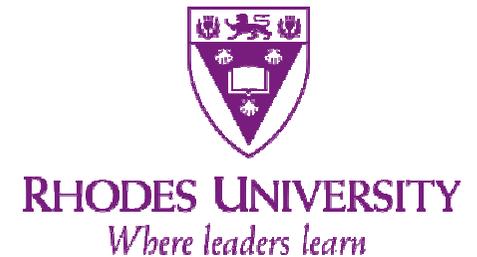
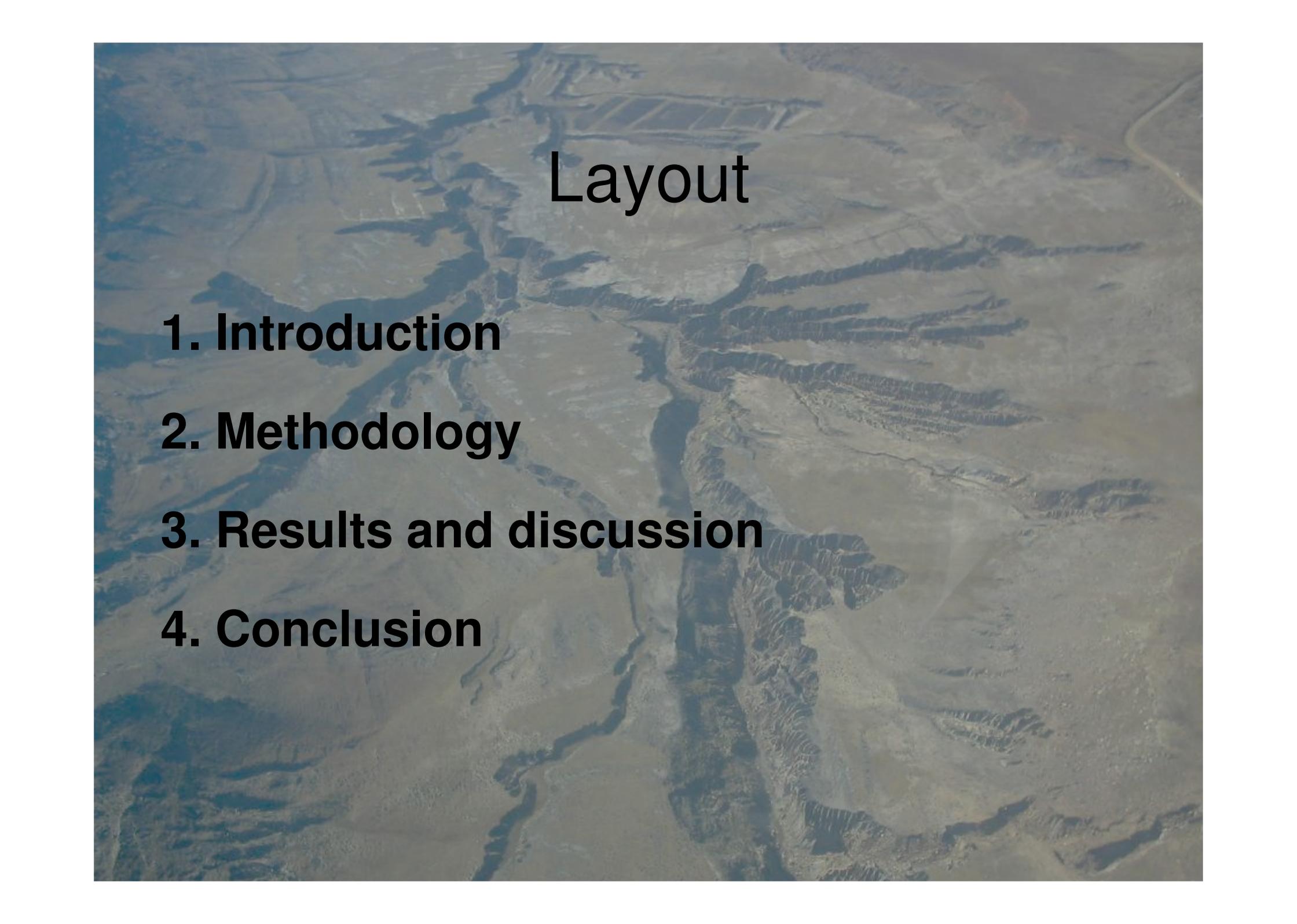


# Gully erosion susceptibility modelling for avoided degradation planning



***Jay le Roux & Bennie van der Waal***



An aerial photograph of a desert landscape. A winding river flows through the center of the image, surrounded by arid terrain. In the upper left, there are rectangular agricultural fields. The overall color palette is dominated by earthy tones like tan, brown, and blue.

# Layout

**1. Introduction**

**2. Methodology**

**3. Results and discussion**

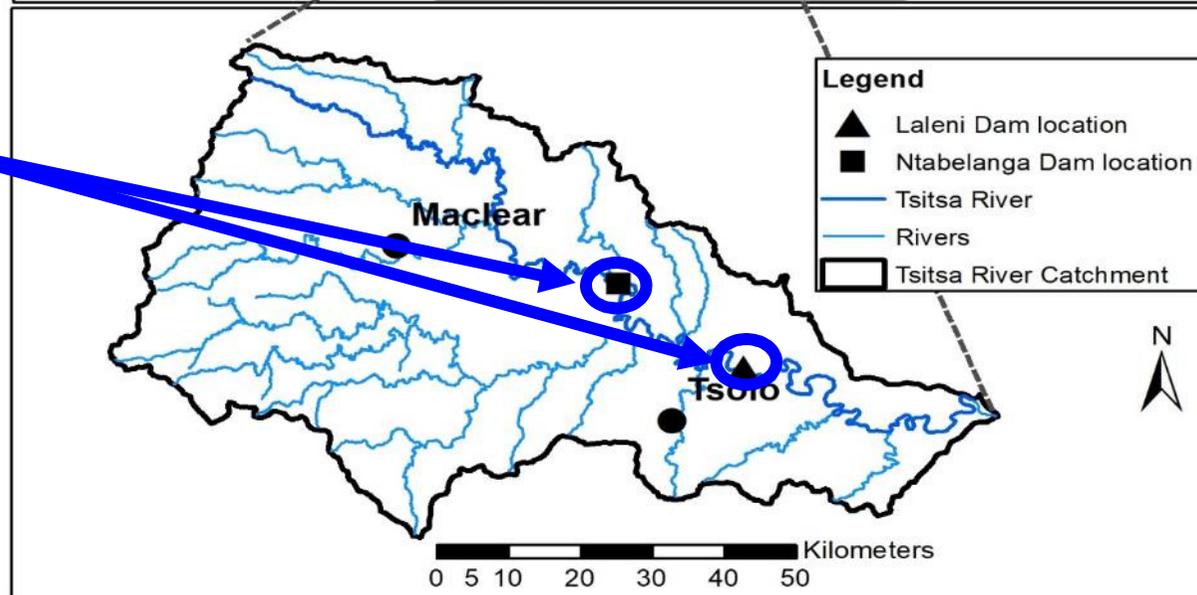
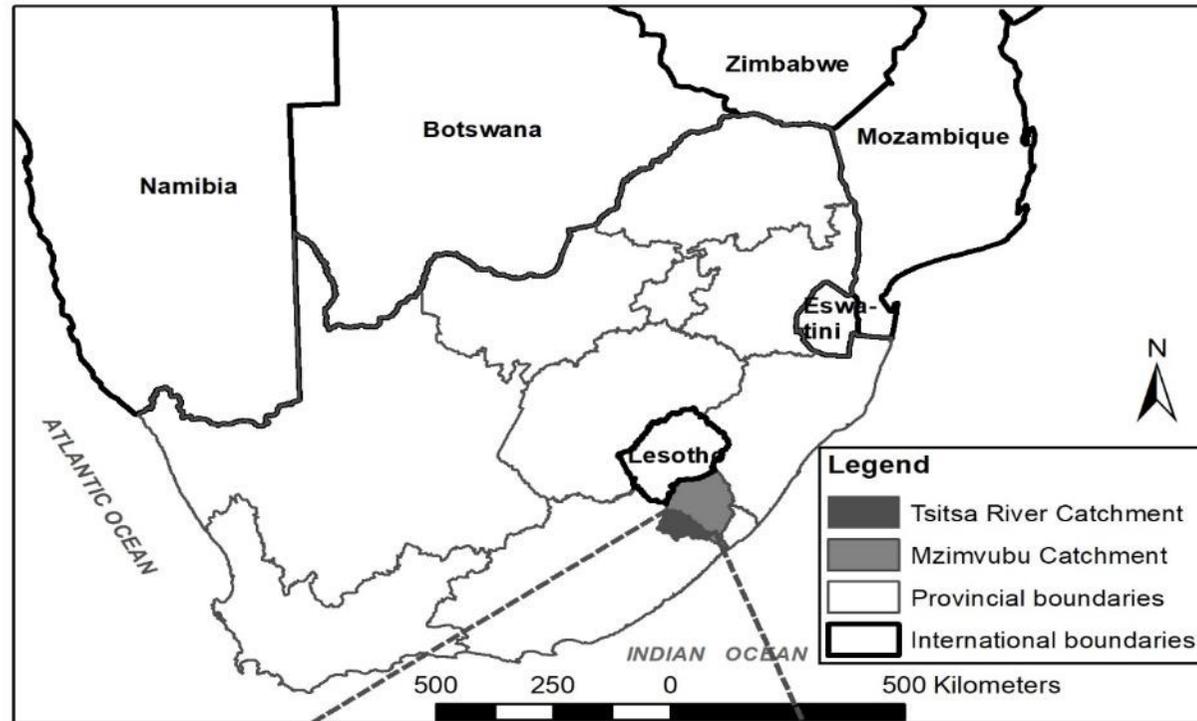
**4. Conclusion**

# Introduction: Tsitsa River Catchment

- Water resource development is planned on the Tsitsa River in South Africa (SA)
  - Project include building of:
    - irrigation dam (storage capacity of 490 million m<sup>3</sup>)
    - hydropower dam (storage capacity of 232 million m<sup>3</sup>)
  - **Only large river network in SA without a dam**
  - Opportunity to accelerate social and economic upliftment within the catchment, one of the poorest and least developed regions of SA



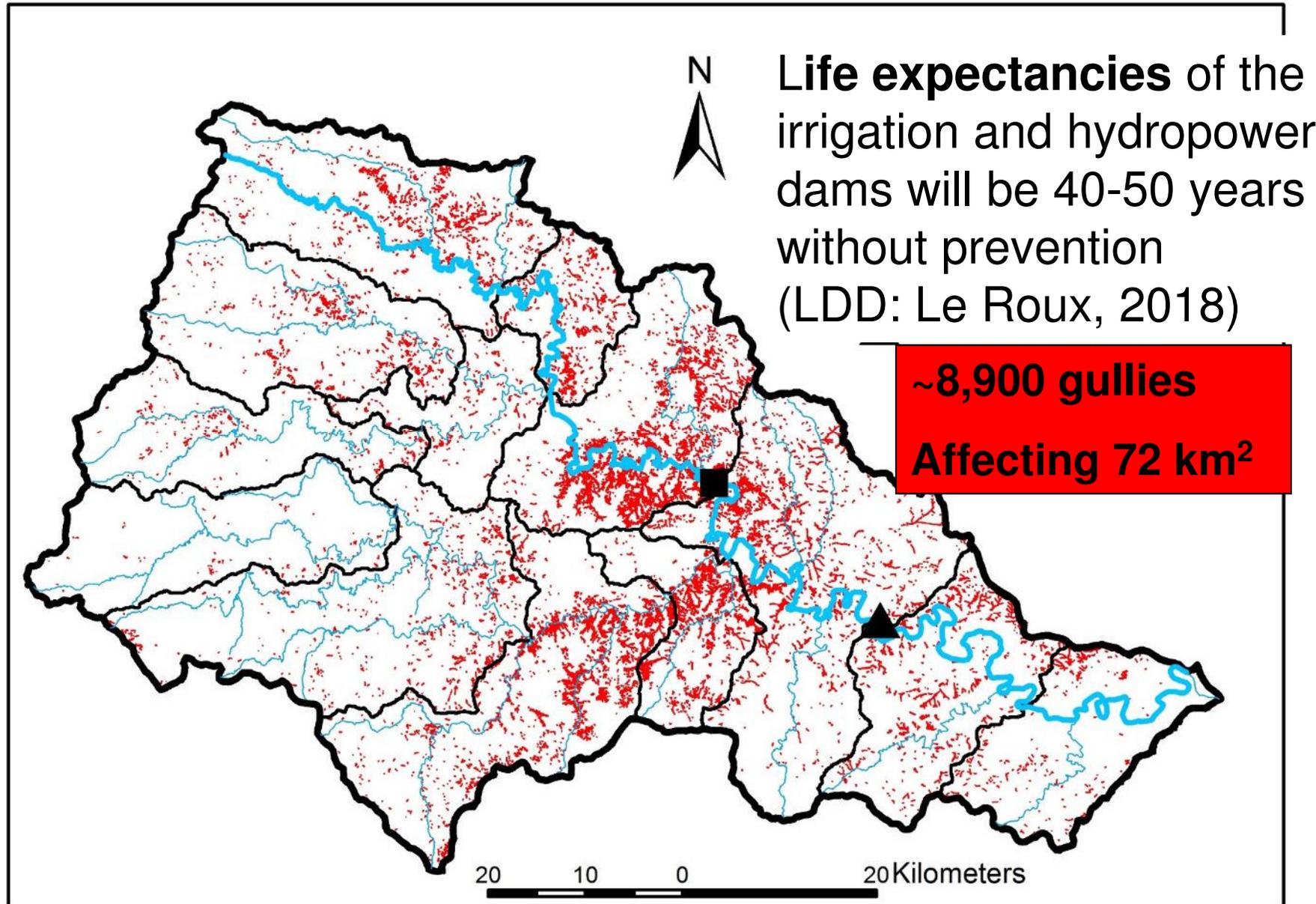
# Introduction: Tsitsa River Catchment



Dam locations



# Introduction: Tsitsa River Catchment



# Introduction: Tsitsa River Catchment



Badlands like these are irreparable

# Introduction: Tsitsa River Catchment



Check Youtube video:  
Tsolo gully exploration

Gully networks  
can be more than  
10 m deep, over  
100 m wide and  
several km long

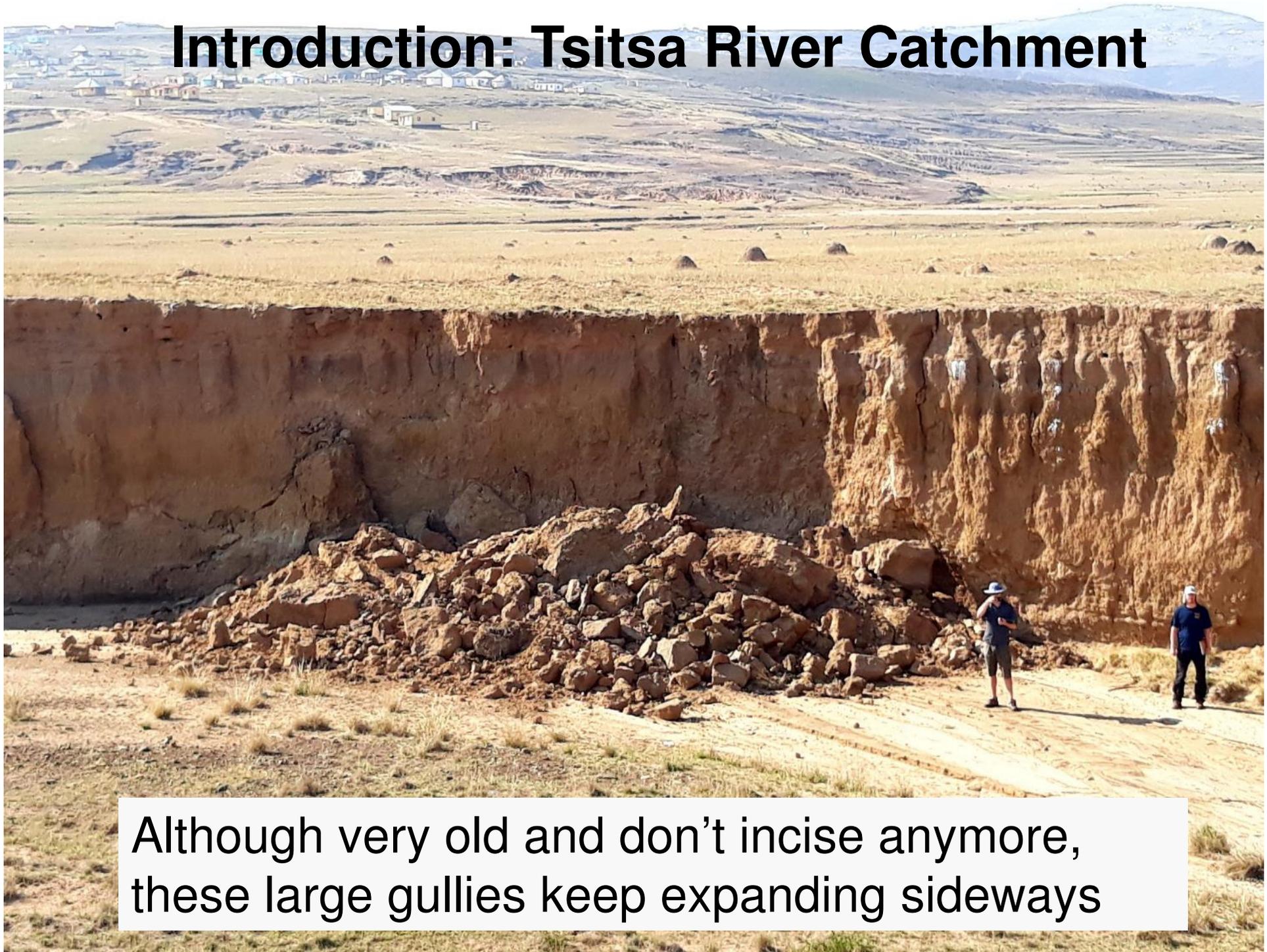
Arguably largest gully  
in the world a.k.a.  
**“The Mother”**

**Photo by David Hedding and video by Rhett Calvert**

<https://www.youtube.com/watch?v=nF9izujoGG0>

**RC** videography

# Introduction: Tsitsa River Catchment



Although very old and don't incise anymore, these large gullies keep expanding sideways

# Introduction: Tsitsa River Catchment

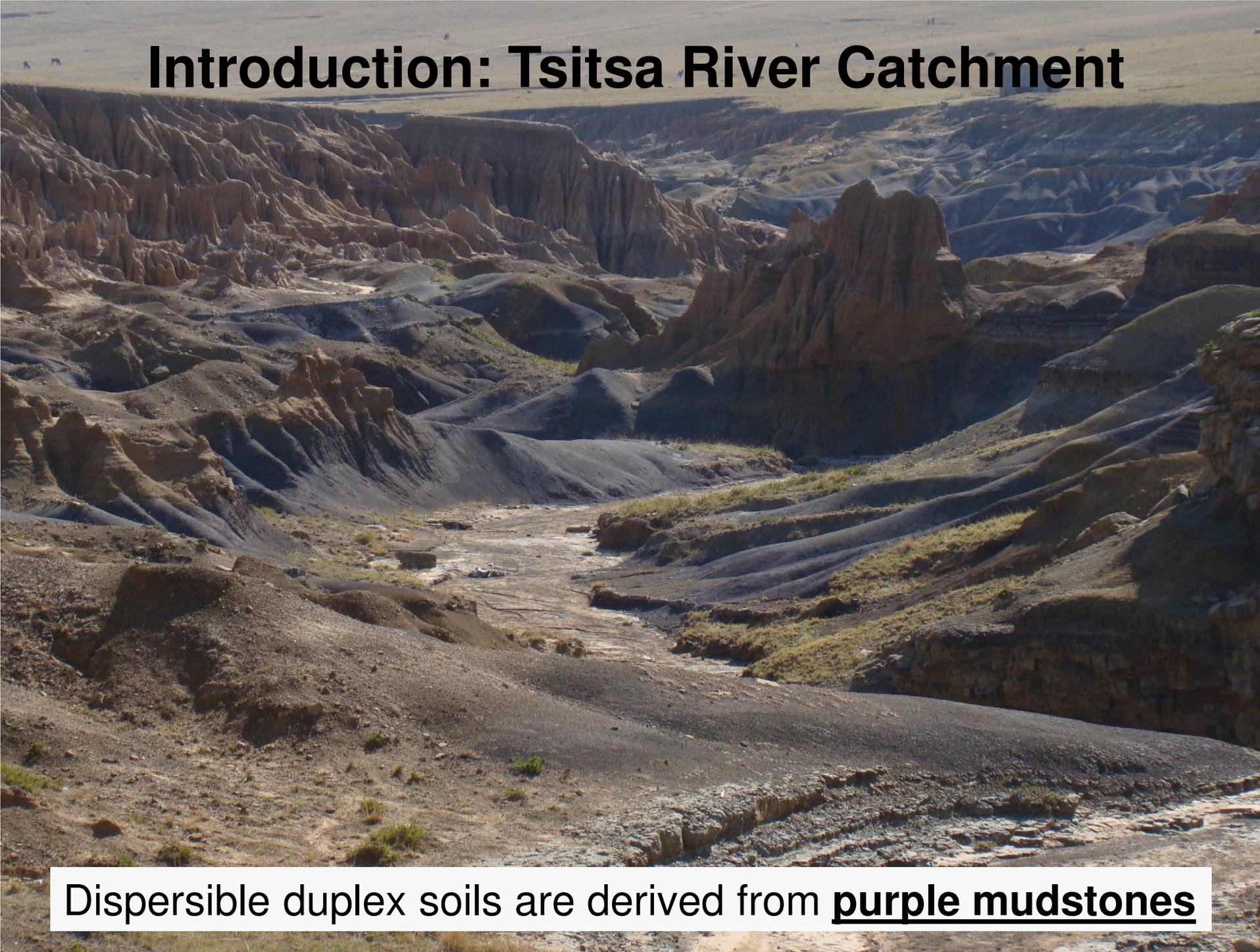
Soils are extremely erodible due to **dispersive and duplex nature** of soils (classified as Planosols by the FAO)

Non-dispersive (stable topsoil)

Dispersive clay (unstable subsoil)



# Introduction: Tsitsa River Catchment



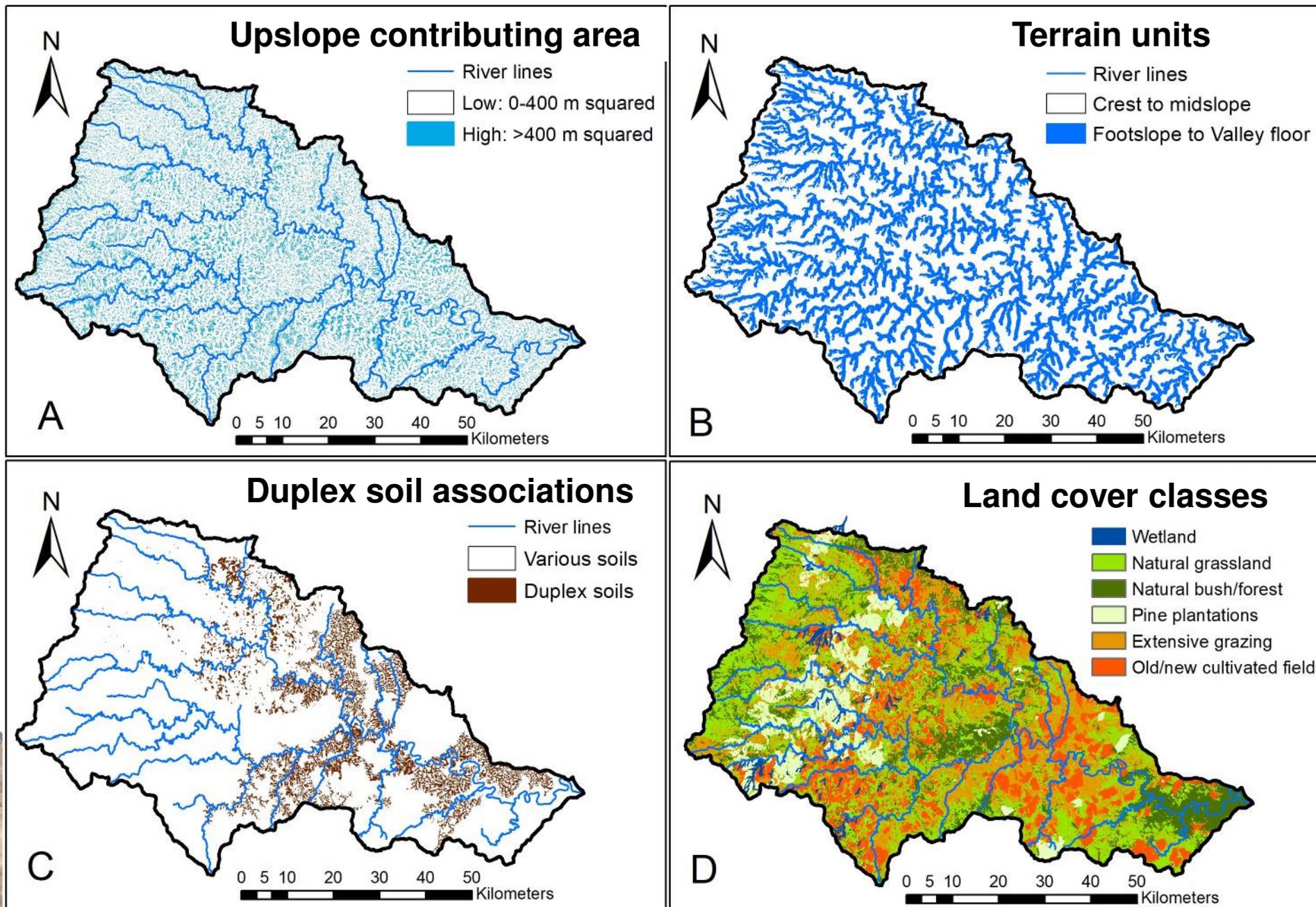
Dispersible duplex soils are derived from **purple mudstones**

# Introduction: Tsitsa River Catchment

- Not feasible to rehabilitate large gully networks
- More practical to formulate preventative measures and to target areas with short term advantages and large impacts at low cost
- **Aim: The aim of the study is to map vegetated and/or gully-free areas susceptible to gully development**
- Gully-free/susceptible areas were identified by mapping areas that have same DEM-derived topographical variables and parent material-soils interactions than gullied areas including...

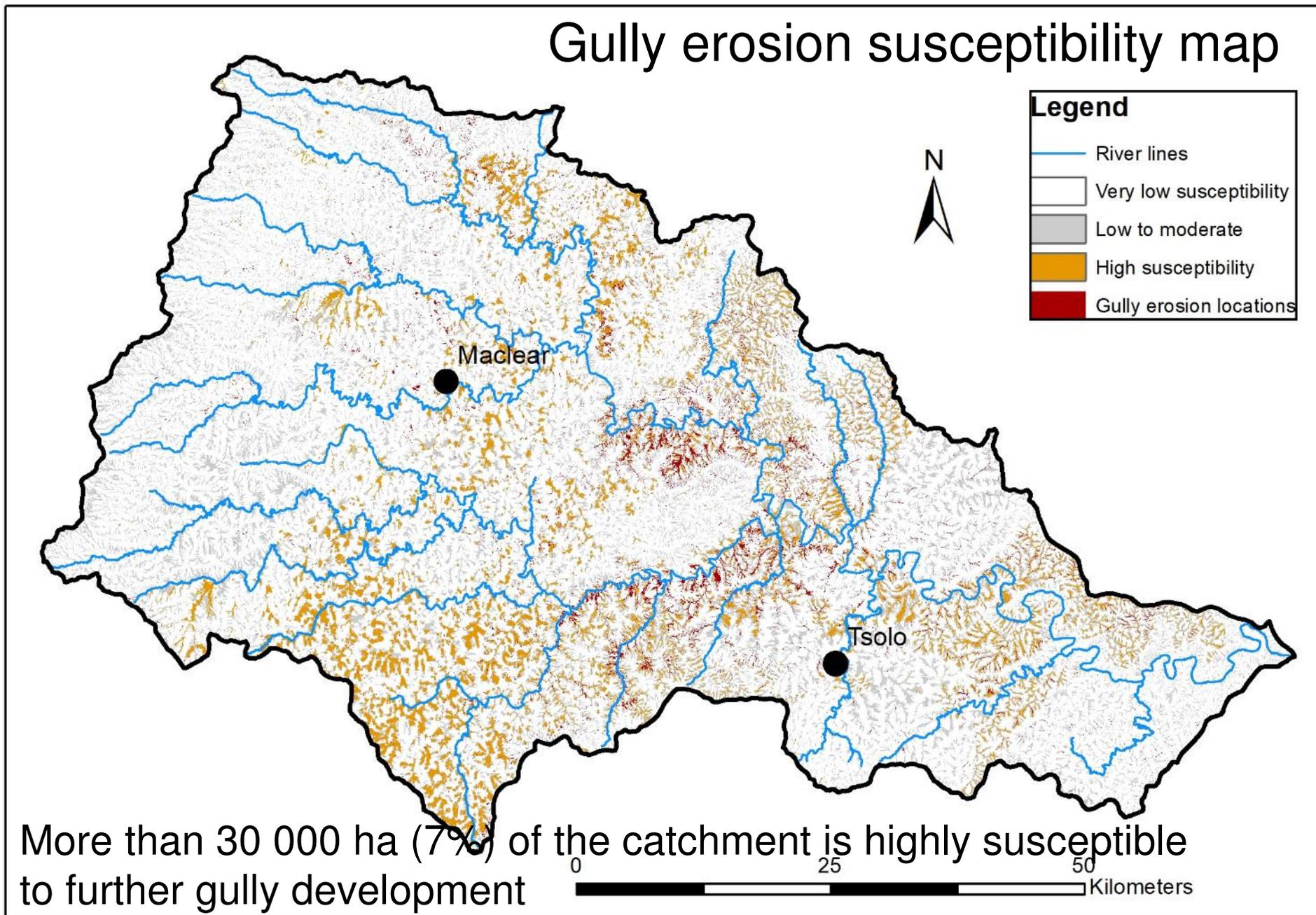


# Methodology



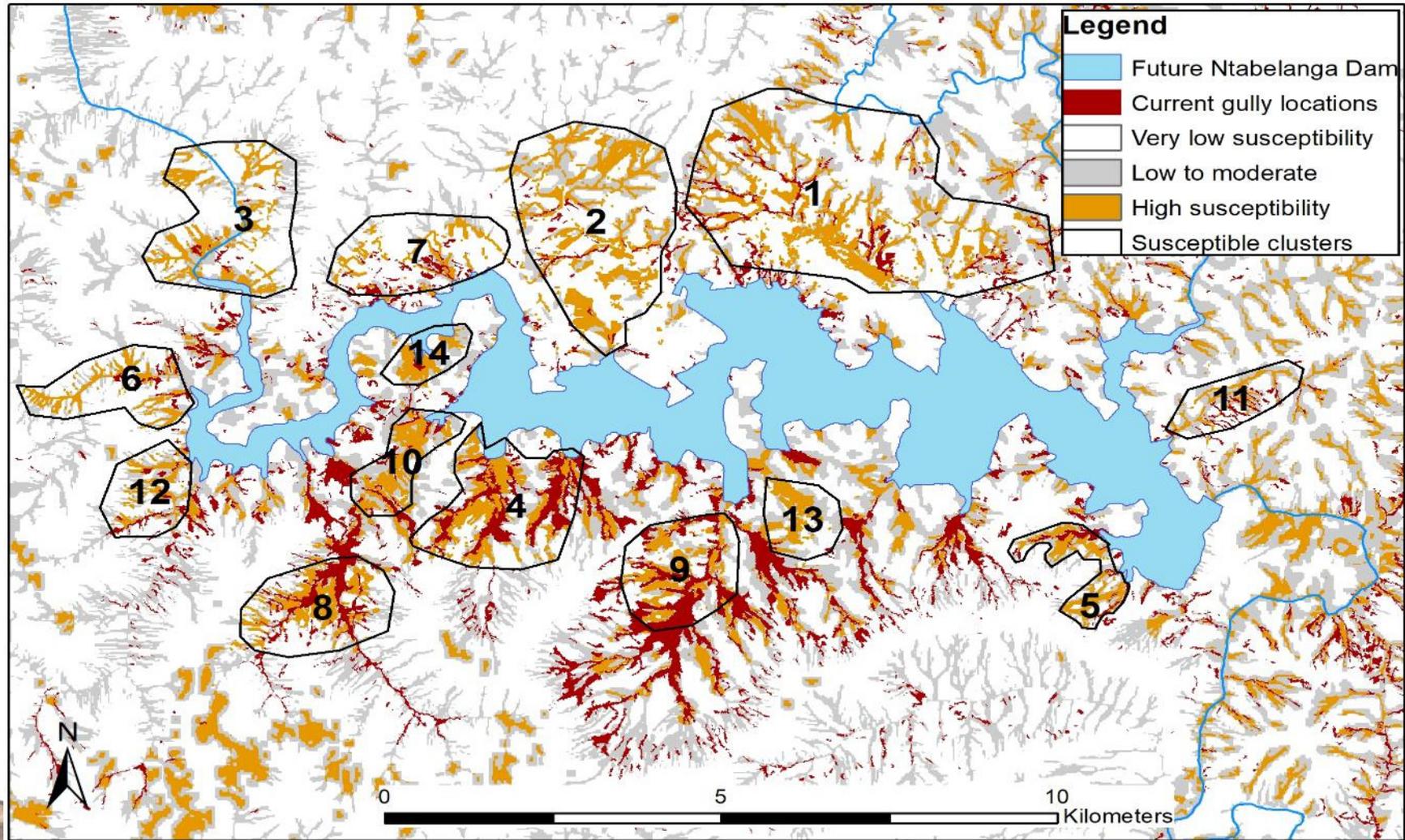
# Results and discussion

## Gully erosion susceptibility map



# Results and discussion

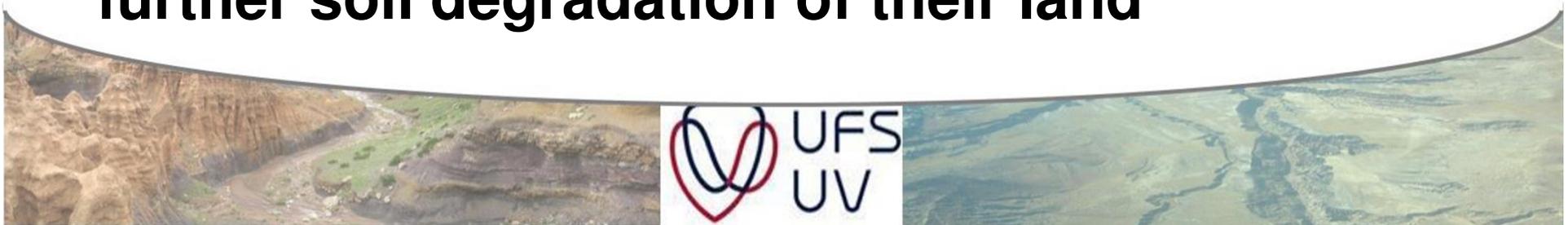
Areas susceptible to gully erosion near future dam



Imperative to prevent further erosion of these areas that are connected with the to river and future dam

# Conclusion and recommendations

- Prevention and rehabilitation of susceptible areas need to be prioritized according to NB criteria:
  - Sediment connectivity and sediment delivery potential, and
  - Socio-ecological criteria (identified by communities)
- If not protected, susceptible areas will contribute **additional sediment** loads to the river network
- Soil erosion prevention will not only reduce the **sediment yield** and increase **dam life expectancy**
- Also benefit the local communities by preventing further soil degradation of their land



# Thank you

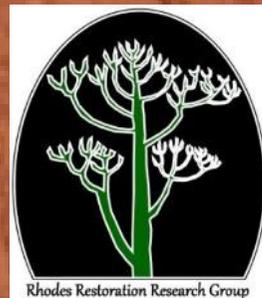


Photo: Japie Buckle