

# Forest Fires in Israel

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Fire is the most important natural threat to forests and wooded areas in Israel. It destroys more trees than all other natural calamities: parasite attacks, insects, etc. During the past decades, Israel experienced a sharp increase in the number of forest fires of various extents and levels of severity<sup>1</sup>.

The Mediterranean ecosystem in Israel was damaged. Hundreds of years of grazing, fires, and cutting for wood and fiber production left the landscape bare from woody plants. During the last hundred years the landscape was rehabilitated (naturally and by men). Cutting, grazing, and burning are forbidden, unless permitted and intensive forestation occurred. The planted forest areas grew from 301 km<sup>2</sup> at 1960 to 1,035 km<sup>2</sup> at 2010<sup>2</sup>. Forests cover now 8% of Israel and they spread over 1,661.6 km<sup>2</sup>. The main trees are:

Conifers, which spread over 495 km<sup>2</sup>, of which 413 km<sup>2</sup> with the main genus is *Pinus*;

*Eucalyptus* is planted over 81 km<sup>2</sup>;

Further broad leaves species include *Quercus* and *Pistacia*.

Most of the forests were planted in the center and north of the country. The rise of land surface covered by forests and their poor management increases the likelihood of fire. Due to the size of forests nowadays, the fires spread over larger areas than in the past.

Forest fires in Israel (like in other Mediterranean countries) are largely conditioned by the local Mediterranean climate: long, warm and rainless summer and autumn (May-November), and generally mild winter (November-March). Rainfall is relatively heavy in the north and in the center of the country, and almost negligible at the south (ranging from 700 mm rainfall in the north to 100 mm in the south)<sup>2</sup>. The long dry summer with high temperatures reduces the moisture content of dry plant debris and leaves. Dry forest litter is especially susceptible to ignition, which can lead to wildfires.

The majority of fires are caused by humans<sup>3</sup>. Some are associated with fixed installations (power lines, rubbish dumps), others are linked to human activity, mainly carelessness of people that visit forests, military exercises, wars etc. The anthropogenic pressure in Israel is very high and it tends to increase over the next years<sup>4</sup>. Israel is one of the most populated countries in the world. Its population increased from 872,700 people in 1948 to 7.8 million people at 2010<sup>2</sup>. The total land area of Israel is 21,000 km<sup>2</sup>, which means an average of approximately 370 people/ km<sup>2</sup>. The country is most crowded in the central part, with 7,000 people/ km<sup>2</sup>.

## Forest Fires

More than 30,000 fires started in the open spaces between the years 1987-2007, which means an average of 1,000 fire events/ year and an average of 3,700 hectare burned every year. While 53% of the fires occurred during the months of May and July, many happened during autumn. The combination of long dry season, accumulation of dry herbal material, and consecutive high

cover raise the probability of fires to start and spread during this season<sup>5</sup>. Most of the fires start within a distance of 50 meters from roads and/or in areas with human activities. Even when the origin of 50 to 77% of the fires is unknown, it is assumed that most if not all fire events in Israel are caused by human activities<sup>6</sup>. Several forest fires in the north part of the country were caused by wars. For example, during the second Lebanon war (July 2006) forest fires erupted after the fall of missiles and nearly 100 hectare of forests were burned<sup>3</sup>.

Most of the fires in Israel are considered small and affect areas smaller than 1,000 hectare. 5% of the fires burned 95% of the area. The most devastating forest fire in the history of Israel (2-5 December, 2010) occurred on Mount Carmel. The blaze, which lasted 3 days, destroyed 5 million trees, 3,500 hectares of chaparral (mostly *Pistacia* and *Quercus*) and 400 hectares of planted forest (pines mostly). 44 people died and the damage to property was estimated at 40 million\$, and another 40 million\$ damage to roads and forest. This event is considered the biggest natural disaster in Israel<sup>4</sup>.

Unfortunately there is no organized database of forest fires in Israel. Partial documentation was collected by the JNF (Jewish National Fund), a professional organization responsible for treating the forests, and the INPA (Israel Nature and Parks Authority), an organization responsible for the open spaces. Since 1987 the collection of data improved, its more detailed, precise and comprehensive, still the database is not complete. The following informative data has been retrieved from the database in the Carmel mountains only<sup>5</sup>.

According to the database of the Carmel Mountain the number of forest fires increased from 1944 to 2009<sup>5</sup>. During the 1944-1986 period there were approximately 10 forest fires per year. Over the next 12 years (1987-2009) there is a dramatic increase in forest fire events with an average of 20 fires per year. Fire return time (average interval of time between two fires in the same place in one ecosystem) in areas bigger than 500 hectares is 6%, which means a probability of fire every 16.5 years according to calculations of the database. In case of areas larger than 150 hectare the probability is 16%, which means that fire return time is 6 years. From these figures it appears that recurrence of forest fires on the Carmel Mountain is frequent (the fire return time interval is very short). Between 1940 and 1973 six big fires occurred and devastated over 100 hectares of forest. From 1974 to 2010 10 big fires were observed. Thus, the occurrence of big fires increased dramatically in this hilly region of Israel. Since it takes almost 40 years for the forest trees to reach the mature phase, fires on Mount Carmel are particularly destructive.

## **Fire preventing**

### **1. Forest management**

Forest management includes the following steps: thinning, pruning, grazing, sanitation, and evacuating tree waste. All these operations have huge influences on forest fires. Recommendations regarding these procedures have been changed during the last decade. Updated recommendations will be published formally over the next years (David Brand, JNF-personal communication). According to the new instructions thinning and pruning are defined as steps meant to prevent spreading of forest fires. The main aim of grazing is to reduce the amount of flammable material in forests. In Israel variable biotic and abiotic conditions (vegetation, soil etc.) are observed within one forest.

The new recommendations must thus be flexible in order to be applied by foresters in accordance to the specific local conditions of a particular forest.

After the fire on Mount Carmel (December, 2010) recommendation for use of firebreaks were reconsidered. The main aim of creating firebreaks is to decrease the intensity and spreading of fires, and to create a space that fire forces can use to operate from against fires. The mass of flammable materials must be cleared from the firebreaks. The recommendation suggested that the length of firebreaks should be 75 meters. They function like a line of defense, which means that all trees and other vegetal material should be removed. There is a strict guidance how to create and sustain them (type of vegetation allowed etc.). There are several different types of firebreaks according to the needs of protection. The most important ones - with most strict rules, are found around settlements to protect the built areas. Firebreaks should be created in forests as well, to help protecting the spread of fire from one area to another.

Due lack of knowledge the authorities responsible for forests in Israel (JNF and INPA) never used human-initiated fires to decrease the amount of inflammable material and therefore decrease fire risks.

## **2. Activities to minimize forest fire damage.**

Fire extinguishing material expenses account for only 15% of forestry budget of the JNF. This includes maintenance and operation of JNF's firefighting services, which include 22 firefighting vehicles, dozens of fire fighters on duty 24 hours a day, communications systems and 30 fire watchtowers in forests occupied by guards during the summer season throughout the country<sup>7</sup>. Other facilities include water infrastructures, and improved roads (in the forests in order to allow fire forces to reach the fire place easily). JNF also operates a forest fire risk forecast service.

During the years 1989-2001 'Yasur' helicopters of the Israel's military with water container were used for putting out fires. The use of the helicopters was stopped at 2001 since carrying water damaged the chassis of the helicopters. As a result of the big fire at Mount Carmel, 'Elad Squadron' was established in 2011. It includes 5 extinguishment planes, model Air Tractor AT-802.

## **3. Public education and explanation:**

Since most of the fires in Israel are caused by human activities the main effort is to educate the public. All current mass communication channels are used to reach the general public, including television campaigns, posters and radio advertisements. These media channels remind about the rules of behaving in forests, especially regulations restricting the right to light fires including smoking (unless certain place where barbecue is allowed). Intensive campaigns take place before holidays and vacation periods, at times when people visit forests extensively. Permanent signs placed in forests help refresh the public's memory. Fires are forbidden when the weather is hot and windy<sup>5</sup>. Specific and more intense programs (including lectures) concentrate on the adult public and school children located in areas of risk.

In Israel setting fire deliberately is punished and fined. It has, nevertheless, been observed that it is difficult to prove arson, and courts are reluctant to condemn arsonists; for example the two young boys that started the big fire on Mount Carmel – possibly accidentally) will not be charged because of lack of evidence.

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# Forest fires in Israel: Occurrence and Prevention

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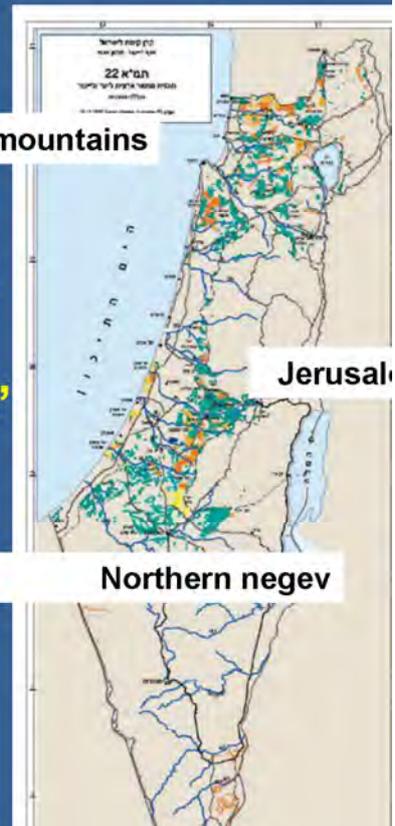
## Forests Map

- Total forests 120,000 h'
- Man made 80,000 h'
- Reforestation /year 840 h'
- Afforestation/year 400 h'

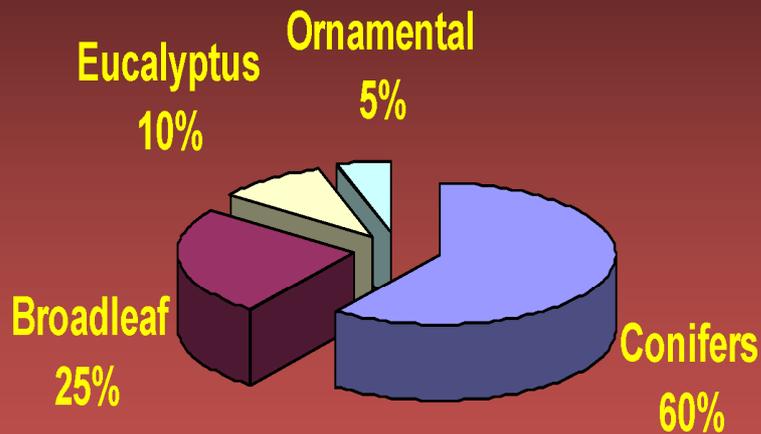
Galil and Carmel mountains

Jerusalem

Northern negev



## Percentage of Different Species in Planting



The Mediterranean ecosystem in Israel is considered to be damaged.

Hundreds years of grazing, fires, and cutting for wood and fiber production.

Area near Jerusalem



## Barriers without vegetation

(Especially around settlements, roads, forest parking, and factories)



**Two weeks after the fire at Mount Carmel**

