



with the contribution
of the LIFE
Programme of the
European Union

Life FoResMit

Recovery of degraded coniferous Forests
for environmental sustainability
Restoration and climate change Mitigation



Ugo Chiavetta



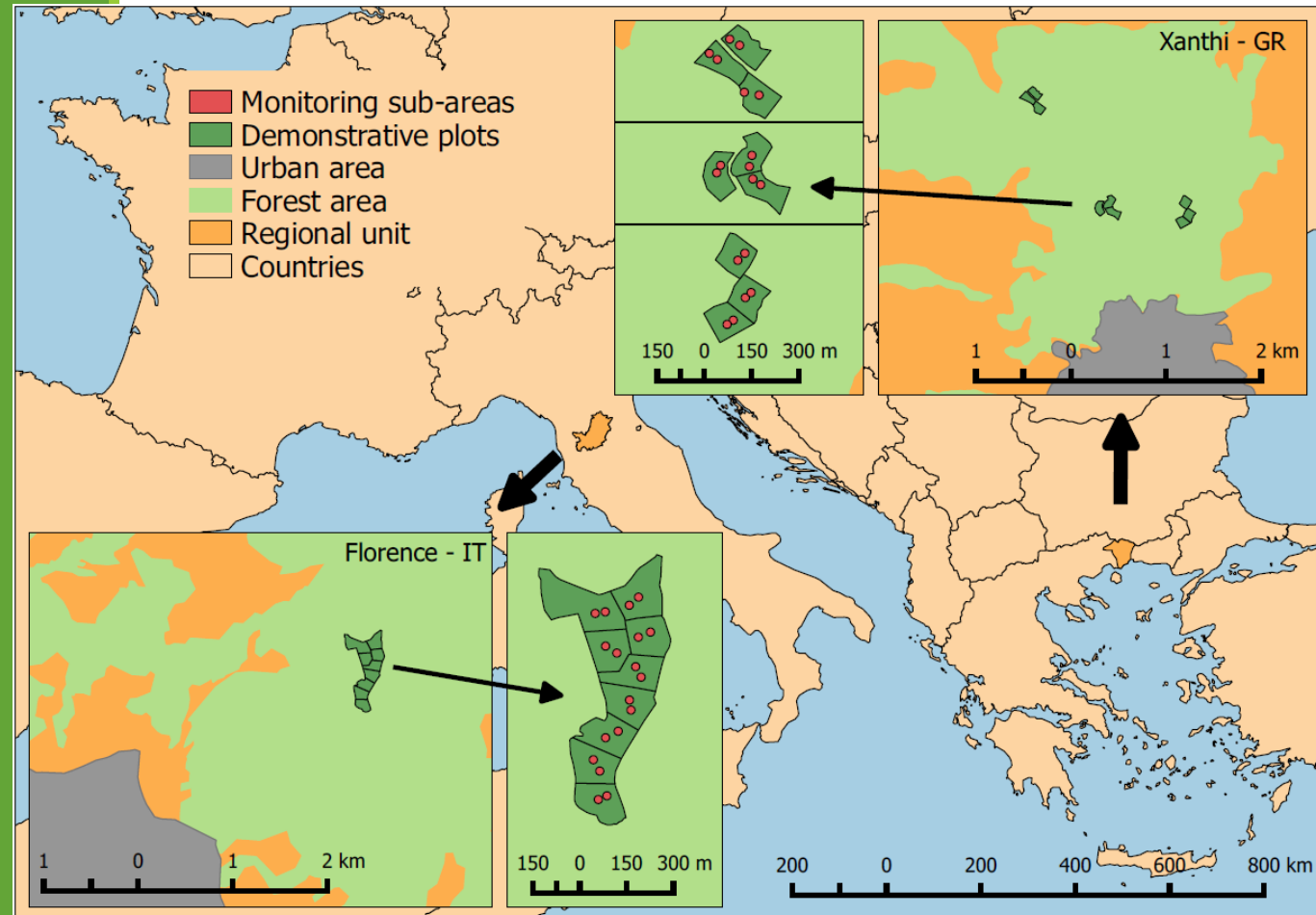
Demonstration areas

Italy – Tuscany
(Firenze)

Greece – Trace
(Xanthi)

Over 40 ha

Of silvicultural
intervention



THE ENVIRONMENTAL PROBLEM: pine plantations degradation

Conifers, including pines, have been used since the end of the 1800s to reforest abandoned, degraded agricultural areas at risk of hydrogeological instability.

After the planting, mostly the pine forests were not managed and never received cultural care (e.g. thinning)

Today 31% of pine forests in Italy show signs of decay, with many dead, fallen or sick trees.



Specific objectives

Silvicultural guidelines for the restoration of degraded peri-urban pine forests in Italy and Greece by optimizing the following aspects:

Financial

- Energy production
- Value chain analysis

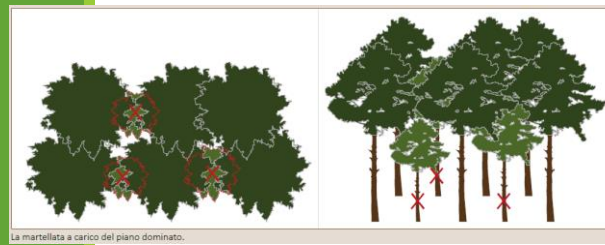
Environmental

- Carbon sequestration
- Greenhouse gases emissions reduction
- Biodiversity
- Forest ecological stability

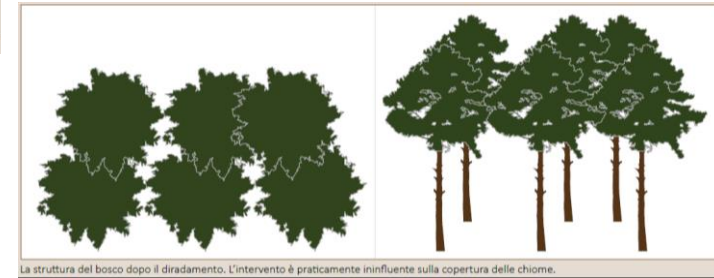
Social

- Improving resilience
- Recreational value

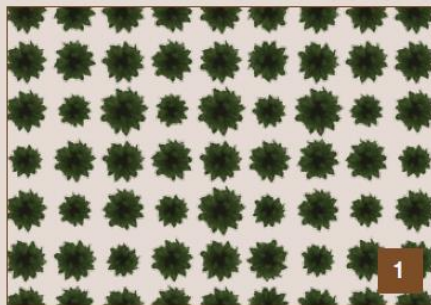
THE PROPOSED SOLUTION: the selective thinning



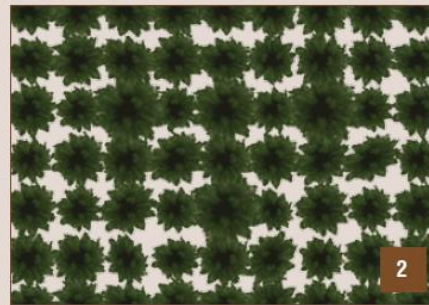
Traditional



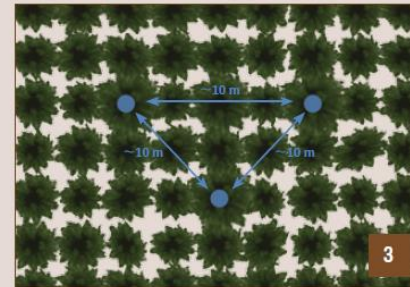
Selective



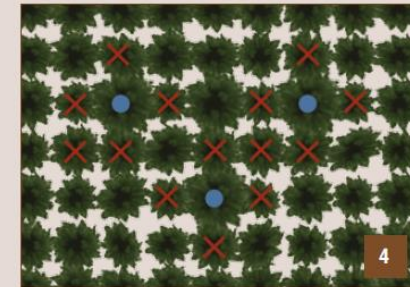
Young artificial pine forest in which the tree crowns are not in contact yet.



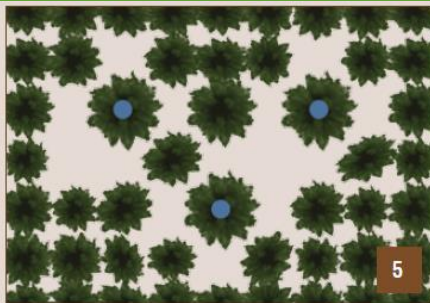
Stage which trees come into competition, the crowns are in contact: it's time to make thinning.



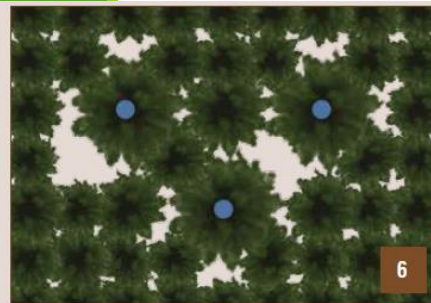
Selection of candidate trees (see section 3.3.1). With a density in pine forests of 100 candidate trees per hectare, the average distance is about 10 m.



Selection of direct competitors, from dominant candidate trees.



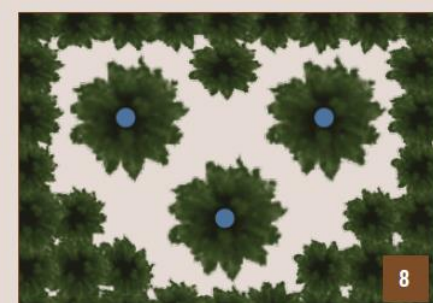
Situation after selective thinning.



Trees, both the candidate than those of margin, are taking advantage of the spaces created by thinning.



It's time for a new thinning with direct competitor removal.



Situation after the selective thinning.

Results: Financial



Traditional thinning (from below)

- Removing of 40% of the number of plants (25% of biomass)
- Removing only dominated plants
- No consideration for the understory trees
- No consideration for deadwood

- Lower gross income (-43%)
- Higher logging costs
- Negative net income

Selective thinning (target trees)

- Identification of CANDIDATE trees based on SPECIES, HEALTH and STABILITY
- Removal of the DIRECT COMPETITORS of the candidates
- Release of the best shoot of the understory layer
- Removal of slightly degraded deadwood (on the ground and/or standing)

- Higher gross income (+43%)
- Higher logging costs
- *Less* negative net income

Results: Environmental



Traditional thinning (from below)

- Removing of 40% of the number of plants (25% of biomass)
- Removing only dominated plants
- No consideration for the understory trees
- No consideration for deadwood

Forest structure

- No significant increase in DBH variability
- No significant variation in spatial distribution heterogeneity

Species composition

Species composition shifted to broadleaves by 3%

Selective thinning (target trees)

- Identification of CANDIDATE trees based on SPECIES, HEALTH and STABILITY
- Removal of the DIRECT COMPETITORS of the candidates
- Release of the best shoot of the understory layer
- Removal of slightly degraded deadwood (on the ground and/or standing)

- No significant increase in DBH variability
- No significant variation in spatial distribution heterogeneity

Species composition shifted to broadleaves by 5%

Results: Environmental



Traditional thinning (from below)

- Removing of 40% of the number of plants (25% of biomass)
- Removing only dominated plants
- No consideration for the understory trees
- No consideration for deadwood

Growth: CARBON SEQUESTRATION

The relative increment both in biomass and in total volume was 1-2 times higher than control (t_1 vs. t_0)

Tree stability

No significant increase in trees stability

Selective thinning (target trees)

- Identification of CANDIDATE trees based on SPECIES, HEALTH and STABILITY
- Removal of the DIRECT COMPETITORS of the candidates
- Release of the best shoot of the understory layer
- Removal of slightly degraded deadwood (on the ground and/or standing)

The relative increment both in biomass and in total volume was 2-3 times higher than control (t_1 vs. t_0)

- Mean trees stability increased of 4%
- Number of unstable trees reduced of 33%

Results: Social aspects



Traditional thinning (from below)

- Removing of 40% of the number of plants (25% of biomass)
- Removing only dominated plants
- No consideration for the understory trees
- No consideration for deadwood

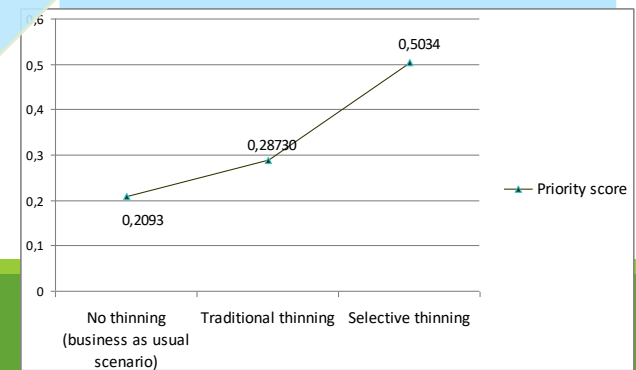
Selective thinning (target trees)

- Identification of CANDIDATE trees based on SPECIES, HEALTH and STABILITY
- Removal of the DIRECT COMPETITORS of the candidates
- Release of the best shoot of the understory layer
- Removal of slightly degraded deadwood (on the ground and/or standing)

Recreational value

- Recreational value increases by 37% over the control condition (no treatment)

- Recreational value increases by 140% over the control condition (no treatment)



Replicability



Continental level: Guidelines for forest recovery policy in pine plantations

Mediterranean
environment

...

National level: Guidelines for forest recovery policy in pine plantations

Pine plantations

Actual replication on Regione
Marche (Italy) for the highway
compensation measure

...

Local level: Implementation
into local managers' practice

Xanthi

Florence

...

Conclusions

1. The project was able to address four main issues:

- Is the selective thinning a compensation measure to improve carbon sequestration in pine plantations?
 - YES, but a careful information campaign is needed before application
- How many time do we need after the selective thinning to start compensate carbon emission?
 - More than two years, in ten years the compensation is very meaningful (projections to be verified in the AFTERLIFE)
- Can local managers implement easily the selective thinning?
 - Yes, the method is very simple to be implemented by local managers
- Are soils emissions positively or negatively affected by selective thinning?
 - Positively, above all in Mediterranean environment

2. We already replicated the project in Regione Marche

- With no need for accounting the method is ready to be applied

3. All pine plantations are areas of application of FoResMit method

- The quantification is species and fertility dependent, so a more consistent accounting system is needed



Dr. David J. Schwab is a professor of psychology at the University of North Carolina at Chapel Hill. He is also a senior research advisor at the Center for the Study of Social Design. He has a Ph.D. in psychology from the University of North Carolina at Chapel Hill. He is currently working on a book about the psychology of social design.

A woman with short blonde hair, wearing a dark top, is seated at a blue podium. She is speaking into a microphone. A water bottle is visible on the podium to her left.A man with a beard, wearing a dark jacket and jeans, is sitting on the ground at the base of a large, thick tree trunk. The ground is covered with dry leaves. The background shows a forest with more trees and a path.

Every good work is a team work!