

Using NDVI to Estimate Vegetation Cover Change in the Baviaanskloof Catchment Area



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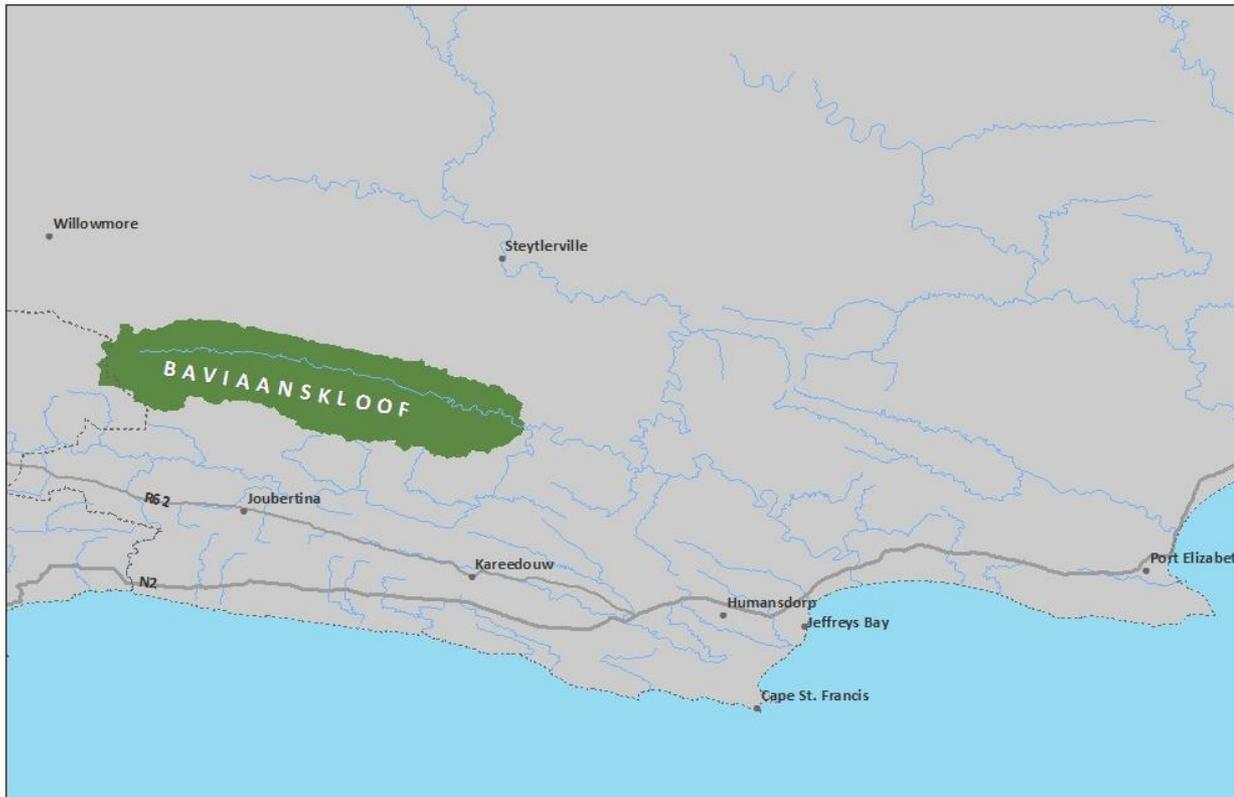


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Background: Vegetation change in the Baviaanskloof

Located in the Eastern Cape, severely degraded areas of Subtropical Thicket.

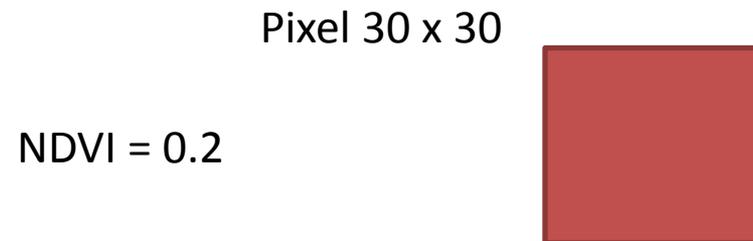


Objective & Questions

- Establishing the relation of NDVI (Normalized Difference Vegetation Index) to vegetation canopy cover and LAI (Leaf Area Index), for an assessment of regeneration of degraded vegetation in the Baviaanskloof Catchment.
- What is the change over time in percent vegetation canopy cover in the Baviaanskloof Catchment?
- Is restoration of vegetation cover detectable and can we measure it using NDVI?

What is NDVI?

- Normalized Difference Vegetation Index
 - Derived the ratio of Red to Near Infra Red reflectance spectra (light reflected by surfaces).
 - Values range between -1 to 1
 - vegetation generally between 0.2 and 0.8
- In this study NDVI was calculated from Landsat Satellite imagery.



Relation to Vegetation
Cover and LAI?

Why Landsat?

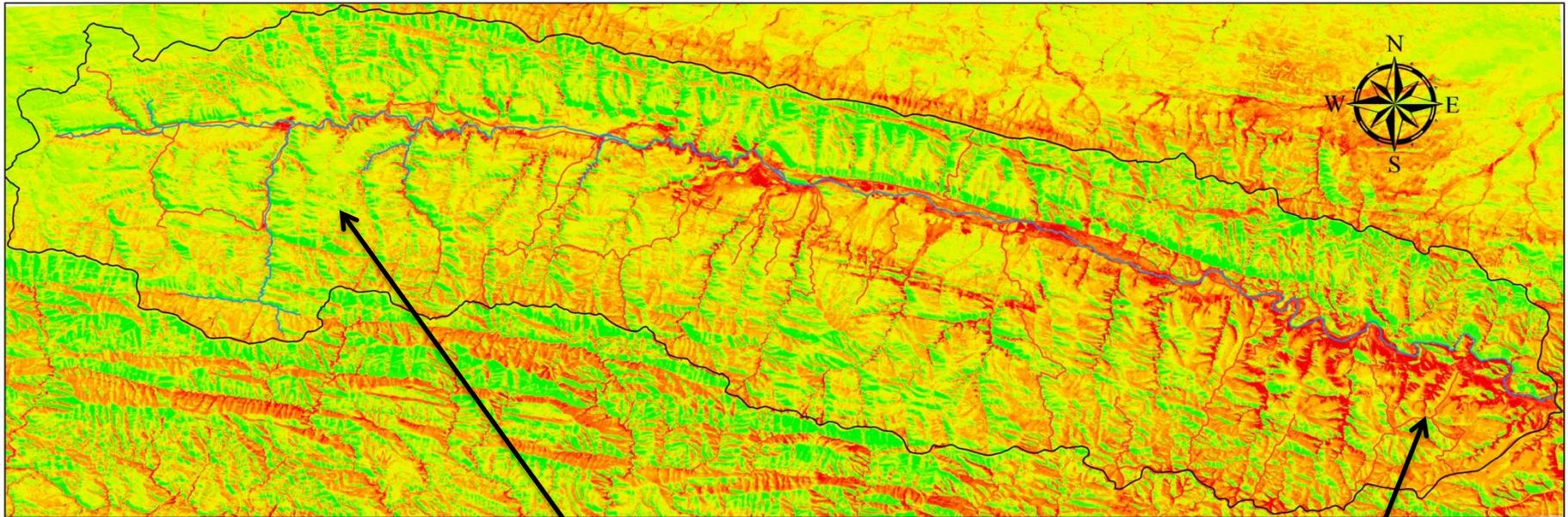
- High detail 30 x 30 m. Pixels
 - Therefore, is able to detect small changes.
- Taken each 18 days – large database available.
- Images available from 1986 to now.

However

- Disturbances by Shade and Clouds.

May 2013

Baviaanskloof Water Catchment Area

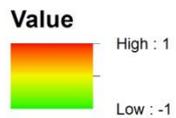


0 2.5 5 10 15 20 25 Kilometers

Legend

- Catchment
- River
- Road

2013(May)

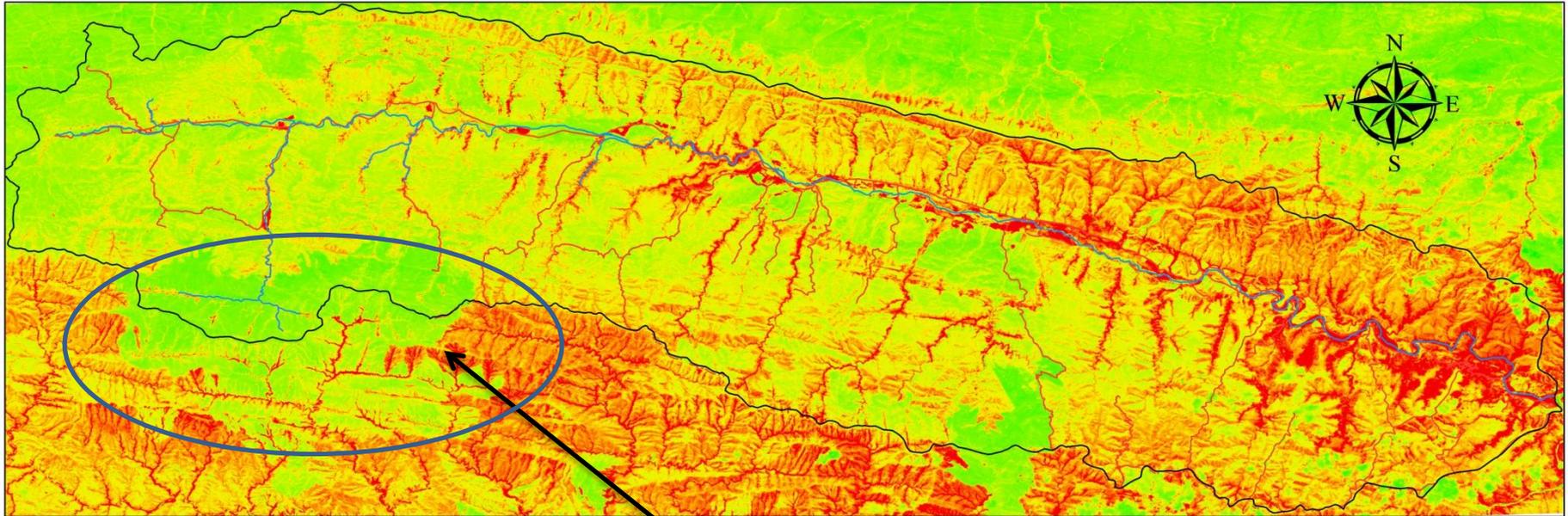


NDVI suggest low Vegetation
Cover and LAI

NDVI suggest high Vegetation
Cover and LAI

Oct 1999

Baviaanskloof Water Catchment Area



0 2.5 5 10 15 20 25 Kilometers

Legend

-  Catchment
-  River
-  Road

1999oktcl

Value

-  High : 1
-  Low : -1

Scorched area, due to a fire.

Method & Results

Field measurement of:

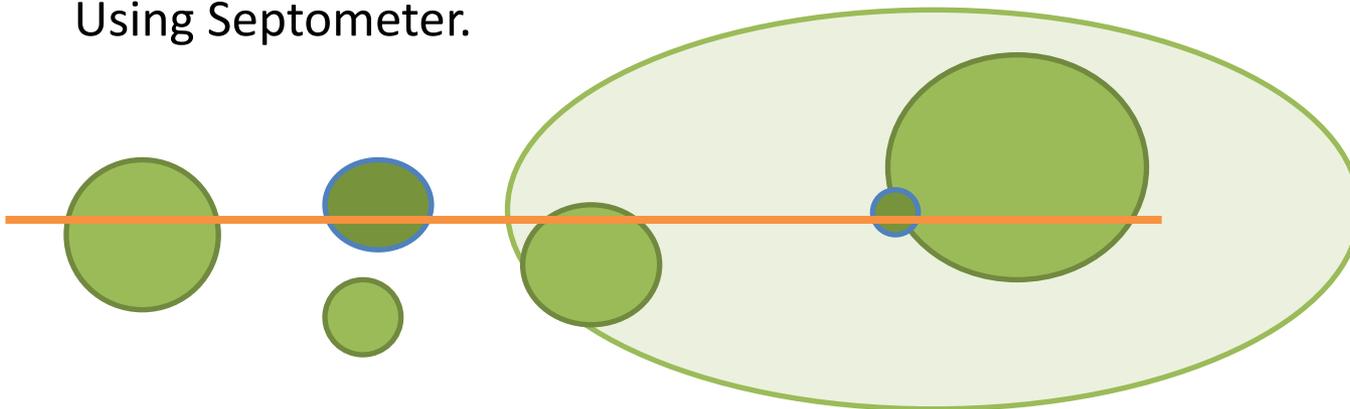
- **Vegetation Cover**

Using “Clump intersect” along 100 m transect.

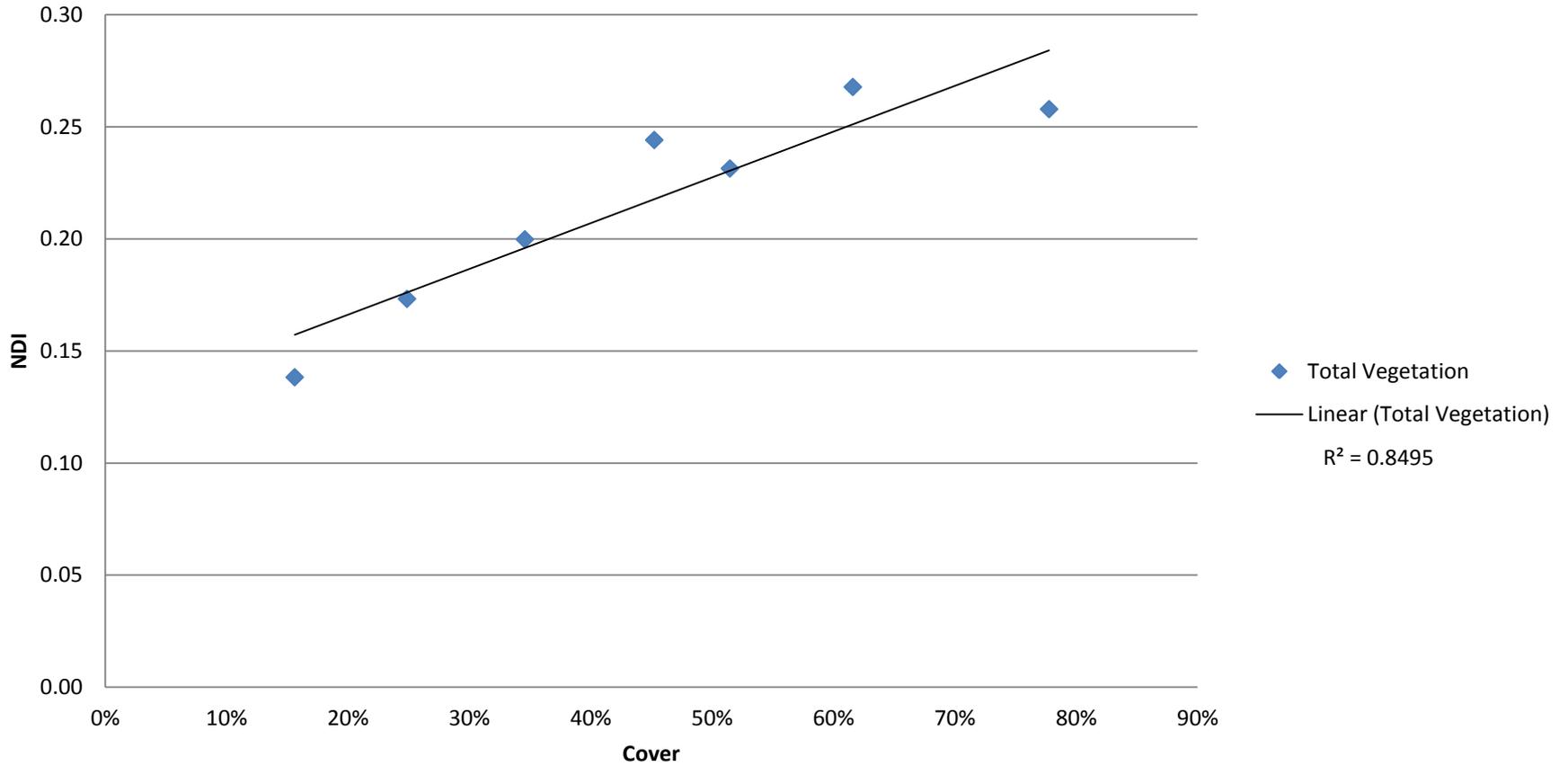


- **LAI (Leaf Area Index)**

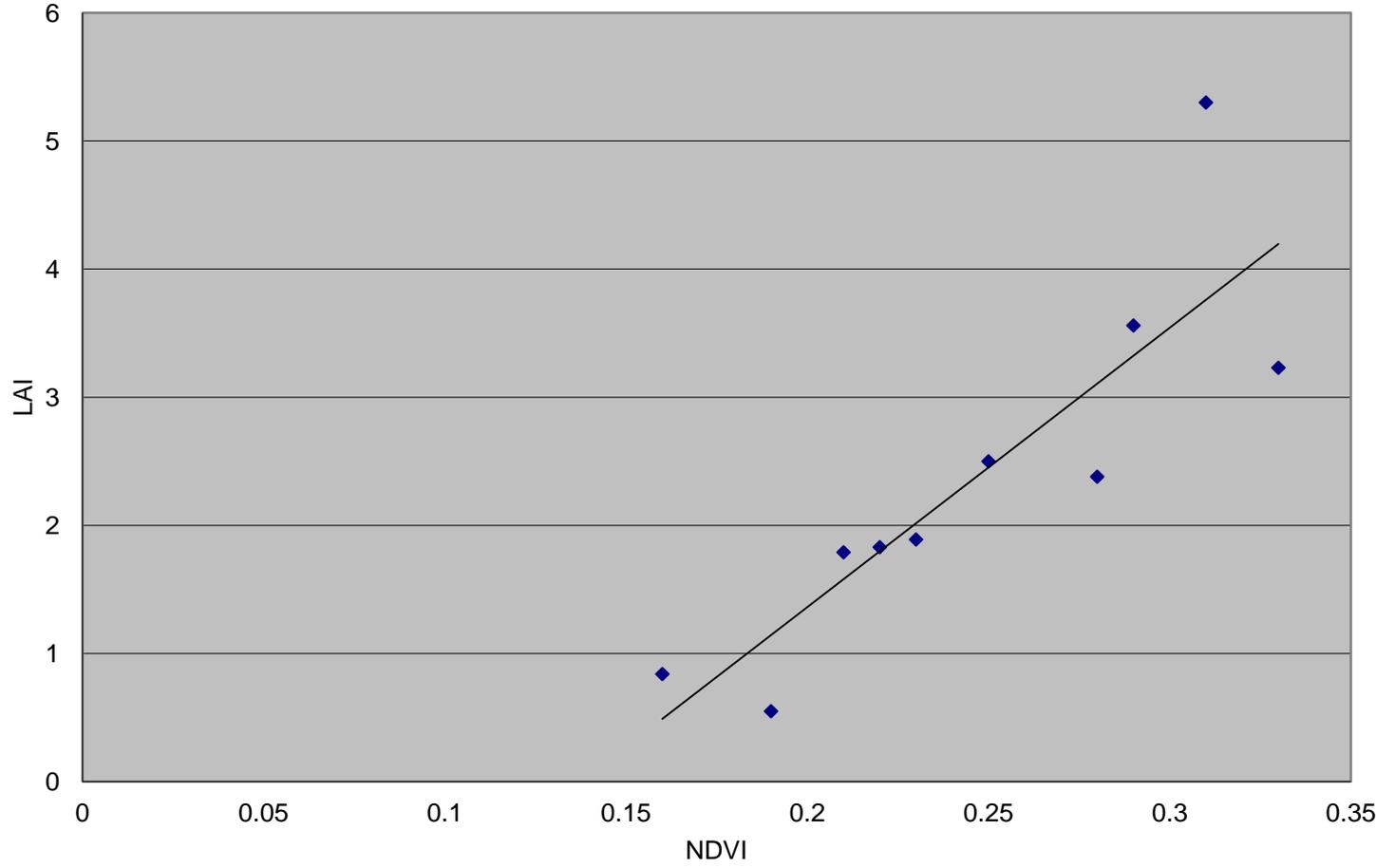
Using Septometer.



Percent Vegetation Cover



LAI



$R^2 = 0.7437$

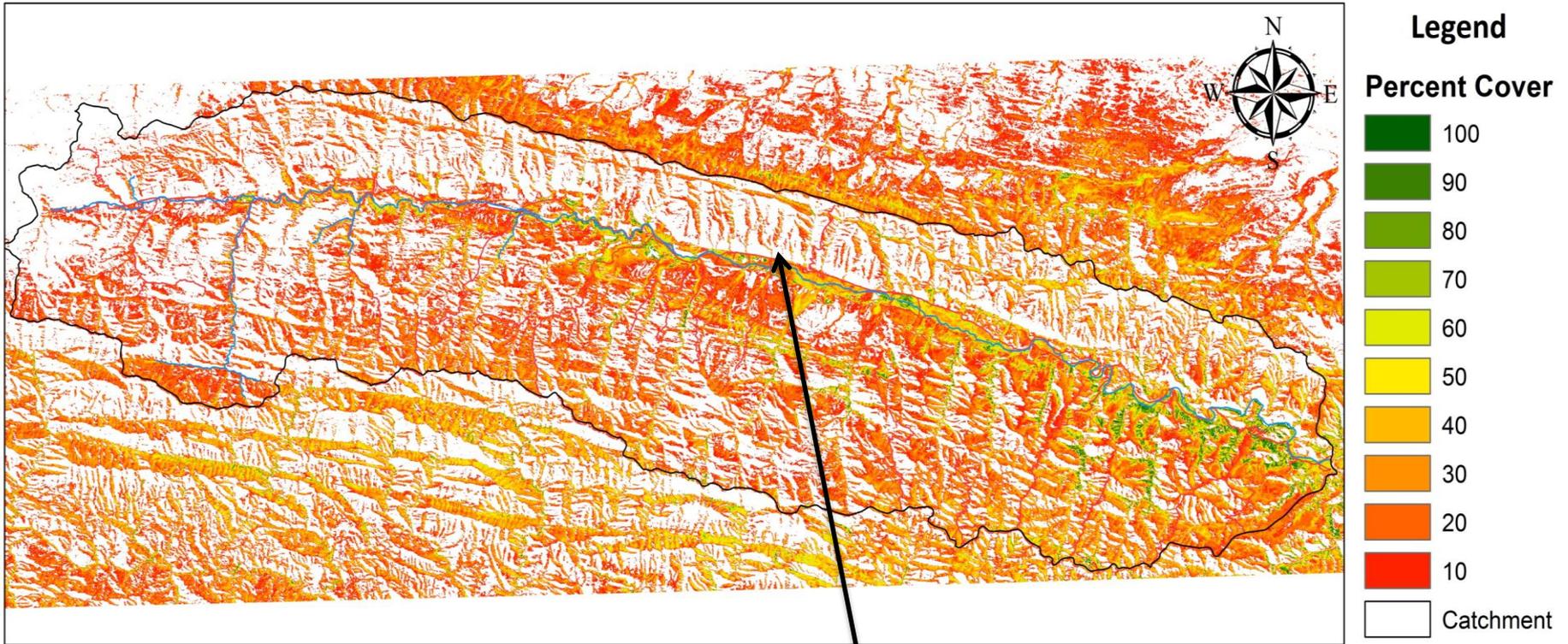
Reclassify the NDVI

- Reclassed years: 2013, 2002, 1999, 1997 and 1989
- All reclassified based on current Sample Data (!)

Cover Class Table

- Ten percent interval
- Shade Classified as “NoData”
- Values outside Cover Class Table “NoData”

Vegetation Cover (2013)



0 2 4 8 12 16 20 Kilometers

Map Showing Vegetation Cover for the Baviaanskloof Water Catchment. Colors show the percentage of cover. No data on cover is presented by white.

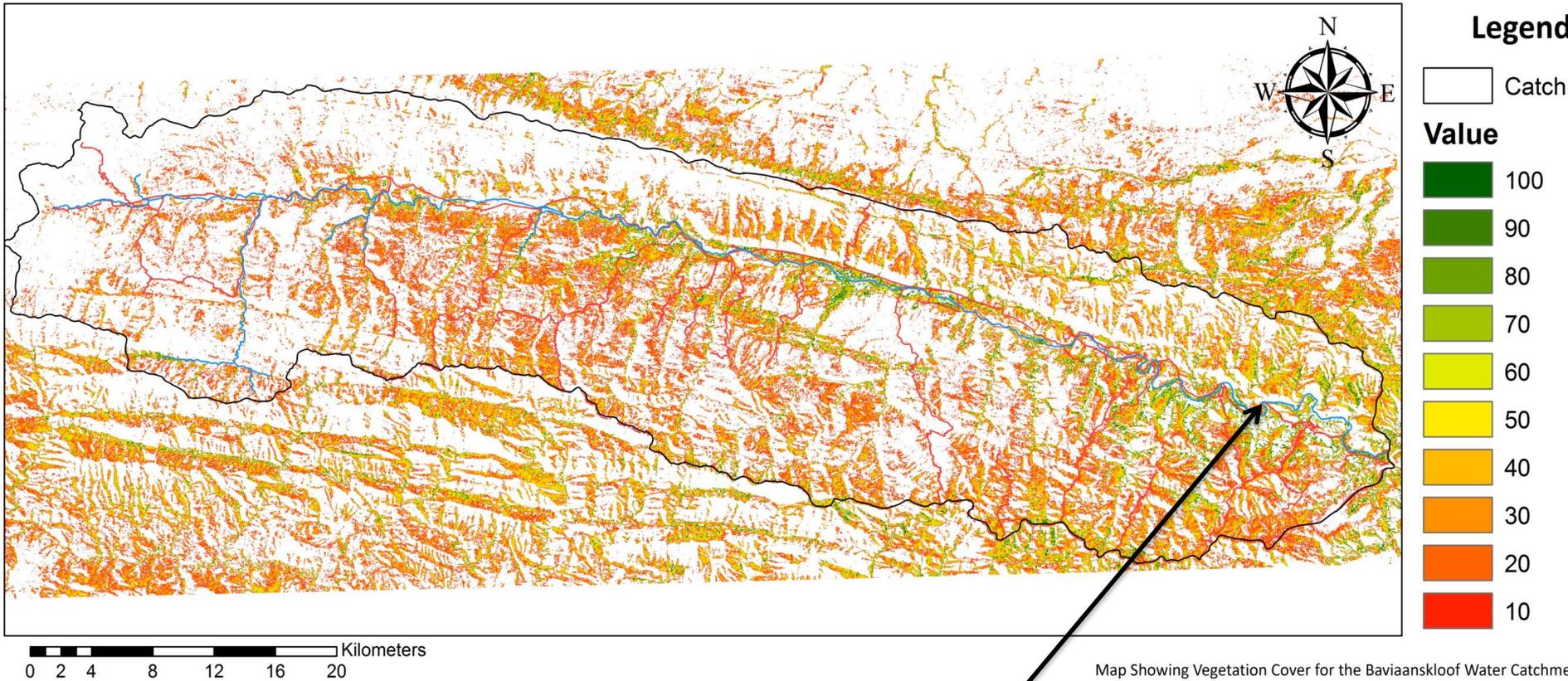
Source Data: Landsat8 OLI TIRS
Source Date: 2013-05-19
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

“NoData” errors, due to shade or low NDVI.

Created in August 2013

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Vegetation Cover (2002)

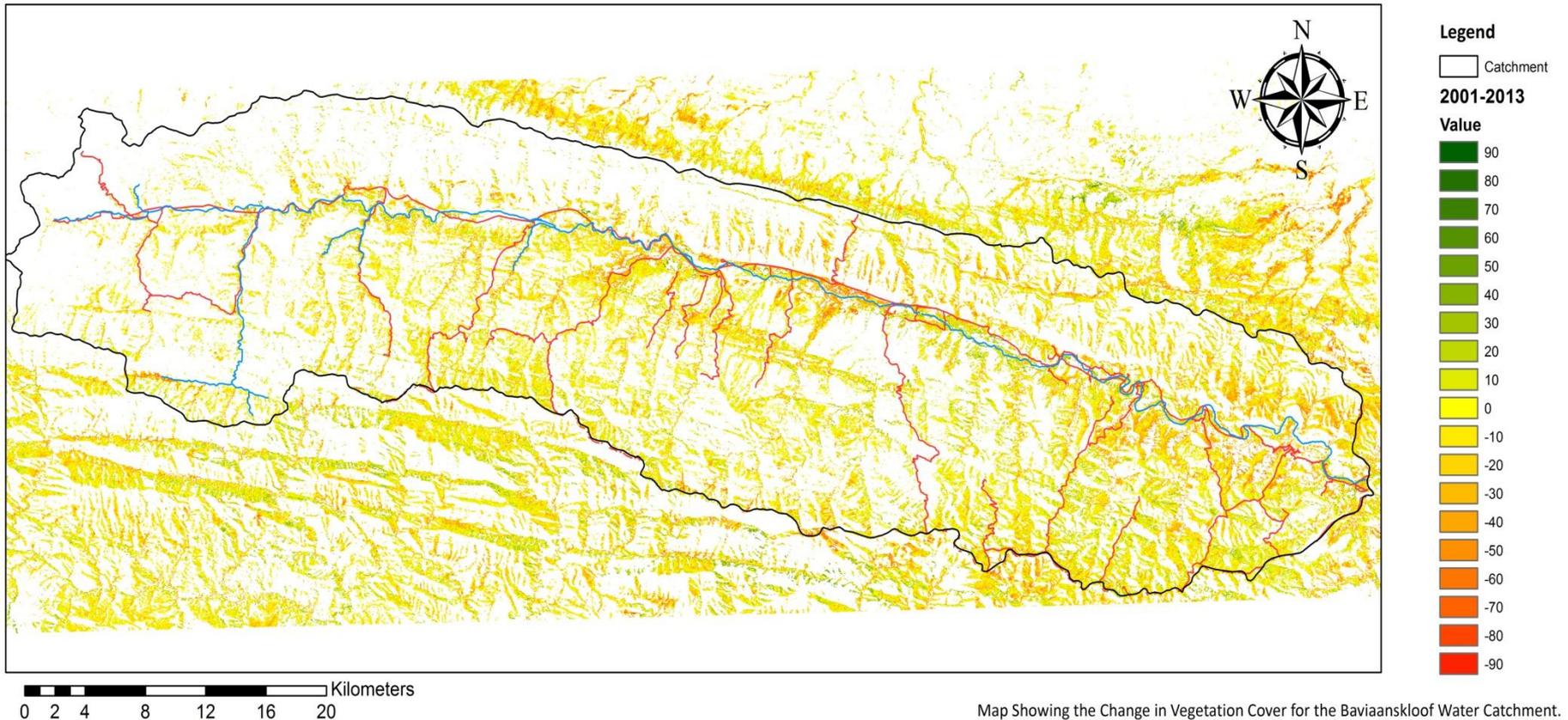


Map Showing Vegetation Cover for the Baviaanskloof Water Catchment. Colors show the percentage of cover. No data on cover is presented by White.

Source Data: Landsat7 ETM+
Source Date: 2002-04-26
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

“NoData” errors, High Vegetation Covers were expected.

Vegetation Cover Change (2002 - 2013)



Map Showing the Change in Vegetation Cover for the Baviaanskloof Water Catchment. Colors show the percentage of cover. No data on cover is presented by White.

Source Data: Landsat7 ETM
Source Date: 1999-10-28 & 2002-04-27
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Overall Decrease in Vegetation?

Created in August 2013

Vegetation Cover Change (1986 - 1997)



Map Showing the Change in Vegetation Cover for the Baviaanskloof Water Catchment. Colors show the percentage of cover. No data on cover is presented by White.

Source Data: Landsat5 TM
 Source Date: 1986-12-19 & 1997-05-23
 Coordinate System: GCS WGS 1984
 Datum: WGS 1984
 Units: Degree

Overall increase in vegetation?

Created in August 2013

Conclusion

- Limitations in:
 - Sample Data
 - Shade Error
 - Landsat Data availability
- Seasonal change effects reflectance and absorption of RED and NIR.

Recommendations

1. Sample Data

- To Fill the Gaps or “NoData” areas

2. LAI relation Vegetation Cover

- Vegetation Percent Cover Change due to rainfall.
- Enhances understanding -> NDVI of different years, seasons, months

3. High Quality Vegetation Cover maps

- Gaps are filled.
- Periodic change understood
- Dynamics and relations clarified.