

Peak river flow and variability drive spatio-temporal change in riparian woodlands in a protected area savanna



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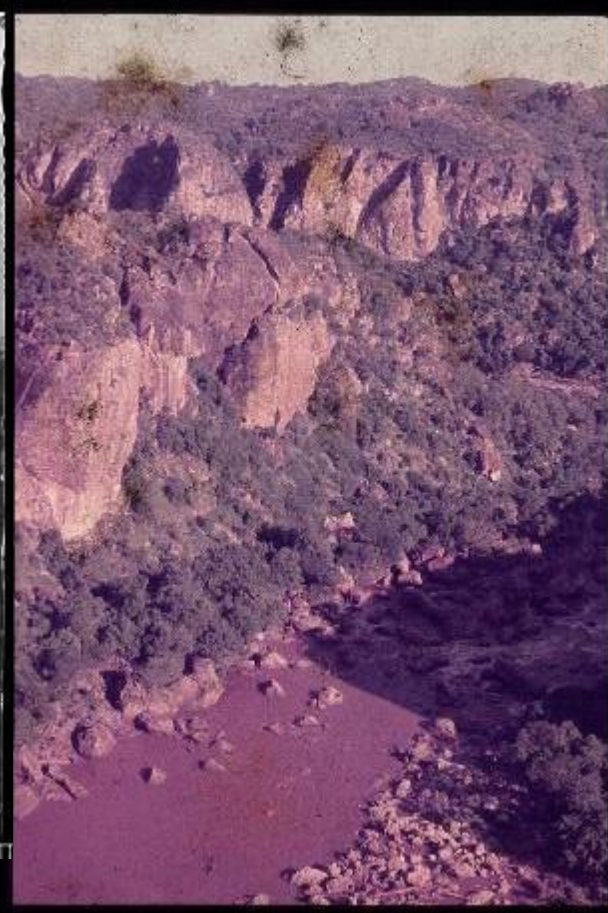
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Flooding in Kruger threatens catastrophic loss of species, scientists warn

18 MAY 2018 - 06:22 by DAVE CHAMBERS



south africa 21.4.2018 06:40 am

Sabie River needs to stay one of Africa's most pristine

Olifants river in danger

One of South Africa's most important rivers, the Olifants, which flows through the world-famous Kruger National Park, is in serious trouble.

November 28, 2016

The fall and fall of MAPUNGUBWE'S RIVERINE FOREST

PUBLIC RELEASE: 16-MAY-2018

Climate change impacts fragile river ecosystems

New research in the Geological Society of America Bulletin

GEOLOGICAL SOCIETY OF AMERICA

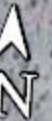
Olifants
River

S91

Google Earth

Image © 2013 DigitalGlobe

July 2013

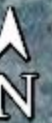


Olifants River

Olifants - Satara Rd



Luvuvhu River



The 'riparia' of KNP

- Some of most pristine and extensive examples of riparian woodland in southern Africa.
- High biodiversity per unit area.
- $\pm 4.37\%$ total KNP area!
- Highly diverse in structure and composition.
- Several ecosystem services.



Main Research Questions

- How much, when and where have riparian woodlands changed?
- Potential causes of change?



← 835
← Orpen Dam Lodge 11
← Wapiti 12

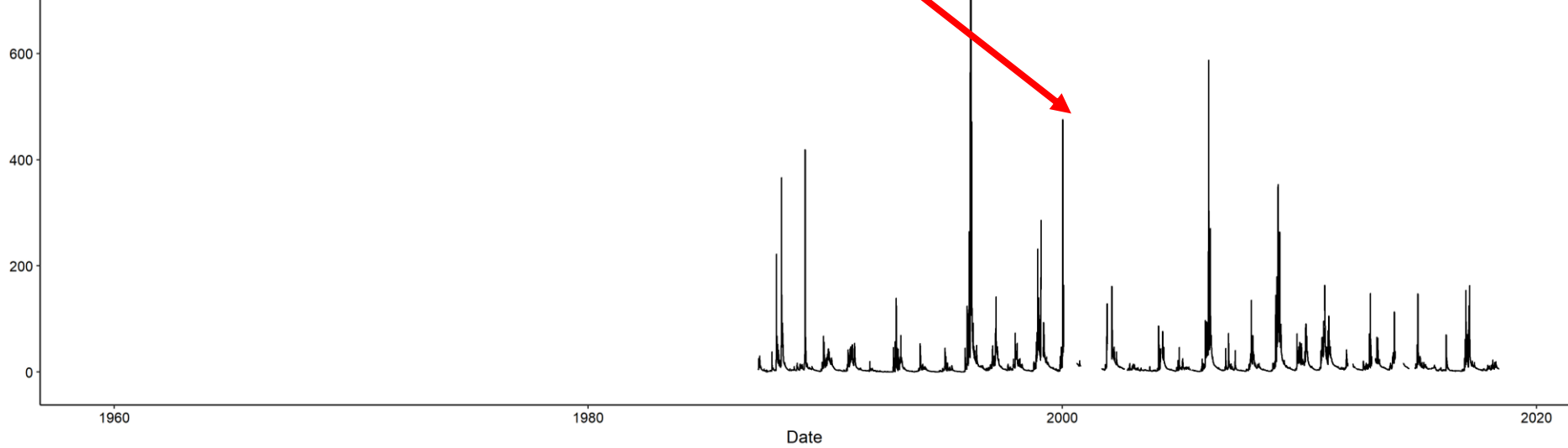
Other variables?









Methods: River flow/discharge

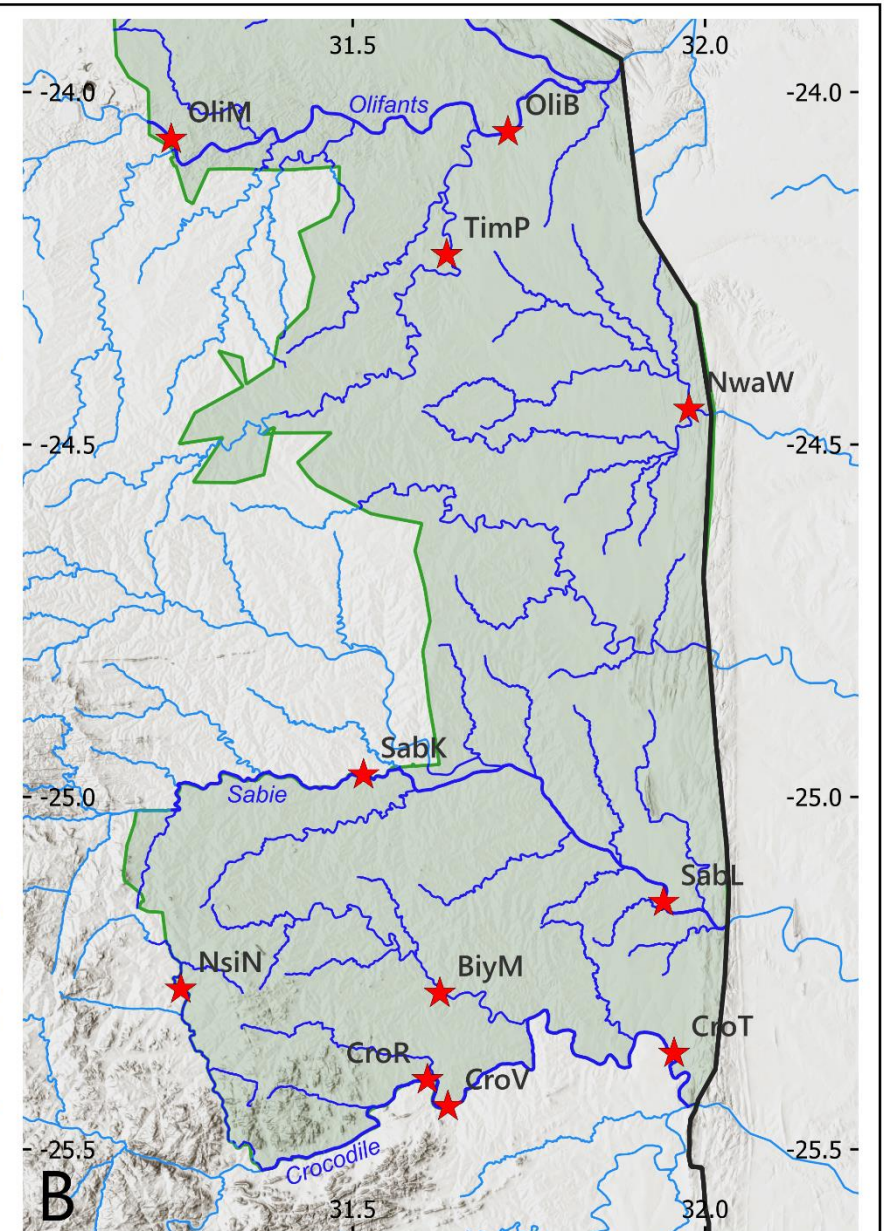
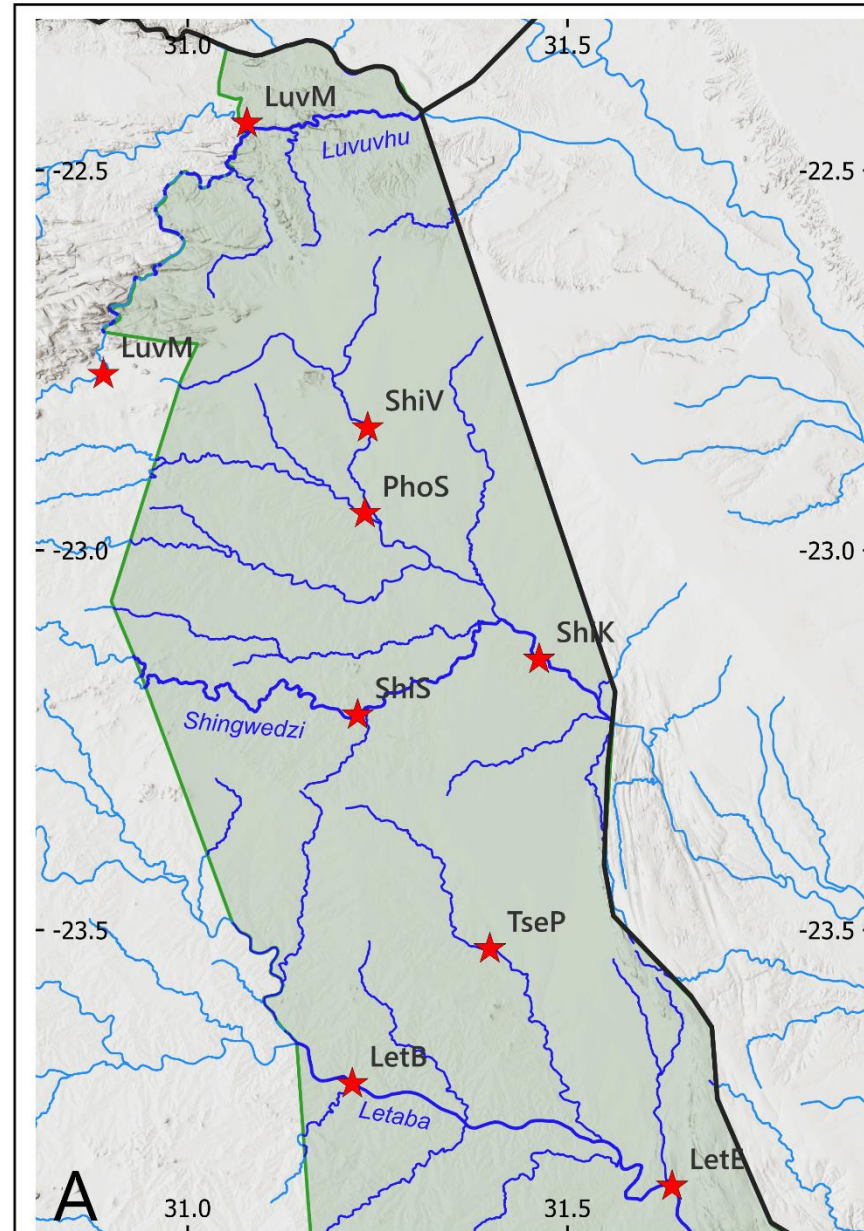
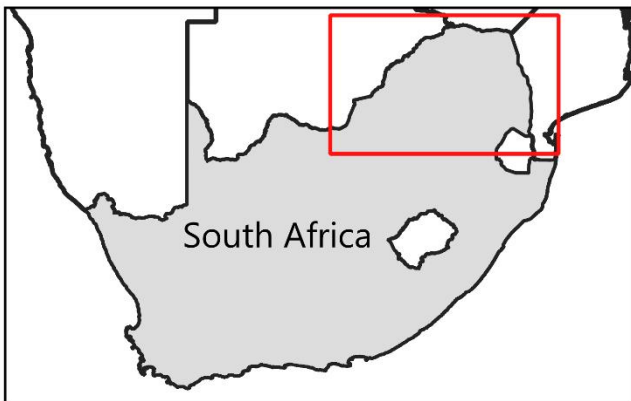
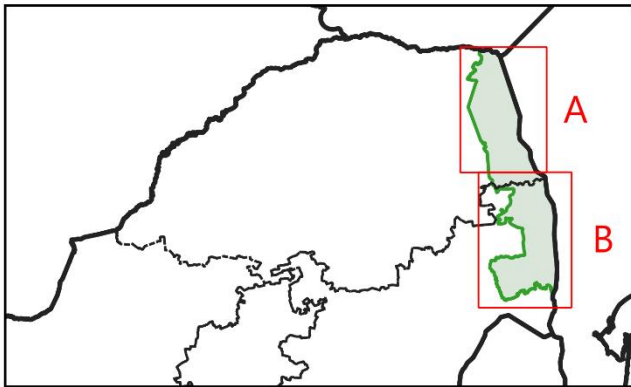


Daily mean flow ($\text{m}^3 \text{s}^{-1}$)

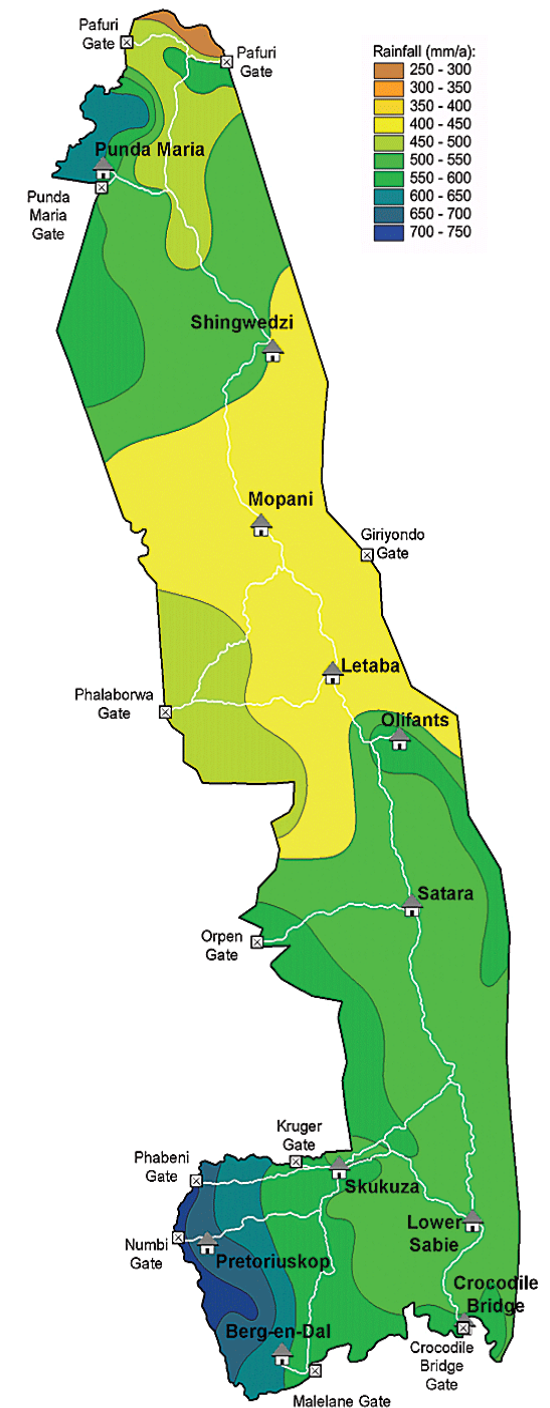


Legend

-  Kruger National Park (KNP)
-  Gauging station
-  Major river (inside KNP)
-  Minor river/tributary (inside KNP)
-  River (outside KNP)
-  International Border



Methods: Rainfall



FLIGHT PLAN

JOB 779

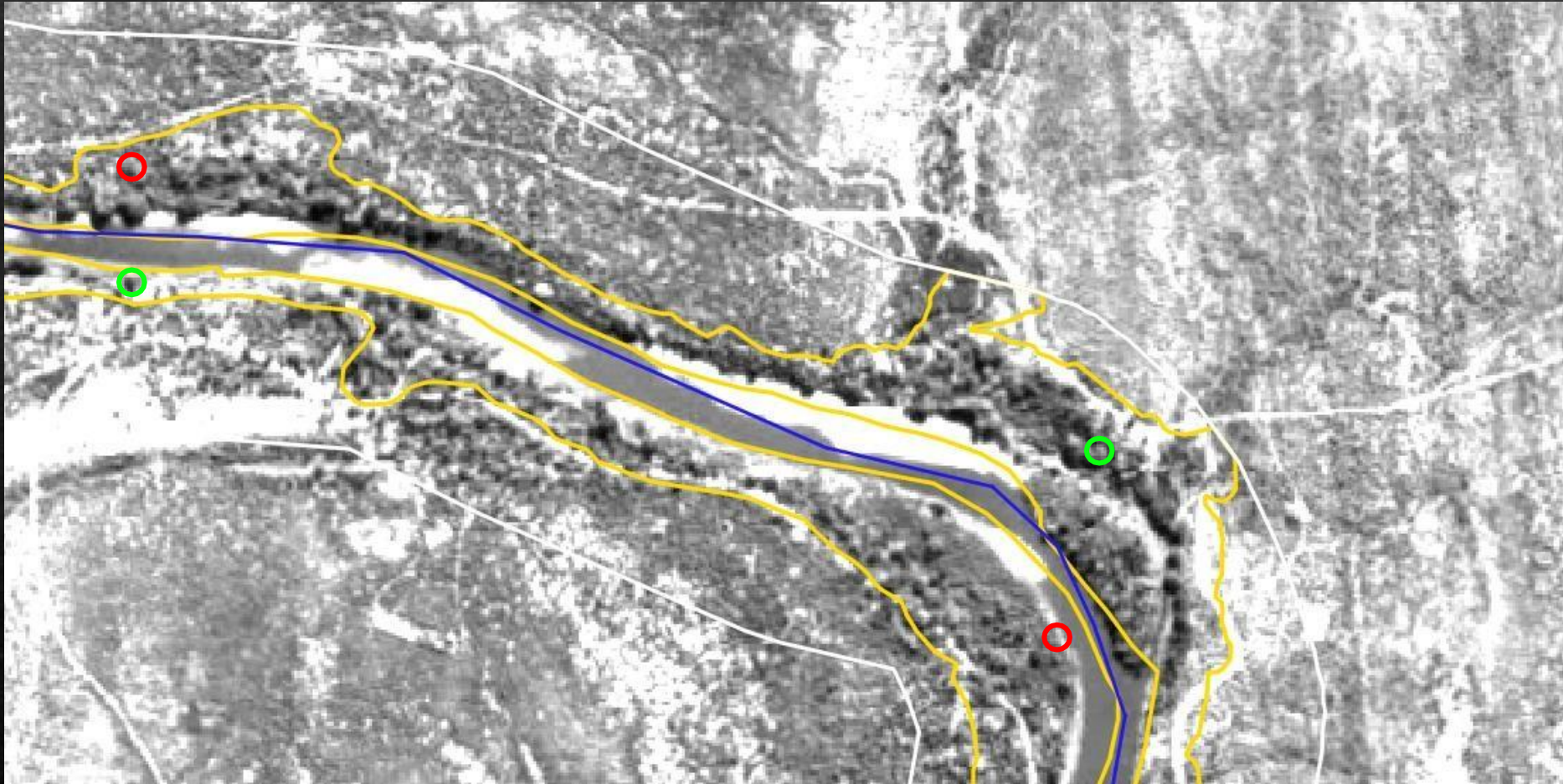


JOB 779		
STRIP	PHOTO NOS	DATE
1	5233 - 5240	18-9-77
2	5231 - 5223	
3	5286 - 5291	
4	5221 - 5210	
5	5233 - 5297	
6	5171 - 5168	20-7-77
7	5257 - 5266	
8	2892 - 2902	
9	2889 - 2872	
10	2850 - 2867	18-9-77
11	5277 - 5268	
12	2838 - 2847	
13	2793 - 2826	20-7-77
14	2650 - 2616	
15	2680 - 2614	19-7-77
16	2577 - 2543	
17	2503 - 2537	
18	9852 - 9820	3-6-77
19	9783 - 9817	
20	9781 - 9745	20-7-77
21	2787 - 2749	
22	9574 - 9536	2-6-77
23	2710 - 2747	
24	9492 - 9454	20-7-77
25	9410 - 9451	

SCALE OF PHOTOGRAPHY STRIPS	1-12 1:55 000
	9-25 1:50 000
CAMERA LENS CONE	WILD RC 10 2021
PRINCIPAL DISTANCE	88,18mm
FILM TYPE	PANCHROMATIC
FILM BASE	POLYESTER
PHOTOGRAPHY CHECKED	2-11-77 S. Matthews
FLIGHT PLAN CHECKED	15-11-77 S. Matthews
JOB ACCEPTED	17-11-77 S. Matthews
FILM FINALISED	6-12-77 M. BUTH



Methods: Tree cover



Results: Woodland cover change



11 net decrease

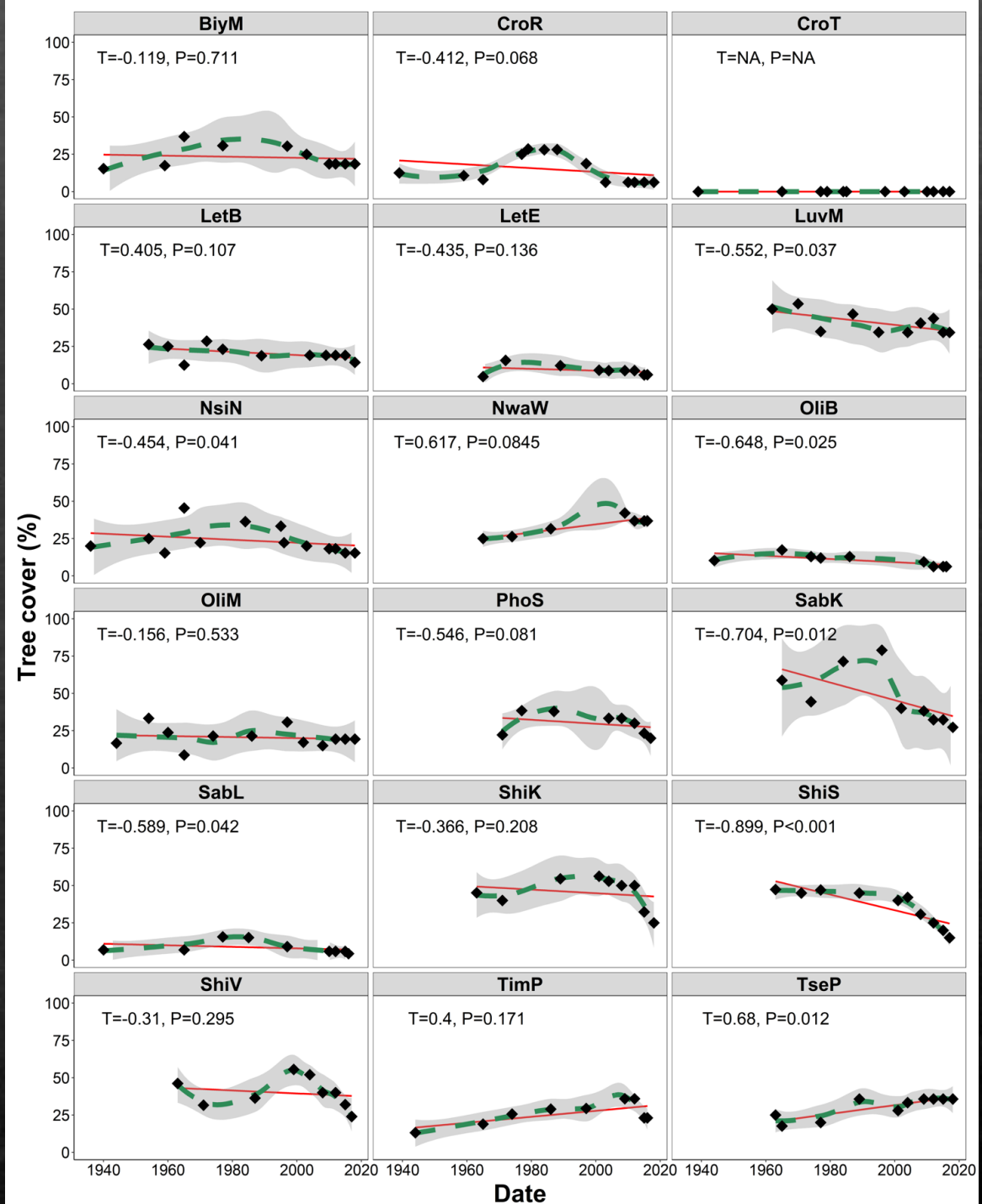
14 negative trend, 6*



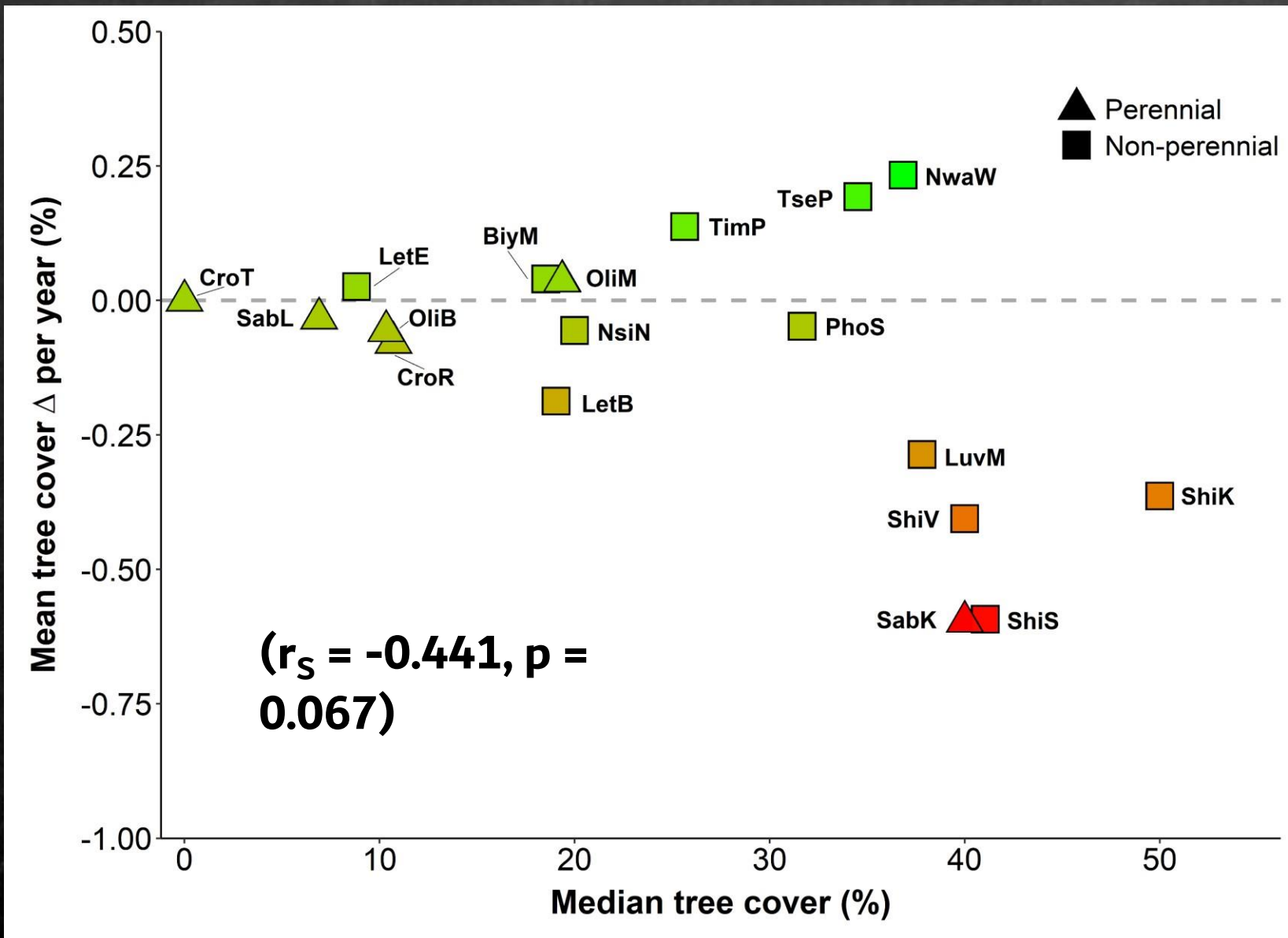
6 net increase

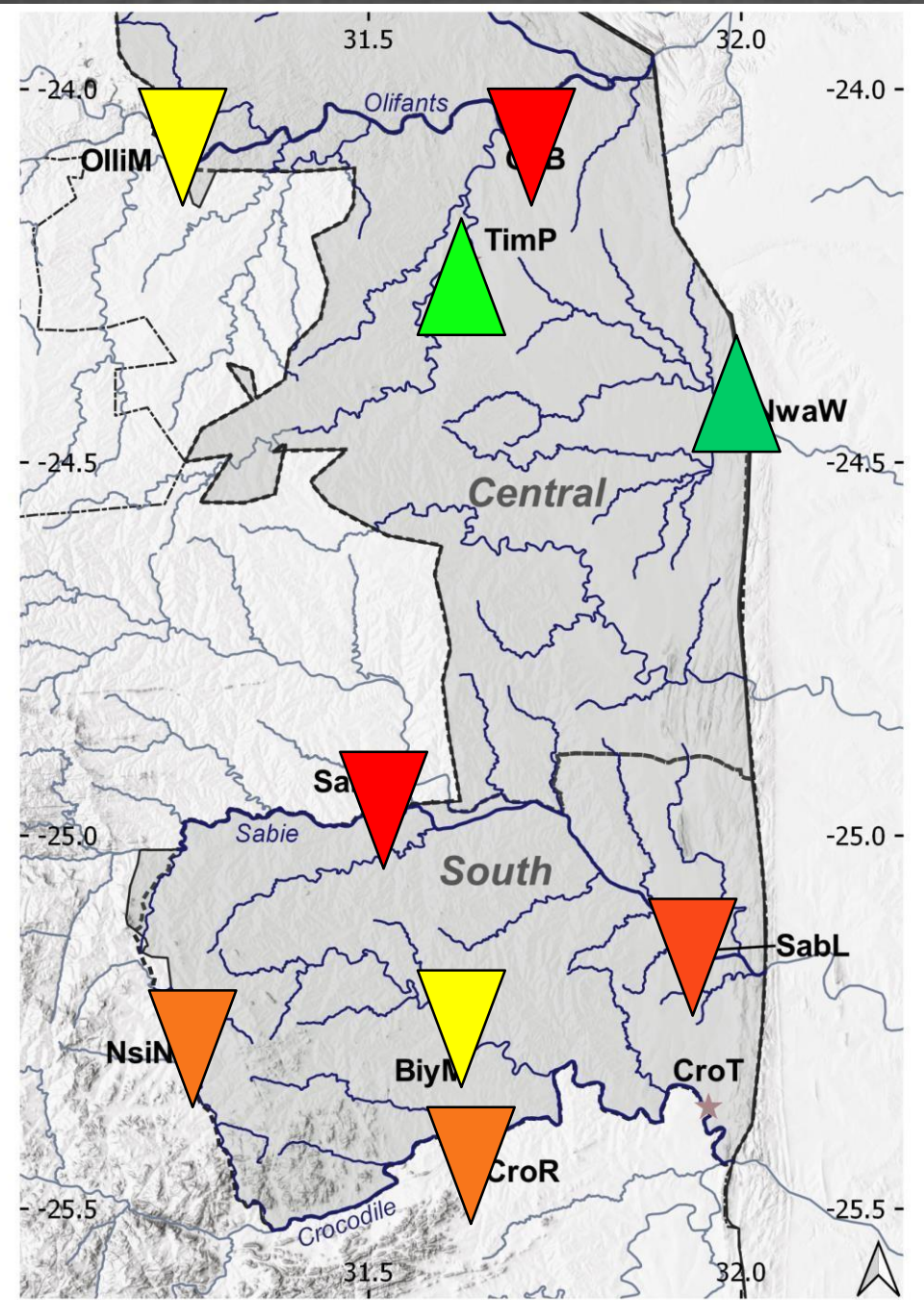
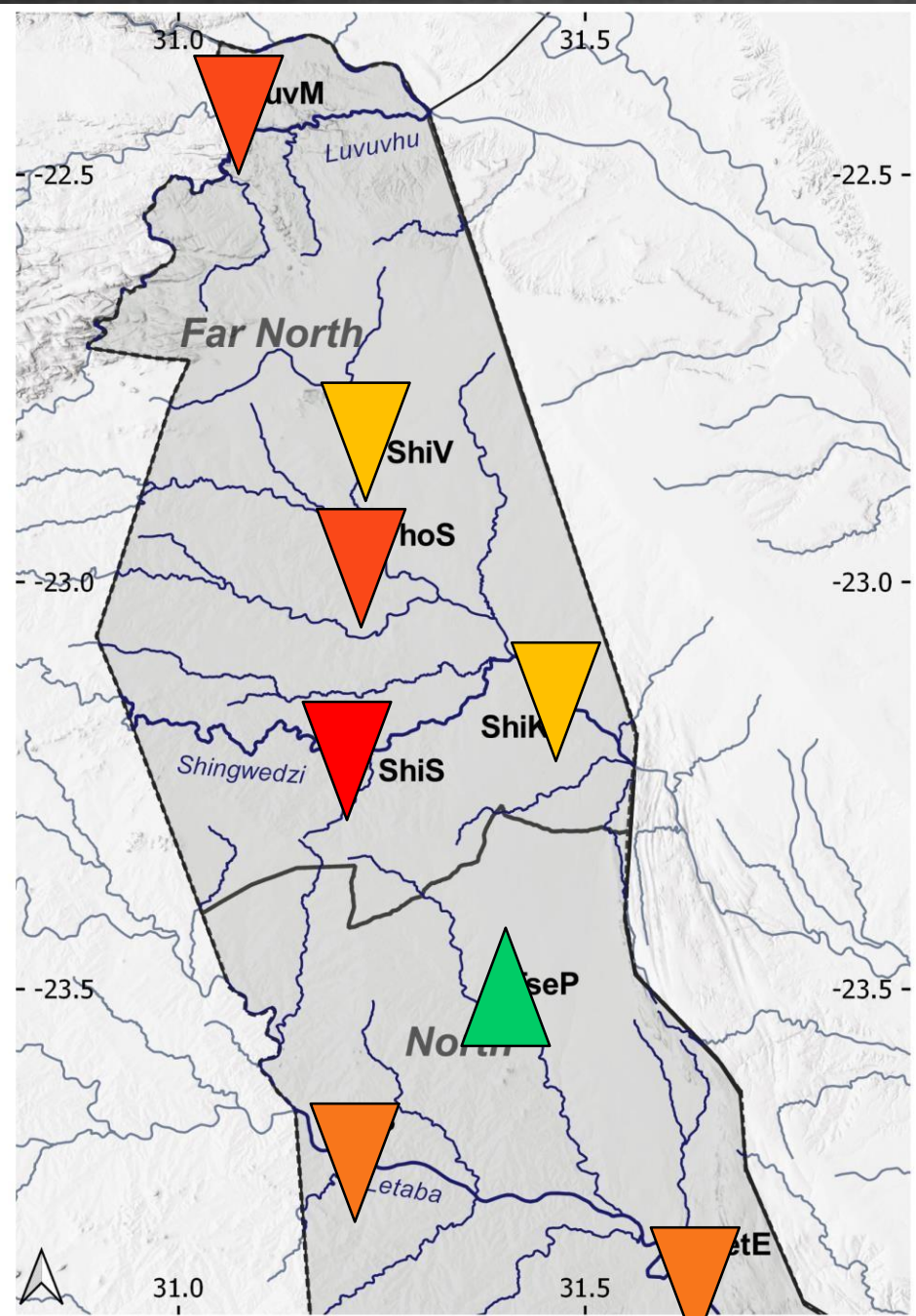
3 positive trend – all non-perennial, 1*

*significant



Results: Tree cover (overall Δ)





Results: (Monthly) Flow Trend

6 x decreasing trend



11 x increasing trend



Results: Veg Δ vs flow and rainfall

Multiple Linear Model

Response variable	Explanatory variable	Coefficient $\times 10^3$ (mean change)	Std. error $\times 10^3$	T value	P value
Tree cover change (proportional)	Maximum flow recorded (event)	≈ -1.0	<0.1	-2.000	0.049
	CV flow	7.0	3.3	2.157	0.034
	Cumulative rainfall	≈ 0.1	<0.1	1.996	0.049
	Maximum monthly rainfall recorded	-0.5	0.1	-2.560	0.012

Conservation Implications and Thoughts



- Given the losses, the concern is the tiny fractional area of riparian woodland
- Whilst heterogeneity and flux is encouraged, these changes may go beyond a certain concern “threshold”
- River systems need to consider upstream and downstream (Mozambique)
- Economic implications given the outsized importance of riverine networks in Kruger
- Long-term future of riparian habitats is uncertain given erratic rainfall and likely increase in LIDs
- Role of SANParks, water boards, industry, upstream landowners → promote sustainable environmental flows that aligns with legislation

Link to the paper
and contact
details



DOI: 10.1002/eco.2685

RESEARCH ARTICLE

WILEY

Rainfall, peak river flow and flow variability drive spatio-temporal change in the extent of riparian woodland in an African protected area savanna

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Acknowledgements

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