

Structure, composition and response of mature stands to disturbance agents in the Sierra de Lousã, Portugal.

R. Salas, B. Fidalgo

*Instituto Politécnico de Coimbra, Escola Superior Agrária, 3040-316, Bencanta, Coimbra,
Portugal. Tel.: 00 351 239802940; Fax: 00 351 239802289, rsalas@esac.pt; bfidalgo@esac.*

Introduction

- *Disturbance is a central driver of forest successional and structural dynamics*
- *Variation in disturbance type, extent, and frequency influences temporal and spatial patterns of forest composition and structure*
- *Gap-scale disturbance created by pest and wind storms need to be followed to understand the pos-disturbance successional dynamics*
- *Climate change is predicted to increase the frequency and severity of large –scale disturbances*
- *Post-disturbance management strategies must therefore adaptatively change to account for increased natural disturbances and promote resilience*

Introduction

- *Compound disturbance stand-replacing events followed by salvage logging could inhibit forest recovery by permanently altering species composition, forest structure, recovery capacity and ecological resilience*
- *Since 2011 PNW affected maritime pine stands at Serra da Lousã mountains, imposing to carry out sanitary cuts on mature stands*
- *More recently, 2013 and 2018, two strong wind storms blow these forest producing significant damage*

Objectives

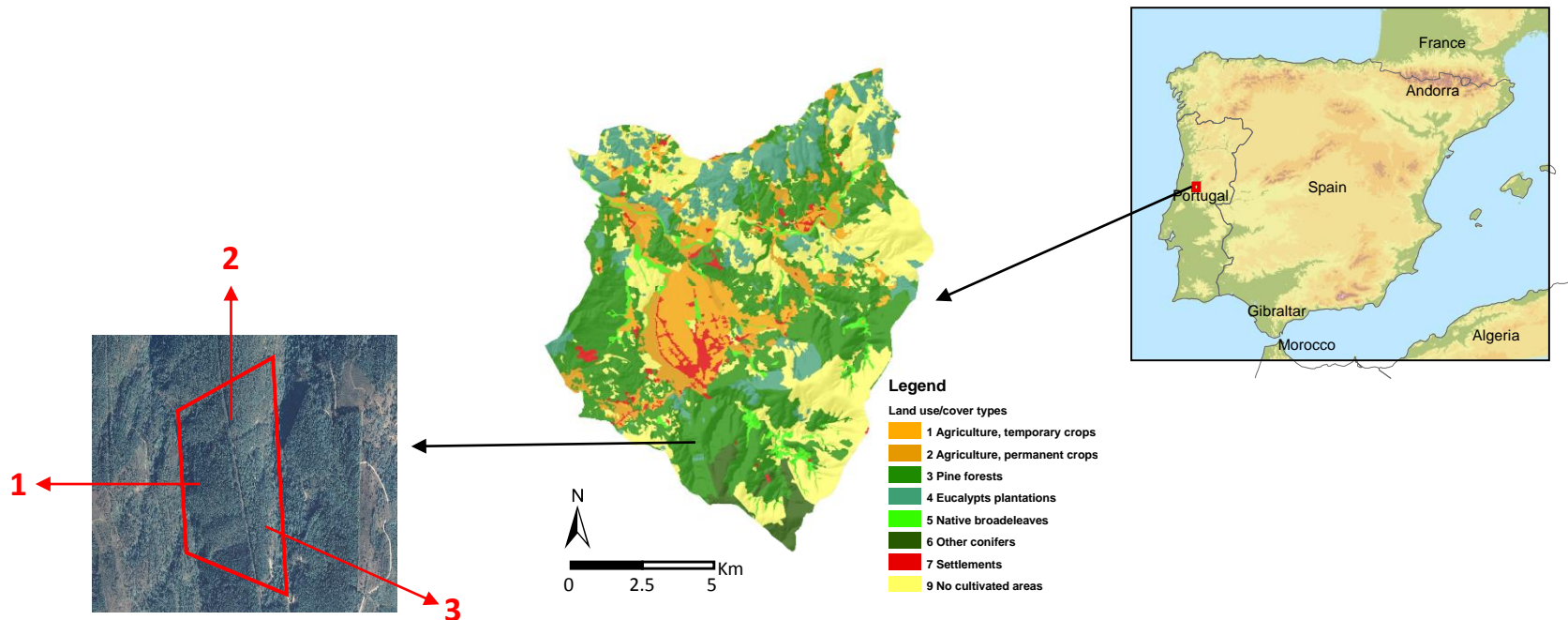
Comparing three different locations with maritime pine stands, we asked the following questions:

- *The structure of the remnant and prior stands differed?*
- *Volume of dead trees differed among stands?*
- *Tree regeneration, abundance and composition differed?*
- *Diversity of understory (composition and structure) differed?*

Material and Methods

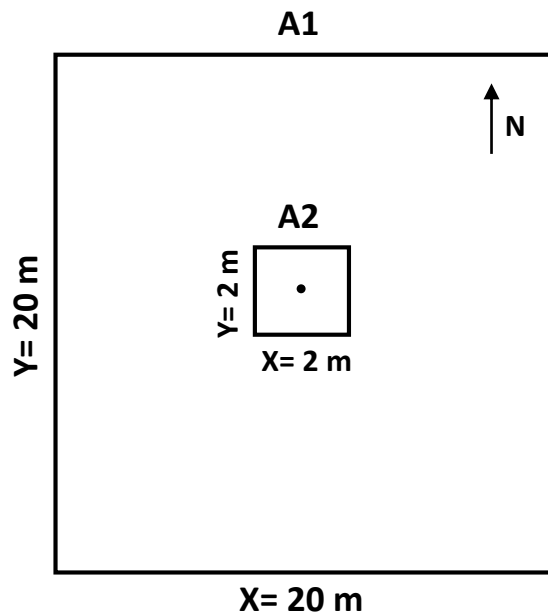
Study area

- *Lousã: Council in Central Portugal, 138 Km², forest main cover area, 90% private property.*



Material and Methods

Data collection



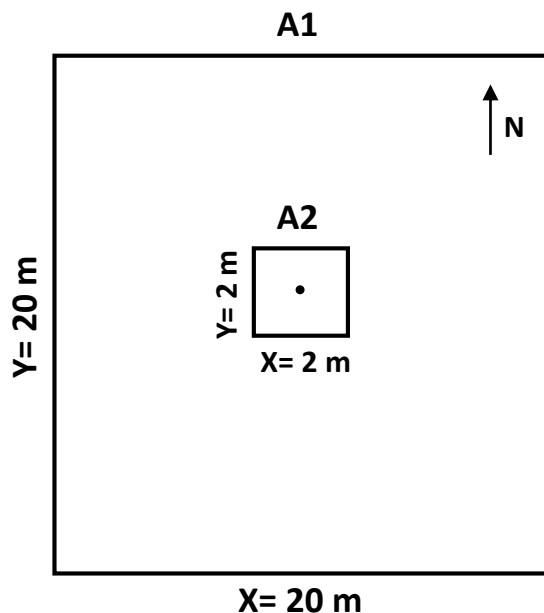
- *Systematic sampling, 30 plots*
- *Data collected in 2012 and 2017*

Plot A1:

- *All standing live and dead trees were measured (X, Y, dbh > 5cm, and height)*
- *Diameter at the base were measured in ½ trees*

Material and Methods

Data collection



- *Diameter of the recent stump was measured*
- *Crown diameter was measured in living trees*

Plot A2:

- *Tree regeneration < 5 cm and understory cover by species were recorded*

Material and Methods

Data handling and processing

- *Structure: Stand density, basal area and volume of living and dead trees were assessed with analysis of variance*
- *Composition: Tree regeneration, richness and biodiversity were also evaluated with analysis of variance*
- *Variables, if it was necessary, were transformed to ensure the assumptions of normality-distributed residuals and equal variance (Levene's test)*

Results

Structural conditions of the stands

- *Structure: were found statistical difference in stand density, basal area and volume of living and dead trees by area*

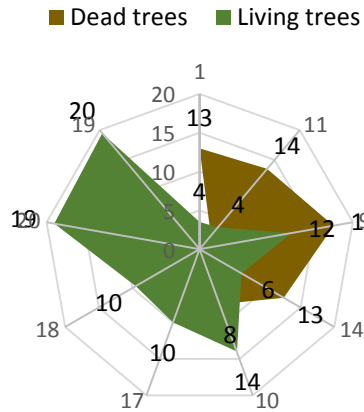


Results

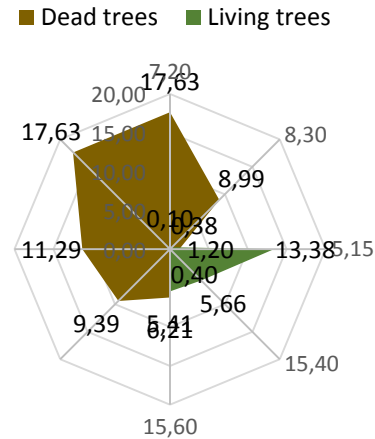
Structural conditions of the stands

- Change in the structure of the stand and biophysical conditions of the stands (aspect, slope and wind exposure)

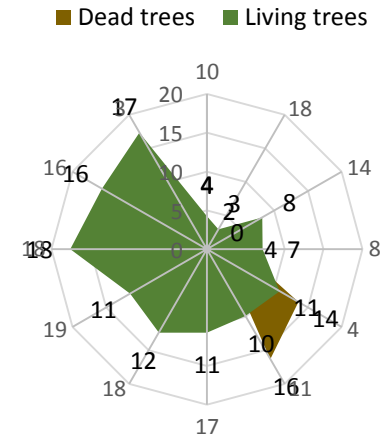
Crown cover - Area 1



Crown cover - Area 2



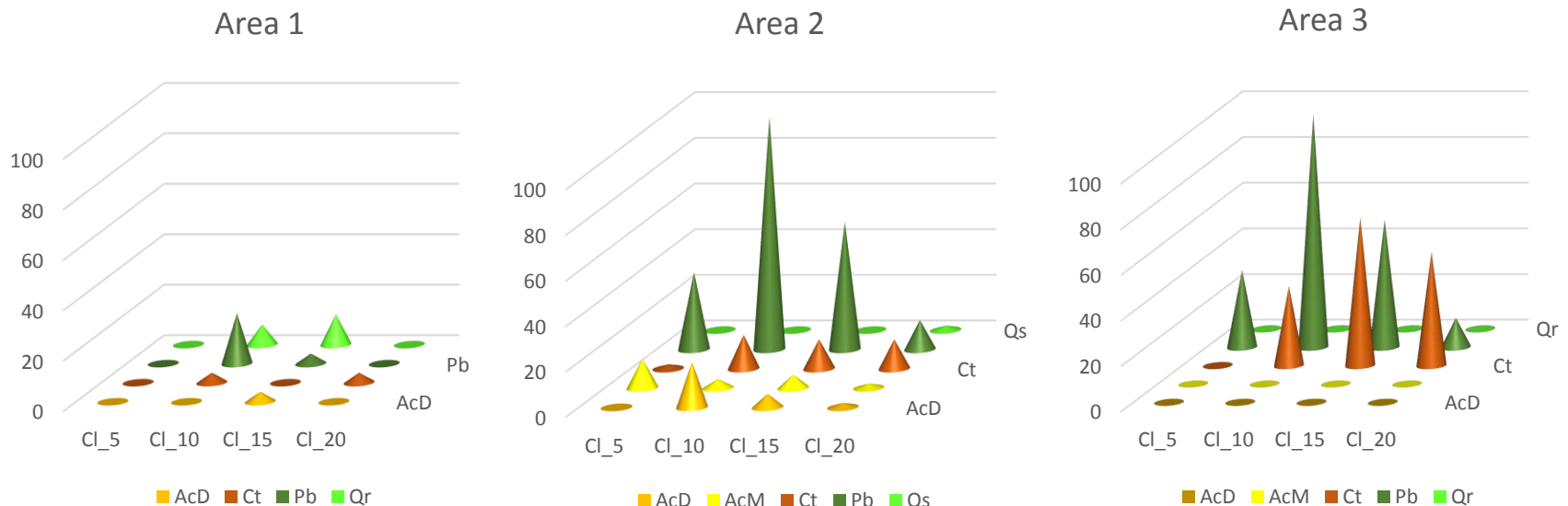
Crown cover - Area 3



Results

Natural Regeneration

- *Composition: Natural regeneration was scarce. Statistical differences were found in natural regeneration by area*

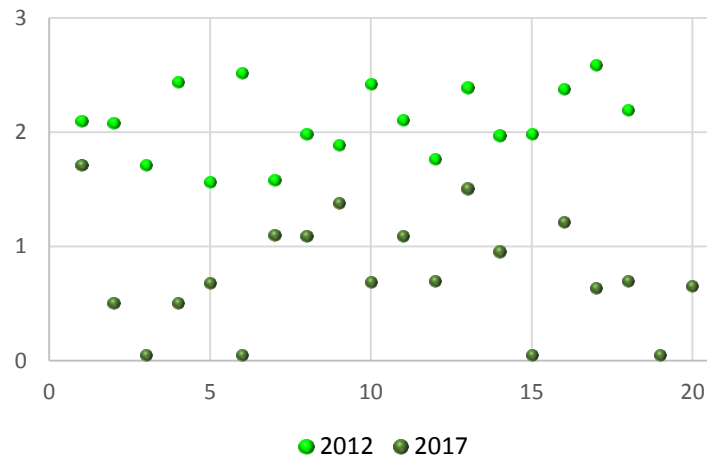


Results

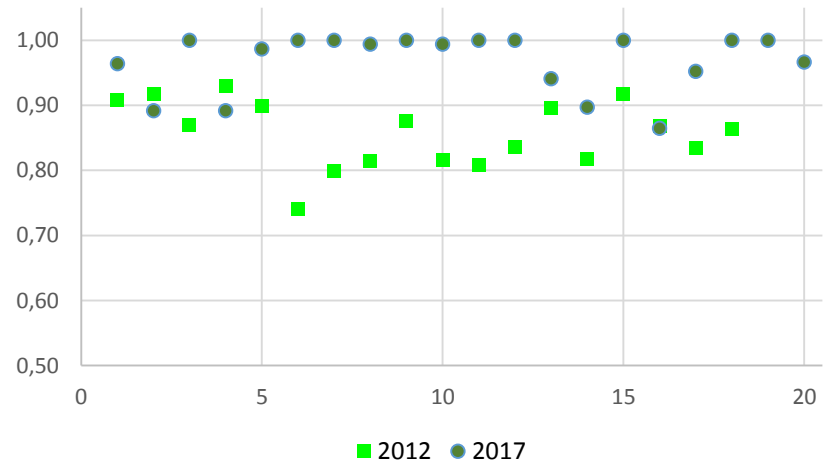
Biodiversity

- *Composition of the understory: Species diversity in 2017, it was not showed significant differences among areas*

Shannon's Index



Hill's Index



Conclusions and management implications



- *Natural disturbance has produced changes in stand structure*
- *Frequent salvage logging practices has generated a reduction in natural regeneration and diversity composition*
- *Salvage logging operations and the creation of new site conditions privileged disturbance-adapted species, such as acacias (invasive species) and grasses. It is necessary silvicultural management in order to ensure the desired composition of the next stand.*
- *There are also many benefits with the salvage logging: aesthetic, fire forest risk reduction, economic recovery. Nevertheless, these practices have immediate impact on forest communities*
- *The creation patchy mosaic of unlogged and logged areas could contribute to encourage continued structural and spatial diversity in the recovering forest*

Thank you
Gracias
Obrigado