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Analysis of the Wildland-Urban Interface Fire Problem of Greece

Abstract

During the last 30 years Greece gradually acquired a serious wildland-urban interface fire problem, mostly intensified around metropolitan areas and touristic locations. Extensive urbanization of a large part of the rural population for economic reasons, unplanned touristic development and ever increasing demand for summer housing from the middle-class urban households have created acute human pressure for land use change through fire and, subsequent, encroachment on public wildlands. At the same time, human settlements engulfed by wildland vegetation and forest land fragmentation in a mosaic of agricultural, forest and rural areas have created increased fire hazard and fire suppression planning difficulties. The following measures are proposed for alleviating the problem: (a) Establishment of legislature pertaining to the regional and urban planning of wildland-urban intermix areas; (b) Strict regulations regarding the location of the waste disposal sites and other public and private enterprises of human activities in forest lands; (c) Legislature for fire safety regulations for houses and residents in the wildland-urban interface; (d) Special forest management practices pertaining to the 'peri-urban forests' (wildlands that surround urban settlements). All silvicultural treatments and management practices will set as priority the protection of the urban structures that they surround; and, (e) Development of particular fire-safety planning and installations designed for cultural monuments and antiquities that are surrounded by forest vegetation constituting the natural setting of the monument and part of its scenic beauty.

Keywords: Peri-urban forest, wildland/urban interface, fire, Mediterranean, Greece.

1. Introduction

Greece has a severe wildland fire problem which has significantly augmented during the last 30 years. Almost 80% of the total number of fires occurs at the Mediterranean zone which extends from the coastal line to an elevation of approximately 800 m, including all the islands. This area combines the typical Mediterranean climate (pronounced hot and dry period during the summer, mild winters with most of the total rainfall) with flammable vegetation types comprised of drought resistant and fire-adapted evergreen / broadleaved sclerophyllous shrublands (maquis) and low-elevation coniferous forests of Aleppo pine (*Pinus halepensis* Mill.) in the mainland, and Calabrian pine (*Pinus brutia* Ten.) in the islands. Also, due to the fact that in the Mediterranean zone of Greece takes place most of the country's economic activities (90% of touristic development, 70% of industry, 40% of agricultural activities, most urban development), over 70% of the total population is concentrated in these areas. This has resulted in an ever increasing human pressure on the natural environment for land use change, which is reflected by the high frequency of arsons and 'unknown'-cause fires in the wildlands. The intermix of human settlements with natural ecosystems created a severe wildland-urban interface fire problem that has become a major issue of political debate and confrontation, due to the public awareness and mass media attention especially during the summer months when most fires occur. We will analyze the wildland-urban interface fire problem of Greece in terms of its current status, causes and possible mitigation measures.

2. Causes of the Wildland-Urban Interface Fire Problem of Greece

Greece has undergone significant social changes over the last 30 years (since the 1970s) which created and aggravated its wildland-urban interface fire problem:

1. Large parts of the population from mountainous areas migrated to the major urban centers (internal migration). The 'urbanization' of Greece resulted in half the population residing in only two cities (Athens, Thessaloniki).

2. There was significant but unplanned touristic development all over Greece and, particularly, the Greek islands, resulting in a continuous construction of holiday resorts and hotel accommodations in the wildlands without any fire safety infrastructure.
3. There has been a 'fashion'- trend in most middle class urban families for acquiring a 'vacation house' near the sea for summer vacations.
4. Human activities in the forests have increased due to the enhanced accessibility that resulted from an extended forest road network in combination with the ever increasing number of private cars.
5. Numerous municipal waste disposal sites have been arbitrarily established on public forest lands.
6. There has been extensive intermix of agricultural areas, forest lands and rural settlements over large areas in the Greek Mediterranean countryside, creating a 'mosaic' of different land uses and fire hazards.

All these reasons resulted in tremendous pressure for land use change of wildlands for urban, touristic and agricultural development in the Mediterranean areas. Given the fact that Greece still lacks a national cadastre (register) and land use classification mapping, the public forest lands were the first to be attacked by arsonists aiming at the destruction of the natural vegetation through fire and, subsequently, the encroachment and conversion of the burned areas to urban settlements or agricultural areas. In most cases, law enforcement procedures for the eviction of intruders from the burned wildlands are time-consuming and ineffective. On the contrary, in many cases followed a 'legalization' of the encroachment on the burned public wildlands by the Greek government for 'social reasons', thus creating an additional motive for arson. Consequently, in Greece the most densely inhabited or touristically developed areas are fire-stricken (Attica peninsula with Athens metropolitan area, Thessaloniki with the Chalkidiki peninsula, Kavala, Aegean and Ionian islands, Crete, Magnesia and Evia) with severe fire rural/urban interface problem which coincides with high fire frequency and areas burned, mostly attributed to arson or unknown causes.

The wildland/urban fire interface problem of Greece first became apparent when a large, wind-driven fire on 4 August 1981, in the northern suburbs of Athens, resulted in the destruction of many luxurious residences. In 1985, numerous arsons destroyed the peri-urban forests that surrounded Kavala, in Northern Greece. In 1995, a large fire (6500 ha) in the Penteli mountain at the outskirts of Athens metropolitan area, burned approximately 100 structures causing panic to the population. Another fire at the same mountain in 1998 was equally destructive and received huge media attention and public awareness, thus creating a severe political issue. Multiple arsons burned most of the aesthetic forest that surrounded Thessaloniki in July 1997. Numerous fires devastated large areas of public pine forests at the Chalkidiki peninsula in 1981, 1985 and 1990, resulting in the development of numerous summer cottages and villas in the burned areas without urban planning. Additionally, significant economic losses result every year from fires that burn at the rural/urban interface and expand from forest areas to adjacent agricultural lands (mostly olive groves, grapevines, and wheat fields).

Finally, in most cases, the natural fire regime has been altered in the wildland-urban interface due to increased fire frequency, thus adversely affecting biodiversity and ecosystem processes in these areas. Also, expanding urbanization has resulted in wildlife habitat fragmentation.

3. Particularities of Fire Suppression in the Wildland-Urban Interface

Fire suppression in the intermix context of urban and wildland is complicated and particular. In some instances, wildlands constitute enclaves within urban environments, and suppression proceeds within the general context of urban firefighting. In other cases, houses form small 'islands' within a 'sea' of public wildlands, and wildfires must be controlled as ancillary functions to general wildland fire control. In other words, the mixture of wild, urban, agricultural, public and private lands prevents either urban or wildland fire strategies (Pyne et al., 1996).

Perhaps the really unresolved issue is not so much the suppression of an isolated structural fire but the protection of structures within the context of a true fire intermix (Weise and Martin, 1994). Ethical instincts and legal structures impose the preferential protection of houses (not to mention their residents) even if this means that the overall fire continues to propagate freely. Perimeter control is problematic; counterfiring is almost impossible; prescription control unthinkable. No clearly articulated strategy exists (NWCG, 1989). Instead, firefighting resources, especially engines, are massed and dispatched to protect structures. Control of structural fires differs from control of wildland fires in

several respects (Radke, 1983). There is, first, the question of people, victims who may need medical attention, residents who need evacuation, onlookers who may require restraint. There is also a matter of fire behavior. Compared to wildland fires, fuel loads in structures are heavier, fuel moisture lower, residence time longer, and fire build-up more rapid (Fischer and Arno, 1988). A review of past wildland-urban interface fires showed that most structures were lost or damaged when they were not separated from the surrounding flammable vegetation, built in steep (over 50%) slopes, and the firefighting forces had poor access to the structures, limited water supply, and they arrived late (Moore, 1981).

When a fire occurs, it is often unclear to what extent suppression should emphasize the saving of property or the containment of the spreading fire. It is likely that fire management will focus on just such issues in the coming decade (Gale and Cortner, 1987).

4. Proposed Measures for Alleviation of the Wildland-Urban Interface Fire Problem

The wildland-urban interface fire problem of Greece can be alleviated with a combination of institutional and technological measures:

1. Establishment of legislature pertaining to the regional and urban planning of wildland-urban intermix areas. These regulations should provide for restricted areas were construction is not allowed due to high fire risk, for maximum housing density per unit of wildland area, for adequate road network density for easy accessibility of all structures, for evacuation routes and sites in case of emergency. Also, strict regulations should apply regarding the location of the waste disposal sites and other public and private enterprises of human activities (open mines, amusement parks, picnic areas, nature trails, etc.).
2. Establishment of fire safety regulations for houses and residents in the wildland-urban interface. The residents will be obliged to apply all fire safety regulations at their own expense for their house (clearing vegetation, provide extra sources of water, use appropriate building materials) with severe penalty for the violators.
3. Jurisdiction by legislature should be granted to the firefighting forces regarding the selection of the appropriate fire strategy for optimal results (i.e., choice of fire protection priorities, forced evacuation of people from residences, destruction of fences and gardens, use of private water sources, curfew of vehicle circulation).
4. Assignment of a special category in forest management practices pertaining to the ‘forests at the urban interface’. These forests should not be managed on a traditional ‘sustained yield’ basis or as purely ‘protective forests’, but rather as ‘peri-urban forests’ (wildlands that surround urban settlements) and, therefore, all silvicultural and management practices will focus on the protection of the urban structures that they engulf. In other words, the primary management objective of the ‘peri-urban forests’ is the protection of the human lives and structures that reside in them, and secondary, the aesthetics of the landscape. These objectives should be clearly described and imposed by specific and regulatory guidelines issued by the Forest Service.
5. Provisions for extra water supply and intensive urban silvicultural practices (pruning, thinning, fuel removal and isolation, breaking of horizontal continuity, etc) should be applied in all peri-urban forests. Special underground installations for ample water supply should be established in the wildland areas prior to urban development.
6. Special fire-safety planning and installations should be designed and established for cultural monuments and antiquities that are surrounded by natural vegetation of high aesthetic value, constituting the natural setting of the monument and part of its scenic beauty (Ancient Olympia, Mount Athos, etc.). In such cases, all fire suppression measures should aim at adequately protecting the monument without disturbing the natural beauty of the site (Dimitrakopoulos, 2000).

5. Conclusions

During the last 30 years Greece acquired a serious fire problem at the wildland-urban interface, mostly intensified around metropolitan areas and touristic locations. Internal migration, touristic development and need for summer housing have created increased human pressure for land use change through fire and, subsequent, encroachment on public wildlands. Legislative and regulatory measures

regarding the function and management of 'peri-urban forests' need to be imposed by the State and Municipal authorities for fire hazard reduction and the protection of human settlements.

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