

## Can artificial plantings resemble natural vegetation? Preliminary evidence.

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### INTRODUCTION & AIM

EU Nature Restoration Law (n 1991, July 2024):

- 20% of degraded land and sea by 2030
- all ecosystems requiring restoration by 2050.

National Restoration Plans under tricky timelines:

- submission by August 2026
- finalized by September 2027.

Knowledge on past restoration events becomes crucial to predict the outcomes of future interventions.



Research focused on Riparian mixed forests (Habitat 91F0), highly biodiverse ecosystems but in bad conditions and facing severe threats, including variations of water tables, poor recruitment, canopy collapse.

Our research aimed to assess whether

1. Natural dynamics could provide effective forest recruitment in gaps.
2. Artificial plantations will be colonized by the ground flora typical of meso-hygrophilous forests.

Ground flora serving as a key indicator of recovery.

### METHOD

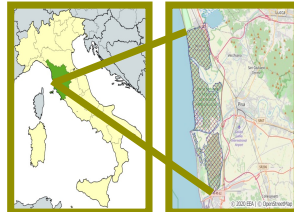
Study area: Nature 2000 Site 'Selva Pisana' (IT5170002), along the Tuscan coast, west from Pisa.

Three vegetation types:

MF, mature mixed *Quercus robur* L. forest

FG, gaps formed after natural treefall

AF, artificial plantation of *Q. robur* set up around 1990 in an area used for centuries as pasture and farmland bordering MF



Forest Gaps (FG)



Mature forest (MF)



Artificial forest (AF)

Floristic inventories and cover/abundance assessment (Braun-Blanquet) were conducted from May to October 2025 on five replicate plots of 400-m<sup>2</sup> for each vegetation type.

The occurrence of species in 16 sampling units (0.5 x 0.5 m in size) set along the plot diagonals was used to estimate species frequency and vegetation diversity within plots.

Recorded species were categorized for: Life form, Chorotype, Ecological Indicator Values (EIV), and typical habitat.

Ground floras were compared by means of: Sørensen similarity index (IS), Life spectra, Chorograms, Ecograms and typical Habitat.

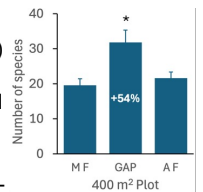


### RESULTS & DISCUSSION

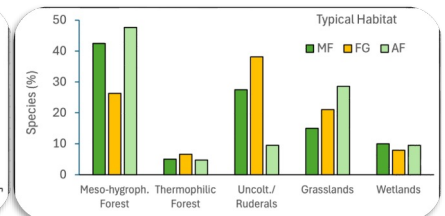
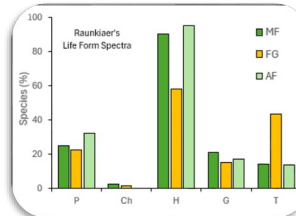
#### SPECIES RICHNESS

Mean plot richness was higher in FG (32 species) than in forests (20 in MF, 22 in AF).

Mature forests shared 58% of species with AF and FG. Similarity between AF and FG was only 47%.

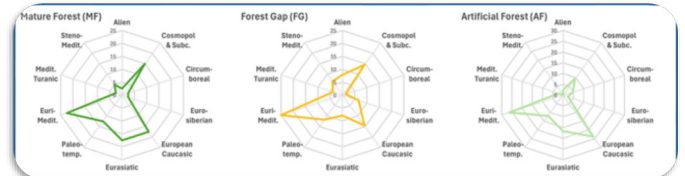


#### BIOLOGICAL SPECTRUM AND TYPICAL HABITAT



- FG: Higher presence of Therophytes (T)
- MF e AF: Higher presence of Hemicryptophytes (H)
- Species typical of forest habitats, 50% in MF and AF, 33% in FG.
- Ruderals represented 38% in FG, 28% in MF and only 10% in AF

#### CHOROGRAMS

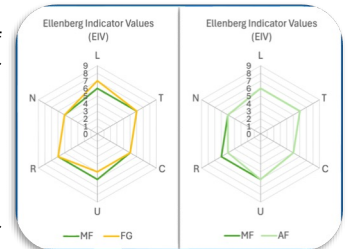


MF vs. AF: higher % of Cosmopolitan and Eurasiatic chorotypes  
FG: highest % of Cosmopolitan and Euri-Mediterranean  
Alien species: 2.5% in MF and AF, 8% in FG.

#### ECOGRAMS

From ecograms it can be inferred:

- FG shows higher presence of heliophilous species and fewer hygrophilous species than MF, which is typical of open field plant communities.
- MG and AF differ only for more acidic species in AF, which could be an index of less mature or early leached soils in the latter.



### CONCLUSION

Natural gap dynamics were ineffective for forest recruitment due to poor soil conditions and high anthropic pressure, whereas artificial stands provided refuge for riparian species, highlighting important considerations for future forest restoration efforts.

### FUTURE WORK

Further research should focus on comprehensive, year-round monitoring to capture the presence and dynamics of early spring nemoral species, as well as to evaluate long-term successional changes and the effectiveness of different restoration strategies in promoting native forest biodiversity.