



Food and Agriculture
Organization of the
United Nations

GLOBAL
SYMPOSIUM on
SOILS and **WATER**

02-05 October, 2023

Soil and water:
a source of life



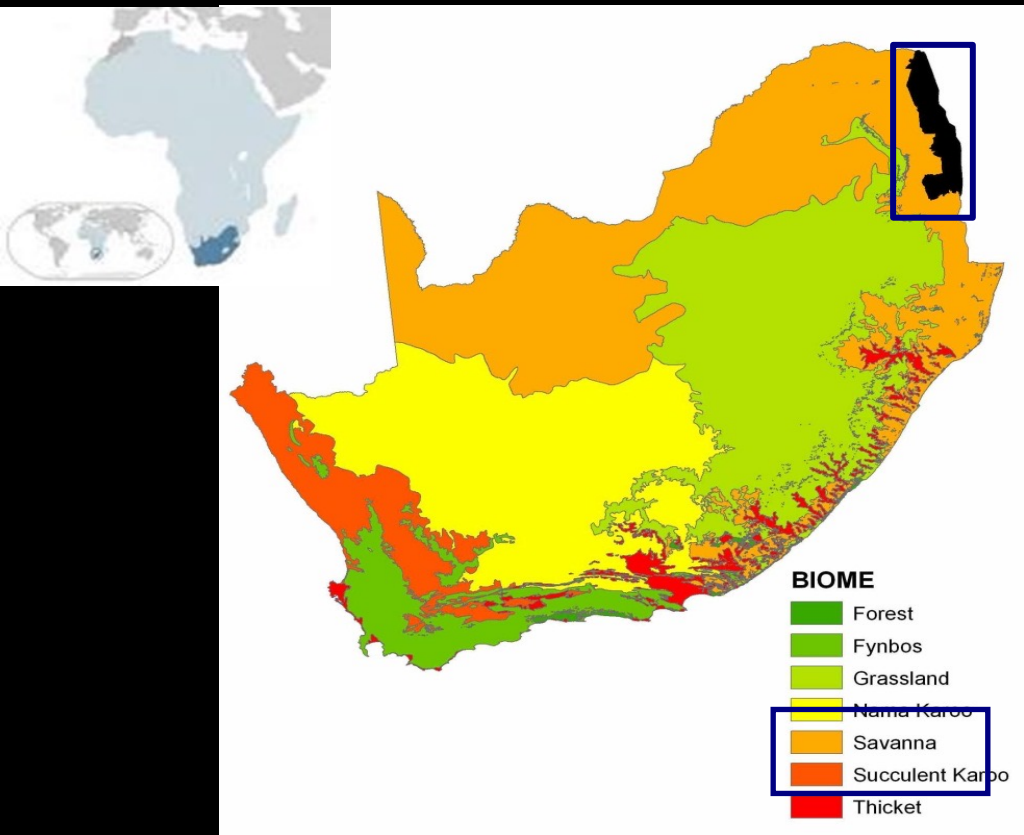
After the Soil Conservation Act

Evidence of soil water response to
experimental burning in Kruger
National Park

Tercia Strydom, Izak Smit and Johan van Tol



Kruger National Park



- Kruger NP is situated in the north-eastern region of South Africa
- Savanna biome
- Approximately 2 million hectares
- World renowned Conservation Area



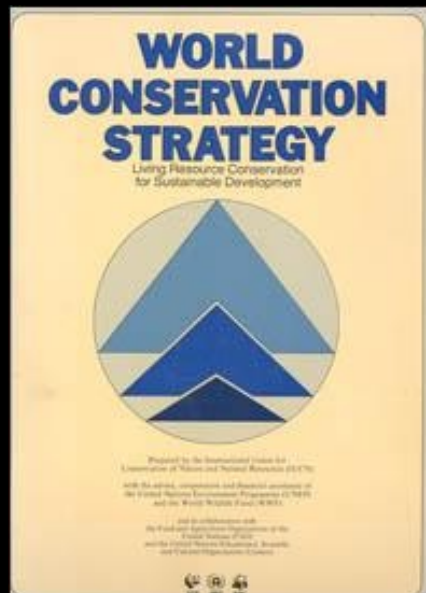


“Kruger National Park”



Soil Conservation for Ecological Reasons

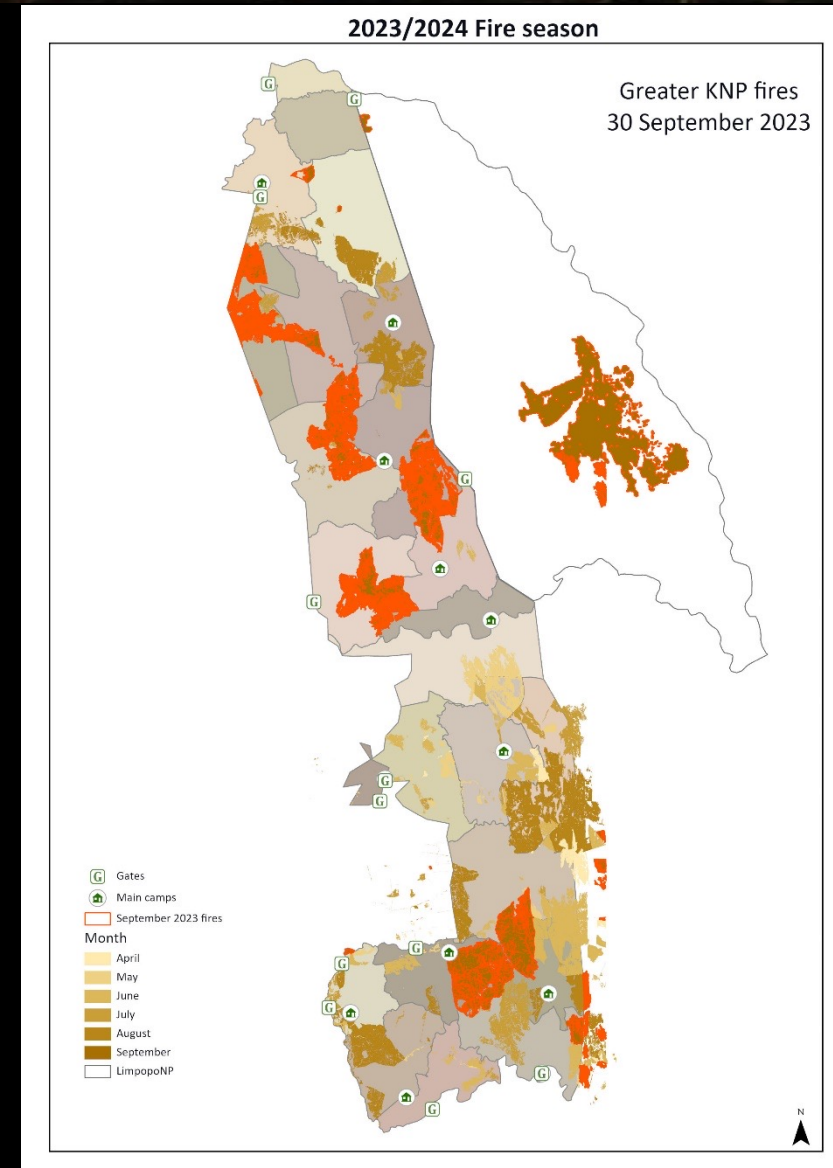
IUCN, 1980 – aiming “*to maintain essential ecological processes and life-support systems such as soil re-generation and protection*”



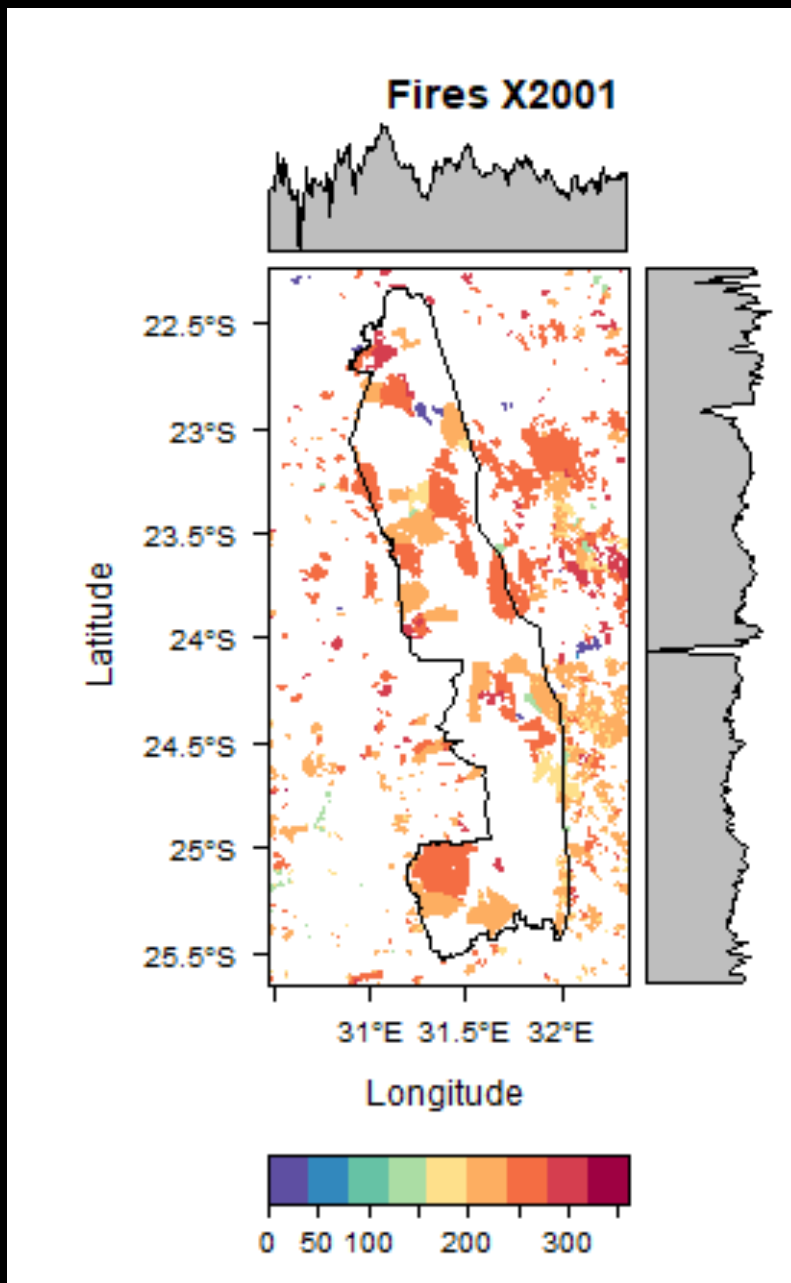
Almond *et al.* 2020 – emphasized the **role of soil** (and their biodiversity) in the overall assessment of the **world's biodiversity.**

Fires in Kruger

- Fires are a key abiotic factor influencing ecosystem dynamics in African savannas.
- These fires are ignited either by people or naturally by lightning.
- On average, ~10% (200 000 ha) burns every year.
- Due to high fuel loads, some years ~20% (400 000 ha) burns.



2001 - 2020



(MacFadyen & Strydom, 2022)



Governance Issues

- In the 1940s, philosophies around burning changed with the Soil Conservation Act no. 45 of 1946
- Perceived negative effects of burning on soil properties
- Land could be expropriated if found burning on your property



Fire-soil research in SA

- Long and rich history of fire research in SA
- Scarcity of local studies on fire effects on soil properties

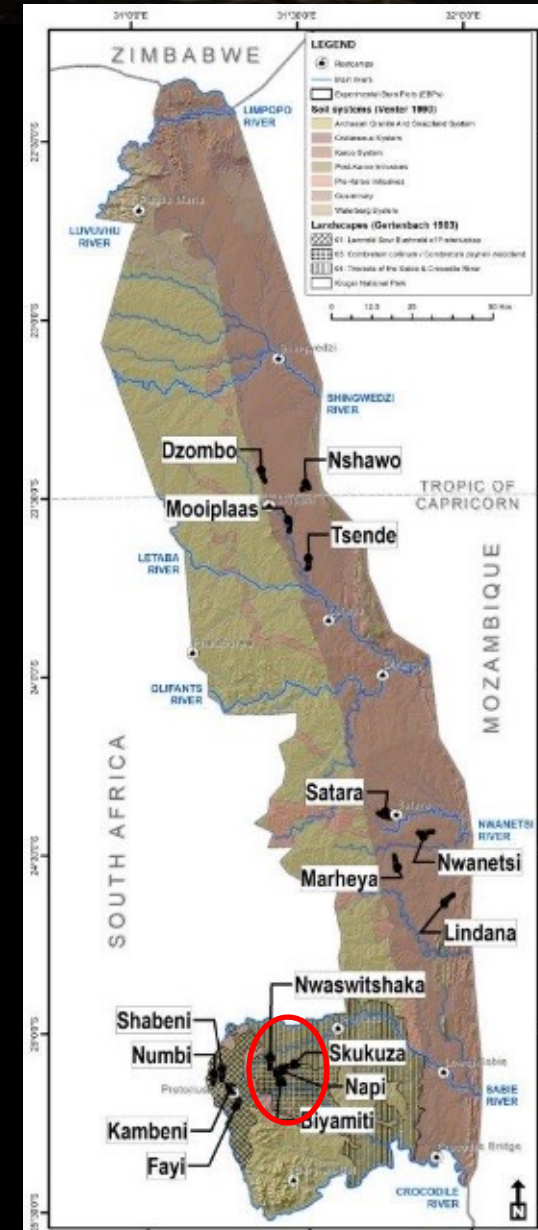
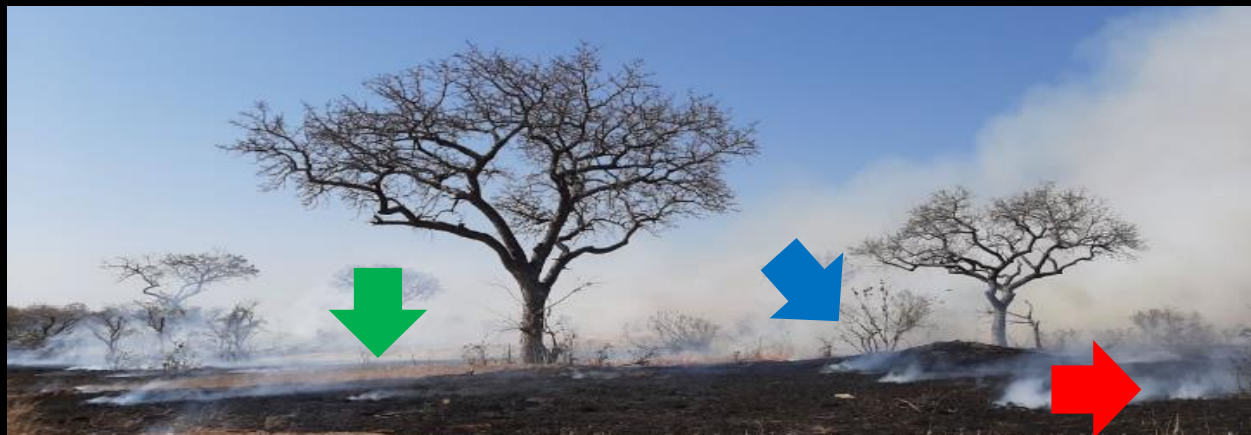
Why do we care?

1. High prevalence of fire in South Africa
2. World-wide studies found fire effects on soils elsewhere
3. Historical perceptions of fires impacting soils - Soil Conservation Act No. 45 of 1946

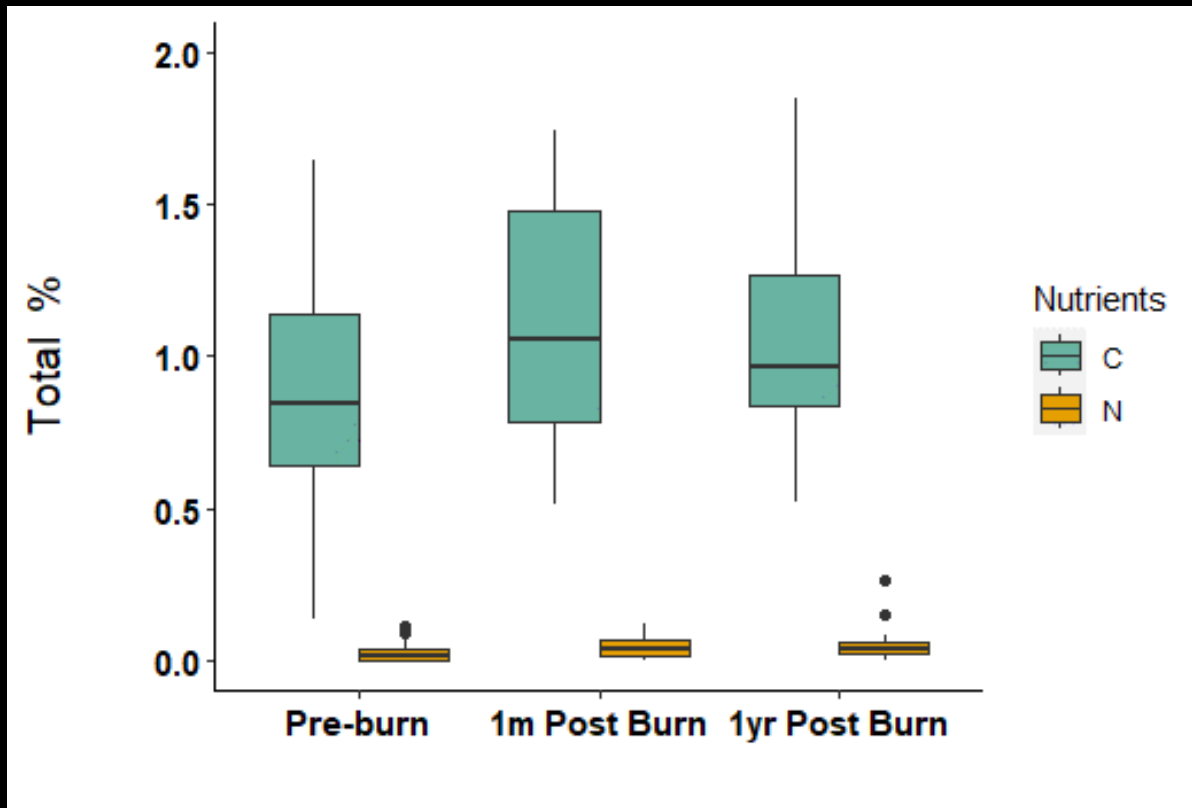


Current Research

- Using a ~70 year fire experiment in Kruger NP
- No burn VS Annual - Skukuza
- Aims to address some key gaps
 1. Effect of herbivores
 2. Short term effects
 3. Direct vs indirect effects of fire



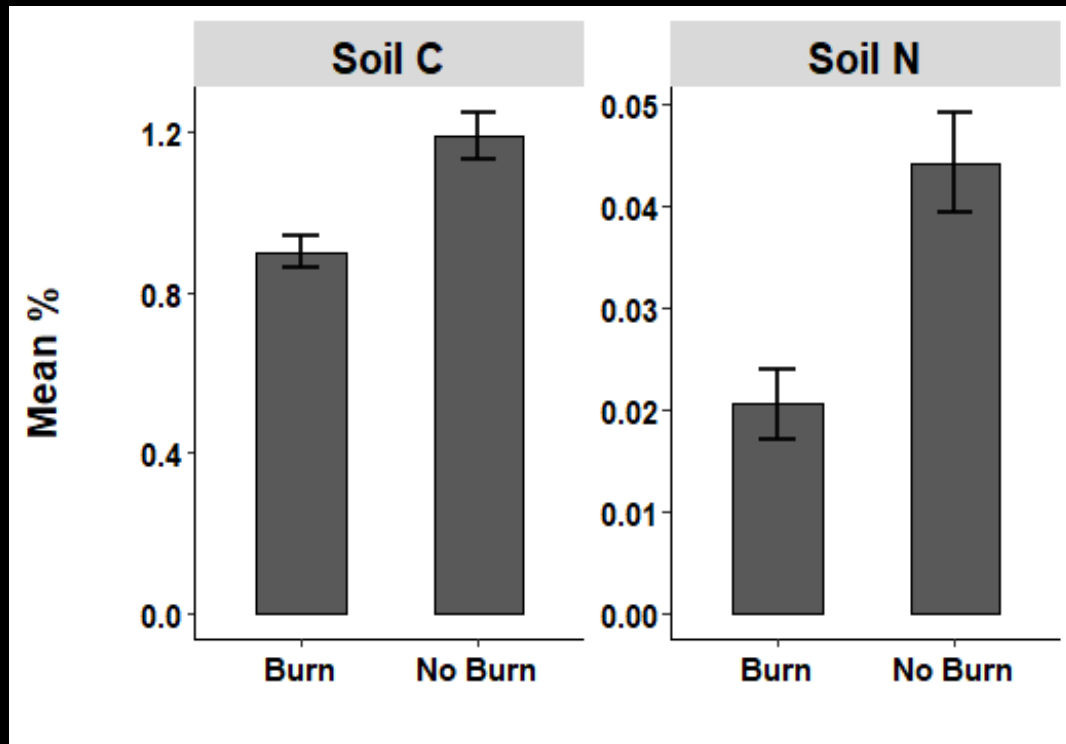
Soil C and N: Short-term



Fires have a short-term effect on soil C ($p < 0.01$) and N ($p < 0.001$) even up to 1yr post fire



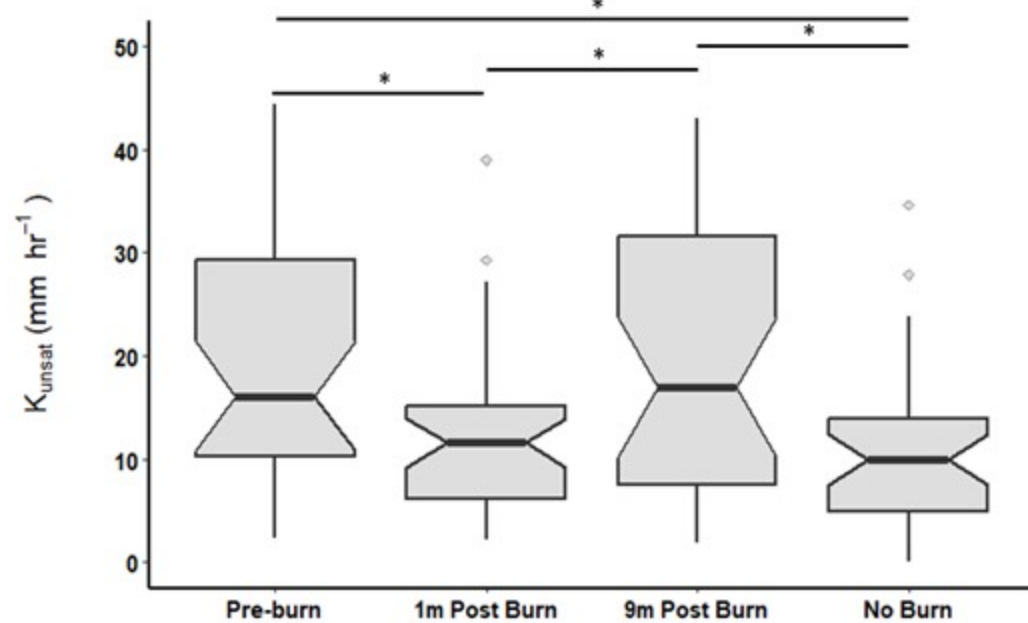
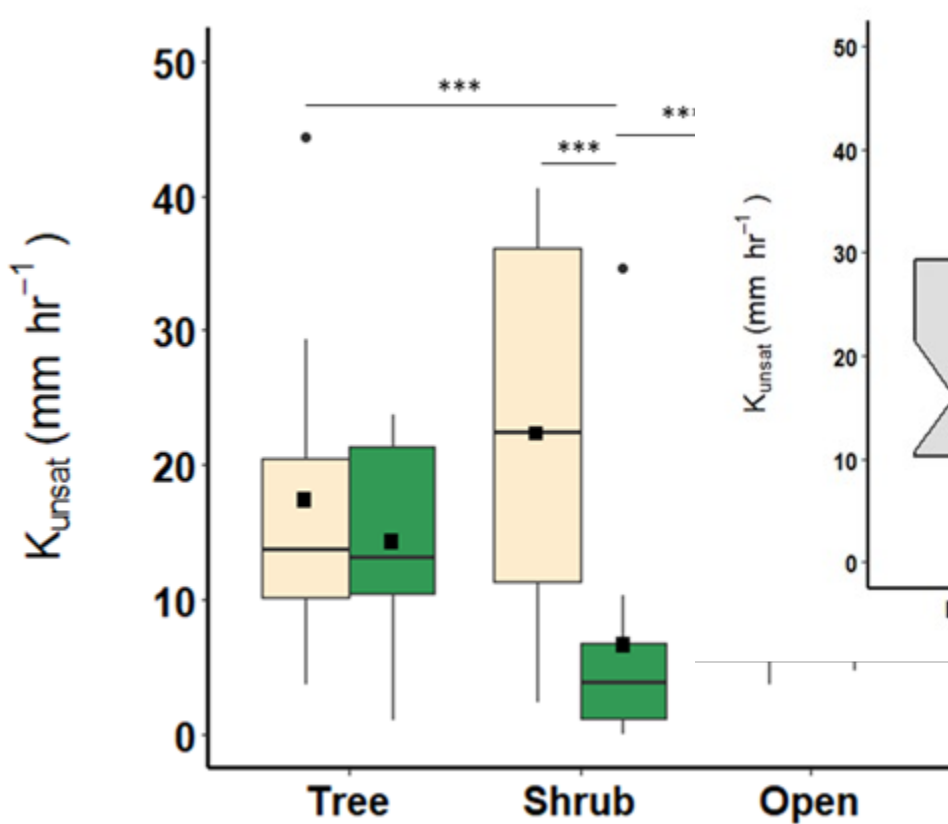
Soil C and N: Long-term



- Frequent burning reduces soil C and N ($p < 0.001$)
- Indirect fire effect?



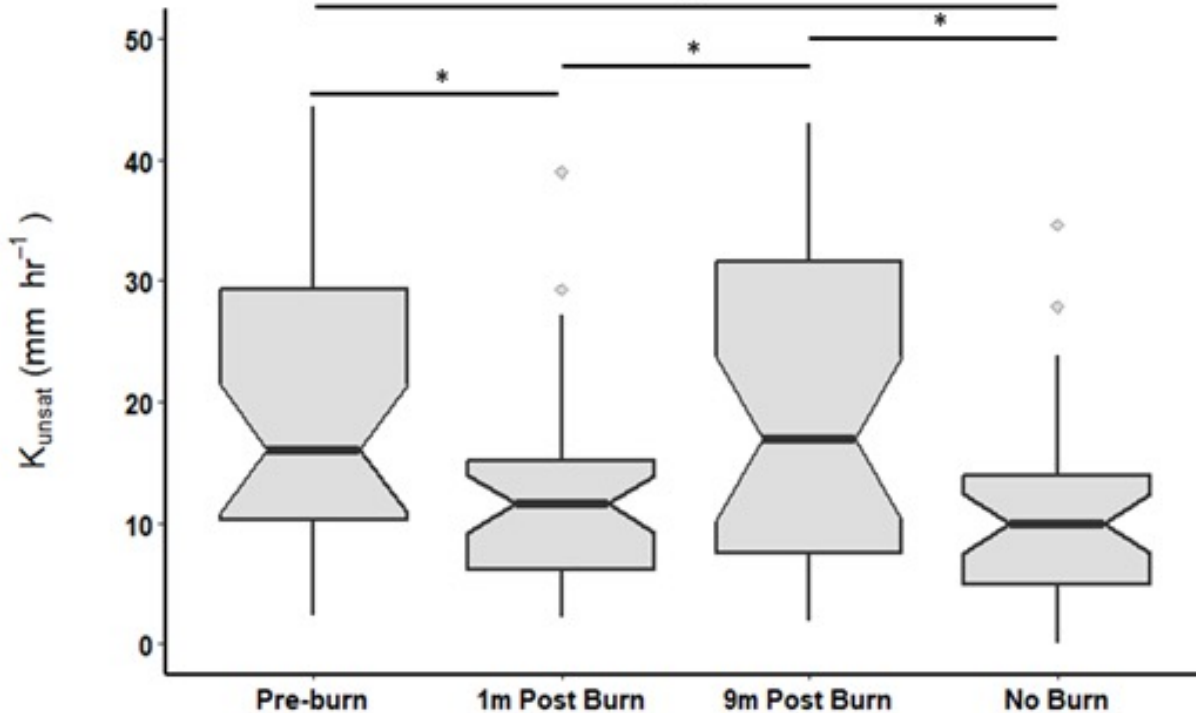
Soil infiltration: Veg structure



...n rates is slowest
...in the unburned plots

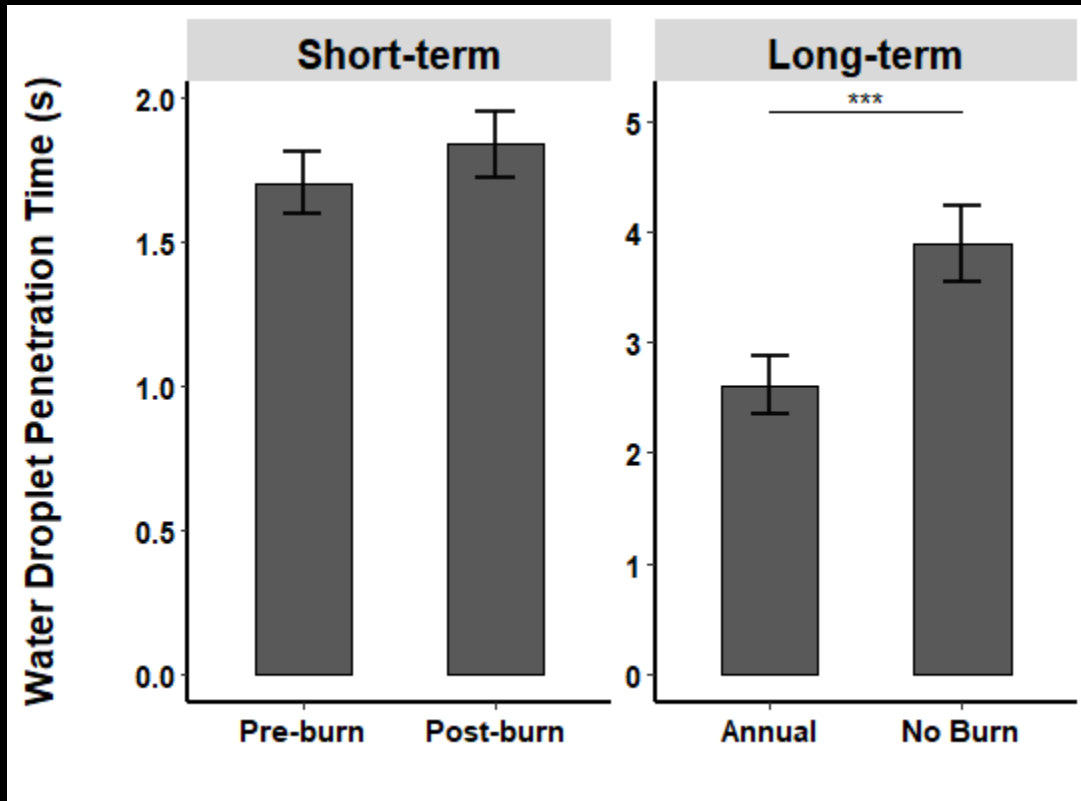
...e soil C observed?

Soil infiltration rates



- Fires lead to slower infiltration rates in the short-term post-fire ($p < 0.05$) but then recovers by 9th month
- Long-term fire exclusion leads to slower infiltration

Hydrophobicity



- No immediate effect of burning on soil hydrophobicity ($p > 0.05$)
- After ~ 70 years, soils are more hydrophobic ($p < 0.05$)



Conclusion



- Fires have varying effects on soil properties and time since last fire is important.
- How does this influence Governance within Kruger?
 - ❖ *Incorporation in Fire Management Strategy*
 - ❖ *Addresses park management concerns (& public)*

Acknowledgements

- Scientific Services Fire Team
- Shedron Mukhumo, Khensani Mkhonto, Duduzile Mzimba
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UNIVERSITY OF THE
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Thank you

