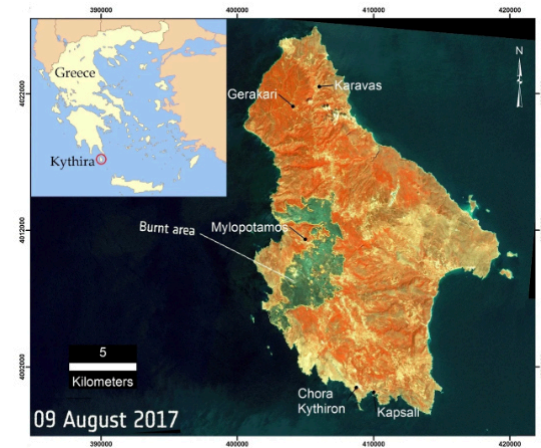
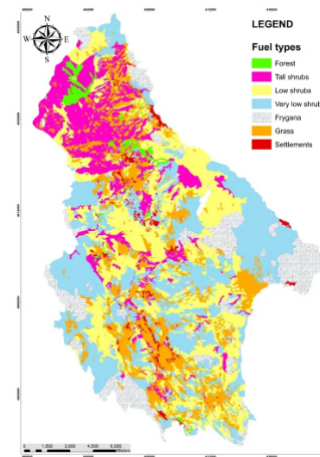


Forest fire prevention in Kythira island, Greece, through mobilization and cooperation of the population

Properly informed and mobilized citizens can help avoid fire starts and reduce damages. A project in Kythira island offers a good example.



Annotated false color composite image of Kythira, captured by the Copernicus Sentinel-2 satellite pair, immediately after the 4 August 2017 fire.
Author: Copernicus Sentinel Hub | © European Space Agency



Kythira forest fuel types map.
Author: Institute of Mediterranean Forest Ecosystems
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/// Context ///

Fire prevention is a complex task with a very important role in forest fire management. In remote places, such as Kythira island, with limited local firefighting resources, difficulties in transportation of ground reinforcements and delays in the arrival of aerial support due to distance, the role of fire prevention becomes critical. An in-depth analysis of fire statistics on the island, followed by documentation of significant past fires that was achieved by a detailed search in the archive of local newspapers, were used to make citizens aware of the problem and motivate them to contribute to fire prevention efforts. A key element of the project was harmonious cooperation of specialized scientists from the Institute of Mediterranean Forest Ecosystems (IMFE) of the Hellenic Agricultural Organization Dimitra and the Hellenic Society for the Protection of Nature (HSPN), with volunteering citizens of Kythira. The volunteers, with the need for prevention evident and under the guidance of the scientists, were mobilized, offered many ideas and devoted considerable time and effort to organize and carry out various activities. The most important overall outcome was an improvement of the overall picture: in the years that followed the 2017 disaster forest fires did not become an issue on the island again, although Greece faced two fire disaster years in 2021 and 2023. Of

In remote places, such as Kythira island, with limited local firefighting resources and delays in the arrival of reinforcements due to distance, the role of fire prevention is critical.

course, there have been fire starts but the number is much smaller. The average yearly burned area decreased sharply as there have been no major fires, and there have been no damages to structures.

The project demonstrated the possibility to improve fire prevention and reduce damages through education and mobilization of the population. This was achieved at a very low cost and included fuel hazard reduction carried out by volunteers at a few critical forest locations, while many locals invested effort to reduce the risk to their homes. However, all this did not happen spontaneously. There has to be a spark for such an effort to start and continue and there needs to be credible scientific guidance which, in this case, was offered by the scientists participating in the project.

Working with the local population on forest fire prevention for effectiveness and efficiency.

The fire prevention effort did not happen spontaneously. There has to be a spark for such an effort to start and continue and there needs to be credible scientific guidance and involvement.

/// Solution for a Resilient Future ///

Smart fire prevention solutions are necessary in small islands and other remote places in Greece. As the population is small and resources are limited, it is necessary to ensure that everybody is mobilized to reduce fire starts and prepare for the case of a forest fire that may burn for hours without adequate firefighting. On Kythira island this harsh reality became obvious when, in August 2017, a large fire burned nearly 10% of the island, causing damages and scaring locals and summer tourists. Soon after the fire, HSPN started efforts to turn the fear and anger of the people in a positive direction. “The Trip for the Regeneration of Kythira has started...” was an initiative about the rehabilitation of the island after the fire. In its efforts, HSPN requested the expertise and support of the researchers of IMFE. The two partners soon secured funding from the Green Fund of the Ministry of Environment and Energy for a low-cost project named “Innovative Action for fire prevention in Kythira through mobilization and cooperation of the population”. The project aimed to mobilize and raise the awareness of the residents of Kythira Island about preventing fires, strengthening security and avoiding disasters. It started in April 2019 and concluded in October 2021.

First, the scientists worked to understand and analyze the fire problem and the conditions (e.g., fuels, topography, weather) on the island, collecting and using data from various sources (fire statistics, local newspaper archives, weather data, published reports etc.). Through these, they identified the conditions (place and time) associated with very high fire hazard. Next, fuel situations on the island were identified through a field campaign, were assigned to fuel models and were mapped through manual interpretation/digitization, in a GIS environment, developing a forest fuel map for the island for the first time. The map was then used in fire spread simulations with a fire spread simulator (G-FMIS) to predict potential fire spread. An initial simulation of the spread of the 4 August 2017 fire, comparing predictions to the real evolution with good results, ensured confidence on the predictions of the system. Further simulations under plausible adverse fire weather scenarios highlighted the damage potential and risk to homes and infrastructures posed by wildfires that may occur in specific areas of the island.

Forest fire prevention involving citizens on a remote island in Greece.



Workshops with students at the school and citizens in local places.

Author: Gavril Xanthopoulos

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Smart fire prevention solutions with the local population are necessary in small islands and other remote places in Greece.

The scientific analysis helped to illustrate the need to be prepared for difficult fire behavior conditions that could occur without adequate firefighting support at the early stages of the fire, in a series of workshops that were tailored to specific audiences (students, farmers, tourists, tourism professionals, officers of the authorities, population at large). Both the importance of preventing fire starts and the need to improve the safety of homes became evident to all participants. This increased involvement in prevention actions, including participation in various activities, such as forest fuel management at selected locations, reforestation efforts, and contribution to volunteer groups that helped with the evaluation of the risk of destruction of nearly all the buildings (N=610) in three settlements. After training, the volunteers visited each structure and filled a form about the factors affecting its risk in case it is exposed to a fire (location, access, surrounding vegetation, building characteristics, availability of fire protection infrastructure, etc.). Using these forms and additional information (Google Earth, on-site visits), the fire experts assessed the risk to each structure and prepared a form, explaining the risk and suggesting pre-fire measures and response in case of fire, that the volunteers distributed to the owners. Furthermore, they mapped the structures and combined

Both the importance of preventing fire starts and the need to improve the safety of homes became evident to all workshop participants. This increased involvement in prevention actions.

Evaluation of the risk of destruction of a house due to a forest fire

House - Questionnaire Number:	XXX
Owner:	Unknown
Housing Location:	Gershori
Phone number:	Unknown



Index A - Hazard resulting from the characteristics of the forest fire	Very High
Index T - Vulnerability of the residence	Average
Index K - Integrated risk assessment for the structure	High

The risk of destruction of the house by a forest fire is High.

The surrounding vegetation is a factor of especially high risk to your house. You should contact the local Forest Service or the Municipality immediately in order to get help regarding prevention measures you could take. You have to clean the area around the house from dead flammable material to mitigate the danger from a possible forest fire. Causes have to be cut and removed, shrubs must be flamed out and lower tree branches have to be pruned to a minimum of 2 meters from the ground.

The vulnerability of your residence from a probable forest fire is average. There are some changes and improvements that should be made to the most vulnerable elements, which are a source of weakness. To keep the safety of your residence at a high level, make sure that in the case of a forest fire you will shut off the windows and doors in time, to prevent smoke and burning embers from entering. If you cannot evacuate in time, in an organized way and safely, you will need to remain in the house so that you will not be exposed to smoke and flames.

You should know that if you decide to stay and protect your residence, you should have received training by the Fire Service and should be using the proper equipment for personal protection and firefighting.

If there are obstructions to the access of the firefighting forces to your house, they may delay their efforts and decrease their ability to fight the fire.

A wooden pergola can be an element that increases the risk in case of a forest fire, especially if combined with straw, water seed or cloth to provide more shade. To decrease the risk, you may paint it with fire-resistant varnish, and may use a fire-resistant cloth.

Fences made with succulent vegetation (Thuja, Leyland, Cypress) are easy to ignite even from lighted embers and burn with great intensity. Fences made with broad leaved plants (such as Nerium oleander) and even better with climbing species (ivy, honeysuckle) offer protection instead, especially if they are watered regularly.

The above assessment is a short and non-exhaustive way of assessing the potential risk of destruction of a house by a forest fire. The method of calculation covers the most important factors of this risk and gives a fairly representative assessment, in order to offer a fast assessment to the owner as to whether his house is in danger and what could be the possible changes to improve the situation. By using the corresponding application on the IMFE website (<http://www.imfe.gr/grip/grip/Assessment-Form.html>) the results of possible changes that the owner will make in reducing the risk can be evaluated.

ATTENTION: As IMFE is not directly involved in the recording of data, but also due to the existence of many unpredictable parameters during the passage of a fire, IMFE cannot be held responsible for any failures. Citizens should be informed and follow the instructions of the official bodies in case of fire. More information on fire prevention for citizens is available at <http://www.imfe.gr/grip/grip/> and about the project at <http://www.imfe.gr/mediterranean-forest-ecosystems/>

All the scientific project results, were made available to the firefighting authorities for their operational fire management needs.

Example of a structure risk assessment form, returned to the owner, detailing the risk from fire, suggesting prevention improvements and response if it occurs.

Author: Miltiadis Athanasiou

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this mapping with mapped estimates of Safe Separation Distance (SSD) based on simulated fire behavior potential under adverse weather scenarios, to identify extreme risk hot-spots.

All the above, were made available to the firefighting authorities for their operational fire management needs.

Their response was very positive. Many articles in the mass media of Kythira and comments on social networks and in-person discussions were also positive. On the negative side, there were a few people among the local authorities who, without an obvious reason, remained indifferent about the whole effort.

/// Always Moving Forward ///

All the activities described earlier have certainly contributed towards the main objective of the project, to improve forest fire prevention in Kythira. The element of innovation was mostly in the way the technical work blended with the involvement of the local population in order to achieve better fire prevention efficiently. Community participation is sought and is a longstanding practice around the world. However, people's attitudes are very different between countries and continents and the same is true for their social structures and their natural and built environment. As a result, the examples of community involvement cannot be simply copied. The work in Kythira demonstrated that in Greece, where less than 10% of adults participate in volunteer activities, it is possible to attract and strengthen volunteerism even in remote places such as Kythira, if the people are approached properly, are helped understand the problem they need to face, and are offered knowledge and opportunities to co-create ideas, develop activities and contribute to solutions. Motivation is key to this and it was achieved by providing examples. As the other people watched the volunteer teams become organized and trained, and then visit structures in the three settlements completing forms, they became curious. Participation in the talks and the activities increased. Many owners of restaurants and coffee shops offered their space and infrastructure for free. The elementary and high-school teachers on the island also contributed enthusiastically, facilitating the work of the environmental educators of

The element of innovation was mostly in the way the technical work blended with the involvement of the local population in order to achieve better fire prevention efficiently.

the HSPN. The delivery of the final risk assessment forms by the volunteers to the structure owners, on a personal basis, further increased awareness and provided motivation by example.

The fire prevention project in Kythira took advantage of the "window of opportunity", created by the disastrous fire of August 2017, which made the people on the island very concerned about their safety and the damage caused to the island's environment. However, they did not act spontaneously. They were happy to volunteer when the opportunity came, and devoted a significant amount of time, but there was always the need for scientific and technical guidance and cooperation from the two project partners. This became evident by the loss of momentum caused by the measures for the COVID-19 epidemic that resulted in minimization of activities throughout 2020. The activities resumed when the experts of IMFE and HSPN were able to visit the island again.

Future prevention efforts in places like Kythira, will need similar support to get off the ground. In future efforts it could come from other directions (specialized forest service employees, local authorities, NGOs, trained and motivated volunteers, etc.). The example of Kythira clearly justifies development of a well-designed country-wide fire prevention program of this type, especially for islands and other areas that face similar problems with fires.

Effective and efficient low-cost prevention involving the population, requiring, however, guidance and motivation.

Projects of this kind are not easy to plan and carry out over large spatial scales. It is advisable that large prevention programmes (e.g. country level) should have certain guiding axes, common approaches, and supporting materials, but should also try to consider the local characteristics and to address the people locally. This can increase both effectiveness and efficiency. A small yearly investment in fire prevention, assigning/employing highly motivated specialized individuals, linked in a country-wide network with a small budget, to organize fire prevention activities, can make a substantial long-term contribution to reducing fire loads and damage. This cost could be less per year than three to four hours of flight time of aerial resources and the results could be tremendous.

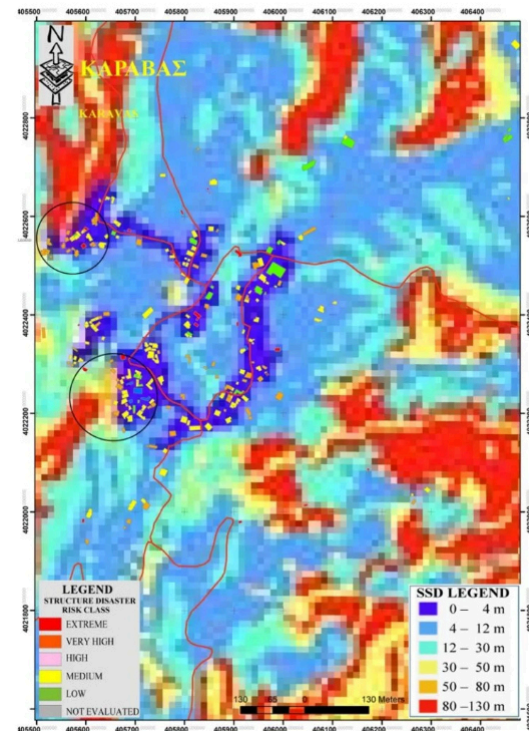
A small yearly investment in fire prevention, assigning/employing highly motivated specialized individuals to organize fire prevention activities can make a difference and can be cost-effective.

Part of the map that combines home risk and SSD. High risk spots are denoted with black circles.

Author: Miltiadis Athanasiou

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The fire prevention project in Kythira took advantage of the “window of opportunity”, created by the disastrous fire of August 2017, which made the people on the island very concerned.



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Authors: Gavriil Xanthopoulos, Miltiadis Athanasiou, Konstantinos Kaoukis, Georgios Mantakas

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