

Change in Madagascar's grassy ecosystems: Implications for biodiversity and carbon storage

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Royal
Botanic Garden
Edinburgh



Biodiverse
Landscapes
Fund

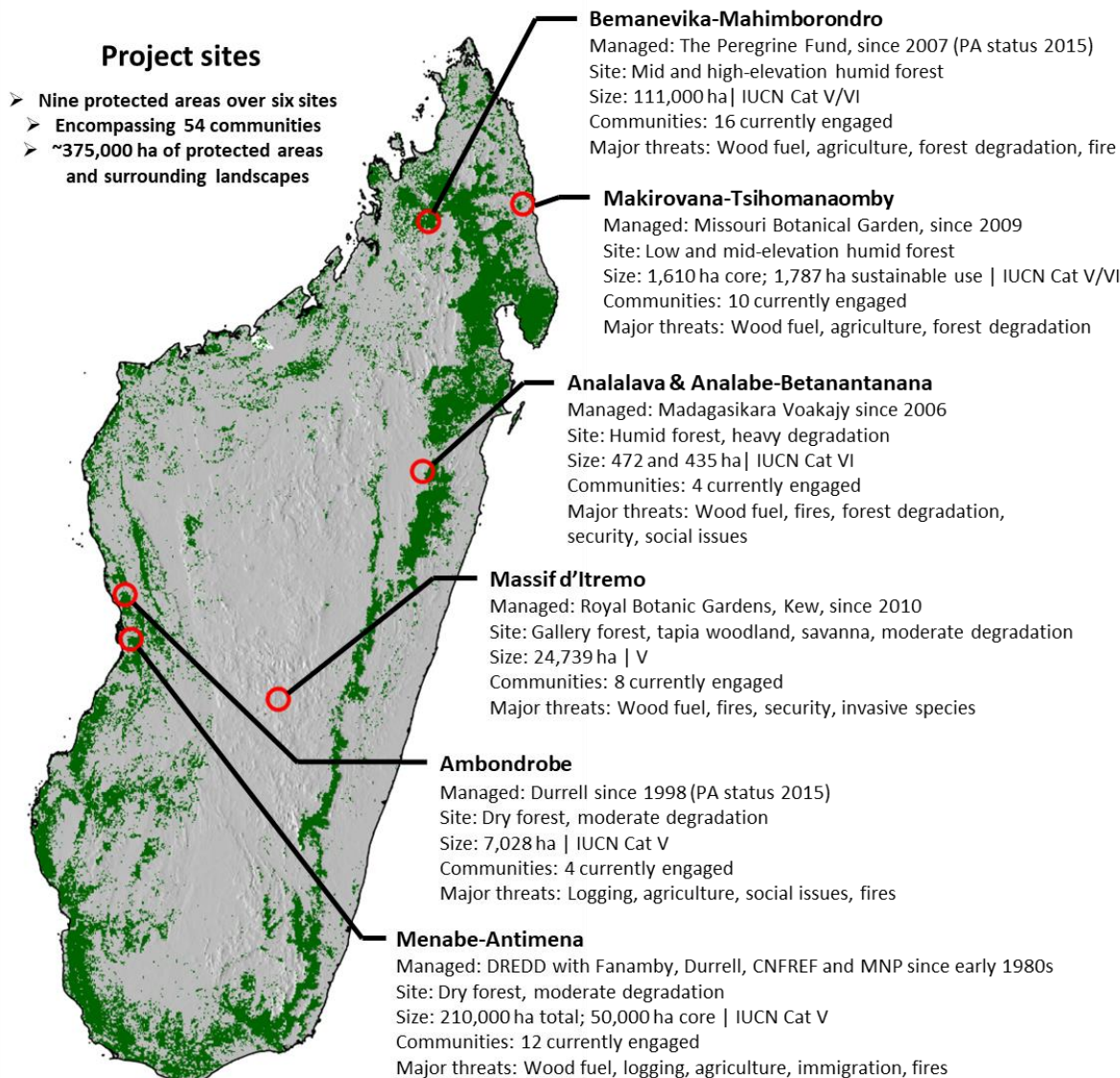


UK International
Development
Partnership | Progress | Prosperity





Study area



PA-based partners

- Missouri Botanical Garden
- The Peregrine Fund
- Madagascar Voakajy
- Durrell Wildlife Conservation Trust
- RBG Kew

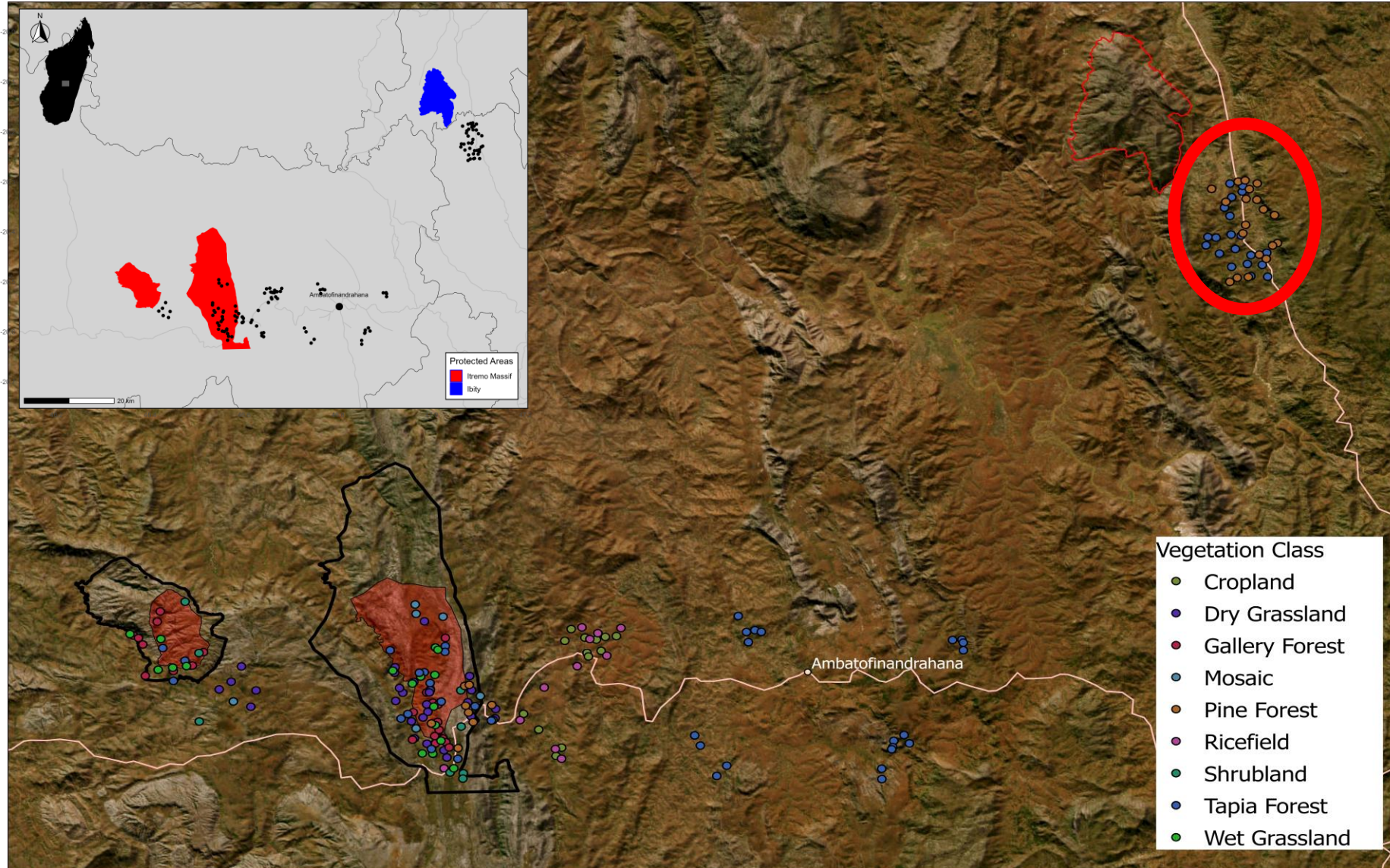
Two overarching partners

- CARE International (Community development)
- LTS-NIRAS (Internal monitoring, evaluation and learning)

Study area



FITANTANANA MAHARITRA
HOLOVAIN-JAFY



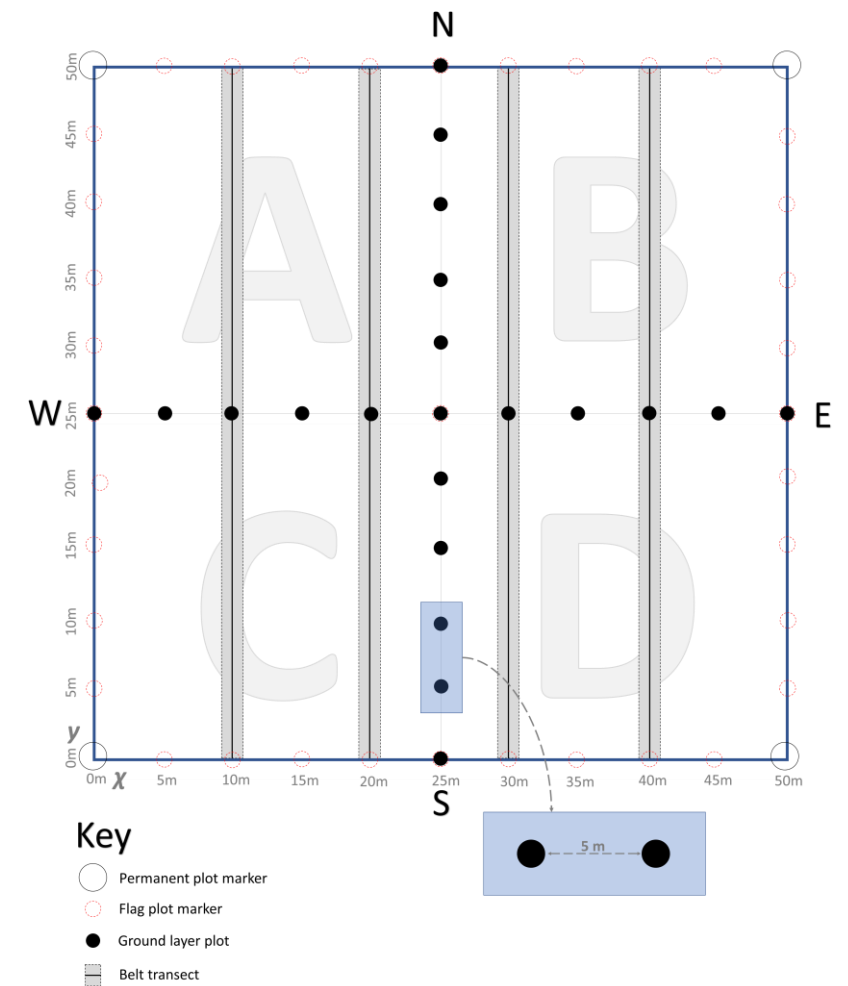




Tapia (*Uapaca bojeri*)



Our approach



Aims & Objectives

To assess pine invasion in the Central Highlands of Madagascar and its impact on biodiversity and carbon storage.



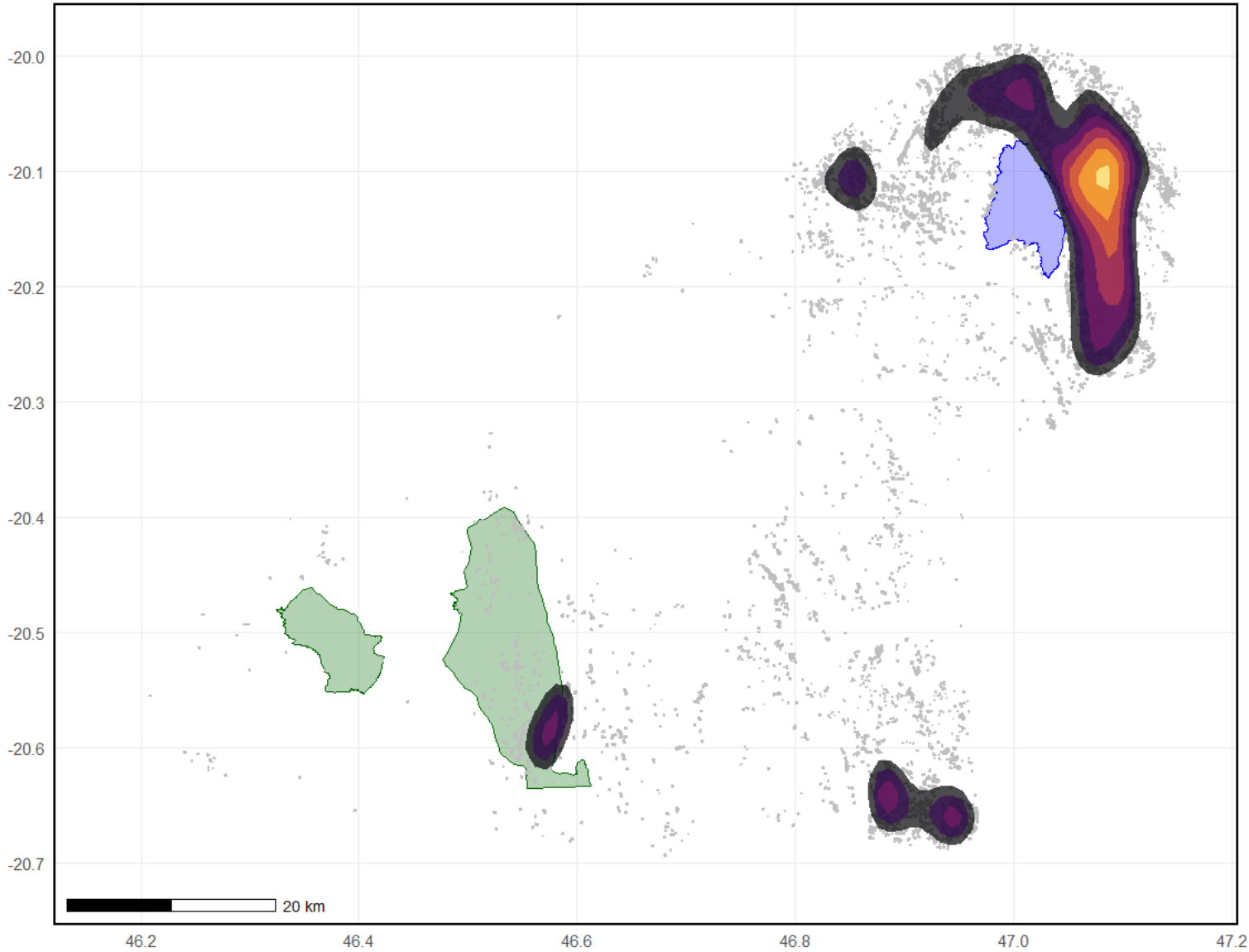
Map invasion: Identify the spatial distribution of pine invasion in the region.

Biodiversity impact: Evaluate changes in species diversity and ecosystem composition due to pine encroachment.

Carbon storage: Quantify differences in above-ground and below-ground carbon storage between invaded and native tapia ecosystems.



Obj. 1: Map invasion

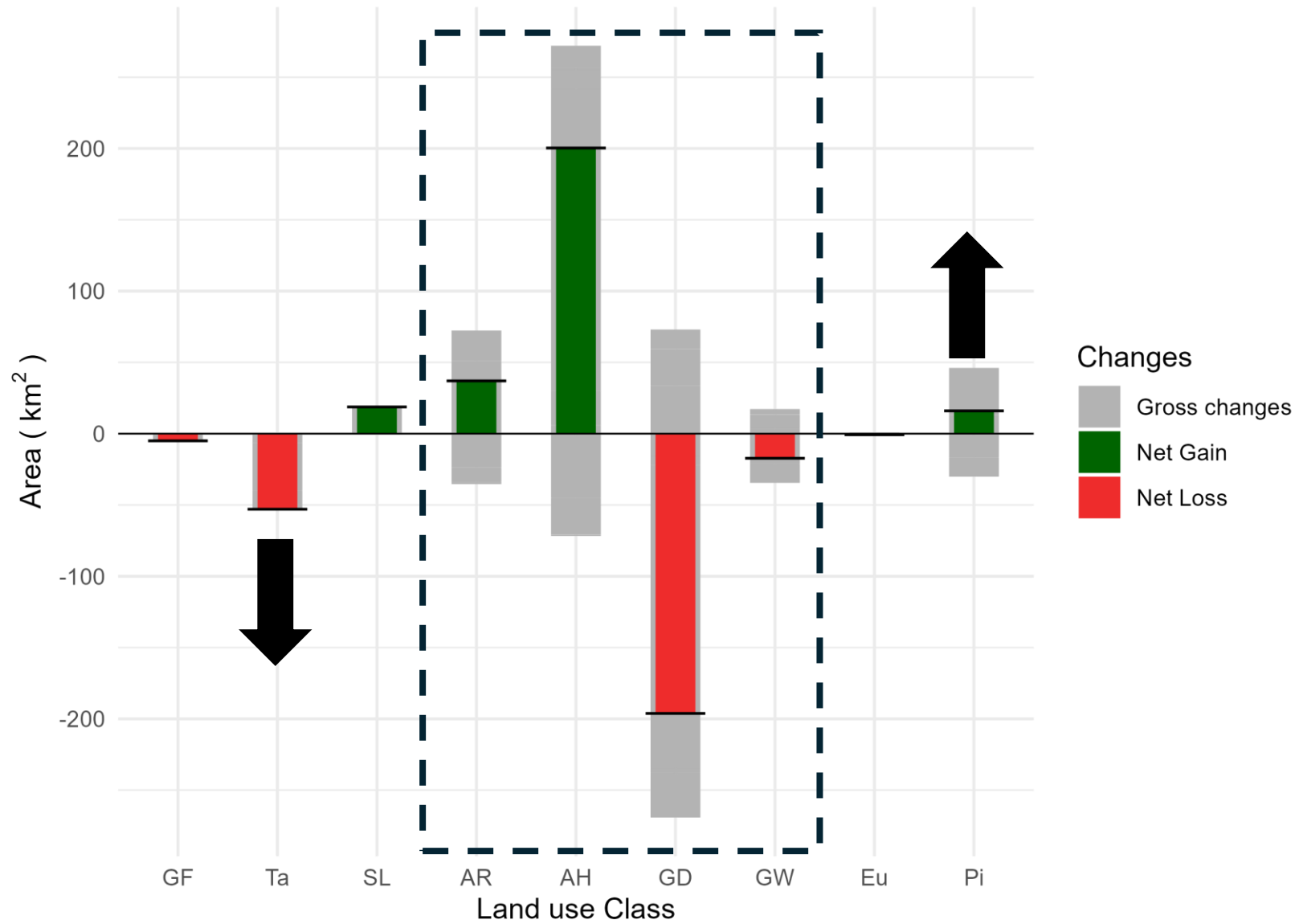


2014

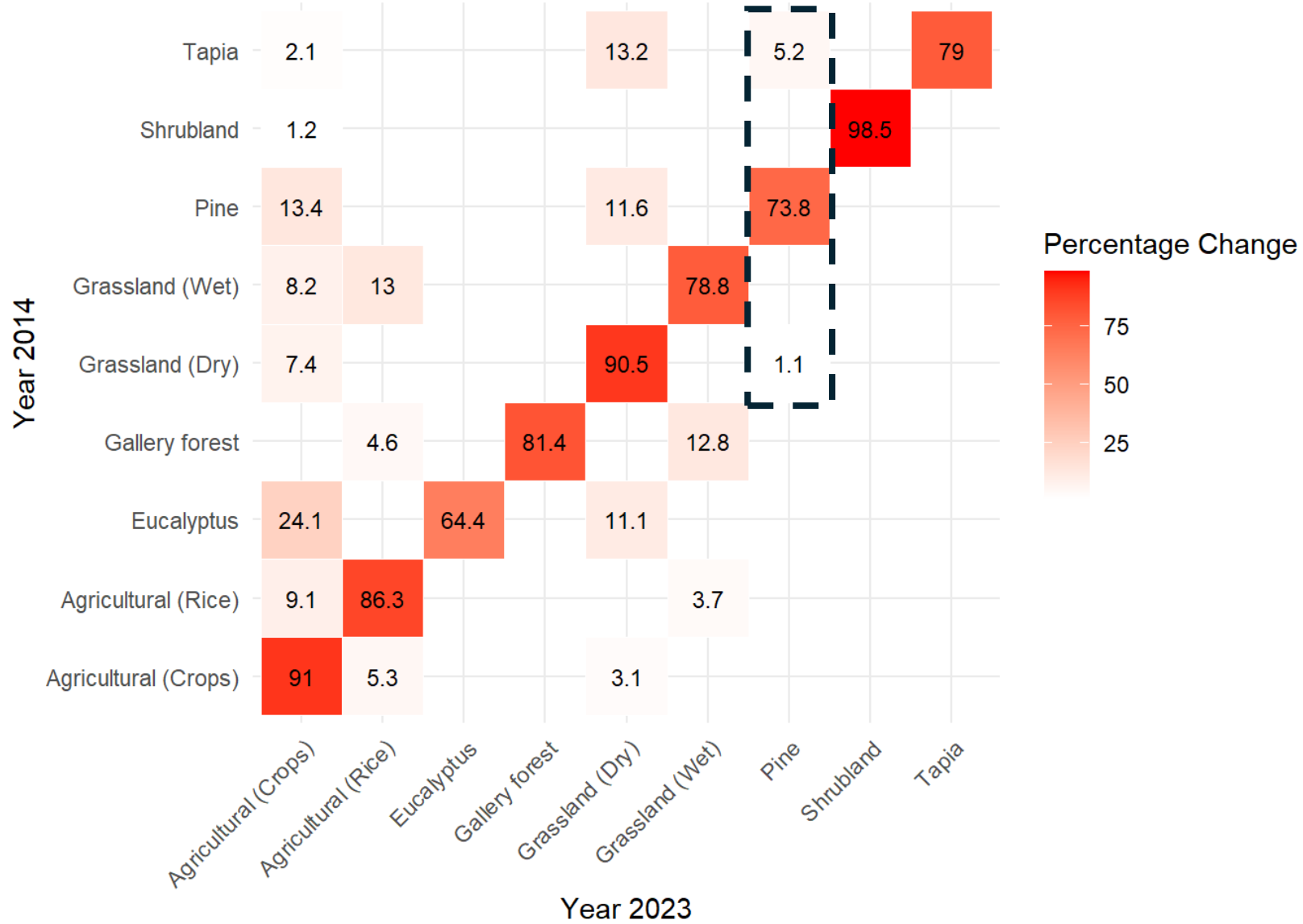


2023

Obj. 1: Map invasion



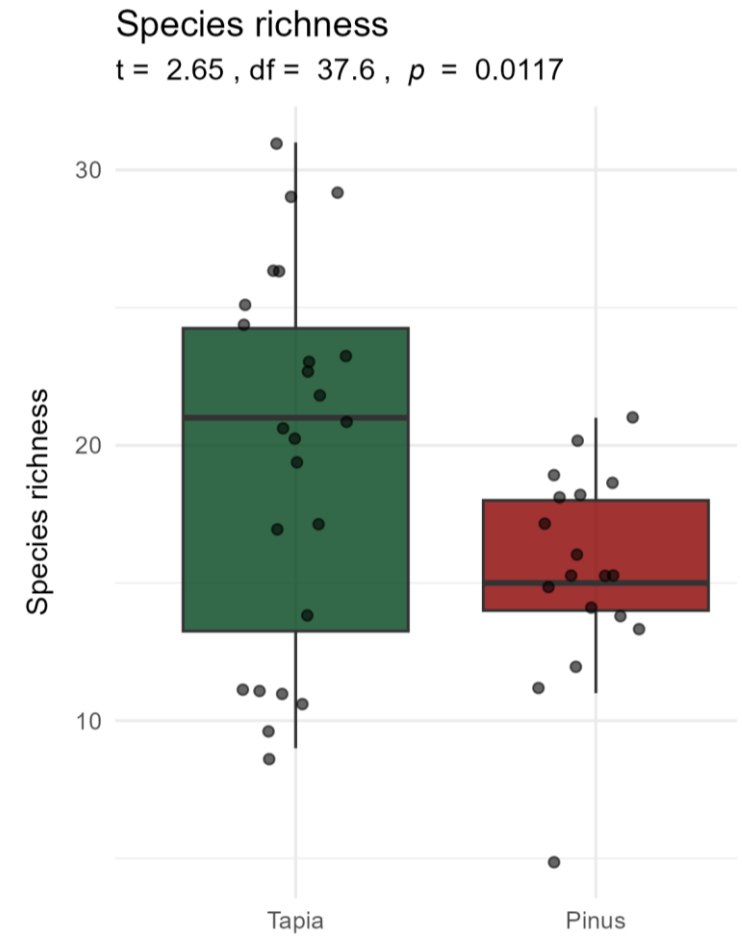
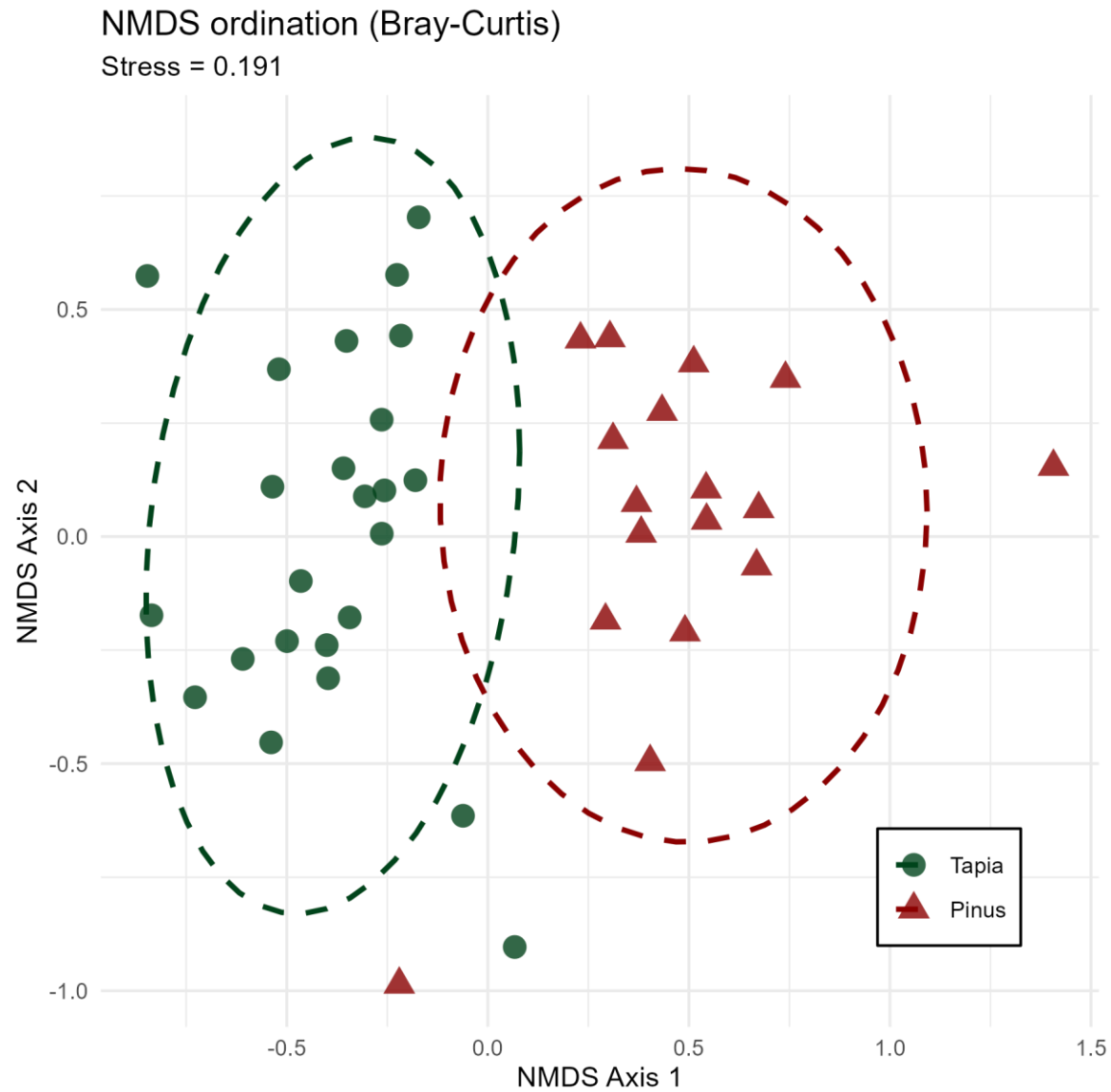
Obj. 1: Map invasion





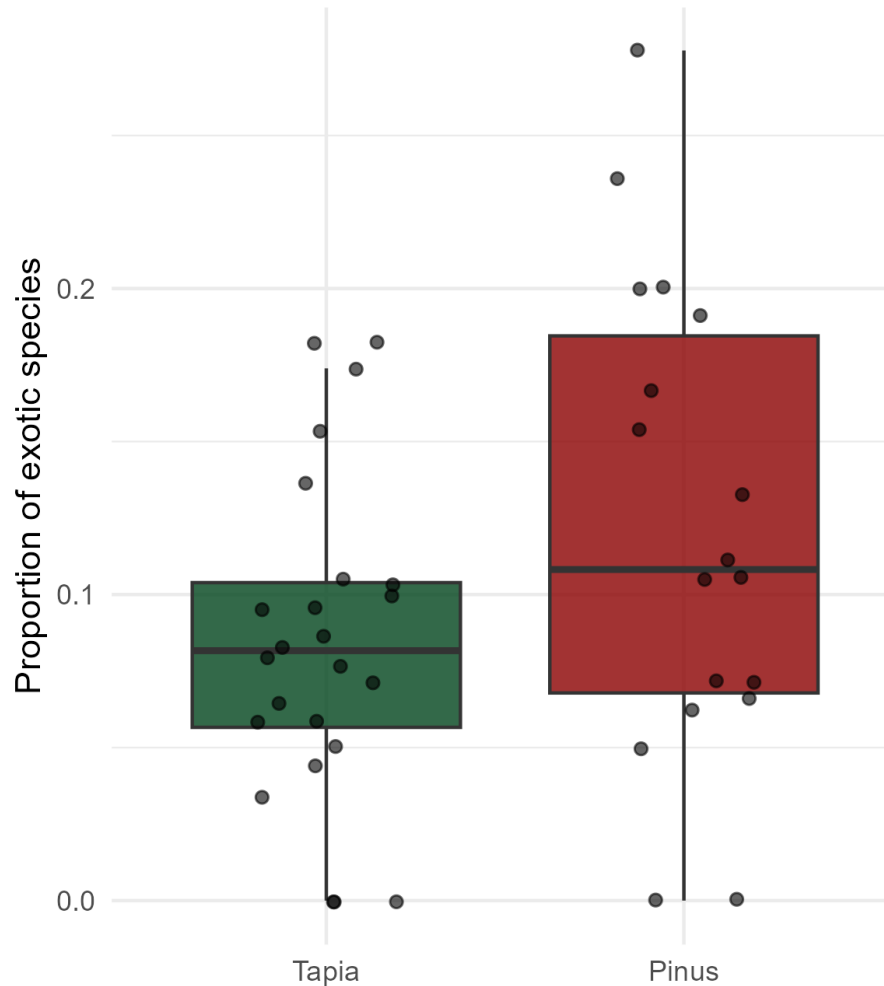


Obj. 2: Biodiversity impact

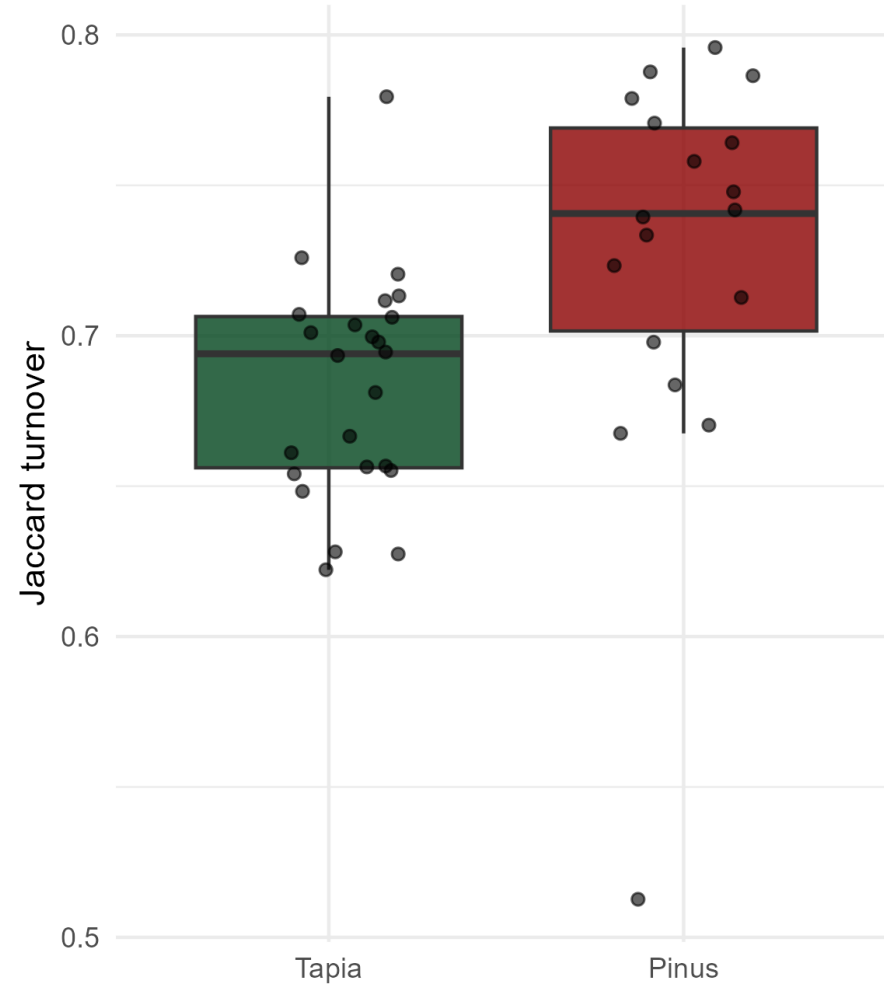


Obj. 2: Biodiversity impact

Proportion of exotic species
 $t = -1.75$, $df = 28.2$, $p = 0.091$



Beta turnover between Tapia and Pine
 $t = -2.43$, $df = 24.8$, $p = 0.0224$

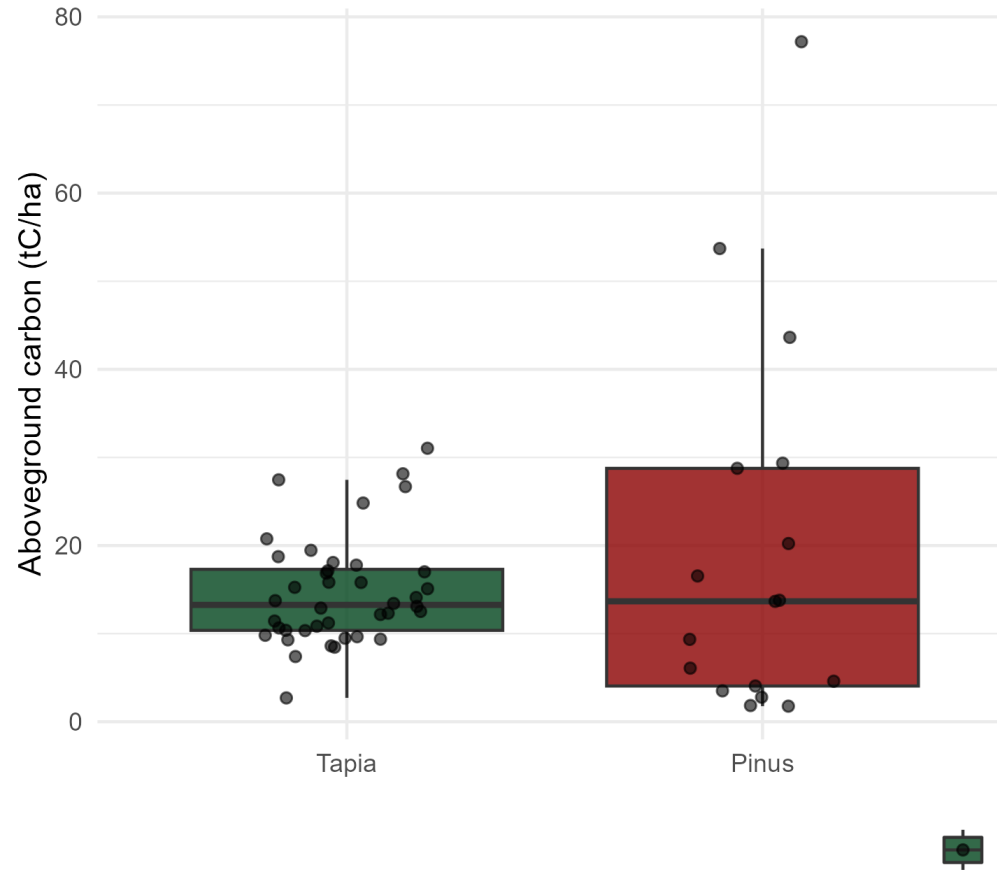


Obj. 3: Carbon storage



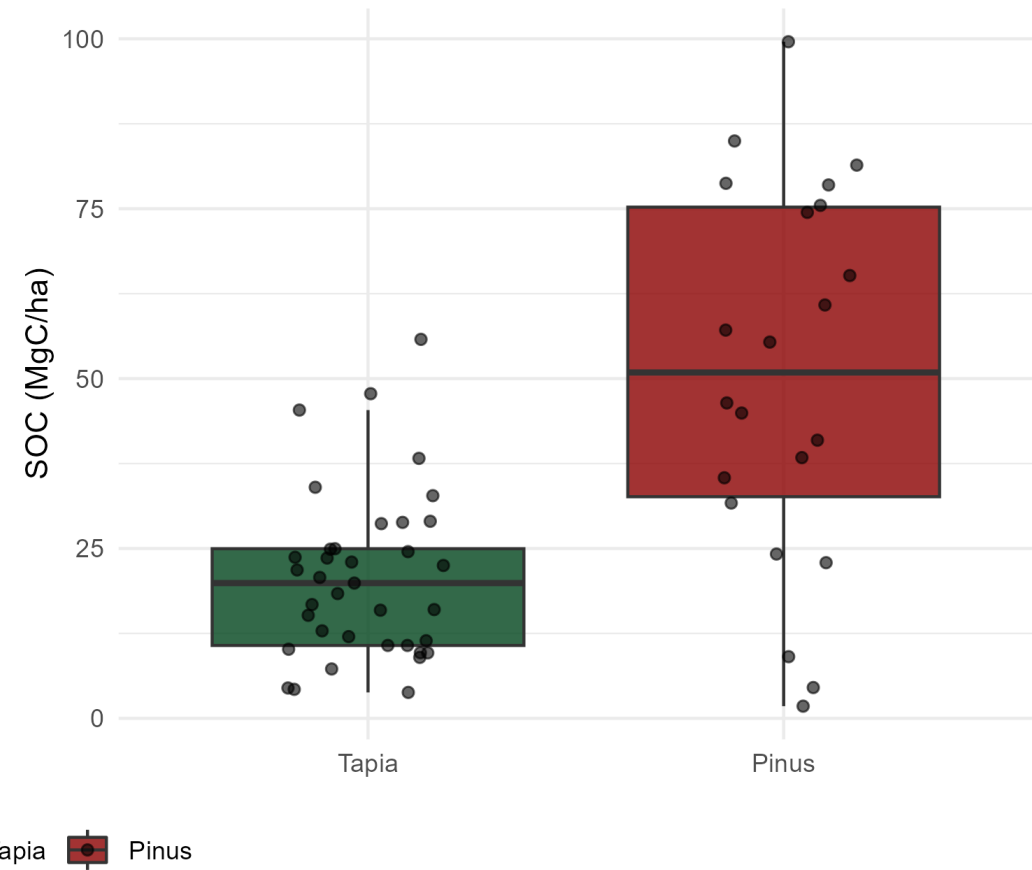
Aboveground Carbon stock

$t = -0.9$, $df = 17.2$, $p = 0.382$



Soil Organic Carbon stock (0-30 cm)

$t = -4.75$, $df = 26$, $p = <0.001$



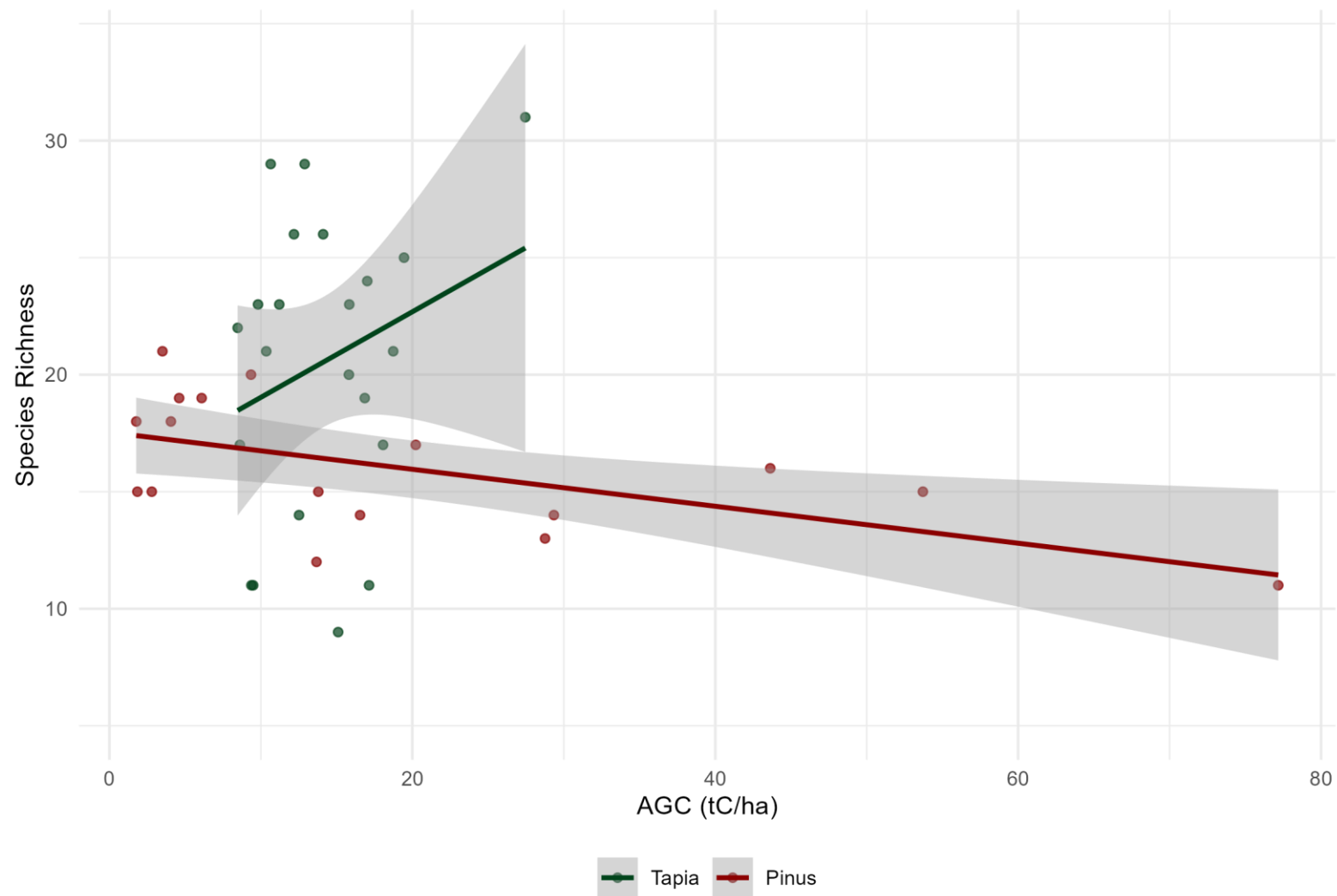




Obj. 3: Carbon storage



Interaction of AGC and Site Type on Species Richness
p-value Tapia: 0.0338 , p-value Pinus: 0.592



Findings & Next steps



To assess pine invasion in the Central Highlands of Madagascar and its impact on biodiversity and carbon storage.

Pine has expanded by 16.0 km² (13.8%) over the last nine years. With much expansion occurring in dry grasslands and tapia forests.

Pine negatively impacts ant diversity, leading to turnover in community structure and is associated with increased presence of non-native ant species.

No difference in AGC, however, higher SOC associated with areas invaded by Pine.

1. Incorporate ground layer vegetation/biomass and stand age structure into the analyses.
2. Account for turn-over of pine forests in AGC storage calculations.
3. Model pine spread based on BAU scenarios, to assess landscape level effects.

