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FOREST MANAGEMENT FOR FIRE PREVENTION. ARE WE ALWAYS ON THE RIGHT PATH?

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Forest fires in Italy

The global Mediterranean is affected since decades by forest fires; however, the problem is currently extending to yet unaffected regions. In Italy, forest fires are known to be frequent and numerous (Fig. 1) with a fluctuating trend. However, while the 50 years' average is 53,000 ha burned per year, in the last years an increasing trend occurred with an unparalleled peak of 150,552 ha in 2021. While an infinitesimal percentage is caused by natural phenomena as lightning and eruptions, almost all of the events are of anthropic origin, either negligent or with intent. Actually, the detected increase in fire-related crimes (+18.3% in 2020 compared to 2019 and +27.2% in 2021 compared to 2020) is of great concern and despite much improved investigation techniques, it remained difficult to identify the responsible. In some cases, even a relationship between forest fires and the need for woody biomass to feed power plants has been reported (Procura di Castrovillari, 2023 Jona, 2022) (see Fig. 2).

Damages and risk

The above outlined development causes enormous damages to the national forest heritage, both directly and indirectly: loss of biodiversity (also animal and fungal), loss of old-growth forest structures, disruption of ecological succession, increase of erosion processes, impoverishment of material and energy flows in the food chain, soil impoverishment, and water and atmosphere pollution.

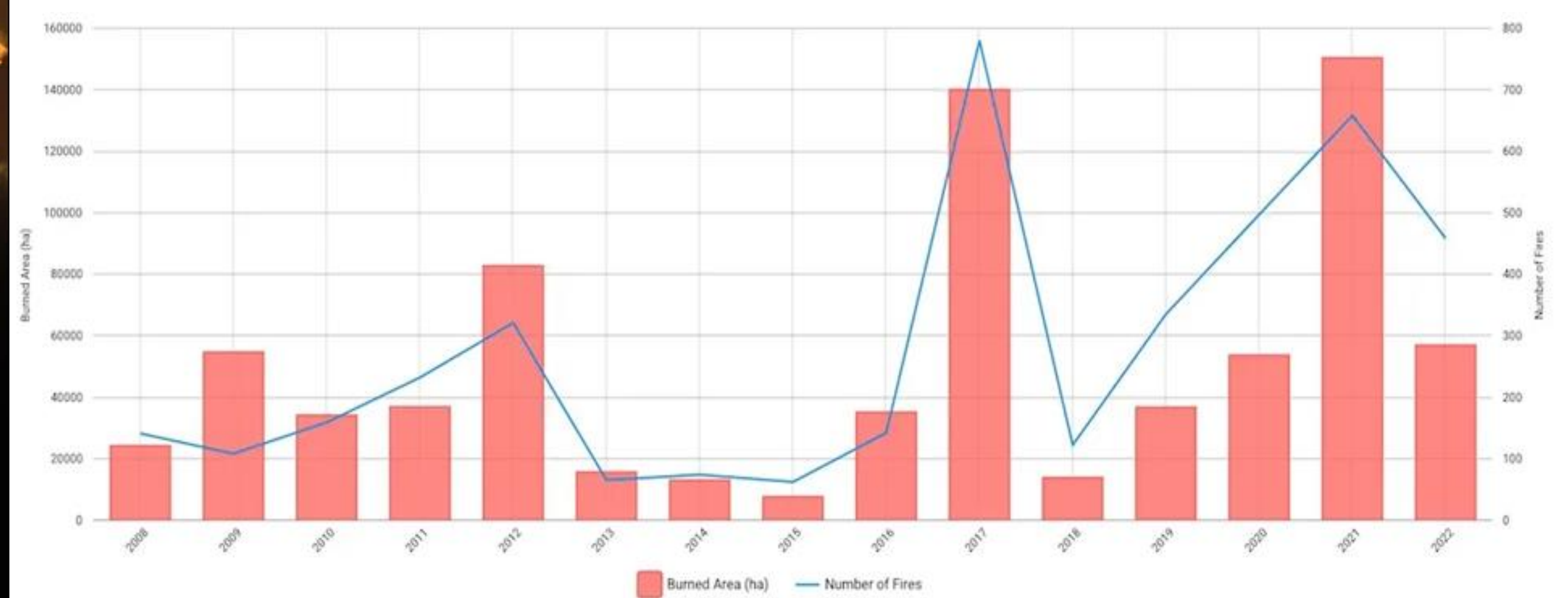


Fig. 1 Forest fires in Italy, source: EFFIS, 2023

Are we using always the right measures?

One of the most frequently proposed measures for fire risk reduction in Italy are forest thinning to reduce combustible mass and clearing the undergrowth, with prescribed fires or grazing (Legambiente and Sisef 2021). Acceptance by the Ministry of the Environment made them likely to be financed for the drafting of mandatory fire prevention plans for National Parks. In reality, these measures proved ineffective in other contexts (e.g., Taylor et al., 2020; Bushfire Recovery Project, 2021) because the canopy opening causes a significant loss of understory humidity and a resulting increase of fire risk due to greater microclimatic aridity and dryness of the herbaceous layer. Moreover, in arson cases, forest density has no meaning to the fire outbreak because even a single tree could be set on fire. Secondly, fire spreading is mainly by wind-blown sparks and incendiary embers blown away from the crowns of burning trees. There is higher frequency in coniferous woods due to boiling of resin together with release or explosion of combustible gases which burn when temperature exceeds 200 degrees. Third, elimination of the undergrowth, in order to be effective, must be almost total, i.e., also eliminating the renewal of the forests, interrupting natural processes and the assurance of forest continuity. In addition, if not removed immediately and dried *in situ*, remained clippings increase fire risk. Fourth, due to the fast and high resprouting capacity of shrubs, herbs and grasses after cutting, several repetitions of the clearing would be necessary on a monthly basis. All this becomes impracticable for logistical-organizational and, above all, economic reasons. Therefore, new firebreaks which should be at least 100m wide and continuously cleared are not being made in Italy. Why, though, in Italy there is so much insistence on the need for forest thinning, until the definition of "preventive forestry" (Motta, 2021)?

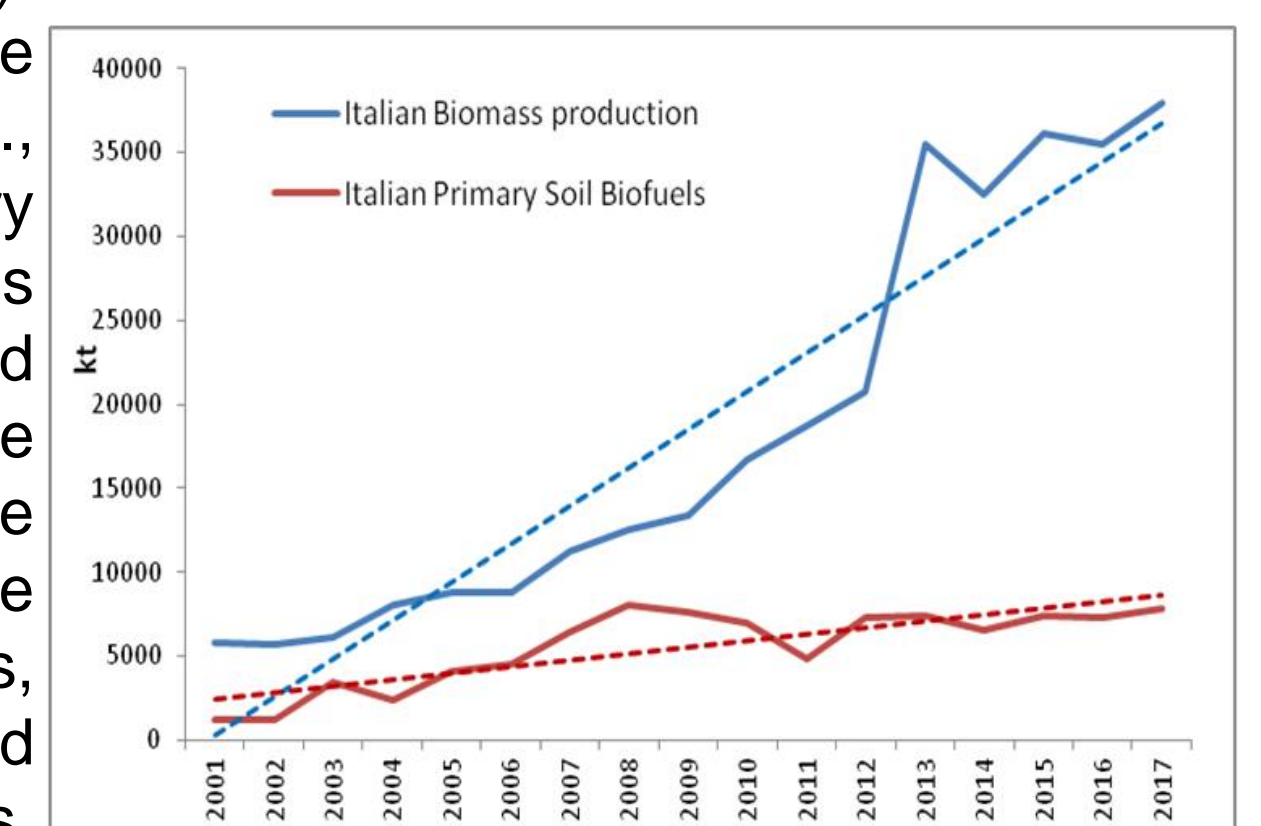


Fig. 2 Biomass for energy in Italy

Three cases from Central Italy as example

1. Pineta del Tombolo, Marina di Grosseto (Toscana region): Arson attack in 2012 affected 60 hectares of forest (with a strong prevalence of *Pinus pinea*), however at least one third of the trees had still perfectly intact crowns and only blackened bark. Nonetheless, the pine forest was totally demolished (Biagioni *et al.*, 2014) and has not been rebuilt since then. All the wood obtained was sent to a biomass plant in the province of Frosinone (Latium, Italy). For another innovative geothermal/biomass plant Cornia 2 in the province of Pisa, a delivery of 40,000 tons of vegetable matter per year was planned (Corrieri, 2023). To guarantee this production of woody material, a fire prevention plan based precisely on the thinning out of the pine forests had been prepared at the disposal of the local administrations. After a tough fight that lasted at least 4 years, the plan was suspended, but the fate of the Grosseto pine forests is still uncertain.

2. Pineta di Villetta Barrea (Abruzzo region): This pine forest, of great phytogeographic and biogenetic value as it is made up of *Pinus nigra* var. *italica*, is included in the integral protection area of the National Park of Abruzzo, Lazio and Molise (Fig.3). Even here, despite the harsh opposition of a local committee of citizens, supported by numerous exponents of the scientific world, it is proposed to thin out the pine forest in order to prevent any fires which, in memory of man, never happened in that area. The particular insistence with which the presidency and above all the management of the Park support this project is perplexing as it is difficult to exclude a logical connection with the construction of a small biomass power plant in the Municipality of Pescasseroli, in the center of the park, and with the economic development of the territory falling within the park which, according to the director, can no longer be based solely on tourism, but must provide for a forestry chain for the production of timber. The dispute has not yet ended with the parties involved who are currently remaining on their positions.



Fig. 3 Villetta Barrea pine forest

3. Pineta d'Annunziata, Pescara (Abruzzo region): Remnant of the historic *Pinus halepensis* formation (*Silva lentisci*), once covering large parts of the Adriatic coast (Cianfaglione *et al.*, 2014), now protected as regional reserve by the Abruzzo Region. After numerous attempts by various subjects to have the pine forest downgraded from a nature reserve to a city park, by dropping the protection constraints that weigh on the area, in 2021 a large portion of the pine forest burned down at the hands of arsonists who, on the basis of the investigations by the Fire Brigade, had used at least 10 triggers. After the fire, some local Agronomists and Foresters hastened to present a fire prevention plan based, once again, on clearing and thinning out the pine forest without taking into account the fact that, following the wind, the cones and other embers climbed over 15m high buildings and reached 200m away, burning open umbrellas on the beach. Even direct observation of events, therefore, does not serve to draw up rational plans.

Conclusion

It can be concluded that in various places, including in Italy, the following idea is gaining ground: if possible, one of the most effective forest fire prevention systems is instead of using water to extinguish fire, to wet the forests earlier, when climatic conditions make the risk of fire more probable (UIA, 2023). In all three cases described there was and still is ample water availability: the Grosseto pine forests form a strip along the Tyrrhenian Sea at most 1 km wide, the Villetta Barrea pine forest overlooks the homonymous lake, and the Pescara pine forest overlooks the sea and is 800 m from the Pescara river.