

Response of the Upper Tugela River to Climate and Anthropogenic Forcing



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Introduction

- ✓ The Tugela River is one of the most important rivers in South Africa.
- ✓ South Africa is a semi arid country and water management is key to continued growth.
- ✓ **Geomorphological Sensitivity** is the response of the environment to external forcing which can be seen in changes in the geomorphology of the landscape.
 - ✓ River channel morphology.

Aims

The aim of the study was to determine if the Tugela River has been affected by changes in climate or land use.

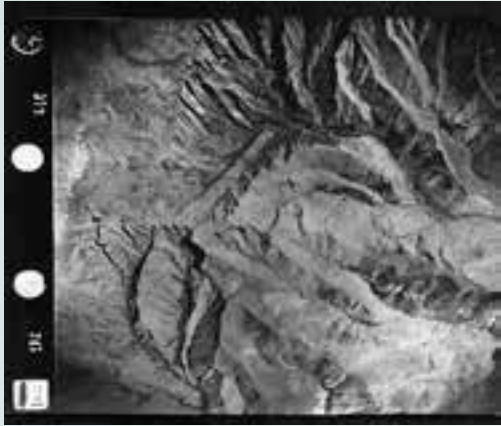
Objectives

Analyse rainfall data to determine any changes in average annual rainfall or the frequency and intensity of extreme events.

Determine any changes in land use using aerial photographs.

Determine any changes to the river channel morphology, by mapping the river using aerial photographs

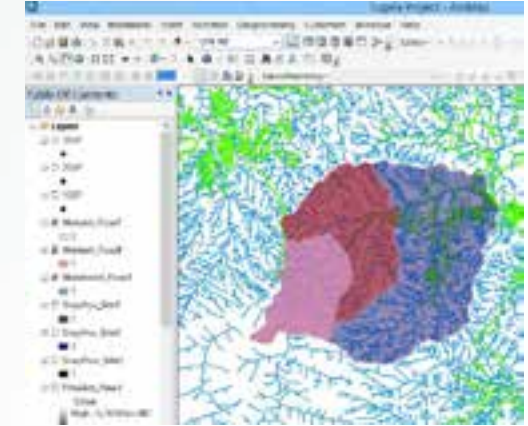
Methods



**Aerial
Photographs**

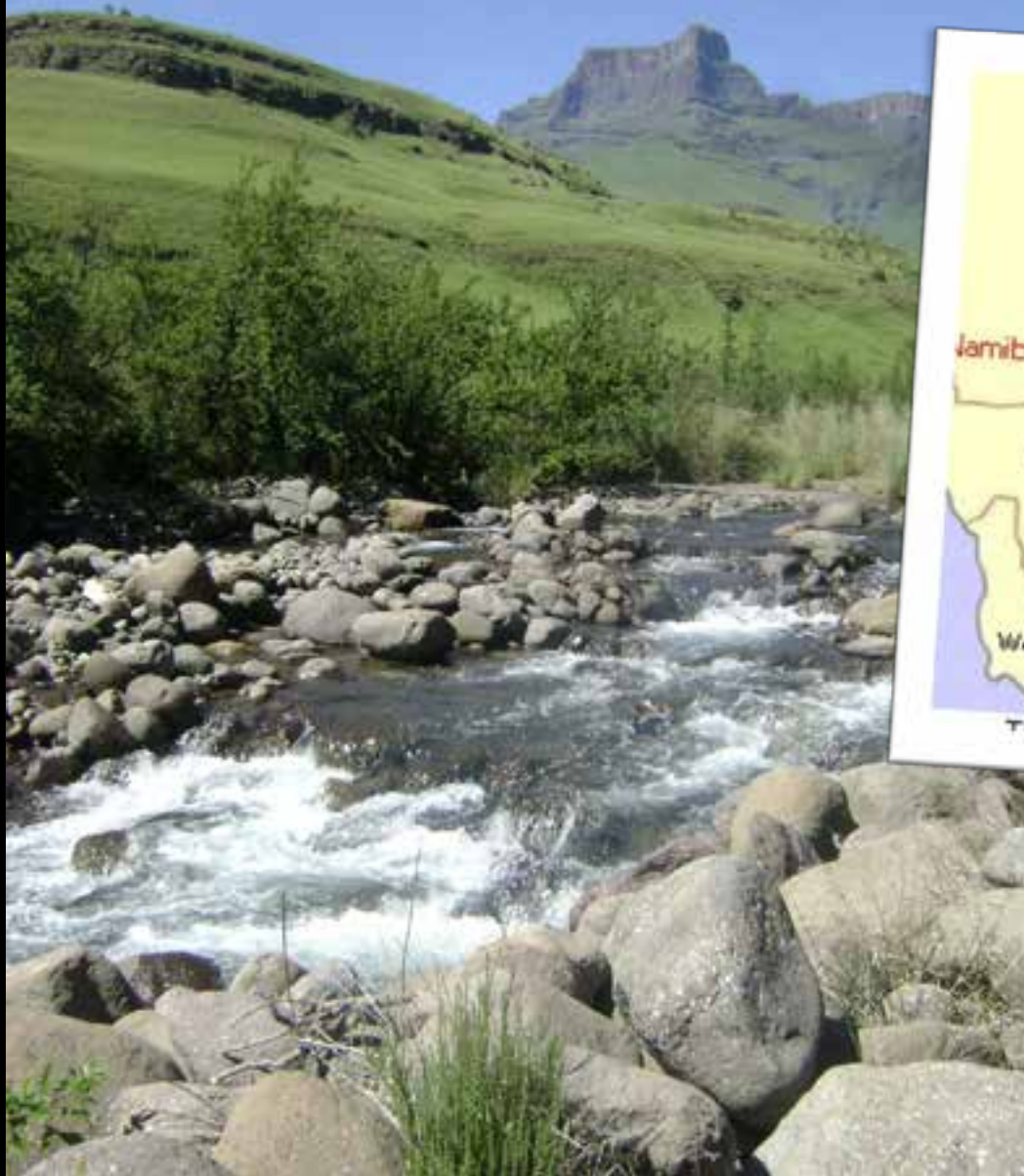


Field Work



GIS

Study Area

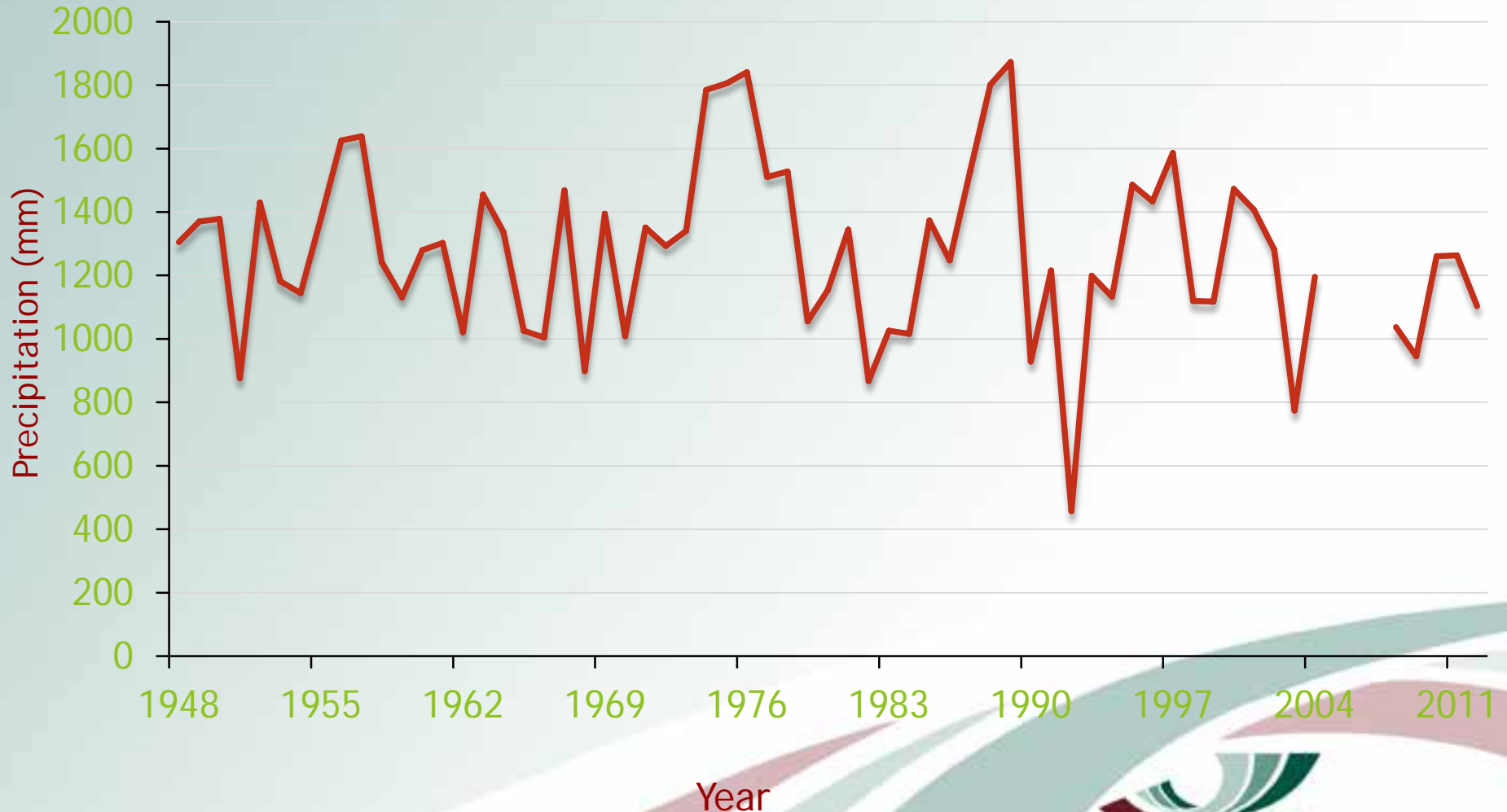




Adapted from: maps.google.co.za

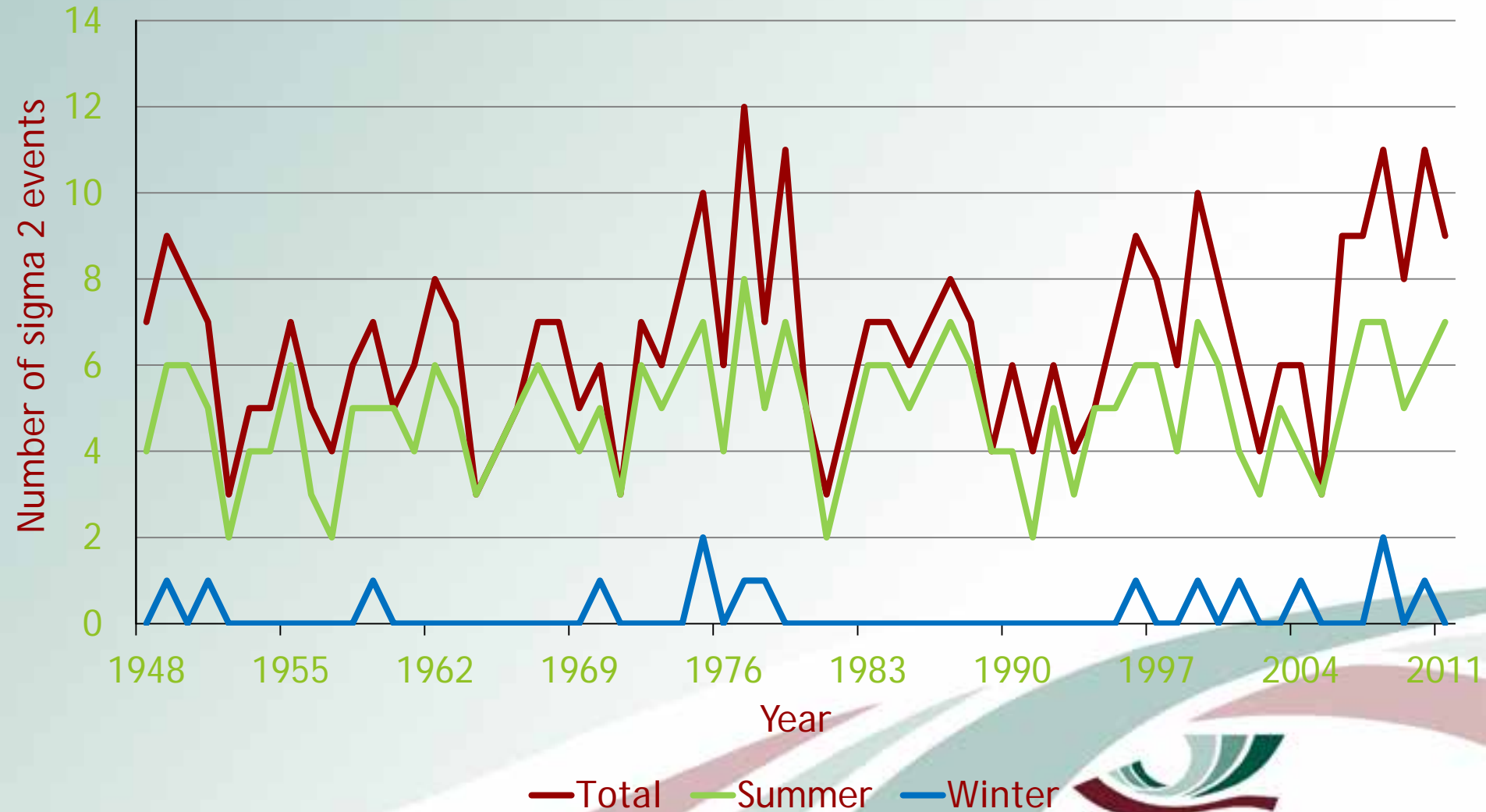
Results: Rainfall

Average Annual Rainfall



Results: Rainfall

Frequency of extreme events



— Total — Summer — Winter



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Results: Rainfall

Inter-Annual Variability



Results: Land use Change

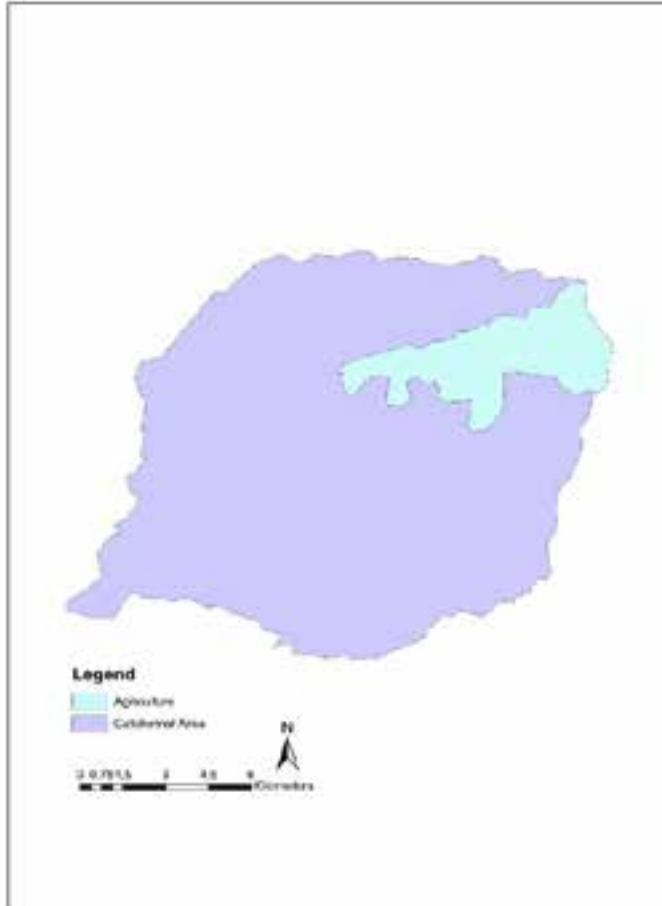


Site 2: 1944

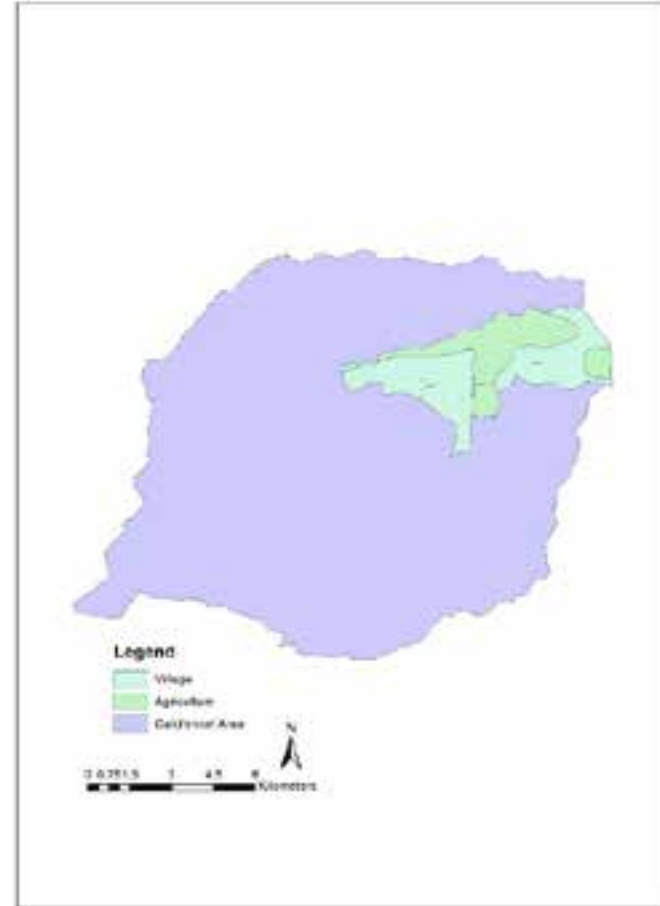


Site 2: 2004

Results: Land use Change



1944



2004

Results: Channel Morphology (Site 1)



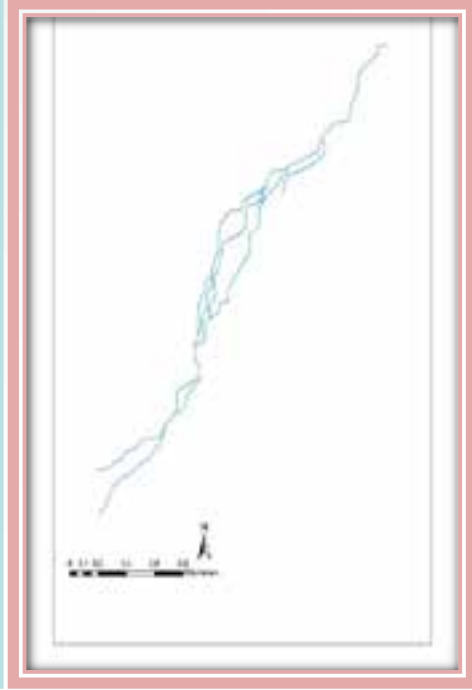
1944



1962

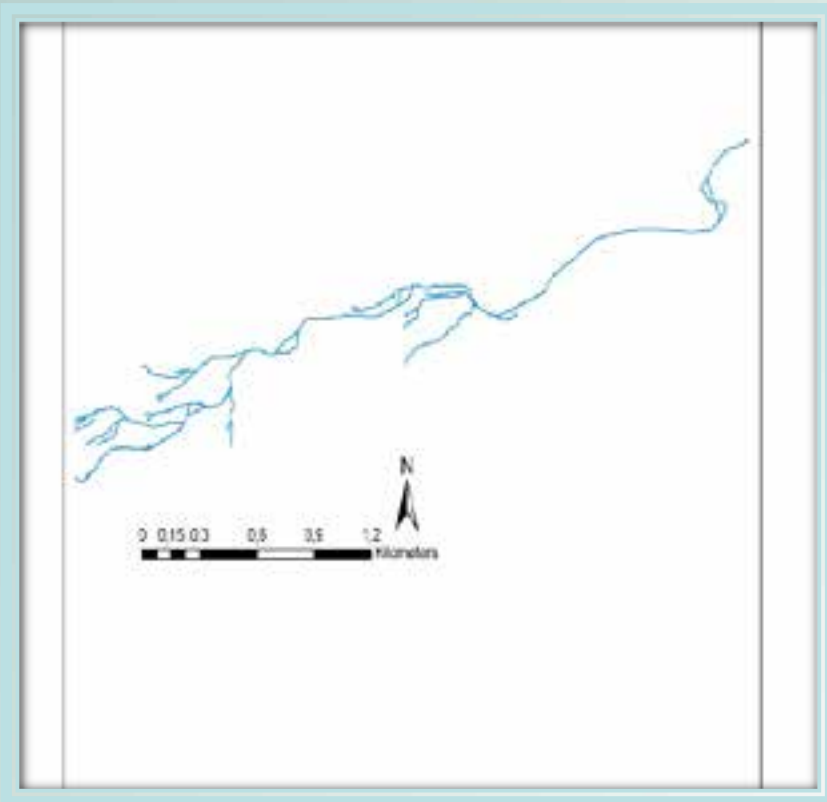


1986

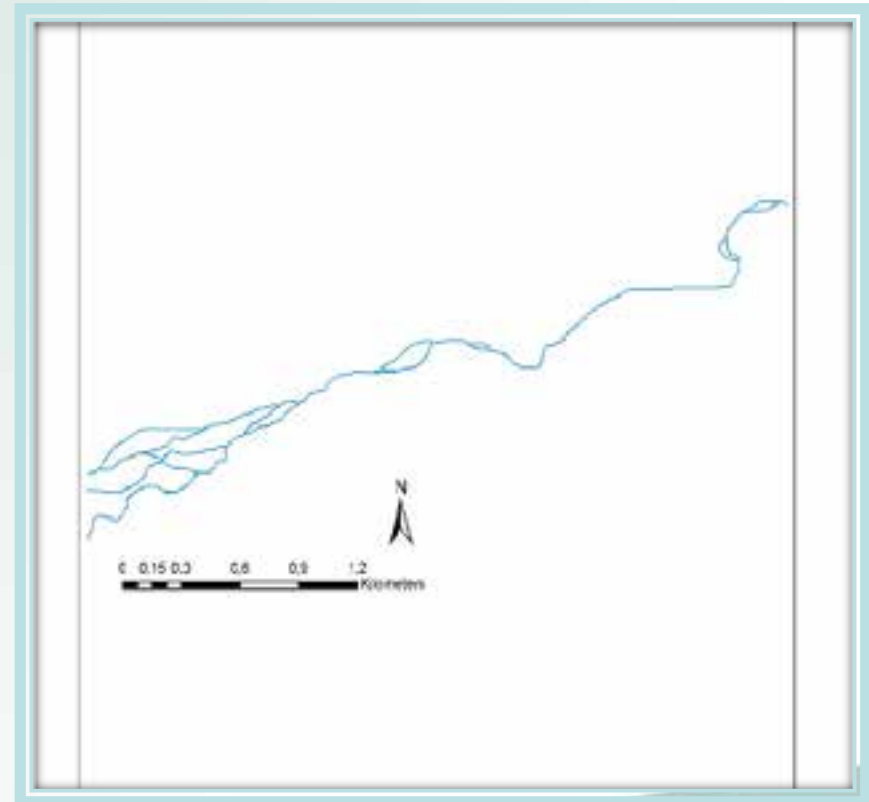


2004

Results: River Channel Morphology (Site 2)

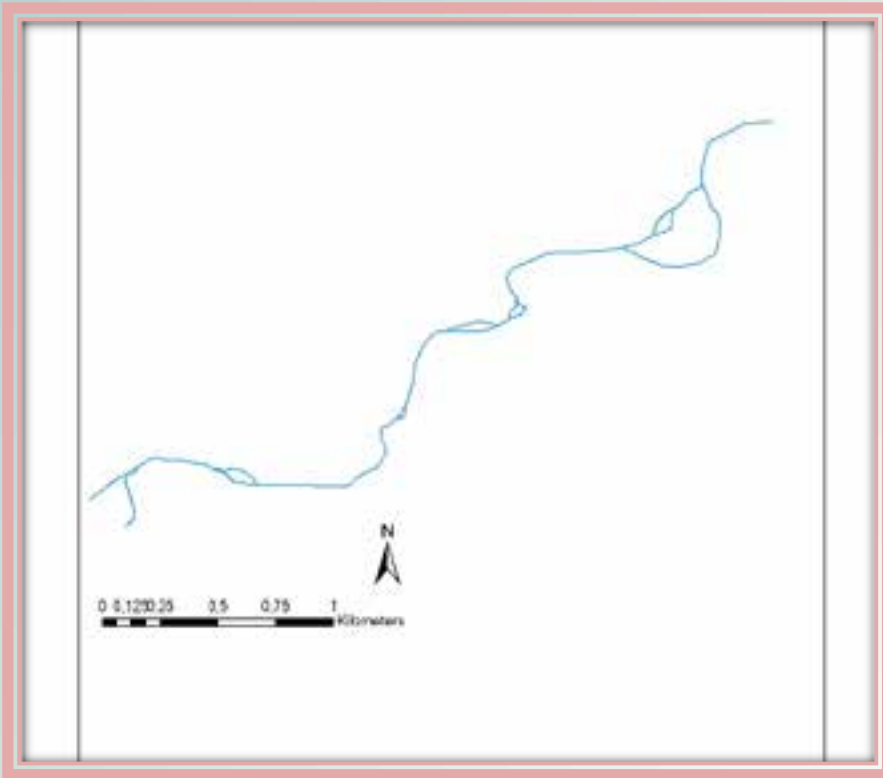


1944

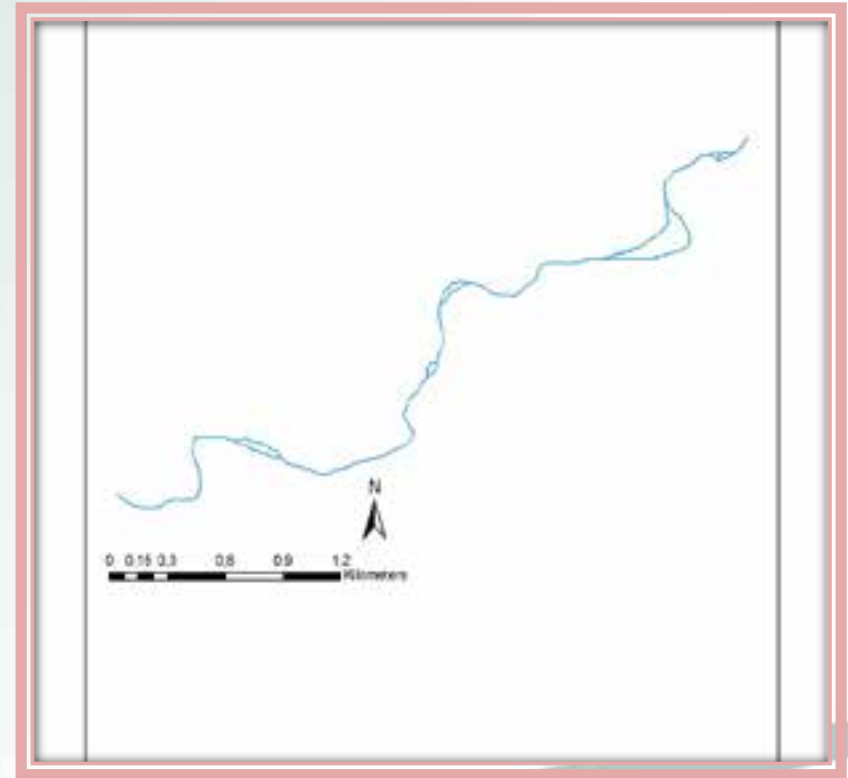


2004

Results: River Channel Morphology (Site 3)



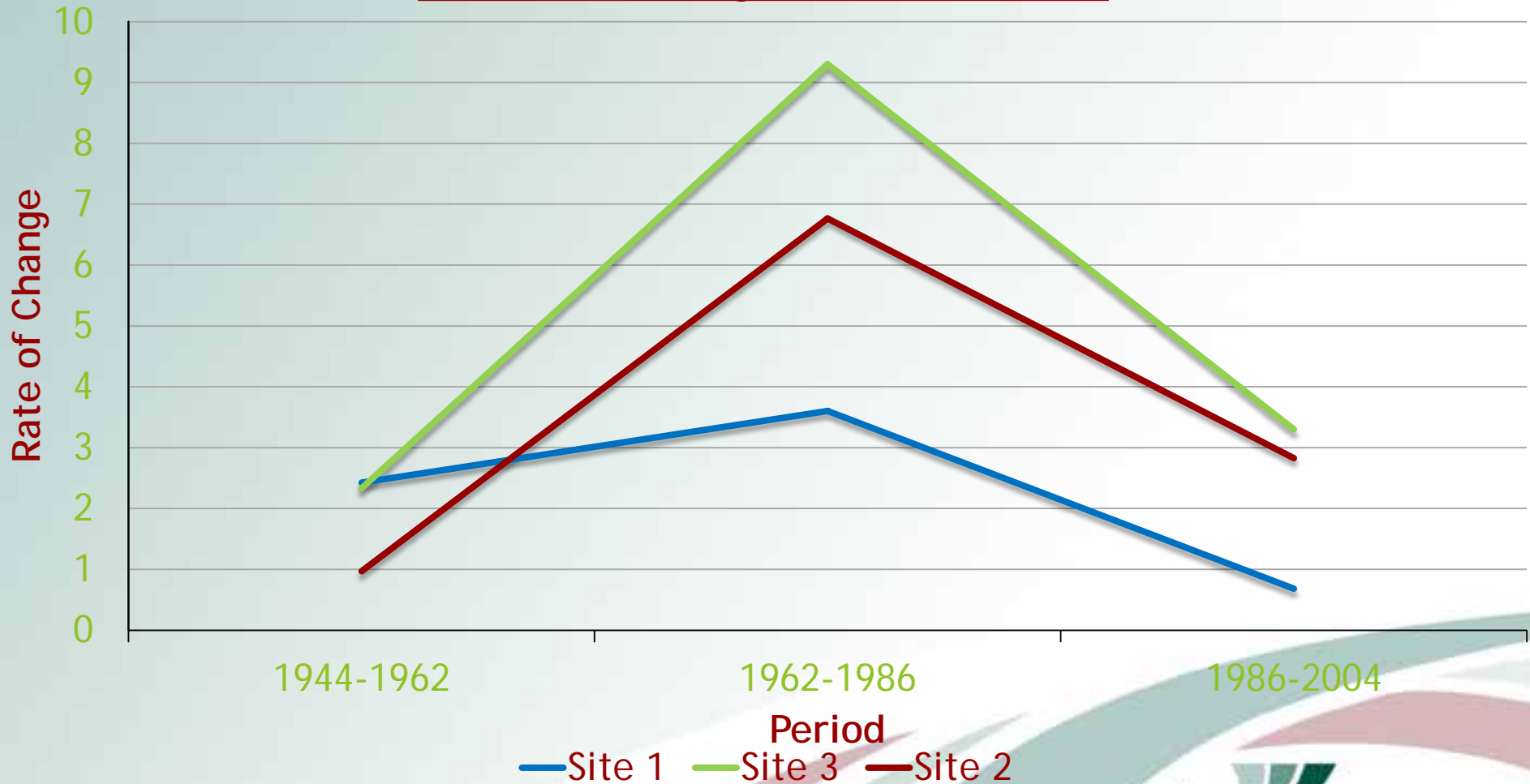
1944



2004

Results: River Channel Morphology

Rate of Change for Each Site



Conclusion



Results show the morphology of the upper Tugela River did change.



All 3 sites showed changes although site 2 and 3 showed greater change.




Changes reflected effects of flooding and natural channel change. However site 2 and 3 show accelerated rate of change.



Changes in land use did affect the channel morphology.

Conclusion

The Tugela River did not show extreme changes when compared to other studies



The river is not as sensitive to changes in land use.



Land use changes aren't great enough.



Changes are greater downstream.

Significance of Study

Few studies of this type have been conducted in Southern Africa.

www.worldatlas.com



The study shows that land use changes in the catchment basin of a river can be seen in changes to river channel morphology.



This can have important implications on catchment management practices and dam management.



The study can be broadened by incorporating studies focusing on recovery from flood events, changes in channel pattern and sediment load.





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