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Interaction between disturbances and their effects on the recovery of a heterogeneousMediterranean landscape in South America

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Fires and droughts are important drivers of disturbance in Mediterranean forests. Despite this, there is a gap of knowledge of the effect of climate change and particularly the interaction of longer periods of drought with other disturbance processes in remnants of native forests. As the frequency of these events is expected to increase in the future, it is important for forest managers to understand recovery patterns and the response of vegetation to these interactions. The objective of this work is to quantify the effects of the interaction of drought and fires in the recovery of Mediterranean-type forests at a local scale in South America using field data, satellite images, and trend analysis. These forests have experienced significant reductions in their extension and fragmentation, and in recent years have been subjected to the longest drought since there are records and that occurred between 2010 and 2020. Using a time series of Landsat satellite images (1986-2020) and the fire registry of the National Forestry Corporation (CONAF) we evaluate the relationship between the Normalized Difference Vegetation Index (NDVI) and other vegetation indices with characteristics measured in the field to evaluate the recovery after a fire event. We quantify the temporal trends of the NDVI to discover the location, direction, and timing of the change. In addition, we evaluate the interaction of climate, soil, and topography by forest type. We observe that the NDVI recovery slope is less steep in burned areas in the periods after 2015, exacerbating in topographic conditions of northern exposure (of the southern hemisphere). Even for the time period analyzed, some areas were reported where recovery levels still do not show a significant positive trend. We also observed a difference in the recovery of areas that experienced high severity fires versus low or intermediate severity fires in a period of drought, the recovery of areas exposed to a high severity fire takes twice as long to recover. These results indicate that the vegetation recovery processes can be negatively affected by the drought that occurs before, during, and after fires. Our analysis identifies spatially explicit patterns of short- and medium-term trends in these “new” regimes of prolonged droughts and fires, providing insight into forecast warmer and drier weather conditions so that our results can serve as a general framework for the resource management of these highly stressed areas, which can be applied to similar Mediterranean ecosystems.