



Conference Abstract

Grazing can alleviate drought stress in trees of natural and planted Mediterranean forests - long-term manipulation experiments at the edge of the desert

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Abstract

Mediterranean oak and pine forests support a large diversity of plants and animals, and provide multiple ecosystem services to the benefit of people. Many of these forests are threatened by climate change-induced drought, especially in marginal habitats and at the dry edge of their distribution. Livestock grazing is widespread in drylands, but research on the impact of grazing focuses mainly on the herbaceous vegetation and much less is known on the consequences for woody vegetation, including trees. The overarching objective of this series of studies was to evaluate the impact of livestock grazing on trees in natural oak woodlands and planted pine forests in the drylands of the eastern Mediterranean region that are affected by climate change. Our results showed that mortality of oak trees (*Quercus calliprinos*) in a marginal habitat for this species increased non-linearly with decreasing annual precipitation in a 10-year monitoring study. Cattle grazing in a semi-arid woodland consistently improved the water status, storage and use of oaks, and led to enhanced tree growth. The presence of cattle under the tree canopy

led to increased soil moisture, microbial activity, and nutrient availability, and raised the trophic level of the soil detritivore community. Pine mortality (*Pinus halepensis*) in an arid forest was particularly pronounced in extreme drought years and in soils with a low stone content, thus accelerating seasonal soil desiccation. Sheep grazing tended to improve the water status and increased the growth response to precipitation of these trees. In semi-arid regions, goat grazing in a *P. pinea* forest led to increased soil nutrient cycling and availability (nitrogen, phosphorus), while cattle grazing in a *P. brutia* forest reduced drought stress in trees. These studies showed that grazing can be applied as an adaptive land management tool to mitigate some of the negative impacts of extreme drought on oak and pine trees. Grazing might advance the conservation of natural oak woodlands and the sustainability of planted pine forests in drylands. This mitigation potential of livestock grazing might be key for survival of forest trees in a future warmer and drier climate.

Keywords

Mediterranean forests, woodlands, long-term ecological research, manipulation experiments, livestock grazing, land management, climate change, drought stress, trees

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Conflicts of interest

The authors have declared that no competing interests exist.