



UNIVERSITY OF  
LIVERPOOL

# Distinguishing tropical grassy ecosystems & why it matters

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EURAGRI-CIRAD workshop, 23 October 2024



# A brief guide to Tropical Grassy Biomes (TGBs)



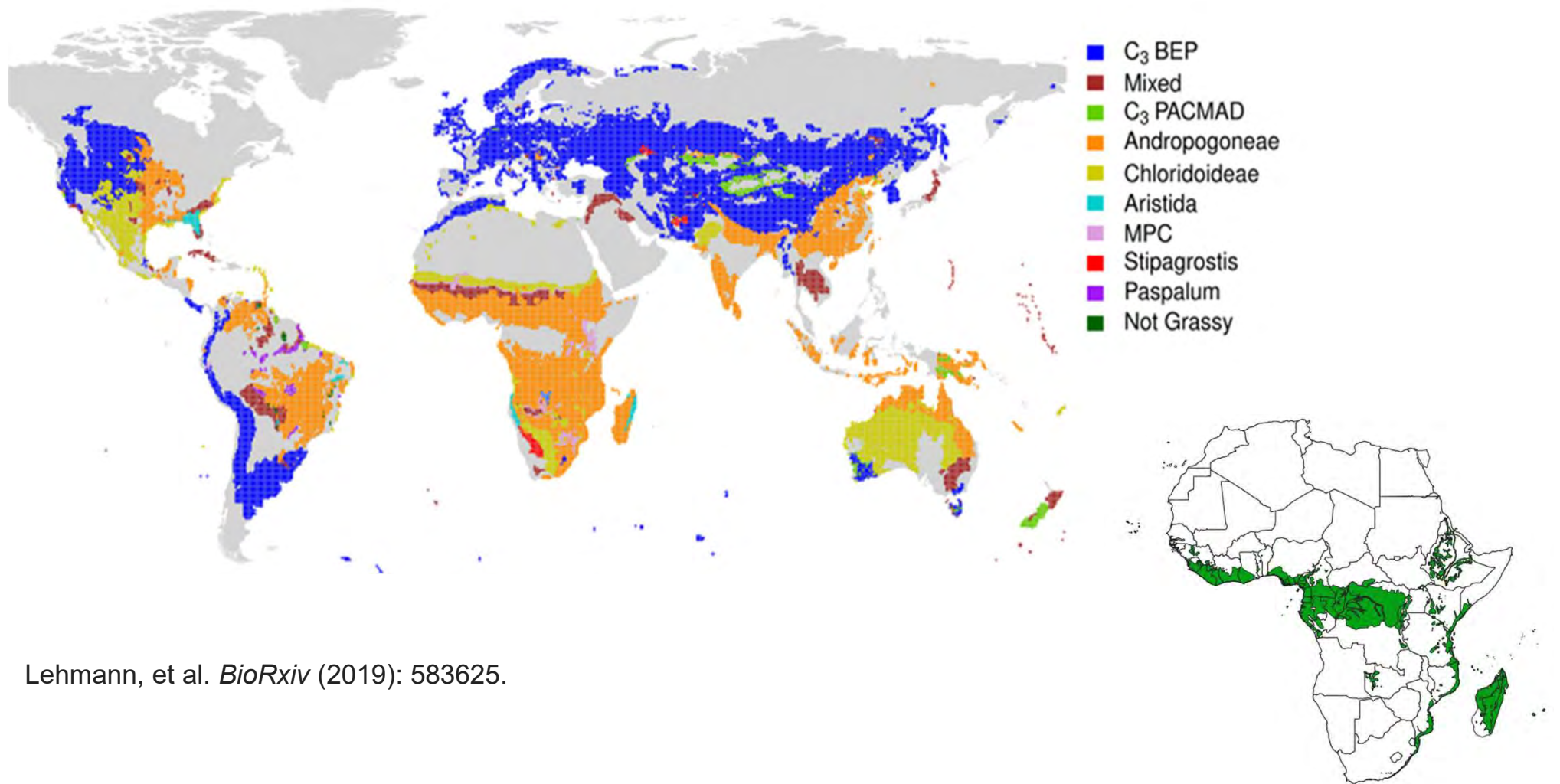
1. Tree cover is highly variable
2. Light loving, **grassy** under-story
3. Plants evolved for **fire/herbivory** but not shade (for understory)

**Trees  $\neq$  Forest**



# The Incredible Dominance of Grass

Global distributions of grassy biomes and dominant grass lineages



Lehmann, et al. *BioRxiv* (2019): 583625.

WWF/RESOLVE biomes

# Misclassification of Grassy Systems

## Colonial legacy

## Misinterpretation of the landscape



Millbert (1812): Representing the irresponsibility & culpability of indigen people for deforestation



Baikie (1857): Shola-grassland mosaics, India



Molopo, South Africa

# Misclassification of Grassy Systems

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*“the Earth that we inhabit is, in its natural state....universally, wherever waters do not prevail, covered with **woods**....”*

Thomas Pownall (1776)

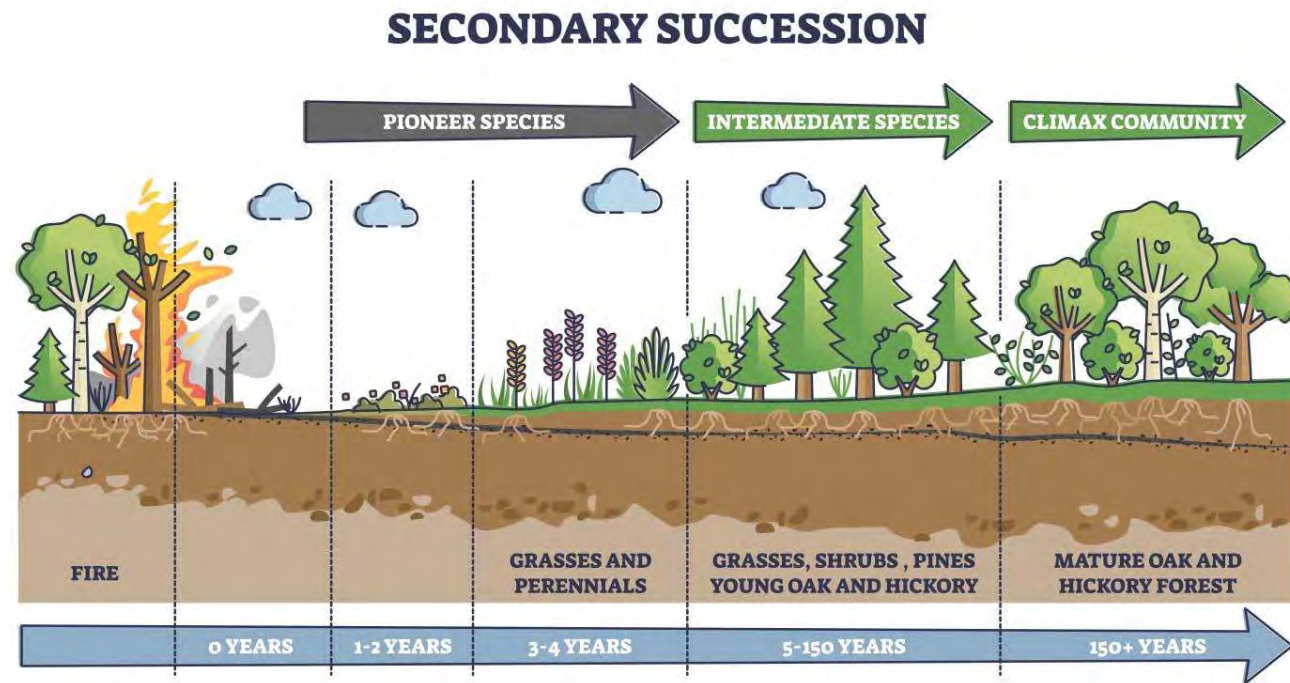
Silveira et al. 2022 *J Applied Ecol*, Veldman et al. 2019 *Science*,  
Lehmann & Parr 2016 *Phil Trans Roy Soc B*, Parr et al. 2014 *TREE*, Bond & Parr 2010 *Biol Cons*

# Misclassification of Grassy Systems

Science legacy too!

Anglo-European bias towards trees ('arboreal chauvinism')

Clements 'Theory of Succession'



**Secondary  
successional  
stage**

# Misclassification of Grassy Systems

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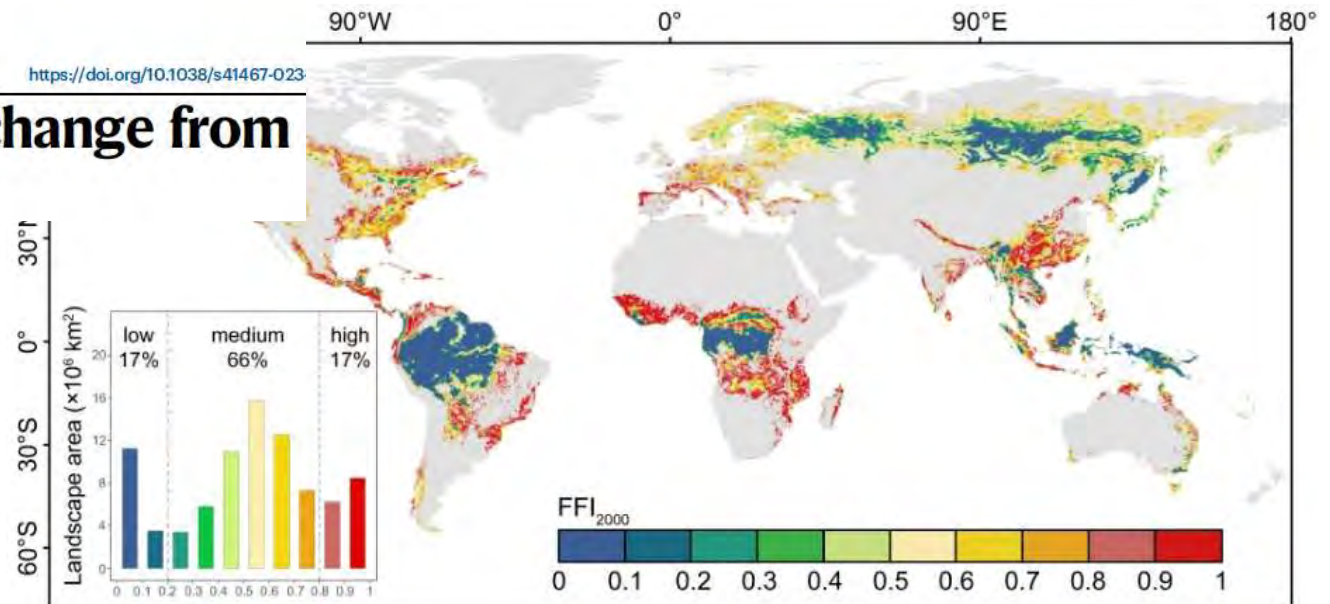
Global 'forest' studies frequently include TGBs

nature communications

Article

<https://doi.org/10.1038/s41467-023>

## Global forest fragmentation change from 2000 to 2020





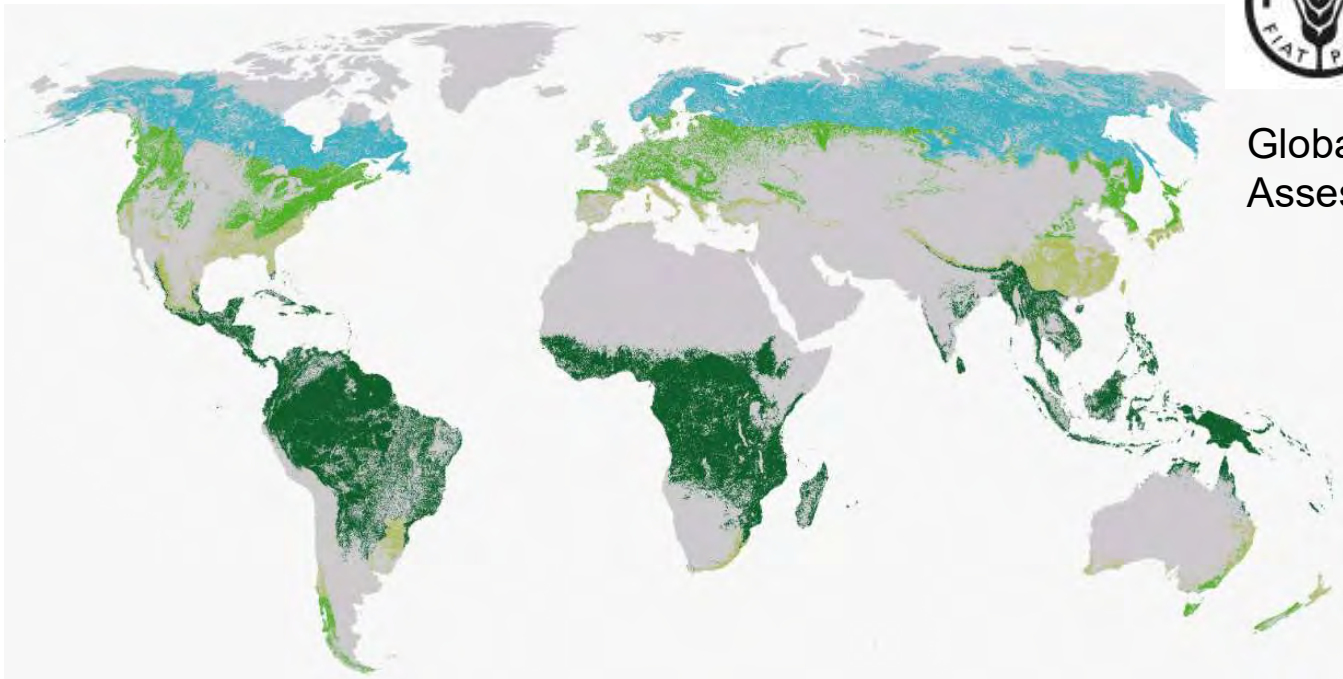
# Misclassification of Grassy Systems

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Widespread misclassification (as forest)

Perpetuated by structural-based definitions of forest

- Tree-based definitions
- FAO definition = 10% canopy cover in 0.5ha
- Remote sensing approaches use tree-cover



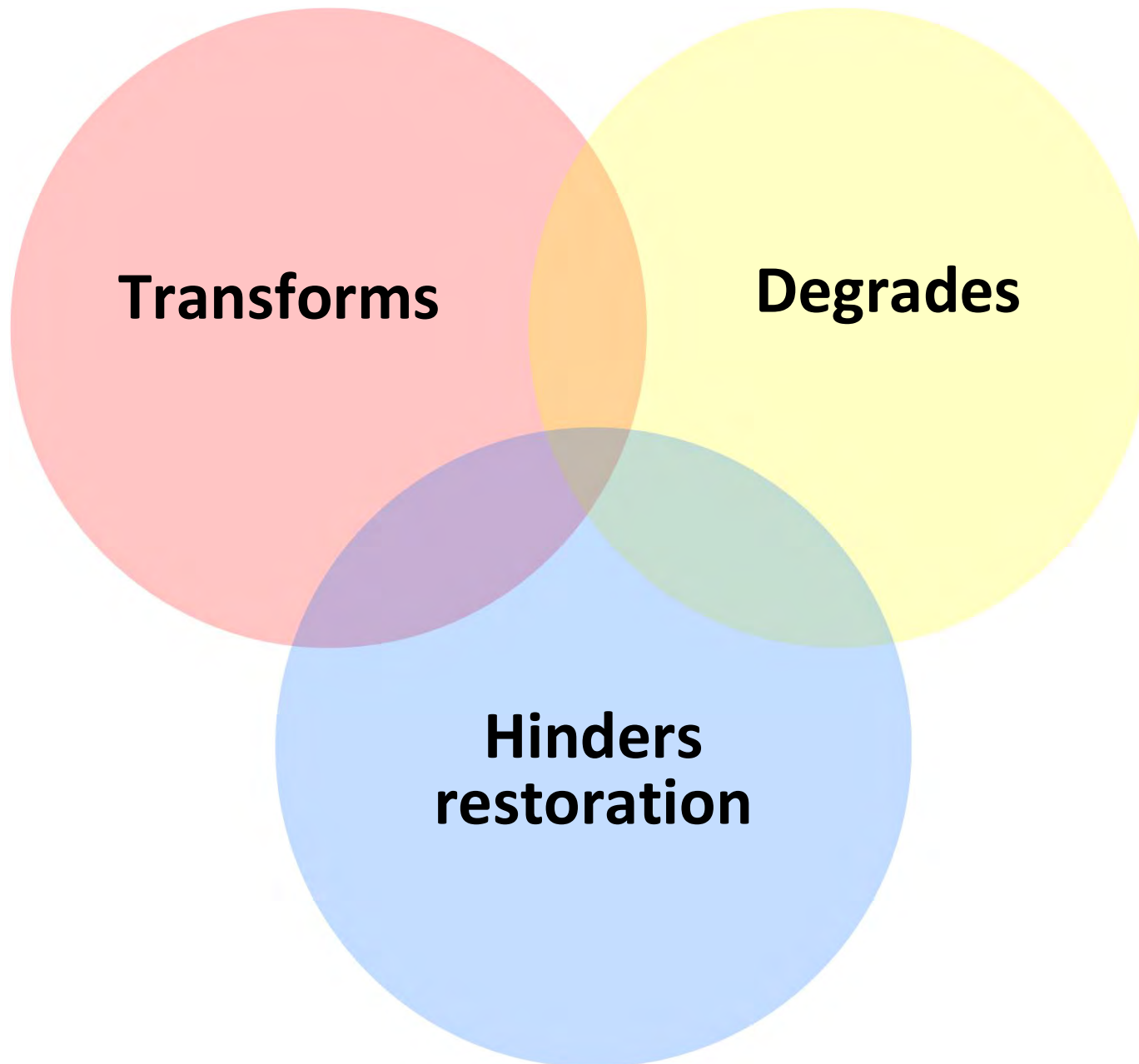
Food and Agriculture Organization  
of the United Nations

Global Forest Resources  
Assessment



# Why is Misclassification a Problem?

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# Why is Misclassification a Problem?

## Transforms

'Empty' landscapes/wastelands narrative

Ripe for transformation

Disposable



DIRECTIONS IN DEVELOPMENT  
Agriculture and Rural Development

### Awakening Africa's Sleeping Giant

*Prospects for Commercial Agriculture in  
the Guinea Savannah Zone and Beyond*



# Why is Misclassification a Problem?

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## Degrades

If misclassified = **mismanagement can result in degradation**

e.g. Fire suppression = increase trees = decrease in grass



Annual fires  
for 50 yrs



Fire exclusion  
for 50 yrs

# Why is Misclassification a Problem?

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## Hinders restoration

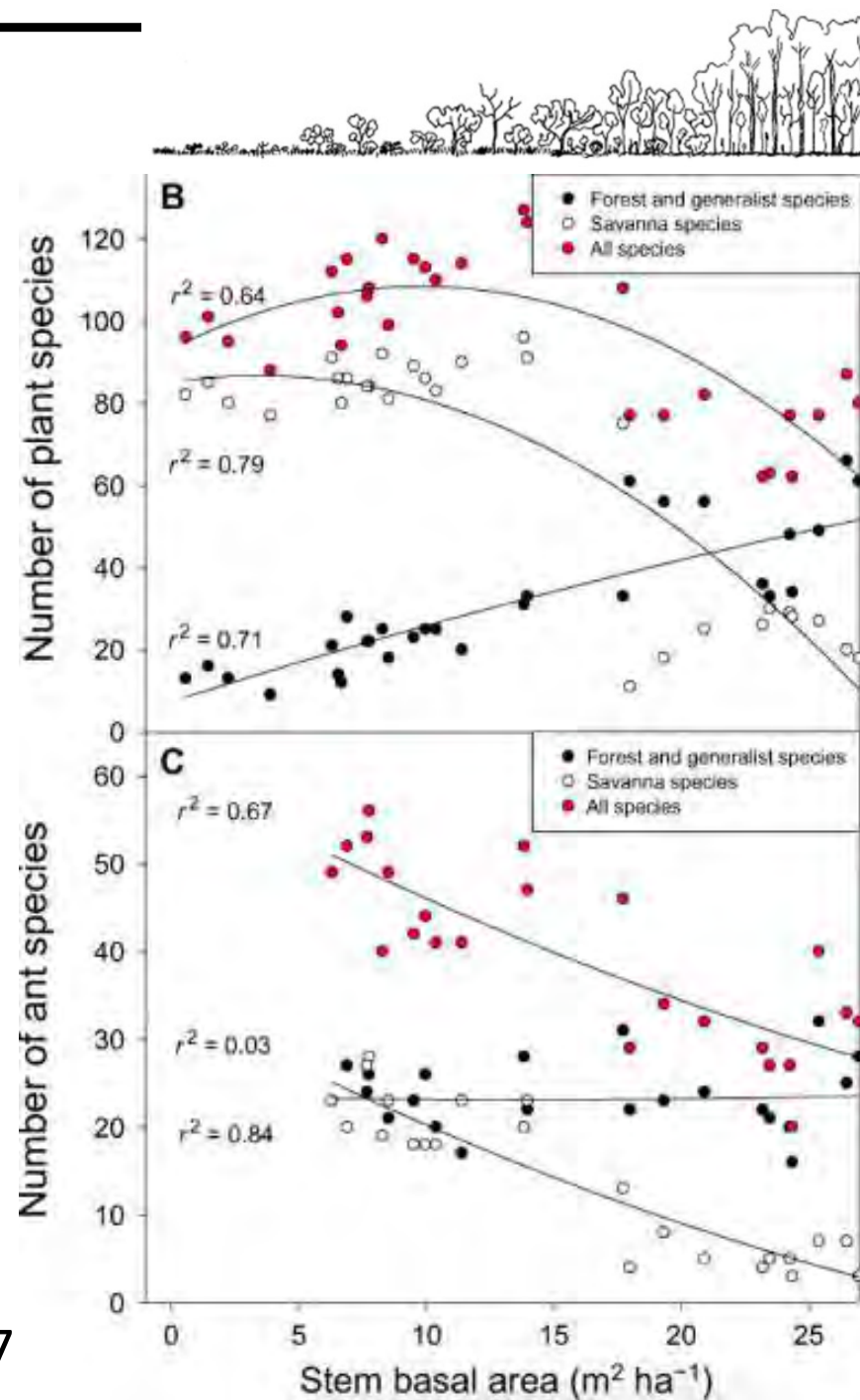
Inappropriate tree-based restoration



# Why is Misclassification a Problem?

Hinders restoration

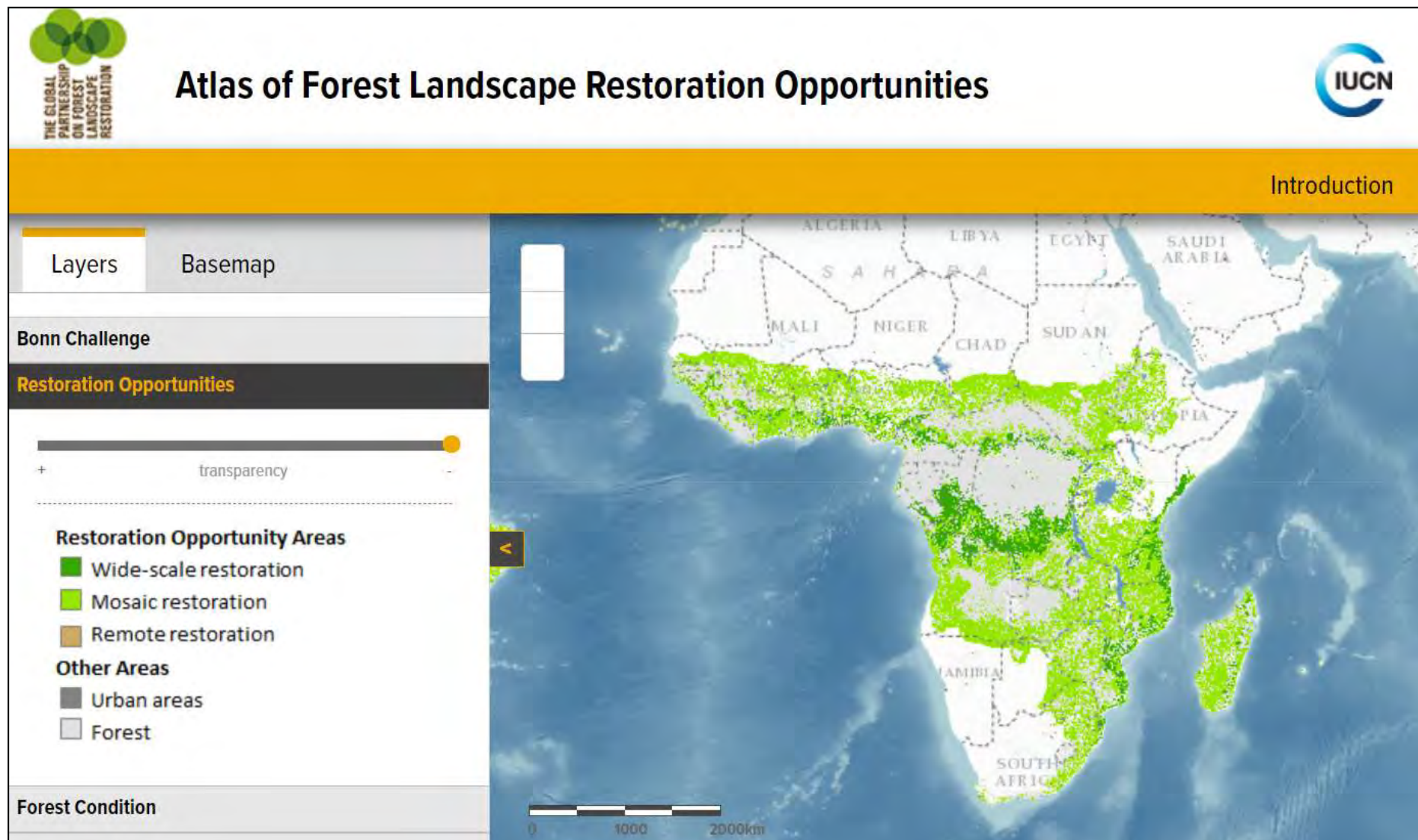
Too many trees degrades open ecosystems!



Abreu et al. 2017

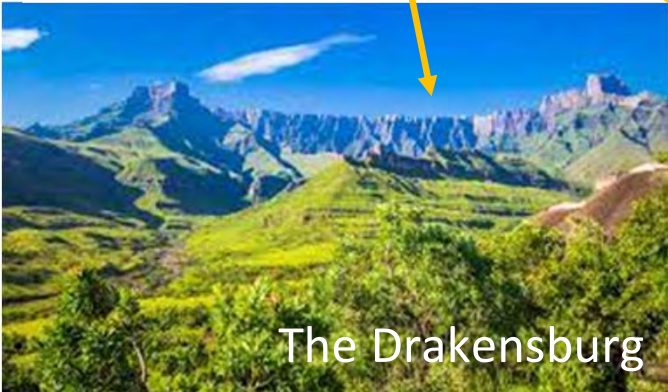
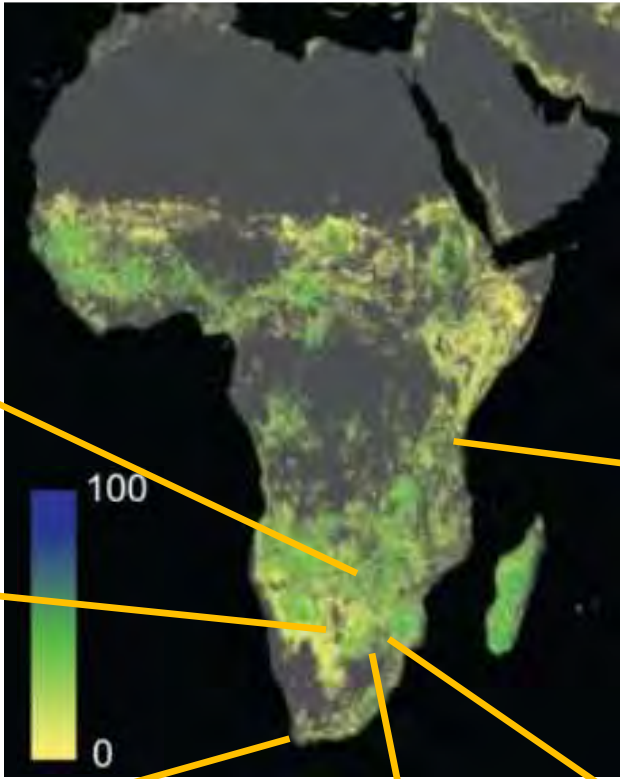
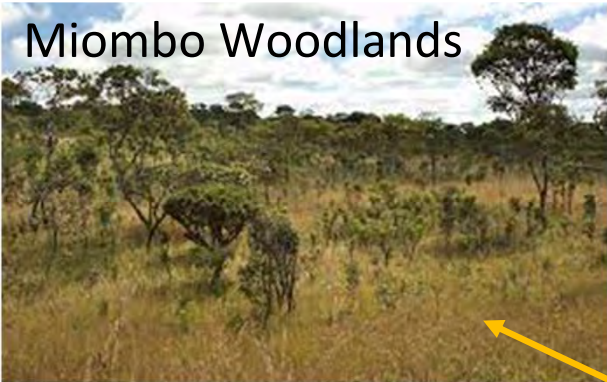
# Inappropriate Restoration

Concerns raised that large proportions of grassy ecosystems are being mistakenly identified as suitable for tree planting



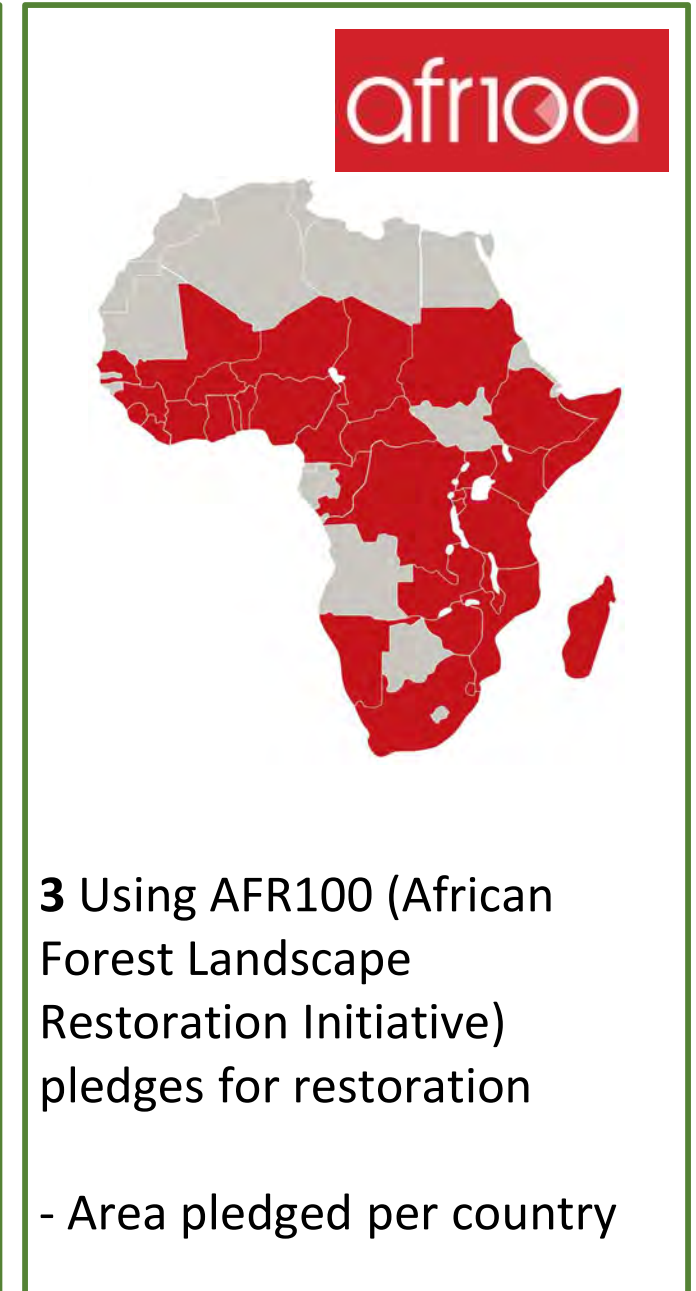
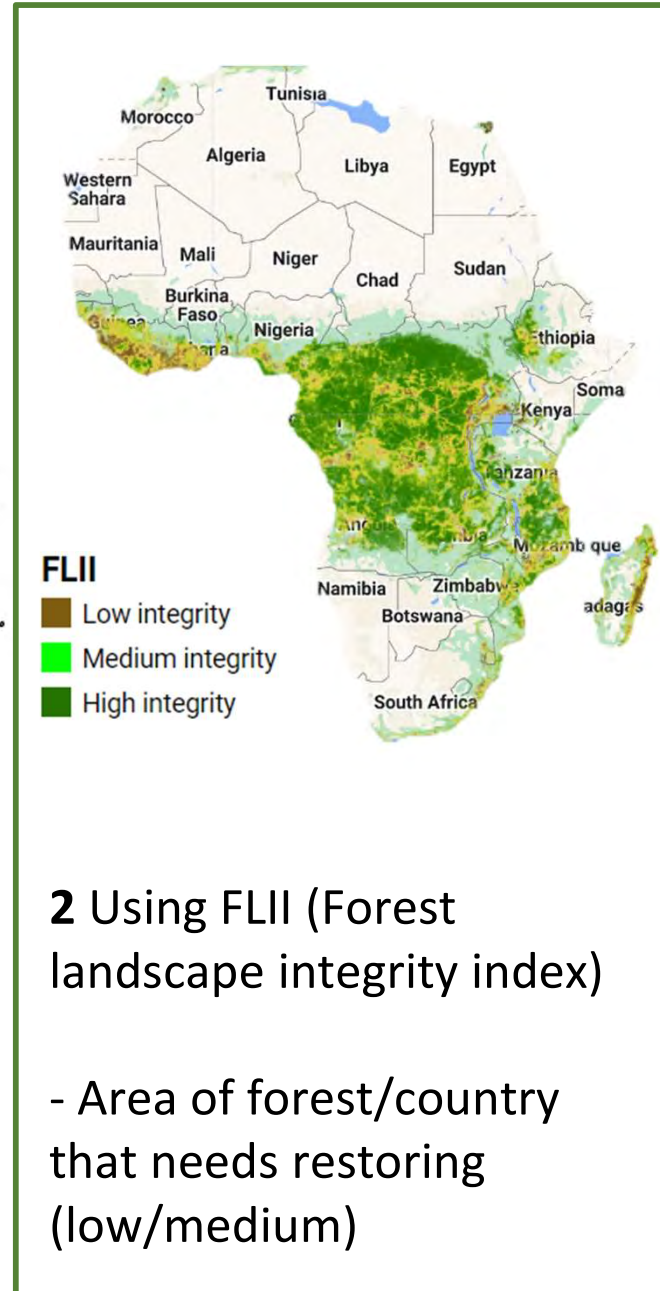
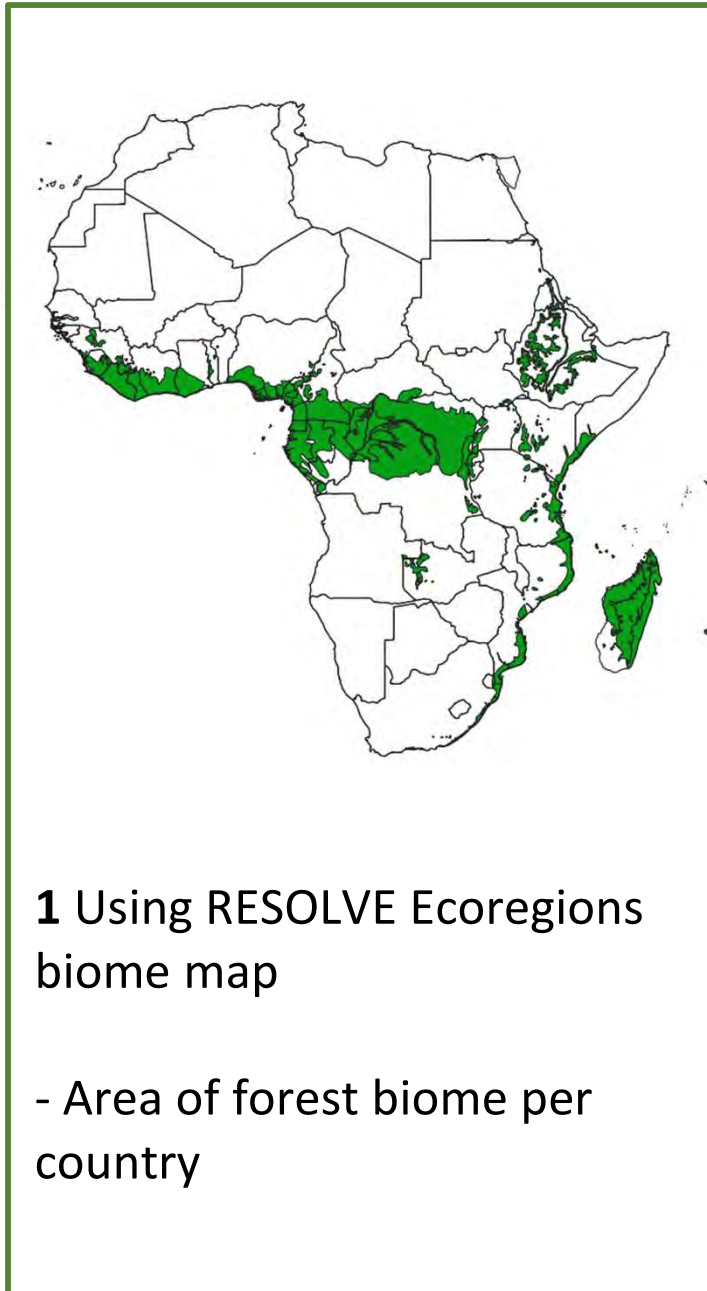
# The Global Tree Restoration Potential (Bastin et al. 2019, *Science*)

## Space to plant 1 trillion trees

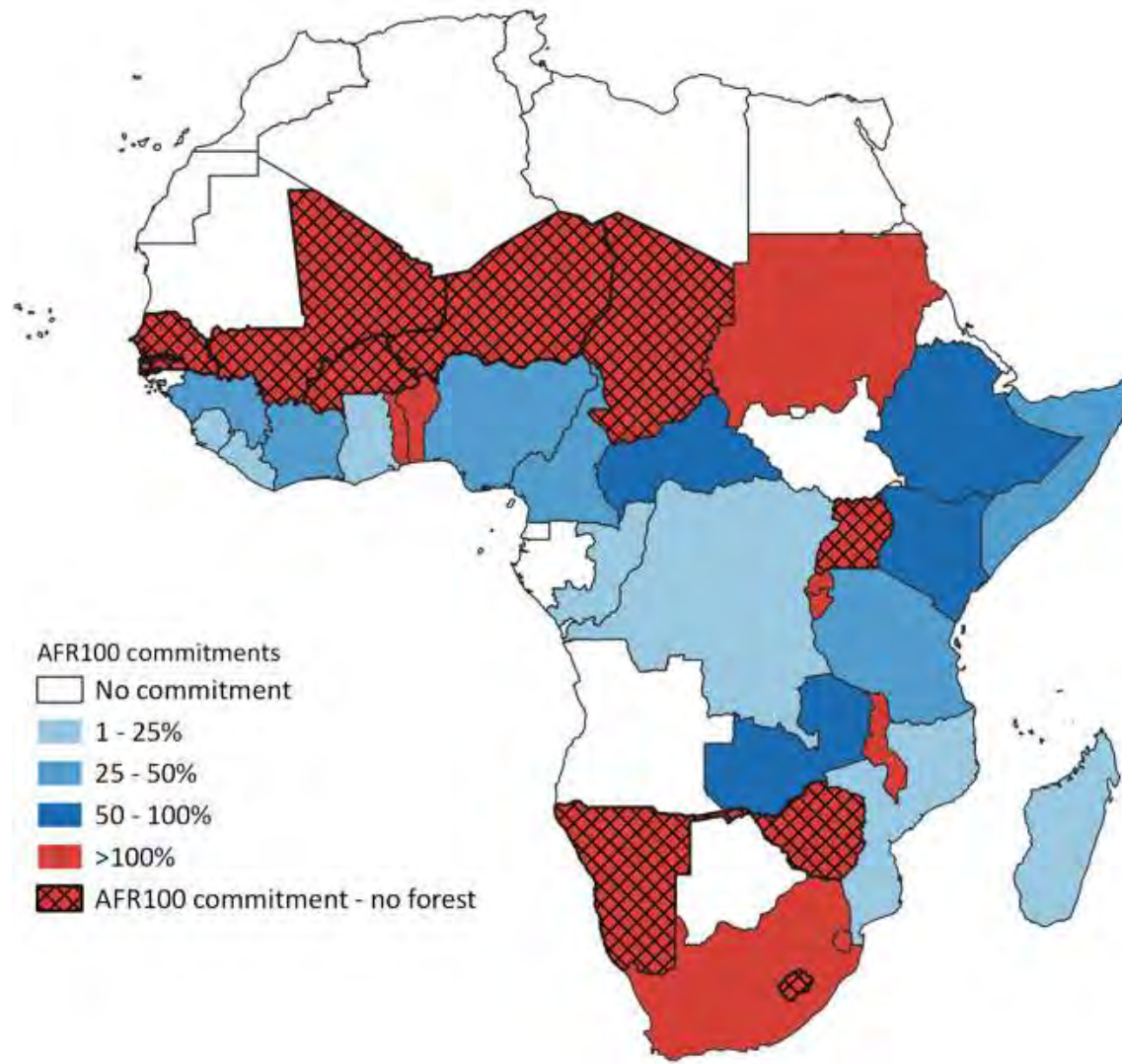




# The magnitude of tree-based 'restoration' pledged in Africa



# Restoration pledges as percentage of forest area



Many countries committed greater area for restoration than the forested area available

More than half of area for restoration is non-forest

Area the size of France!



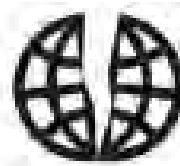
UNITED NATIONS DECADE ON  
**ECOSYSTEM  
RESTORATION**  
2021-2030

*“the process of halting and reversing degradation, resulting in **improved ecosystem services and recovered biodiversity**”* FAO, IUCN CEM & SER (2021)

## TEN PRINCIPLES THAT UNDERPIN ECOSYSTEM RESTORATION



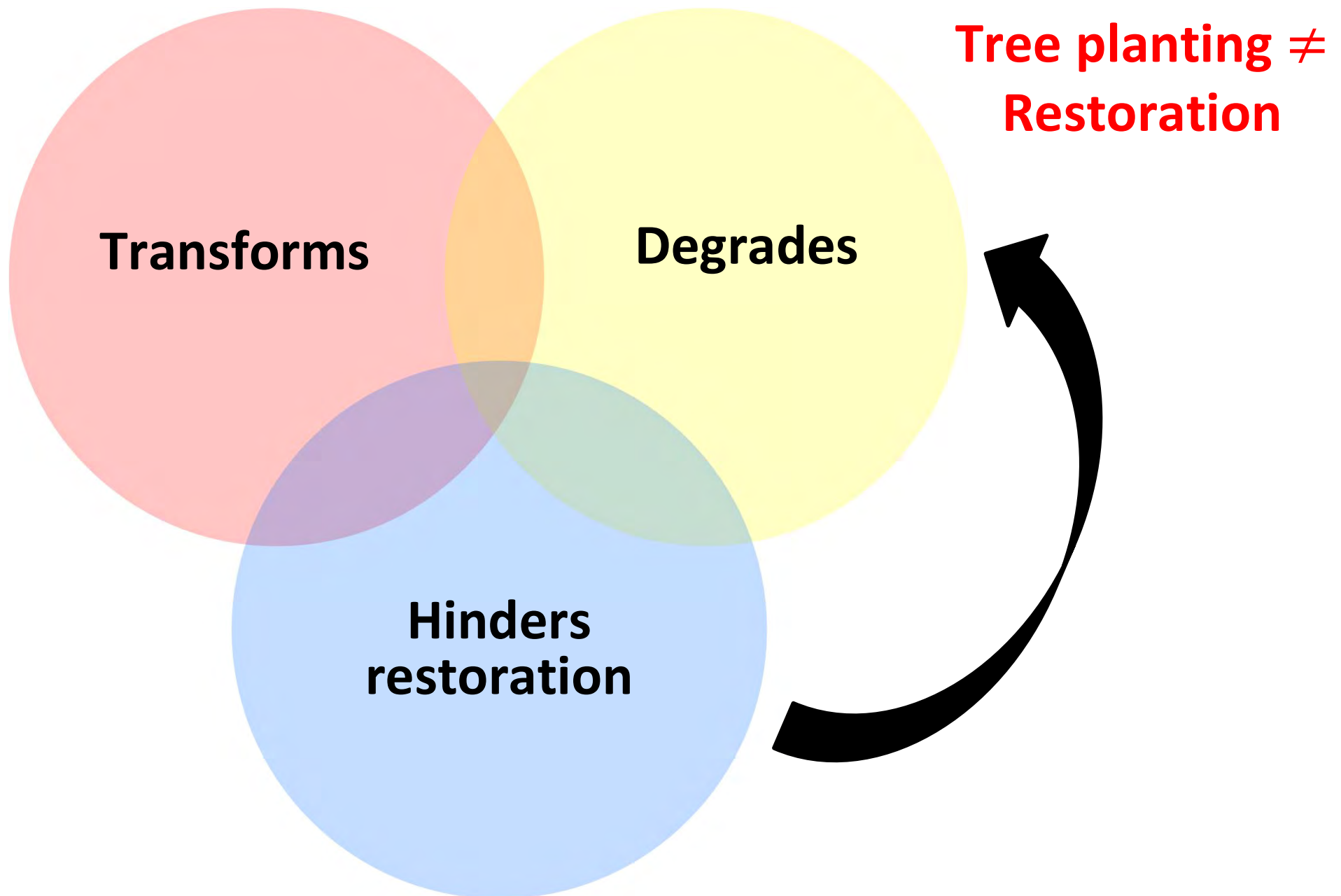
**BENEFITS TO  
NATURE AND PEOPLE**



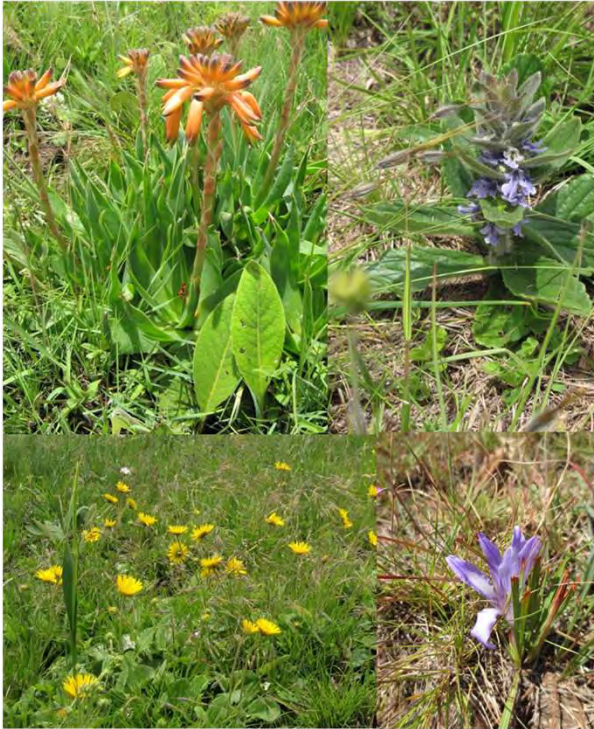
**ADDRESSES CAUSES  
OF DEGRADATION**

# Why is Misclassification a Problem?

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# Consequences: Biodiversity



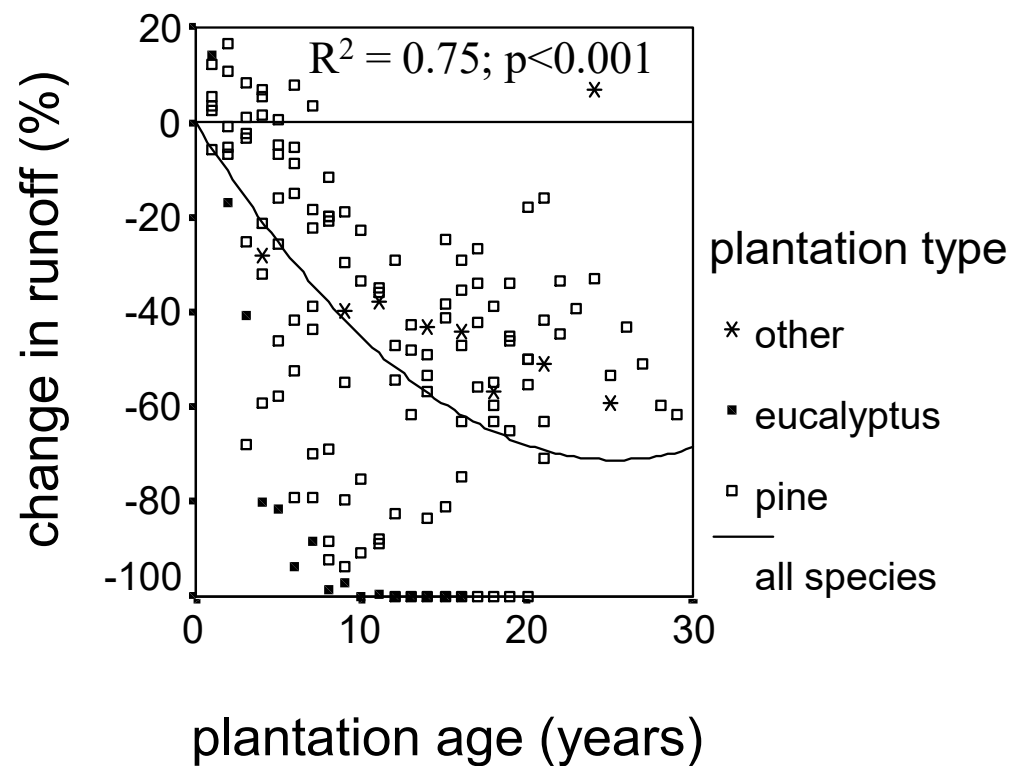
Buisson et al. 2020



# Consequences: Water

Decreased ground water supplies

Base flow reduced by up to 50%



# Consequences: **Human Livelihoods**

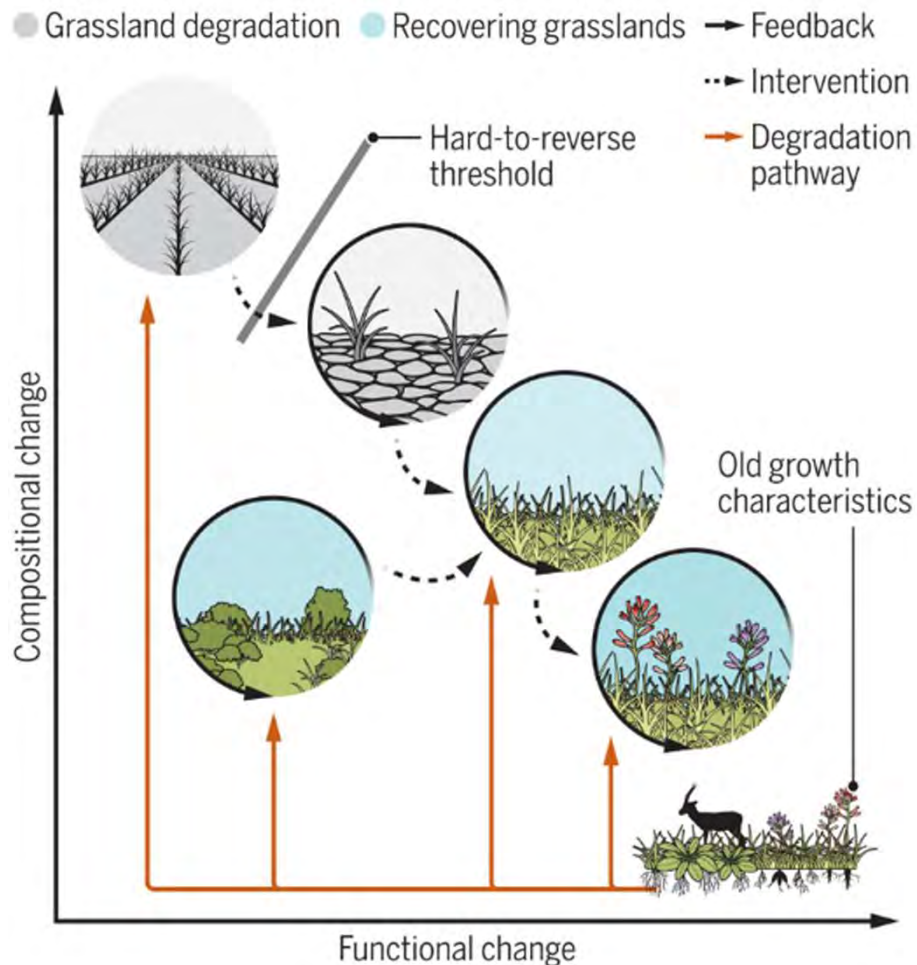
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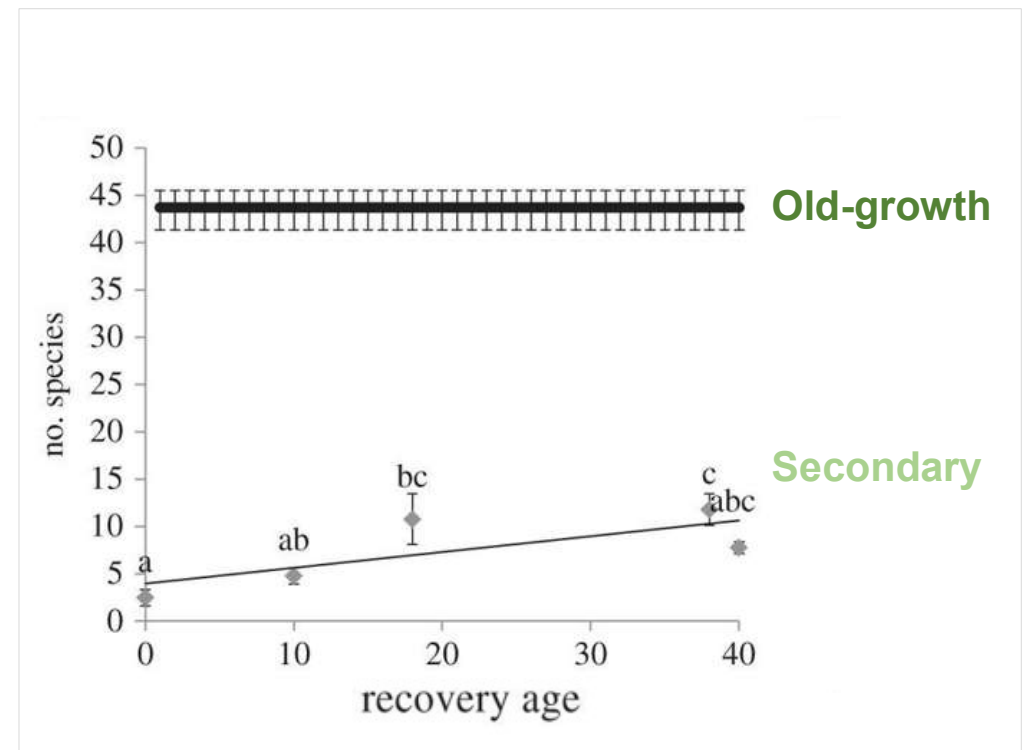
# Restoration is Very Difficult

Misclassification as forest fundamentally (and sometimes can permanently) alters TGBs

## A Trajectory of recovery in restored grasslands



Buisson et al. 2022



Zaloumis & Bond 2016



# Recognising TGBs for what they are matters!

- Revisit how forest is defined
- Fundamental flaws if rely on tree cover (e.g. FAO)
- IUCN Typology (functioning is considered)
- Map grassy ecosystems – hotspots, areas of contention, threats

**Thank you**

**Merci**

