Short-term regeneration dynamics after windstorm: the study case of Vaia storm

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Summary

- Introduction
- Study area
- Methodology
- Prelimary results
- Conclusions

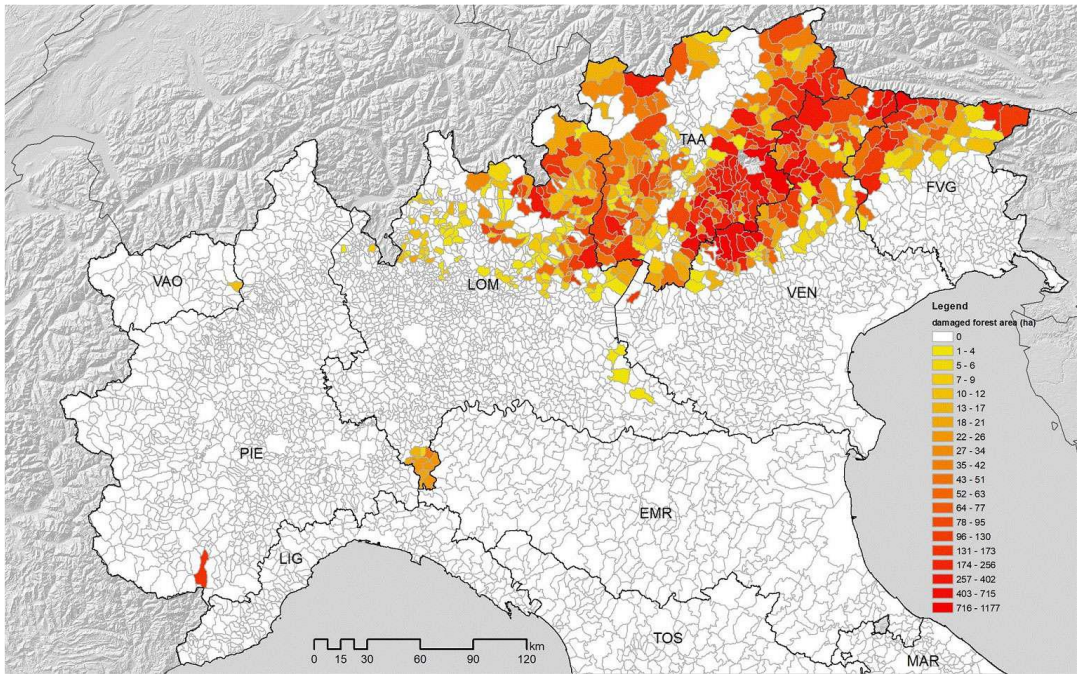
Introduction

Storm Vaia, 27-30/10/2018

- Wind gusts >200km/h
- ~ 50000 ha, >10 million m^3

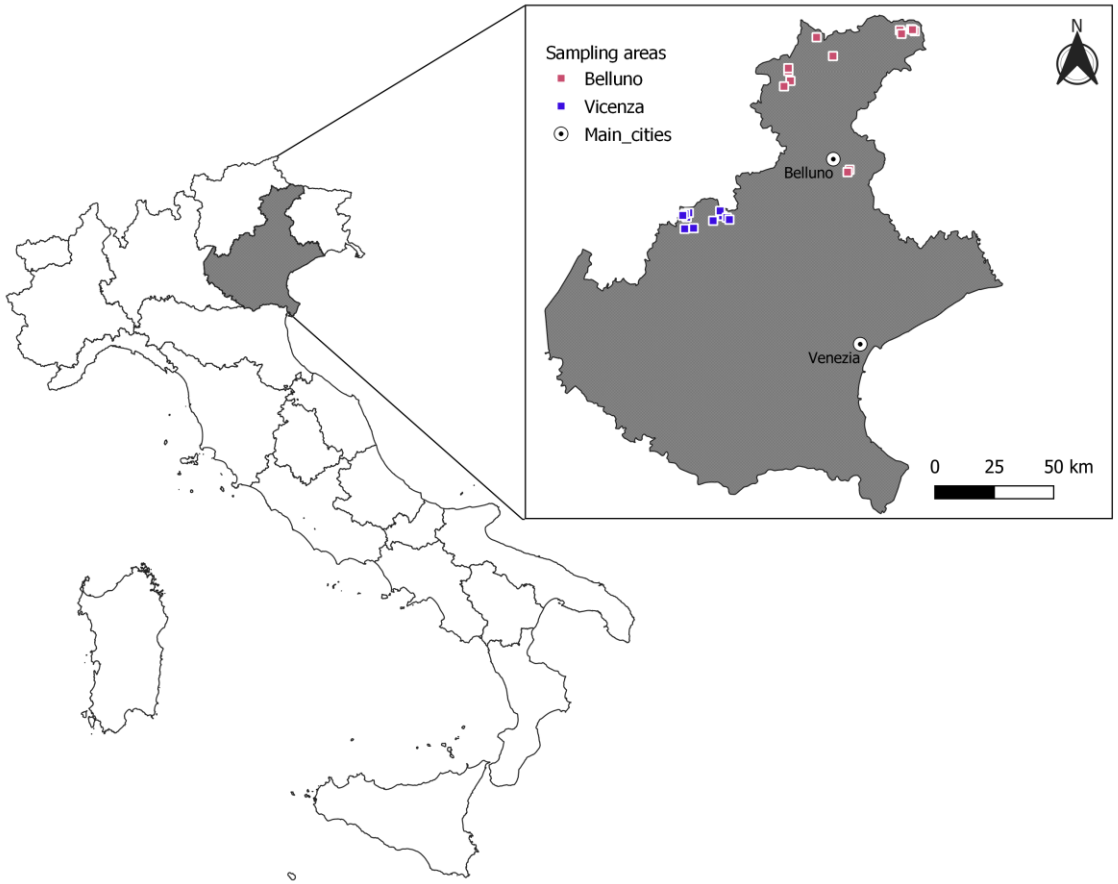
- ~ 60% damaged areas salvage logged (Regione Veneto)
- Restored forest functions

Monitoring regeneration dynamics



Forest damaged (ha) by the storm Vaia, Chirici et al., 2019

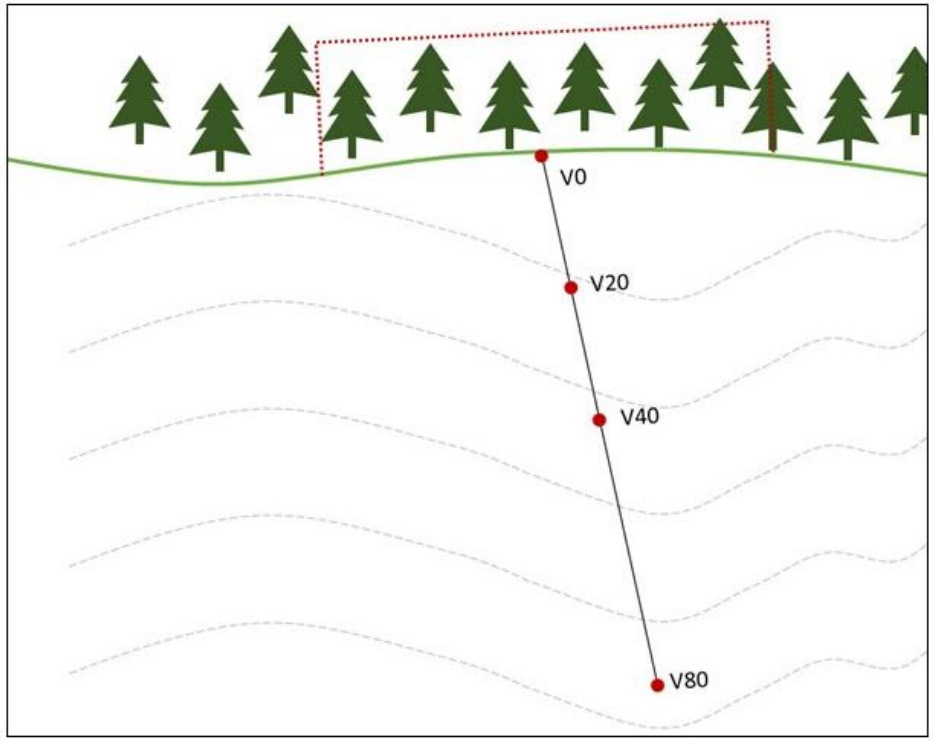
Methods: study area

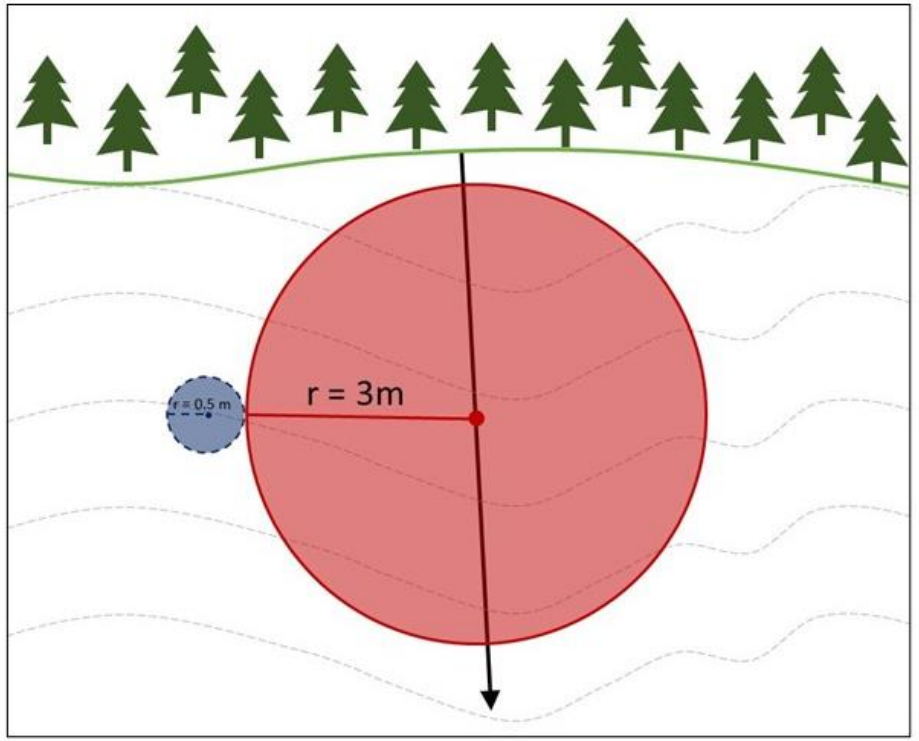


- 25 areas in Veneto Alpine range
- Between 1250 and 1700 m a.s.l.
- Mean annual temperature ~ 10°C
- Cumulated annual precipitation ~ 1300 mm/y

Method: sampling protocol

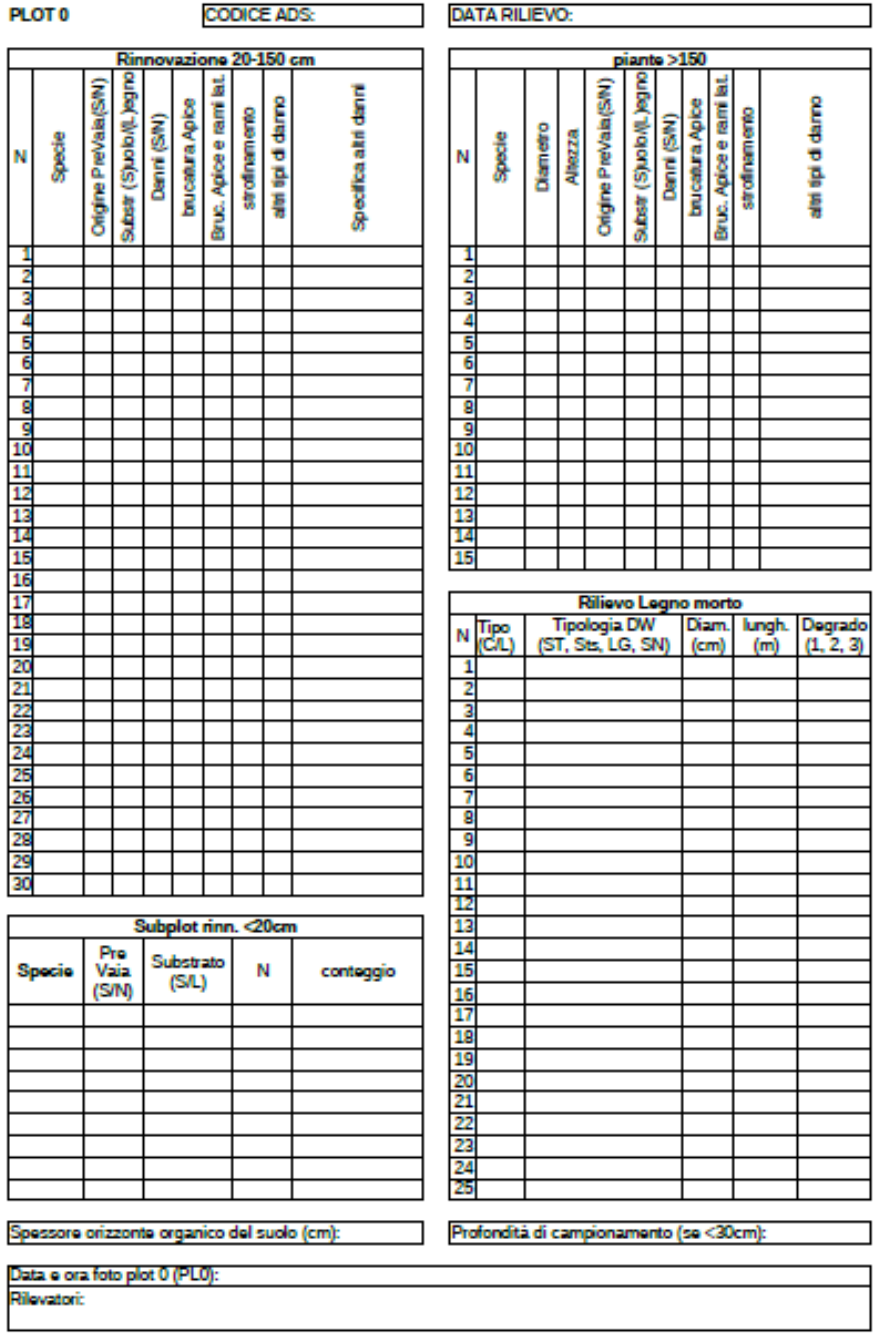
Sampling protocol adapted from previous experiences in Switzerland after Vivian (1990) and Lothar (1999) (Kramer et. al 2014, Priewasser et al. 2013)





Method

- Regeneration density as dependent variable
- Comparison between different treatment (hf, cy, mix), exposition, distance, and species
- GLM to analyze the influence of different variables on the regeneration density



PLOT 0 | CODICE ADS: | DATA RILIEVO:

Rinnovazione 20-150 cm

N	Specie	Origine PreVaia(S/N)	Substr (Stuolo/L legno	Danni (S/N)	brucatura Apice	Bruc. Apice e rami lat.	strofinamento	altri tipi di danno	Specifica altri danni
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

piante >150

N	Specie	Diametro	Altezza	Origine PreVaia(S/N)	Substr (Stuolo/L legno	Danni (S/N)	brucatura Apice	Bruc. Apice e rami lat.	strofinamento	altri tipi di danno
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Rilievo Legno morto

N	Tipo (C/L)	Tipologia DW (ST, Sts, LG, SN)	Diam. (cm)	lungh. (m)	Degrado (1, 2, 3)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Subplot rinn. <20cm

Specie	Pre Vaia (S/N)	Substrato (S/L)	N	conteggio

Spessore orizzonte organico del suolo (cm):

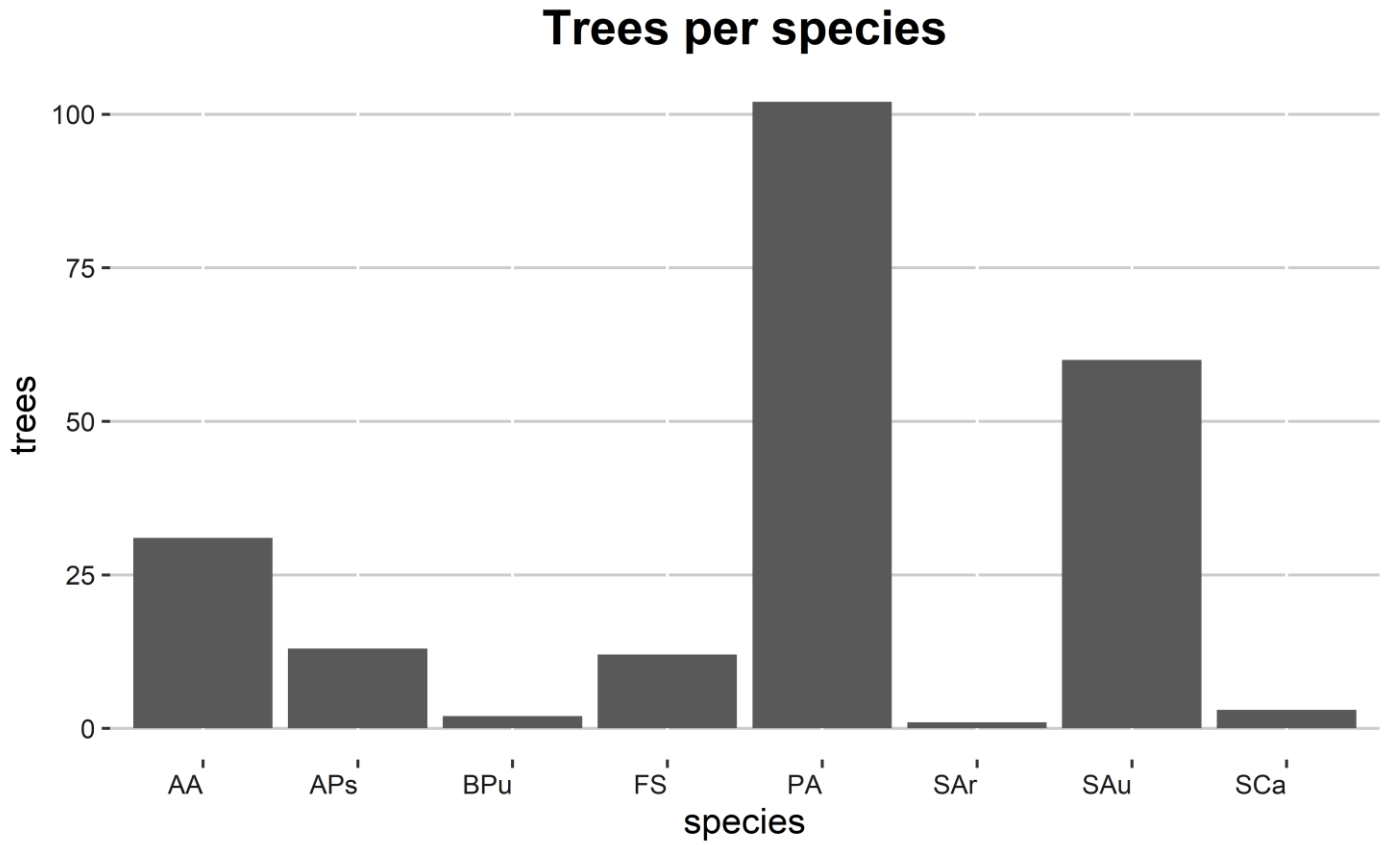
Profondità di campionamento (se <30cm):

Data e ora foto plot 0 (PL0):

Rilevatori:

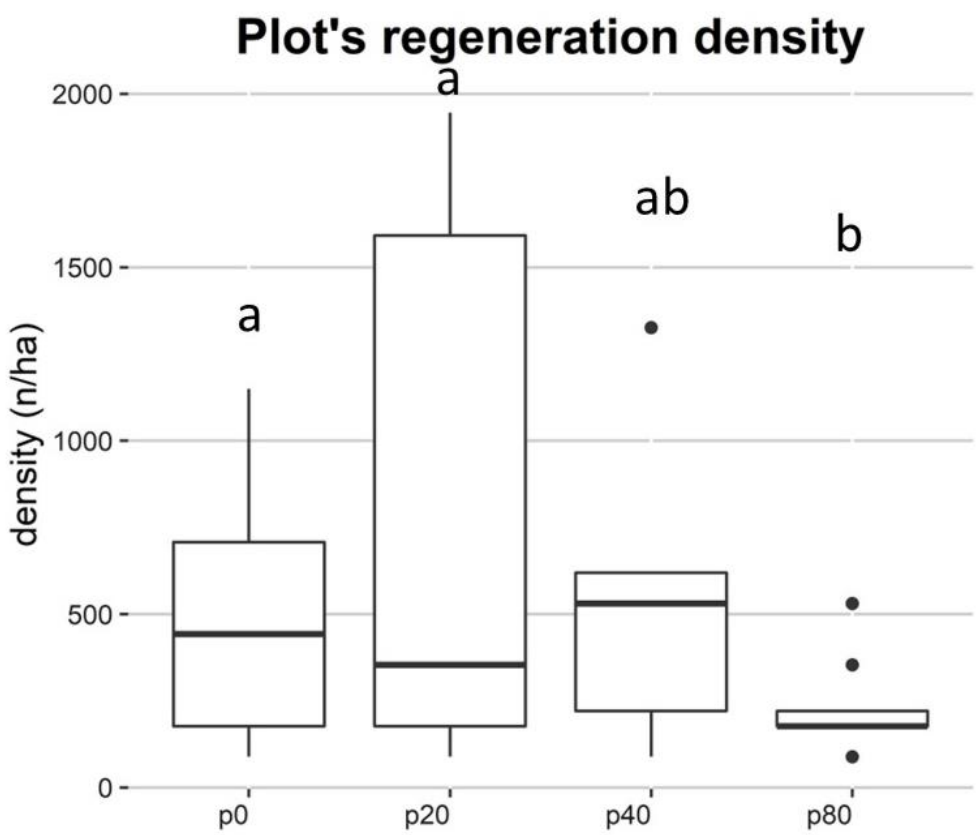
Preliminary results: descriptive statistic

- Regenerating species similar to the previous stand
- High frenquency of Rowan (*Sorbus aucuparia* L.) seedlings, due to birds dissemination

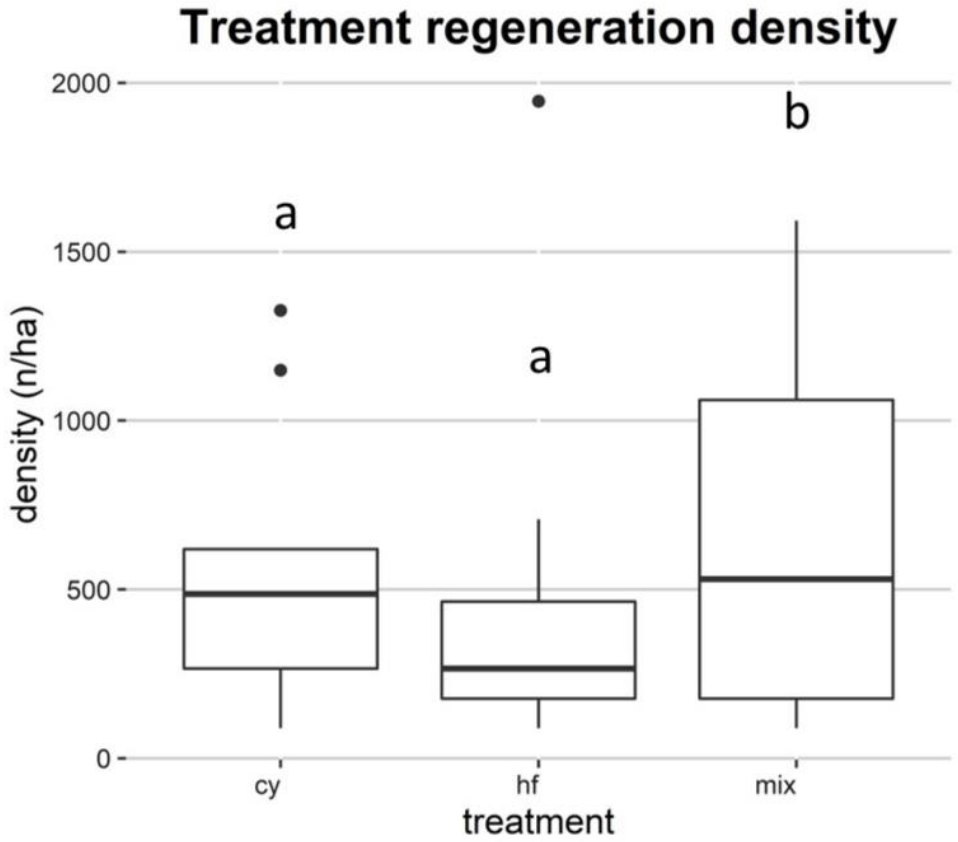


Overall trees per species (AA = *Abies alba*, APs = *Acer platanoides,* BPu = *Betula pendula*, FS = *Fagus sylvatica*, PA = *Picea abies*, Sar = *Sorbus aria*, SAu = *Sorbus aucuparia*, SCa = *Salix caprea*)

Preliminary results: significant differences



Tuckey's HSD test p<0.05.
p0= 0m, p20 = 20m, p40 = 40m, '80 = 80m.



Tuckey's HSD test, p<0.05.
Salvage logging systems: cy = cable yarding, hf = harvester/forwarder,
mix = both cable yards and harvester/forwarder

Preliminary results: GLMs output

Response variable	Explanatory variable	Estimate		SE	z	p
Trees						
	Elevation	0.001	±	0.000	1.282	0.120
	Treatment_hf	**-0.426**	**±**	**0.120**	**-3.808**	**0.000**
	Treatment_mix	**0.219**	**±**	**0.108**	**2.023**	**0.043**
	Deadwood	**-0.159**	**±**	**0.064**	**-2.483**	**0.013**
	Plot_id_p20	**0.387**	**±**	**0.088**	**4.384**	**0.000**
	Plot_id_p40	-0.031	±	0.114	-0.274	0.784
	Plot_id_p80	**-0.756**	**±**	**0.191**	**-3.965**	**0.0001**

- Treatment influences the number of seedlings
  - High mechanization → -
  - Mixed methods → +
- Deadwood presence reduces the number of tree regeneration

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Distance from the edges influences seedlings' availability

- <20m → increase
- >80m → decrease

Conclusion

- Different salvage logging methods influence regeneration density
- Too much deadwood, in the short-term, prevents the establishment of the seedling (mulching effect)
- Higher regeneration density closer to the edges. In large gaps (r>80m) difficult dissemination in the gap’s center.
- Lot of regeneration from species with zoochory dissemination (e.g. Rowan)

Future steps and perspectives

- Enlarge the dataset up to 100 areas in NE of Italy
- Keep monitoring the areas → time series on regeneration dynamics
- Dealing with subsequent disturbances (e.g. bark beetle outbreaks)


Thanks for the attention