

# **Tourism carrying capacity of Mediterranean natural protected areas based on wildfire safety**

Ortega, Macarena and Molina, Juan Ramón

*Forest Fire Laboratory (LABIF). University of Córdoba. Campus de Rabanales. 14071 Córdoba, Spain*

## **Abstract**

Tourism has long been a major contributor to Spanish economy (Drius et al., 2019) and, currently, it plays a keystone role in the development of Mediterranean rural areas. Moreover, the awareness of conservation and the interest in natural protected areas have increased considerably in the last decades (Prévoit et al., 2018). Consequently, tourist arrivals, both domestic and inbound, have experienced a significant growth in protected areas, exerting higher pressures on the environment (Pickering et al., 2018). Regarding this constraint, the concept of carrying capacity (Chapman et Byron, 2018) emerged as the maximum sustainable level of human pressure that the area can support without degrading its ecological integrity or exceeding its capacity to maintain biodiversity and ecosystem services, preserving their natural values and avoiding damage.

In addition, due to Global Change, wildfires are becoming more virulent and the effects on ecosystems and population are becoming more devastating (Pausas and Fernández-Muñoz, 2012; Molina et al., 2017). Along with this, the increase in the number of visitors make wildfire risk of natural areas rises meaningfully. As a result, wildfires and their impacts are becoming frequent headlines in relation to tourism. The achievement of sustainable tourism requires the incorporation of wildfire disaster planning. Being adapted and protected from wildfires, allows natural areas visited by tourist to suffer less impacts and to recover faster from the disturbance of fire. Therefore, managers should be able to effectively protect natural areas from wildfires and preserve visitor safety. For this purpose, it is necessary to estimate the number of people who can safely visit the space, that is to say, the tourism carrying capacity based on wildfire safety.

The goal of this research is to develop this new approach and propose a methodology to adjust the optimum number of visitors admitted daily to a natural protected area according to wildfire safety. The tourism carrying capacity is modeled and calculated statically based on the physical carrying capacity, the structural building risk and the fire suppression difficulty, and it is adjusted dynamically with daily weather conditions and the derived potential fire hazard of vegetation. Under the most unfavorable wildfire scenario, the physical carrying capacity of natural protected areas could be reduced between 28% and 34% because of the recommended safety distance depending on the radiation heat flux. The results of this study will assist decision making to manage natural

protected areas integrating rural development and the tourist fire safety.

**Keywords:** wildfire protection, physical carrying capacity, fire management, potential fire hazard, structural building risk, fire suppression difficulty, radiation heat flux

### **References**

Chapman E.J., Byron C.J., 2018. The flexible application of carrying capacity in ecology. *Global Ecology and Conservation* 13. Drius M., Bongiorno L., Depellegrina D., Menegon S., Pugnetti A., Stifter S., 2019. Tackling challenges for Mediterranean sustainable coastal tourism: An ecosystem service perspective. *Science of the Total Environment* 652, 1302-1317 Molina J.R., Moreno N., Moreno R., 2017. Influence of fire regime on forest structure and restoration of a native forest type in the southern Andean Range. *Ecological Engineering* 102, 390-396 Pausas J.G., Fernández-Muñoz S., 2012. Fire regime changes in the Western Mediterranean Basin: from fuel-limited to drought-driven fire regime. *Climatic Change* 110, 215-226 Pickering C., Rossi S.D., Hernando A., Barros A., 2018. Current knowledge and future research directions for the monitoring and management of visitors in recreational and protected areas. *Journal of Outdoor Recreation and Tourism* 21, 10-18. Prévot A.C., Cheval H., Raymond R., Cosquer A., 2018. Routine experiences of nature in cities can increase personal commitment toward biodiversity conservation. *Biological Conservation* 226, 1-8