Workshop
Protective forest
Management after large-scale disturbances in Austria and Slovenia
October 10th-12th 2022, Villach/Beljak (Austria) and online

The day after the VAIA storm: an experience from the Dolomites & Experiences with wind damages in Central Italy

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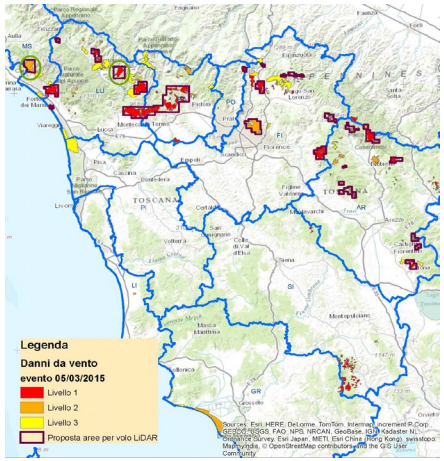
UNIVERSITÀ DEGLI STUDI FIRENZE
DAGRI DEPARTMENT OF AGRICULTURE FOOD, ENVIRONMENT AND FORESTRY
geo LAB

Wind damages in Tuscany Region, Central Italy

In March 2015 a windstorm hit the Tuscany Region
The windstorm had a dominating northeastern wind with gusts > 165 km/h

A Task force was created by Regional Forest Office with the aim of:

1) assessing forest windthrow damages
2) developing guidelines for forest restoration



Task force

Regione Toscana

CONSORZIO LaMMA

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GESAAF
DIPARTIMENTO DI GESTIONE DEI SISTEMI AGRARI, ALIMENTARI E FORESTALI

Corpo Forestale dello Stato

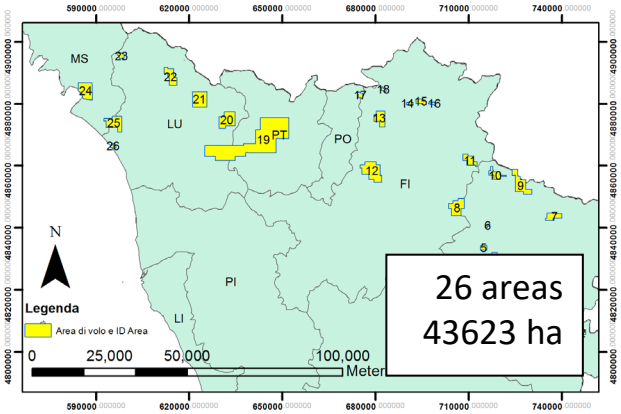
Assessing forest windthrow damages

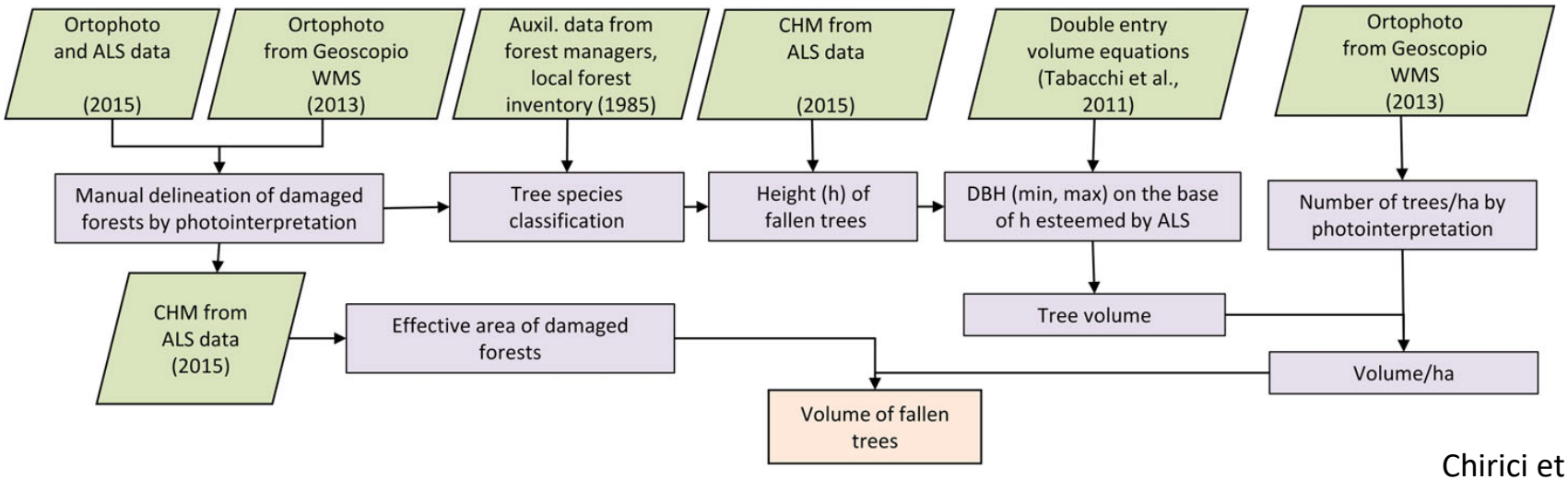
Pre-event data

- Orthophotos (2013)
- Forest inventory (1985)

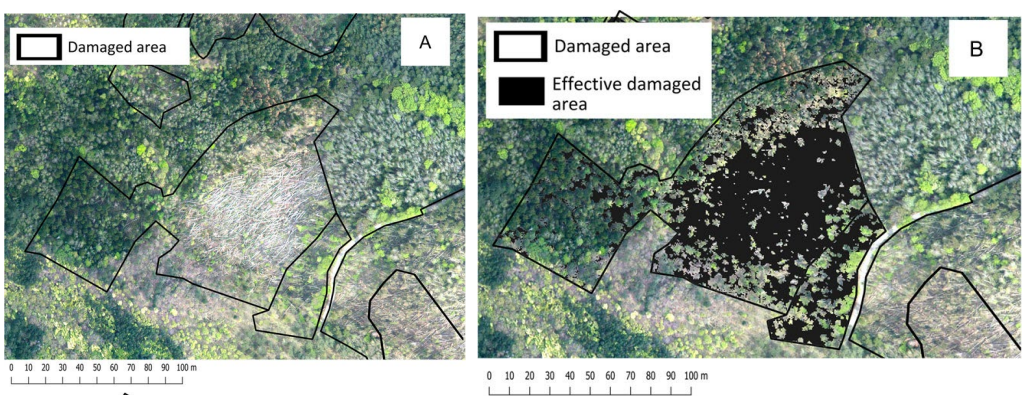
Post-event data (May 2015)

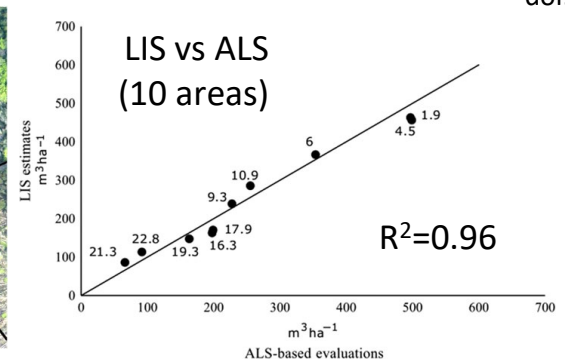
- ALS data (10 pts/m^2)
- Orthophotos
- CHM (pixel=1 m)





Chirici et al (2018)
doi:10.1093/forestry/cpx029





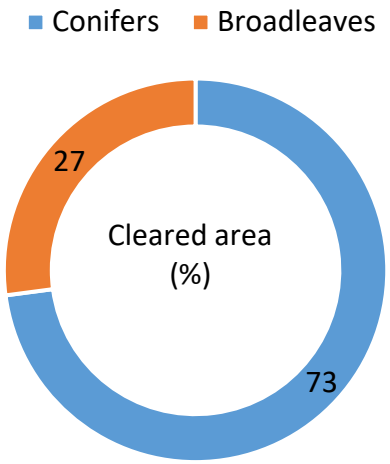
Developing guidelines for forest restoration

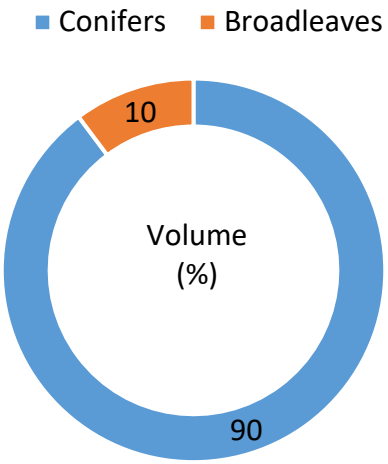
Site condition (slope) and risk for soil erosion
Stand structure and forest management
Area of damaged forest
Risk for fire, insects attack, etc
Management objectives

Bottalico et al (2016, in Italian)
doi:10.4129/ifm.2016.4.04

Results

Tree species	Area of forest damage (Ha)	Effective cleared area (Ha)	Volume of fallen trees (m^3)	Number of fallen trees (n)
Abies alba (Silver fir)	372	124	80825	38160
Castanea sativa (Sweet chestnut)	285	177	17054	55376
Cupressus arizonica (Arizona cypress)	2	1	61	297
Fagus sylvatica (European beech)	17	5	2959	952
Ostrya carpinifolia (European hop-hornbeam)	4	1	85	298
Picea abies (Norway spruce)	4	1	1085	482
Pinus nigra (Black pine)	331	171	102390	59341
Pinus pinaster (Maritime pine)	655	461	88135	135090
Pinus pinea (Stone pine)	88	34	9232	3767
Pinus radiata (Monterey pine)	4	2	242	984
Pinus sylvestris (Scots pine)	9	3	603	862
Pseudotsuga menziesii (Douglas fir)	69	24	15305	8860
Quercus cerris (Turkey oak)	4	2	216	501
Quercus pubescens (Downy oak)	4	2	384	361
Robinia pseudoacacia (Black locust)	170	118	13227	41837
Total	**2018**	**1126**	**331803**	**347168**





Common criteria for restoration interventions in high forests

Damage	Fallen trees (%)	Damaged area (ha)	Suggested actions
Low	< 50	-	Cut and removal of dead trees
Medium	> 50	< 0.2	Cut and removal of dead trees
High	> 50	> 0.2	- Cut and removal of dead trees - Plantation is suggested if: Natural regeneration is laking 1-2 years after the removal of dead trees Forest roads are available or new forest roads can be opened - In case of plantation: Plant materials must be in accordance with Regional Forest Low Tree species must be selected in accordance with Regional Forest Low Forest operations (e.g. replacing young dead trees) will be carried out for at least 3 years after the plantation

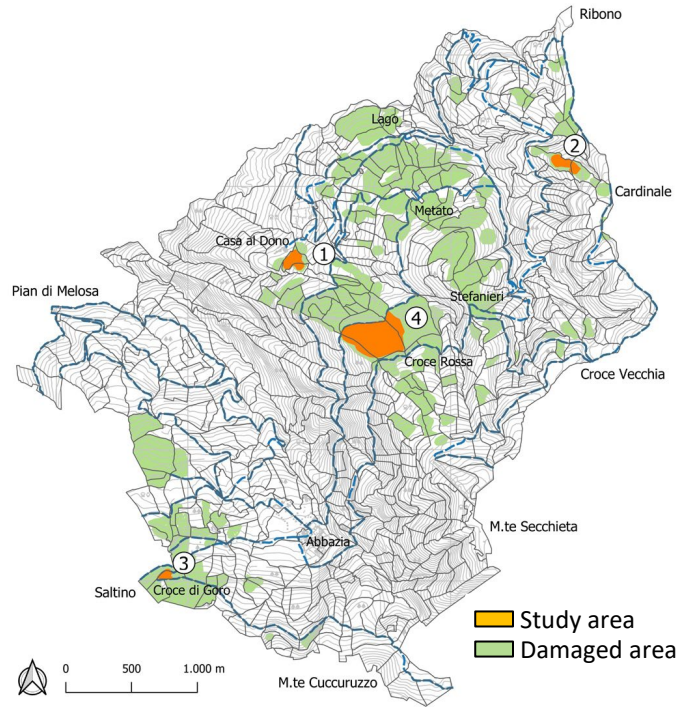
Other criteria based on tree species and management objectives

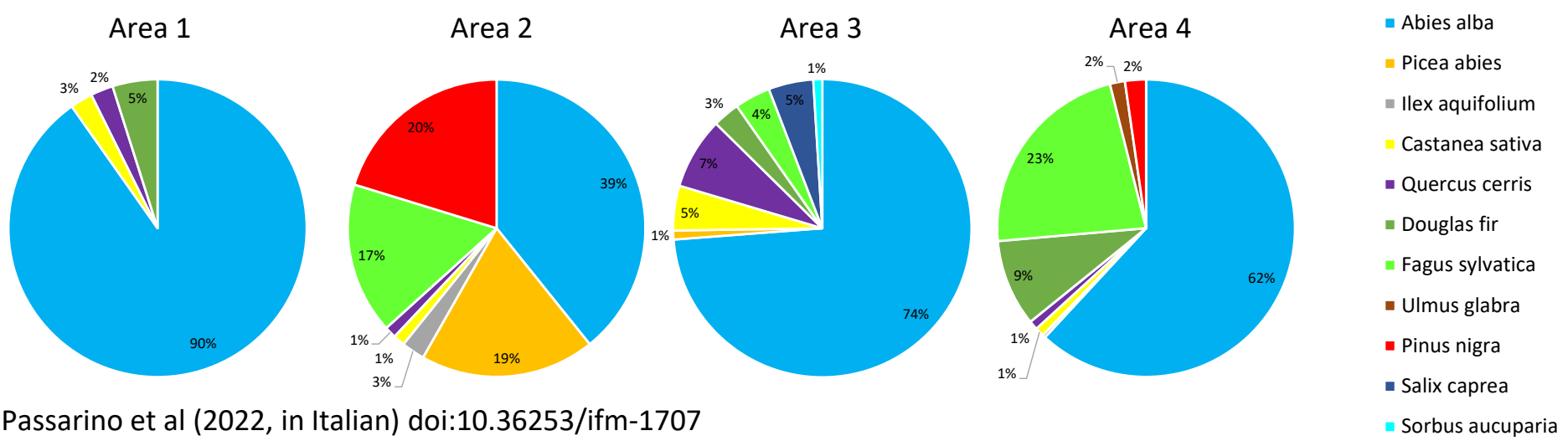
- Productive forests (e.g. Silver fir, Duoglas fir): plantation with conifers
- Landscape and cultural heritage conservation (e.g. Silver fir, Stone pine): plantation with conifers
- Protective forests (e.g. Black pine): plantation with broadleaves
- Nature conservation (e.g. Silver fir, Douglas fir): plantation with broadleaves or natural regeneration
- Coppice forests (e.g., Sweet chestnut, Black locust): clear cut (num of damaged stumps >50%)

Forest monitoring: Nature Reserve of Vallombrosa (Florence)

Monitoring of natural regeneration 5 years after the storm
4 study areas (3 Silver fir stands and 1 Spruce stand)
30 transects in total
Species composition and density (n m^{-2})

Area 1	Area 2	Area 3	Area 4	Average
n m^{-2}	n m^{-2}	n m^{-2}	n m^{-2}	n m^{-2}
0.68	0.71	1.13	0.78	0.83





Passarino et al (2022, in Italian) doi:10.36253/ifm-1707

Conclusions

- Estimation of the area of forest damage is needed to support forest management and planning after wind storms, but also to reduce the risk of future windthrows

- ALS data are useful for providing estimates of storm damaged areas and volume of fallen trees, even if pre-event ALS data are not available

- Guidelines for restoration interventions in Tuscany were aimed at increasing resistance and resilience of forests so as to maintain their ecological functions in face of a future which appears very uncertain

- Monitoring damaged areas is necessary to adapt forest management based on forest dynamics

Thanks for your attention

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