

A new pine forest to save biodiversity

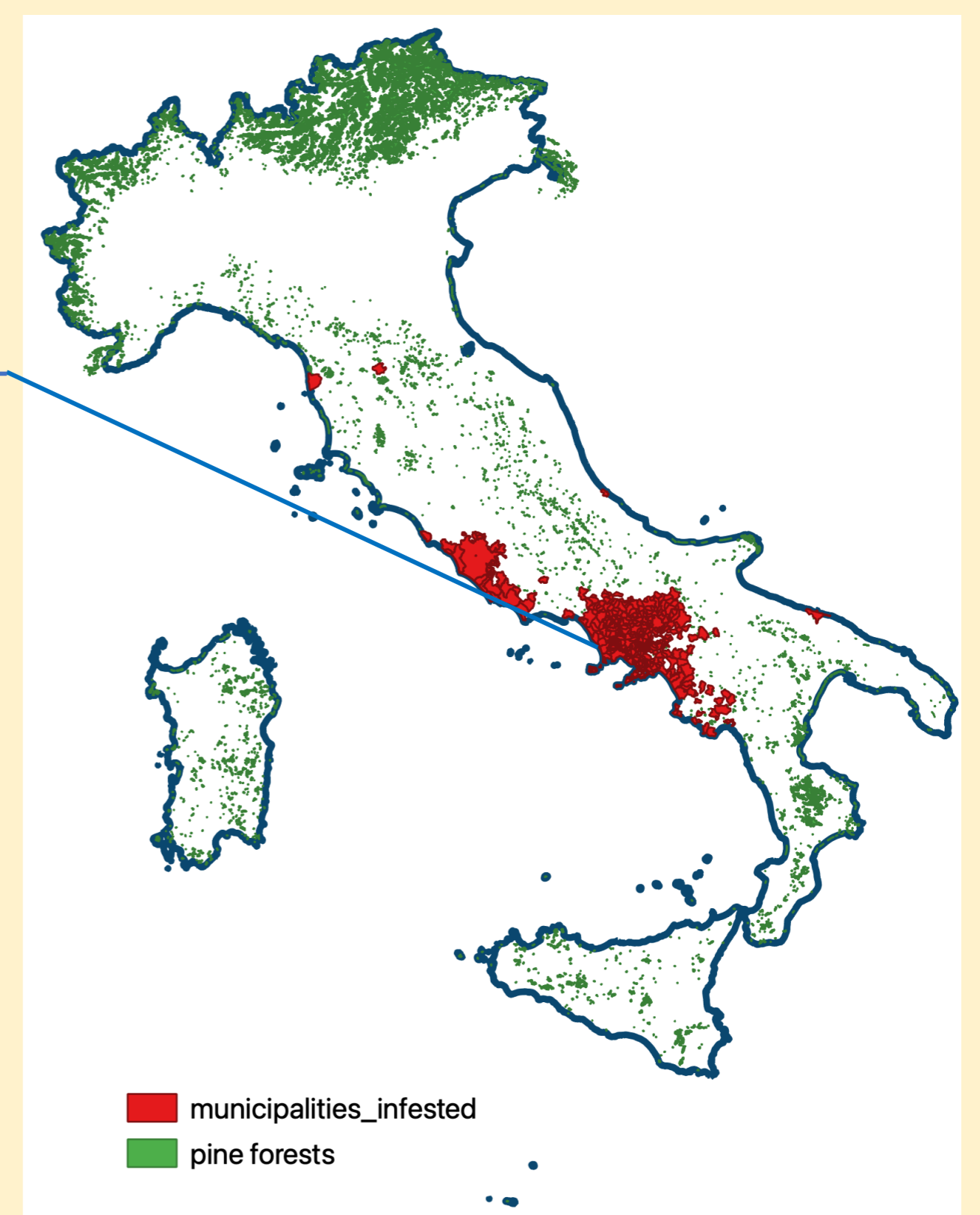
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BACKGROUND

In recent years, due to climate-related environmental changes, large areas of pine (*Pinus pinea* L.) forest have been exposed to invasion by alien species (*Toumeyella parvicornis* Cockerell) that has reduced vigor to the point of causing entire forest areas to disappear. Monitoring the state of the vegetation using remote sensing has highlighted the usefulness of this technique for preserving the biodiversity of the pine forest ecosystem.



Fig. 1. Satellite images taken in 2016 (sx) and 2023 (dx) are compared; they allow us the state of dieback of the pine forest of Domitian Litoral. On the right, spread of *T. parvicornis* in Italy in 2023 (data obtained from regional sites).



MATERIALS AND METHODS

The use of low-cost technologies and a good level of analysis allow us to evaluate when plant communities are in states of stress (Fig. 1). The Sentinel-2 images, available by the Copernicus consortium, made it possible through spectral indices to highlight the critical states of the vegetation of stone pine, ascertained with field surveys (Fig. 2).

In these contexts, biodiversity decrease represents one of the critical points, especially if associated with poor forestry management and the presence of repeated disturbances such as asparagus harvesting, fires, illegal tree cutting.

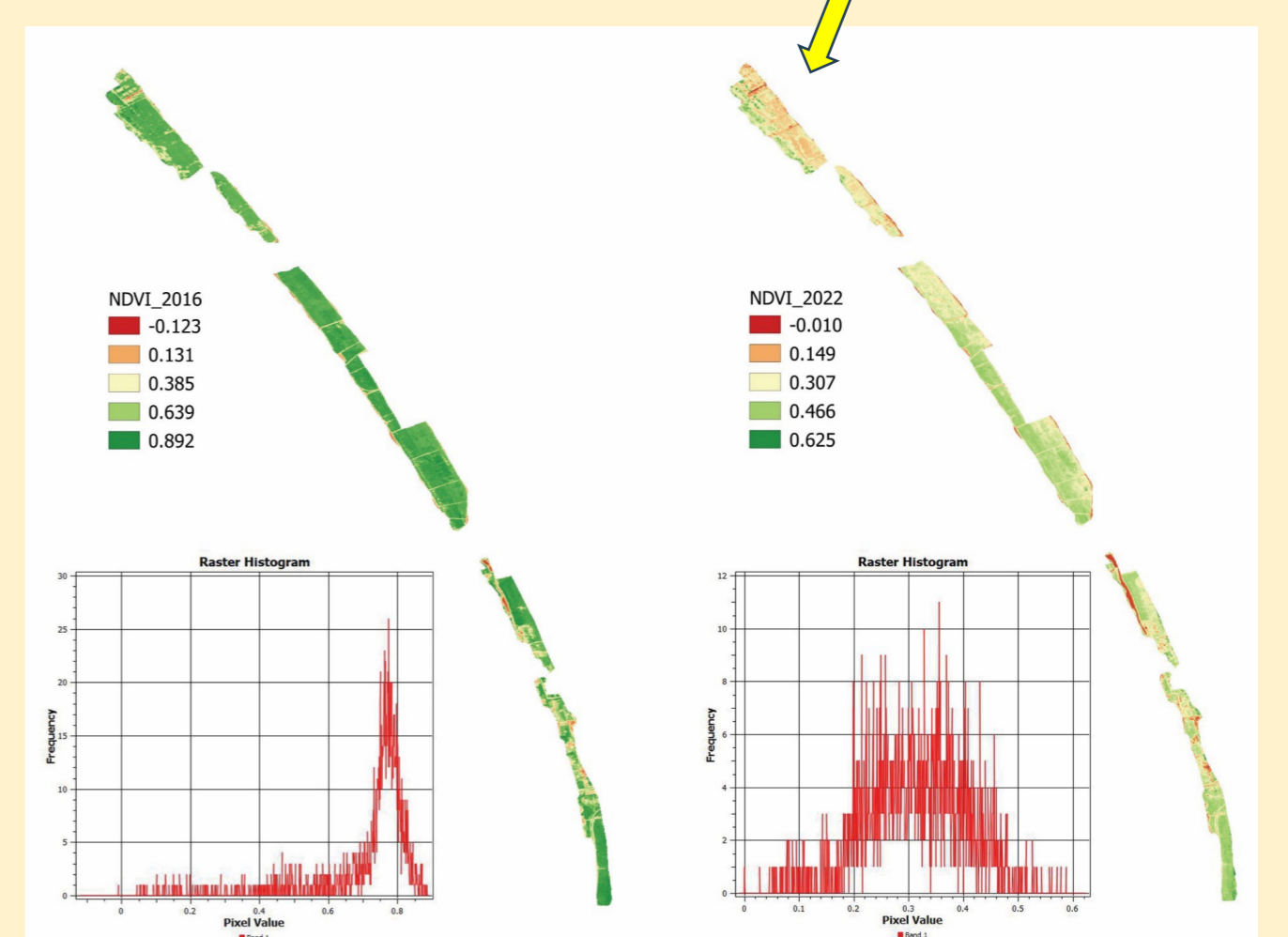


Fig. 2. The figure shows NDVI index for the years 2016 and 2022 with the related histograms; the photo allows us to highlight the state of dieback of the portion of pine forest coincident with the lower NDVI values.



Fig. 3. Reforestation interventions with *P. Pinea* and *Quercus Ilex*.

RESULTS

Analysis of this type allow us to plan the restoration of the forest using different species in order to encourage an increase in biodiversity (Fig. 3).

DISCUSSION AND MAIN CONCLUSIONS

The lack of timely eradication and monitoring of the spread of *T. parvicornis* has caused part of the pine forests to dry out. From a long-term perspective, more natural and less monospecific forests should be planted to reduce vulnerability to pests and increase biodiversity.