



Wildfires in the Miombo woodlands of southern Africa: insights on research and management needs

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(MN steering Committee)

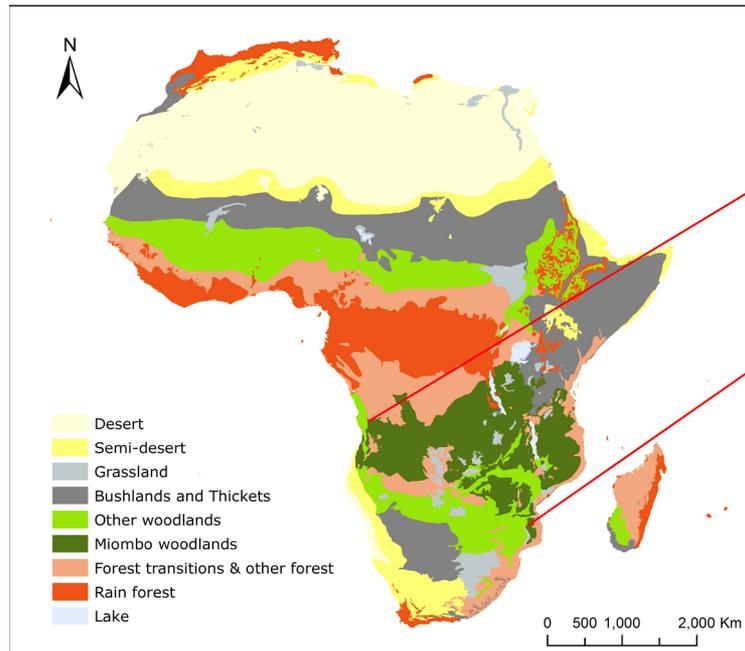
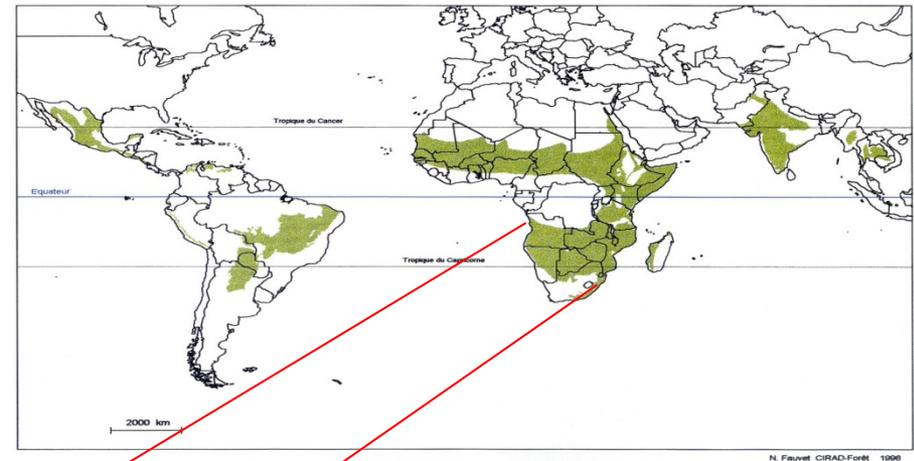
<http://miombonetwork.org/>

3rd GWIS AND GOFC-GOLD FIRE IT MEETING

UMD College Park, Maryland

October 2018

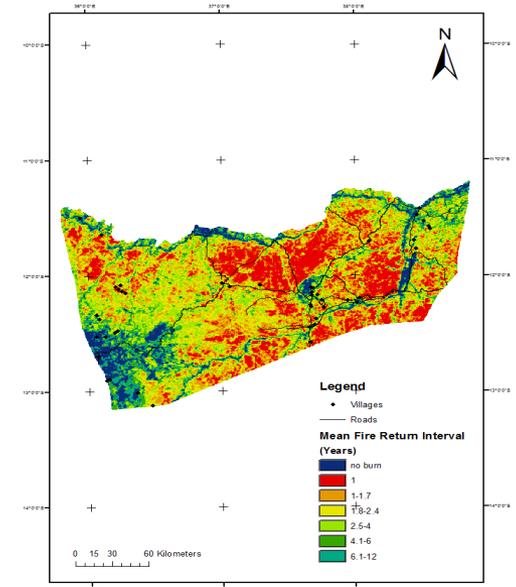
Miombo woodlands



- The largest dry forest ecosystem.
- Occupies about 2.7 million km² in Southern Africa across 7 countries (Mozambique, Malawi, Tanzania, Zimbabwe, Zambia, Angola and DRC).
- Provide goods and services for over 70% of rural and urban populations in the region.
- Woodlands store 18-24 PgC carbon (Ryan et al., 2016).

Fire is part of Miombo Ecology

- Have long existed in MW (probably ~200,000 years ago).
- A major management tool for rural people (90% of fires are anthropogenic).
- Some plant species are adapted and other depend on fires to survive.
- Fire regimes are important to maintain the ecosystem.
- Warmer and drier climates and human growth are imposing changes in fire regimes.

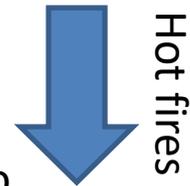
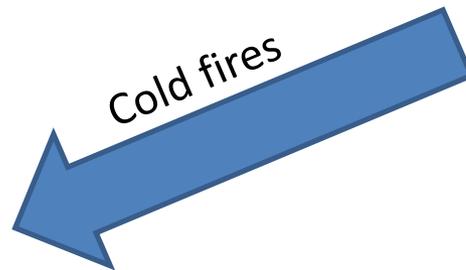


Source: Ribeiro et al., 2017

Fire is part of Miombo ecology



Grass fuels in the
understory burn
every 3-4 years



Tall miombo

Shrub miombo



Fire Research in Miombo

- Long-term fire experiments are rare, given the difficulties and demands of operation (e.g. Trapnell, 1959, 15 years).
- ⇒ Knowledge about fire regimes, impacts and management options are still incipient.
- **Impacts of fire on vegetation**: e.g. Zambia (Trapnell, 1959; Chidumayo, 1997); in Zimbabwe (Furley et al 2008); Mozambique (Ribeiro et al., 2008; Ryan & Williams, 2011; Ribeiro et al., 2013); Angola (De Cauwer & Mertens, 2018).
 - **Fire regimes/emissions**: e.g. Tanzania (Tarimo et al., 2015), Mozambique (Ribeiro et al., 2017; Ribeiro et al, in prep.).
 - **Continental/regional scale studies**: e.g Archibald (2010); Archibald (2016); van Der Werf (2017).



Fire management in Miombo

- 90% of fires resulting from human activities => emphasis on awareness and community engagement (recovery of traditional knowledge).
- Most legislation prohibits fire, but recognizes the need for prescribed burning as a management tool.
- Relevant government sectors expected to handle fire information and community training (e.g. Forest Services in Tz and National Disaster Management Institute, Moz).
- Private sector to implement specific FMS.

Main challenges

Research

- Development of knowledge in an holistic manner such as:
 - Fire regimes vs Climate change,
 - Fire behaviour and ecology under specific conditions;
 - development of fire prediction models as well as associated fire impact and fire severity;
 - Fire emissions under different regimes (EDS vs LDS).
 - Recover traditional knowledge on fire management.

Management

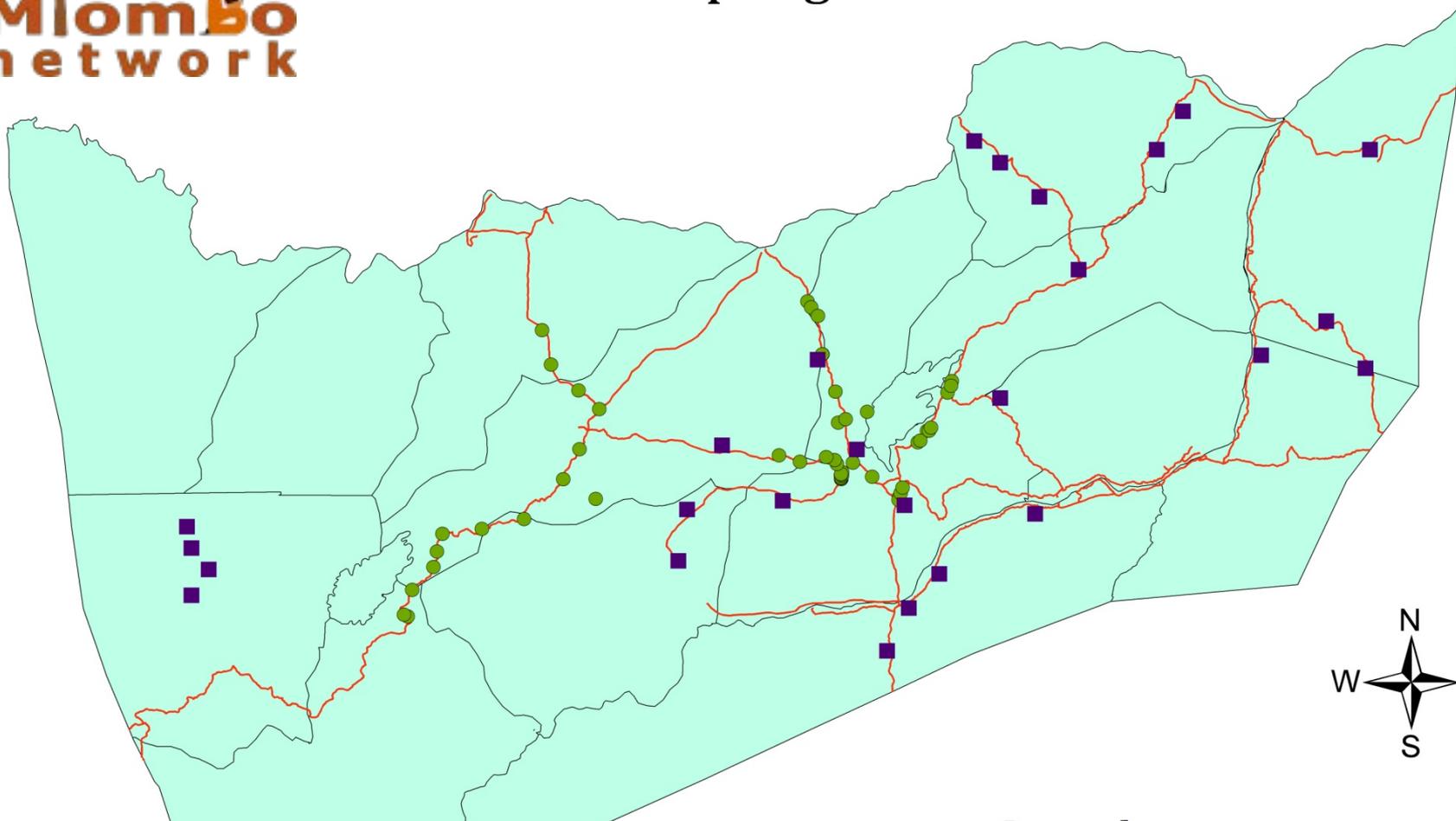
- Information access, archiving and, dissemination and sharing;
- Coordination among sectors;
- Engaging local communities in fire management

Needs identified as a pre-requisite for improving fire management

- Near-real time fire information for key areas (Conservation areas, concessions, etc);
- Knowledge about FDR in most key areas;
- Information on fire regimes and impacts on ecosystems (e.g. Niassa National Reserve)
- Investment in resources at local level (capacity building, equipment, technology, etc)



Permanent Sampling Plots



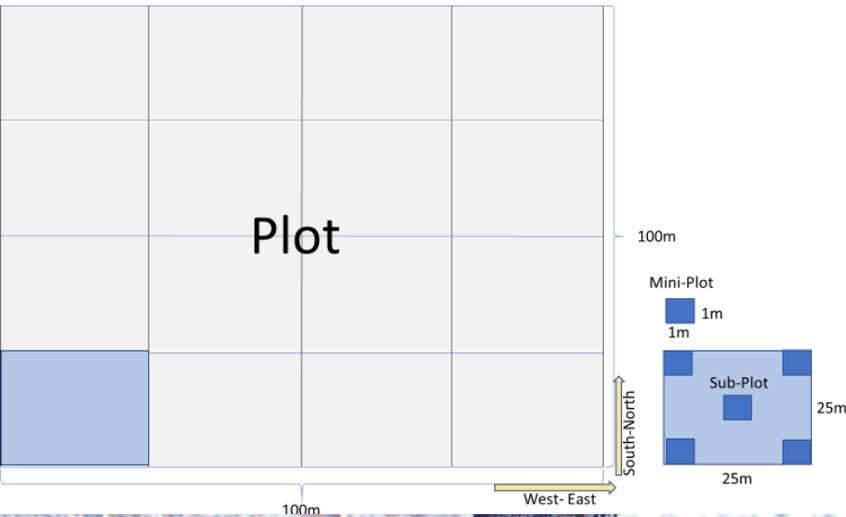
Legend

- Square Permanent Plot 100x100m
- Circle Permanent Plot r=15m
- Roads
- NNR

		Aridit Index class						
		5388	5600	5800	6200	6800	7600	8500
Fire Frequency level	0		a	b	c	d	e	f
	1	p	a_p	b_p	c_p	d_p	e_p	f_p
	3	q	a_q	b_q	c_q	d_q	e_q	f_q
	7	r	a_r	b_r	c_r	d_r	e_r	f_r
	11	s	a_s	b_s	c_s	d_s	e_s	f_s



Data collection



Adult tree

- Sp Id (mark with a tag)
- DBH
- Height
- Health /Disturbance

Natural regeneration

- Sp id
- Number of individuals per species

Grass Species

- Disc Pasture Meter (DPM) in each 1x1m sub-plot, 80 readings in the plot. Before burning and after burning.

Soils (30 cm)

- **Five samples per plot:** N, C, OM, pH

Fire emissions (EDS and LDS):

- **Direct method:** Carbon Analyzer located at the center of the block at 3m height above.



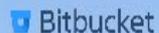


Role of the MN: (i) promote collaborative research projects

- Analysis of the regional legal and policy framework for miombo woodlands (2017/2018).
- An integrated approach to maximize the use NTFP and to improve agricultural systems in the Miombo woodlands (**submitted to IDRC**) – **Consider fire as the main management tool**
- Socio-Ecological Observatory of SA Woodlands (SEOSAW), collate and analyse existing plot data in the MW and associated woodlands (**on-going**)
- Understanding plant establishment traits to predict tree distribution ranges in changing African savannas (in progress, GCF)

SEOSAW

A Socio-Ecological Observatory for Southern African Woodlands



About SEOSAW: an activity of the Miombo Network



2269

Woodland plots



11

Countries



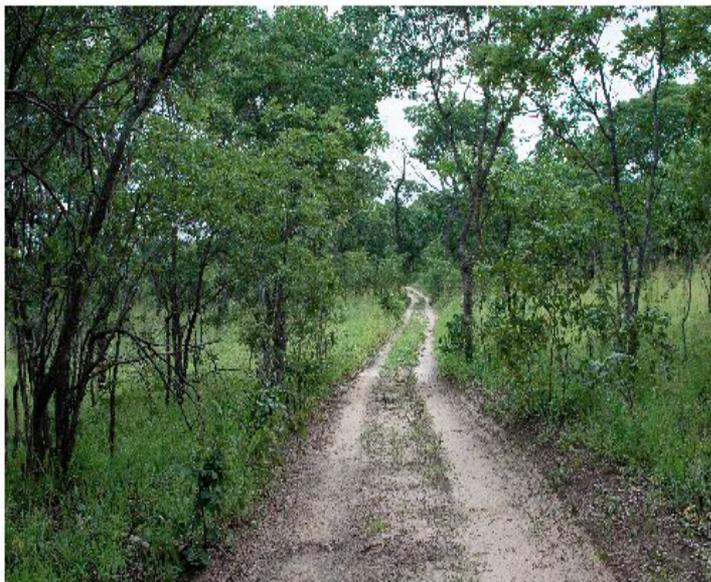
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Tree measurements



43

Researchers



The long-term goal of SEOSAW is to understand the response of southern African woodlands to global change.

Key outputs:

1. Novel analyses of the determinants of ecosystem structure and function for the region; these will answer key science questions for the first time at a subcontinental scale, and showcase the new data set.
2. Standardised methods for plot design and measurement, tailored to the socio-ecology of African woodlands.
3. A long-term regional plan for plot remeasurement supported by the Global Land Project and the Miombo Network.

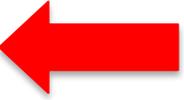


Role of the MN: (ii) Synergize with other regional networks

- MN attended the last SAFNet meeting:
 - Summary of current trends in remote sensing of fire – for African users.
 - Research paper/s (e.g. **what remote sensing data are available for African scientists**. Sally Archibald to lead).
 - Letter of introduction/newsletter about SAFNet activities
 - Increase communication/participation
 - Active webpage and or other social networking
 - MN is now part of the SAFNet SC.



Role of the MN: (iii) dissemination of information

- Policy Briefs: 1 on MW restoration, 1 on land use and 1 on sustainable timber production.
- Forest policy analysis (*in print*)
- Scientific publications (e.g. Furley et al., 2008; Tarimo et al., 2015; Ribeiro et al., 2017, among others)
- Miombo Book Project (*on-going*).
- Participation in the IUFRO's issue paper (Forest Fires as the Climate Warms). 
- Support to decision-makers: e.g. FMP of NNR; Mpingo Conservation and Development Initiative in Tz.
- Scientific meetings (2013, 2016; reports available, **next meeting 2019**). 

THANK YOU



HOME

ABOUT

OUR WORK

MEDIA

GET INVOLVED

DISCUSSIONS

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Promoting sustainable management of the Miombo Woodlands in Southern Africa



Communicates Evidence-based Scientific Information

Communicates evidence-base scientific information about Miombo Forests to improve management and enhance positive human-miombo forest relationships that ...



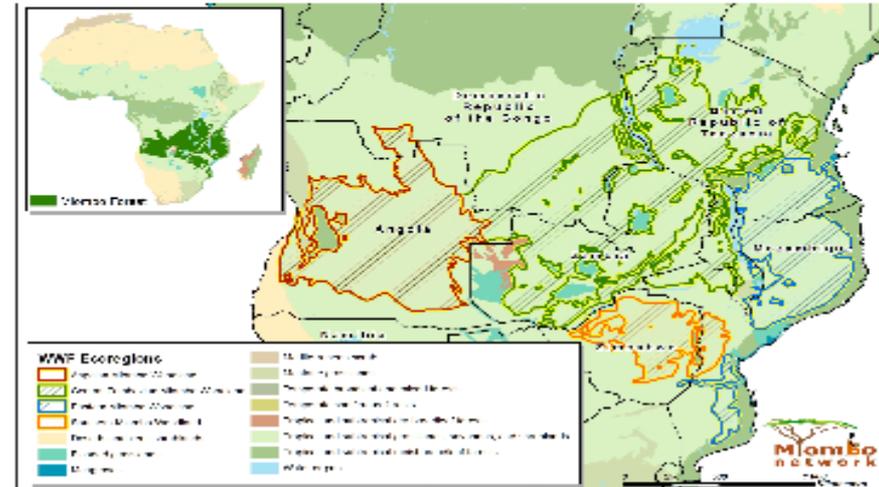
Conducts Policy Analysis To Provide Policy Advise.

Conducts policy analysis to provide policy advise to improve conservation and management of miombo forests within individual ...



Conducts Research On Various Themes

Conducts research on various themes: ecology, socio-cultural and economic and governance in miombo forest to foster effective ...



<http://miombonetwork.org/#>



Research needs

- Fire regimes (frequency, intensity, seasonality) in a changing world (climate vs human growth).
- Fire emissions under different regimes (EDS vs LDS).
- EDS vs LDS (how early?; species responses?; effects on ecosystems functions (hydrology, soil fertility and biology; NPP?).
- fire vs herbivory vs climate (key for protected areas management)
- Fire vs ecosystem services (spatial and temporal variations of ES according to fire regimes?)
- Cultural issues/traditional knowledge.