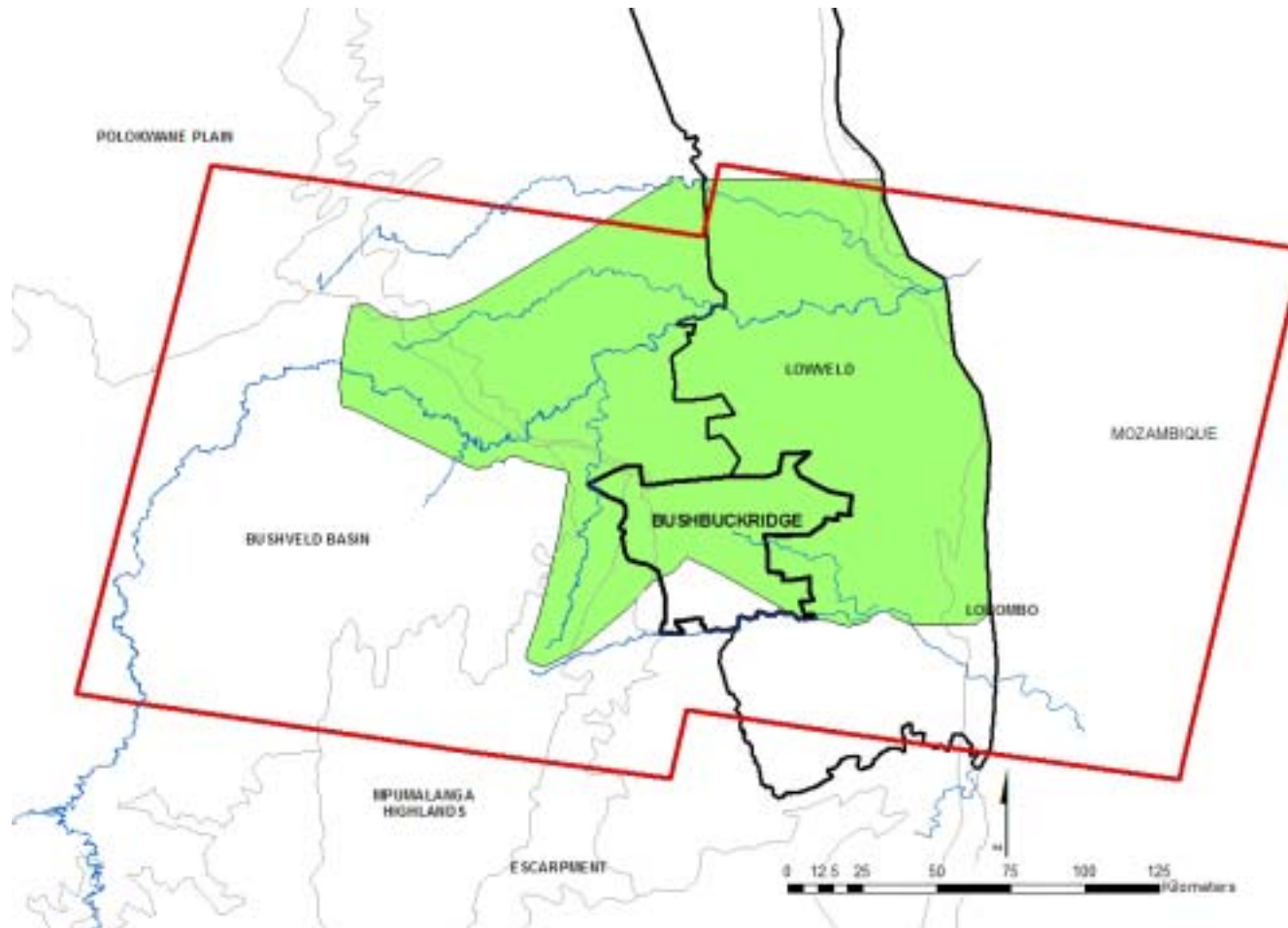
Satellite Imagery: Footprint

Kruger to Canyon Biosphere



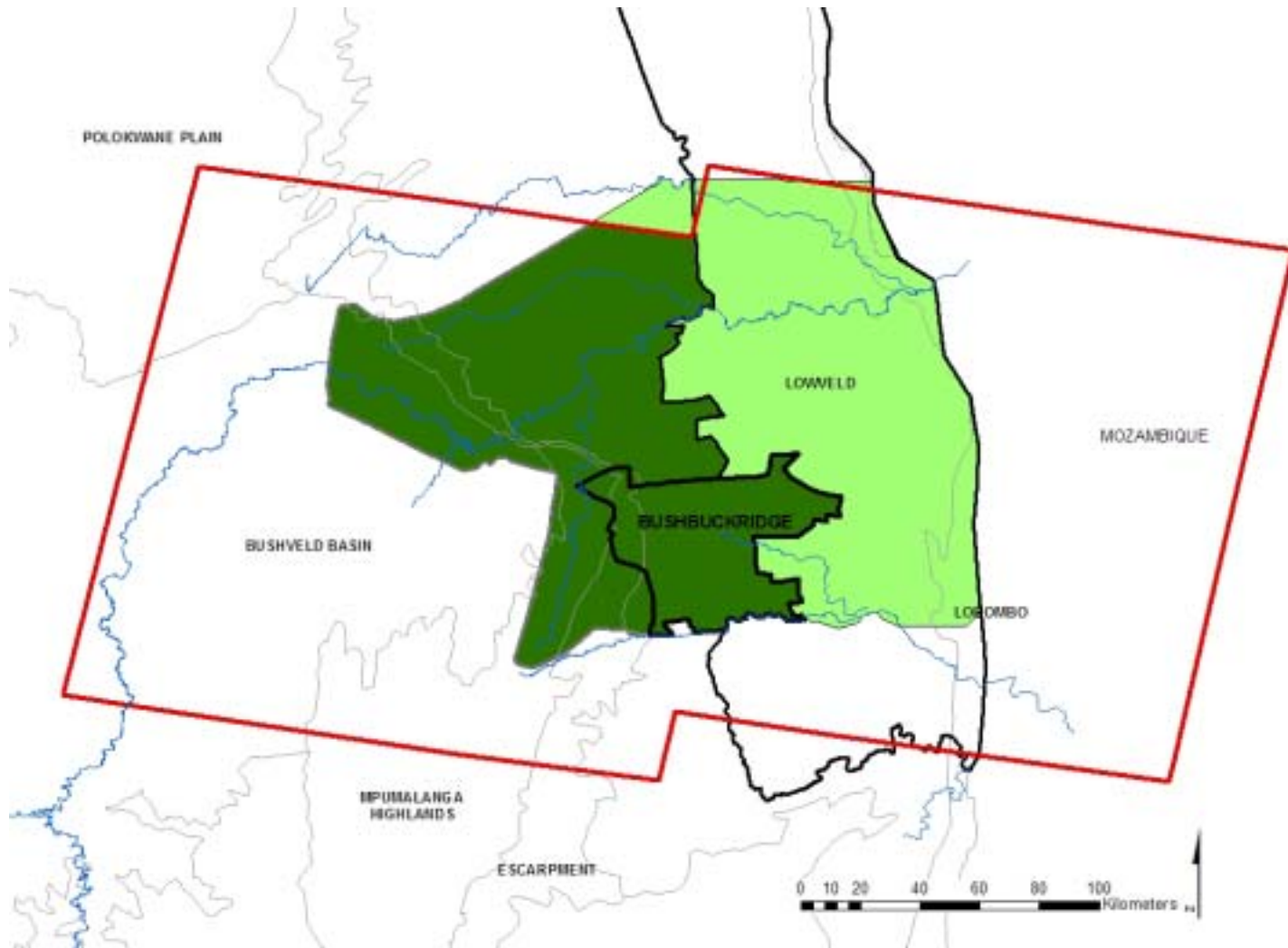
Satellite Imagery: Footprint

Bushbuckridge Municipality



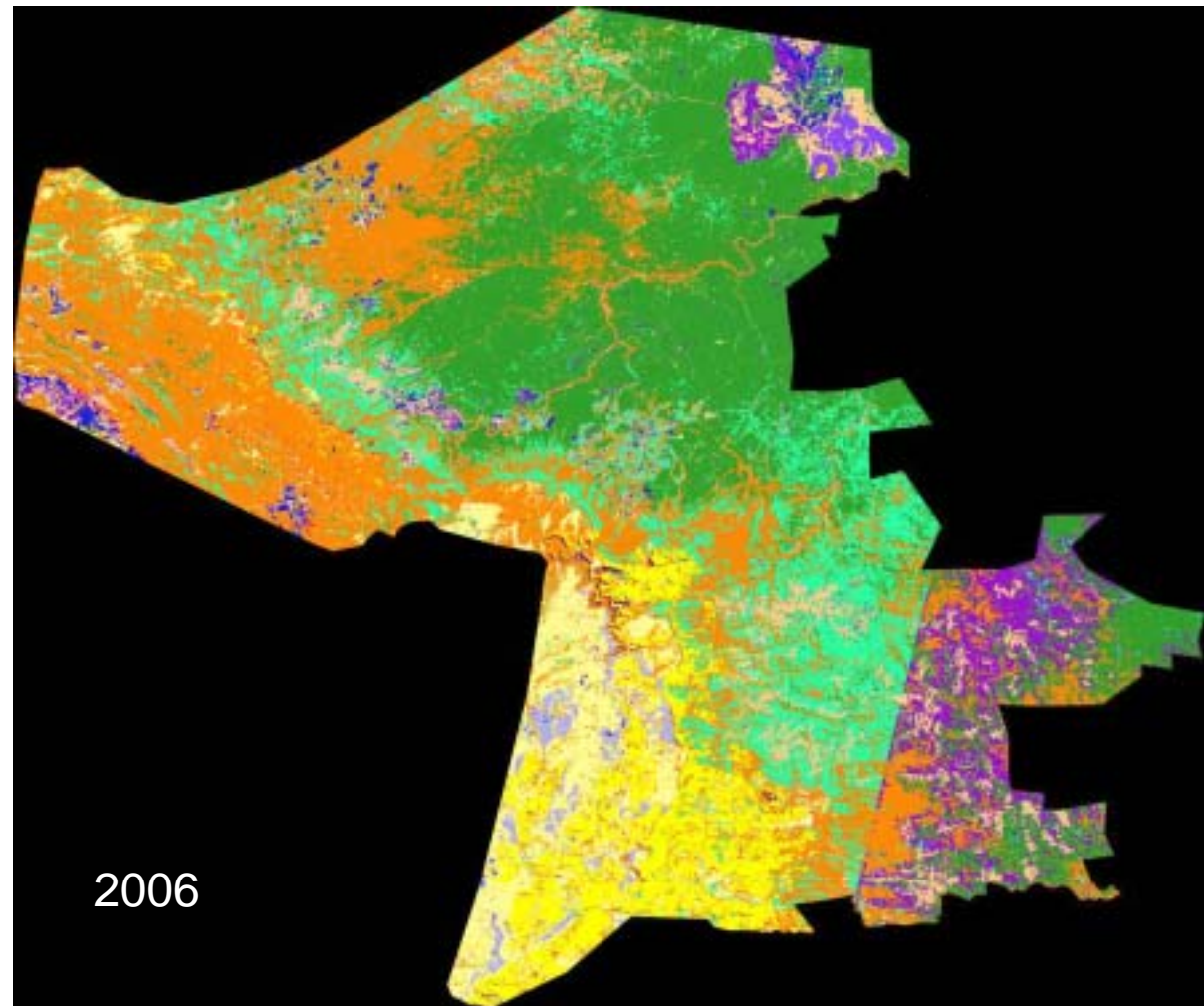
Satellite Imagery: Footprint

K2C- Bushbuckridge adjusted – KNP excluded

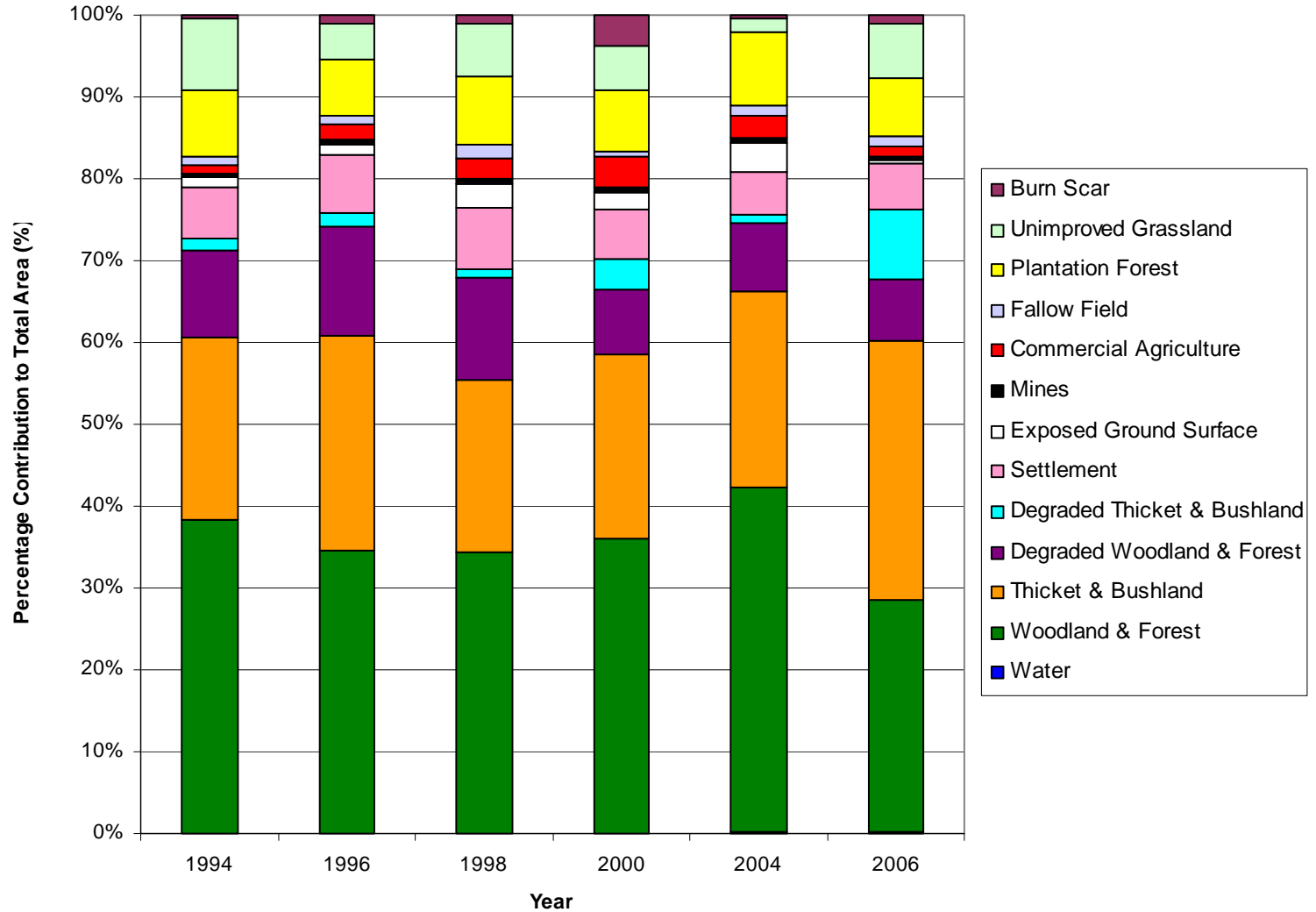


Change Analysis: Classification

1994;1996;1998;2000;2004;2006



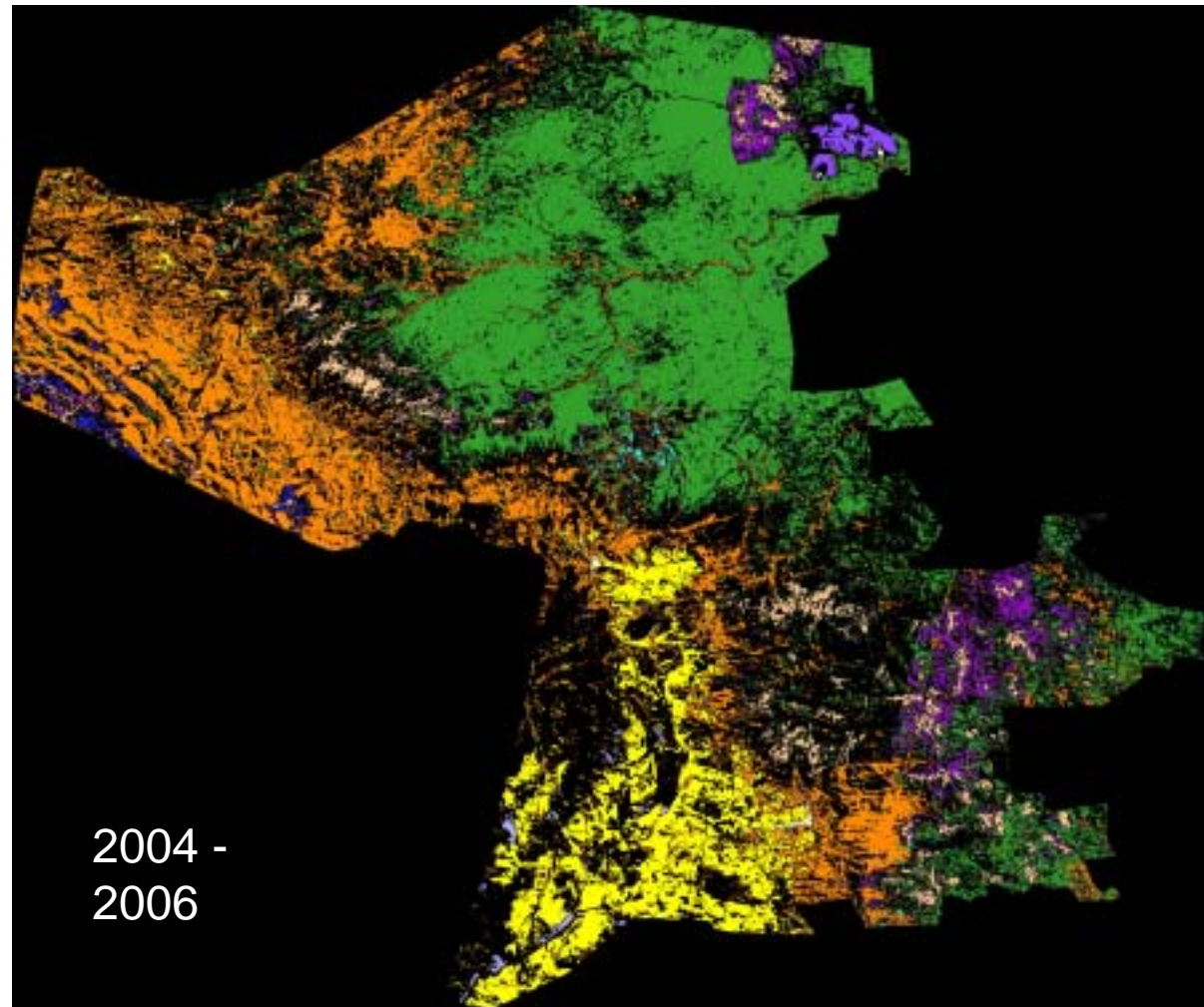
Area changes per year



Percentage Land Cover Class Area Contribution to Total Area

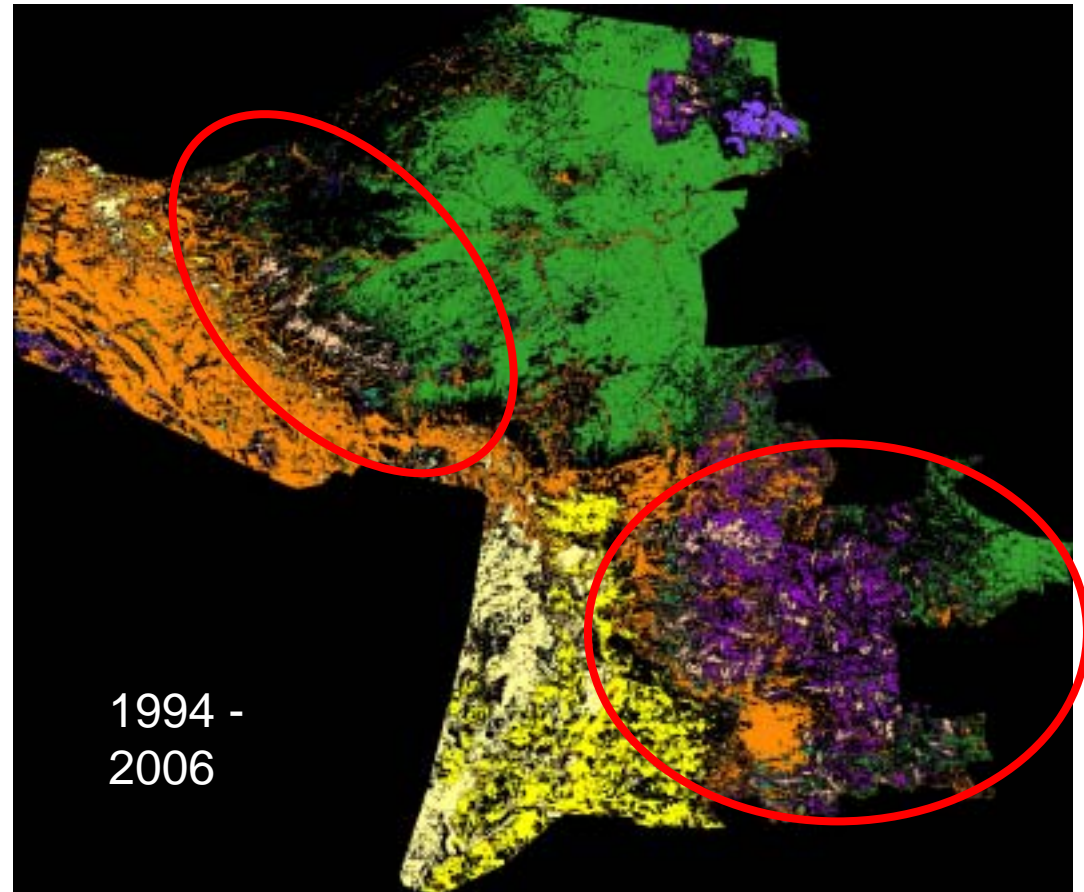
Change Analysis: Persistence

1994-1996;1996-1998 ;1998 -2000;2000-2004;2004-2006

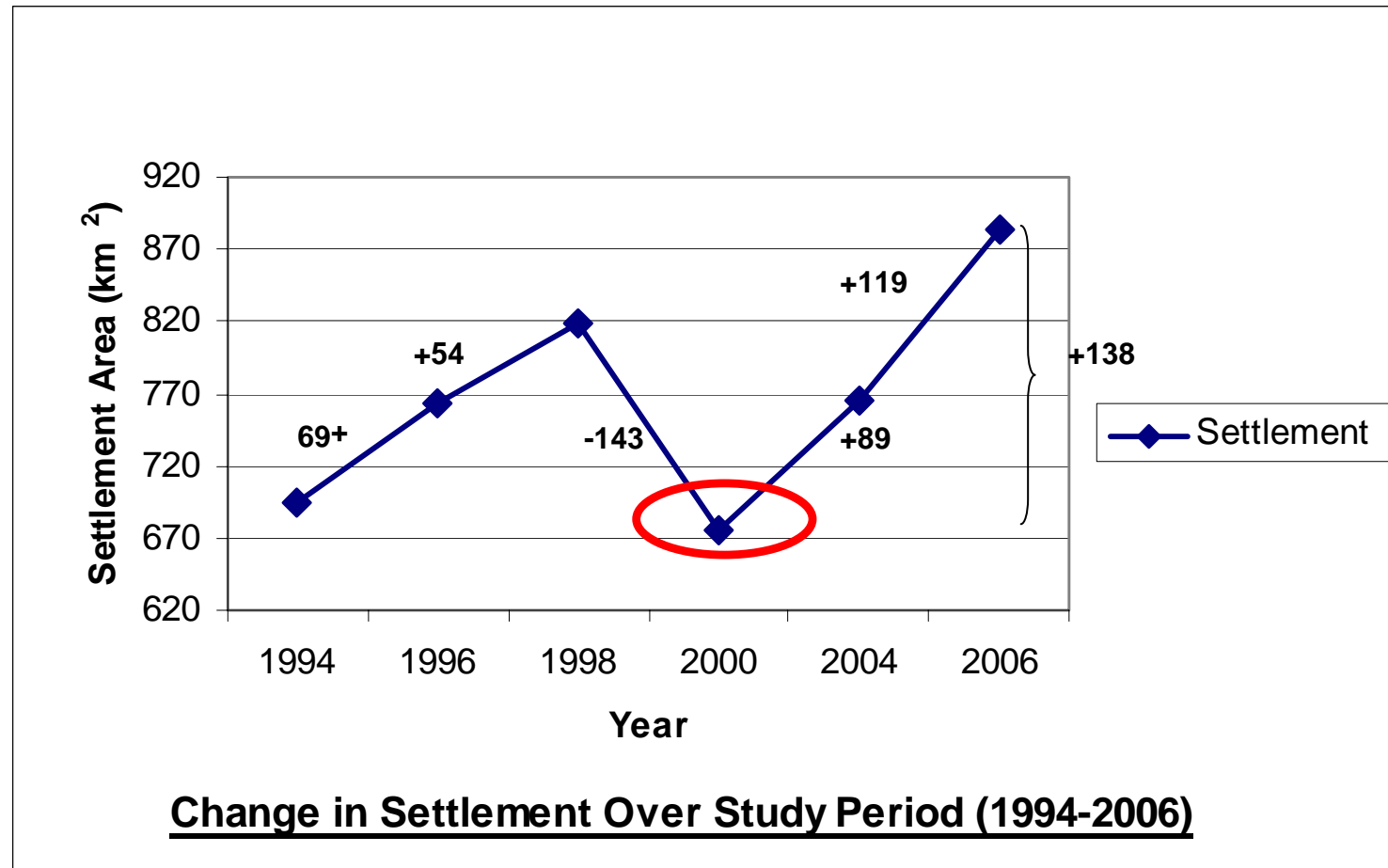


Change Analysis: Areas of significant transition

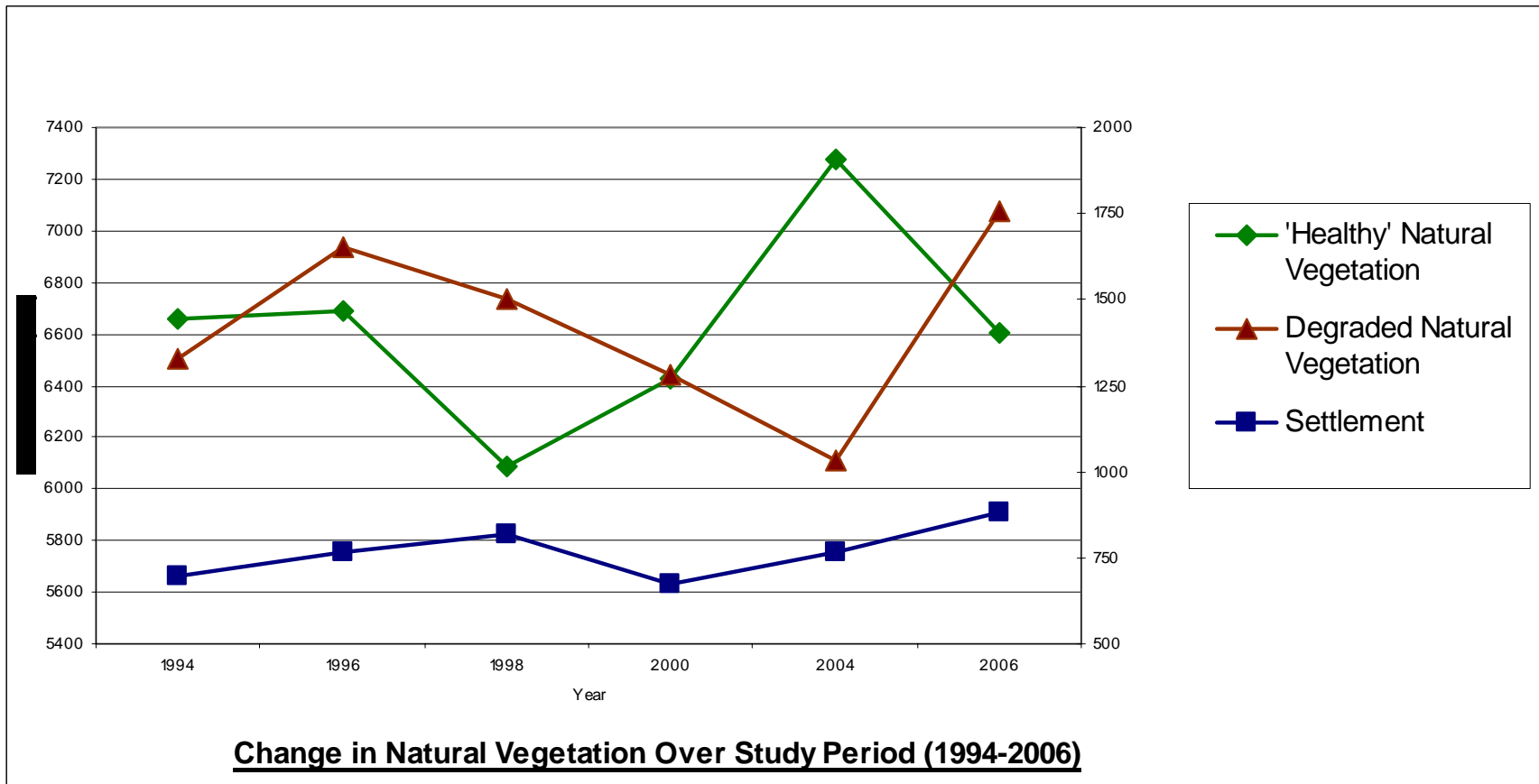
- Exposed Rock
- Deep Water
- Woodland & Forest
- Thicket & Bushland
- Degraded Woodland & Forest
- Degraded Thicket & Bushland
- Settlement
- Mines
- Commercial Sugarcane
- Commercial Agriculture -Other
- Plantation Forest
- Fallow Field
- Burn Scar
- Unimproved Grassland
- Exposed Ground



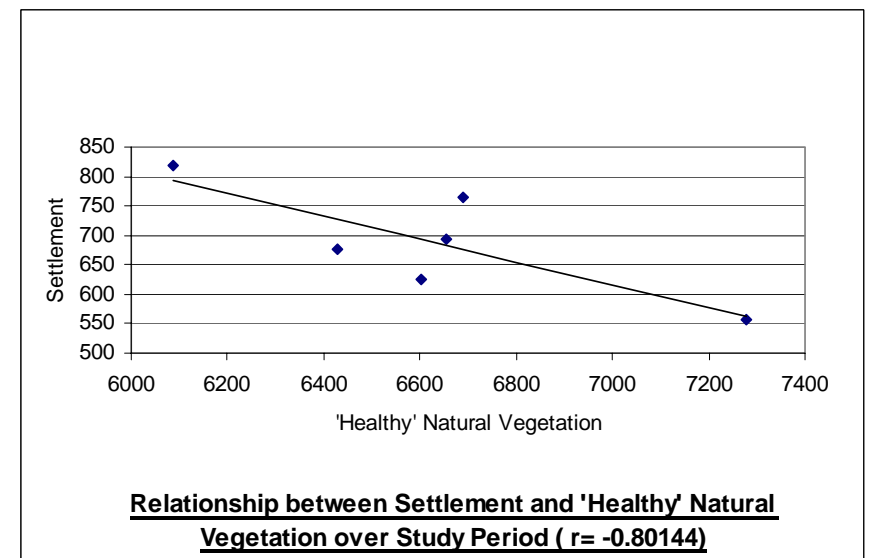
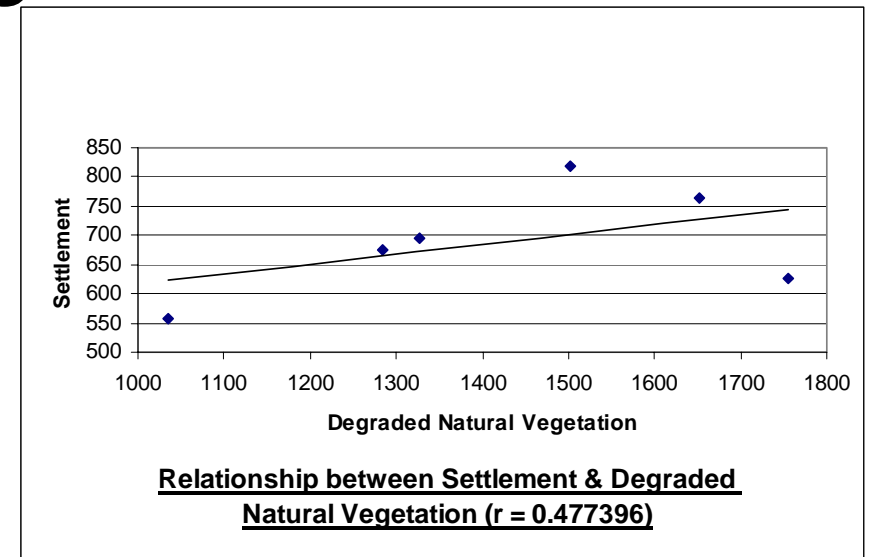
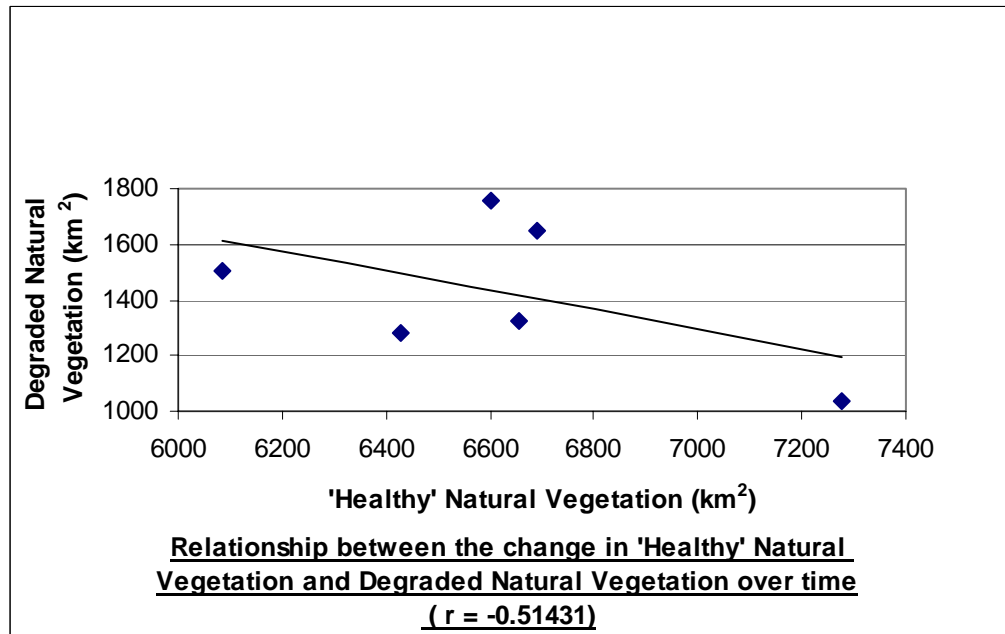
Settlement Change over time



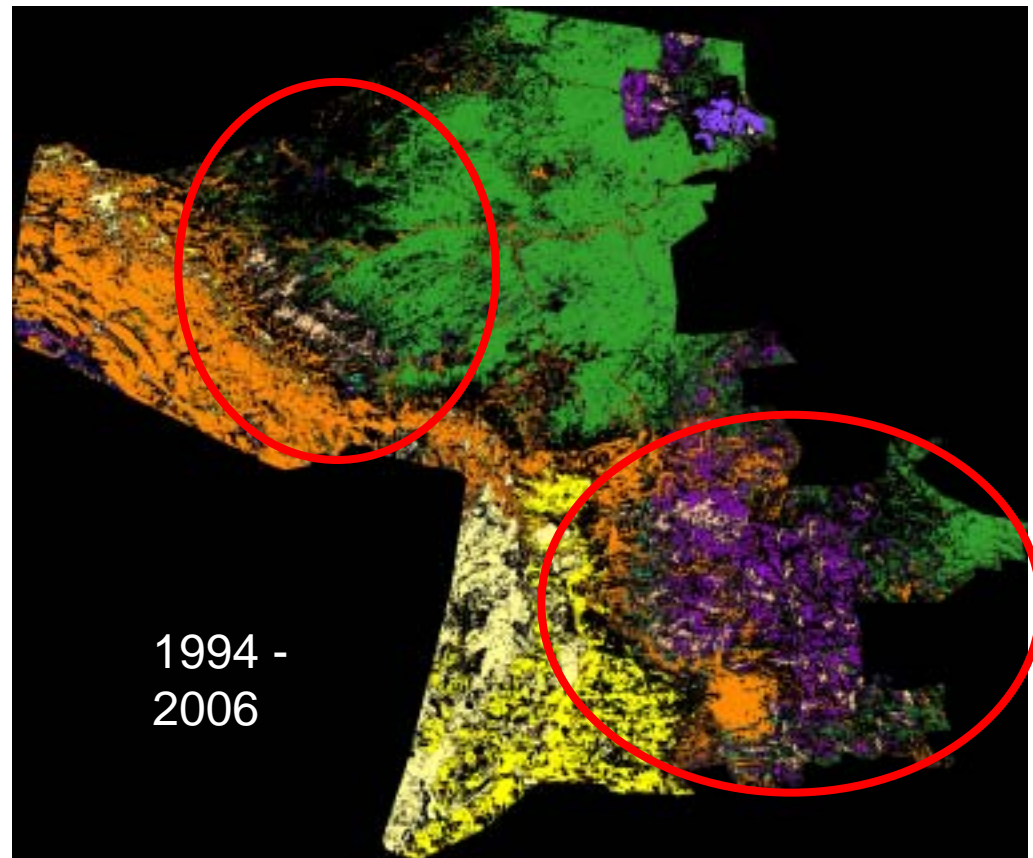
Change in Natural Vegetation over Study Period



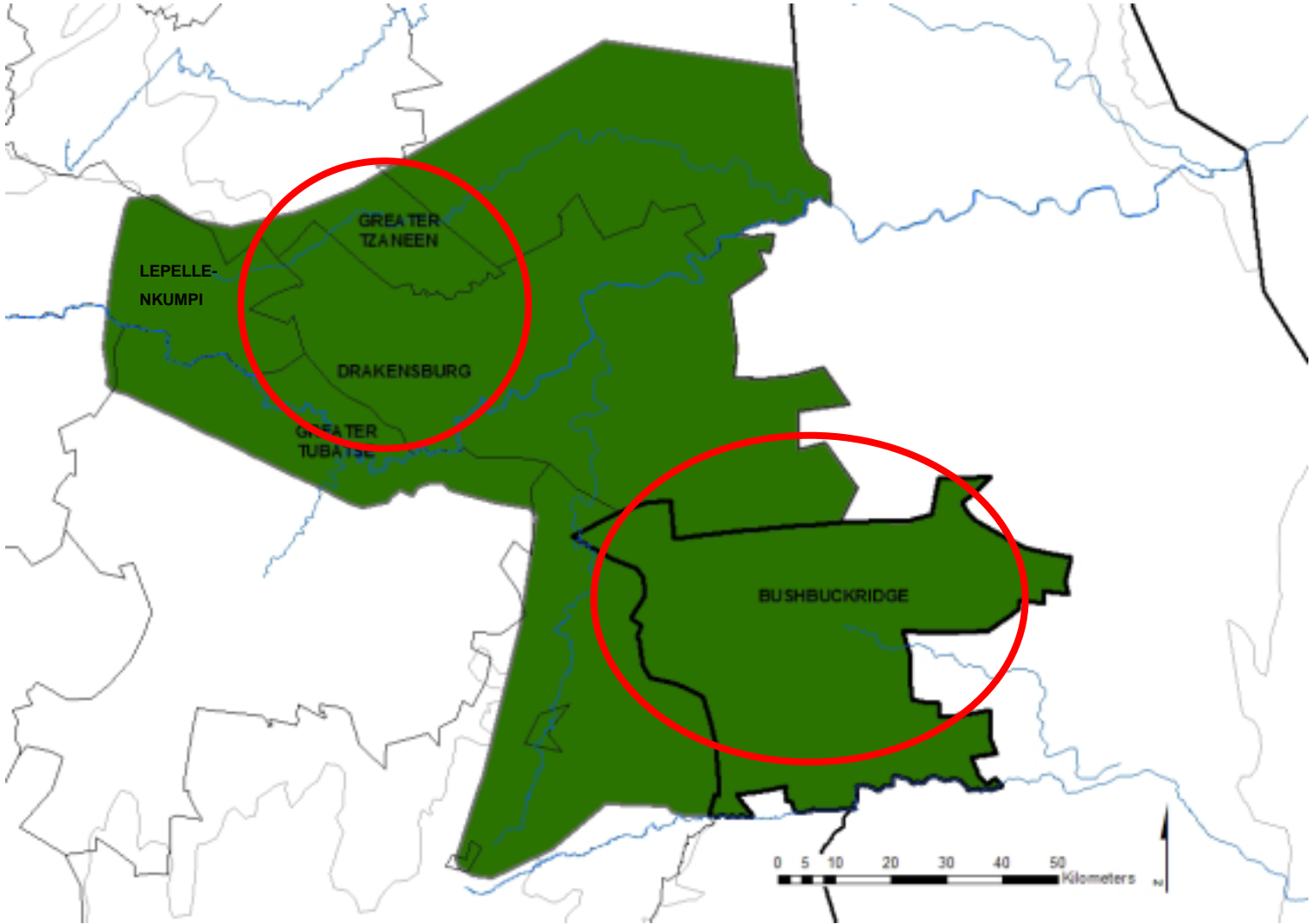
Relationship between Settlement & Natural Vegetation



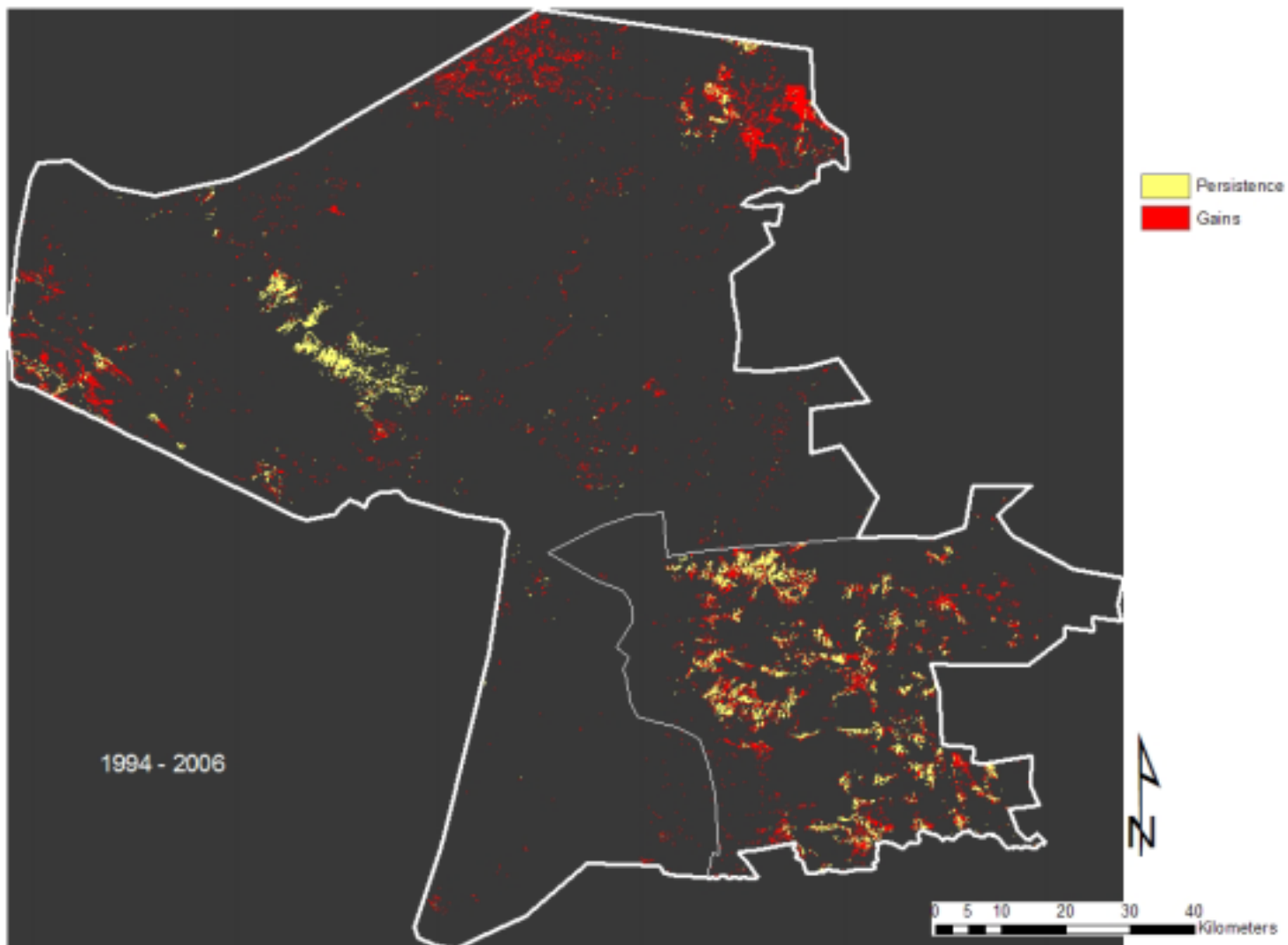
Change Analysis: Areas of significant transition



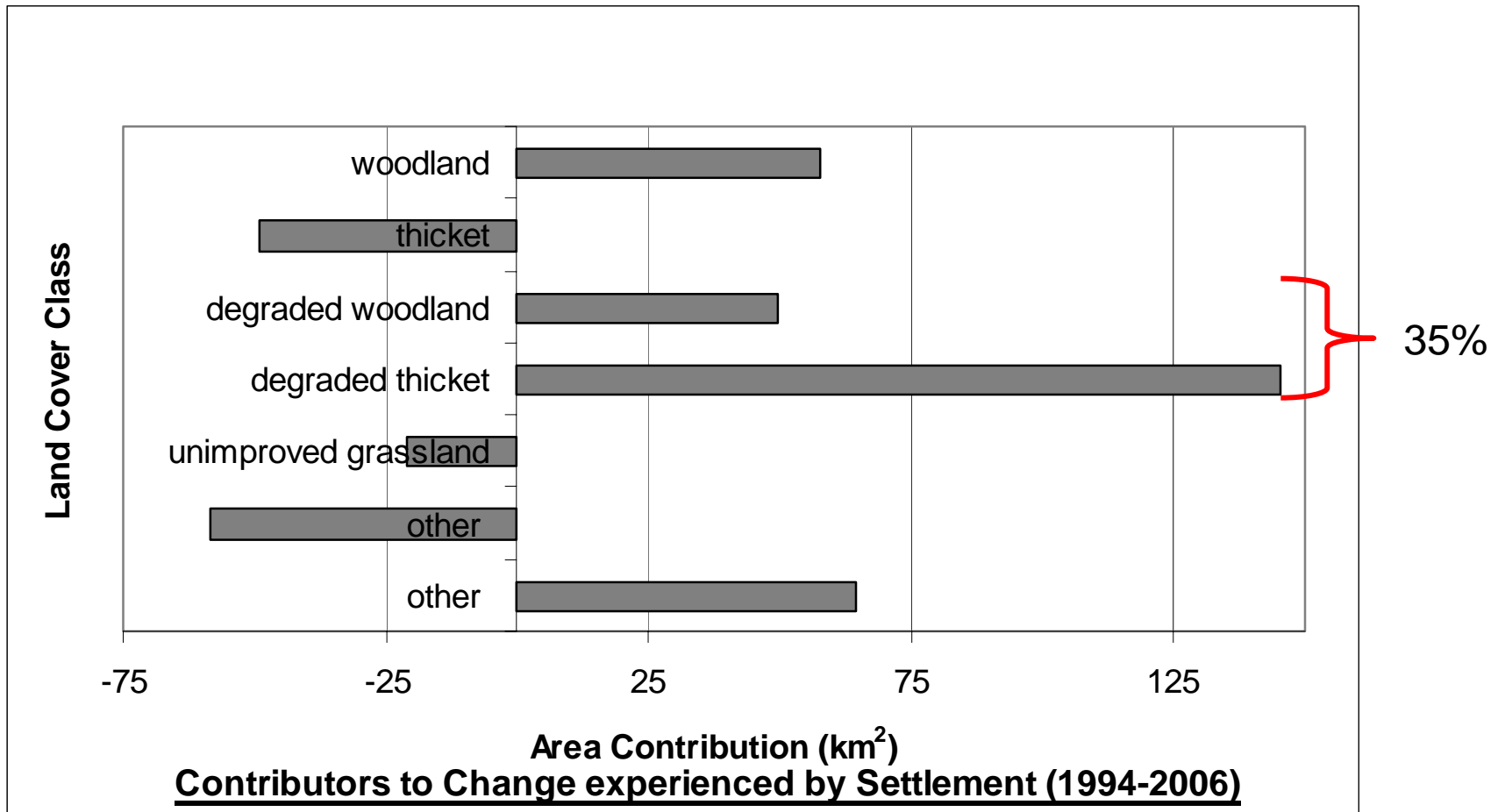
Change Analysis: Areas of significant transition



Net Settlement Change: 1994 - 2006



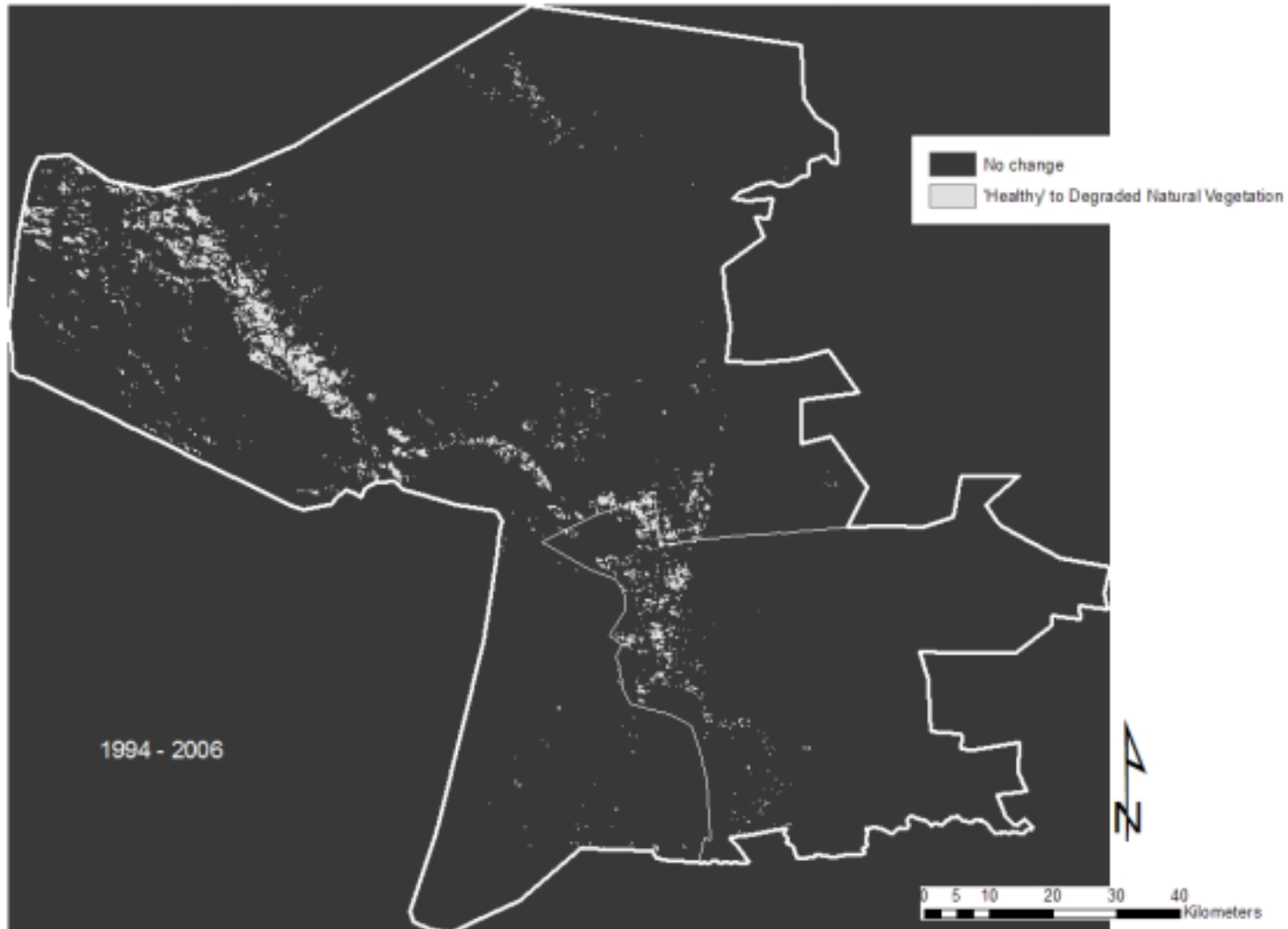
Relative proportion contribution of other land cover classes to settlement change (1994 - 2006)



Net Transitions from Degraded Natural Vegetation to Settlement: 1994 - 2006



Net Transitions from 'Healthy' to Degraded Natural Vegetation: 1994 - 2006



Summary

- Settlement has shown net increase over time;
- Settlement has shown an increase per analysis year – except for 2000;
- Settlements appear to be getting larger rather than new ones establishing;
- Majority of settlement increase appears to be into degraded vegetation;
- Degraded vegetation has increased over time – expanding into adjacent ‘healthy’ vegetation.
- On a year – by – year basis, difficult to find consistent trends – net change more useful.
- Year-by-year analysis likely to be more important for prediction into the future & transition modeling

So where to from here?

- Complete ground-truthing & generate kappa statistic
- Complete future change prediction
- Complete transition probabilities for land use classes
- Conservation planning exercise

Acknowledgements

- My supervisors:
 - Dr BF Erasmus
 - Prof ETF Witkowski
- CSIR + Meraka – Asheer Bachoo

Transitions from Degraded Vegetation to Settlement:

1994 - 1996; 1996 - 1998; 1998 - 2000; 2000 - 2004; 2004 - 2006

