

The Fire of Montiferru

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Global change ecology - Unibo

July 2024

Outline

1 Materials and methods

2 Studied area

3 Data analysis

4 Conclusion

Images

Images downloaded from **Copernicus Browser**:

- Searched for the study area.
 - Cloud cover lower than 5 %.
 - Downloaded images True Color and False Color.
 - Images format .jpg high resolution.

Packages

For my script I used the following packages:

- terra
- imageRy
- viridis
- ggplot2
- patchwork

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Where?

We are in Sardinia, in the area of Montiferru, province of Oristano.

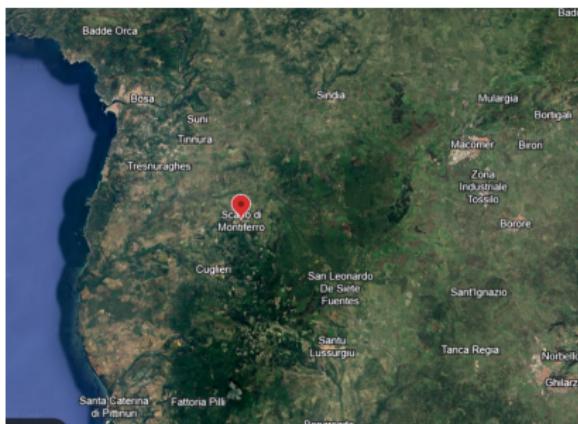


Figure: Province of Scano di Montiferro, OR

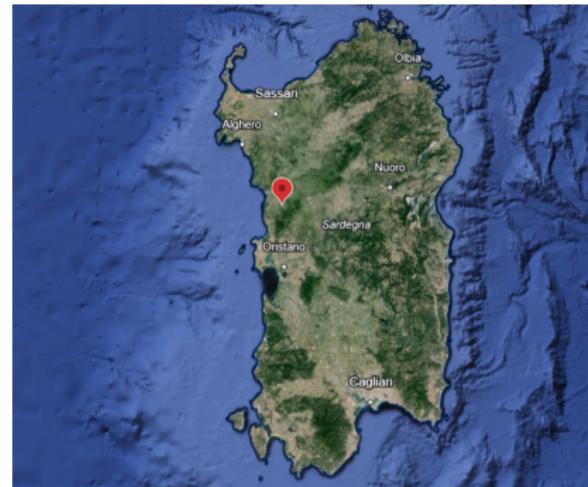


Figure: Sardinia region

What happened?

During July 2021, a massive wildfire destroyed the area of Montiferru, burning almost 13.000 hectares of land, of which 4.000 were woods.

It seems that the fire was caused accidentally, because a car caught fire on the road, but it turned out to be the worst wildfire that affected Sardinia in the past 24 years.

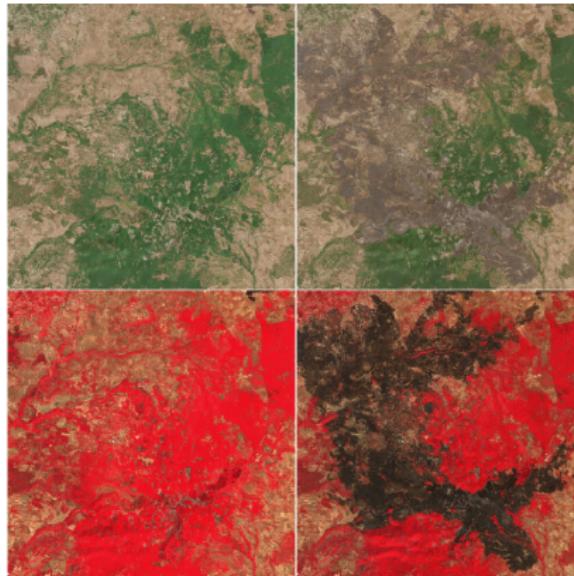


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Comparison July - August 2021

Let's see the difference before and after the fire with true and false color images.



Spectral indices

Through false color images we can calculate spectral indices for vegetation.

DVI

Difference Vegetation Index

$$DVI = NIR - RED$$

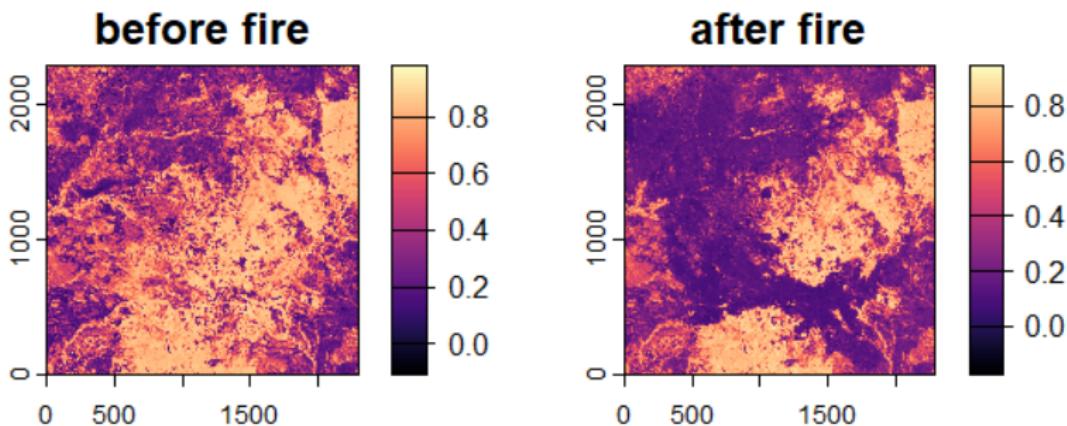
NDVI

Normalized Difference Vegetation Index

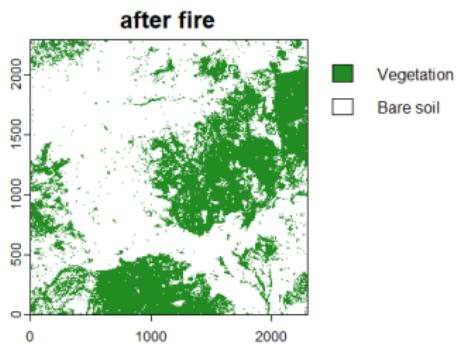
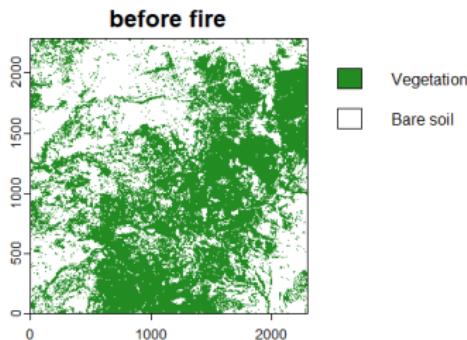
$$NDVI = \frac{NIR - RED}{NIR + RED}$$

NDVI

Let's see NDVI comparison before and after the fire
(July - August 2021)

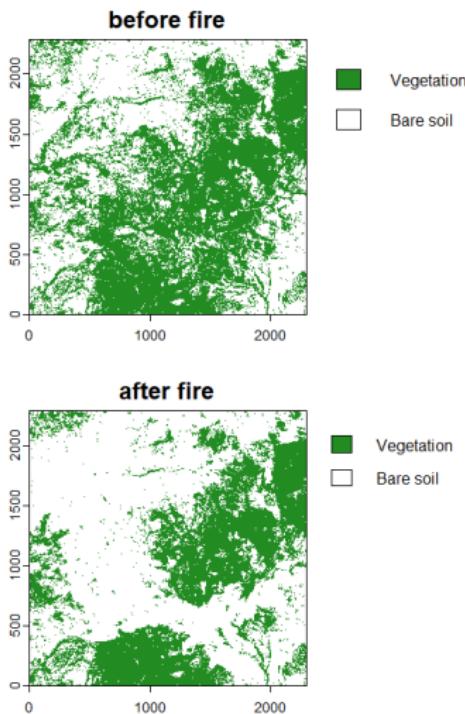


Classification



Classification based on NDVI values before and after the fire.

Classification



July 2021:

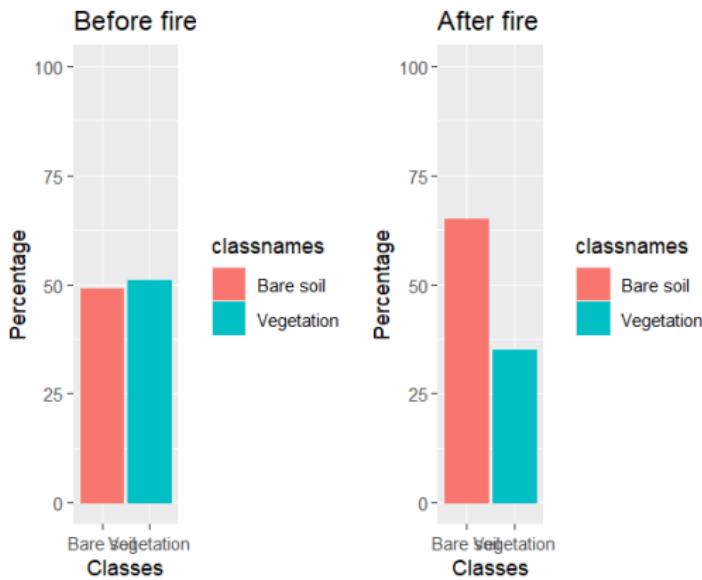
- Vegetation = 51 %
- Bare soil = 49 %

August 2021:

- Vegetation = 35 %
- Bare soil = 65 %

Classification

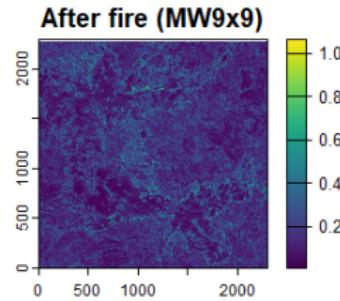
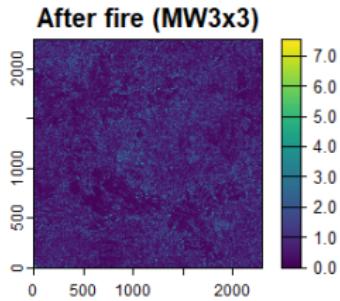
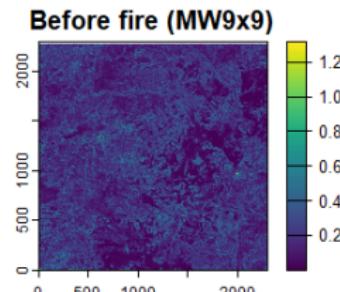
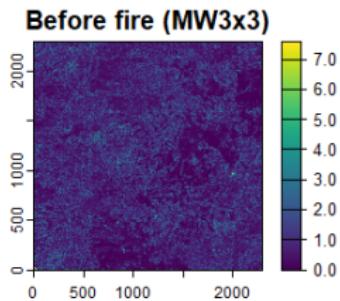
Let's visualize graphically the classes percentages before and after the fire.



We can see a clear vegetation reduction after the fire.

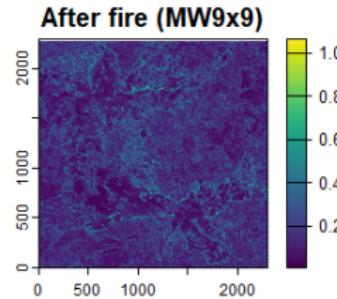
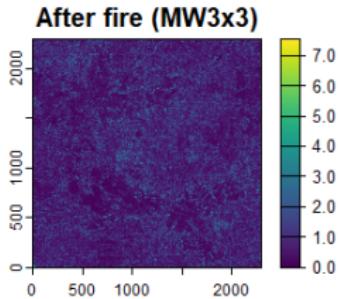
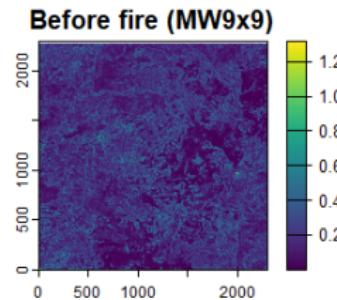
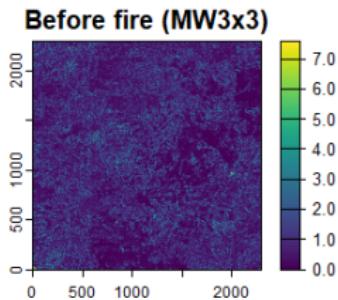
Spectral variability

PCA on NIR, R and G bands.
Moving window (MW) of different sizes on **PC1**.



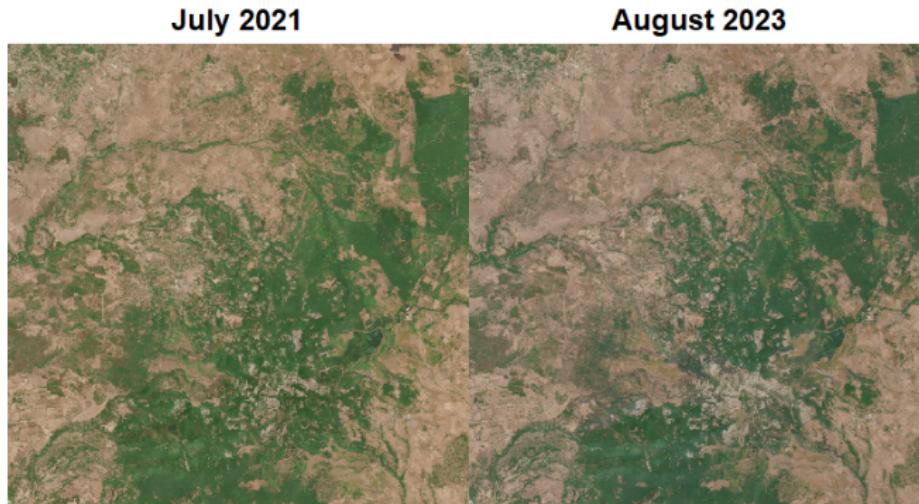
Spectral variability

We can see that the fire reduced the habitat heterogeneity, with a likely consequent decrease of biodiversity.



Recovery

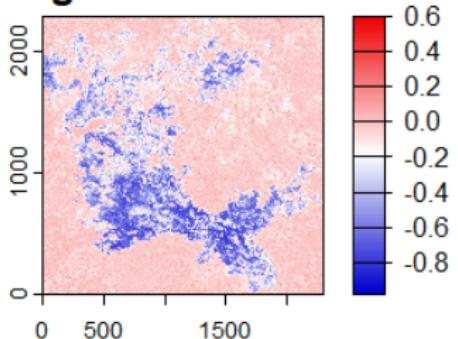
Let's compare the status of the area before the fire with the actual situation (August 2023).



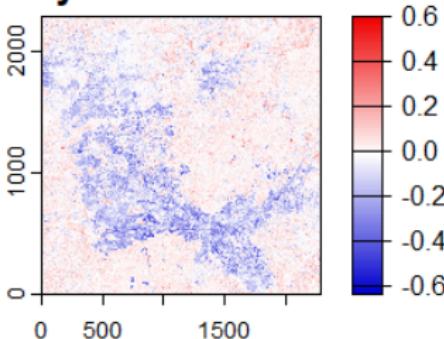
Recovery

Let's do another comparison by calculating NDVI differences between August 2021 and August 2023.

Right after the fire



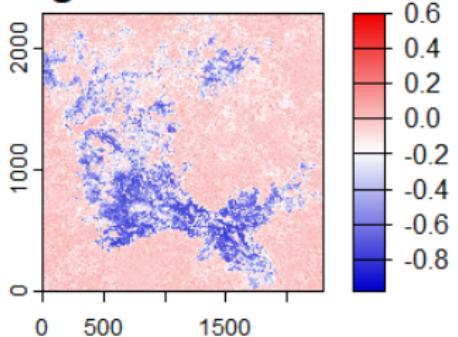
Two years after the fire



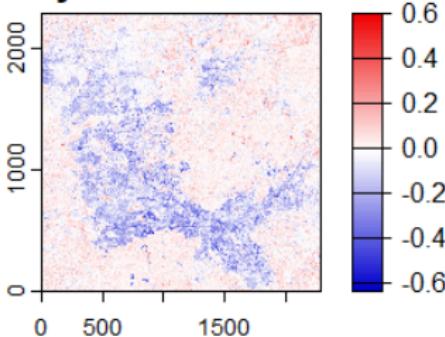
Recovery

We can clearly see that two years after the fire secondary succession is restoring the environment.

Right after the fire



Two years after the fire



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Resume

- Clear vegetation reduction after the fire.

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Resume

- Clear vegetation reduction after the fire.
- From July to August 2021, we are witnessing a vegetation loss of 16%.
- After the fire, the habitat results to be less heterogeneous with also a biodiversity decrease.
- Looking at the status of the environment two years after the fire, NDVI tells us that secondary succession is restoring the area.

The End

Thanks for the attention!