# Degradation dynamics in southern African savannas: people, trees and fire



Ellie Wood, University of Edinburgh helena.wood@ed.ac.uk linkedin.com/in/ellie-wood-scientist

Dr Casey Ryan, University of Edinburgh Dr Janet Fisher, University of Edinburgh Dr Kate Schreckenberg, King's College London **Professor Isla Grundy, University of Zimbabwe** 





## Degradation dynamics in savanna woodlands

Degradation (reduced tree cover) critically threatens the world's largest savanna. Southern African woodlands spanning 2.3 million km<sup>2</sup> provide ecosystem services (benefits from nature) for local and global populations through rich biodiversity, as vast carbon stores, and by directly supporting 150 million people (Ryan et al. 2016). Degradation here is widespread – impacting 17% of wooded land area in 3 years – but ground data to elucidate its mechanisms and impacts on people and nature are lacking (McNicol et al., 2018).

**People:** Humans manipulate southern African savannas in ways that are both very useful and very destructive, for example when clearing land for agriculture, and collecting building materials and fuel. Research is needed to inform sustainable management, to protect ecosystem services for local and global populations.

**Trees:** Recent research indicates that large diameters are keystone structures disproportionately dictating the carbon storage capacity, diversity, health, structure and functioning of wooded ecosystems (Lutz et al. 2018). Understanding how degradation impacts them can help to target conservation of the ecosystem for carbon storage and biodiversity.

**Fire:** Wildfires are common in southern African savannas, often caused by people burning to clear land areas, to make grasses grow for livestock, and for hunting. This has complex implications for both nature and people, but very little is known about this academically.



The study site is the coastal Kilwa District in southeastern Tanzania, where 70% of the landscape is a complex mosaic of miombo woodlands and the highly threatened East African Coastal Forest. Kilwa is one of the poorest parts of Tanzania, and its sparse human population is ~85% rural and dependent on resources from their valuable local environments. Degradation is widespread due to commercial logging and as local communities grow and consume more of the land, for example through cutting trees for firewood and charcoal, or by setting fires for agriculture and livestock.

The map shows the potential extent of southern African savanna woodlands based on expert opinion and vegetation maps. Land conversion due to agriculture, urbanisation etc. not indicated. Inset shows the extent of African savannas (Ryan et al., 2016).

# My research in Tanzanian communities focuses on the use of fire, and how this and other drivers of degradation impact people and big trees – which store half of the carbon in the ecosystem.



A savanna woodland in Kilwa, composed of a grassy understorey and an open tree canopy. Ellie Wood (2017).





A fire burning in Likawage village, Kilwa. The fire came from a neighbouring village, but we do not know the cause. Ellie Wood (2018).





Kikole village, Kilwa, has been burned to clear land for agriculture. Ellie Wood (2018).

A transect walk through Mbwemkuru village, Kilwa. Ellie Wood (2018).



# Studying people, trees and fire

My research uses both natural and social science methods to develop an understanding of degradation dynamics in Kilwa, Tanzania (see map left) that is inclusive of local needs as well as national and international conservation goals.

Social – completed 2018: 6 village meetings, 12 participatory mapping groups, 12 focus group discussions, 24 transect walks and 90 semi-structured interviews in 6 villages.

Ecological – fieldwork due in 2019: Inventory of 2500 large diameter (>40cm) trees (which were last measured in 2010/2011), recording: species, diameter, damage and mortality, resprouting and new recruits.



(2018).

### Findings so far

Preliminary analyses from social research conducted in 2018 suggest that people use fire in Kilwa for many different reasons and there are often trade-offs or conflicts between one person's fire use and another. Unintended negative consequences occur regularly, though it is difficult to assign blame and deal with the impacts as causes of fires are often hidden. There are also conflicting feelings about impacts for individuals – usually benefits for those setting the fire – and impacts for the community, which are generally thought of as negative. The environment is highly valued locally; most people consider conservation of wildlife and habitats as inherently important and also worry that degradation can limit economic development.

### Future directions

My ecological study to be completed this year is built on concern over degradation impacts on ecosystem services. Field data on 2500 large trees will reveal degradation patterns and ecosystem resilience. Combining ecological and social science data will show changing ecosystem contributions to wellbeing over time and from multiple perspectives, synergies and trade-offs between social and environmental goals. This research is designed to inform targeted interventions and policy: for biodiversity, local communities and climate change mitigation, for equitable and effective land management of socioecological savannas in Tanzania and across Southern Africa.

#### References

Lutz et al. Glob. Ecol. Biogeogr. 27, 2018. McNicol et al. Nat. Commun. 9, 2018.

A map of Mchakama village, Kilwa, created by some of its residents. Ellie Wood