Water use of thicket in the Addo Elephant National Park

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Outline

- **Thicket classes in AENP**
- **The ET$_{MODIS}$ evapotranspiration model**
- **Running the model for AENP**
- **Validation**
- **Discussion**
- **Acknowledgements**

Thicket classes in AENP (courtesy of Isak Smit)

- Botanical reserve

- Intact thicket

- Sparse thicket

- Degraded thicket

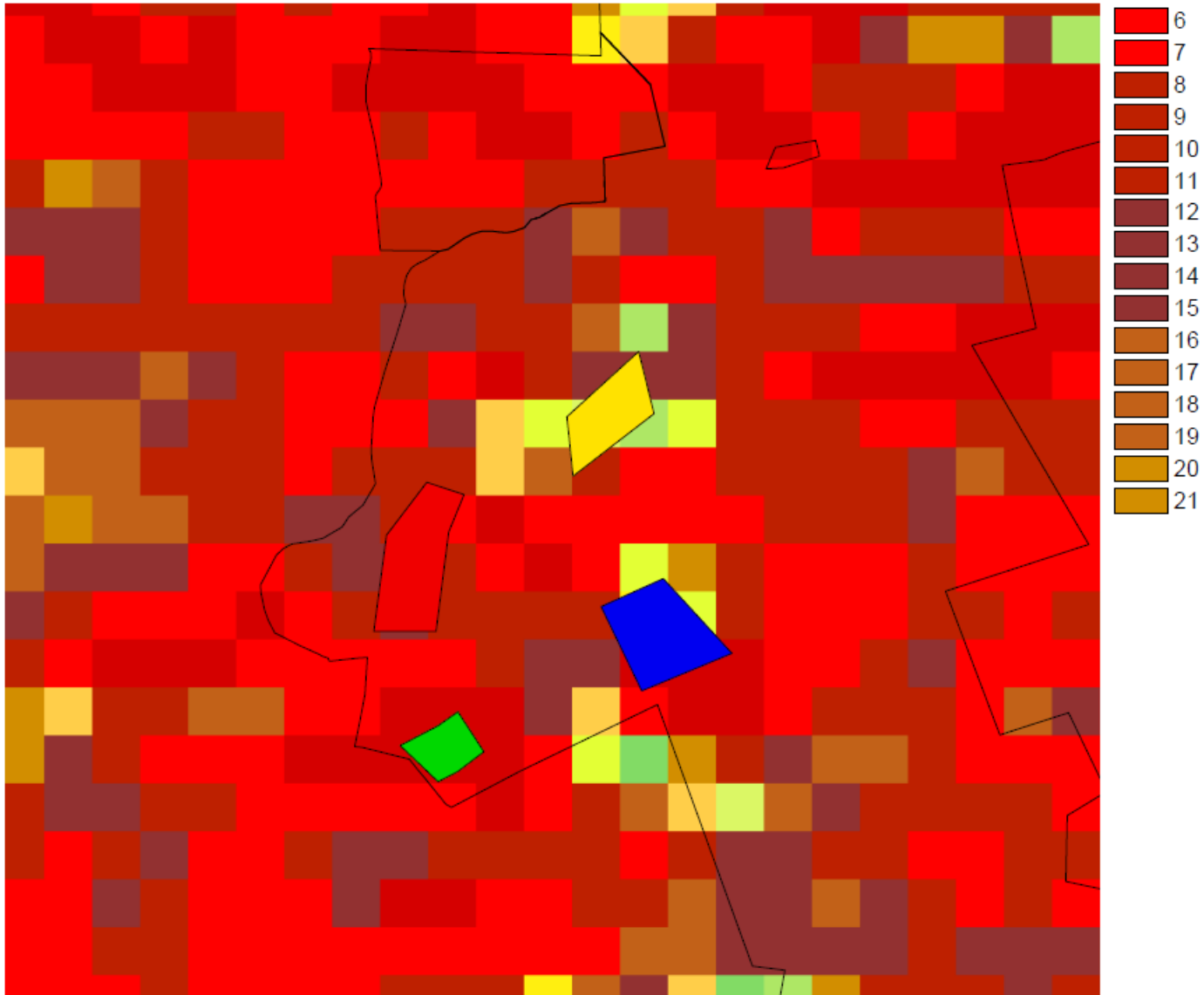- Cleared grassland (previously cultivated)

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Study area

Training sites for ET measurements

Botanical Reserve
Intact Thicket
Sparse Thicket
Degraded Thicket
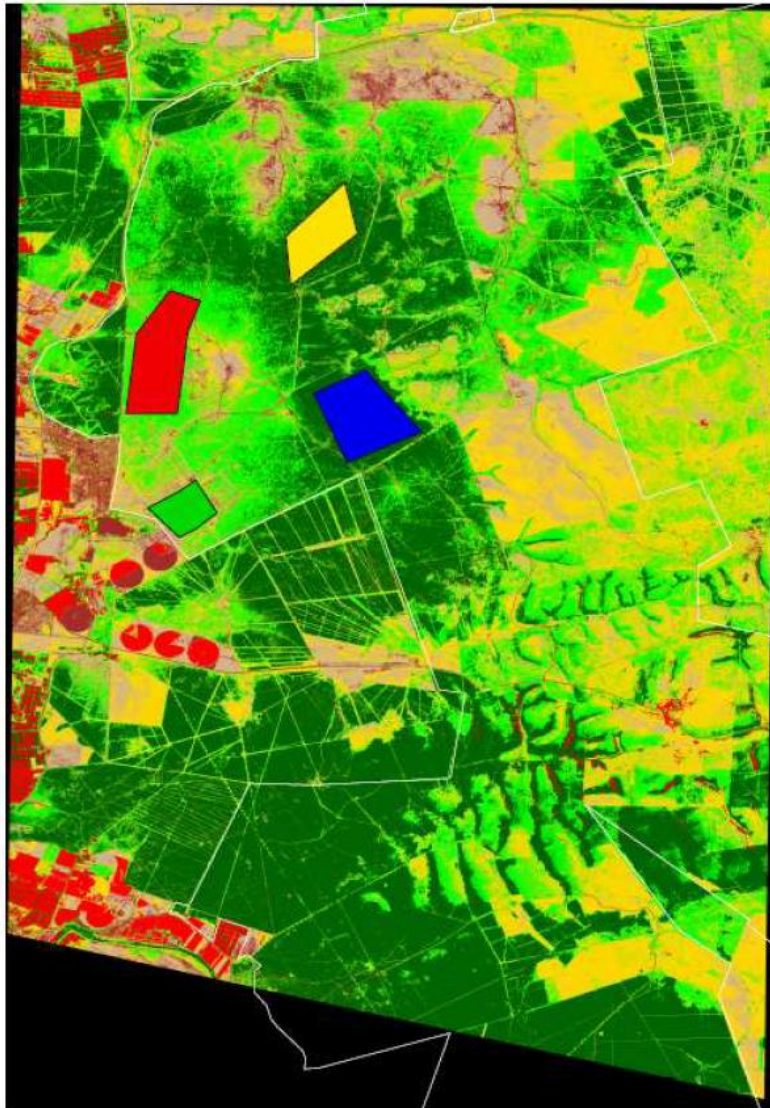
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MODIS LAI January 2008

Degraded versus intact

Methods
1. The modelling process

a) ET0 – from AWS station at Addo – calculated using the Penman Monteith equation
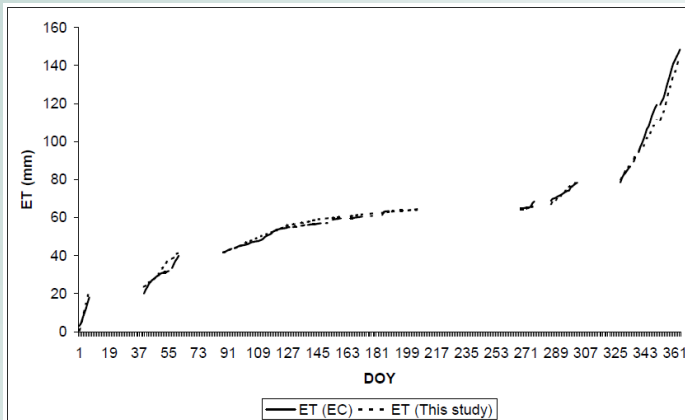b) Leaf area index from MODIS LAI

ET $_{MODIS}$ model

In dry season
ETa = ET0 x (MODIS LAI/MODIS LAImax) x 0.65

In wet season
ETa = ET0 x (MODIS LAI/MODIS LAImax)

Skukuza 2007 – ET $_{MODIS}$ versus eddy covariance tower

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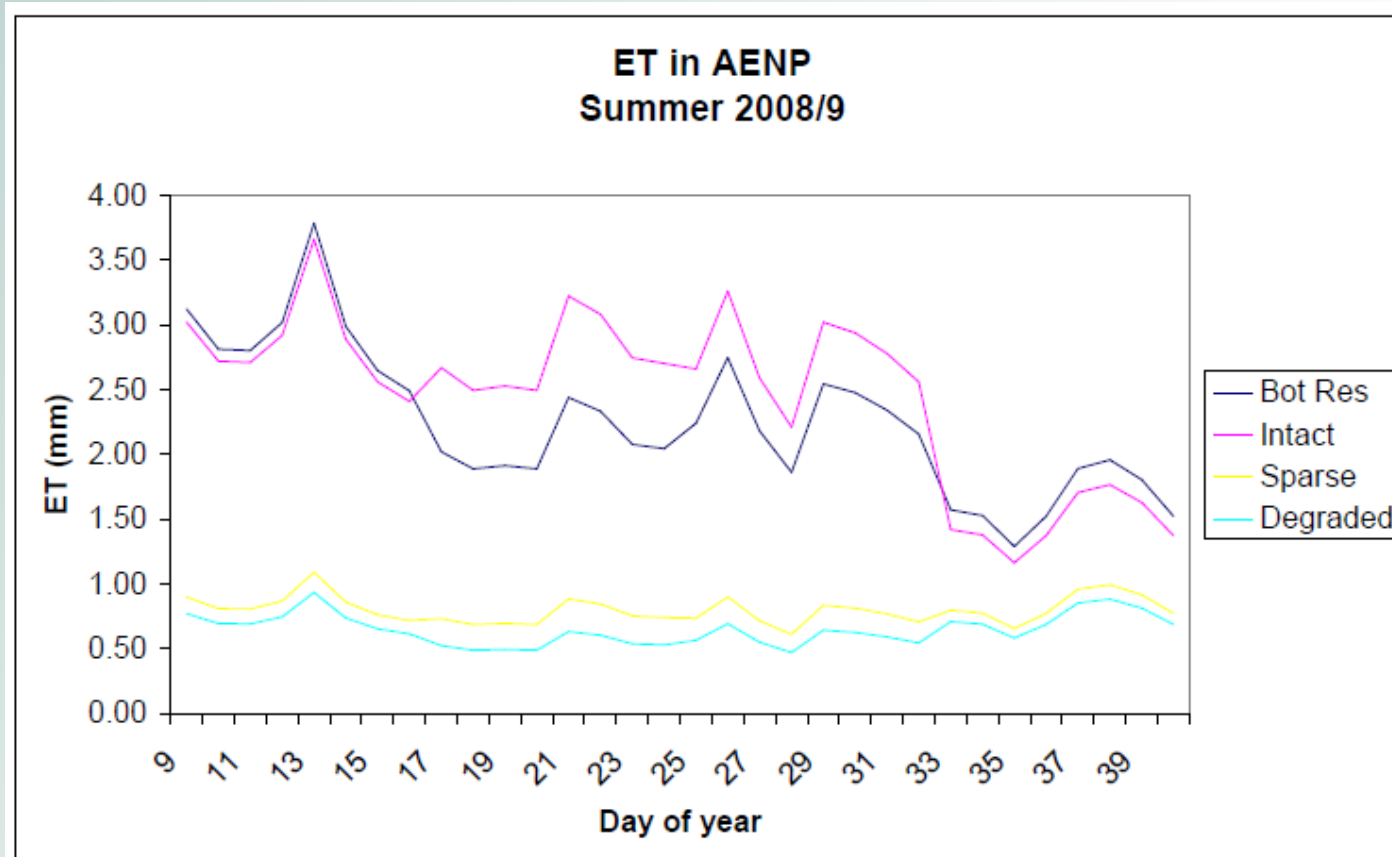
MODIS LAI for AENP
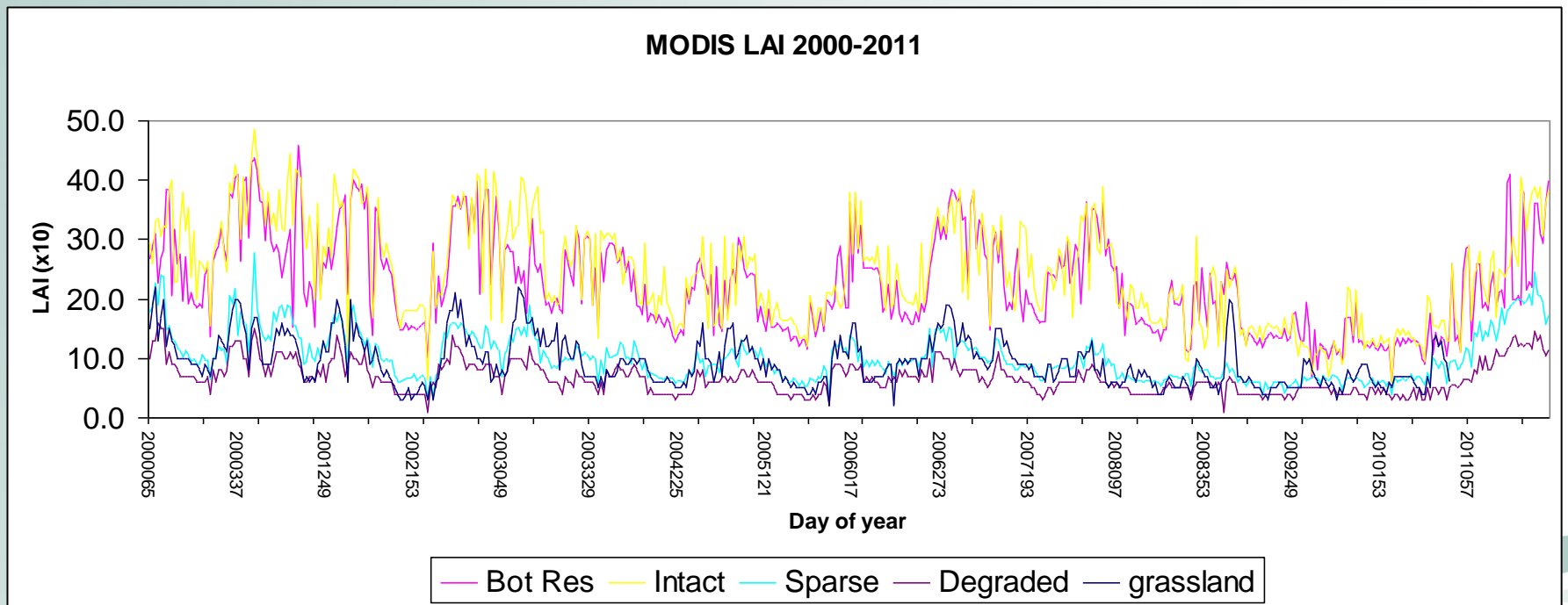
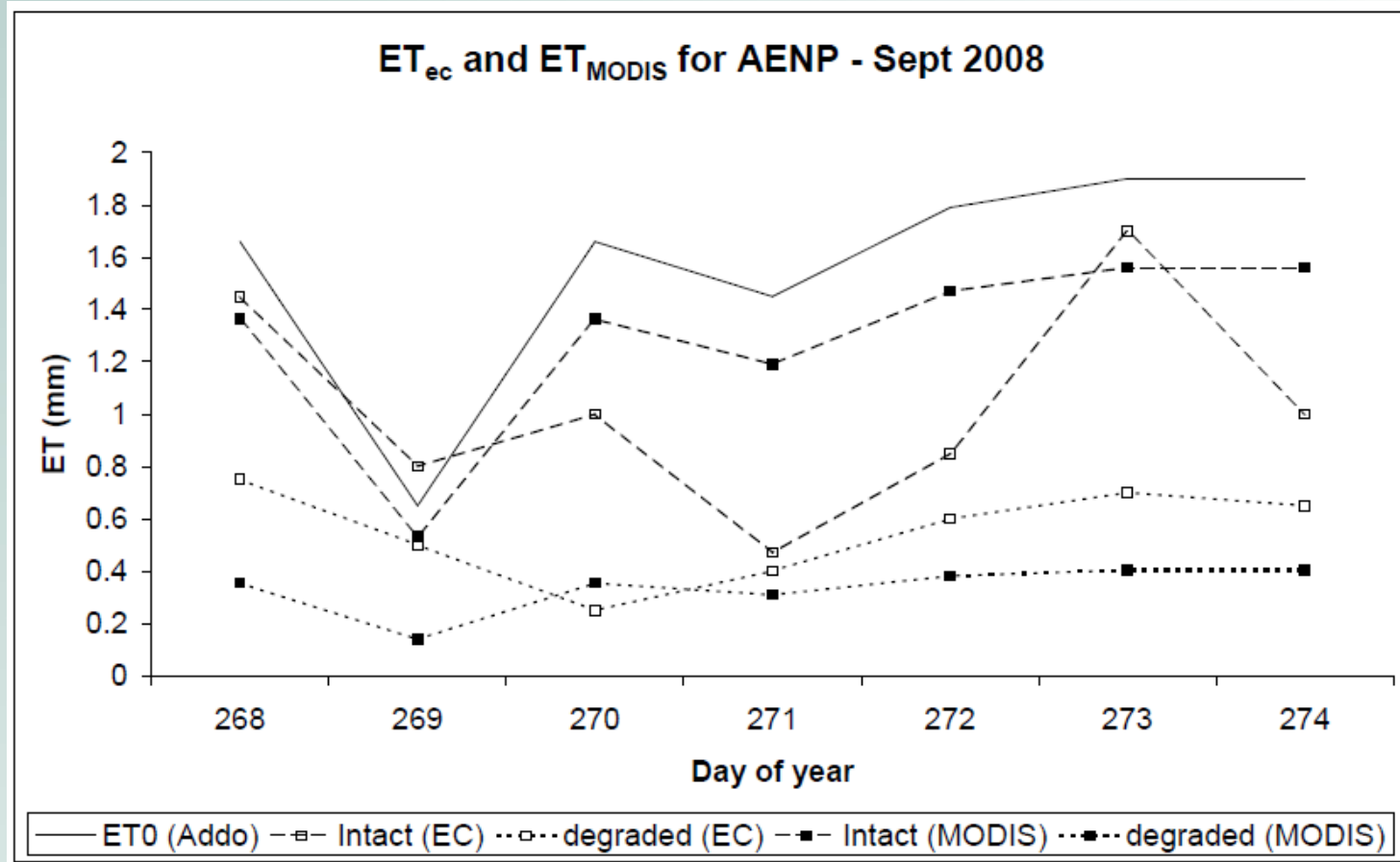# ET_{MODIS} Spring 2008
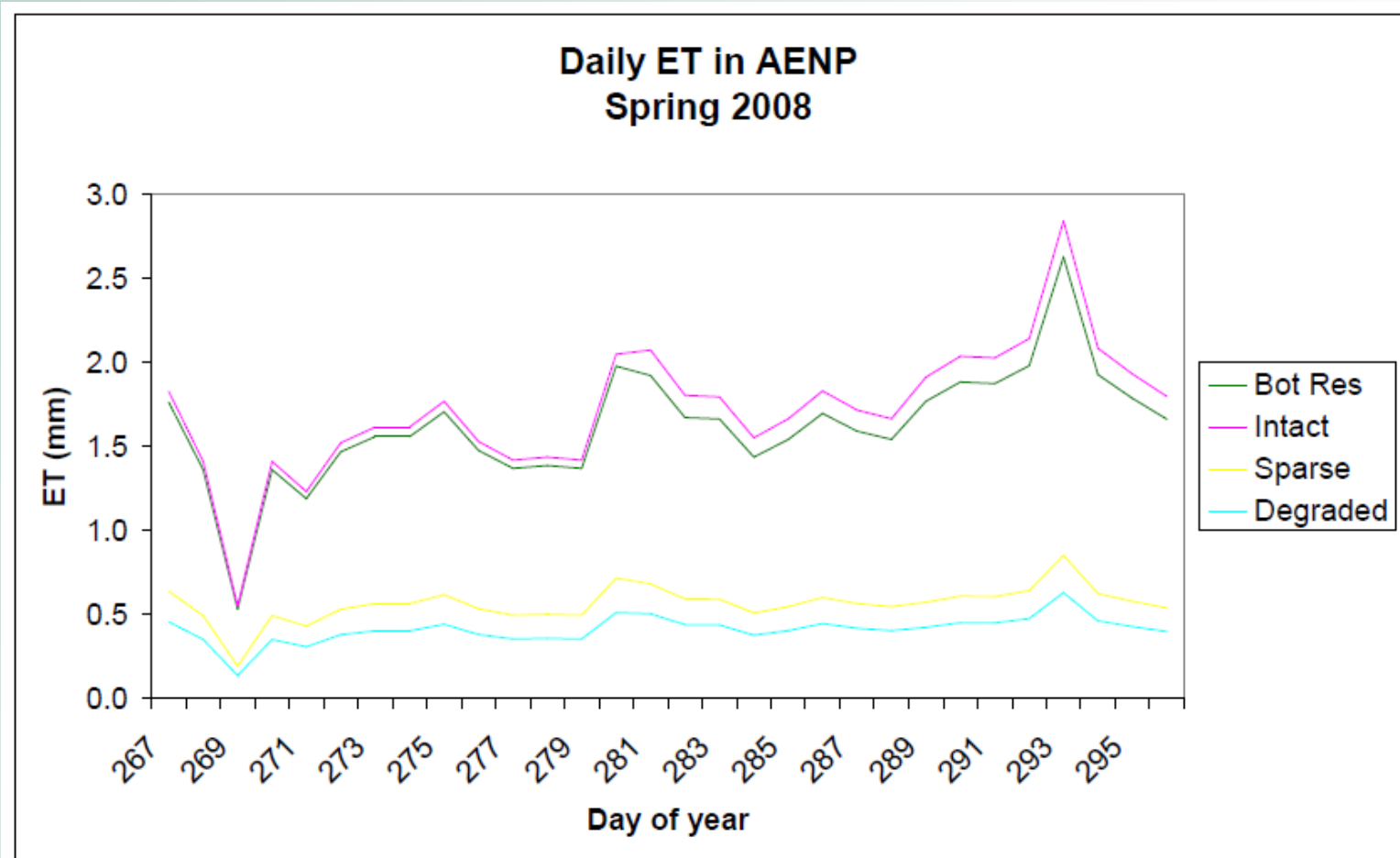
ET$_{MODIS}$ Summer 2009

Methods
2. Validation

a) Independent Validation – ET from eddy covariance system used at Kirkwood by Jarmain et al

b) Sept 2008 – cool, wet season. Included a rainfall event.

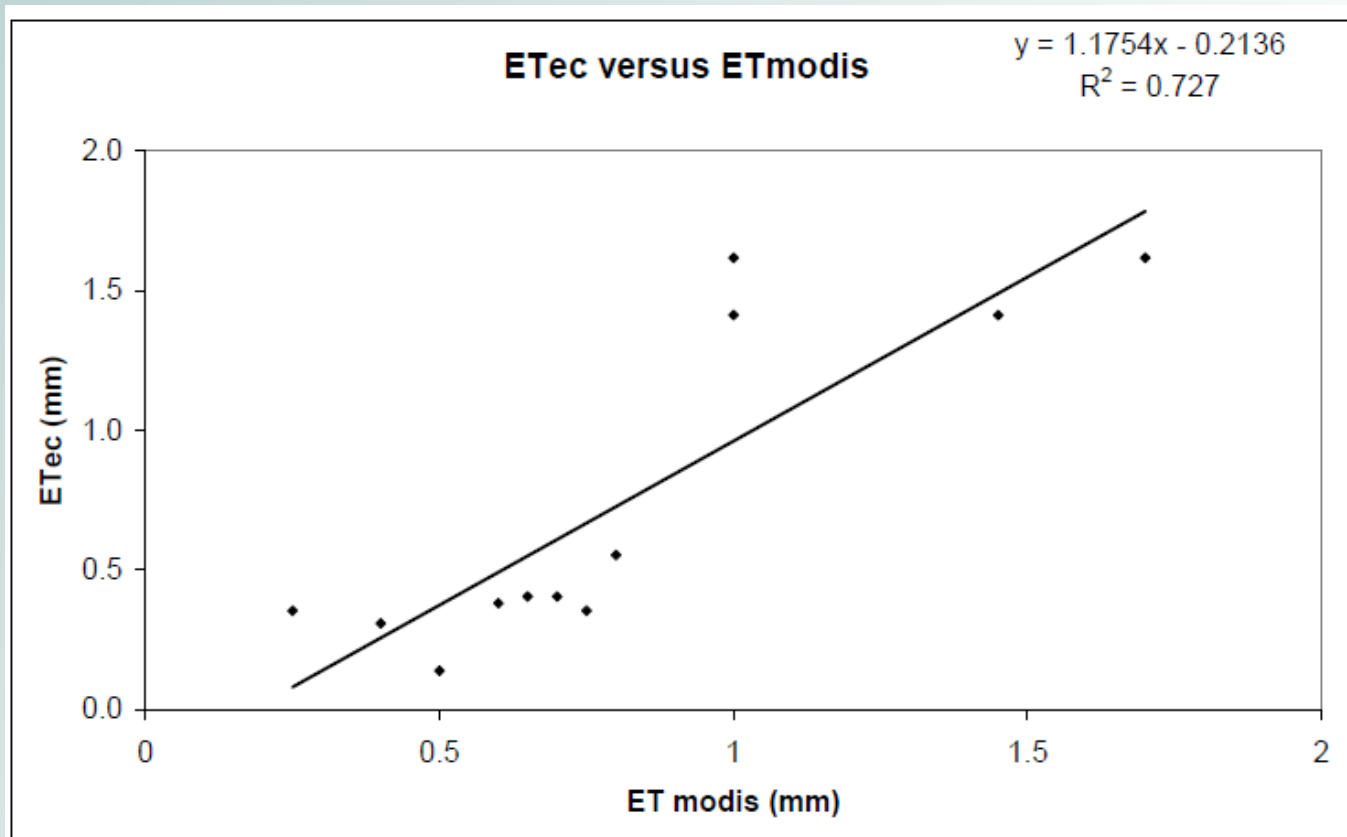# Validation

ET$_{ec}$ and ET$_{MODIS}$ for AENP - Sept 2008

EC = eddy covariance system
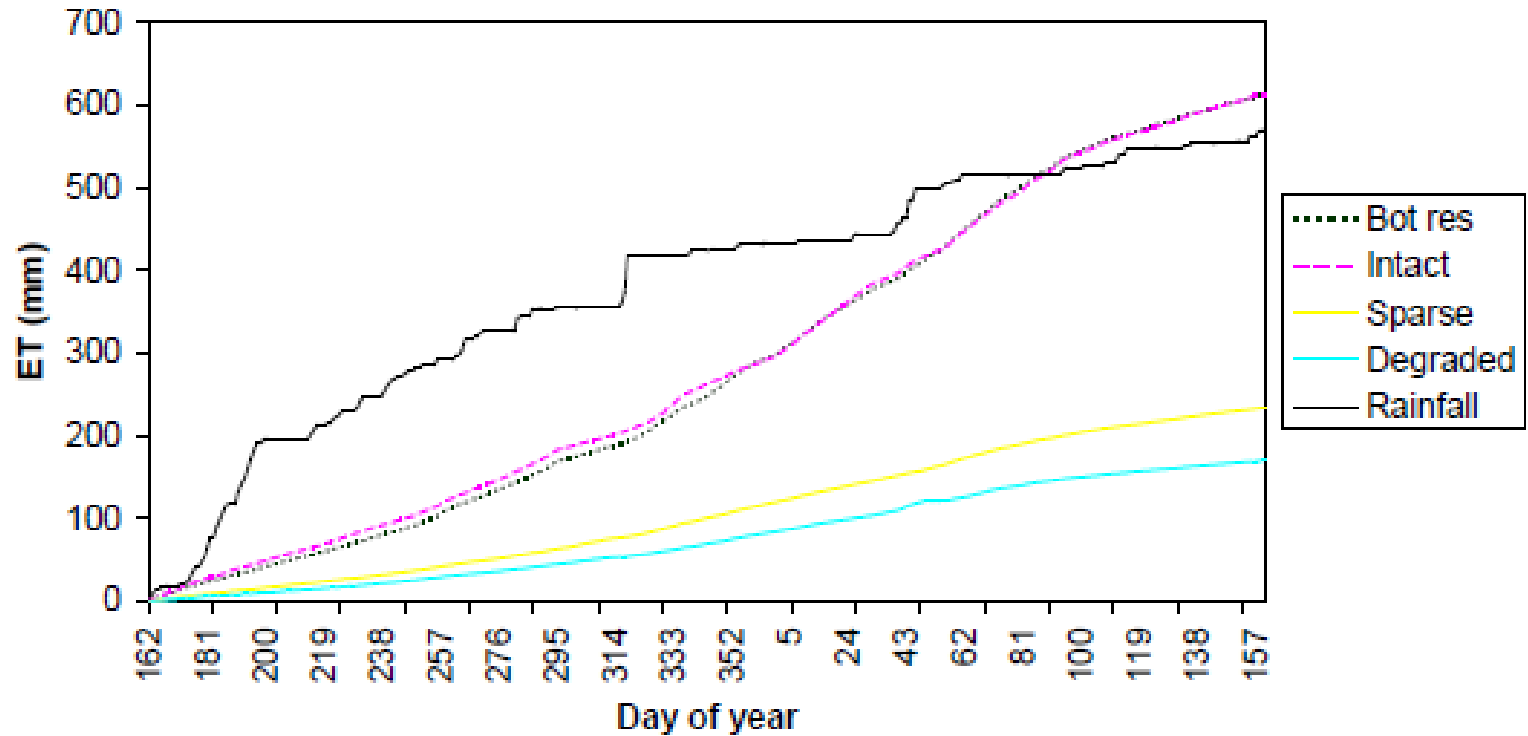MODIS = ET$_{MODIS}$ model

Validation

EC = eddy covariance system
MODIS = ET$_{MODIS}$ model

AENP Accumulated ET and rainfall
10 June 2008 - 9 June 2009

How much of Main Camp is affected?

Description	Area (ha)	Proportion
Sparse thicket	5794	0.27
Improved grassland	5558	0.26
Riparian	148	0.01
Degraded thicket	1833	0.08
Roads + bare	414	0.02
Intact thicket and botanical reserve	7818	0.36

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Conclusions

- The LAI for 5 condition classes (protected, intact, sparse and degraded thicket, and improved grassland) has decreased under increasing elephant population in Main Camp between 2000 and 2010.
- These changes parallel rainfall trends during this period.
- For 2008, the annual modelled ET (ET_{MODIS}) in degraded and sparse thicket was 350 mm less than for intact thicket.

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Conclusions

- Van Lujik et al (2013) show that recharge is very low in degraded thicket.
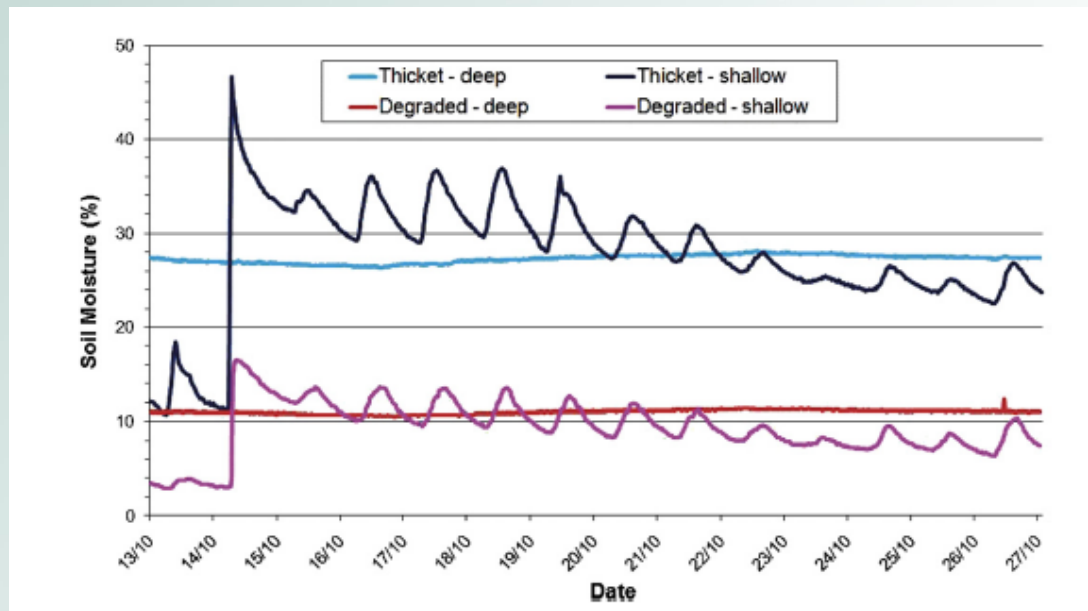
Hydrological implications of desertification: Degradation of South African semi-arid subtropical thicket

G. van Luijk [a,b], R.M. Cowling [c], M.J.P.M. Riksen [a,*], J. Glenday [b,d]

Conclusions

- The reduced evapotranspiration from degraded, sparse and improved grassland will result in increased run-off and soil loss during storm events.
- 61% of the 21565 ha considered in this study is affected.
- Run-off from these areas may provide significant benefits to down-stream users (mainly irrigation farmers).

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Thank you

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