



Forest Fires in Greece 2007

1. A First Assessment of the 2007 Wildfires

1.1 Extent of the fires

No official data for 2007 available at the time of writing this report. According to the European Forest Fire Information System, about 270,000 hectares of vegetation in Greece had been affected by wildfires by mid-September. This figure exceeds by far any previous record. The vast majority, 184,000 hectares, went in just four days, between 24 and 27 August 2007.

Most of the fires occurred in the south of Greece, in Peloponnese. Burned area mapping by the laboratory of forest management and remote sensing of the School of Forestry of the Aristotelian University of Thessaloniki, in cooperation with the World Wide Fund for Nature (WWF), completed by the end of September, produced an estimate of 177,265 ha, specifically for Peloponnese. Forest and other natural areas accounted for 55% (97,618 ha) of the total burned area while agricultural areas reached 16,432 ha. More than 30,000 ha burned are classified as Special Protection Areas of the NATURA 2000 network.

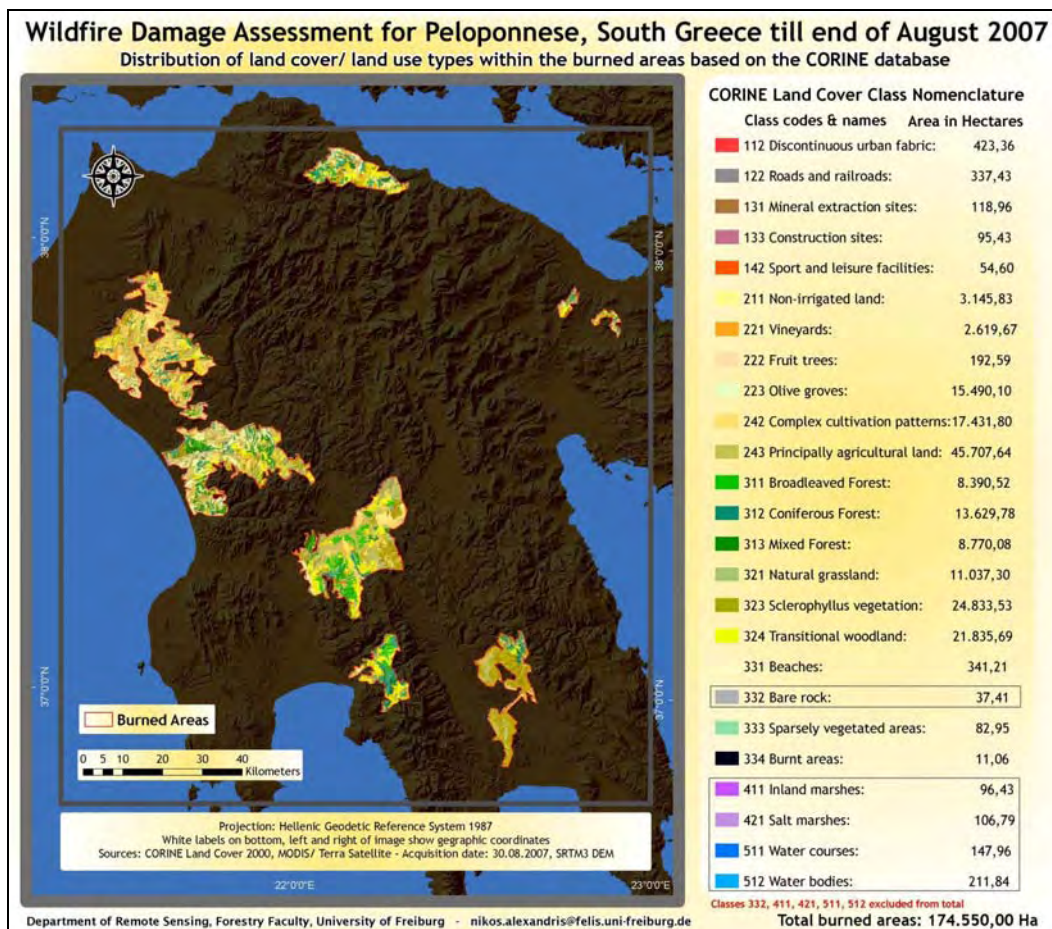


Figure 1. First quick assessment of the area burned by CORINE land cover classification at the end of August 2007. Source: Nikos Alexandris, Global Fire Monitoring Center (GFMC) and Department of Remote Sensing, Freiburg University.

1.2 Causes of the wildfires

There is lack of reliable data on fire causes in Greece, especially after 1997, when the responsibility of firefighting was transferred from the Forest Service to the Hellenic (Greek) Fire Corps. Earlier statistics from the Forest Service, however, reveal that around the late 1980s to the early 1990s the vast majority of fires were due to human causes (Table 1).

Table 1. Wildfire cause statistics of the Forest Service 1988-1993

Fires Causes	1988 (%)	1993 (%)	1968–1993 (%)
Lightning	2.6	2.7	2.4
Accidental causes	3.1	2.5	3.5
1. Power lines	0.8	1.0	0.7
2. Engine sparks	1.4	1.0	2.1
3. Use of explosives	0.3	---	---
4. Army target shooting	0.6	0.5	0.7
Negligence	27.3	28.2	36.0
1. Stubble burning	11.8	9.0	16.0
2. Cigarettes	4.0	2.1	8.7
3. Garbage burning	4.2	2.5	3.9
4. Workers in the countryside	3.8	4.0	3.2
5. Recreationists and hunters	1.6	0.8	1.3
6. Other known causes	1.9	9.8	2.9
Deliberate causes	33.5	18.0	29.2
1. Rangeland improvement	15.6	6.6	---
2. Arson			
Deliberate (for profit, revenge, etc.)	17.2	10.8	---
By people with reduced mental capacity			
Children	0.3	0.2	---
Pyromaniacs	0.2	0.2	---
Other psychopaths	0.2	0.1	---
Mentally retarded	0.0	0.1	---
Unknown or suspected causes	33.5	48.6	28.9
Total	100	100	100

Table 2 is based on more recent data from the Greek Fire Corps and refers to only those cases that were investigated by the corresponding Fire Investigation Department and a report was sent to court. Obviously, this is not a complete un-biased sample.

Table 2. Fire cause statistics for the period 2000 to 2005 from the website of the Greek Fire Corps (www.fireservice.gr)

Cause	2000	2001	2002	2003	2004	2005	Total	Percent
Unknown	628	714	469	640	721	532	3,704	37.60%
Arson due to negligence	481	835	409	453	553	437	3,168	32.16%
Deliberate arson	297	389	209	359	398	300	1,952	19.81%
Accidental	4	2	2	15	9	1	33	0.33%
Natural	80	235	182	233	158	107	995	10.10%
Total	1,490	2,175	1,271	1,700	1,839	1,377	9,852	100.00%

In short, more than 95% of the fires are due to human causes. There is a general tendency of people to believe that most fires are deliberate, started by people who want to achieve gains on public land, taking advantage of the lack of a complete land cadastre, or want to build homes in forested areas where this is prohibited. Although the existence of such motives cannot be questioned in some cases, there is a multitude of other reasons behind deliberate arson. Negligence is the most common cause. Education of people about fires is relatively poor. Furthermore, the general belief that “arsonists” are the overwhelming reason behind the fires, which is “cultivated” by the mass media, leading to indifference and negligent behavior of the people, does not help in reducing the number of fires that are due to negligence.

1.3 Description of selected extreme fires in 2007

In summer of 2007 Greece faced a very difficult fire season. Signs about the difficulty of the fire season were evident early on. Snowfall in winter was deficient, making it impossible for many ski areas to operate. Rainfall was also well below normal. A few rainy days in May did not solve the problem as they were followed by an early heat wave in the last days of June.

The difficult conditions were obviously the main contributing factor to the large fire disasters that the country faced. Some of the most notable ones are described below.

The fire on Parnis Mountain

The fire on Parnis Mountain, a few km NW of Athens that burned most of the Parnis National Park. The fire started in the area of Dervenohoria in the evening of 27 June 2007, at a distance of 15 km from the National Park. The cause were electric sparks from the overloaded power utility network that had been trying to cope with the high demand for electric power for the air conditioning units, as people were trying to find relief from the first – early – heat wave of the summer. Two large fires in central Greece, the first in the area of Agia on mount Ossa, that claimed two civilian lives, and the second on the extremely beautiful and highly visited Mount Pelion in Magnesia, as well as many other smaller fires, did not allow massive initial attack by aerial means. The fire potential was underestimated and firefighting efforts during the day of the 28 June 2007 were not of the urgency that would be expected for such a fire. In the evening, the fire passed the last open spaces at the base of Parnis and started a quick run in the draws of the mountain that were occupied by Aleppo pine (*Pinus halepensis*) forest at elevations below 800 m and fir forest (*Abies cephalonica*) above that. It created a huge convection column and rushed to the top of the mountain defying all efforts to control it.

The fire finally burned 5,600 ha including 2/3 of the precious Parnis National Park. More important, it created great concern for the people of Athens who felt that they lost an important natural reserve and recreation area which also helped to regulate the climate of the city and to filter the air they breathe.

The fire near the village of Doxaro, Rethymnon, Crete

On 11 July 2007, three seasonal firefighters lost their life while firefighting near the village of Doxaro, in the prefecture of Rethymnon, in Crete. A fourth firefighter sustained extensive burns and died in a hospital a few days later.

The fire was probably due to arson. Such events are common in Crete where shepherds regularly burn (illegally) the low thorny shrubs (mainly *Sarcopoterium spinosum*) called “phrygana” on the overgrazed rocky land, in an effort to stimulate growth of new palatable forbs and grasses for their goats. It started at 13:20 in an area such low shrubby vegetation bordering agricultural vegetation. According to the official announcement of the Greek Fire Corps, the total firefighting forces mobilized were 11 fire trucks with 30 firefighters, a Kamov-32 helicopter, two Canadair amphibian water bombers, and two hand crews of 8 firefighters each. It is unlikely that all these forces were on the fire at the time of the accident.



Figure 1. The draw through which the main fire entered into the core of the Parnis National Park late in the evening of 28 June 2007. The true fir (*Abies cephalonica*) forest burned completely. Average fire spread during this run was estimated at 4.5 km/h. Photo: G. Xanthopoulos.

The wind was not very strong and fire behavior in the phrygana vegetation did not appear threatening. The accident happened just before 17:00h. Based on the images projected on TV reports and on interviews of firefighters immediately after the accident, the firefighters tried to control the fire at the bottom and left side of a narrow steep canyon, using hoses from a fire truck that had stopped mid-slope on an unpaved road. They achieved this and retreated back on the road while there were small flames at some points on the opposite site of the canyon where the vegetation had not burned. Four firefighters of one of the two hand crews moved on that slope trying to extinguish these small flames with backpack pumps. At that moment the fire moved unexpectedly to unburned fuels under them at the bottom of the canyon. Helped by the nature of the fine fuels, the steep slope (more than 40%) and probably a wind gust, the fire became intense in seconds and started moving upslope towards the four firefighters. They started running but they made the choice to run along the steep slope moving further into the canyon where the fuels had not burned. The fire accelerated in the canyon behind them. They shouted for help on the radio. This is when their colleagues near the truck realized they were in grave danger but they could not react in the smoke-filled environment of the canyon.

The three firefighters fell after running for about 200 m. The fourth firefighter managed to climb a little further and protect himself in a little cave-like depression. According to the TV reports he suffered damage to his lungs in addition to receiving second degree burns over 40% of his body. Based on the accounts of the firefighters who witnessed the evolution of the accident, the time between the blow-up and the fatality was not longer than five minutes.

The four firefighters were 34 to 40 years old with 5-7 years of experience. According to their comrades they all were in good physical shape. Although it will be a long time before any official investigation reports, it appears that the two main reasons behind this accident are topography (box-canyon, Y-shaped near the point where the firefighters fell) and light flashy fuels. A third factor that may have played a critical role, since it was mentioned in some witness reports, is the firefighting activity of the Kamov-32 helicopter which produces a very strong downdraft. If it did make a drop in the canyon close to the area where the firefighters were operating, it could very well be the cause of the fire spotting to unburned fuels below the four firefighters and starting the blow-up.

The fire on Hymettus mountain

This fire was not important because of its large size but because it took place only three weeks after the fire on Parnis Mountain, on 16 July 2007, at the base of mount Hymettus, in an area that is practically in contact with the east side of Athens. It received extensive live coverage by the media and increased further the feeling of insecurity of the people.

The fire started at about 03:00pm in a well-guarded area next to the ring road of Athens, occupied by an Aleppo pine forest-park, under high wind conditions (45 km/h). In the 30 minutes that were needed for the aerial means to arrive it progressed quickly, unhampered by the suppression efforts of the ground forces, while the people watched, either from their balconies or from the live TV coverage. Then the aerial means arrived (6 Canadair water bombers, two Erickson and one MI-26 heavy lift helicopters) and taking advantage of the short distance to the sea (8 km) they controlled the fire in less than an hour. The final burned area reached 36 ha.

Fires in high elevation forests

Fires in high elevation forests, consisting of species like *Pinus nigra*, *Pinus sylvestris*, *Abies cephalonica*, *Abies alba*, etc. are quite uncommon in Greece. They usually occur for a short period at the end of the summer (August / early September) when these forests dry-out and before the first rains of autumn. The lack of snow and reduced rainfall of 2007 increased the probability for such fires much earlier. The fire on Parnis Mountain in late June was one such example.

Between July 19 and 5 August 2007, associated with the second heat wave of the summer, a series of fires erupted in high elevation forests, mainly in northern Greece, including many fires near the border with Albania most notable being the fire on Grammos mountain close to the city of Kastoria, a fire near the village of Kristallopigi of the prefecture of Florina, and a fire near the village of Amarantos, near the city of Konitsa in the prefecture of Ioannina; a fire on Belles mountain and another on Rodopi mountain both of them near the border with Bulgaria; and a fire on Pieria mountain in central Macedonia. In southern Greece, the fir forests on Parnassos and Elikonas mountains and near Fteri village in the prefecture of Achaia were also on fire.

Some of these fires continued burning for more than ten days. The amphibian water bombers are generally ineffective when fighting fires in these forests due to the long distance to the sea. Although heavy lift helicopters operated on these fires, their numbers were limited due to the high demand in many simultaneous fires. More important, water drops cannot fully extinguish fires in these forests that have thick canopies and deep humus and litter layers. Intervention by well-trained ground forces is absolutely necessary. Lack of well trained and sufficient in number hand crews in combination with poor tactics (for example, no use of fire to control fire) proved to be a major shortcoming. The nearly complete dependence of the Fire Corps ground forces on using water from fire trucks for putting out forest fires proved a major weakness in these areas that lack a dense road network.

On 5 August 2007 a cold front that passed over north Greece produced a lot of rain. In some places, especially in NW Greece, there was even heavy flooding. This helped to put out the fires in the mountains of north Greece. It also helped these areas to avoid what was to happen in the forests of southern Greece within the next month.

The fire of Aigialia

As the fires at the high elevation mountains were in progress, a series of fires also erupted in many parts of central and south Greece. Between 18 and 23 July 2007 attention was concentrated on the fires in the prefecture of Corinth, near the villages of Mapsos and Hiliomodi including the ancient site of Acrocorinthos – the ancient Acropolis of Corinth, a large fire near the city of Nafpaktos on the north coast of the golf of Corinth and a devastating fire on the tourist island of Kefallinia in the Ionian sea.

In the morning of 24 July 2007, a fire near the village of Kounina in Aigialia, an area along the north coast of Peloponnese in the prefecture of Achaia, caused huge devastation. The fire had been announced as “under control” the previous evening but re-started because the site was not attended properly. Being on a long steep slope and faced with delayed and inadequate initial attack, it accelerated quickly and very soon started threatening the villages in its path.

Within the next four days, the fire nearly reached the top of the north slope of the Panahaiko mountain burning more than 30,000 ha of forest and agricultural land, destroying more than 70 homes in many villages and killing three old civilians -a shepherd who tried to save his flock and two women who were unable to move and leave their home when it caught on fire- and large numbers of livestock. Furthermore, this fire demonstrated that the firefighting mechanism was unable to cope with the load imposed on it and was showing signs of collapse.

The fire of Penteli

On 16 August 2007 a fire started around 10:00am near a monastery on the slope of Penteli Mountain, the northeast boundary of the Athens basin. The initial ground attack failed. The northeast wind, blowing at about 25 km/h moved the fire front toward the Vrilisia and Nea Penteli suburbs of Athens. The fuel was mostly regenerating pine forest after a 1982 fire. The combination of heavy fuel and dry conditions with a medium wind resulted in the development of strong, nearly vertical, revolving convection column above the fire. The aerial means could not make water drops because of erratic winds and smoke, so the fire moved unchecked toward the two suburbs. Also, the rotation of the column resulted in a sideways spread of the fire flank in a west direction towards Kifissia and Ekali two of the richest suburbs of Athens.

At about 12:30pm the wind became stronger reaching approximately 35 km/h. The smoke column leaned forward, making it a wind-dominated fire (Rothermel, 1991), and the aerial means were able to start making drops. By that time, however, the fire had reached the settlements. By the end of the day the fire was partially controlled, after burning tens of houses and destroying an estimated 800 ha of precious forest. Again, all this was reported live on TV, making people wonder about the fire suppression mechanism's ability to protect them.



Figure 2. The fire of Penteli reaching the suburbs of Athens on 16 August 2007 at 12:47pm. Photo: Miltiadis Athanasiou.



Figure 3. Explosive fire behavior as the fire of Penteli, on 16 August 2007, is reaching one of the suburbs making police, firefighters and the public run for safety. Source: Footage offered to the Institute of Mediterranean Forest Ecosystems and Forest Products Technology by the Public TV Channel NET.



Figure 4. Explosive fire behavior as the fire of Penteli, on 16 August 2007, reaches one of the suburbs where it destroyed many houses. Source: Footage offered to the Institute of Mediterranean Forest Ecosystems and Forest Products Technology by the Public TV Channel NET.

The fires in Peloponnese and Evia

From 24 to 28 August 2007 a series of fires that started in the south part of Greece burned as if there was nothing and no one to control them. Within those days Greece faced its worst forest fire disaster ever both in regard to the size of burned area and to the loss of life and property. The damages were beyond imagination.

Fire danger had been extreme. Temperatures above 39°C for three days were followed by a day of strong winds with velocities of 50-70 km/hr winds and extremely low relative humidity. In addition to all these, the vegetation was severely water stressed. There had been no rain in southern Greece for the whole summer, and, for the first time on record, there had been three heat waves during the summer: the first in late June, the second in July and the third in August, just before the onset of the disaster. The level of water stress of the vegetation is reflected in predawn water potential measurements for August, made near Athens over a five-year period (Table 3) (Xanthopoulos et al., 2006). The summers of 2003, 2004 and 2005 had at least one rainfall event. In 2006, the last rainfall came in early in July. The water potential showed a pronounced drop by late August 2006, when two major fires occurred in Kassandra Peninsula (Northern Greece) and in the area of Mani in south Peloponnese. Although there had been some rain in late May 2007, June and July had been dry.

Table 3. Predawn water potential measurements of three Mediterranean species in Attica, in August of the years 2003-2007

Species	Water potential (bar)				
	5 August 2003	4 August 2004	7 August 2005	23 August 2006	9 August 2007
<i>Pinus halepensis</i>	-7.3	-6.5	-9.0	-23.7	-21.0
<i>Quercus coccifera</i>	-19.0	-20.0	-14.5	-28.5	-34.5
<i>Cistus creticus</i>	-20.5	-43.6	-26.0	-61.0	-45.0

When fires starting in this explosive situation were faced with ineffective initial attack from the ground, the stage was set for disaster. Two fires started on 23 August 2007, one on Mount Parnon east of Sparta and the other on Mount Taygetos west of Sparta in Peloponnese. They soon raged out of control. A new fire erupted the next day (24 August 2007) near the towns of Oitylo and Areopolis, roughly 30 km south of the fire of Taygetos. This fire caused the first six deaths and attracted the attention of the Fire Corps and the media – until news of massive fatalities at a new fire in Iliia (Western Peloponnese) came that afternoon.

As the news about the deaths started adding up, coordination started failing. New fires that started in other parts of Iliia, Arcadia, Messinia, Corinthia in Peloponnese, and on Evia Island north of Athens did not receive a proper initial attack. They escaped and started growing quickly. They were not attacked methodically. Fire trucks were sent to the villages in the way of the fires to protect them. Evacuations were ordered or spontaneously started from panic. The perimeters of all fires were practically abandoned. The fires grew and some united with each other. The large fleet of aerals did not offer effective help partly because of the extreme conditions (on some occasions Canadair planes were not able to operate safely due to the wind and smoke) but also because ground forces below them could not finish extinguishing the fire.

For the next four days, aerial and ground forces were seen as ineffective, thanks to the large number and size of fires and the countless pleas for help, many of them relayed through the 24-hour live TV coverage. The planes and helicopters were sent in for a few drops only to then be called-off to another fire.

Not realizing that tactical firefighting was doomed to fail, the Fire Corps kept pushing people to evacuate villages indiscriminately. They should have coordinated capable villagers to prepare their homes and agricultural fields (such as clearing grasses in their olive groves) in advance, fight flanking fires with their agricultural equipment or protect themselves in the village. To its credit, the government declared a general state of emergency, mobilized the army and asked for international help.

The fires in Iliia started merging with each other by 26 August 2007. The situation turned critical as the first aerial reinforcements from other countries started arriving. One of the fires reached the ancient

site of Olympia, which was surrounded by mature pine forest. The site and its museum were barely saved by focused ground forces, strong aerial support and an on-ground automatic sprinkler system installed before the 2004 Olympic Games that only worked partially. All the forest around it, however, burned down.

Things started to improve by 27 August 2007 as relative humidity increased substantially, the wind calmed and the temperature dropped. Locals, realizing they would be homeless if they abandoned their villages, often refused to evacuate and stayed to defend their homes (which are generally built with stones or bricks and reinforced concrete) and cultivations. Officers of the Forest Service with forest workers started building firebreaks and performing small scale firing-out operations. A ground crew from Cyprus that came to help, successfully used backfiring techniques on Evia Island, to the surprise of the reporters who had never witnessed this technique being used by the Fire Corps. A French hand crew did the same on Parnon Mountain. Heavy equipment from the army created firebreaks on relatively flat ground.

By that time, a huge aerial fleet was operating in the skies over Peloponnese and Evia. Twenty-three airplanes and 18 helicopters from European Union and non-European Union countries supplemented the Greek aerial forces, forming arguably the largest aerial firefighting fleet operating anywhere. Significant international ground forces also started to arrive, creating a model of solidarity that hopefully will be repeated if another country finds itself in need.

Taking advantage of the calmer winds, the firefighting forces brought most of the fires under partial control in the next few days. However, the Greek TV channels were showing battles against fire re-starts along the large fire perimeters until the 5th of September. Much of their footage looked as a textbook example of the ineffectiveness of aerial firefighting when it is not followed by well-coordinated ground firefighting (Xanthopoulos, 2007a).



Figure 5. Explosive fire behavior in Ilia. The type of fuel, a mix of *Pinus halepensis* forest and olive groves is visible. Photo: Miltiadis Athanasiou.



Figure 6. A crown fire burning *Pinus halepensis* forest in Ilia on 25 August 2007. Photo: Miltiadis Athanasiou.



Figure 7. A photo showing two fires mixing with each other in Ilia on 25 August 2007. The smoke of another fire behind the camera is visible at the top of the photo. Photo: Miltiadis Athanasiou.



Figure 8. Large convection column in Ilia on 25 August 2007. Photo: Miltiadis Athanasiou.

1.4 Fire Damages in 2007

Eleven people had died before the huge fires at the end of August. The toll includes two Canadair CL-415 pilots who were killed on 23 July 2007 when they crashed while fighting a fire near the town of Styra on Evia Island. Then, the devastating fires of August claimed sixty six lives more. Most of the dead were caught in the open, either trying to flee or surrounded by the fire as they were trying to save their property. This death toll of seventy seven lives far exceeded anything that the country had experienced in the past (Xanthopoulos, 2007b).



Figure 9. Fire behavior in maquis in Arcadia on 31 August 2007. A spot fire that has started growing is visible to the left of the main fire. Photo: Miltiadis Athanasiou.

More than 110 villages were destroyed leaving thousands of people homeless, surrounded by blackened land. The government tried strongly to handle the situation on the public relations side. It announced increased support for the people whose properties were destroyed. It also talked about an organized arson plan, without, however, presenting any evidence.

More than 2/3 of the prefecture of Ilia burned. Large areas also burned in the prefectures of Arcadia, Laconia, Messinia, Corinthia, and on the island of Evia. Much of the burned area is agricultural, mainly olive groves. Estimates about the total financial damage of these fires vary tremendously as they are influenced by politics. An independent estimate by the international assessment firm Standard & Poors brought the damage in the range 3-5 billion €, corresponding to 1.4-2.4% of the gross national product of the country.



Figure 10. A well maintained olive grove in Arcadia that survived the fire. Photo taken on 1 September 2007 by Miltiadis Athanasiou.

As mentioned earlier, the total burned area exceeded 270,000 ha. The fire in Ilia exceeded 45,000 ha, breaking the all time record set in Aigialia only a month earlier.

The government won the elections on 16 September 2007. After that it continued providing support to the affected population. Aid also came from other countries such as Cyprus, from the private sector of economy (construction companies, banks, communication companies, etc.) and from private citizens and volunteer organizations. The government also initiated urgent burned area rehabilitation works trying to reduce damages due to flooding. Given the size of the burned areas it was not possible to protect all areas before the autumn rains. Significant damages occurred, especially in Ilia, but huge disasters and loss of lives have been avoided so far (December 2007).

The environmental damages are heavy. It is known that Mediterranean ecosystems are resilient to fire. However, the size of the burned areas is important. In this case the size is huge, being to a large extent the result of successful fire suppression in the previous "easy" fire years. Given this size soil erosion and flooding potential are much heavier than ever before. Wildlife has difficulty finding refuge and food. Seed sources for non-fire adapted species are often many kilometers away and will probably result in changes in vegetation composition. This is more of a problem in the high elevation forests where natural regeneration of *Abies* spp. is far from certain and even artificial regeneration through planting of seedlings cannot guarantee reestablishment of *Abies* stands.

It should be noted that the huge losses of 2007 followed a series of relatively “good” fire seasons, after the also disastrous fire season of 2000. The heavy investments on the fire suppression mechanism in the previous years appeared to have solved the problem. However, as explained below, this was far from true.

1.5 Fire prevention measures in 2007

The difficulty of the 2007 fire season was not hard to predict. It was evident by the end of February and the government tried to respond to it. Unfortunately, although the General Secretariat of Civil Protection produced a very successful daily next-day fire danger prediction map, the fire prevention mechanism of the country that includes among others the local authorities, the Forest Service, the Local Civil Protection officers, etc., proved inadequately prepared to take advantage of it. The efforts and funding spent were clearly not enough to make a difference.

Public preparedness proved to be extremely poor. Television and radio messages were relatively few and poor, and did not manage to alert and sensitize people. It suffices to note that in many cases in Peloponnese, the locals flocked the coffee shops in the villages discussing and watching the 24 hour coverage on TV as the fire burned their neighboring villages, instead of clearing vegetation around their homes before it was the turn of their village to be overrun by the fire.

Also, forest roads and firebreaks that would logically have to be prepared for such a fire season in a timely manner were not properly attended. Funding funneled from the General Secretariat for Civil Protection to the Regions of the country for such tasks, was inadequate and did not get in the proper hands (Forest Service) in time. The local authorities that mostly received such funds did not always act effectively or even properly.

1.6 Response to fires in 2007: Fire suppression

The Greek government, officially realizing the difficulty of the fire season of 2007 increased the number of contracted heavy-lift helicopters. However, this was not followed by efforts to strengthen the ground forces accordingly both in regard to training and preparedness and in terms of the number of seasonal employees. Furthermore, an unusually large number of Fire Corps officers retired in March as a result of the yearly evaluation of the top ranking officers.

During the fire season these shortcomings became evident. Neither the central coordination centre in Athens nor the local commands performed well especially in regard to achieving effective initial attack. Firefighters on the ground often found themselves without guidance or a specific plan to follow. Without these and proper material support their effectiveness was often very poor. Although the media tried to avoid blaming the firefighters, there was a lot of criticism towards the top officers of the Fire Corps for the obvious inadequacies and mistakes that contributed to the disaster.

2. National Cooperation in Responding to the 2007 Fires

2.1 Role / action of agencies at national and provincial level

The national cooperation in responding to the 2007 fires was relatively poor. The long-term problem of fuel build-up, which has been worsening in the last decades as the young people are abandoning the countryside and the Forest Service has been unable to manage forests appropriately – itself deteriorating in personnel, organization, funding, and morale after losing the responsibility for fire suppression to the Fire Corps in 1998 (Xanthopoulos, 2000) – has not been addressed by any means. Even locally, there was no effort of the Forest Service, the Local Authorities and the people to work together in the direction of preparing defensible space around the villages. In the publicity battles played on the mass media there was little room for fire science or the voice of true experts.

The Fire Corps personnel suffered a lot during the fire season. They did put a lot of effort and often stressed themselves to their limits but the result of their efforts was very poor. Their shortcomings in their own organization scheme, training, planning, manning etc., were further compounded by their poor level of cooperation with the other agencies, such as the General Secretariat for Civil Protection, the Forest Service, and even the Armed Forces (except for the Air Force which operates the Canadair water bombers). They also did not do a good job in organizing and supporting local volunteers and incorporating them in their plans.

The Army was mobilized by the government to support the Fire Corps only after the major part of the disaster in Peloponnese had already taken place. As a result its contribution was quite limited.

2.2 Role / action of local communities

The passiveness and even indifference exhibited by many people living in the affected areas were a real surprise to all those closely observing the evolution of the events. It is also difficult to explain. A possible explanation may be that the people were influenced by a sense of total disaster and inability to do anything that was reported by the TV stations. Little if any useful guidance was offered during the critical period of the last days of August. It was only after the first 2-3 days that local Forest Service officers with forest workers and some locals, realizing the breakdown of the suppression mechanism, started to act, clearing parcels of land and burning-out areas to stop the perimeter of fires that was otherwise unattended, and protect communities and properties.

3. International Cooperation

3.1 Receiving assistance

As mentioned earlier, the international help that was received by Greece was substantial. It consisted mostly of aerial resources but ground crews were also sent to help with firefighting operations. The European Union Civil Protection passed the Greek requests for help to the other EU countries. The Greek Prime Minister also communicated directly with the Russian president and secured additional Russian aerial resources to those contracted from the beginning of the season, including, for the first time, a Beriev-200 amphibian water bomber. The resources that arrived and operated in Greece in the last days of August and the first days of September are shown in Table 4.

Greece did not provide assistance to a neighbor country in 2007.

Table 4. A list of the countries that offered help with firefighting and the type of resources they contributed. Source: Official announcement of the Greek Fire Corps.

Country	Aerial Resources		Ground Resources	
	Airplanes	Helicopters	Personnel	Vehicles
France	4		72	
Spain	4			
Italy	1			
Croatia	1			
Turkey	1			
Portugal	1			
Russia	1			
Romania		1		
Serbia	7		55	7
Germany		5		
Switzerland		4		
Netherlands		3		
Austria	3	2		
Norway		1		
Sweden		1		
Slovenia		1		
Cyprus			139	14
Israel			60	
Hungary			19	5
Albania			4	1
Bulgaria			46	5
International Volunteers			7	
Total	23	18	402	32

4. Analysis and Recommendations

There is no question that the fire season of 2007 was a very difficult one in Greece. However, it cannot be considered unique, and it would be very simplistic to attribute the disaster to "extreme conditions due to climate change". For example, the period 1992-1994 was so rainfall-deficient that the water reserves of Athens dropped to such alarming levels that special measures had to be taken to reduce water consumption. Fires were difficult in those years and lives were lost (Xanthopoulos, 2007b) but the burned area remained at about 60,000 ha for each of the three years.

If adverse conditions are not the only one to blame for this disaster one should look for other contributing reasons. In the opinion of this author such reasons are the specific errors described earlier, but also some long term weaknesses of the current fire management scheme:

Firefighting organization (Greek Fire Corps) operational weaknesses:

- Heavy reliance on aerial means support during initial attack, which has led to relative complacency of the ground crews. Unfortunately this approach failed in 2007 due to the quick acceleration of the fire and the lack of timely and adequate aerial support due to the large number of fires.
- Inadequate dispatching and coordination by the central coordination centre in Athens.
- Lack of sophistication in coordinating large scale firefighting operations. Use of maps, fire behavior prediction tools, fuel maps etc., if any, is limited. Without good coordination by well trained and experienced officers, the often heroic efforts of the firefighters are wasted
- Nearly total reliance of ground forces on water for extinguishing the fire. Use of hand tools is limited and there is no provision for use of fire for fire control (backfire, or even burning-out). As a result, effectiveness in areas with few roads (such as in high elevation forests) was very low.
- The huge budget spent for forest firefighting every year is used mainly for contracting helicopters. Very little funds are diverted for other important purposes such as modern training, purchasing personal protection equipment, obtaining additional tools for alternative fire operations (e.g. portable pumps, drip torches, etc.).

Flawed overall fire management organization:

- The Forest Service, after losing forest firefighting responsibility to the Fire Corps in 1998, has practically been excluded from fire management operations. Although, according to the law it is still responsible for fire prevention, its deteriorating status and lack of funding preclude any serious work on this.
- Forest management has nearly been abandoned for the same reasons. The result is increasing biomass in the forest. The abandonment of villages by younger population contributes further to the problem of fuel build-up.
- Forest road condition has been constantly deteriorating due to lack of funding for maintenance.

The problems have been obvious for sometime and have been explained in writing many times (Xanthopoulos, 2000, 2004, 2007c). However, as firefighting is more straightforward and impressive, it has not been possible to this date to convince decision makers about the need for a balanced approach that will involve all players in a system that will maximize their contribution towards an integrated and effective fire management scheme. It can only be hoped that the disaster of 2007 will bring second thoughts, realization of the flaws, and changes in the right direction. Otherwise, if emphasis is given only on increasing the firefighting capacity quantitatively, acquiring or contracting more aerial means and hiring more firefighters, it will not be long before Greece will experience another round of disaster.

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