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Forest Fires in Europe, Middle East and North Africa 2019

Joint Research Centre

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Cover image: Fire in Tortolì, near Nuoro, Italy on 13 July 2019; © National Fire Corps - Forest Fire Fighting Service - Italy

Forest Fires in Europe, Middle East and North Africa 2019

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Preface

The “Forest Fires in Europe, Middle East and North Africa” report series aims to provide information on the fire management activities in those countries, compile up to date data that can support evidence based policy making at the pan-European scale and support current and future initiatives at the European Union and international level. As in previous years, the 2019 season showed again that wildfires are still of great concern in the European Union: the 2019 Report indicates that over 400 000 ha of our natural land were burnt and many of our protected areas were affected by wildfires. Approximately 48% of the areas consumed by fires were within the Natura2000 EU protected areas, creating damage in these invaluable ecosystems that will take many years to restore.

Fires are no longer a concern only for southern Mediterranean countries, but have spread widely across the EU territory. Indeed, climate change is already affecting the intensity and extent of wildfires, making them common in areas where they were rarely occurring in past years. The European Union is striving to enhance the conditions of our forests and make them more resilient against risks from forest fires and other agents such as wind storms and pests. Information on EU forests, and especially on those areas most heavily affected by wildfires, is essential. Therefore, evidence based advice is more than ever necessary in order to enhance the preparedness against forest fires. For this, in collaboration with the fire agencies in the countries, the European Union has developed the European Forest Fire Information System (EFFIS), which provides early warning of fire danger in the pan-European territory and up to date information on wildfire impacts. EFFIS, developed within the European Commission Joint Research Centre (JRC), supports the EU Member States and the European Commission services that deal with the different phases of wildfire management. EFFIS is part of the EU Copernicus Program, along with other early warning and monitoring services, which are embedded in the Copernicus Emergency Management Service (CEMS).

Additionally, the EU has recently reinforced its capacity to tackle critical fire situations in any of the EU countries or one of its neighbours. Under the EU Civil Protection Mechanism, which has been recently reinforced through the RescEU legislation, countries can provide collaborative support to those suffering critical fires. Furthermore, the new RescEU provides the direct funding of additional firefighting capacity by the European Union. With the recent RescEU actions, the Commission aims at strengthening the European civil protection focusing on two complementary strands of action: creating a stronger collective response at the European level, and improved prevention and preparedness capacities. This capacity has already been in place in 2020, providing additional support to fire management administrations in the countries. These activities, which involve the direct collaboration of national fire management agencies in the countries, are supported by EFFIS, which has been further developed to provide decision support tools to assist the ECHO Emergency Response Capacity Centre (ERCC) in taking decisions when dispatching those aerial means funded by the EU.

However, wildfires are not only a concern in the European territory. As in Europe, climate change is already taking its toll at the global scale. The last years have seen unprecedented and devastating fires all over the world, in USA (California), Australia, Indonesia, the Amazon region, the Arctic Circle, etc. Unfortunately, at the time of release of this Report, the situation in the Amazon and neighbouring regions is again critical. The European Commission has taken the necessary steps to support countries that suffer devastating fires in its recent Communication on stepping up the EU actions to reduce deforestation and forest degradation worldwide; here again the development of information systems that support evidence based initiatives and policy decisions is of paramount importance. European efforts must be coordinated with international initiatives that are aimed at minimizing the impact of wildfires and reducing their effects, in terms not only of economic damage, but also as related to human casualties and environmental impact. In this context, in 1998 the JRC and the Directorate General Environment set up the Expert Group on Forest Fires (EGFF) that supports the Commission services in gathering best practices and lessons learnt that can support EU policy decisions. This group is currently composed of 43 countries in Europe, Middle East and North Africa.

Although fires cannot and should not be completely excluded from our ecosystems, the necessary prevention and containment of dangerous wildfires is something that has to be tackled by competent fire administrations and citizens together. Still, most of the fires (over 95% of them) are caused by human actions. It is thus imperative that citizens are aware of the situation and help the relevant services to prevent unwanted fire ignitions.

In the light of the above considerations, the Commission calls upon all countries, involved organizations in Europe and globally and citizens worldwide to put together their strengths, to work together and to reduce the risk of wildfires, in order to have a safer society and to preserve the environment for future generations.

Stephen QUEST

Director-General

JRC

Executive summary

This is the 20th issue of the EFFIS annual report on forest fires for the year 2019. This report is consolidated as highly appreciated documentation of the previous year's forest fires in Europe, Middle East and North Africa. In its different sections, the report includes information on the evolution of fire danger in the European and Mediterranean regions, the damage caused by fires and detailed description of the fire conditions during the 2019 fire campaign in the majority of countries in the EFFIS network. The chapter on national reporting gives an overview of the efforts undertaken at national and regional levels, and provides inspiration for countries exposed to forest fire risk.

The preparation and publication of the report aims at improving cooperation with the members of the Expert Group on Forest Fires (EGFF) especially with regard to fire prevention and climate change adaptation measures in relation of fires. Our common aim is to maintain and protect our landscapes and natural heritage, to avoid loss of human lives and to minimise the damage caused to property by uncontrolled forest fires.

The aim of the European Forest Fire Information System (EFFIS) is to provide harmonised information on forest fires and assessment of their effects in the pan-European region. For this purpose, collaboration with EU Member States and neighbouring countries has been on-going since 1998. EFFIS started as a pilot project of collaboration between the European Countries and the European Commission in the area of fire information and fire prevention.

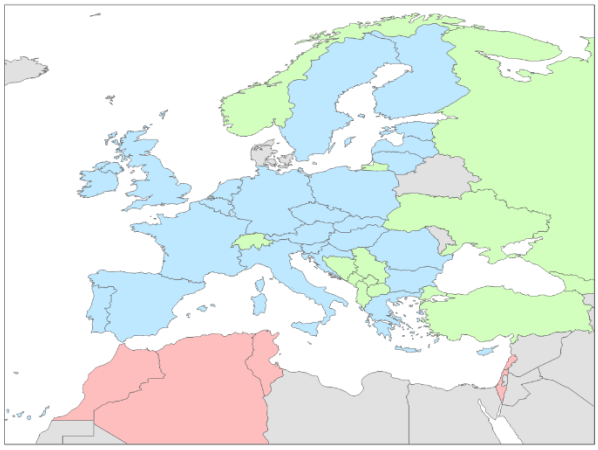


Figure 1. EFFIS network (blue: EU; green: non-EU; pink: MENA)

On the Commission side, EFFIS was initiated by the Joint Research Centre in collaboration with the DG Environment. Due to the high support from the Expert Group on Forest Fires, which constitutes the network of experts from the countries contributing to EFFIS, the system was developed to an operational level supporting national and European policies and providing the information basis for the discussion of issues related to forest fires in the European Parliament[1]. Currently, EFFIS provides operational support to DG ECHO in the area of civil protection, DG DEFIS in the implementation of the Copernicus Regulation [3] as well as to DG REGIO regarding the implementation of the EU Solidarity Fund Regulation [4] for critical fires. In 2015, EFFIS was included as a component of the EU Copernicus Program Emergency Management Services, which provides a legal and financial basis for its operation under this framework since then.

EFFIS provides an ideal platform for countries to exchange good practices on fire prevention, firefighting, restoration practices and other activities related to fire management, and for the European Commission to update the forest fire services in the countries on relevant initiatives at the European level.

Since its first operation in the year 2000, the number of countries contributing to the information on forest fires in EFFIS and receiving data from it has increased steadily. The EFFIS system was used by government organizations and citizens, with nearly 200 000 users from 188 countries in 2019.

Currently, the EFFIS network constitutes 43 countries, including 26 EU Member States (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, the Netherlands and the United Kingdom[2]), 12 European non-EU countries (Albania, Bosnia & Herzegovina, Republic of North Macedonia, Georgia, Kosovo, Montenegro, Norway, Russia, Serbia, Switzerland, Turkey and Ukraine), and 5 MENA countries (Algeria, Israel, Lebanon, Morocco and Tunisia).

[1] http://www.europarl.europa.eu/plenary/en/parliamentary-questions.ht

[2] For the 2019 fire season, UK was still an EU member and is treated as such throughout this report.

1 Forest Fires in 2019

1.1 Introduction to the 2019 fire season

Table 1. Overview of the number of fires and burnt areas reported by the contributing countries in 2019[3].

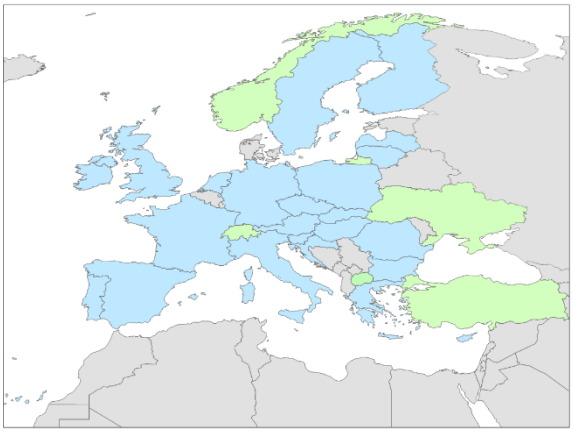
Country	Number of fires			Burnt area (ha)			Notes
	2019	2009-18 average	2019 as % of average	2019	2009-18 average	2019 as % of average	
Algeria	**2278**	2919	78	**21048**	30877	68	Average 2011-2018
Austria	**235**	289	81	**20**	128	16	Change in method of recording fires
Bulgaria	**668**	435	153	**5620**	4931	114	
Croatia	**123**	205	60	**2180**	11313	19	
Cyprus	**99**	102	97	**733**	1594	46	
Czech Rep.	**1963**	1130	174	**520**	313	166	
Finland	**1458**	11238	118	**565**	525	108	
France	**5435**	3810	143	**23477**	11831	198	
Germany	**1523**	789	193	**2711**	514	528	
Greece	**657**	986	67	**9153**	26839	34	
Hungary	**2088**	1070	195	**6541**	4733	138	
Italy	**4351**	5527	79	**36034**	67639	53	
Lebanon	**194**	125	155	**3155**	883	357	Only 4 previous years to compare
Lithuania	**279**	171	163	**200**	107	187	
Latvia	**1107**	552	201	**805**	596	135	
Morocco	**529**	471	112	**3232**	2935	110	
Netherlands	**548**	635	86	**250**	436	57	New contributor – only 2 previous years to compare
North Macedonia	**251**	192	131	**4834**	4121	117	
Norway	**261**	194	134	**3077**	893	345	Change in method of recording fires 2016
Poland	**9635**	7141	135	**3572**	3110	115	
Portugal	**10832**	18345	59	**42084**	138841	30	
Romania	**425**	274	155	**2496**	1678	149	
Slovenia	**84**	87	97	**154**	273	56	
Slovakia	**210**	248	85	**462**	432	107	
Spain	**10883**	12182	89	**83963**	99083	85	
Sweden	**5483**	4391	125	**1233**	4730	26	
Switzerland	**79**	101	78	**31**	111	28	
Turkey	**2688**	2388	113	**11332**	6665	170	
Ukraine[4]	**1261**	1992	63	**1065**	3720	29	

[3] Some countries do not report precise figures for fire numbers/burnt area and are not included in this table.

[4] Data on forest fires reflect statistics obtained from forest users and owners, which are coordinated by the State Forest Resources Agency of Ukraine (73% of all forests in Ukraine).

1.2 European countries

The following chapters contain the reports from the contributing European countries. The reports are arranged in alphabetical order and comprise reports from 23 (with UK) Member States and 5 other non-EU members of the EFFIS network.



1.2.1 Austria

Fire danger in the 2019 fire season

The spring season brought no exceptional high fire danger in Austria. Dry and above-average temperatures were present in March and April. May 2019 was one of the coolest and wettest May months in Austria in recent decades. Yet it was followed by the hottest June ever recorded in Austria. Therefore, fire danger locally reached high levels by the end of June.

2019 was also the second warmest summer in Austria since recording of meteorological data began with locally heavy drought, especially in the north and east of Austria. However, mainly due to recurring showers and thunderstorms, forest fire danger in the Alpine mountain forests was mostly moderate. The rest of the year brought no exceptional fire danger situations.

Fire occurrence and affected surfaces

Most of the forest fires occurred in the summer months due to high temperatures and regional dry conditions. In terms of the number of fires, 2019 was above average with 235 documented forest fires. However, likely because of low-wind conditions and moderate fire danger in the mountain ranges, the burnt areas of most of the forest fires were small. Only six forest fires were larger than one hectare, leading to a total burned forest surface of about 20 hectares. This is one of the lowest burned areas in recent years.

Fire causes

About 30% of all forest fires were caused by lightning, making 2019 a year with an exceptionally high amount of natural (but mainly small) fires. One reason for this evidence can be found in the strong summer season, where more fires than usual were ignited by lightning – despite the fact, that the total number of cloud-to-ground lightning strikes was very low in 2019 (Figure 2). The most frequent anthropogenic causes in 2019 were arson and carelessly discharged cigarettes (about 15% of all fires each).

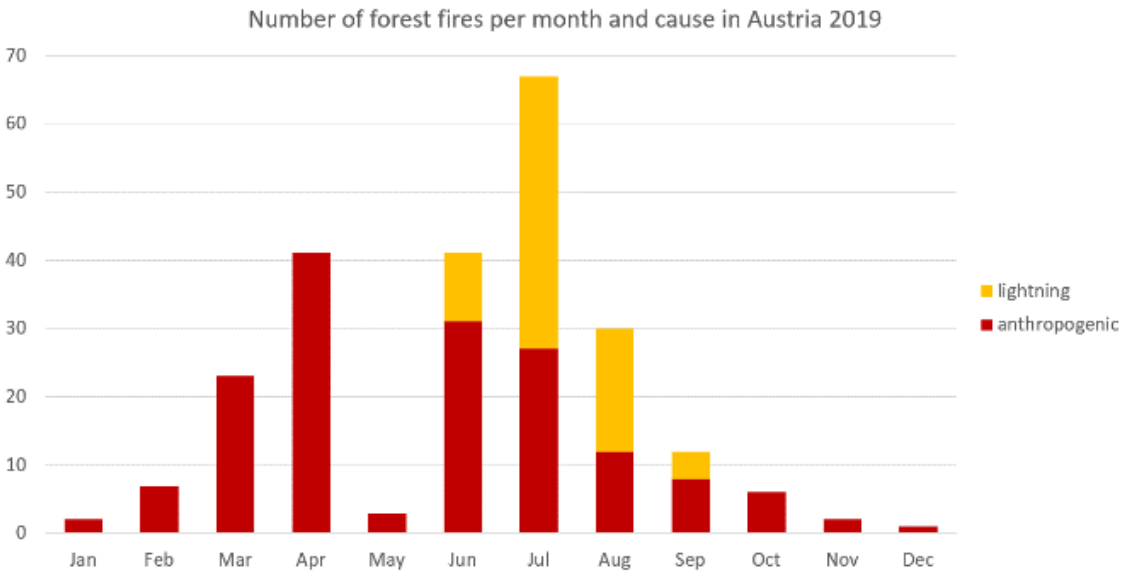
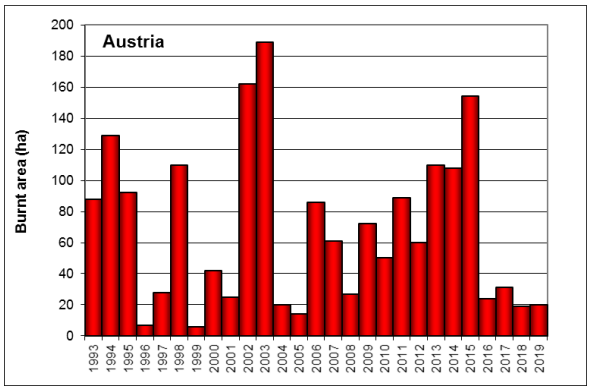


Figure 2. Monthly number of fires by cause (natural/human caused) in Austria in 2019.

The total number of fires, burnt area and average fire size from 1991 to 2019 is presented in Figure 4.



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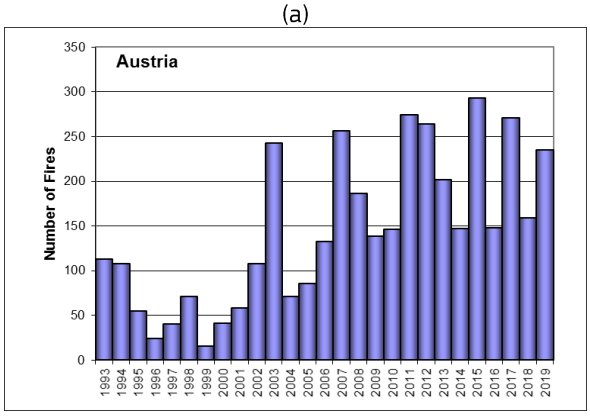

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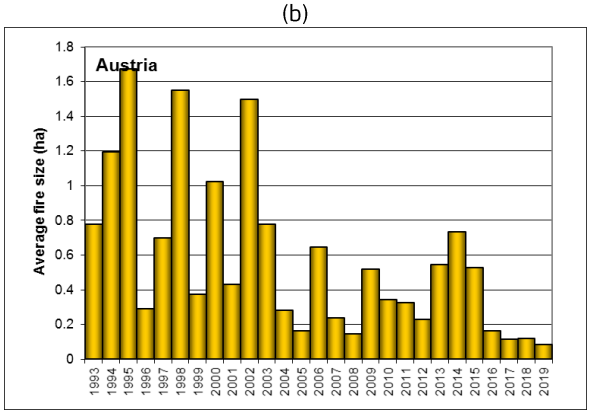


(c)

Figure 3. Burnt areas (a), number of fires (b) and average fire size (c) in Austria from 1993 to 2019.

Fire prevention activities and information campaigns

The Austrian federal fire brigade association organized a priority program for fighting ground fires. The working group plans technology, tactics and special equipment. The aim is to create new courses and training for fire fighters on the base. The competence centre is the fire service college in Tyrol. There are also courses for group commanders, operations managers, and work with helicopters.

Research activities aimed at improving fire management

In 2018, a research project focusing on Alpine fires was initiated and led by the Austrian Federal Ministry of Agriculture, Regions and Tourism in cooperation with the Institute of Silviculture, University of Natural Resources and Life Sciences Vienna, and the EUSALP Action Group 8. This project was continued in 2019, with a forest fire workshop in Vienna in summer and participants from the whole Alpine region (Italy, Slovenia, Switzerland, Germany, France, Liechtenstein, Austria). The workshop was followed by a detailed study on the forest fire situation in the Alps, entitled: "*Forest fires in the Alps – State of knowledge, future challenges and options for an integrated fire management*". This study was finished and published in early 2020 on behalf of the EUSALP AG 8 and is available for download: https://www.alpine-region.eu/results/forest-fires-alps-state-knowledge-and-further-challenges.

(Sources: Institute of Silviculture, University of Natural Resources and Life Sciences, Vienna; Austrian Federal Ministry of Agriculture, Regions and Tourism; The Austrian Federal Fire Brigade Association, Austria).

1.2.2 Bulgaria

Activities for forest fire prevention are the priority of the Ministry of Agriculture, Foods and Forests and the Executive Forest Agency (EFA). Annually before the active fire season, all regional authorities develop an annual plan for forest fire protection of the forest areas and an action plan for forest fire fighting. Those documents are to be submitted annually to the committee of representatives from EFA and to the Directorate General for Fire Safety and Protection of the Population.

Fire occurrence and affected areas

According to the Executive Forest Agency database in 2019 the number of forest fires in Bulgaria was 668 and the burnt area is estimated to be 5 619.6 ha, with 419.1 ha of them burned by crown fires. The average size per forest fire in 2019 increased to 8.4 ha. The biggest forest fire affected 426 ha of forest territories. The largest number and area burnt by forest fires were reported in Regional Forest Directorate (RFD) Lovech with 96 fires and 1485.5 ha, RFD Berkovitsa with 52 fires and 692.5 ha, and RFD Kardzhali with 52 fires and 588.4 ha. About 50% of all burned forest areas in the country are concentrated in these three RFDs.

Despite the increased number of fires, (for the 2019 fire season we can note about 500 in excess of the average annual number of forest fires for the last 10 years), we report about the same size of burned forest areas as the average (5 200 ha) for the same period.

Distribution of the burnt areas in 2019 according to ownership is:

- State forest - 56%,
- Municipal forest – 21%
- Private forest – 22%
- Other forests – 1%.

The main causes for the forest fires during 2019 are as follows:

- Carelessness – 519 in number (78%);
- Arson - 31 in number (5%);
- Natural - 8 in number (1%);
- Unknown - 110 in number (16%).

The total number of fires, burnt area and average fire size from 1991 to 2019 is presented in Figure 1 and forest fire statistics including causes are in Table 1.

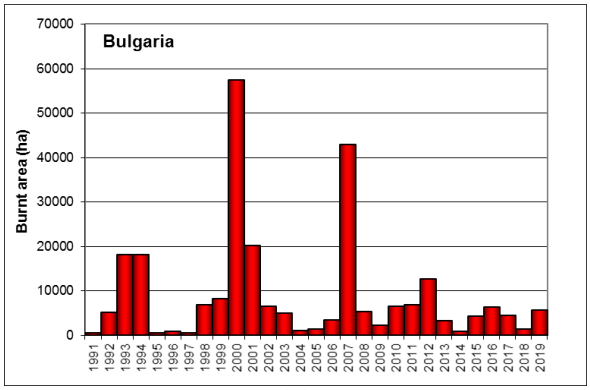
The direct losses by forest fires in 2019 are estimated at 1 060 000 Euro, although the average losses for the last 10 years total about 2 300 000 Euro.

Injuries and loss of human lives

During 2019 there were no reported losses of human lives or injuries from forest fires. In 2019 on the territory of the country no crisis situations were announced in connection with forest fires.

Table 2. Forest fire statistics for Bulgaria 2009-2019.

Year	Burnt area (ha)		Fire causes (number)			Total number of fires
	Total	Forest lands	Human activities	Natural	Unknown	
2010	6526	6526	191	1	30	222
2011	6883	6883	418	7	210	635
2012	12730	12730	669	42	165	876
2013	3314	3314	334	12	62	408
2014	916	916	128	3	20	151
2015	4313	4313	335	12	82	429
2016	6340	6340	472	22	90	584
2017	4569	4569	433	14	66	513
2018	1453	1453	201	7	44	222
2019	5619	5619	550	8	110	668
Mean	**5266**	**5266**	**373**	**13**	**88**	**471**



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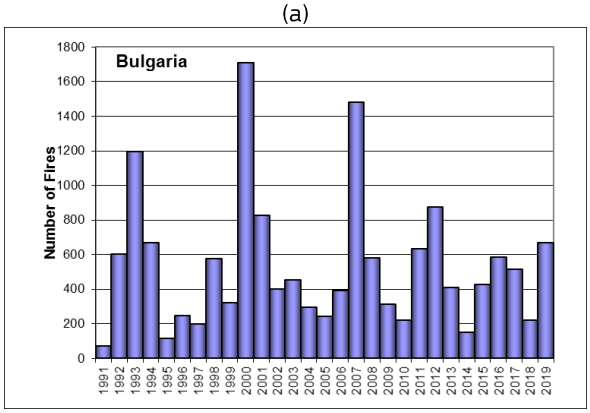

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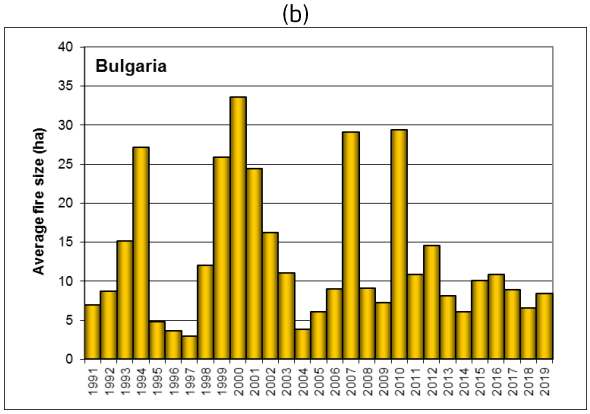


(c)

Figure 4. Burnt areas (a), number of fires (b) and average fire size (c) in Bulgaria from 1991 to 2019.

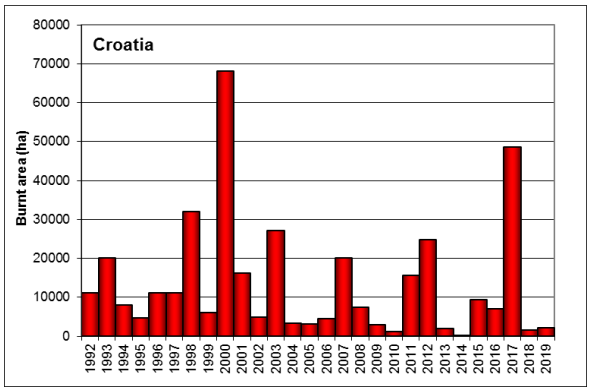
(Source: Executive Forest Agency, Bulgaria).

1.2.3 Croatia

Fire occurrence and affected surfaces

According to data received from the Croatian authorities, 123 fires were reported in Croatia in 2019, which burned a total of 2180 ha (including agricultural land). This was higher than 2018, but less than the average of the previous 5 years.

In 2019, most of the burnt area occurred in forest or other wooded land (Table 3). The largest fire of the year occurred in Šibenik region and covered over 500 hectares. Across the whole year, only two other fires spread to an area larger than 100 ha. The trend of number of fires, burnt area and average fire size can be seen in Figure 5.



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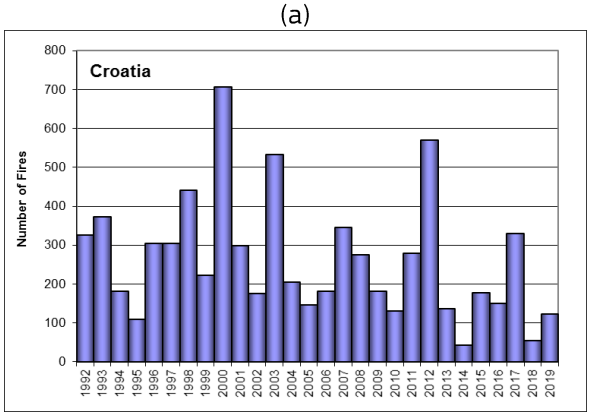

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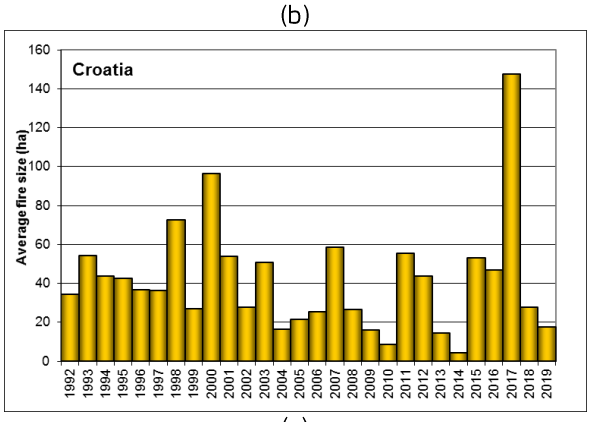

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Figure 5. Burnt areas (a), number of fires (b) and average fire size (c) in Croatia from 1992 to 2019.

There were two peaks in the season – one in March and the other in July (Figure 6).

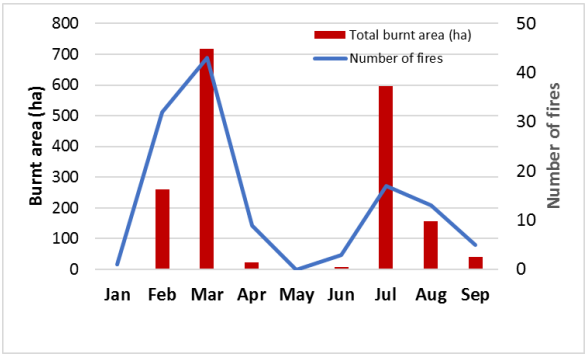


Figure 6. Monthly distribution of fires in 2019.

Table 3. Burnt area according to land type.

Year	Area burned in forest fires (ha)			
	Forest	Non-forest	Other / Agricultural	Total
2008	4119	2868	356	7343
2009	2316	446	138	2900
2010	753	267	101	1121
2011	6937	3106	5512	15555
2012	15515	6201	3106	24804
2013	942	628	429	1999
2014	120	45	23	188
2015	6569	1462	1385	9416
2016	4288	2698	114	7100
2017	31931	12560	4052	48543
2018	750	478	278	1506
2019	**1304**	**498**	**377**	**2180**

Fire causes

In 2019, half of the fires were of unknown cause. Most of the known causes were due to negligence, in particular from vegetation management (Figure 7).

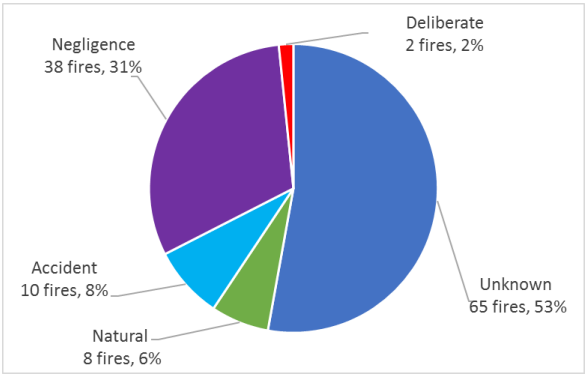


Figure 7. Causes of fires in Croatia in 2019.

(Source: Directorate for Forestry, Hunting & Wood Industry, Ministry of Agriculture, Croatia; National Protection and Rescue Directorate, Croatia).

1.2.4 Cyprus

Fire danger in the 2019 fire season

The period from January to April 2019 was extremely wet. During this period, the air temperature was around normal and the area average precipitation was well above normal.

In May the weather was extremely dry and hot. The mean air temperature was 2.0°C above normal and the area average precipitation was 8% of normal. Heat wave conditions prevailed during certain periods of the month, with maximum daily temperatures exceeding 40°C. The daily maximum temperature of 42.1°C recorded in the capital Nicosia on the 29th of May, was the highest for the specific area and for this month, since 1983.

In June the weather was relatively wet and hot. Unstable weather conditions prevailed during certain periods of the month, giving showers, local thunderstorms and hail in many areas. The mean air temperature was 1.5°C above normal and the area average precipitation was 325% of normal.

In July the weather was hot and dry. The mean air temperature was around normal and the area average precipitation was 15% of normal. During certain periods of the month heat wave conditions prevailed, when maximum temperatures were up to 6°C above normal, exceeding 40°C.

In August the weather was hot and relatively wet. The mean air temperature was 1.5°C above normal and the area average precipitation was 276% of normal. Unstable weather conditions prevailed during certain periods of the month, giving local showers and isolated thunderstorms, mainly inland and over the mountains.

In September, the weather was wet and relatively hot. Unstable weather conditions prevailed during certain periods of the month, giving local showers and isolated thunderstorms. The mean air temperature was 1.0°C above normal and the area average precipitation was 220% of normal.

In October, the weather was wet and warm. Unstable weather conditions prevailed during certain periods of the month, giving heavy showers, local thunderstorms and hail over several areas. The mean air temperature was 2.0°C above normal and the area average precipitation was 187% of normal.

In November the weather was dry and warm. The mean air temperature was 3.0°C above normal and the area average precipitation was 35% of normal.

In December the weather was extremely wet and relatively warm. The mean air temperature was 1.0°C above normal and the area average precipitation was 194% of normal.

Fire occurrence and affected surfaces

During 2019, Cyprus experienced 99 forest fires that burned 733 hectares, mostly forest and other wooded land. Three of these fires were over 50 ha in size.

Table 4. Number of forest fires and burnt areas in Cyprus from 2015 to 2019.

Year	*Number of fires*	*Burned area (ha)*		
		Total	*Forest and other wooded land*	*Agriculture and other artificial land*
2015	87	652	350	302
2016	119	3205	2946	259
2017	92	428	270	158
2018	131	1136	997	139
2019	99	733	494	239

Major fires in 2019

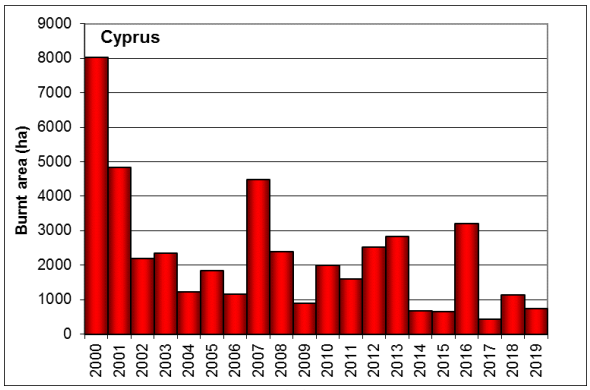
On the morning of the 13th of November 2019, a fire caused by simultaneous arson attacks at Akamas National Park, burned a total area of 110 hectares of pine trees, shrubs and other wild vegetation.

At noon of 12 August 2019, a fire broke out near Kissousa village, Limassol District. The firefighting efforts were hampered by strong winds. The residents of Kissousa village were evacuated and the main road passing through the affected area, remained closed for several hours. The blaze burned 363 ha of wild brush, vineyards and other agricultural crops.

Fire causes

Out of the 99 forest fires that occurred in Cyprus during 2019, 14 forest fires (14%) were of unknown origin. Regarding forest fires with known cause, most fires were deliberately set (33 fires - 39%), followed by negligence (32 fires - 38%) and natural (20 fires - 23%).

The trends regarding both the number of fires and burnt areas over the last 20 years (2000-2019) are shown in Figure 8.



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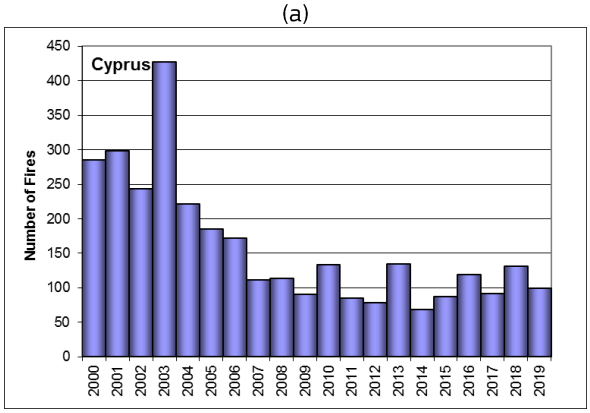

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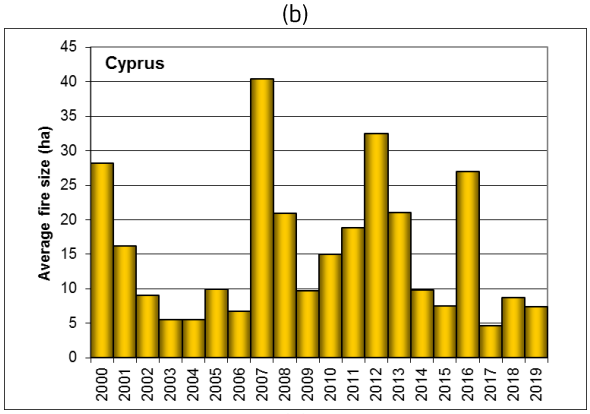

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Figure 8. Burnt areas (a), number of fires (b) and average fire size (c) in Cyprus from 2000 to 2019.

Fire fighting means

The aerial firefighting means that were available during the 2019 fire season, consisted of four primary and three secondary aerial assets. The primary aerial assets included 2 light type firefighting airplanes and 2 medium type firefighting helicopters. The secondary aerial assets included 2 light type helicopters and 1 coordination helicopter.

Ground firefighting means that were available for deployment in firefighting operations consisted of about 2 000 permanent and seasonal employees and 230 fire engines, from different government departments.

Fire prevention activities and information campaigns

The fire prevention program consisted of various activities, including fire break construction and maintenance, fuel management and law enforcement. Moreover, numerous actions and activities aiming to inform and raise awareness among the public, were implemented. For fire detection purposes, 44 lookout stations operated throughout the fire season and air and ground patrol missions were executed.

Injuries and loss of human lives

There were no casualties during the fire suppression operations.

Operations of mutual assistance

During May 2019, two light type firefighting airplanes with a crew of two each and a four-member ground support team, were sent to Israel in response to a request for assistance, in combating numerous raging forest fires across the country.

During October 2019, Cyprus assisted Lebanon with two light type firefighting airplanes and four-member ground support team, in the battle to extinguish a massive fire in Beirut.

Climate Change

Wet conditions with extraordinary large amounts of precipitation, prevailed in Cyprus prior to the beginning and before the end of the 2019 fire season. According to climatological historical data, the hydrological year of 2018-2019 was the second best, since 1901. Nevertheless, November was dry and hot. Extremely high temperatures for the month were recorded during certain periods, when maximum temperatures were up to 10°C above normal. For this reason, during November Cyprus experienced numerous forest fires, one of which burnt more than one square kilometre of Akamas National Park, an area of precious ecological significance.

(Source: Ministry of Agriculture, Rural Development and Environment, Department of Forests, Cyprus).

1.2.5 Czech Republic

Fire occurrence and affected surfaces

Forest fires fighting and prevention is covered by the Fire and Rescue Service of the Czech Republic.

In 2019 a total number of 1 963 forest fires were recorded and about 520 ha of forest areas were burned. The total number of fires was significantly almost twice the 10 years average when compared to the 2009-2018 average of 1 127. The burned area was also highly over the 10-year average of 313 ha, although the 2019 fire season was not as bad as 2018. But considering total numbers, it was one of the worst fire seasons in the last 20 years. As usual, the fires were very often concentrated according to the usual fire risk level over the country (Figure 10).

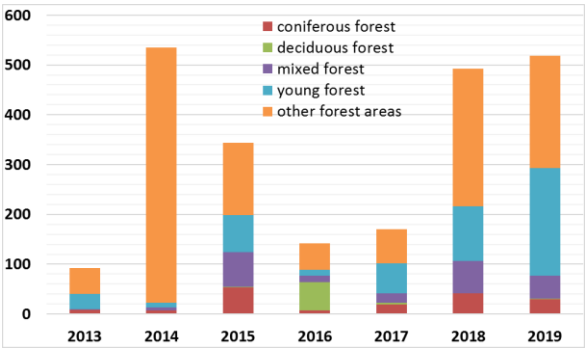
	2012	2013	2014	2015	2016	2017	2018	2019
coniferous forest	210	8	7	54	7	19	41	30
deciduous forest	1	0	0	0	56	3	1	1
mixed forest	59	2	6	71	13	19	64	46
young forest	86	30	10	74	12	60	110	216
other forest areas	276	52	512	145	53	68	277	226

Table 5 (above), Figure 9 (right). Burnt area (ha) from 2012 to 2019 by forest type.

Table 6. Number of fires, burnt area, economic losses and casualties in Czech Republic since 2005.

Year	No. of fires	Burnt area (ha)	Damage caused m.EUR	Saved values m.EUR*	People killed	People injured
2005	626	227	0.8	4.9	0	12
2006	693	405	0.3	4.0	0	16
2007	805	316	0.7	13.3	0	20
2008	470	86	0.1	4.5	3	10
2009	514	178	0.3	6.2	0	20
2010	732	205	0.2	5.0	1	12
2011	1337	337	0.3	6.5	1	27
2012	1549	634	1.8	26.2	2	30
2013	666	92	0.2	3.0	0	7
2014	865	536	0.3	3.3	2	10
2015	1748	344	0.7	24.7	1	33
2016	892	141	0.2	7.8	0	6
2017	966	170	0.3	3.4	2	9
2018	2033	492	0.6	10.5	0	35
2019	1963	520	0.7	12	0	31

**refers to the amount that would have been lost without intervention.*



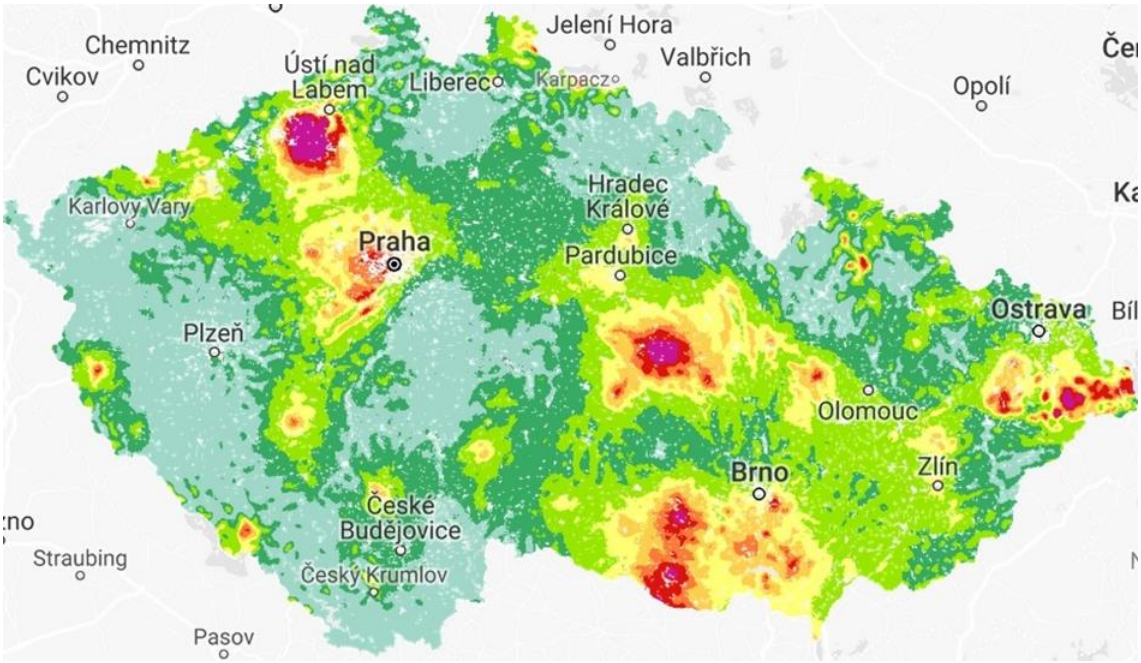


Figure 10. Forests with high risk level, usual situation (*Source: Czech Academy of Sciences, project CzechAdapt*).

The trends regarding the number of fires and burnt areas from 1995 to 2019 are shown in Figure 11.

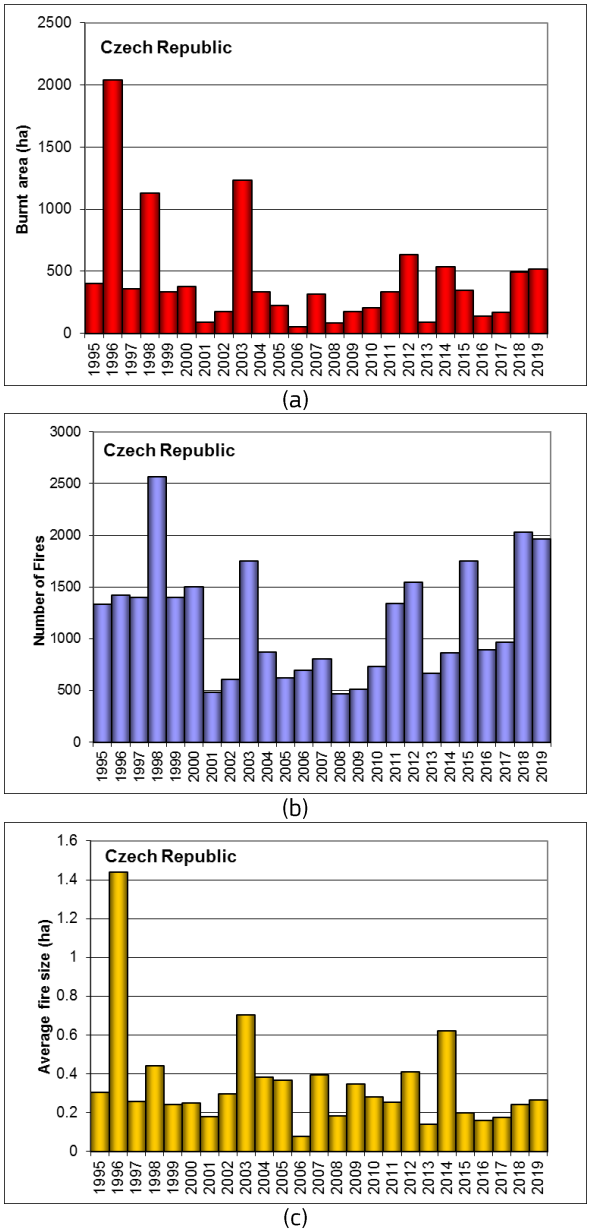


Figure 11. Burnt areas (a), number of fires (b) and average fire size (c) in Czech Republic 1995-2019.

Firefighting means

It is very common, for bigger fires, to use police helicopter support, for tactical exploration and also for aerial firefighting, using water buckets with up to 1000 litres of water. If needed, it is also possible to ask for army helicopters or some private planes in case of emergency. Because of a rapid growth of the number of forest fires and visible climate changes, there were made some decisions such as buying special fire tracks or a consideration of new aerial firefighting means. The newest fire truck suitable for forest fire fighting is a Tatra CV-40 with a total water capacity of 21 000 litres of water (Figure 12).

Figure 12. Tatra Force CV 40 truck.

Fire causes

The main causes for the forest fires during 2019 are:
- Negligence 50.4 %
- Human caused, unknown motivation 30.8%

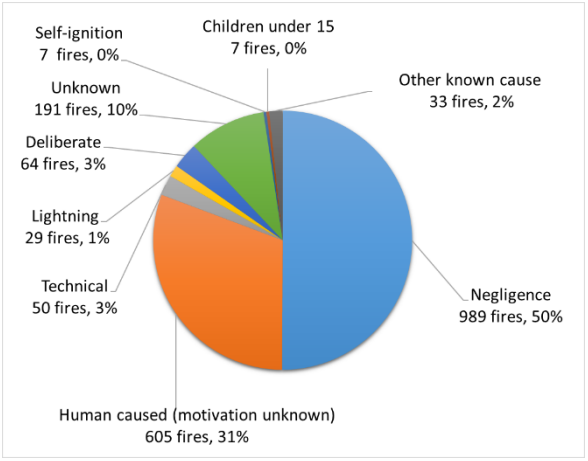


Figure 13. Causes of forest fires in 2019.

The causes of forest fires in the last 5 years are given in Table 7.

Table 7. Causes of forest fires in Czech Republic 2015-2019.

Year	2015	2016	2017	2018	2019
Negligence	630	337	426	793	989
Human caused, Motivation unknown	665	371	343	863	605
Technical	32	16	32	54	50
Lightning	38	4	18	21	29
Intention	67	25	19	72	64
Unknown	253	119	111	205	191
self-ignition	2	5	1	7	7
Children < 15	17	4	10	9	7
Other	7	6	6	9	33

Injuries and loss of human lives

There were no people killed but 31 people injured due to forest fires in 2019. In total, there were 200 people injured and 9 people killed in last 10 years due to forest fires.

(Source: Fire and Rescue Service, General Directorate, Czech Republic).

1.2.6 Finland

Fire danger in the 2019 fire season

Based on information from the Finnish Meteorological institute, the overview from summer 2019 was a normal and average year in Finland. May and June were warm and dry in the southern part of Finland. During July and August it was quite a normal Finnish summer. Fire warnings (days per month) for 2019 are presented below in Figure 14.

Fire occurrence and affected surfaces

The number of forest fires in 2019 in Finland was at a normal average level. There were 2 920 wildfires in Finland last year of which 1 458 of them were reported as forest fires. The total burned area was around 872 ha of which around 565 ha occurred in forest area. The average burned forest area per fire was 0.39 ha. The 10 years statistics from 2010 to 2019 are presented below.

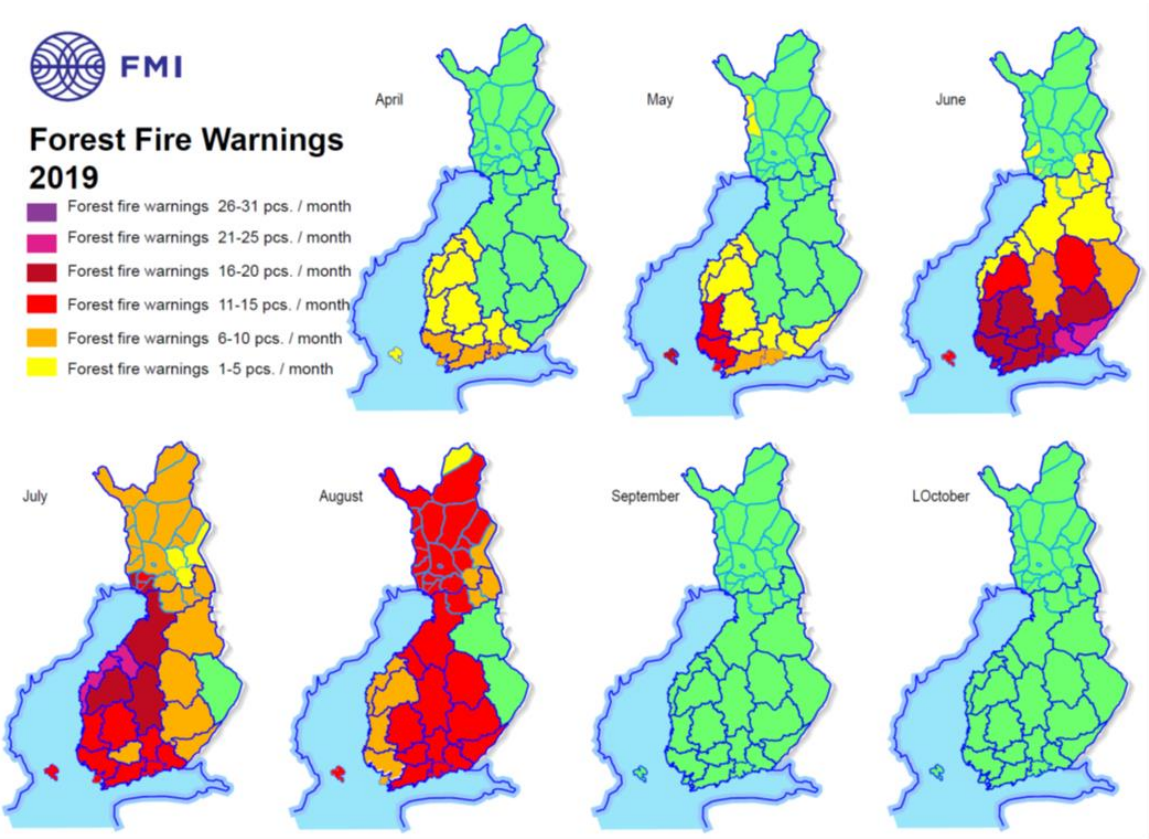


Figure 14. Fire danger days in Finland 2019

Fire causes

The most common cause of wildfires in Finland was human actions. These caused more than 70%, mainly from accidents. The second biggest reason was natural (less than 10% of fires). The reason for the fire could not be found in over 10% of the cases.

Loss of human lives

Nobody died in Finland forest fires in 2019. One person was injured in a wildfire, suffering from burns. Some of the wildfires caused damage to buildings; and conversely some of the wildfires were caused by fires in buildings or vehicles.

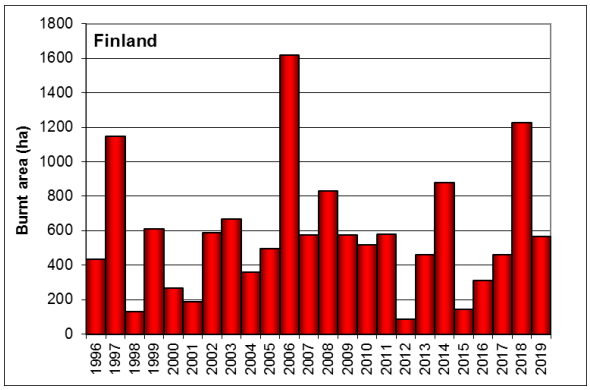
Operations of mutual assistance

There was information sharing between neighbouring countries and the EU.

Fire prevention activities and information campaigns

- Legislation, fire index versus authorities' actions, and a ban on open fires
- Information campaigns
- More co-operation with other authorities and institutes such as the Finnish meteorological institute.

The yearly trends in terms of number of fires and burnt area from 1996-2019 in Finland are shown in Figure 15 and Figure 16.



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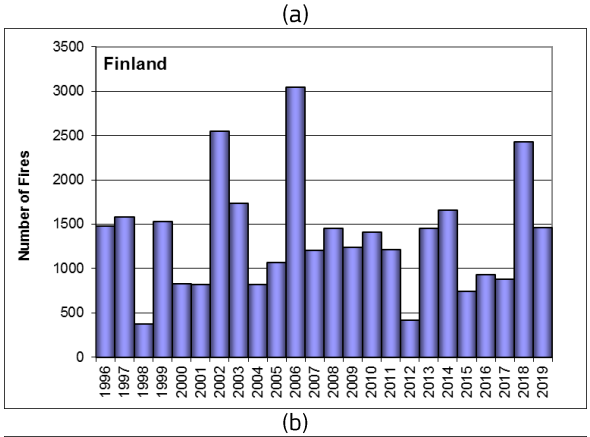

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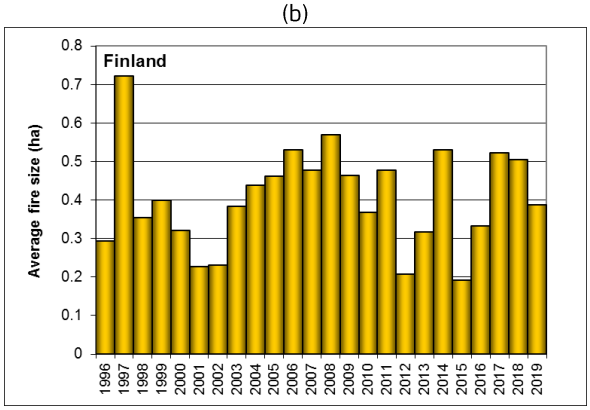

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Figure 15. Burnt areas (a), number of fires (b) and average fire size (c) in Finland from 1996 to 2019.

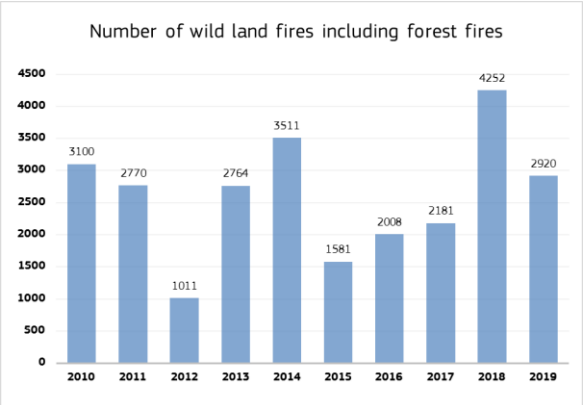


Figure 16. Total number of wildfires including forest fires from 2008-2019.

Fire fighting means

- Finnish military forces NH 90 helicopters are available to extinguish forest fires.
- More co-operation between other authorities such as the border guard.
- Continuation of forest fire aerial officer education for fire officers.
- Starting to improve HNS (Host Nation Support) systems for forest fires.
- Starting also to improve Finnish Forest fire capacities for international assistance.
- Helicopters (Border guard, army, private), helicopter situation is better than last year.
- Fire & rescue services (strong volunteer fire brigade force, 15 000 volunteers also in rural areas), co-operation between rescue services (for example Arctic Rescue Team)
- New innovative equipment (harvesting machines with water tank and hoses etc.)

Climate Change

<u>Climatic conditions and how they impacted the fire season</u>

In the future, the forest-fire risk is expected to increase in Finland and elsewhere in Northern Europe due to global warming. However, so far, annual burned areas in Finland have not increased noticeably.

<u>National adaptation strategies / plans, in particular regarding plans to adapt the forest sector to climate change in order to limit forest fire risks</u>

Finland's National Forest Strategy, adopted by the Government in February 2015, specifies the main objectives for forest-based business and activities until 2025. The strategy was updated in 2019.

<u>Research activities aimed at improving fire management</u>

New research named "Forest fires in area of Fennoscandia when the climate and the structure of the forests change" started in 2019 and will continue through 2020.

<u>Other development goals in future</u>:

- Northern European co-operation (Nordred etc.);
- ensure early warning systems;
- co-operation with rescue services;
- new innovative solutions and equipment.

(Source: Ministry of the Interior, Finland).

1.2.7 France

Fire danger in the 2019 fire season

The year 2019 started with a rainfall deficit from the winter. The significant surface dryness led to high winter values with numerous ignitions from accidental fires and poorly controlled burns, mainly in mountainous areas, in Corsica, in the Southern Alps and in the Pyrenees.

The summer of 2019 was characterized by high temperatures abnormally early between the end of June and the end of July, with two historic heat waves: at the end of June in the south and end of July in the northern half of the country. These high temperatures make it possible to classify the summer of 2019 in second place since 1900 for average maximum temperatures, behind 2003.

The summer season was also marked by a general rainfall deficit from the Centre to the North-East, as well as in the continental Mediterranean regions. This deficit is responsible for a drought (in terms of forest fires, but also agricultural and low groundwater levels) which gradually took hold in July and reached its peak at the beginning of September.

The number of strong wind days was significantly lower than normal, with record low numbers of strong wind days at the statistically windiest sites around the Mediterranean.

Consequently, the level of danger was medium (average from 2001 to 2018) in the Mediterranean area.

Fire occurrence and affected surfaces

In 2019, 23 477 ha were affected by a total of 5 435 fires in France. The result is therefore twice as high as the average over the period 2009-2018 (11 879 ha), but remains much lower than that of record years like 2003 (more than 70 000 ha burned).

The regional breakdown is as follows:

- 8 434 ha in the Mediterranean departments (the ten-year average is 7 015 ha[5]);
- 5 444 ha in the south-western quarter (ten-year average of 3 450 ha), of which 2 044 ha occurred in the Landes massif (compared to around 1 400 ha on average);
- 9 599 ha in the other departments.

2019 thus ranks second in statistics for the decade for areas burnt, behind 2017 (26 378 ha) but ahead of 2009 (17 033 ha).

Mediterranean region (South-East)

There were 1 725 fires burning 8 434 ha in the Mediterranean area.

In particular, numerous winter fires, some with a large surface area, were noted in the Mediterranean area and in the Pyrenees, notably that of Calenzana (Corsica) on 23 February, which covered 1 080 ha. The balance at March 31, of about 2 700 ha, is more than 3 times higher than the average of the last 10 years (850 ha). Pastoral activities are probably the origin for the majority of these fires.

Regarding the summer season (June to September), 13 fires burned more than 100 ha, and the largest fire of the summer took place in the Aude: Montirat, (1103 ha), on 14 August.

Outside the Mediterranean area

The total outside the Mediterranean area (historically the most affected region), was made greater by the winter fires and by the increase in vegetation fires, in particular during the heat waves of late June and late July.

In the South-West (ex Midi-Pyrénées region), there were 742 fires burning 3 401 ha, including 6 winter fires that affected more than 100 ha in the Pyrenees.

The case of the Pyrénées-Atlantiques department deserves special attention, because operational activity was marked by several significant fires of several hundred hectares mixed with numerous prescribed fires. It is very difficult to distinguish the surfaces which were caused by authorized burns from those which were burnt by uncontrolled fires. This results in a significant difference between the estimates of areas covered from satellite image processing and the assessments established by the local services. Satellite image processing carried out as a methodological test at the end of spring made it possible to map more than 42 000 ha of burnt vegetation in this department during the period. About 75% of the area concerned is made up of woody heathland, and probably corresponds to voluntary and planned clearing. The remaining 25%, representing nearly 10 000 ha, concern forest formations. A study is underway to reach a better understanding of the problem and an integration into the national fire statistics.

In the Landes massif, the data managed by the GIP ATGERI show 1 306 fires for 2 044 ha burnt. There was a notable fire on 11 July in Ychoux (Landes) of 154 ha.

Finally, there were large-scale vegetation or forest fires regions in the north and centre of France, which is usually little affected, in particular during the day of 25 July:

[5] Before the strategy of attacking flare-ups in the late 1980s was implemented, this average was 34 000 ha.

- 17/07 Villedomer (Indre-et-Loire) 150 ha
- 20/07 Lacroix-sur-Meuse (Meuse) 180 ha
- 24/07 Montigny-les-Vaucouleurs (Meuse) 136 ha
- 25/07 Pressigny-les-Pins (Loiret) 111 ha
- 25/07 Saint-Lubin-de-Cravant (Eure-et-Loir) 250 ha
- 25/07 Manchecourt (Loiret) 250 ha
- 25/07 Audeville (Loiret) 100 ha
- 25/07 Couture Boussey (Eure) 157 ha
- 25/07 Serazereux (Eure-et-Loir) 200 ha
- 18/09 Migne (Indre) 130 ha
- 18/09 Chalais (Indre) 450 ha

It should be noted that most of these fires start and develop mainly in areas of crops or wasteland, then spread into the forest, most often at the edges, by preferentially consuming the brush and undergrowth.

The case of the fire at Migne (Indre) illustrates this phenomenon:

The roadside fire covered 130 ha, including a dozen hectares of forest, only in the wasteland / forest contact area.

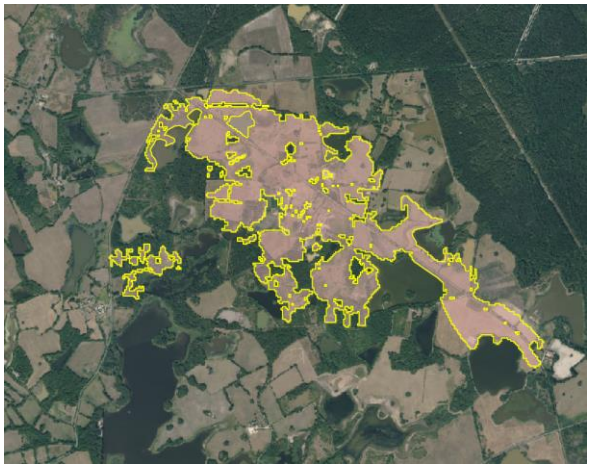


Figure 17. Cartography of the perimeter of the fire at Migne (04/09/2019, 130.42 ha). Satellite image SENTINEL 2A, copyright CNES 2019 – ESA 2019, treatment ONF-DFCI

This is very probably one of the first signs of the effects of climate change, which makes open and herbaceous formations and the understory of forest formations very sensitive; However, the expected climatic changes in the regions affected in 2019 give rise to fears in the medium term of a greater sensitivity of the tree strata, especially in the regions affected by forest dieback.

Forest fires in Réunion Island

The 2019 results of forest and vegetation fires in Réunion were heavily marked by the fire of January 20 on the volcano, which covered 1 756 ha. In total, 1 812 ha were burnt by 27 fires, compared to an average of 584 ha over the period 2009-2018.

The yearly trends in terms of numbers of fires and burnt areas in France since 1980 are shown in Figure 18.

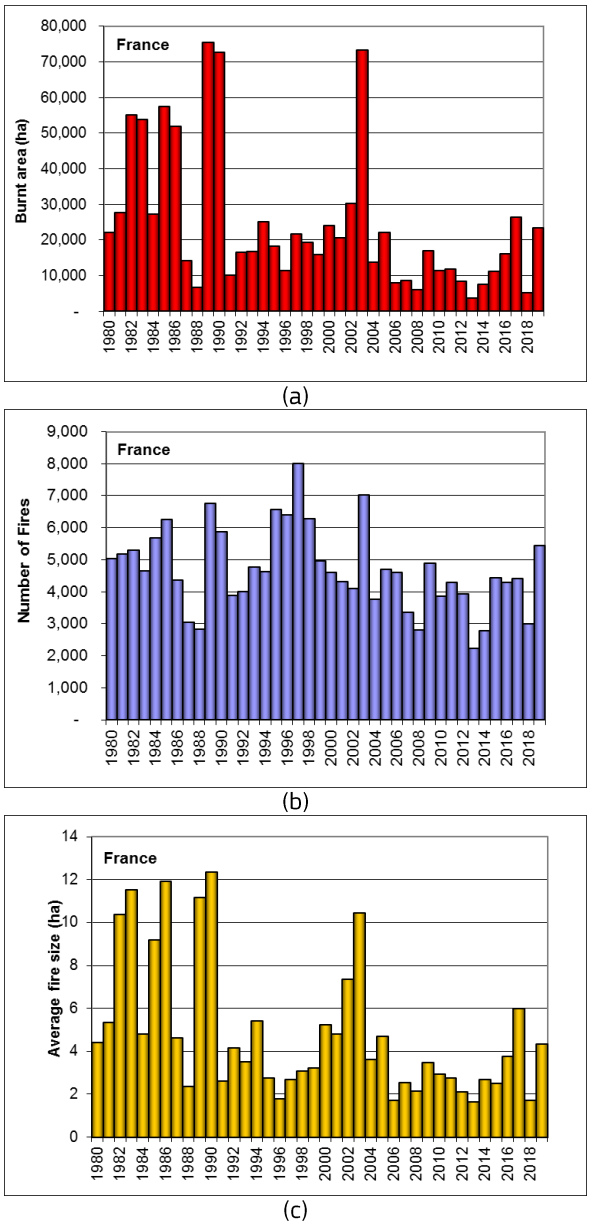


Figure 18. Burnt areas (a), number of fires (b) and average fire size (c) in France from 1980 to 2019.

Fire Causes

Of the 5 435 fires identified in 2019, the majority (3 572) were of unknown origin. 129 of the other fires are attributed to a natural cause (lightning), 1 222 are accidental in nature, and 512 fires are deliberate (Figure 19).

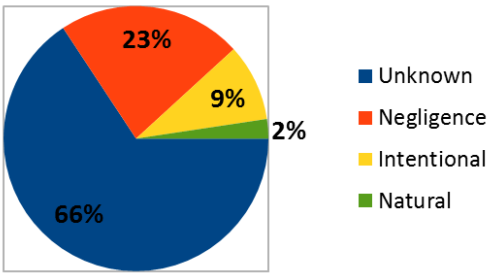


Figure 19. Main causes of wildfire in France in 2019.

Fire fighting means

To support firefighters funded by local authorities (numbering 37 000 in the Mediterranean departments and 7 700 in the Landes massif), the Ministry of the Interior deployed reinforcements that included:

- 650 military Civil Protection Training and Response Units (UIISC);
- 23 water bombers (12 Canadair, 8 Tracker, 3 Dash);
- 3 reconnaissance and coordination aircraft and 35 rescue and command helicopters.

Under a protocol signed with the Ministry of Defence, with funding from the Ministry of Interior, 45 men, 15 vehicles and three helicopters were assigned to the work of protecting forests.

Finally, around ten reserve firefighters from departmental fire and rescue services outside the Mediterranean area (strictly respecting the required qualifications) coming from different areas of defence were positioned. At the request of the *Centre Opérationnel de Gestion Interministérielle des Crises* (COGIC) of the Directorate General of Civil Security and crisis management, they were thus able to supplement local arrangements on demand.

The effectiveness of the intervention mechanism depends on its ability to act without delay by applying a strategy of fast attack for incipient fires based on the forecast mobilization of resources to combat during periods of high risk. Ongoing cooperation with *Météo France* and the *Office National des Forêts* (ONF) makes it possible to have specifics on the level of foreseeable danger to anticipate the danger and to be more reactive in operational response in the event of a fire.

Thus, in periods of high risk, both national and local resources are mobilized proactively according to the danger level to act promptly while the fire is still manageable: the UIISC elements are deployed in the most sensitive forests alongside local fire brigades, water bombers provide armed air surveillance missions (*guet aérien armé*: GAAR), and the military provide patrols alongside local actors (foresters, firefighters, members of community committees for forest fires).

The summer reinforcement mechanism mobilized by the Ministry of the Interior until mid-September was in great demand.

During the year, the civil water bombing aircrafts were engaged on more than 260 fires. The majority of these engagements were made between the end of June and the end of September. In 2019, the total operational activity of civil security aircraft in forest fire interventions was 2 780 flight hours. The Tracker contribution was 967 flight hours, of which 327 hours were on fighting established fires and 640 hours in GAAR. The Dash, three in number as of July, achieved 494 flight hours including 241 in combat and 253 in GAAR. The 12 Canadair, meanwhile, completed 1 252 hours, including 1 167 hours in firefighting and 85 hours in GAAR. 1 600 tonnes of air retardant additive were consumed.

Finally, the reinforcing columns of firefighters were mobilized during the summer to strengthen the preventive systems of the fire and rescue services of the Mediterranean departments when the danger of forest fires was particularly high. The DGSCGC coordinated the engagement of the equivalent of 70 columns of firefighters, generating an activity equivalent to 23 ,500 man-days. (For the record, for the whole of summer 2017, this figure was 29 600 man-days).

Figure 20. Fire-fighting means deployed in 2019.

Fire prevention activities

Most of the preventive actions were in the Mediterranean region:

- 116 meteorological zones are equipped with a network of stations, of which 73 are dedicated to forecasting forest fire danger;
- these forecasts were supplemented by monitoring the dryness of the vegetation at 30 sites (Figure 21);
- during the summer, a thousand foresters participated in surveillance and alert operations (lookouts, surveillance, deterrence and first response patrols) for a total of approximately 36 000 man-days funded by the state and communities;
- investment in field equipment continued, representing an investment of around €10 million of work, which benefited from the financial support of the European Union (around €1.4 million from EAFRD: the European Agricultural Fund for Rural Development) for the maintenance of existing amenities (tracks, water points etc.);
- information campaigns were conducted at departmental level (NUTS3) and across the entire region (NUTS1), to publicise preventive regulations (limitation or prohibition of use of fire, traffic in the massifs, clearing obligations, etc.) and dissemination of safety recommendations, in addition to a national inter-ministerial campaign on fire prevention;
- interdisciplinary units (foresters, firefighters, policemen) worked together in most departments to investigate the causes of fires, in order to guide preventive actions and improve the criminal justice response.
- regarding communication, the *Délégation à la Protection de la Forêt Méditerranéenne* (DPFM) has a website (www.dpfm.fr) which provides information on regulations and relays the main events and articles in French related to the DFCI.

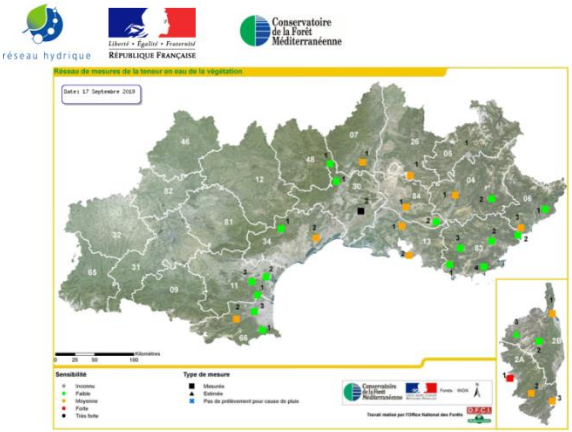


Figure 21. State of vegetation monitoring.

Impacts on human lives

The 2019 campaign was marked by the death of a Tracker pilot working on the Générac fire on August 2.

The measures taken to prevent and fight against forest fires were effective in protecting the civilian population and there were no casualties among them.

Operations of mutual assistance

France did not provide assistance to other European countries in 2019. However, a detachment of 38 Civil Security firefighters was engaged in Bolivia in early September to fight the fires in the Amazon.

Climate Change

The two exceptional episodes of high heat which affected France, first at the end of June in the Mediterranean region, then at the end of July over a large part of the metropolis, induced a very high flammability of litter and herbaceous plants, both natural and cultivated. (especially cereal crops).

Very many fires therefore developed in these non-forest formations, both in the Mediterranean region on June 28 (with for example more than 50 fires in the Gard department alone, where the temperature reached 46°C) and in the centre of the metropolis, with very large harvest fires on July 24 and 25 (nearly 15 000 ha burnt over these 2 days).

Beyond the damage inherent in the burnt areas, this extreme heat in the Mediterranean region led to immediate drying out of cultivated plants (particularly vines) and also of natural vegetation (in particular low scrubland) over more than 5 000 ha, making these formations extremely vulnerable to fire.

In the centre and the north of the country, the cumulative dry and relatively hot years since 2017 have weakened certain forest stands, limiting their growth and causing drying out.

These effects have been accentuated by pathogen attacks (particularly bark beetles), which make the affected stands much more sensitive to potential crown fires (although these have been so far infrequent in these regions).

To cope with this extension of the fire danger to areas that had hitherto been little affected, the relevant ministries have extended communication campaigns and measures to raise public awareness of this emerging risk throughout the metropolitan area.

A national network of forestry advisers is being set up by the National Forestry Office.

Figure 22. Damage to stands of Kermes oaks following extreme heat, Pyrénées-Orientales (*Photo credit: NFB*)

Research activities aimed at improving fire management

Research work has been undertaken in recent years to simulate the effects of climate change on the risk of forest fires in France. They are currently being deployed and should lead to an update of the mapping of areas exposed to the danger of summer fires by 2040 and 2070.

The evolution of the winter fire danger requires additional research, and for the moment cannot be simulated on the whole territory (its evolution depends of course not only on the climate, but also on agricultural and pastoral practices).

Mapping work began this year, and relates to a national mapping of the types of combustible plant formations.

In addition to an increase in temperatures and a decrease in summer rainfall, the effects of climate change should also translate (at least in the Mediterranean region) into an increase in the phenomenon of heavy rains during the autumn. These phenomena can be particularly dangerous on soils exposed by the passage of a fire.

In addition, research and cooperation actions are also carried out on post-fire phenomena, the means to predict them, and also to prevent their consequences through appropriate measures (silvicultural works, minor civil engineering).

The burned-out site of Montirat (Aude), the biggest fire in the summer of 2019, serves as a study site for these research and cooperation actions, particularly within the framework of an INTERREG SUDOE program EPyRIS (Joint Strategy for the recovering and protection of ecosystems damaged by Forest Fires: https://www.interreg-sudoe.eu/gbr/projects/the-approved-projects/187-joint-strategy-for-the-recovering-and-protection-of-ecosystems-damaged-by-forests-fires).

(Source: Ministère de l'Intérieur – DGSCGC / SPGC / BAGER; Ministère de l'Agriculture et de l'Alimentation : DGPE / SDFE / SDFCB / BGED, France).

1.2.8 Germany

Fire occurrence and affected surfaces

According to the data supplied by the authorities, a total of 1 523 forest fires were reported in Germany in 2019, corresponding to a burnt area of 2 711 ha (726 ha in deciduous forests and 1 985 ha in coniferous forests). This is a slightly lower number of fires but a higher burnt area than was recorded in 2018.

As usual the most affected province (Land) in 2019 was Brandenburg which accounted for around half of the total burnt area recorded in the country (Table 8, Figure 23). Three Länder (Bremen, Hamburg and Schleswig-Holstein) did not record any fires.

Table 8. Burnt area in total and by forest type, and total number of fires, Federal Republic of Germany, 2019.

	Burnt area (ha)			Number of fires
	Coniferous forest	Broadleaved forest	Total	
Baden-Württemberg	2.14	8.81	10.95	19
Bayern	75.24	51.70	126.94	164
Berlin	10.89	3.02	13.91	22
Brandenburg	805.23	583.40	1388.63	429
Bremen	0	0	0	0
Hamburg	0	0	0	0
Hessen	13.98	5.78	19.76	86
Mecklenburg-Vorpommern	982.86	0.72	983.58	75
Niedersachsen	19.73	8.65	28.38	285
Nordrhein-Westfalen	18.80	9.00	27.80	95
Rheinland-Pfalz	2.51	5.85	8.36	35
Saarland	1.40	2.40	3.80	6
Sachsen	27.18	29.61	56.79	155
Sachsen-Anhalt	18.16	2.41	20.57	106
Schleswig-Holstein	0	0	0	0
Thüringen	7.30	14.33	21.63	46
Germany	**1985.42**	**725.68**	**2711.10**	**1523**

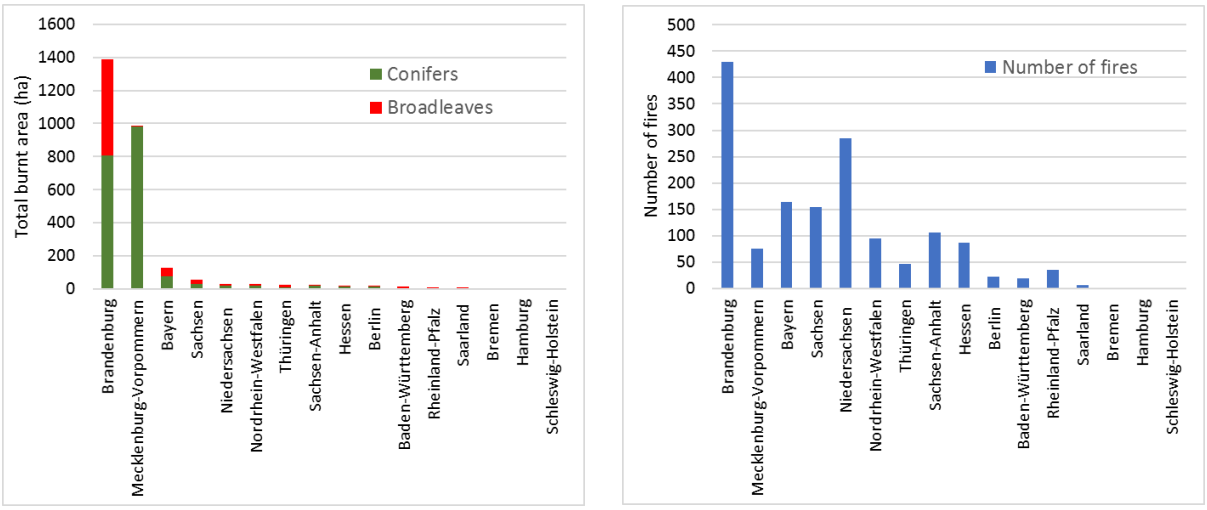


Figure 23. Burnt area (left) and number of fires (right) in Germany in 2019 by Land, ordered by total burnt area.

In 2019 there were two peaks of the season: one in Spring when the fires were relatively small and another in June, when most of the burnt area occurred. (Figure 24).

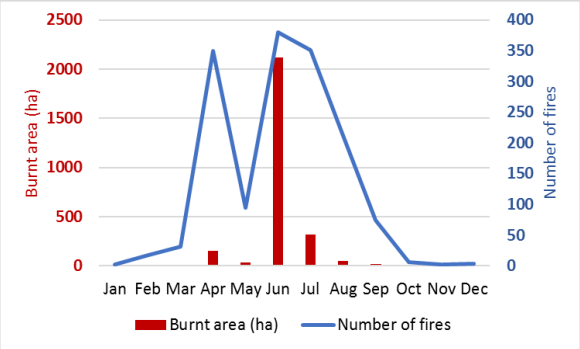


Figure 24. Number of fires and burnt area by month in Germany in 2019.

The trend of the burnt areas, number of fires and average fire size in Germany for the years 1991-2019 are shown in Figure 26.

Fire causes and impacts

The main causes of forest fires during 2019 are shown in Figure 25. Within the category of accident/negligence fires, the majority (183) were caused by the general public (campers, visitors, children etc.).

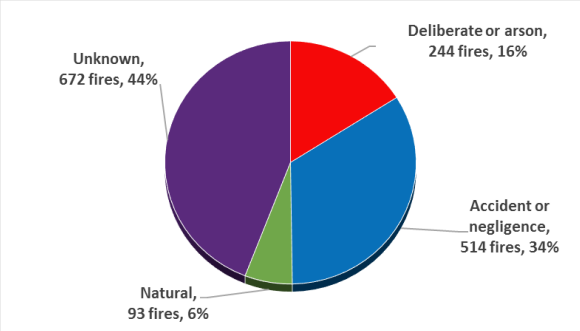


Figure 25. Causes of forest fires in 2019.

The economic damage caused by forest fires in 2019 is estimated to be around 2.22 million Euro (Table 10), higher than the long-term average from 1991 to 2019, which is 1.79 million Euro. The cost per hectare burnt was estimated at just over 819 Euro/hectare.

In 2019, approximately 5.08 million Euro were spent on prevention and control measures (Table 9).

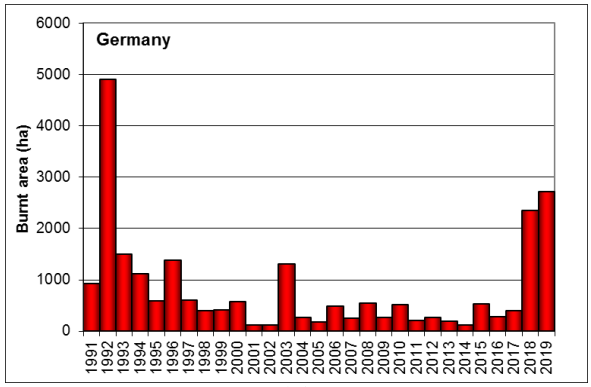
Table 9. Expenditure on forest fire prevention and control.

Expenditure (1000 Euro)	**2017**	**2018**	**2019**
Forest service	2144	3209	4804
Other (public and private	71	162	277
Total	2215	3371	5080

Table 10. Losses from forest fires in Germany 2017-9.

	Year	2017	2018	**2019**
Total volume of non-recoverable wood (1000m^3 overbark)	Sawlog size	1.6	881.9	**135.5**
	Other	72.7	82.2	**90.2**
	Total	74.3	964.1	**225.7**
Total value (1000 Euro)	Wood & other tangible losses[1)]	188	2,144	**1663**
	Other[2)]	103	525	**558**
	Total	291	2669	**2221**

1) Estimate of the stand expectation value less the stumpage value plus consequential costs caused by fire (additional planting cost etc.) as well as other material damage.
2) Other damage according to material value method (Koch) or other comparable cost estimates.



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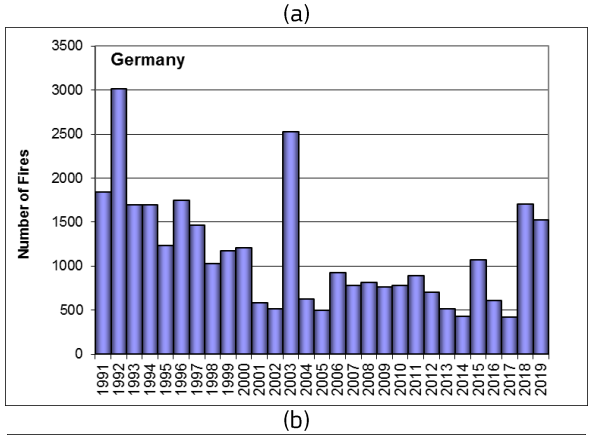

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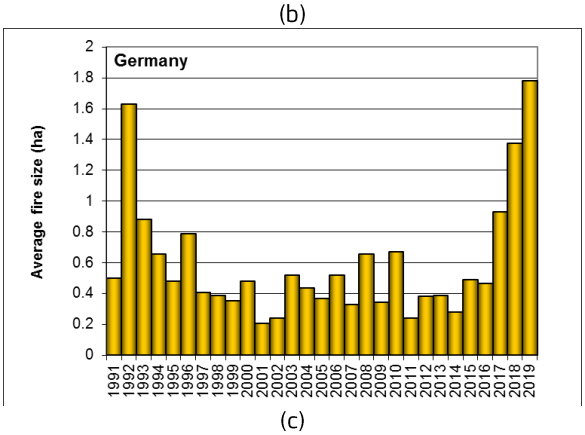


(c)

Figure 26. Burnt areas (a), number of fires (b) and average fire size (c) in Germany from 1991 to 2019.

(Source: Federal Agency for Agriculture and Food, Germany).

1.2.9 Greece

Fire danger in the 2019 fire season

Forest fires, during the year 2019 in Greece ranged at a low level. The fire season started out with low temperatures conditions and high precipitation levels especially in June and July.

However, July August and September were characterized by extremely warm weather conditions with maximum air temperature above 41 degrees Celsius in the central and continental parts of the country, high wind levels (13/08-7/08) and a fierce storm struck especially in Chalkidiki area (10/07) where human lives were lost.

Fire occurrence and affected surfaces

According to the data supplied by the local Forest Services, the most notable fire activity took place

in **Elafonisos** Island on the 10th of August burning 576.4 hectares,
in **Evia**; on the 13th of August burning 2.318.2 hectares,
and in **Zakinthos** Island on the 15th of September burning 854.81 hectares.

During the 2019 fire season, a total number of 657 fires were recorded with an affected burnt area of 9 152.77 hectares, 8 750.22 hectares of which occurred in wooded forest land and 402.54 hectares were on non-wooded forest land. The majority of fires (468) resulted in less than 1.00 hectare of burnt area.

From the current provisional results, the number of fires in 2019 compared with the previous year's fire events in 2018, show a significant reduction not only in the number of fires (657 compared to 793 forest fires) but also in the total burnt area (9 152.77 hectares compared to 15 463.61 hectares).

Table 11 shows the number of fires and burnt area in Greece in 2019. As mentioned, this number is still provisional and it is likely to rise when the compilation of fire data will be completed. However, no large deviation from this figure is expected.

Table 11. Number of fires and burned area in 2019 by regional forest administration

FOREST ADMINISTRATION AUTHORITIES	*Number of fires*						*Burned area (ha)*		
	Total	*<1 ha*	*1-5 ha*	*5-100 ha*	*100-500 ha*	*>500 ha*	*Total*	*Wooded*	*Non wooded*
Macedonia-Thrace	202	144	49	8	0	1	1116.09	1056.22	60.77
Epirus & Western Macedonia	157	105	41	11	0	0	643.986	597.97	46.02
Thessaly and Central Greece	77	48	16	10	2	1	3322.02	3209	113.00
Peloponnese, Western Greece & Ionian	120	89	17	7	4	3	3747.07	3637.20	109.87
Attica	18	15	3	0	0	0	9576	9576	0
Crete	65	52	7	6	0	0	187.87	139.039	48.838
Aegean	18	15	2	1	0	0	125.27	101.22	24.05
TOTAL	**657***	**468**	**135**	**43**	**6**	**5**	**9152.77**	**8.750.22**	**402.544**

Provisional

Fire fighting means

In 2019 the Fire Brigade personnel consisted of 17 065 people, 11 174 of whom were permanent personnel of the Fire Brigade dealing also with structural fires, 2 492 were personnel employed with a five years contract and 1 374 were seasonal personnel, hired for forest fire suppression activities. A further 108 civil service staff and 1 912 volunteer fire fighters were also involved.

The Fire Brigade of Greece has a total of 3 336 vehicles of various types. These vehicles are distinguished as follows:

Firefighting vehicles	1955
Helping vehicles	981
Special vehicles	236
Motor cycles	164
Total	3336

The aerial means used during the 2019 campaign are shown in Table 12.

Table 12. Aerial means participating in the 2019 campaign

National fleet		
Type	Number	Availability 2019 (max)
Aircraft CL-415	7	5
Aircraft CL-215	13	9
Aircraft PEZETEL	19	19
Helicopter SUPER PUMA AS 332 L1	2	2
Helicopter BK 117 CL	3	3
Helicopter CHINOOK	3	3
Aircraft C-130	1	1
Total	48	42
Leased air means		
Type	Availability 2019	
Medium Press Helicopters	12	
Heavy Duty Helicopters	6	
Total	18	

The yearly trends in terms of numbers of fires and burnt areas in Greece from 1980 are shown in Figure 27.

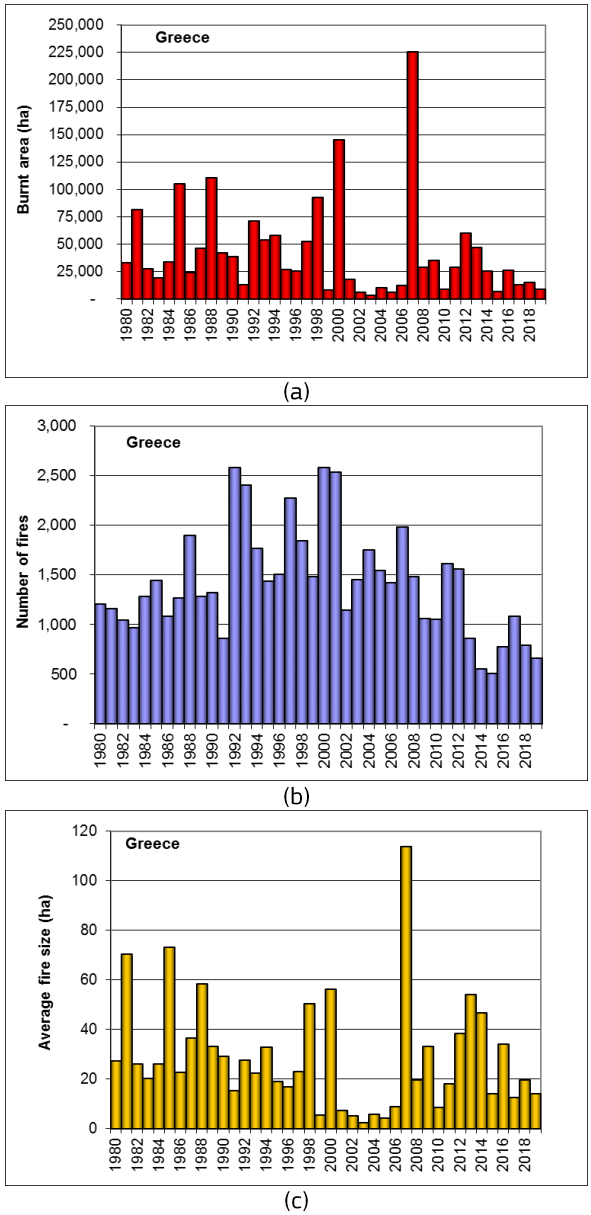


Figure 27. Burnt areas (a), number of fires (b) and average fire size (c) in Greece from 1980 to 2019.

Injuries and loss of human lives

During the fire-fighting period of 2019, nine (9) fire fighters were injured and three (3) citizens were killed.

(Source: Ministry of Environment and Energy; Directorate General For The Forests And The Forest Environment, Greece).

1.2.10 Hungary

Fire danger in the 2019 fire season

FWI derived data and values were reported throughout the whole fire season by the Forest Authority (FA). FA has been using the JRC's data service to monitor the daily fire danger situation.

Compared to previous years, a long period between 15th February and 20th April was much dryer than the average. Precipitation in March was only 30% of the multi-year average. Due to the very dry period the fire danger increased, causing a lot of fire events. The high danger period shifted to 20th April last year. From the start of March, a total fire ban was ordered and was in place for 39 days. There were several rainy days in May and June, so there was no significant fire danger. Because of the uneven distribution of precipitation in the second part of the summer there were two short periods when the FWI values reached a high level in June and July, both times for a week only. At the end of the fire season in October, a dry period began again and fire numbers increased. A short fire ban had to be ordered in the pine wood region in the Great Plain.

Fire occurrence and affected surfaces

Forest fire data are collected in close cooperation with the disaster management authority. Data collected on the spot by fire fighters are uploaded to the database weekly, and can be done day-to-day if necessary. Forest fire data are produced and analysed with a GIS method and checked on the spot by the forest authority. The gathered fire data are processed and evaluated by size, date, cause and duration of fires. They are then compared with traditions in forest management processes and the behaviour of visitors and hikers in the forest land area. Data from 2011-2019 are shown in Table 13.

Table 13. Number of fires and burnt areas.

Year	*Total number of wildfires*	*Forest fires*		*Other land types*
		Number	*Burned area (ha)*	*Number*
2011	8436	2021	8055	6415
2012	21581	2657	14115	18924
2013	4602	761	1955	3841
2014	5783	1042	4454	4741
2015	5318	1069	4730	4249
2016	2677	452	974	2225
2017	7122	1454	4933	5668
2018	2981	530	906	2451
2019	7296	2088	6541	5208

Figure 28 represents the tendencies experienced in last 9 years that there are two most dangerous forest fire periods during every year. Traditional use of grassland includes burning methods in early spring, which can accidentally spread to nearby forest. These fires usually burn in March and April. Spring vegetation fires usually burn with low or medium intensity in broadleaf forests, juvenile growths, shrubs and grasslands. Fire totally or partially consumes forests and causes serious harm. Based on a yearly data set, we found that 55% of forest fires occurred in two high danger periods. In the same period of the reported year, 81% of all fires occurred due to the long dry period. The number of forest fires in February was 13 times higher than in the same month of the base period (2011-2018). There were 2.5 times more forest fires in March and 1.5 times in April.

Table 14. Classification of fires by size class in Hungary in 2019.

Classification of burnt area	Number of forest fires	Burnt area (ha)
less than 1 ha	1478	444
1 – 50 ha	594	4159
50 – 100 ha	10	823
100 – 500 ha	6	1115
more than 500 ha	0	0
Total:	**2088**	**6541**

A total of 2 088 forest fires were registered in 2019. That value is the third highest in this decade after the two driest years 2011 and 2012. Despite the high number of fires, the average burned area was 3.1 ha, which is not an extreme value.

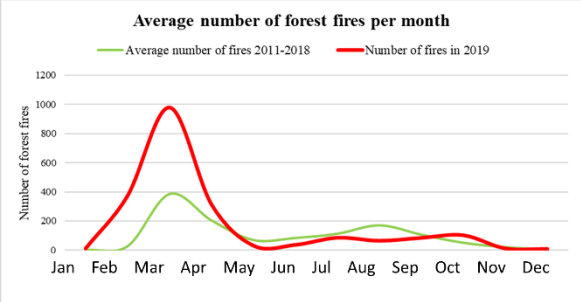


Figure 28. Average number of fires per month.

A total of 1 695 forest fires occurred in spring, which accounts for 80% of all the forest fires in 2019. Most of the spring fires (47%) burned in northern areas (Borsod-Abaúj-Zemplén County, Heves County, Nógrád County and Pest County) which indicates these areas as high forest fire danger zones. In these areas, not only traditional grassland management methods, but also other social-economic factors add to forest fire danger. Unlike spring fires, summer fires usually burn in the Great Hungarian Plain.

Figure 29 shows locations of forest fires in Hungary in high danger periods of the year. A total of 265 forest fires occurred but there were no large fires last summer. Compared to previous years, the number of summer fires did not change.

98% of forest fires were surface fires in the 2019 fire season, when surface litter and other dead vegetal parts and smaller shrubs burnt. The average proportion of fires smaller than 1 hectare is almost 70%. There were no large fires in 2019. There were only 16 fire events where more than 50 hectares were burnt. (Table 14).

Analysing the statistics we can see that a total of 4 197 hectares of forest land were burned or affected by forest fire during 2019. In addition, more than 847 hectares of grass vegetation and 1 497 hectares of other wooded land were destroyed in forest fires (Table 15).

Table 15. Fires by forest type

Forest type	Total burnt area (ha)
Forested land	4197
Other wooded land	1497
Other land	847
Total	6541

Fire Causes

99 % of forest fires are human induced (negligence or arson). Most fires are induced by negligence (adults and infants) and only a small proportion of fires are caused by arsonists. Typical forest fire causes are the incorrectly extinguished fires of hikers, illicit agricultural fires, discarded cigarette butts and sometimes slash burning.

Fire fighting means

Fires were usually extinguished in less than an hour after the alarm. The fire service arrived at the fire in 30 minutes on average. Small fires are extinguished within half an hour.

Injuries and loss of human lives

No death or personal injury occurred during firefighting in 2019. Fire service equipment was not heavily damaged.

Operations of mutual assistance

Neither Fire Service nor Forest Authority served mutual assistance last year.

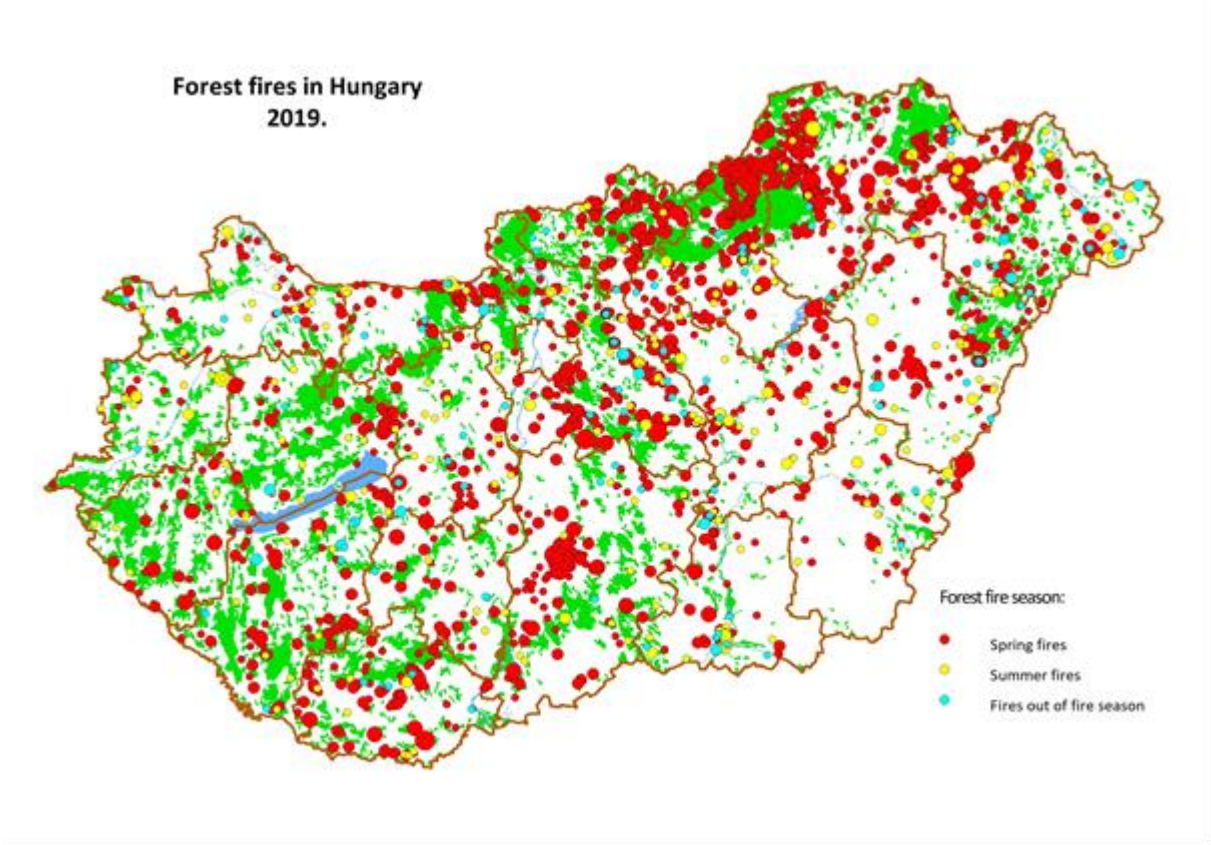
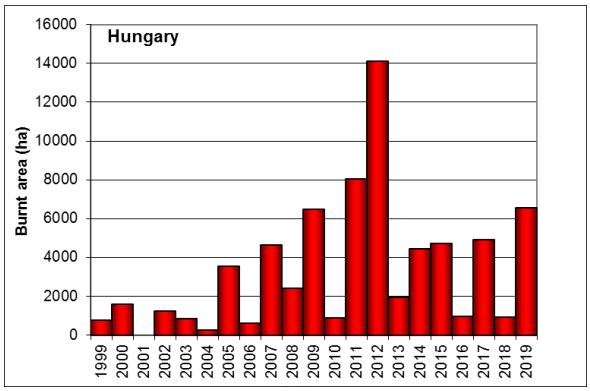


Figure 29. Locations of forest fires in Hungary in 2019.

The yearly trends in terms of number of fires and burnt area during the last 21 years in Hungary are shown in Figure 30.



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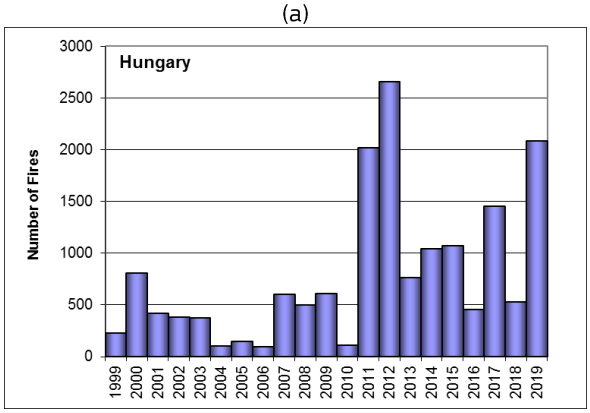

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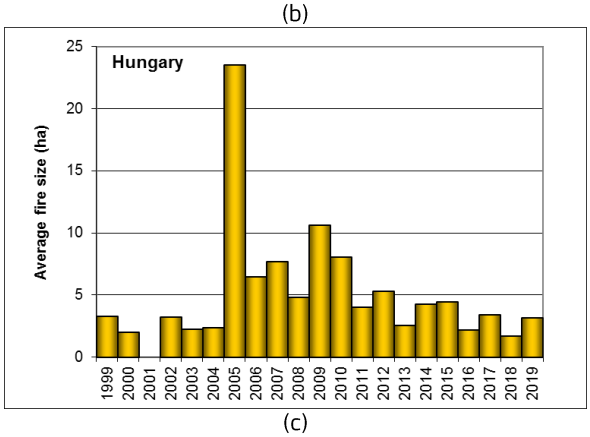

(c)

Figure 30. Burnt areas (a), number of fires (b) and average fire size (c) in Hungary from 1999 to 2019.

Fire prevention activities and fire information campaigns

In summer of 2019 we started a short study to gather the aspects that may be suitable for determining periods of fire risk and evaluating the effectiveness of forest fire prevention activities in Hungary. We are focusing on daily fire risk values and length of periods when a fire may occur. During the study we take into account fire statistics, meteorological data, fire risk and also FWI data sets.

There is a cooperation agreement between the Fire Service and the Forest Authority. The National Fire Prevention Committee established by the government has been monitoring all fire prevention activities. Forest fire prevention activities are implemented by the forest authority in the frame of a FIRELIFE project.

The last major event of the project was training for forestry, nature conservation, environmental protection and agricultural specialists. International processes of fire prevention, the characteristics of the Hungarian fire season, the related regulations, as well as the challenges and tasks of domestic forest fire prevention and the steps of planning and implementing controlled burning were presented in the framework of the training. The training presentations can be freely downloaded from the project website. http://erdotuz.hu/eloadasok/

The Firelife project entered the follow-up period after January 2019, but the effective communication developed in the project was continued during the spring and summer fire seasons with the budget support of the National Food Chain Safety Office. About 15 000 posters and 35 000 flyers were distributed, and the FIRELIFE adventure track promoted the importance of forest fire prevention at 10 events.

The communication project drew attention to the forest fire problem and restarted many fire prevention processes that had been abandoned. On the basis of the information received during the implementation of the project, we have improved the fire prohibition system, which now operates more flexibly and faster, using forest fire indices calculated by the EU JRC. Daily updated fire-prevention maps have been placed on the project's website, where related leaflets can be accessed immediately.

(Source: National Food Chain Safety Office; Forestry Directorate).

1.2.11 Ireland

The Department of Agriculture, Food and Marine (DAFM) is the agency responsible for forest Protection in Ireland.

Fire occurrence and affected surfaces

During 2019 it is estimated that approximately 3 800 ha of land was affected by fire, including approx. 100 ha of forest lands.

Table 16. Estimated total losses in 2019.

Forest	Non-Forest
100 ha	3700 ha (estimated)

There were no injuries, deaths or structure losses reported as a consequence of wildfire during 2019. Two homes and a number of other structures were destroyed in Co. Donegal, as a consequence of wildfires during April 2019.

Fire danger during the 2019 season

Fire risk conditions for 2019 can be considered typical for Ireland.

The permitted season for controlled burning closed on February 28th 2019, and this date coincided with localised high risk conditions in the east of the country and a significant number of upland fires were observed in a phase between February 27th and March 2nd.

The DAFM Forest Fire Danger Rating System was activated with a Yellow notice in early March 2019 and a series of five Condition Orange High Fire Risk warnings were issued between March and May 2019, in line with usual spring fire risk patterns. No condition red notices were issued during 2019.

Fire danger notice	Condition	Date
01/2019	Yellow	04/03/2019
02/2019	Orange	29/03/2019
03/2019	Orange	11/04/2019
04/2019	Orange	18/04/2019
05/2019	Orange	13/05/2019
06/2019	Orange	27/06/2019

Figure 31. Typical Irish upland landscape in high risk spring conditions.

Fire prevention activities

A Lessons Learned report - '*Response to Wildfires in 2018 – Report and Recommendations*' arising from wildfires during 2018 assisted preparedness for agencies involved during 2019.

Coillte (Irish State Forestry Board) Fire Improvement Plan was continued for 2019 and implemented during the season, including improved equipment, training, procedures and increased availability of contract air support. A number of fire training events were held prior to fire season, hosted by Coillte.

A continued reduction in illegal agricultural burning was generally observed during 2019 fire season. However, other forms of ignitions, particularly those associated with traditional peat cutting and illegal waste dumping were observed, and media messaging was adjusted accordingly. A number of Media statements and Fire Danger Notices received significant national media attention, both prior to and during the main active phases of the fire season.

A Ministerial press release was issued by DAFM in early March, 2019 advising of the dangers of fire in the countryside. A 'baseline' Condition Yellow Fire Danger Notice was issued on 4th March, advising of inherent seasonal risks. Fire prevention messages were modified in 2019 to cater for a wider audience than was previously the case, particularly the general public and recreational users. A number of Government Departments, Local Authorities, Forestry Companies and the State Farm Advisory service also issued guidance on fire prevention.

European Innovation Projects (EIP) and LIFE projects located in main fire risk mountain areas in Wicklow, Kerry, Inishowen, Blackstairs, Hen Harrier Project delivered specific fire management modules and hosted a number of events aimed at increasing the awareness of fire risks to landowners, and improving land management activities and measures that can reduce fire risk and treat fuel loads on a sustainable basis.

Figure 32. KerryLIFE Project Prescribed fire Operation, Blackwater Co. Kerry, February 2019.

A large scale aerial firefighting exercise was conducted in Lough Dan in Co. Wicklow in July, 2019 involving the National Directorate for Emergency Planning, Defence Forces and Coillte and Wicklow Fire and Rescue Service (Figure 33). This Exercise involved four aircraft and simulated aerial firefighting and coordination exercises.

Figure 33. Joint fire preparedness exercise, Avondale Co. Wicklow. March 2019

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Fire Activity

Initial seasonal activity occurred in the east of Ireland, within and adjacent to Wicklow Mountains National park and within sight of Dublin city. A second high profile fire took place in Killarney National Park in early April 2019.

Easter weekend occurred late in season in comparison with recent years and this is traditionally already a high risk period in Ireland due to weather conditions and increases in seasonal land use activities associated with fires. A large scale fire was experienced in the Annagry area of Co. Donegal that caused significant impacts on communities affected.

Approx. 1000 ha of land was burned over during this incident between April 20 and April 22 (Figure 34) and firefighting efforts involved the use of dozens of local volunteers, in addition to air support, civil defence teams and local fire services. Two homes and a number of associated uninhabited structures were destroyed. No injuries were reported. No Forest lands were affected during this incident.

One individual has been arrested and charged following this event and the case is currently before the courts.

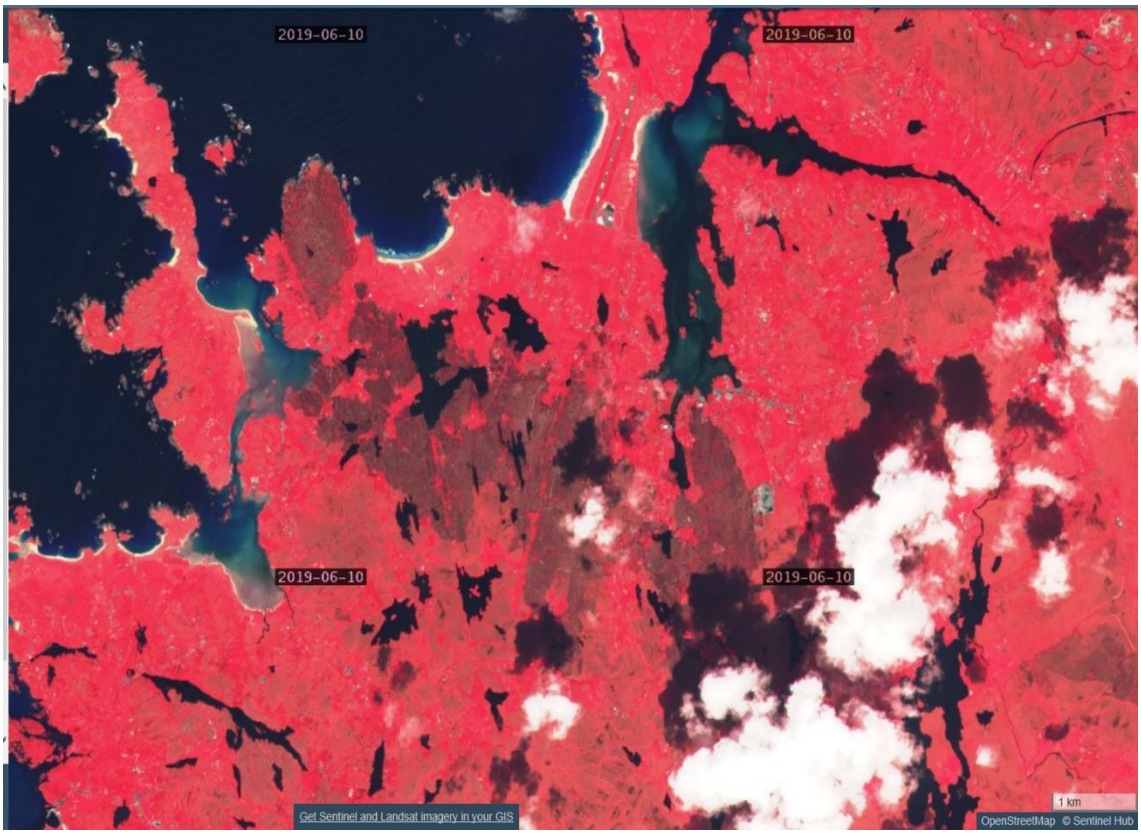


Figure 34. Annagry Fire, Co Donegal, June 2019 (Image courtesy of Copernicus)Fire Suppression

Fire suppression activities are usually conducted and led by Local Authority Fire and Rescue Services. On state owned forest lands and Nature Reserves, these services can be augmented by firefighting personnel, air support and equipment from Coillte Teoranta (State Forestry Board), National Parks and Wildlife Service, Bord Na Mona (Irish Peat Board) and the Irish Defence Forces.

Ground operations during 2019 were augmented by 2 Helicopters (EC120) hired from private sector contractors and additional medium lift helicopter support (AW 139, EC135) from the Irish Defence Forces where required.

2019 saw a continued development of air support practices at fires, and the early deployment of aerial assets in response to wildfire incidents. This process reflects lessons learned arising from 2017 and 2018 seasons.

International Assistance

There were no requests for assistance during 2019.

(*Source: Forest Service, Department of Agriculture, Food and the Marine, Ireland*).

1.2.12 Italy

Fire Danger

In 2019, the mean fire danger in Italy during the fire season (July to September) was slightly below the average (period 1988-2019), corresponding to the 68% of the highest FWI in 2007 (Figure 35, left). Note that FWI does not display any trend over the period of analysis (red dotted line - Figure 35, left).

A significant proportion of the inter-annual change in total burnt area in Italy is explained by changes in fire weather (Figure 35, right). A change in FWI from one year to the next is correlated with the corresponding change in burnt area, with 2019 showing average changes for both FWI and burnt area.

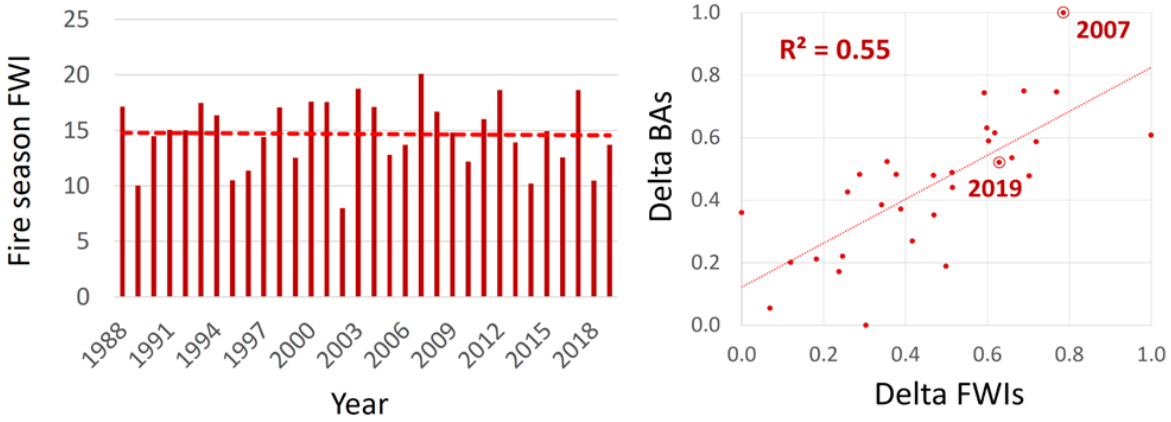


Figure 35. (left) Mean daily fire weather during the fire season (Jul-Sep) from year 1988 to 2019. The red dotted line indicates the linear trend over the period of analysis (left). Total burnt area in Italy for years 1988-2019 as a function of mean daily fire weather during the fire season (right). Calculations used the delta approach to correct for autocorrelation: a change in burnt area (Delta BAs) from one year to the next is correlated with the corresponding delta in FWI. Changes are standardized from 0 to 1. Year 2007 (highest FWI and largest burnt area) and 2019 are evidenced by a double circle. Fire weather was indexed using the FWI according to the Global fire danger re-analysis (Vitolo *et al.* 2020).

Fire danger analysis is increasingly important to inform fire management decisions in Regional Fire Management Plans in Italy (art. 3, 353/2000). For example, the Regione Lombardia renewed its fire management plan and, in collaboration with the University of Milan, equipped the plan with predictions of the number of fires and burned areas under several climate change scenarios up to year 2050. Predictions were based on the statistical relationship between Fire Weather Index and its sub-components, and daily weather observations for the past 15 years. Such relationship was extrapolated using future daily weather data at 8 km resolution generated by the COSMO-CLM regional climate model under scenarios RCP4.5 and RCP8.5, made available by the Euro-Mediterranean Centre for Climate Change (CMCC). A variation of the average annual burnt area is expected from -1 to + 3% in 2030, from +10 to +11% in 2040 and from +8 to + 23% in 2050 (Table 1), with similar variations in the average number of fires per year. The largest increases in burned area will be related to summer (+ 26-33%); the spring and autumn fires could undergo an increase of +11-13%, while the winter ones would remain almost unchanged (-1-2%).

Table 17. Burned area (ha) annual average by scenario and period of analysis

Scenario	**RCP4.5**			**RCP8.5**		
Period	2021-2030	2031-2040	2041-2050	2021-2030	2031-2040	2041-2050
Ha/year	1165	1137	1271	1069	1307	1270
Change %	-1%	+10%	+8%	+3%	+11%	+23%

Fire occurrence and affected surfaces

In 2019, both number of fires and extension of burnt area were greater than the previous year. In the course of the winter, a high number of fires and vast burnt area were registered in the northern part of Italy and Tuscany due to several days of strong and dry wind from north, high temperature and scarce rainfall (Table 18). The most affected regions in this period were Lombardy, Liguria and Tuscany. In March, fires mainly occurred in Piemonte region. In this area, the occurrence of strong winds and a prolonged drought in March 2019, combined with the steep slopes of the remote alpine reliefs, favoured decisively the spread of fires and strongly hampered the operations to extinguish them.

Table 18. Number of fires and burnt area in Italy by region in 2019.

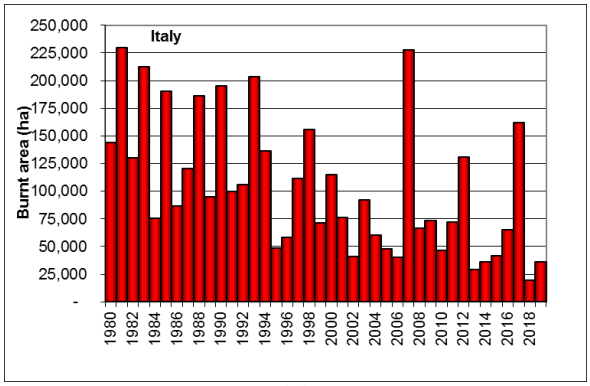
Year 2019	Num. fires	Burnt area (ha)			
		Forest	Non-forest	Total	Av. fire size
PIEMONTE	154	1479.4	486.2	1965.6	12.8
VALLE D'AOSTA	11	4.1	1.5	5.6	0.5
LOMBARDIA	187	816.7	443.2	1259.9	6.7
P.A. BOLZANO	31	3.9	3.0	6.9	0.2
P.A. TRENTO	24	20.6	2.4	23.0	1.0
VENETO	26	27.0	3.6	30.6	1.2
FRIULI V.GIULIA	71	34.1	82.8	116.9	1.6
LIGURIA	156	512.8	211.8	724.6	4.6
EMILIA ROMAGNA	53	44.3	25.0	69.3	1.3
TOSCANA	324	1481.6	336.2	1817.8	5.6
UMBRIA	64	109.1	37.3	146.4	2.3
MARCHE	53	55.8	35.0	90.8	1.7
LAZIO	234	1650.1	449.0	2099.1	9.0
ABRUZZO	48	177.8	225.0	402.8	8.4
MOLISE	27	59.9	135.9	195.8	7.3
CAMPANIA	513	1915.2	1097.9	3013.1	5.9
PUGLIA	355	1012.0	1691.0	2703.0	7.6
BASILICATA	185	630.8	1021.4	1652.2	8.9
CALABRIA	669	3700.9	1594.2	5295.1	7.9
SICILIA	819	2051.6	8732.5	10784.1	13.2
SARDEGNA	347	1929.2	1702.6	3631.8	10.5
TOTAL	**4351**	**17716.9**	**18317.5**	**36034.4**	**8.3**

NORTH	**713**	**2942.9**	**1259.5**	**4202.4**	**5.9**
CENTRE	**750**	**3534.3**	**1218.4**	**4752.7**	**6.3**
SUD+ISOLE	**2888**	**11239.7**	**15839.6**	**27079.3**	**9.4**
ITALIA	**4351**	**17716.9**	**18317.5**	**36034.4**	**8.3**

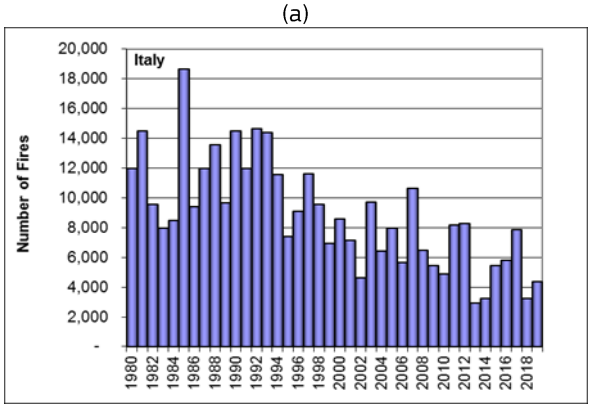
However, since May the fires have mainly affected Sicily and Calabria, with an anticipation of the summer campaign which, in these regions, occurred with some regularity in recent years. These two regions recorded the greatest number of fires and the largest burnt area in Italy, while in September north-western winds brought up Sardinia in the front for a few days, registering several simultaneous fires close to the urban-forest interface. Therefore, the fire campaign was further extended to November in the southern regions.

In 2019, the areas most affected by forest fires in terms of number of events were the Mediterranean scrub areas located on the hills of central-southern Italy (Figure 37). These ecosystems are wooded areas that can be defined as a degrading stage of holm oak, due to previous fires (0-5 years) and super grazing (cd disclimax), often located into areas not suited to productive silviculture or intensive agriculture. Instead, in winter time fires affected mostly mountain forests of *Pinus sylvestris* and pastures.

The yearly trends in terms of numbers of fires and burnt areas in Italy since 1980 are shown in Figure 36.



(a)



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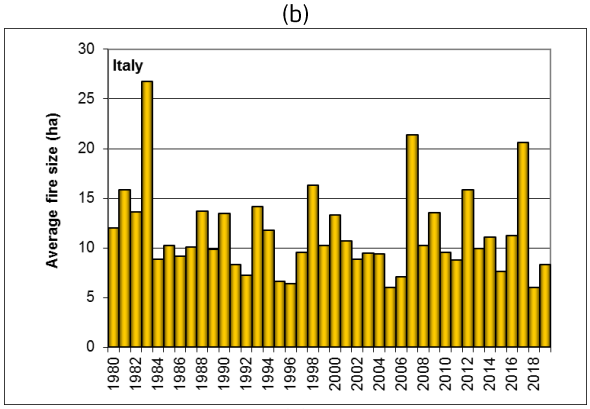

(c)

Figure 36. Burnt areas (a), number of fires (b) and average fire size (c) in Italy from 1980 to 2019.

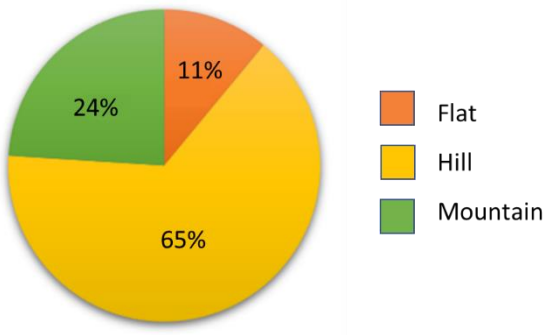

Figure 37. Localization of fires relating to orography (%).

Fire causes

Investigations by Carabinieri concluded that more than 57% of forest fires were man-made and intentional (Figure 4). The most frequent motivations being the renewal of pastures, while further reasons are linked to hunting activity, social unrest and pyromania. Unintentional causes (13.7%) are mainly due to activities related to burning plant debris generated by agriculture and forestry activities: in this case the perpetrators are in the main elderly people, who are not able to keep the fire under control and sometimes become victims of such fires.

A further 2% of fires are due to natural reasons: almost all for lightning.

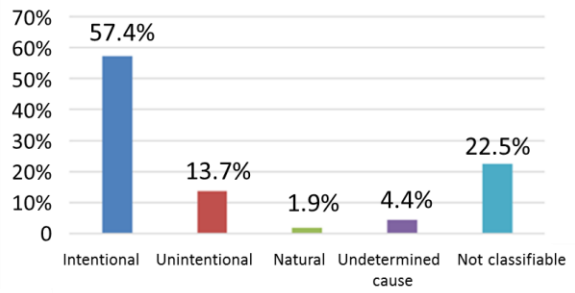

Figure 38. Main causes of forest fires in Italy in 2019.

41% of the ignition points of Forest Fires are directly located in the forest (Figure 39); 14% of ignitions reach the forest coming from cultivated areas and pastures, 19% from uncultivated lands, while 24% of fires are ignited near the road network.

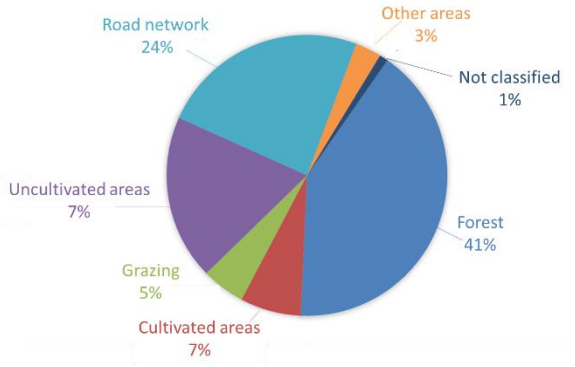

Figure 39. Location of start of fire.

Intelligence and investigation activities on forest fires carried out by Arma dei Carabinieri in the course of 2019, made it possible to report to the Judicial Authority 417 people, 44 of whom were arrested in "the act of crime". The outcomes of Carabinieri Activity over the period 2017-2019 are reported in Table 19.

Table 19. The outcomes of Carabinieri intelligence and investigation activities on Forest Fires in the period 2017-2019 (data provided by Arma dei Carabinieri).

Period	People reported to the Judicial Authority	People arrested in the act of crime	Total
2017	480	65	545
2018	160	30	190
2019	373	44	417
Total	**1013**	**139**	**1152**

Figure 40. Fire investigation activity.

Fire-fighting means

Italy is generally characterized by a double seasonality in terms of forest fires: the winter campaign in the northern part of the country, the summer one in the central and southern territories.

According to the National Law, the local Authorities 'Regione' have the task to extinguish forest fires with ground crews, composed of volunteers and forest workers, as well as Regional Forest Corps in the autonomous regions. Ground crews are supported by light and medium helicopters rented by the 'Regioni'. Each region has a Unified Operational Room to manage all the regional resources. Regions can sign special agreements with National Fire Corps (C.N.VV.F.) to carry out the activity of forest fire-fighting. 17 'Regioni' out of 20 selected this option and subscribed agreements on forest fire fighting with C.N.VV.F.

Figure 41. Piemonte region Forest fire fighting Volunteers in action.

The State coordinates, through the Unified Air Operational Centre (COAU), the National forest fire-fighting air fleet: 19 CL415 Canadair and 4 Ericson S64 heavy helicopters, all of them owned and managed by the National Fire Corps. During the summer campaign, some military helicopters and other medium helicopters from CNVVF are available too. Regional air fleets include some 70 helicopters operated by private companies. Puglia Region only adopted planes (2 Fire Boss).

In the course of 2019 regional aircrafts were engaged on 1731 missions, national assets received 965 requests, one third of which were submitted by Regione Sicilia.

Ground crews make use of Pick-up trucks, with a small water tank (400-600 litres) able to move on the network of narrow roads over Italian hills and mountains.

Figure 42. forest fire fighting light truck from Friuli Venezia Giulia Volunteers. This very small truck is the size of a pick up but carries 2000 litres of water.

The National Fire Corps usually provides heavy fire engines. Several cross-organizational workgroups including the different actors involved in forest fire-fighting activities have been established with the aim of improving the State-Regions System.

The Italian Government decided to increase the ground and air resources of the National Fire Corps through a 10 years plan of investments aimed to improve the response of the State to wildfires.

Climatologists' forecasts foresee an aggravation of the forest fires phenomenon in the coming years, so that the National Fire Corps acquired 2 additional Erickson S64 heavy helicopters to combat the most dangerous events and have a better distribution of the State firefighting fleet in the territory.

Figure 43. One of the new heavy helicopter Erickson S64 procured by National Fire Corps.

After the re-organization of the Forest Fire Fighting System due to the closure of State Forest Corps, National Fire Corps issued a new version of the Operational Cartography SITAC (Complex Tactic Situation) updating and improving the graphic symbology (Figure 44).

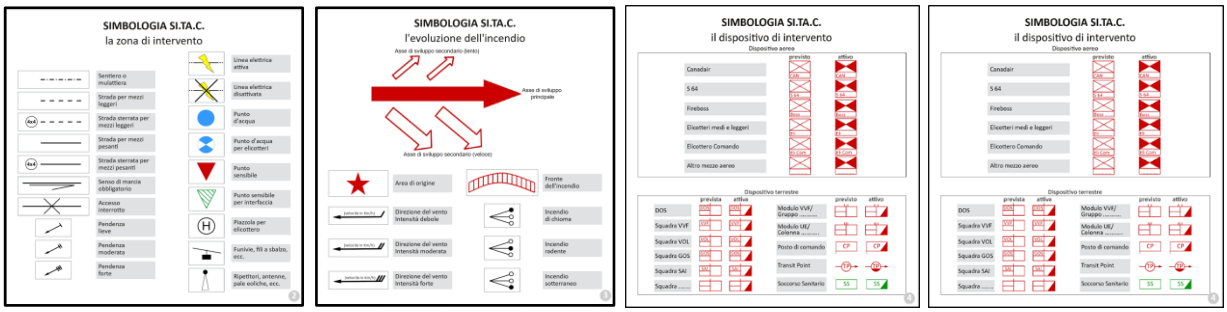

Figure 44. SITAC Symbology by National Fire Corps.

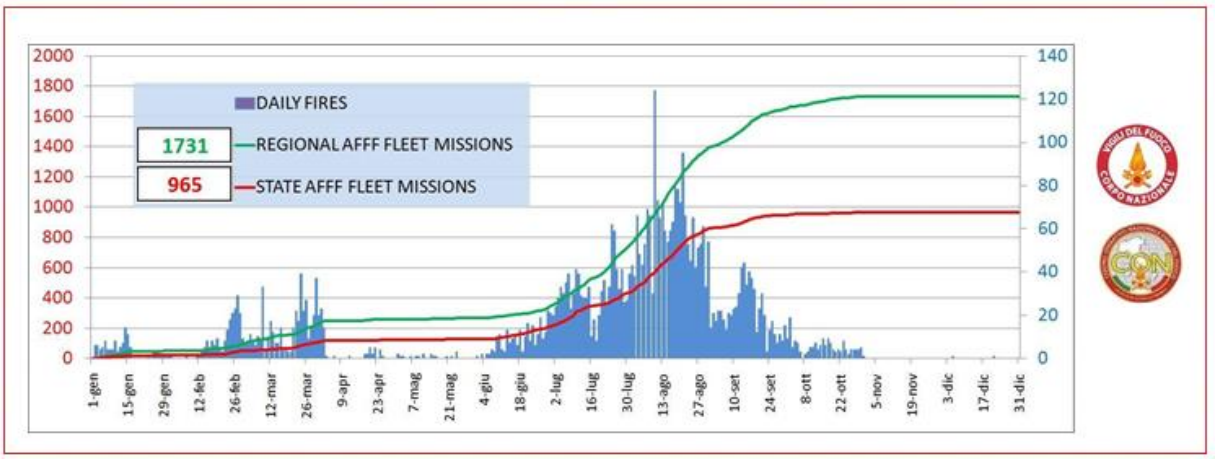

Figure 45. Daily number of forest fires in 2019; number of missions of forest fire fighting aircraft.

Figure 46. in the Italian forest fire fighting system different Organizations and Corps work together.

Fire prevention activities and information campaigns

At a national and regional level, a prevention approach is promoted that integrates forest and agricultural management interventions in areas with high fire risk, particularly at the urban interface, in order to reduce the possibility of fire starting and fire hazard, as well as to increase the safety and effectiveness of firefighting interventions.

The main instruments used on the territory are prevention interventions and agroforestry actions as defined in rural development measures, and are aimed more generally at adapting and restoring forestry potential damaged by natural or anthropic disturbances, fires, natural disasters and catastrophic events.

In 2019, several fire prevention programs were carried out at the regional level. The "*Fondazione per il Sud*" financed an integrated fire management program (named ABCD) in the Astroni Nature Reserve, located in the Campi Flegrei area, Campania Region, an area characterized by high fire hazard and very-high probability of ignition due to social conflicts.

The ABCD program (https://www.abcdastroni.it/) is thus implementing an innovative approach for fire prevention in the area by strategic fuel management involving private owners and citizens to restore traditional cultivation practices around the Nature Reserve.
The Tuscany Region implemented several fire prevention activities by approving 17 Specific AIB Prevention Plans in high fire risk territories throughout the region which define the spatiotemporal distribution and resources for fuel management activities for a period of ten years, including extraordinary interventions with the aim to improve the forest vegetation structures and its resistance and resilience to fire disturbance. Moreover, the Tuscany Region, in collaboration with the PREVAIL project (https://www.prevailforestfires.eu/) and SISEF (https://sisef.org/sisef/gdl/incendi-boschivi/), organized in December 2019 a workshop on fire prevention that hosted almost 100 participants among fire managers, professionals and researchers throughout Italy. Findings of this workshop were published on a special issue of the journal Sherwood dedicated to fire prevention (https://www.rivistasherwood.it/filevari/sommari/2020/Sherwood247-Sommario.pdf - Ascoli *et al.* 2020, Cacciatore *et al.* 2020, Tonarelli *et al.* 2020, Vacchiano *et al.* 2020).
In the framework of the Med-Coopfire and MED-Star Projects (Italia-Francia Marittimo Program), in order to enhance transboundary wildfire management and coordination in case of large events in the area of cooperation, a set of technical meetings among the Regional Agencies involved in this task was organized. A first draft of standardized protocols for mutual assistance and collaboration between Liguria and Regione PACA, Sardinia and Corsica, and Liguria and Tuscany, in case of relevant or transboundary wildfires was defined.

Injures and losses of human lives

According to National Fire Corps data (through the official reporting system 'Stat-Ri-web'), in 2019, 13 persons were injured due to forest fires; 3 of them were probably the authors of unintentional fires due to agricultural practices; 2 were first responders (1 professional fireman and 1 Forest Fire Fighting Volunteer). One casualty was due to forest fires, the author of unintentional fires induced by agricultural practices.

International assistance operations

During 2019, Canadair CL 415 aircraft of the National Fire Corps were engaged in three missions to help other countries in forest fire-fighting, under the coordination of the Italian National Civil Protection Department (Table 20). First, from May 24th to May 26th, two Canadairs were sent to Israel. They made 29 hours of operational flight on site and 7 drops of water.

Two Canadair CL415 of the RescUE element were sent to Greece from 14 to 17 August to fight several fires, in particular on Evia island. The activities of the Italian Canadair, having their base at Elefsina airport, began on August 13th and ended on August 17th, carrying out 5 missions and 126 drops, in the course of an operational flight duration of 28 hours and 35 minutes.

On 13 October 2019, two Canadair were sent to Lebanon, but the mission was soon stopped due to unfavourable weather conditions.

Table 20. Operations of mutual assistance in 2019.

Module	Mission	Time
IT AFFF with planes (2 Canadair CL 415)	Israel	24-26 May
IT AFFF with planes (2 Canadair CL 415)	Greece	13-17 Aug
IT AFFF with planes (2 Canadair CL 415)	Lebanon	15 Oct*

***** *Mission interrupted due to weather conditions*

Figure 47. Italian and Greek Canadair CL 415 during a forest fire-fighting mission in Greece in 2019.

Climate change

The year 2019 in Italy, was the third hottest year of the last 60 years, after 2018 and 2015, with an average temperature of 1.56° C higher than the climatic reference value (1961-90).

In particular, the three summer months recorded an average temperature of 2.88° C higher than the same climatic reference value.

This data confirms the trend of the most recent years, which have seen 8 of the hottest years since 1961 in the last decade.

Analysing the monthly data, excluding January and May, all the other months of the year were warmer than the reference averages.

Rainfall in 2019 was 12% higher than in the reference period, with an alternation of rainier months and drier months. However, it should be noted that in the island regions of Sicily and Sardinia there were some 100 consecutive days with an absence of significant rainfall (greater than 1 mm / day).

In addition to the summer months, other critical periods were the month of March in the North-West of Italy with rainfall some 60% lower than the average for the period and the months of September and October in the Central-South regions with a decrease in the recorded rainfalls of circa 50%, which, coupled with the high temperatures registered, built up favourable meteorological conditions for the spreading of significant fires, notwithstanding the uncommon periods.

Due to strong winds which lasted several days, during the winter a great number of fires and large burnt area were registered in the north-west of Italy and Tuscany. On the contrary in the course of the summer, notwithstanding a high number of fires (in particular in southern Italy), the burnt area was limited, due to some days of rain and only a few windy days.

The most dangerous wildland-urban interface fires in 2019 were registered in:

- Cogoleto, near Genova on 25 March 2019;
- Catania on 10 July 2019;
- Tortolì, near Nuoro on 13 July 2019, which required evacuation by boats of people from the beach (Figure 48, Figure 49);
- Monreale, near Palermo on 02 August 2019;
- Sarno, near Salerno on 20- 21 September 2019;
- Arborea, near Oristano on 22 October 2019;
- Bosa, near Nuoro on 22 October 2019.

Figure 48. Tortoli fire: fire spreads quickly burning machis and threatening beaches and camping sites.

Figure 49. Tortoli fire: it was also necessary to evacuate people by boats (photo Avioclub Ogliastra).

In 2019 too, the tendency to have very dangerous fires outside the high-risk periods was confirmed.

Italy must increase its preparedness to deal with wildfires campaigns that are no more well defined in terms of time and space.

Also, the land use is changing quickly; the borderlines between forests and fields are no longer well defined.

In the marginal agricultural areas, fields are no longer cultivated, and transition shrubs stands are growing, creating very suitable areas for the fast spreading of fires. For these reasons, the protective effect of cultivated areas is decreasing and, in the worse years, like 2007 or 2017, agricultural areas are no more safety lines to stop wildland fires; on the contrary, they become areas which allow a faster spread of fires to the forests. Noteworthily, fires involving agricultural areas, including those with transition shrubs stands, are growing and their number exceeds forest fires. National Fire Corps data (Stat-Ri-web) reports in 2019 more than 60 600 "vegetation fires" (Figure 16), better defined as "rural fires", (not classified as forest fires according to the National law). This evolution also increasingly challenges the forest fire-fighting response system.

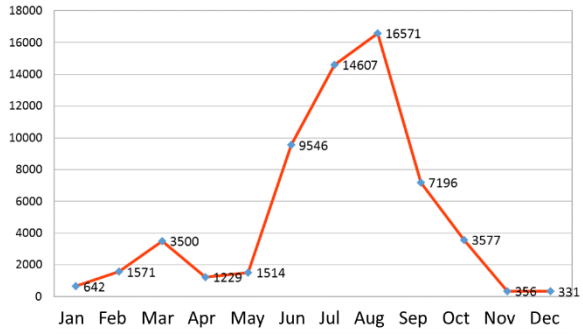

Figure 50. Numbers of vegetation fires ("rural fires") in Italy during 2019; these fires are not classified as forest fires according to the national law (data from National Fire Corps).

National or sectoral (forest) adaptation strategies and plans: adaptation measures promoted to limit forest fire risks

The National Forestry Strategy (SFN) (legislative decree 34/2018), in coherence with the European Forestry Strategy, and international and European commitments on climate change adaptation and biodiversity conservation, was set in 2019 and is currently under approval. The SFN provides for specific actions aimed not only at improving the adaptation of forest heritage to climate change but also at encouraging forest management interventions over a large area for the prevention of forest fires and extreme natural events.

In particular, the SFN aims to increase forest fire prevention by integrating forest management planning and agro-sylvo-pastoral practices with strategic fuel management, in order to support firefighting. This policy will make it possible to integrate into ordinary land management and in a more targeted way, actions aimed at reducing the risks of fire ignition and propagation by reducing the frequency and intensity of fires, and facilitating the operational interventions of active firefighting.

The SFN also highlights the importance of inter-institutional coordination for integrated fire management. In this context, with the "Specific Sub-Action 2.1: Government, fire management and inter-institutional coordination", the SFN envisages to develop tools and actions for coordinating sectors dedicated to forecasting, prevention, information, surveillance, firefighting, investigation and post-fire recovery, as defined by the L. 353/2000 and the most recent legislative decree 177/2016 (divided between Regional Forest Services and Civil Protection, National Civil Protection, National Fire Corps, CUFA, Park Authorities, Volunteering). This guideline will allow individual Regional Fire Management Systems to improve internal coordination among the competent regional services, safeguarding the relative and distinct competencies, and to improve the national coordination. It is therefore proposed to create an inter-agencies committee under the Presidency of the Council of Ministers, reinforcing the role of the inter-institutional table for fire management, established in April 2018, by decree of the Head of the Civil Protection Department of the Presidency of the Council of Ministers, with no overlap with fire management competences of Administrative Regions, State Administrations, Ministries, and Civil Protection

Research activities aimed at improving fire management

Several studies and research programs aiming at improving fire management in Italy were carried out and published in 2019. Elia *et al.* (2019) focused on the urban interface addressing what are the human and natural factors driving spatial patterns of fire ignition at the WUI in the Apulia region. Carlucci *et al.* (2019) analysed the socioeconomic processes influencing Italian fire regimes for the period 1961-2017. The CNR-Institute of BioEconomy published a client-server wildfire simulator (WWS) developed to provide real-time support to wildfire management operations in Sardinia (Arca *et al.* 2019). WWS is fully generalizable to other regions if the required weather conditions inputs and fuel model maps are available. A number of studies addressed post-fire ecology and restoration techniques after large fire events (Marcolin *et al.* 2019, Morresi *et al.* 2019, Semeraro *et al.* 2019, Tinebra *et al.* 2019), with particular attention to the large fires that occurred in 2017 (Carabella *et al.* 2019, Coschigliano *et al.* 2019, Esposito *et al.* 2019). The increase in such studies indicates the importance of investigating medium-term cascading effects of extreme fire seasons. As an example, in summer 2017, about 88% of the forest vegetation of the Vesuvius National Park was affected by multiple fire events compromising ecosystem services. The Department of Agricultural Sciences (University of Naples Federico II) has been

involved in a research program to assess the damaged forest areas and plan the most appropriate post-fire restoration activities of ecosystem services, with a strong interdisciplinary approach. A satellite-derived burn severity map was produced to spatially identify the Vesuvius forest areas severely damaged by such multiple wildfires (Saulino *et al.* 2020) and priority intervention areas were identified by means of a spatial multicriteria decision analysis (Cervelli *et al.* 2019). Using the same large fire as a study case, Espinosa-Prieto *et al.* (2019) demonstrated that prescribed burning can reduce fire severity in Pinus pinaster forests, but its effectiveness largely depends on fire weather, while Niccoli *et al.* (2019) demonstrated that *P. pinaster* growth reduction is strictly linked to the percentage of crown scorch and that even trees with high level of crown scorched can survive.

As regards ongoing research programs, the PREVAIL project (https://www.prevailforestfires.eu/) under the EU Civil Protection Mechanism is analysing the use of Rural Development Program funds for fire prevention, and documented several best practices for optimizing resources and reducing costs of fire prevention in southern Europe. In Southern Italy, national and regional research funds are supporting interesting research programs. The funding program "Research projects of national interest – PRIN (https://www.researchitaly.it/en/research-projects-of-national-interest/)" financed the Italian Tree Talker Network, which includes real time tree physiological analyses at burnt sites in the Vesuvius National Park using the Tree talker system (https://www.nature4.org/technology). The data are indicating differences in sap flow, and above all an increased vulnerability of previously burnt trees. Finally, the Regione Apulia financed the FORMA Project https://www.researchgate.net/project/FORMA-Fuel-models-and-fORest-roads-MAps) which is conducting aerial surveys with Laser Scanner to assess forest resources in the Apulia region to support the development of fuel models maps in the region.

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1.2.13 Latvia

Fire danger in the 2019 fire season

In 2019 the forest flammable period was set from April 19 and continued until September 19.

Fire occurrence and affected surfaces

In the reporting year, 1107 forest land fires were detected and extinguished, of which 805.16 ha of forest land was affected, including 220.9 ha of new stands.

In April, 513 forest land fires with a burned forest land area of 335.9 ha were registered. The biggest forest fire broke out on May 19, 2019 in the Riga regional forest district, Olaine municipality, Olaine parish, as a result of which 60.7 ha of forest land was burned. A helicopter from the National Armed Forces was involved in controlling the fire.

The average forest fire area in 2019 was 0.74 ha.

Table 21. Number of fires and burnt areas by month

Month	Number of forest fires	Burnt area (ha)
January	2	0.07
February	2	0.101
March	20	14.5131
April	513	500.3018
May	222	157.8403
June	129	51.5292
July	63	60.0159
August	94	18.6467
September	51	2.0772
October	6	0.046
November	4	0.023
December	1	0.0017
Total	1107	805.1659

Fire prevention measures in 2019 cost 101 582 Euro (Table 22).

Table 22: Expenditure on fire prevention measures in Latvia in 2019

Title	Costs, EUR
Latvian State forest	
Creating new fire breaks, 0 km	0
Existing fire break cultivation, 3333km	72015
Water point, warning sign renovation	29567
Total	101582
Riga City Forest	
Creating new fire breaks, 0 km	
Existing fire break cultivation, 548km	

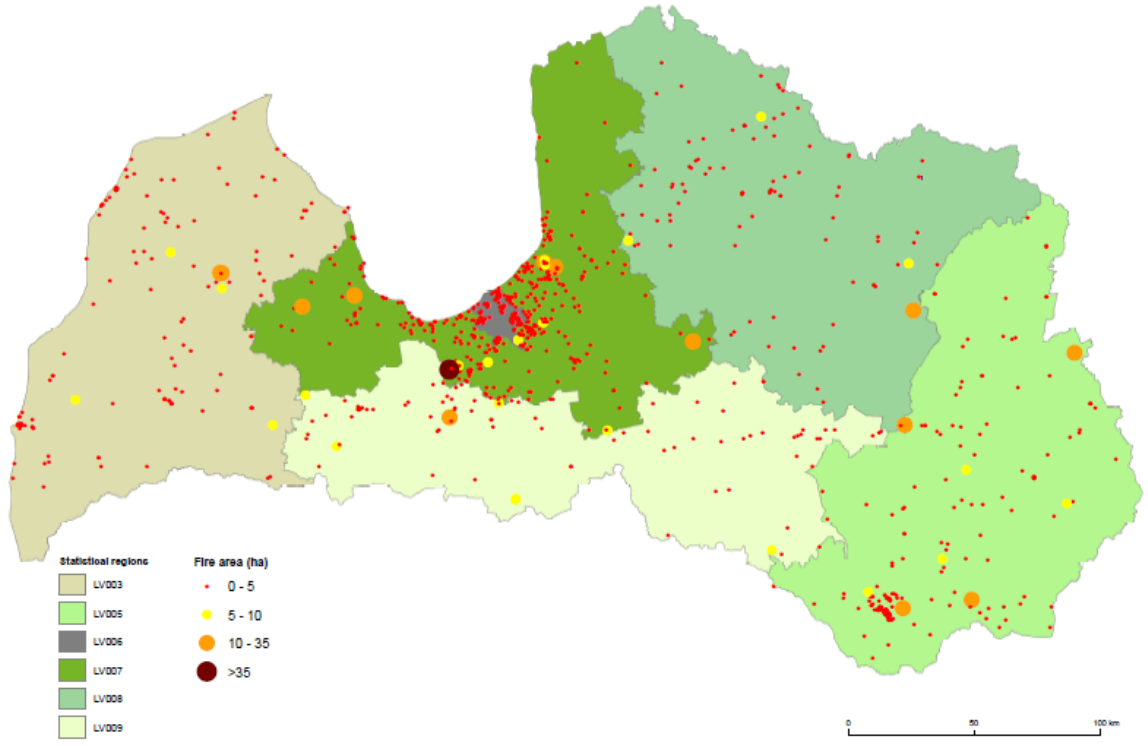


Figure 51. Map of forest fire locations in Latvia in 2019.

The yearly trends in terms of number of fires and burnt area during the last 27 years in Latvia are shown in Figure 52.

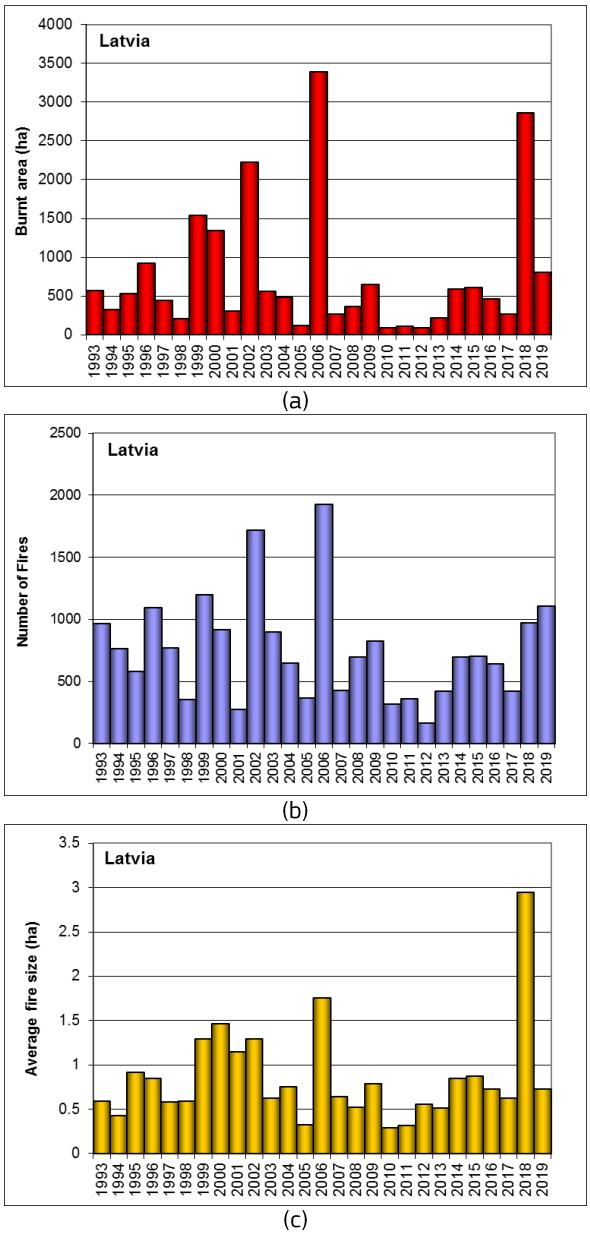


Figure 52. Burnt areas (a), number of fires (b) and average fire size (c) in Latvia from 1993 to 2019.

Preventive measures

The fire service network is used for fire protection (in total 180 fire towers).

In the summer of 2019, the State Forest Service provided seasonal workers with 335 posts (tower attendants, specialized fire tanker drivers, forest firefighters, forest fire station managers, operational duty officers), without which rapid response to forest fires would not be possible and would increase burnt forest land areas.

New equipment

In 2019, the State Forest Service purchased 1 new Mercedes Benz UNIMOG 4023 forest fire truck. In total, the Service has 17 Mercedes Benz UNIMOG 4000 and 12 Mercedes Benz UNIMOG 4023 forest fire trucks to ensure the rapid detection, control and elimination of forest fires. The service also has at its disposal 85 Toyota Hilux pick-up equipped with extinguishing equipment. In addition, the Service has purchased 2 new Polaris Ranger quad bikes, which will facilitate the delivery of firefighting equipment to places where other technical units cannot access.

In 2019, the Service has also purchased 3 MAVIC 2 ENTERPRISE unmanned aerial vehicles (drones), which will be used in forest fire protection, forest health assessment, etc.

(Source: State Forest Service, Environmental and Forest Protection Division, Latvia).

1.2.14 Lithuania

Fire danger in the 2019 fire season

The number of wildfires and the total burnt area was higher than in 2018. The first fire in 2019 was recorded in January, the last one in October. Fire danger during the fire season 2019 was characterized by high temperatures levels and high wind levels.

A heat wave in Lithuania occurred in May and August. The number of fires was influenced substantially by the weather conditions in spring and summer. The most notable forest fires for season 2019 are listed below.

Date	Burnt area, ha
2019-04-03	25.85
2019-04-24	21.28
2019-04-24	10.12
2019-04-23	6.68
2019-04-07	6.55

Fire occurrence and affected surfaces

In 2019, according to the data of the State Forest Enterprise, 279 forest fires occurred and damaged 200.17 ha of forest, of forest of which State forest accounted for 121 ha and forest fires in private forests covered 79.11 ha. 38 forest fires were bigger than 1 ha and two of these were over 20 ha in size. The highest number of forest fires occurred in April (46.24% of fires and 81.4% of burnt area).

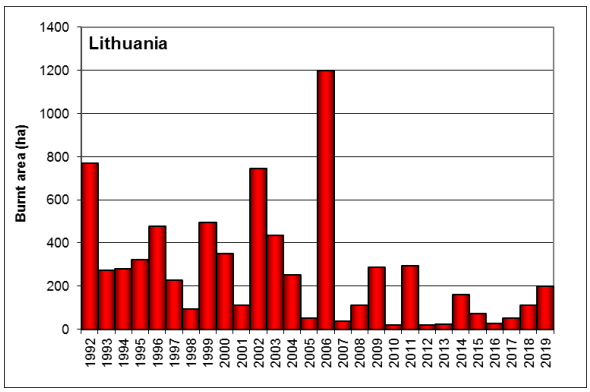
Fire Causes

In many cases, the ignition source for fires is associated with traditional agricultural burning practices, although the fire causes for the majority of fire incidents remained unknown. Fire departments of the regional units and forest officials have reportedly visited fire locations more than 800 times, according to reports of forest fires

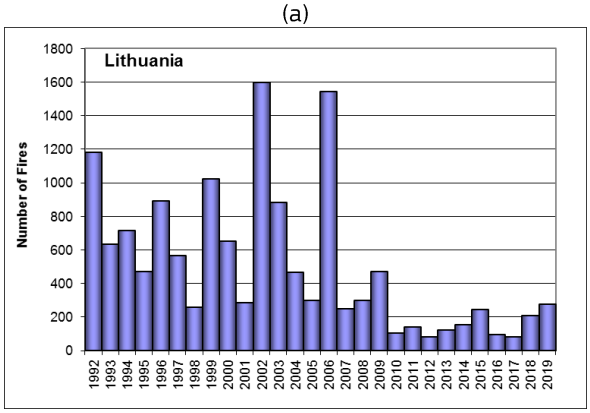
Economic costs

The total damage was estimated to be 74 084 euro.

The yearly trends in terms of number of fires and burnt area during the last 28 years in Lithuania are shown in Figure 53.



(a)



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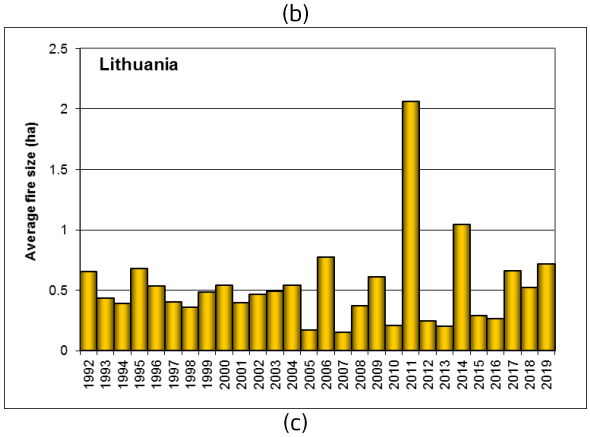

(c)

Figure 53. Burnt areas (a), number of fires (b) and average fire size (c) in Lithuania from 1992 to 2019.

Fire prevention activities

The State Forests Enterprise organizes the establishment of a uniform system of state fire prevention protection measures. Contracts between the Lithuanian Hydro meteorological Service and State Forests Enterprise are signed annually concerning calculations of complex forest fire figures and pronouncements of classes of fire rates in each territory of the state forest enterprise.

A Forest Fire Danger Map is updated daily (at 12 a.m.) from April to September and can be found on http://www.meteo.lt/lt/web/guest/misku-gaisringumo-klases-prognozes.

Every year state forest enterprises, together with Fire and Rescue Services and Armed Forces, organize educational training in the forest in order to check how organizations are able to organize forest fire extinction, manage difficult situations, control the actions, collaborate with each other and keep the connection.

In order to sustain the system of general state fire protection measures, state forest enterprises budgeted 1 907 thousand Eur from their own funds in 2019, and 13 089 km of firebreaks were mineralized.

Automatic early warning systems for forest fire prevention “Fire Watch” are used in the 25 regional divisions of State Forest Enterprise having forests with high fire risk (total 24 central stands and 84 detectors). Forest fire detection systems help to detect forest fire focus coordinates with better precision, so that the fire brigades can arrive at the fire faster and extinguish it more effectively.

In 2019 the State Forest Enterprise has acquired 23 new vehicles for forest fire fighting.

Operations of mutual assistance and loss of human lives

No operations of mutual assistance were taken and no casualties were reported in Lithuania during the fire season of 2019.

(Source: State Forest Enterprise, Forest Policy Group, Ministry of Environment, Republic of Lithuania).

1.2.15 The Netherlands

Fire danger in the 2019 fire season

The fire danger in 2019 was slightly above average in The Netherlands. Fire danger is measured at 20 locations in the Netherlands and data are available from 2014. The peaks in fire activity were in April and July. In late September there was a small peak in fire occurrence due to a few unusual hot and dry days. Despite the peak in the amount of fires in September, there were no large fires. Fire danger was at 'high risk' for approximately 20 days in 2019, where 2018 had more than 50 days of high risk in a row. Although the spring and summer of 2019 were warmer and drier than normal, there were no long periods without rain. Likely as a result of the regular rainfall, fire activity was therefore less than in 2018.

There were no (exceptionally) large fires in 2019. All fires were smaller than 30 hectares, with the largest fires in both cropland and (deciduous) forest near Winterswijk (~25 ha). Other fires were at heather- and grassland near Leusden (~25 ha), Arnhem (~15 ha) and Epe (~20 ha), all in the centre of The Netherlands.

Extreme heatwave

At the end of July, the Netherlands experienced a scorching heatwave. Temperatures reached above 40°C, exceeding the old national temperature record by almost 2°C. Those extreme heatwaves do have our attention, because parts of our vegetation are already in a bad condition due to the dry summers of 2018 and 2019. Extreme heat will be another complicating factor for the health of our forests and other vegetation.

Fire occurrence

The Netherlands Fire Service registered a total of 548 fires (Figure 54) that can be classified as vegetation fires – i.e. burning in for instance grass, shrubs, forest stands or agricultural crops. The total number of fires was roughly 1.7-fold lower than in the previous drought year of 2018 (949 vegetation fires) and 1.7-fold more than in 2017 (321 vegetation fires).

The fires occurred predominantly between April and September, with the largest peak in Spring (April) and a smaller one in Summer (late June to mid-August). Spatially, fires were again concentrated on dry sandy soils - mostly in Noord-Brabant and Limburg (south and southeast of the country, but also in the Veluwe region (centre), Drenthe/Overijssel (northeast) and in the sand dunes along the coast (Figure 54).

The estimated total surface affected by vegetation fires in 2019 was almost 250 hectares. This surface area was estimated based on information from news media, the fire departments and the wildfire cause and origin investigation team. Most fires occurred in heather and grassland (~57%). The remainder was forest (16%) and agricultural land (~28%), mostly crops ready for harvest.

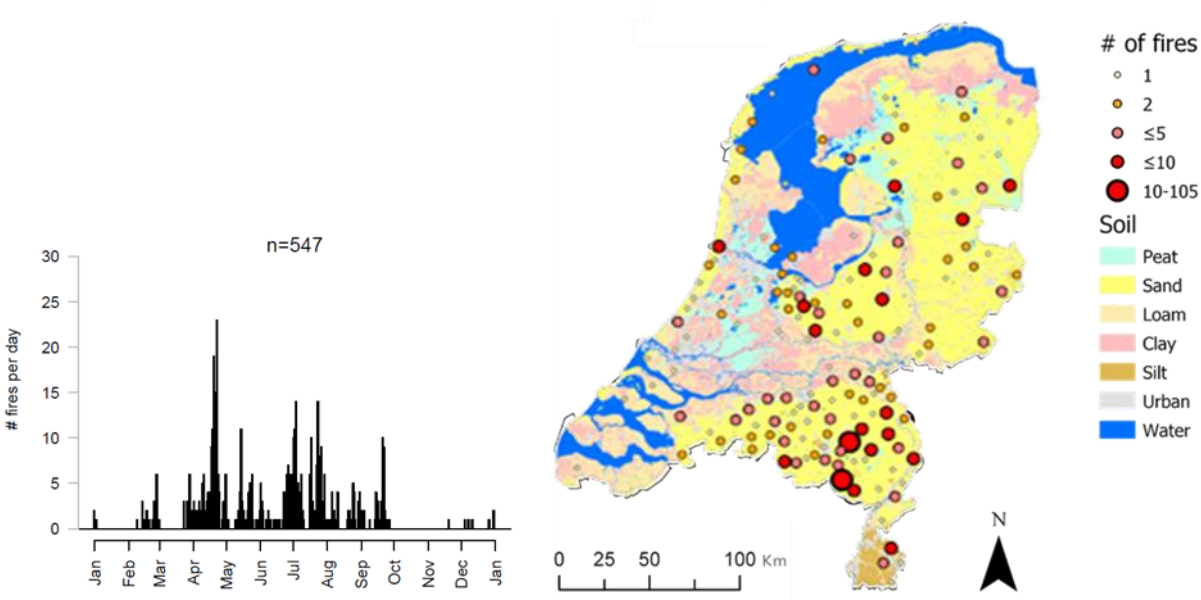

Figure 54. Temporal distribution (number of fires per day, left) and spatial distribution (number of fires per municipality, right) in The Netherlands in 2019. Note that fires are plotted in the centre point of each municipality – not at their exact location within the municipality. (*Map created by Jetse Stoorvogel*).

Figure 55. Wildfire at the Leusderheide.

Development of data collection procedures

In 2019 a pilot was started to use the information of the automated emergency dispatch system as the basis for the registration of wildfires in The Netherlands. For this pilot, we assessed the completeness and the accuracy of the vegetation fires classified via this dispatch system against the manual method described in last year's EFFIS report (San-Miguel-Ayanz *et al* 2019, Chapter 1.2.15), for which results were promising. The data reported for 2019 still follows the manual procedure – in the following years we will register vegetation fires with both methods and will clearly indicate it when we switch to dispatch only once that is fully reliable.

Figure 56. A fire truck is extinguishing a wildfire at the Leusderheide in the central part of the Netherlands.

Fire causes

The information available on fire cause is based on three official fire cause investigations performed by the Wildfire Cause and Origin Investigation Team as well as a large number of informal assessments. In terms of official investigations, fire cause was studied for 3 fires in 2019: two on the island of Terschelling and one on the island of Vlieland. These fires were officially investigated and their cause classified using the European classification for wildfire causes.

For all of the other 545 fires, the cause was not officially investigated. For 321 fires (59% of total), the cause was not assessed or listed at all, while 224 fires (41% of total) were informally assessed. In 141 of these cases the cause was informally assessed and identified; in 83 cases the cause was informally assessed but uncertain. Most of the fires with an identified cause ignited due to humans, mostly deliberate (17% of all fires) or due to the use of weapons on military exercise sites (16% of all fires).

Anecdotal evidence suggests that the number of fires ignited by natural causes (lightning) or due to working activities near vegetation (EFFIS classification 304 – 'Works') in the Netherlands is very small, with the far majority of fires caused by human behaviour (deliberate or accidental).

Fire fighting means

In 2019, approximately 1 200 engines were sent to extinguish the wildfires, with an average of slightly more than two engines per fire. In addition, in 308 out of 548 vegetation fires the suppression activities were supported by a total of 443 water trucks (with a capacity of at least 10 m^3). Three times, an Unmanned Aerial Vehicle from the Fire Department was used to make thermal images of the spread of the wildfires. The specialist wildfire-teams of the Netherlands Fire Service (Handcrew, Fire Bucket Operations and Wildfire Advisors) were not deployed during the season of 2019, because fires remained small and manageable.

Fire prevention activities and information campaigns

In 2019 the Wildfire Cause and Origin Investigation Team, called *Team Natuurbrandonderzoek*, formally started. Wildfire cause and origin investigators have been regionally active in The Netherlands for more than 10 years, but are now united in one national team. The aim of this national team is to increase the number of wildfire investigations in the Netherlands and to improve knowledge about wildfire behaviour and causes of wildfires. The expectation is that in 2021 a new Wildfire Investigation Course (FI210) will be organised in The Netherlands, both for Dutch and international colleagues. After this course it's a possibility that the Netherlands Fire Service will organise more (international) Wildfire Investigation Courses.

Figure 57. Members of the new Wildfire Cause and Origin Investigation Team

In 2020 the Netherlands Fire Service is planning to deliver a toolbox and best practices regarding the area-oriented approach, a close collaboration between nature owners, the fire service, municipality, building owners and other stakeholders to reduce the risk of uncontrollable wildfires. Next to that, we look forward to actively participate in the process of implementing a wildfire risk assessment at pan-European level.

Injuries and losses of human life

No injuries or fatalities were reported in 2019.

Operations of mutual assistance

No operations of mutual assistance were requested or deployed in 2019.

Climate Change

2019 weather vs. climate normals. According to the Dutch Royal Meteorological Institute KNMI, 2019 was the sixth very warm year in a row, which fits the trend of a warming climate (KNMI, 2019). Record temperatures were measured in Gilze-Rijen, which reached 40.7°C - the highest temperature in at least three centuries - on 25 July 2019. We here summarize the 2019 annual weather of the KNMI (KNMI, 2020): February was warm and very sunny, and temperatures particularly rose in the second half of the month, reaching even 20.5°C in Arcen – it had never been so warm in the Dutch meteorological winter before. This likely explains the small peak in February fire activity observed in Figure 54. Warm weather returned in Spring in April, with temperatures above 20°C and in some places even 25°C registered around 20 April. Summer 2019 was very warm (18.4°C average vs 17.0°C normal) – only three summers after 1901 had been warmer. There were two heat waves, and while the Summer was very dry it was less dry than in 2018: drought continued in the east but northwest and centre of the country were wetter than normal. Fall was rather mild, sunny and wet, with pronounced rainfall differences between regions. 2019 was a rather dry year, with 783 mm rainfall compared to 847 mm on average (KNMI, 2019).

Climate and forests. A forest stakeholder team has proposed the Dutch 'National Forest Strategy' that aims to expand the surface of forest in The Netherlands by 10% and make forests more resilient to climate change. This stakeholder team was led by the Dutch Forest and Nature reserve owners association (VBNE), the Union of Forest Groups and the Homegrown Timber Association (AVIH), in collaboration with Wageningen University and Research. At this stage, the National Forest Strategy is a proposal from a collective of organisations with a lot of knowledge on forest management and research, which they hope to see reflected in government policy.

Climate and water management. Water management in a changing climate is another theme that is high on the Dutch agenda. While the focus in the Netherlands has traditionally been on draining land through ditches, channels and canals as quickly as possible (to prevent getting feet too wet), there is increasing attention to retaining water in the landscape to mitigate effects of drought. These activities are aimed at increasing the proportion of rainfall that feeds groundwater resources in the higher Dutch sand landscape, rather than directly leaving these landscapes via surface waters. Since the far majority of vegetation fires in the Netherlands occurs on sandy soils (Mathu and Stoof, unpublished data), maintaining groundwater levels on sandy soils may have positive effects on vegetation fire hazard in case this results in reduced drought effects on vegetation.

Figure 58. Use of a high-capacity pump to pump up water from more than 50 metres below the surface.

Research activities aimed at improving fire management

Fundamental and applied research.

As announced in the last EFFIS report, 2019 saw the start of the Innovative Training Network PyroLife, a 4 million euro 4-year project funded by the European Commission (EU-MSCA Actions, grant number 860787) that trains a new generation of integrated fire management experts. Dr. Stoof at Wageningen University is the creator and leader of this network, that trains 15 PhD candidates across Europe not only in the understanding of fire but also in uncertainty, risk communication, and working across scientific disciplines, linking North and South Europe, linking science and practice and with a strong eye for social and gender diversity aspects. PhD research topics include risk perception, communication and engaging vulnerable communities at risk, as well as development of a temperate European fire danger rating system, prevention approaches and the first European Firewise guidelines, amongst many other topics.

Dr. Stoof also secured a small seedgrant from INREF, to connect fire communities in developed and developing countries, and investigated COVID-19 effects on fire management and collect lessons learned in collaboration with FAO (Moore *et al*, 2020; Stoof *et al*, 2020). Results are published in open-access format to facilitate knowledge sharing across countries and allow best practices to be used globally. The base language of this project is English, with reports translated to Spanish and also Chinese.

At Vrije Universiteit (VU) Amsterdam, Prof. Hans Cornelissen *et al*. at are currently investigating how drought impacts fire regimes in Dutch forests and plantations not only directly, but also indirectly: parasitic fungi (e.g. honey fungus) and wood boring beetles attack drought-affected trees that have declined in vitality. Thereby these trees may not only become more fire-prone and flammable by dying back, but also by these fungi and beetles changing the internal structure of these trees. A special focus within this topic is on black pine (*Pinus nigra*) in the coastal area, as the management of extensive black pine plantations is being much debated. In the fire laboratory FLARE at VU, experimental work on this topic is being carried out

Finally, two large fires in the Deurnese Peel and National Park De Meinweg in April 2020 have initiated a range of internal and external evaluations regarding fire management for which results are expected late 2020.

Practical research.

The Netherlands Fire Service has collected wildfire statistics since 2017, in collaboration with the National Institute for Safety and Wageningen University. In 2020 a pilot project will be launched on wildfire data analysis needs, in which we will evaluate the current process of data collection as well as any data and analysis requirements beyond the current statistics. One of the current ideas is to design 'Fire risk profiles' based on the occurrence and spread of wildfires in different areas.

Figure 59. Use of an all-terrain water truck to provide extra water for the engines that are extinguishing a wildfire.

Figure 60. A fire engine is extinguishing a wildfire during an exercise on the military training site in 't Harde.

(Source: Brandweer Nederland, Institute of Safety; Department of Environmental Sciences, Wageningen University, Netherlands)

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1.2.16 Norway

Fire danger in the 2019 fire season

Norway is using the fire index from Germany (WBKZ). The index is based on three main elements: precipitation, air temperature and humidity. The fire season is normally from March to September. Still, there will be variations since the country is 1 750 km from south to north and there may be flooding in one part of Norway while there is high forest fire index another place.

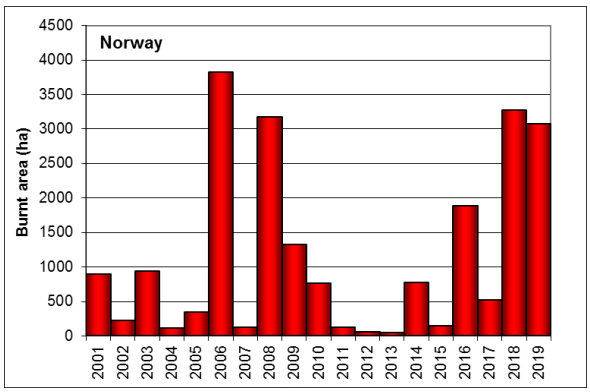
The fire season starts in the south-west in March-April and during the season it moves south and east. In the western part it is mainly brush-fires. In the southern part it is pines on poor soil that dries up quickly which are most commonly affected. The largest areas with forest are in the eastern part of Norway.

This fire season has been significantly calmer than last year. There was a high fire index in the spring for the southern part of Norway and for the northern part of Norway from mid-July to mid-August. The monthly temperature for the whole country was 3.3 degrees above normal. Several places had never recorded higher temperatures. On a national basis, during this year's forest fire season (April-August), precipitation was equivalent to 110 % of normal.

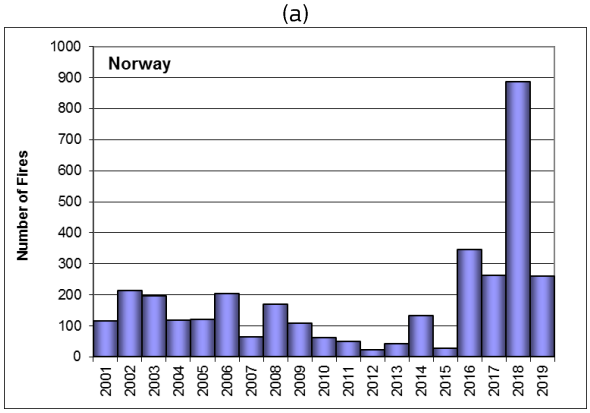
Fire occurrence and affected surfaces

In 2019 there were 261 forest fires recorded in Norway; 47 ha of productive forest and 3 030 ha of other wooded land. There were 559 fires recorded in brush and grass (non-forest).

The trends regarding both the number of fires and burnt areas from 2000-2019 are shown in Figure 8.



(a)



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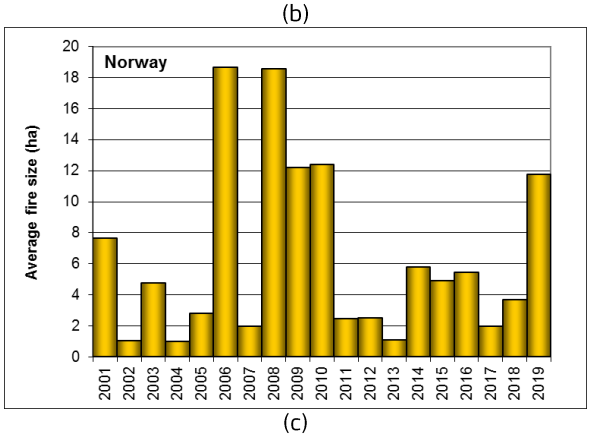
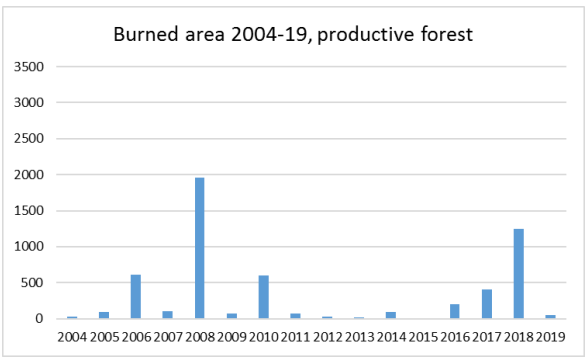


(c)

Figure 61. Burnt areas (a), number of fires (b) and average fire size (c) in Norway from 2001 to 2019.



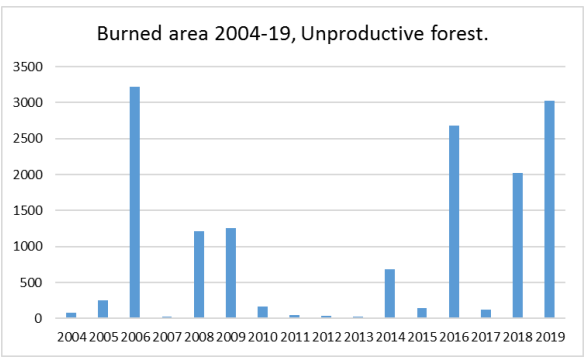


Figure 62. Burnt area of productive/unproductive forest in Norway 2004-2019.

Fire causes

Mainly, forest fires are man-made. This can be children's play with fire, burning debris or grass, forestry etc.

The second largest cause of forest fires is lightning/thunderstorms. Fires can occur immediately, or there may be fires next day after the vegetation has dried.

Fire fighting means

The Directorate for Civil Protection has an agreement with a private helicopter company.

Normally, a helicopter is centrally located in the eastern part of Norway. Through the agreement it is possible to increase number of helicopters and their location if the fire risk is high. The company has 8 locations in Norway and has agreements with other partners.

Helicopters are available for Fire Services in the period from 15 April to 15 September (24/7). For 2019, the helicopter(s) were used in 17 fires with approx. 230 hours in the air. Use of helicopter(s) for exercises were 20 hours.

The Directorate for Civil Protection has established an expert team that supports the local fire chief officer when large forest fires occur and when the helicopter is requested.

Norwegian fire services consist of 4 000 full-time and 8 000 part-time firefighters where the fire department is an all-risk service. For those municipalities that have significant forest fire risk, it is established groups only for fighting forest fires. These groups are managed by the fire services.

Photo credits: Dag Botnen, Norway

Fire prevention activities

The municipalities are responsible for the Fire Services in Norway and the Fire Service is responsible for prevention and action regarding forest fires. Some activities are assigned to Governmental Authorities through the Directorate for Civil Protection.

Responsibilities: Directorate for Civil Protection:

- Establishment of frameworks for the population and Fire Services through laws and regulations. In Norway is it by law prohibited to use fires in the forest or wildland in the period from 15 April to 15 September.
- Following up and maintaining agreement with air resources and coordinate placement and numbers of helicopters.
- Following up and maintaining agreement with forest fire management support.
- Developing and maintaining the system for statistics reporting fires (BRIS).
- Facilitate Norwegian Forest Fire committee (Members represented: Directorate for Civil Protection, Fire Services, The Norwegian Meteorological Institute, Insurance, Aerial resources, and Fire Associations).
- Participate in a Nordic working group for wildland fires. The group is considering a rescEU-team. Mandate is given by the Ministry for each country for development of Nordic cooperating regarding overview of resources, sharing of resources and increased interoperability between the Nordic countries

Responsibilities: Norwegian Meteorological Institute:

- Providing information on the forest fire index through the internet and providing information through television (Forecast) when the forest fire index is high.
- Participate in a Nordic working group developing a new common forest fire index.

Responsibilities: Fire Service, municipalities:

- Prevention: risk analysis, monitoring (air / plane), exercises / skills, information / campaigns and prescribed burning.
- Preparedness: handling the fires with focus on the fire potential (initial attack).

Photo credit: Dag Botnen, Norway

Climate change

<u>Climatic conditions and how they impacted the fire season</u>

Climate change in Norway leads to higher air temperature and it is expected that there will be more precipitation, but also droughts due to increased temperature.

The consequences of this are increased growth in grass, shrubs and trees. This leads to overgrowing of cultural landscapes, a longer fire season and larger fires as a result of more fuel.

National adaptation strategies / plans and in particular regarding plans to adapt the forest sector to climate change in order to limit forest fire risks.

The Directorate for Civil Protection has started an analysis to adapt the national preparedness to large forest fires. It will at a later stage be made a preventive analysis.

<u>Research activities aimed at improving fire management</u>

Project: Wildland-Urban Interface (WUI) Fire Risk

Period: January 2016 – December 2024

Owner: Western Norway University of Applied Sciences

Contact: Torgrim Log, prof.

Description: The goal of the project is to prevent devastating WUI fires in the *Calluna vulgaris* (heather) dominated Norwegian landscape. The project shall develop risk warnings and support civic groups working to reduce the WUI fire risk in coastal Norway.

Operations of mutual assistance

None.

Injuries and loss of human lives

None.

Photo credit: Dag Botnen, Norway

(Source: Directorate for Civil Protection (DSB), Norway).

1.2.17 Poland

Fire danger in the 2019 season

The weather conditions had influence on the forest fire danger risk trend in the year 2019 and were favourable to the occurrence of fires.

The diagrams (Figure 63 - Figure 67) show the variations of air temperatures, precipitation, relative air humidity, pine (*Pinus sylvestris* L.) litter moisture, and the national degree of forest fire danger risk (NDFFDR) in the 2019 fire season (April-September). They also present the number of fire outbreaks.

The mean monthly air temperature was 16.6°C at 9 a.m. and 21.7°C at 1 p.m. For comparison, the average from the years 2001-2010 were 16.0 and 21.0°C, and in the year 2018 17.9 and 23.5°C respectively.

In April, the coolest month of the 2019 season, the mean monthly air temperature reached 9.8°C at 9 a.m. and 16.2°C at 1 p.m. These temperatures were lower, in comparison to 2018, by about 2.8°C in both of the observation terms. In May the average air temperature increased to 13.4°C at 9 a.m. and 17.1°C at 1 p.m.

The highest average monthly air temperatures were observed in June, and reached 23.3°C at 9 a.m. and 28.4°C at 1 p.m. In July and August, the mean monthly air temperatures decreased in the morning. They were brought closer together and reached 19.6 and 19.9°C respectively. In the afternoon they reached 23.6 and 26.0°C respectively.

In September followed a distinct decrease of the air temperature. The mean air temperature decreased to 13.4°C at 9 a.m. and 18.7°C at 1 p.m. The maximum air temperatures oscillated from 23.8°C in May to 35.8°C in June.

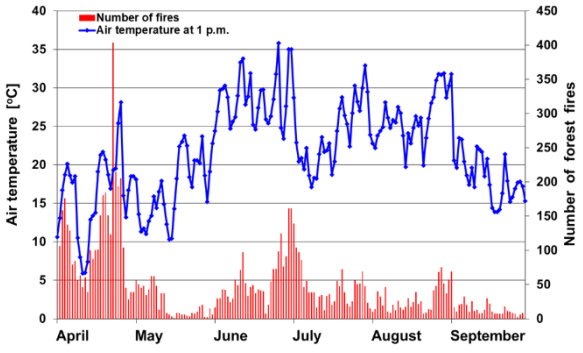


Figure 63. Air temperatures and numbers of forest fires in fire season 2019.

All the fire season was characterised by a small quantity of rainfall. The average precipitation level in the 2019 fire season was 1.8 mm (the same as in the 2018 season) and it was the lowest in comparison to years after the year 2001, except the year 2015 (1.5 mm).

For comparison, the average precipitation level from 2001-2010 was 2.7 mm. The average precipitation level oscillated from 0.7 mm in April to 3.0 mm in May. It was above the seasonal average in May, August and September. The maximum value of rainfall (12.6 mm) in the 2019 fire season was noted in August.

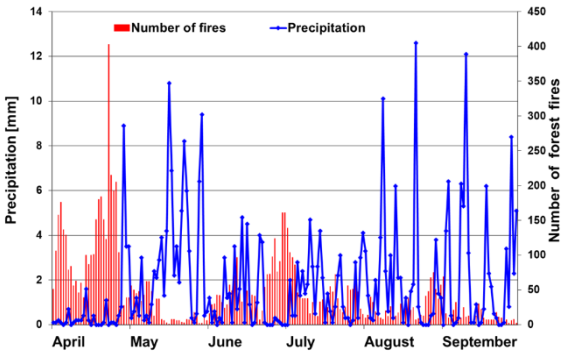


Figure 64. Precipitation and numbers of forest fires in fire season 2019.

Mean pine (*Pinus sylvestris* L.) litter moisture values (the reference fuel type in Poland's condition) were the one of lowest which appeared in years 2001-2019 (a lower value was noted only in 2018). They reached 27.2% at 9 a.m. and 22.2% at 1 p.m., below the security level in respect of fire for dead pine litter, amounting to 30%. In the 2018 fire season they reached 26.8 and 21.3% respectively. For comparison the average from years 2001-2010 amounted to 31.0% and 26.0%.

Below average mean litter moisture values for the 2019 fire season were noted in both of the observation terms in April (19.2% at 9.00, and 15.4% at 1 p.m.), June (respectively 20.2% and 14.7%) and July (respectively 25.4% and 20.8%). In the remaining months (May, August and September) mean litter moisture values were above the average for the 2019 fire season. They oscillated within the range of 28.4-35.6% at 9 a.m. and 22.2-30.1% at 1 p.m.

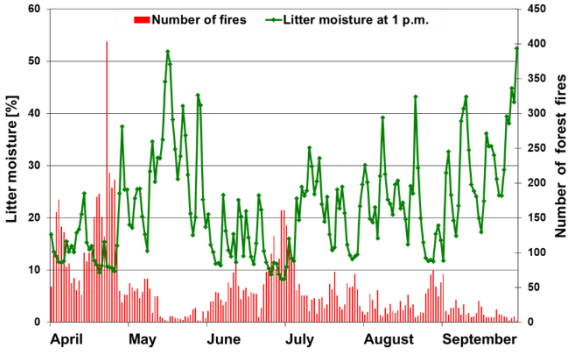


Figure 65. Litter moisture and numbers of forest fires in fire season 2019.

The mean relative air humidity for the 2019 fire season reached 74.8% at 9 a.m. and 52.6% at 1 p.m. They were lower in comparison to years 2001-2010, when they reached 76% and 55%, and in the year 2018 (87.1% and 54.5% respectively). The lowest values at 1 p.m. (below the average for the 2019 fire season) were observed in April (41.3%), June (45.7%), August (50.1%) and July (52.0%). The higher values from the average for the fire season appeared in May (61.5%) and September (65.0%).

In the morning term of observation, the relative air humidity was below the average for the fire season in April (63.4%), June (65.8%) and July (72.0%). Whereas the highest mean relative air humidity was observed in September (89.3%).

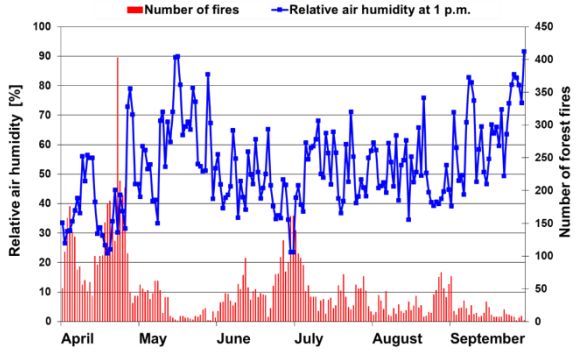


Figure 66. Relative air humidity and numbers of forest fires in fire season 2019.

The average national degree of forest fire danger (NDFFDR) in the four-degree scale (0, 1, 2, and 3) reached 1.2 at 9 a.m. and 1.5 at 1 p.m. It was identical to the 2018 fire season. This means that the fire danger in the whole analysed period was moderate.

The greatest forest fire danger appeared in April, when NDFFDR reached 1.8 at 9 a.m., and 2.3 at 1 p.m. In June (in the second month in respect of forest fire danger) NDFFDR reached 0.8 and 1.9 respectively. In these two months the percentage of occurrence in the third level of forest fire danger was the highest and reached 49.9% in April and 27.0% in June in the afternoon.

The lowest forest fire danger was in September, when NDFFDR reached 0.7 in both of the observation terms.

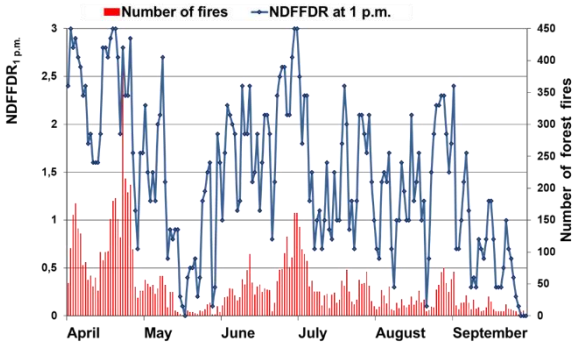


Figure 67. The National Degree of Forest Fire Danger Risk and numbers of forest fires in fire season 2019.

Fire occurrence and affected surfaces

In 2019 in Poland, a total of 9 635 fires broke out (6 532 in forest and 3 103 in other non-wooded natural land), over 768 more than in 2018 (8 867 fires), with a surface area of 3 572.42 ha (2 340.74 forest and 1 231,73 ha other non-wooded natural land), over 876.34 ha more than in the last year (2 696.13 ha) - Table 23 and Figure 70.

The greatest proportion of fires occurred in April (37.3%; i.e. 3 593) - Figure 68. This was followed by June (17.0 %) and July (14.9 %). The lowest number of fires in the fire season (April - September) occurred in September (4.5 %) and May (7.0 %). 89.7 % of the fires occurred in the fire season.

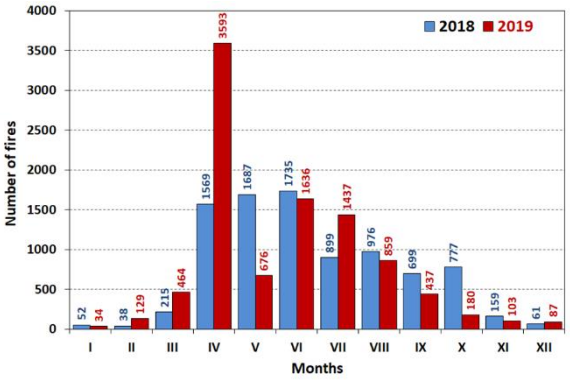


Figure 68. Distribution of number of forest fires by months in 2018 and 2019 in Poland.

The largest number of fires in 2019, similar to last year, occurred in Mazowieckie Province (2 699 – 28 %). The lowest number of forest fires occurred in Opolskie Province (148) and Małopolskie Province (19). These data are illustrated in Figure 71 - Figure 73.

The largest burnt forest areas were recorded in:

- Mazowieckie Province (1 144 ha),
- Podlaskie Province (312 ha),
- Świętokrzyskie Province (275 ha).

The smallest area was in Małopolskie Province (53 ha) and Opolskie Province (69 ha).

Small forest fires; i.e. with a surface area of less than or equal to 1 ha, represented 94.03 % of all the forest fires in 2019 (Figure 7), with the burnt area amounting to 36.20 %.

Fires with a surface area of between 1 ha and 10 ha represented 44.92 % of the burnt area, with their number representing only 5.73 %.

In addition, there were 23 large fires (10-100 ha) representing 18.76 % of the burnt area.

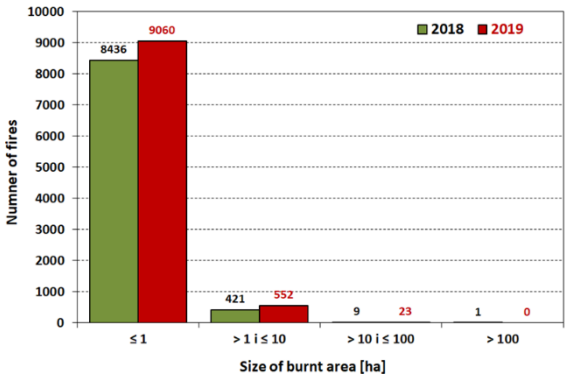


Figure 69. Distribution of the number of forest fires by size of burnt area in the years 2018 and 2019 in Poland.

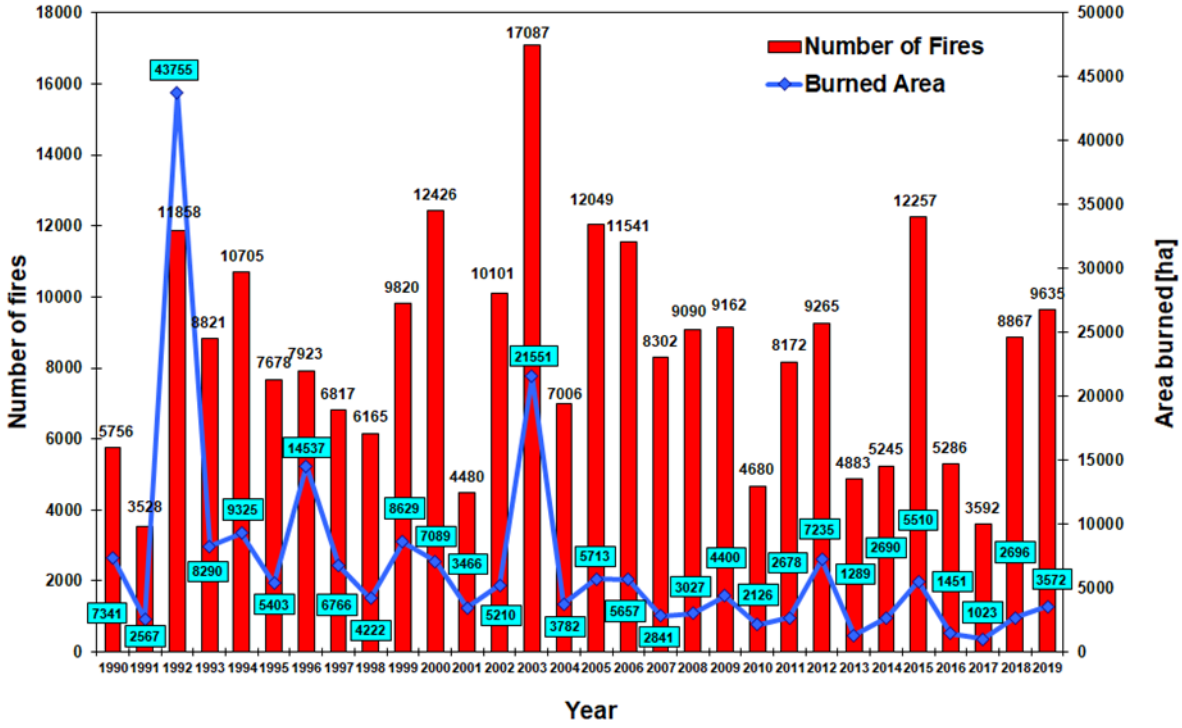


Figure 70. Total number of fires on high forest and area burned in Poland in the period 1990-2019.

Table 23. Forest fires in Poland in the period 2007-2019.

Year	Number of fires			Burnt area (ha)		
	Forest	Non wooded	Total	Forest	Non wooded	Total
2007	5 086	3 216	8 302	1 642.64	1 198.24	2 840.88
2008	5 568	3 522	9 090	1 810.74	1 216.39	3 027.13
2009	5 633	3 529	9 162	2 524.58	1 875.90	4 400.48
2010	2 975	1 705	4 680	1 358.26	767.98	2 126.24
2011	5 126	3 046	8 172	1 526.11	1 151.66	2 677.77
2012	5 752	3 513	9 265	4 781.65	2 453.62	7 235.27
2013	3 168	1 715	4 883	810.42	478.12	1 288.54
2014	3 603	1 642	5 245	1 956.90	733.55	2 690.45
2015	8 292	3 965	12 257	3 765.87	1 744.03	5 509.90
2016	3 545	1 741	5 286	862.37	588.68	1 451.05
2017	2 334	1 258	3 592	692.73	329.80	1 022.53
2018	5 947	2 920	8 867	2 047.26	648.87	2 696.13
2019	6 532	3 103	9 635	2 340.74	1 231.73	3 572.47

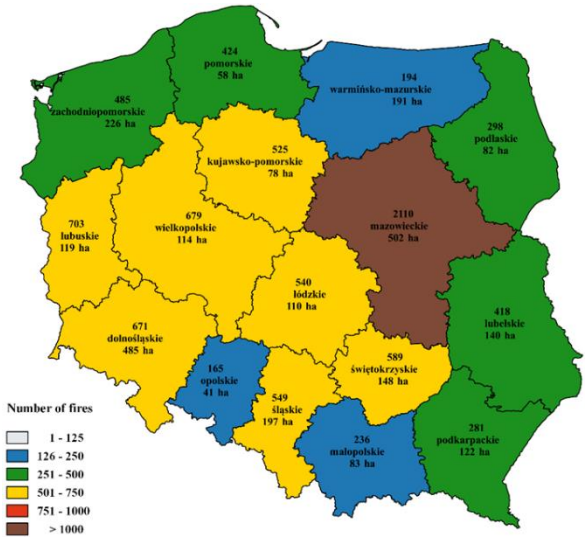


Figure 71. Number of forest fires and burned areas by provinces (NUTS2) in 2018.

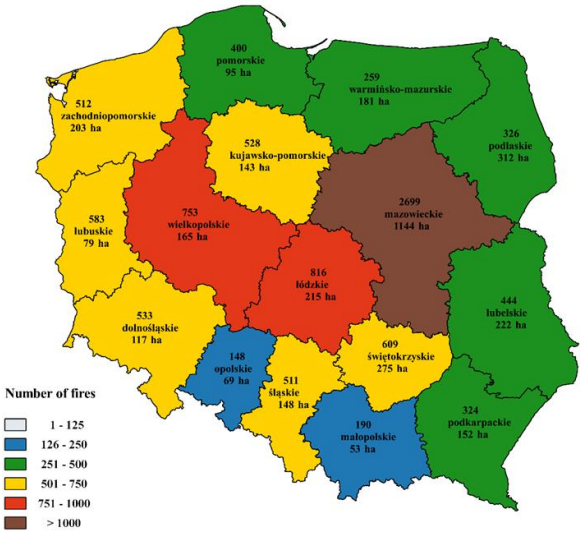


Figure 72. Number of forest fires and burned areas by provinces (NUTS2) in 2019.

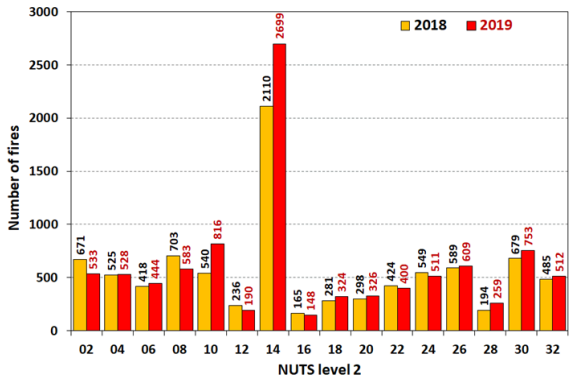
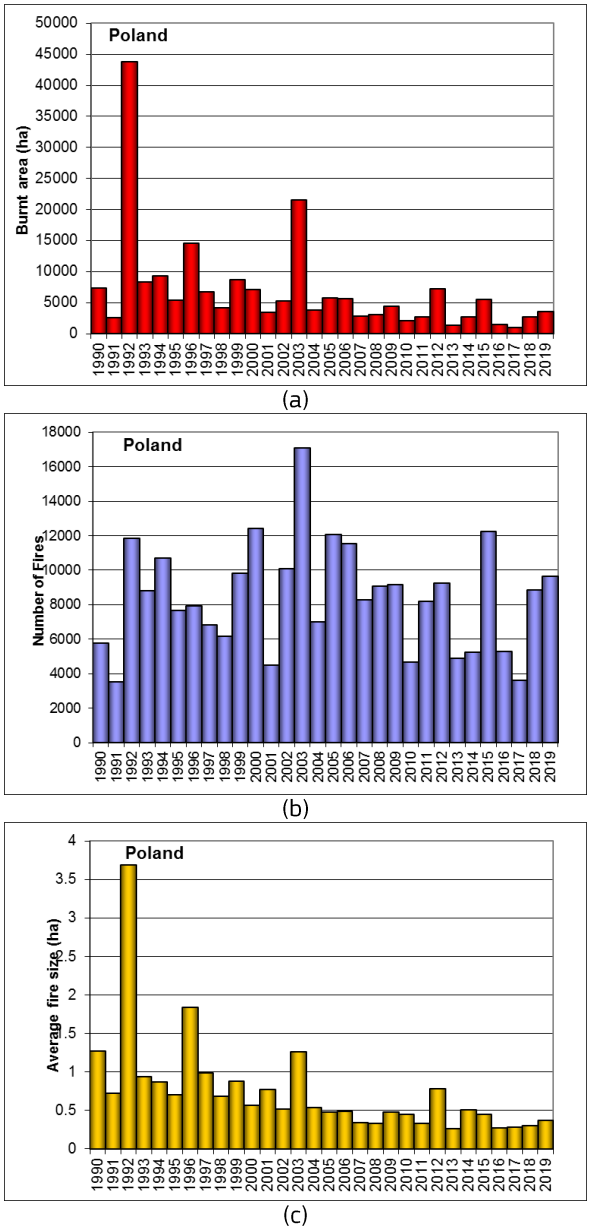


Figure 73. Distribution of the number of forest fires by province (NUTS2) in 2018 and 2019 in Poland.

The burnt area, number of fires and average fire size for the years 1990-2019 are shown in Figure 74.



(a)

(b)

(c)

Figure 74. Burnt areas (a), number of fires (b) and average fire size (c) in Poland from 1990 to 2019.

Fire causes

Human activity was the main cause of forest fires; specifically arson represented almost half of the fires (42.64%), followed by negligence (25.95%) and accident (4.60%), whereas unknown causes accounted for 25.28% (Figure 75).

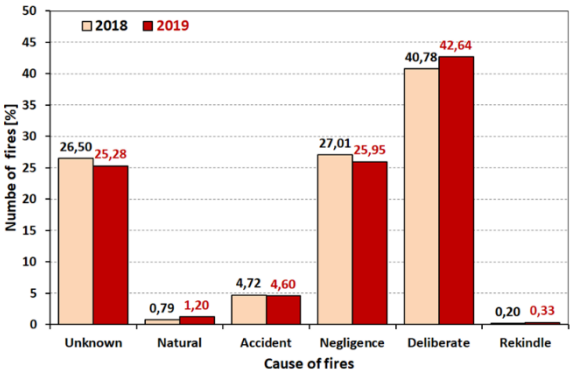


Figure 75. Distribution of the number of forest fires by causes in 2018 and 2019 in Poland.

Fire fighting means and information campaigns

The "State Forests" National Forest Holding (State Forests NFH) had at its disposal equipment, consisting of:

- 37 fire suppression airplanes and 5 helicopters,
- 344 patrol and fire suppression vehicles,
- 5 medium and heavy vehicles,
- 256 portable pumps.

These means were used to extinguish 3% of all the fires in the areas managed by the State Forests NFH, whereas the other fires were suppressed by units of the State Fire Service and voluntary fire brigades.

In 2019, as part of information and promotion activities, the following measures in the State Forests NFH were taken:

- about 10 thousand lectures in schools, youth camps and at country-meetings,
- more than 870 interviews were provided on the radio and the television,
- 87 900 posters, information leaflets and calendars related to forest fires were disseminated,
- 3 400 information boards were erected.

Fire prevention activities

In forest areas managed by the State Forests NFH, works were carried out to prevent the conditions for fire outbreaks and to reduce their spread, by repairing 4 389 km of fuel breaks and building 75 km of new fuel breaks; in addition, forests were cleaned over a surface area of 17 936 ha, by reducing the quantity of inflammable biomass.

The observation system of the State Forests NFH consisted of:

- 684 fire protection lookout points, including 278 (40.64 %) equipped with a system of TV cameras;
- 7 patrol airplanes, 37 fire suppression airplanes and 5 helicopters;
- 344 ground patrols.

The effectiveness rate of fire detection by fire protection lookout points was 32%, airplanes detected 2% of fires and civilians notified of 61%. The other 5% of fires were detected by fire protection patrols.

The communication and alarm network in the State Forests NFH consisted of: 6 294 radio-telephones, including 1 070 base sets, 2 217 mobile sets and 3 007 hand held sets, as well as 72 converters to the frequency band used by the State Fire Service.

Water supply for fire suppression purposes was provided by 11.5 thousand water supply points, including 4.3 thousand natural points and 2.6 thousand artificial ones. Moreover, water was supplied by more than 4.6 thousand hydrants located in the vicinity of forests.

In 2019, the fire protection costs incurred by the State Forests NFH amounted to 99 million PLN.

Information on Poland's National Forest Fire Information System can be found on:

http://bazapozarow.ibles.pl/ibl_ppoz/faces/index.jsp.

Poland's Forest Fire Danger Map, which is updated daily from March to October (at 9 a.m. and at 1 p.m.), is shown on http://bazapozarow.ibles.pl/zagrozenie/

(Source: Forest Research Institute, Forest Fire Protection Department, Poland).

1.2.18 Portugal

Fire danger in the 2019 fire season

In Portuguese mainland territory (NUTS 1 PT1) the burnt area in 2019 was 42 084 ha. The burnt area represents 29% of the average of the previous decade which was 143 088 ha. As to the number of wildfires, there was a total of 10 832 fires in 2019, which represents a decrease of 49% when compared to the average of fires in the last decade and a decrease of 6% compared with 2018.

At Madeira's archipelago (PT3), 54 wildfires were recorded in 2019. The total burnt area in this region was 86.7 ha (58.4 ha in forest and other wooded lands and 28.3 ha in shrublands). In the Azores' archipelago (PT2) a total of 117 wildfires were recorded in 2019.

According to the information provided by the Portuguese Institute for Sea and Atmosphere (IPMA), the meteorological daily severity index (DSR), derived from the Fire Weather Index, shows the evolution of the fire risk in an operational perspective for the year 2019 (Figure 76).

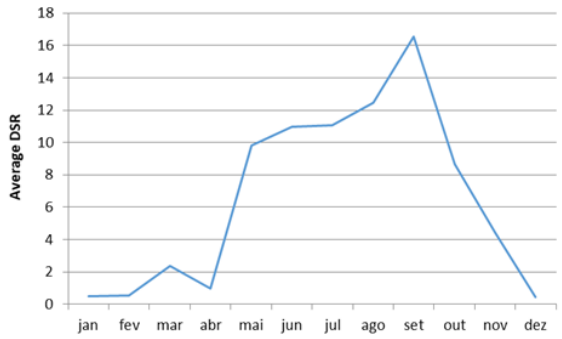


Figure 76. DSR variation in 2019.

Fire occurrence and affected surfaces

In 2019 the Portuguese mainland registered a total of 10 832 wildfires, responsible for the burning of 42 084 ha (Figure 77). Eucalyptus globulus and Pinus pinaster stands were the forest cover most affected by fires.

About 44% of the occurrences (4 712) were reported between January and June, which burned about 9 792 ha (23% total burnt area), as seen in Table 24.

In the summer period (July-September) 5 302 wildfires occurred (49% total wildfires), which consumed approximately 31 505 ha (75% total burnt area).

In 2019, the most critical month was July (Table 24), with 1 496 wildfires (14% total wildfires) and 14 111 ha (34% total burnt area).

Fire occurrence prevailed mostly in the high population density districts, such as Porto (North region), Braga (North region), Viseu (Centre region), Aveiro (Centre region) and Lisboa (Lisbon region) which registered 48% of the total number of fires.

The Centre region NUTS II region was the most affected by wildfires (20 126 ha – 48% of the total burnt area): Table 25.

Table 24. Rural fires in Portugal in 2019 (monthly distribution).

Month	Number of fires	Burnt area (ha)			
		Forest and other wooded land	Shrublands	Agricultural land	Total
January	405	127	535	18	679
February	480	168	512	13	693
March	1255	2211	1673	93	3977
April	216	47	70	16	133
May	1216	498	253	557	1308
June	1140	1105	724	1172	3001
July	1496	8883	4119	1110	14111
August	1591	1615	2277	721	4613
September	2215	6627	5329	825	12781
October	720	140	401	180	722
November	56	7	4	34	44
December	42	3	17	1	21
TOTAL	10832	21432	15913	4740	42084

Table 25. Number of fires and burnt areas in Portugal in 2019 (NUTS2).

PT1 - NUTS 2 Region	Number of fires	Burnt area (ha)			
		Forest and other wooded land	Shrublands	Agricultural land	Total
North	5096	5774	8612	631	15017
Centre	2938	13052	5427	1647	20126
Lisbon	833	84	281	133	498
Alentejo	1548	2267	1376	2237	5879
Algarve	417	255	217	92	564
TOTAL	10832	21432	15913	4740	42084

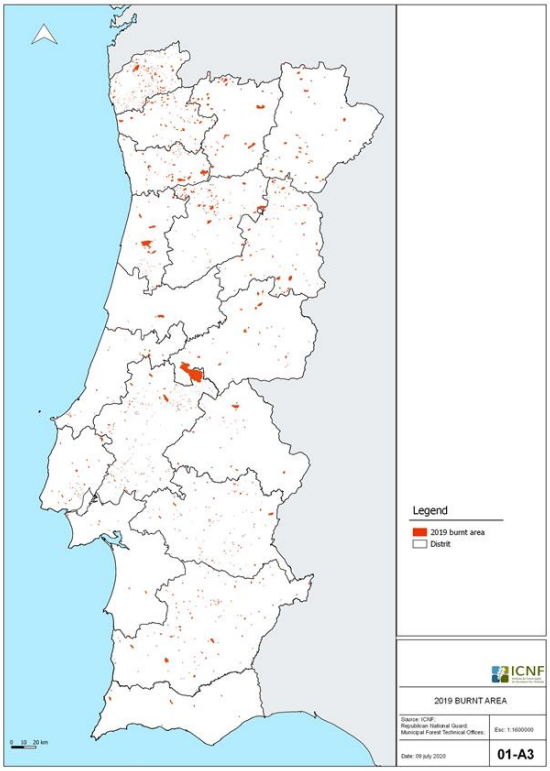
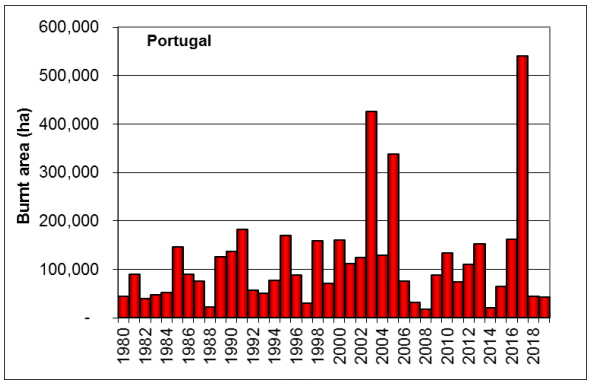


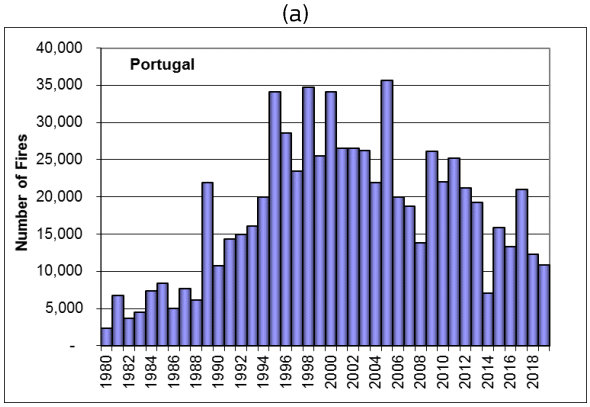
Figure 77. Burnt areas in 2019 (Portugal).

Portugal registered 62 large fires (>= 100 ha), which corresponded to 65% of the total burned area. There were 15 fires larger than 500 ha, which burned 18 807 ha. The largest fire of 2019 occurred in Santarém district (NUTS 2 Centre), with 9 249 ha of burnt area, and lasted from the 20th to the 25th of July.

The analysis of the yearly trends in the number of fires and burnt areas in Portugal is shown in Figure 78.



(a)



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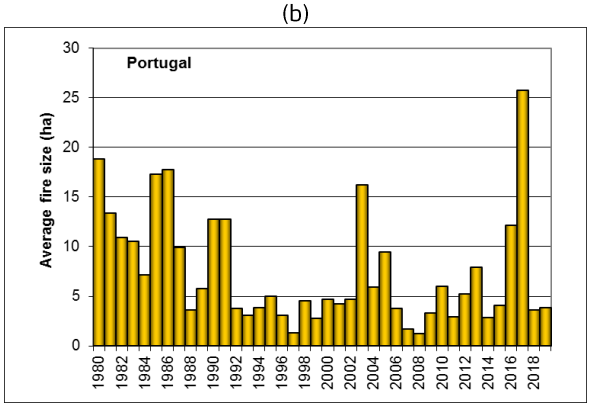


(c)

Figure 78. Burnt areas (a), number of fires (b) and average fire size (c) in Portugal 1980-2019.

Fire causes

Of 10 832 occurrences registered in 2019, the National Guard proceeded with the investigation of causes for 9 915 forest fires (92%), of which 3 578 were of unknown origin (Figure 79).

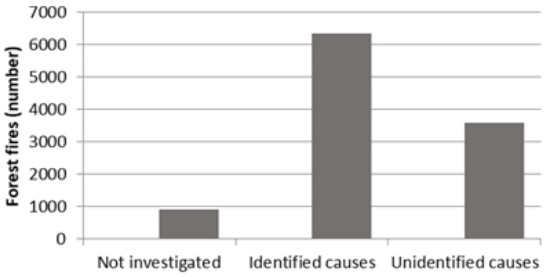


Figure 79. Criminal rural fires 2019 investigation

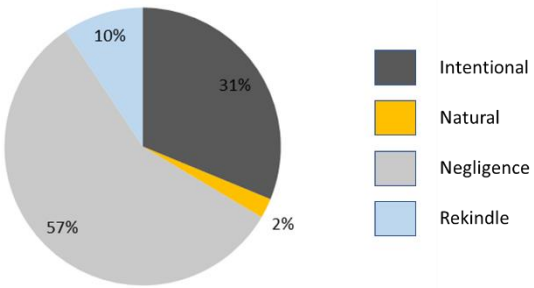


Figure 80. Main causes of rural fires 2019.

Amongst those fires with determined cause, intentional acts corresponded to 31% and accidents or negligence were present in the ignition of 57% of the total number of fires (Figure 80).

The use of fire for renewal of pastures in mountain grazing areas and for forest and agricultural residual biomass cleaning still has a strong impact on the burnt areas total.

In 2019 the ICNF implemented a new application for fire permits, adapted for people in rural areas, which alongside with a new call centre managed within the National Guard "Environment Hotline", allowed a more controlled use of fire, not only regarding fire risk, but also enabling a better preparedness of local authorities and fire management agencies. In 2019 a maximum of 9 261 permits were processed in just one day (on March 2nd).

Forest fire planning

The Institute for Nature Conservation and Forests (ICNF) kept its efforts in the forest fire planning at the local, municipal and regional (district) levels. The municipal planning objective is pursued by the municipal forest technical offices (GTF), based on the municipal plans for forest fire prevention (PMDFCI, 5-year planning) and the municipal operational plans, which are part of the PMDFCI and are updated on a yearly basis.

The GTF provided technical support to the municipal commission for forest protection. By the end of 2019 there were 275 GTF established and 178 updated PMDFCI.

The regional level planning (for the entire Mainland) is assured by 18 regional forest plans updated before each summer in cooperation with municipalities and district commands for relief operations, at the district level.

The processes to review the main legislation still in force and the drafting of the new National Plan for Integrated Management of Rural Fire (2020-2030) were initiated.

<u>Forest fuels management</u>

Forest fuels management is one of the key-actions in the forest fire prevention domain. In 2019, a total area of 64 186 ha was managed with prescribed burning. Note that this numbers include both prescribed burning as well as authorized burning, both being technical fire for forest fuel management.

<u>Water reservoirs</u>

During 2019, 807 water reservoirs (including water tanks) were renovated and 15 new water reservoirs were created.

<u>Forest roads</u>

In 2019, 1 694 kilometres of forest roads were improved in national forests, communal forests and protected areas under ICNF management.

Fire prevention activities

Training

Wildfire fighting continues to be one of the main areas that require the permanent involvement of the National Civil Protection Authority (ANEPC) and all the civil protection agents involved in fire suppression. As in previous years, the ANEPC continued the operational training program, including a set of training and preparation actions especially directed to the fire brigades and, in addition to its training program, in a total of actions that involved a universe of 3 110 trained personnel in areas identified after the previous campaign as priorities, such as the implementation of the operations management system, combat techniques with manual and mechanical tools, combat techniques using track machines, ICS and control of air operations.

Safe village – safe people program

In 2019, ANEPC's involvement in the "Safe Village" and "Safe People" programs continued, jointly promoted with the Municipalities and Parishes, with the objective of establishing measures to protect people and goods and buildings in the urban-forest interface, as well as promoting awareness actions regarding risky behaviour and self-protection measures to be adopted. Within the scope of these programs, there was, in 2019, an increase of about 10% in the number of population centres involved (which totalled 1 963 at the end of the year) and 15% in the number of local security officers identified (accumulated value of 1 555). Since the launch of the Programs in 2018, 1 246 places of shelter and 1 185 places of refuge have been identified (in 1 507 clusters) and 733 evacuation plans have been implemented. 204 exercises were also carried out involving more than 8 500 citizens, and about 600 awareness-raising actions were carried out among the population, which reached close to 25 000 people.

National alert and warning system – wildfire risk

Within the scope of the national alert and warning system for populations, and in particular when predicting the occurrence of highly severe weather episodes, the notification system was used, by sending SMS, during the month of September in two severe weather episodes - September 4 (13 districts) when 5 988 421 messages were sent, and September 13 (10 districts) when 5 667 029 were sent, with 11.6 million messages broadcast in the two episodes.

Global resources

During the most critical phase of 2019 [July-September period], the Special Firefighting Devices (DECIF) expressed in the National Operational Directive (DON) No. 02/2019 integrated a total of 11 492 operational, 2 495 vehicles and 56 aerial firefighting resources.

Although the aerial resources are not responsible for the suppression of forest fires, as these fires are fought on the ground through the use of land resources, their use in wildfire firefighting is essential for the area of rising fires and for reducing the intensity of the fire fronts, making possible a faster and safer intervention of terrestrial resources. The level of commitment of air resources was slightly higher than in 2018, with a total of 5 865 missions and more than five thousand flight hours spent.

Table 26. Use of resources 2017-2019.

	2017	**2018**	**2019**
Flight Hours	9153	4088	5473
Number of Missions	7457	4742	5865
Number Aerial Resources	48	55	59

Decision support cell

As part of the strengthening of technological systems to support operational decisions, the functioning of the Rural Fire Decision Analysis Support Cell (NAD-AIR), based at CNEPC / ANEPC and operated by the Special Civil Protection Force (FEPC), continued, with the aim of providing decision support to the National Emergency and Civil Protection Command (CNEPC), the District Rescue Operations Commands (CDOS) and the Rescue Operations Commander (COS). Such support for the operational decision was translated through:

a) Organization of the collection, analysis and interpretation of information related to the behaviour of current and expected fires, using various tools, including two dedicated aircraft;

b) Preventive and operational strategic analysis for fire risk, through the production of documents;

c) Preparation of operational analysis for the most significant fires in progress, consisting of the Operational Information bulletin (INFOP), production of geographic information and preparation of relevant information to be made available to the different levels of decision.

(Sources: Ministry of Environment and Climate Action, Institute for Nature Conservation and Forests (ICNF), SGIF/System for Forest Fire Information Management; Ministry of Internal Administration, National Authority for Emergency and Civil Protection (ANEPC); Regional Government of the Azores, Regional Directorate for Forest Resources; Regional Government of Madeira, Institute for Forests and Nature Conservation, Portugal).

1.2.19 Republic of North Macedonia

Background

The Republic of North Macedonia covers 2 543 200 ha of land. According to the latest data of the Special plans of woods management, the total forest area in Republic of North Macedonia amounts to 1 091 857.59 ha, of which 835 055.82 ha are totally forest covered area and 256 801.77 ha of the forest is non-covered forest area.

The total forest reserve according to the same database amounts to 75 939 573 m^3: that is 91 m^3/ha. Total annual growth amounts to 1 616 782 m^3 (1.93 m^3/ha). The total anticipated growth for 10 years amounts to 10 948 149 m^3, or annually 1 094 815 m^3. Its utilisation is 75%.

The natural conditions of the Republic of North Macedonia, conditioned by location, climate, relief, geologic structure of terrain, hydrologic features and similar, enable the existence and growth of a great number of plant and animal species. Because of that, forests are characterised by rich biodiversity. A great number of plant and animal species are relics and endemics.

There are two climatic types that collide in the Republic of North Macedonia: Mediterranean and Continental, which results in cold and severe winters and hot and dry summers.

The annual average air temperature is 11.3 degrees Celsius with average precipitation of 983.7 mm/m^2 and average sunshine period of 2 450 hours per year.

The Protection and Rescue Directorate within the regular duties of the Sector for prevention, planning and development organizes, plans and implements the measures and activities for protection and rescue against natural disasters and other accidents, in particular forest fires.

In coordination with the protection and rescue units, data are collected about the current situation and the necessary intervention through assessment of the risks from the dangers that are current. All situations are visualized on a geographical map and recorded. At the end of the day a daily overview of the situation of the fires is submitted.

The data in the form of examinations come to the Sector for Prevention, planning and development, which are processed in the Department for analytics and research, with the note that after the completion of all activities, an official Analysis is made with verified data on the number of fires, engaged subjects, engaged resources for protection and rescue, weaknesses, omissions and lessons learned.

Fire danger in the 2019 fire season

March was an extremely hot month, and the lack of precipitation was particularly prominent.

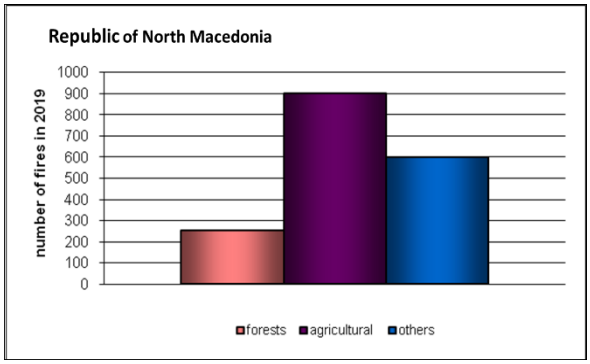
Early March 2019 was characterized by the most prominent and the most enduring heat wave when the absolute air temperature maximums were recorded in inland Macedonia, as well as in parts of the mountainous region. Very hot air also flowed into the mountainous regions.

The firefighting season started with a generally higher fire danger than normal, compared with periods of previous years. It was very warm with temperatures around 2 or 3 degrees above the long-term average. The month was slightly dryer than normal, with about 20% less rainfall than the long-term average. The fire danger became high due to rising temperatures and lack of rainfall at that time, and in March total 124 forest fires occurred.

Fire occurrence and affected surfaces

During the year 2019 there were 1 749 fires of which 251 were forest fires, affecting a total area of 4 834.4 ha. The affected agricultural area was 3 270.2 ha and the affected area of other land types was 732.1 ha. 14.35 % of the total number of fires were forest fires.

The comparative charts for burnt area, number of fires and average fire size for the years 2007-2019 as well as the number of fires and burnt area according to types of fires for the year 2019 are shown in Figure 81 and Figure 82.



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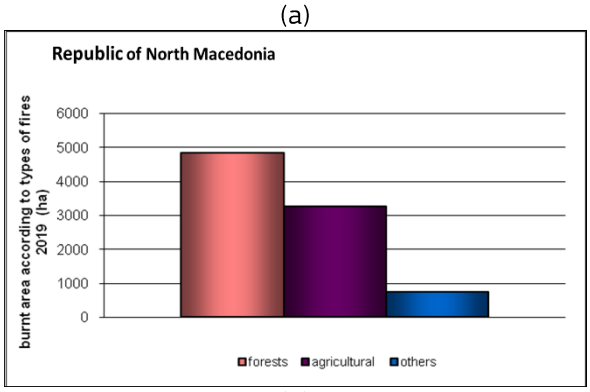
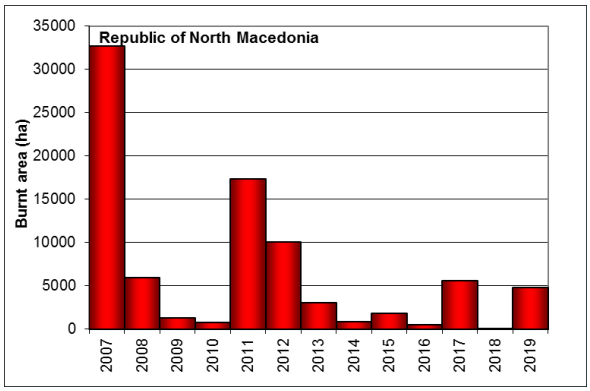


(b)

Figure 81. Number of fires (a) and burnt area (b) according to the type of fires in 2019.



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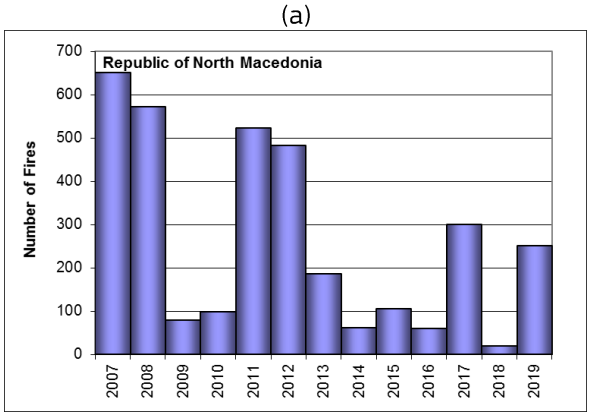

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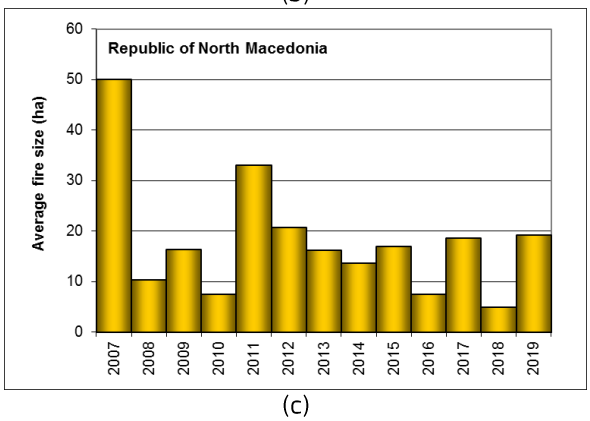


(c)

Figure 82. Burnt areas (a), number of fires (b) and average fire size (c) in the North Macedonia from 2007 to 2019.

Fire prevention activities and information campaigns

The prevention activities start conducting meetings before the season of open fires, and this year the Protection and Rescue Directorate-PRD conducted a campaign for the staff of the PRD, including the 35 Regional departments, from 15/07 to 15/08/2019 for reduction of risks from fires in open space which was supported by EVN AD Skopje as a socially responsible company.

The National Forest Authority kept its efforts in the forest fire planning at the local, municipal levels. The municipal planning objective is pursued by the technical support to the municipalities forest offices, based in the Municipal Plans for Forest Fire Prevention and the Municipal Operational Plans, which are part of the previous plans and which are updated on a yearly basis. The municipalities provide technical support; by the end of the year 34 Plans for Forest Fire Prevention were established and 28 Municipal Operational Plans were approved. 96% of the municipalities are covered by Forest Fire Prevention Municipal Plans.

As part of the campaign, manuals for reducing the risk of fires were distributed in major cities in the country, at toll booths, at border crossings, in rural areas, in National Parks and picnic places where posters with steps of forest fire protection were placed.

Fire prevention and fire fighting activities were undertaken along with public information campaigns. For the purpose of awareness raising, media events such as press conferences, short reports and announcements on the TV and radio were organized.

Collaboration with the operational meteorological services has been consolidated in order to improve the performances by integrating additional data sources.

We have developed a public awareness campaign for forest fires prevention under the slogan "*The future belongs to those who are prepared*". Several actions were taken, following four main strategic axes: National and regional awareness campaigns in the media, warning for hazardous behaviours, promoted by the National Authority for Civil Protection, National Forest Authority and municipalities.

In the public information domain, the National Authority of Civil Protection –Protection and Rescue Directorate –PRD made significant efforts on the availability of on-line information. To reach that goal, they published seven reports, at a critical period and the PRD services displayed on-line information of the most relevant forest fire incidents. Also, the Meteorological Services provided online information concerning FWI and its forecast.

The PRD also provided its partners with an online service for FWI mapping.

School campaigns - During 2019 there were more than 47 presentations in schools and colleges in North Macedonia, giving information to raise awareness on environmental issues, social and economic factors caused by fires, its causes and how it can be avoided. Between 7 and 11 June, there was the final trip for the winners of the competition of this school campaign.

Rural Campaigns - In these campaigns direct actions are intended for the rural population trying to sensitize the population about the most common types of negligence. They transmit a message about the importance of human action to prevent fires.

During the campaign 2019, which started in March, a Manual written by the national authority of civil protection –Protection and Rescue Directorate was launched.

Climate Change

The climate is changing and it is evident in whole territory of the country. National adaptation strategies / plans and in particular regarding plans to adapt the forest sector to climate change in order to limit forest fire risks specifies the main objectives for forest-based business and activities.

Operations of mutual assistance and loss of human lives

No operations of mutual assistance were taken and no casualties were reported in Macedonia during the fire season of 2019.

(Source: Protection and rescue Directorate, Sector for prevention, planning and development, Department for analytics and research, Republic of North Macedonia).

1.2.20 Romania

Meteorological characteristics during 2019

In 2019, the mean annual national temperature (10.9°C) was +1.7°C higher than the standard climatological normal (1981–2010). The year 2019 was ranked as being the warmest year in the 1961-2019 period. Positive deviations of the mean monthly temperature against the normal standard climate of each month were recorded in 9 months, ranging between 0.5°C (April) to 4.9°C (March).

The annual precipitation amount in Romania (614.2 mm) was 3% lower than the standard climate normal (1981–2010). Deviations were negative in 7 months, ranging from 27% in July to 49% in March and positive in the rest of the months, ranging from 13% in November to 80% in May. The maximum annual precipitation was recorded at the meteorological station at Bâlea Lac (1641 mm) in the Făgăraș Mountains and the lowest in Sulina (158 mm), on the Black Sea coast.

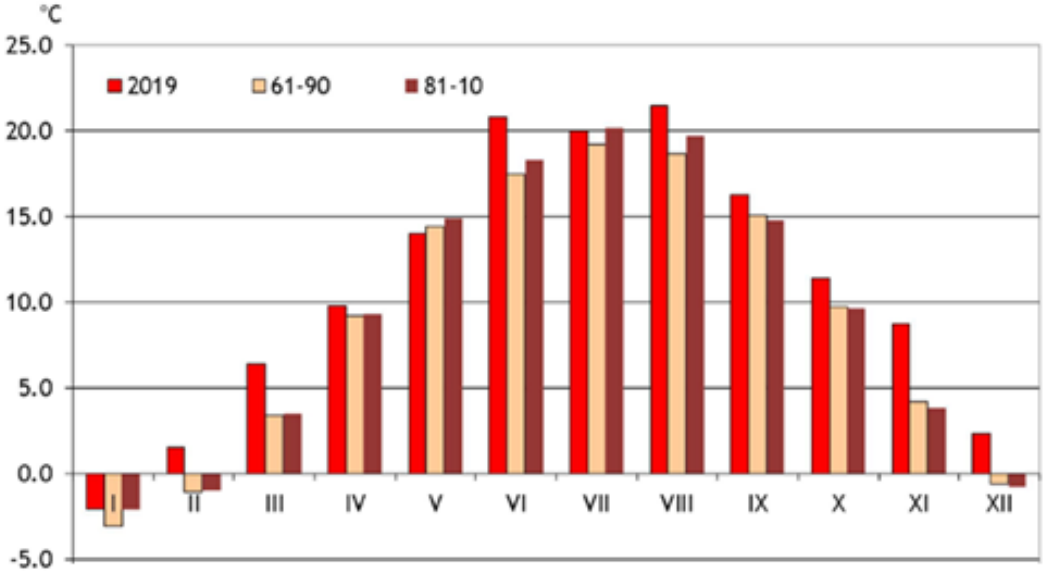


Figure 83. The national mean monthly temperature in Romania in 2019, compared with the standard climatological normal (1961-1990, 1981-2010)

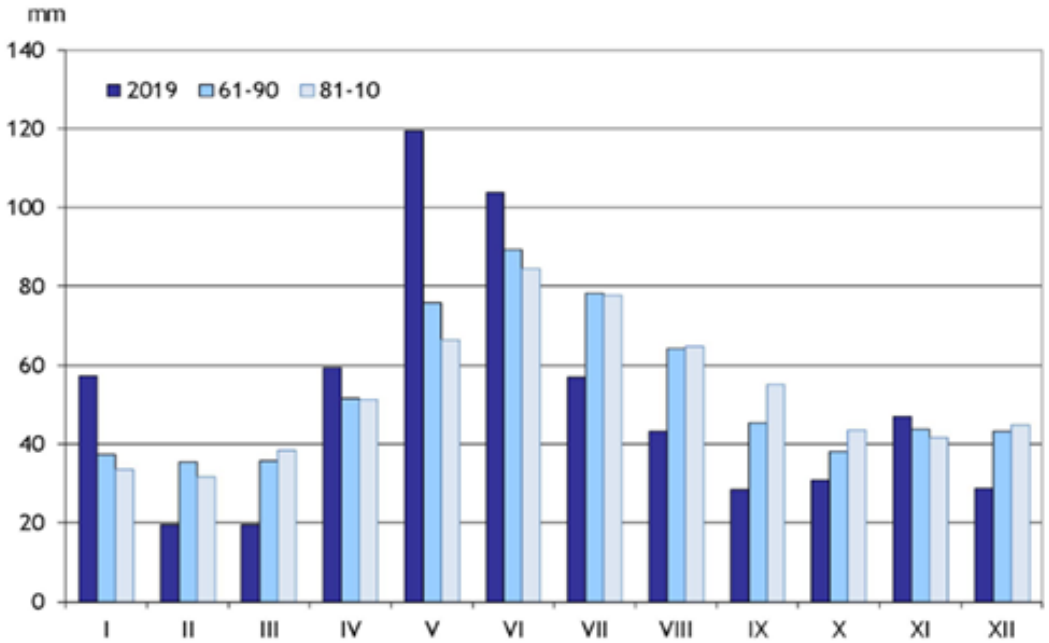


Figure 84. The national mean monthly precipitation amount in Romania in 2019, compared with the standard climatologically normal (1961-1990, 1981-2010)

Fire occurrence and affected surfaces

In 2019, 425 forest vegetation fires were recorded at national level, affecting 2 495.6 ha, of which 417 fires occurred on 2 437.6 ha in the national forest, and 8 fires occurred on 58 ha in forest vegetation, located on land outside the forest.

As a result of the fires, at national level an estimated damage of 35.8 thousand Euro occurred, burning 105.7 thousand seedlings of plantations and natural regenerations plus 1 194 cubic meters of standing or under operation timber.

The periods with the highest number of fires occurred between March 30 and April 8 when there were 114 fires burning a total of 1 109 ha). The main cause was fire propagation from burning pastures in drier, warmer and windy weather.

A summary of the number of fires and total burnt area by cause, land ownership and fire type is presented in Table 27-Table 29.

Table 27. Causes of forest fires.

Cause of fire	EFFIS code	Number of fires	Burnt area (ha)
Unknown	100	87	781.78
Electrical power	301	3	3.5
Vegetation management	411	321	1667.44
Cigarettes	422	7	37.7
Deliberate (with unknown motivation)	500	6	5.12

Table 28. Nature of the affected property.

Property type	Number of fires	Burnt area (ha)
State public property	294	1613.14
Communities public property	49	334.37
Private property	105	548.09

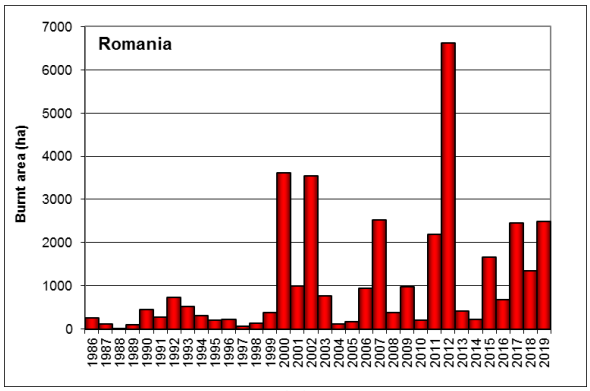
(23 fires common on State, communal and private property)

Table 29. Type of fire.

Fire type	Number of fires	Burnt area (ha)
Litter fires	416	2438.3
Mixed fires (litter, canopy)	9	57.3

In 2019, 26 forest fires were recorded which burned for longer than 24 hours, of which the longest one took place in an inaccessible area in the mountains and was extinguished after 12 days. The biggest area affected by a single fire was 67 ha.

The burnt area, number of fires and average fire size for the years 1986-2019 are shown in Figure 85.



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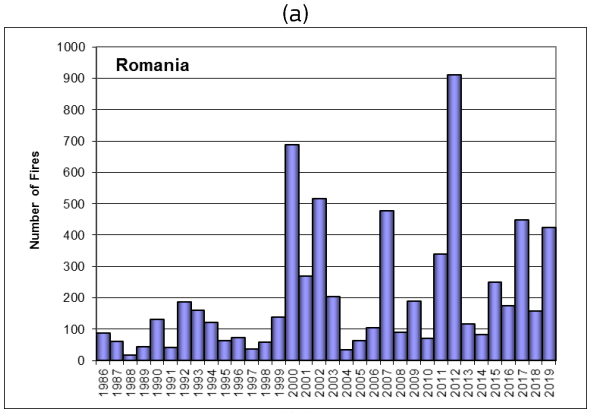

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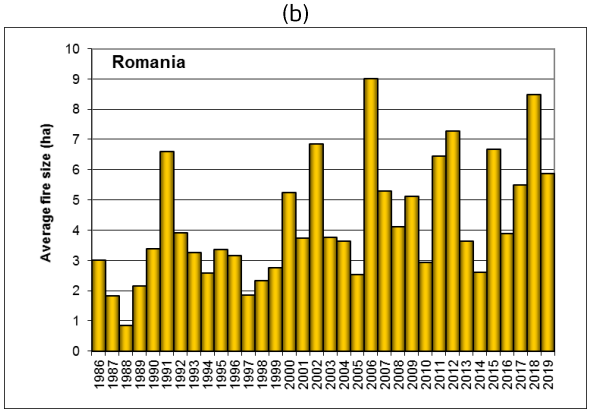


(c)

Figure 85. Burnt area (a), number of fires (b) and average fire size (c) in Romania from 1986 to 2019.

Fire fighting means and fire prevention activities

Firefighting actions involved a total of 9 837 people, of which:

- Forest rangers – 3 020 people
- Military and civilian fire-fighters – 3 527 people
- Policemen and gendarmes - 343 people
- Citizens – 2 950 persons.

In 2019, we began to update the technical instructions and specific legislation, in order to prevent more efficiently the fire propagation from agricultural lands and to decrease the number of forest fires.

(Source: Romanian Ministry of Environment, Waters and Forests (forest fires data); Romanian National Meteorological Institute (meteorological data)., Romania).

1.2.21 Slovakia

Fire danger in the 2019 fire season

The number of forest fires in 2019 is a little lower than that reported in 2018, but the burnt area is higher than last year. The number of fires was influenced substantiality by the rain and the human factor (negligence, particularly) in spring and summer.

The weather conditions had an influence on the forest fires risk trend and the occurrence of fire in the country. Normally the fire season started in March - April.

Last year it was very warm in our territory as a whole. The average annual temperature affected in positions up to 300 m above sea level is 10 to 12° C, occasionally it was also warmer. In valleys and basins with an altitude of 700 to 800 m, the average annual temperature increased to 7 to 8 ° C.

Fire occurrence and affected surfaces

A total number of 210 forest fires was reported in Slovakia in 2019, corresponding to a total burnt area of 462.17 ha. The average burned forest area per fire was 2.2 ha.

The biggest fire occurred on 15/04/2019 around the Raková (district Čadca) and damaged 85 hectares of mixed forest. The cause of the fire was negligence.

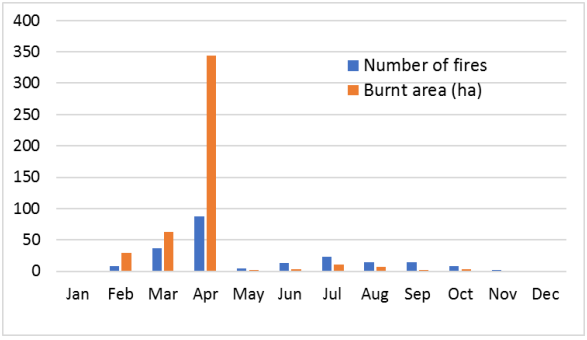
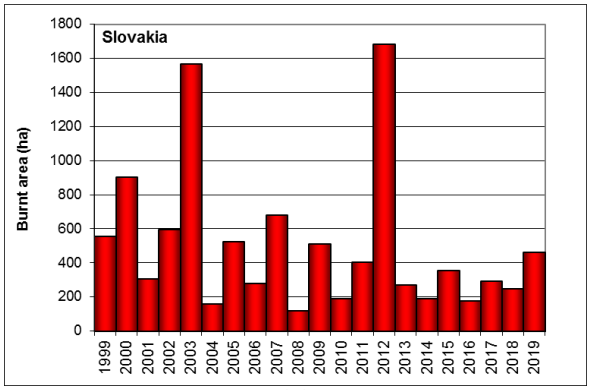


Figure 86. Number of fires and burnt area by month in Slovakia 2019.



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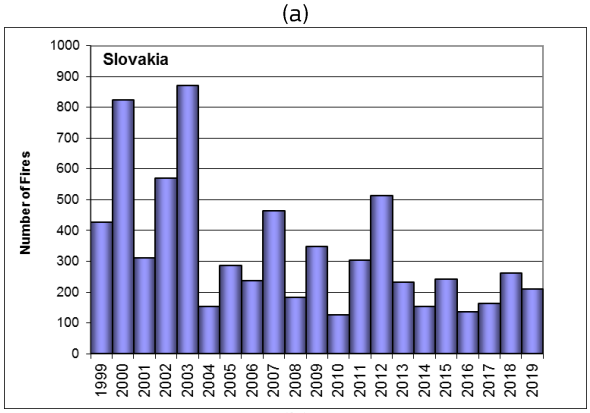

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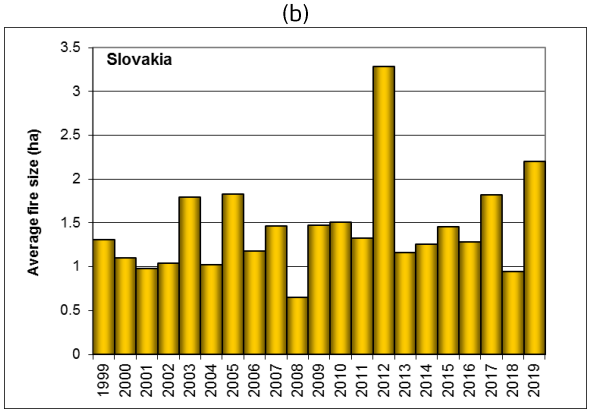


(c)

Figure 87. Burnt areas (a), number of fires (b) and average fire size (c) in Slovakia from 1999 to 2019.

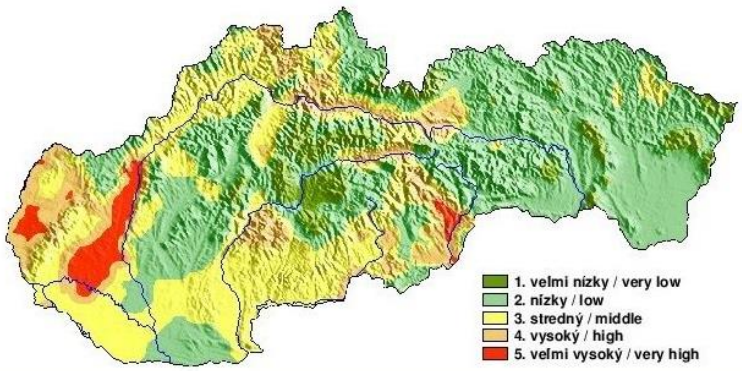


Figure 88. Information on the forest fire index (example for 29/06/2019) - Slovak Hydrometeorological institute.

Fire causes

Forest fire causes in 2019 are shown in Figure 89, and causes for the years 2009–2019 are presented in Table 30.

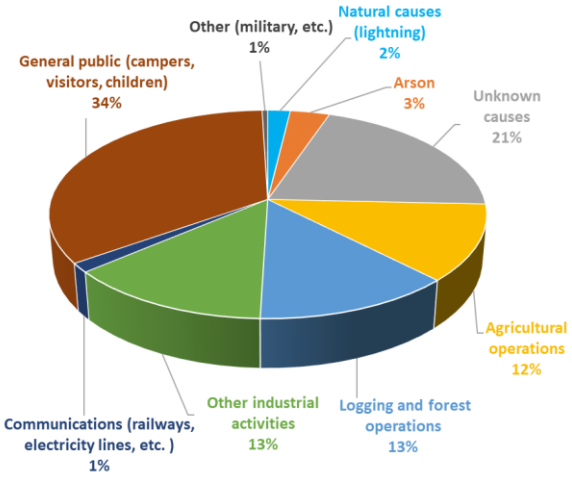


Figure 89. Causes of forest fires in 2019.

Fire prevention activities

- Provide information on the forest fire index through the internet page of the Slovak Hydrometeorological institute;
- Provide information through television when the forest fire index is high;
- Information campaigns;
- Prohibit fire dangerous activities in periods with high Fire index;
- Use of a stationary camera system for the early detection of forest fires.

Injuries and loss of human lives

During the 2019 fire season, two injuries were reported in Slovakia. No lives were lost.

Table 30. Forest fire causes for the years 2009-2019 (number of fires).

	Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Basic information	Total fires	**347**	**123**	**303**	**517**	**233**	**153**	**242**	**136**	**162**	**262**	**210**
Known causes (Human)	Arson	18	6	8	42	33	26	23	12	11	19	7
	Negligence (see also B below)	286	94	244	409	177	112	167	98	108	179	156
Known causes (Natural)	Lightning	3	2	1	8	4	2	12	0	10	9	4
Unknown	Unknown	40	21	50	58	19	13	40	26	33	55	43
B: Supplementary information: Total negligence	Agricultural operations	51	25	59	135	26	24	26	21	20	19	25
	Logging/forest operations	52	25	21	56	15	18	21	14	21	37	27
	Other industrial activities	12	5	0	1	7	1	5	0	0	1	28
	Communications (railways, electricity lines, etc.)	7	2	1	7	3	1	2	1	2	2	3
	General public (campers, other visitors, children)	161	66	222	208	125	67	110	62	65	119	72
	Other (military, etc.)	3	0	0	2	1	1	3	0	0	1	1

Figure 90. Forest fire Spišské Bystré 21. 04. 2019 (*Photo credit: P. Orolin*)

Figure 91. Forest fire Spišské Bystré 21. 04. 2019 (*Photo credit: P. Orolin*)

(Processed: National Forest Centre – Forest Research Institute Zvolen, Slovakia; Source: Institute for Fires and Expertise of the Ministry of Interior of the Slovak Republic).

1.2.22 Slovenia

In 2019, according to the data of the Forest Service, 84 forest fires were reported, with a total burnt area of 153.6 ha, of which 72.75 ha were in forest or other wooded land (Table 31). Eleven of the 84 fires were over 1 ha, and the average fire size was 1.8 ha.

Table 31. Number of fires and burnt area in Slovenia in 2019

Number of fires	< 1 ha	73
	>= 1 ha	11
	>= 100 ha	0
	>= 500 ha	0
	Total	**84**
Burnt area	Woodland	72.61
	Bushes	0.14
	Non woodland	80.85
	Total	**153.6**

Figure 92 shows the trends in terms of number of fires and burnt area during the last 16 years in Slovenia.

As was the case in previous years, the most affected region was Sežana, in which 50% of the fires (three-quarters of the total burnt area) occurred, Figure 93, Table 32).

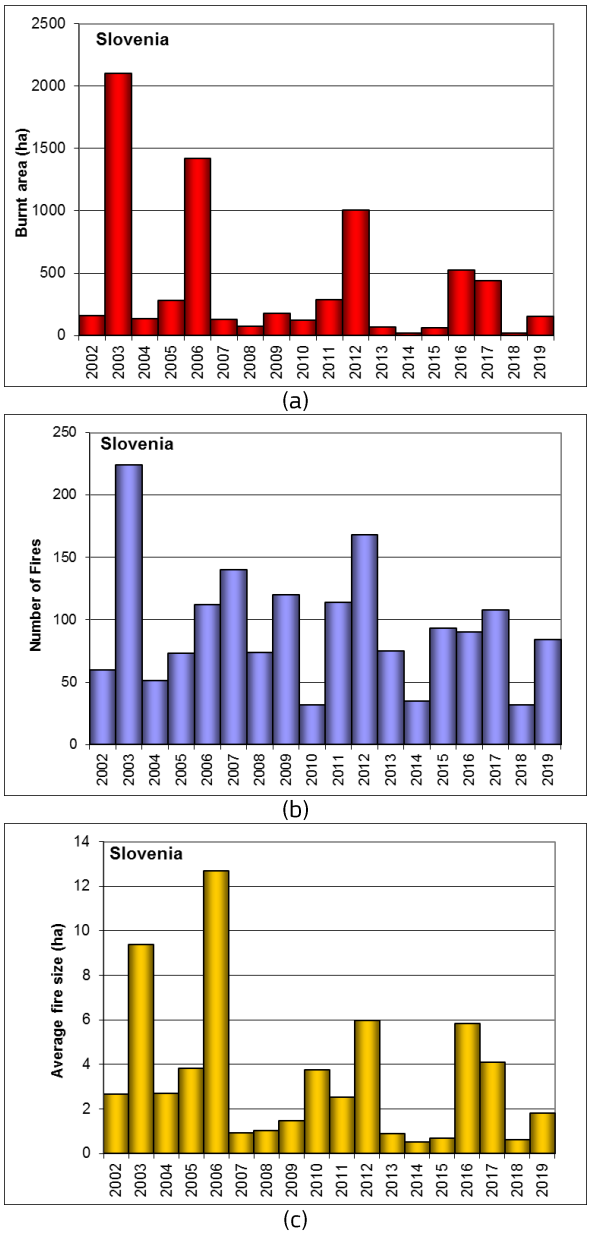


Figure 92. Burnt areas (a), number of fires (b) and average fire size (c) in Slovenia from 2002 to 2019.

Table 32. Number of fires and burnt area by forest management unit in Slovenia in 2019.

	Number of fires			Burnt area (ha)			
Region	**<1 ha**	**≥1 ha**	**Total**	**Forest**	**Scrub**	**Non wooded**	**Total**
Tolmin	5	2	7	5.77	-	2.20	7.97
Bled	0	1	1	3.60	-	-	3.60
Kranj	0	0	0	-	-	-	-
Ljubljana	16	0	16	2.33	-	0.27	2.60
Postojna	3	1	4	0.66	-	0.83	1.49
Kočevje	1	1	2	7.98	-	2.89	10.87
Novo mesto	7	0	7	0.07	0.14	2.15	2.36
Brežice	0	1	1	3.29	-	-	3.29
Celje	2	1	3	1.18	-	0.80	1.98
Nazarje	0	0	0	-	-	-	-
Slovenj Gradec	1	0	1	0.35	-	0.01	0.36
Maribor	0	0	0	-	-	-	-
Murska Sobota	0	0	0	-	-	-	-
Sežana	38	4	42	47.38	-	71.70	119.08
Total	**73**	**11**	**84**	**72.61**	**0.14**	**80.85**	**153.60**

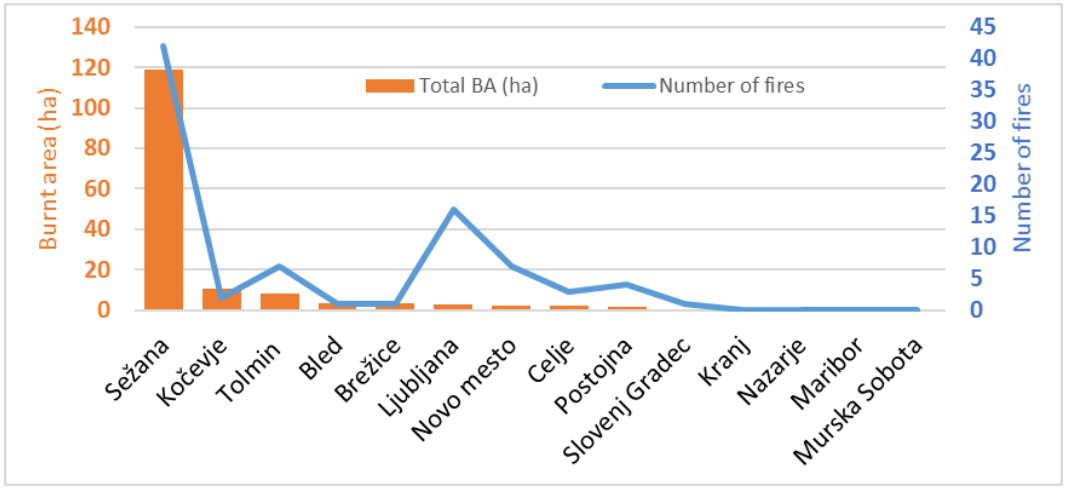


Figure 93. Number of fires and burnt areas by region

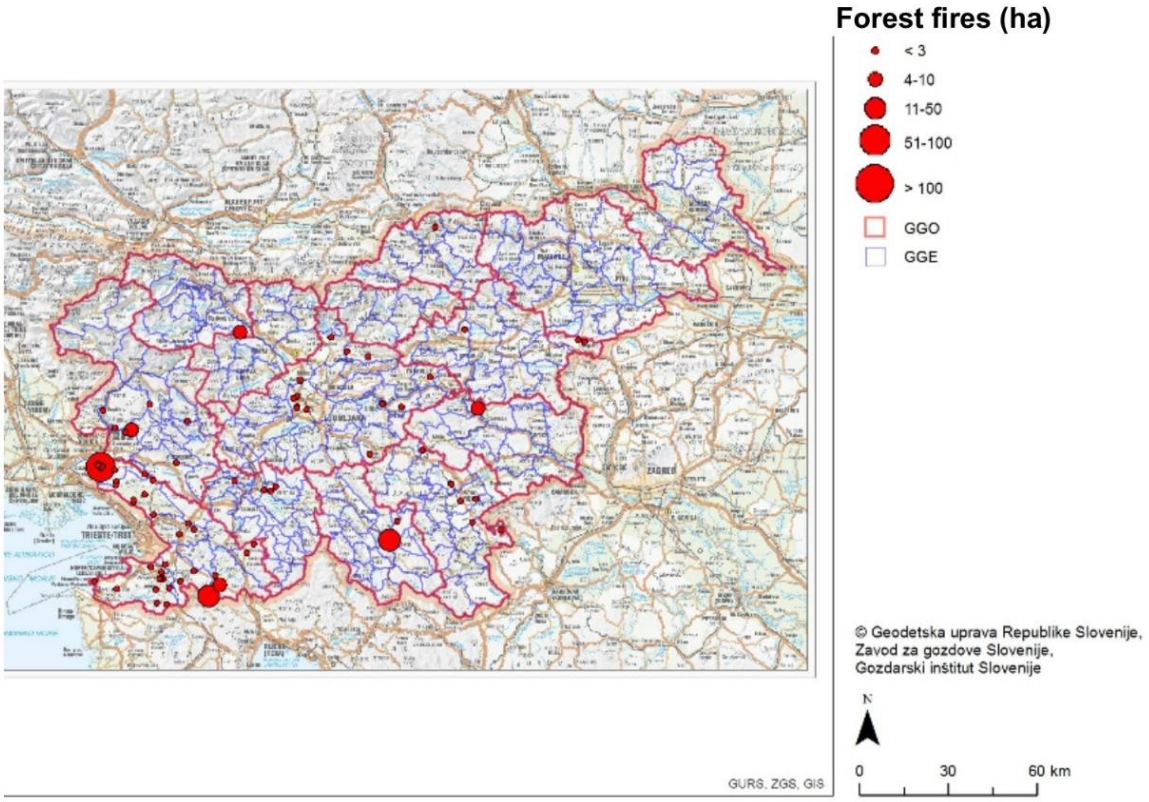


Figure 94. Locations of forest fires in Slovenia 2019.

Fire causes

In 2019, 35 fires were of unknown origin. Of the rest, 5 were caused by lightning, 14 were deliberately started and the remaining 30 were reported as accidental or negligent (Figure 95).

(Source: Ministry of Agriculture and the Environment, Slovenia)

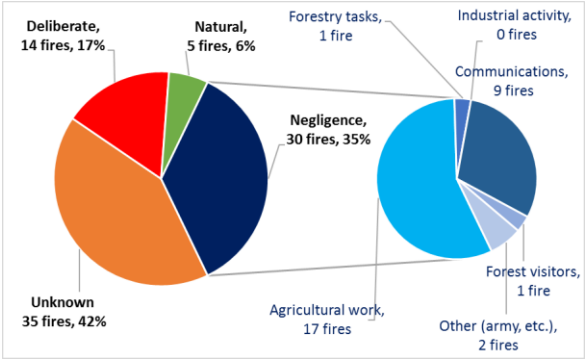


Figure 95. Main causes of forest fires in Slovenia in 2019.

1.2.23 Spain

Number of fires and affected surfaces

The provisional statistics for the period between January 1 and December 31, 2019, are compiled with the information sent by the autonomous regions on a weekly basis during the summer campaign and monthly for the rest of the year.

According to these data, the total number of fires has decreased by 10.66% with respect to the average of the last decade, with a decrease of 9.90% in the number of small fires (area ≤1 ha) and 12.17% in larger fires (area >1 ha) respectively. This year had the fifth lowest number of fires in the last decade.

Table 33. Number of fires in 2019 compared with the 10 year average.

	Average 2009-2018	2019
Number of fires <1ha	8091	**7290**
Number of fires ≥1ha	4091	**3593**
Total	12182	**10883**

Regarding the affected areas, there was a decrease with respect to the 10-year average of 14.20% in the wooded areas and 15.26% in forest areas. In 2019 this total occupies the fifth position in terms of affected forest area.

The yearly trends in terms of numbers of fires and burnt areas during the last 40 years in Spain are shown in Figure 96.

Table 34. Burnt area in 2019 compared with the 10 year average.

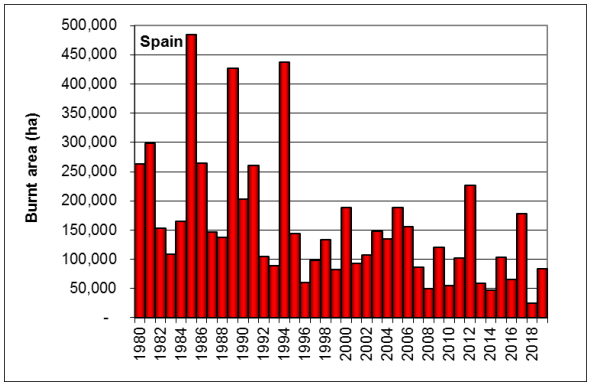
Burnt area (ha)	Average 2009-2018	2019
Other wooded land	30597.36	**26252.32**
Forest	99082.83	**83962.69**

Large fires

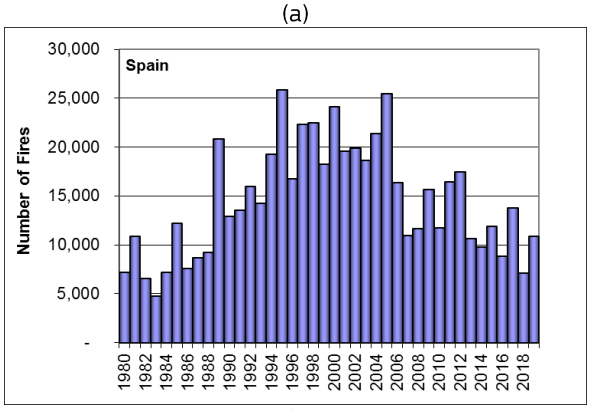
According to the provisional statistics compiled by the relevant departments in the autonomous regions, during 2019 there were 14 large forest fires (*Grandes Incendios Forestales*, GIF), a category which includes fires in excess of 500 hectares affected. Twelve of them took place during the summer campaign and the other 2 during the winter campaign. Regarding the incidence of GIF by geographic regions, the Mediterranean Region and the Interior Communities experienced the highest number. The Canary Islands were the most affected region, with 33% of the national surface affected by GIF. The affected area in the Canary Islands was produced almost entirely by the Valleseco (Gran Canaria) GIF that began on August 17, which in turn caused 85.62% of the total area affected in the autonomous community of the Canary Islands.

Table 35. Large fires in 2019.

Province	Municipality of origin	Start date	Burnt area (ha)
Asturias	Salas	06/03	770.22
A Coruña	Dodro	25/03	1192.71
Huelva	Beas	01/06	1483.10
Tarragona	La Torre d'l Espanyol	26/06	4072.24
Ávila	Gavilanes	28/06	1414.86
Toledo	Almorox	28/06	3014.48
Toledo	Toledo	28/06	1017.67
Almeria	Terque	13/07	900.47
Alicante	Beneixama	15/07	861.97
Zaragoza	Perdiguera	23/07	599.98
Cuenca	Barchin del Hoyo	30/07	2591.00
Las Palmas	Artenara	10/08	1137.60
Las Palmas	Valleseco	17/08	8498.80
Huelva	Patema del Campo	12/09	996.35
	Total burnt area		**28551.42**



(a)



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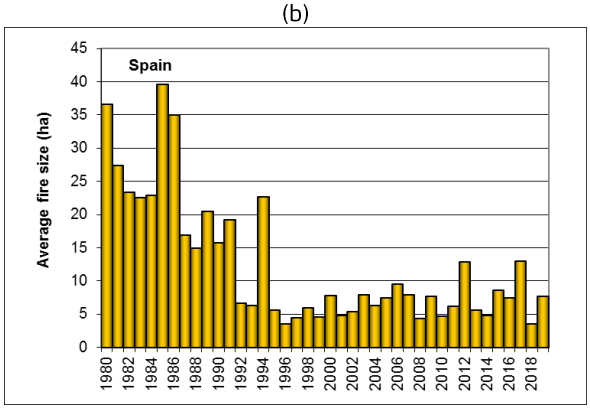


(c)

Figure 96. Burnt areas (a), number of fires (b) and average fire size (c) in Spain for the last 40 years.

Given the heterogeneity of the national territory in terms of meteorology, topography, vegetation and existing socioeconomic factors, forest fires are traditionally analysed by region according to four zones that are considered homogeneous. The defined zones are the following:

NORTHWEST: Includes the autonomous communities of Galicia, Asturias, Cantabria and the provinces of León and Zamora.

MEDITERRANEAN: Includes the autonomous coastal communities with the Mediterranean Sea, including its interior provinces.

CANARY ISLANDS: Includes the entire Canary archipelago.

INTERNAL COMMUNITIES: Includes the provinces of the rest of the non-coastal autonomous communities, except León and Zamora, as well as the Basque Country[1].

The distribution of the total number of fires by geographical area is shown in Figure 98.

It shows that the Northwest region suffered the greatest number of fires, with 43.03% of the annual total. It is followed by the Interior Communities with 38.72%, the Mediterranean area and finally the Canary Islands.

Regarding total forest area affected, the Northwest region represents 45.98% of the total, followed by the Interior Communities, the Mediterranean region, and the Canary Islands.

Considering the wooded forest area, the highest burnt areas occurred in the Interior and Northwest regions, both over 30%, followed by the Mediterranean region and the Canary Islands.

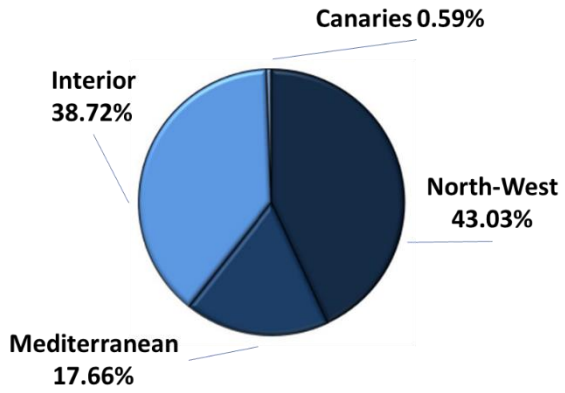


Figure 97. Number of fires in 2019 by geographic region.

1 Traditionally, the Basque Country has been included within the Northwest; however given that its fires are dissimilar to the rest of this region, in terms of number, area and causality, from now on it will be included in the so-called Interior communities.

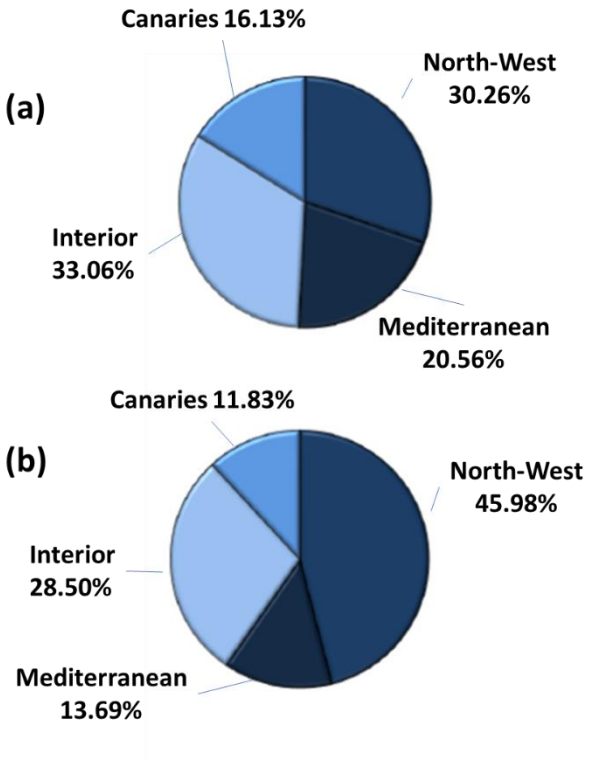


Figure 98. (a) burnt area of other wooded land (ha); (b) burnt area of forests (ha) in 2019 by geographic region.

Prevention measures

Training in fire management

During 2019 MAPA (Food, Agriculture and Fishing Ministry) carried out the following training courses and workshops for professionals who work in defence against forest fires:

- Seminar "50 years of knowledge and prevention of forest fires" (Madrid, 20 November) commemorating the creation of the General Forest Fire Statistics and the Comprehensive Forest Fire Prevention Teams (EPRIF). A commemorative traveling exhibition can be viewed on https://www.mapa.gob.es/es/desarrollo-rural/temas/politica-forestal/incendios-forestales/Coordinacion-institucional/ and the conference is available on https://www.youtube.com/watch?v=o-hMD9cGDxM&list=PLSiWz5lk6UCedw4HIfbotoDZyQk02YX0r
- Conference on accidents in forest fires from the human factor - 2nd edition (Madrid, 16-17 December).

Integral Prevention Teams (*Equipos de Prevención Integral*: EPRIF)

In 2019 the EPRIFs were operational from January 10 until May 31 and resumed work from October 16 to December 20, completing a maximum of 7 months of work at the end of the year.

As an experiment, during 2019 one of these teams, the EPRIF of Cantabria, remained active throughout the year.

During this period, the EPRIFs worked mainly on training activities and meetings with various groups, including ranchers, farmers, hunters, neighbourhood associations, representatives of town halls or teachers, in order to reconcile interests and raise awareness of forest fire prevention.

It is worth mentioning the treatment of 1 071 hectares with 131 prescribed and controlled burns. This helps to reduce the risk of forest fires by reducing forest fuel and creating discontinuities in the vegetation, while also achieving other objectives such as improving pastures, favouring the habitat of various species or improving accessibility to the forest areas. A total of 599 plots were prepared for burning, although the weather conditions did not allow all of the work to be completed.

For performing controlled burns, the EPRIFs occasionally receive support from the Ministry Preventive Work Brigades with bases close to the area of action.

Preventive Work Brigades (Brigadas de Labores Preventivas: BLP)

The Ministry Preventive Work Brigades acted, in collaboration with the autonomous administrations, from the beginning of the year until the beginning of the summer campaign. Once the summer campaign was over, preventive work was resumed, which ended in the middle of December, extending the work period to about 11 months.

During these two work periods, they carried out fire prevention work on more than 1 381 hectares of forest land, which mainly consisted of construction and maintenance of strips and areas of greater resistance to forest fires, through clearing, thinning, pruning and prescribed burning.

In total, more than 400 workers distributed in the 10 Preventive Work Brigades carried out preventive forestry work in the surroundings of the BRIF bases. As already noted, the BLPs also work from time to time in support of EPRIFs in the execution of prescribed burns.

Figure 99. Tabuyo del Monte BRIF working in the Belmonte de Miranda fire (Asturias), 26/02/2019

Figure 100. Amphibious plane operated by the 43rd Group in the Porto fire (Zamora), 27/03/2019

Work on fire fighting extinction

Human resources: Reinforcement Brigades against Forest Fire (*Brigadas de Refuerzo contra Incendios Forestales*: BRIF)

The Ministry deploys five BRIF-i during the winter-spring campaign in the north and west of the Peninsula, and ten BRIFs during the summer campaign distributed throughout the national territory.

In the summer campaign the BRIF are composed of three teams each comprising 2 supervisors and 14 specialists under the command of 1 technician. For transport and support for fire extinction they have two transport and extinction helicopters with 1 200 litre of capacity. In the Puerto del Pico (Ávila) aerial base a BRIF-B type brigade is available, which is smaller in size and similar to the brigades of the BRIF-i winter campaign, consisting of three teams of 7 specialists, 1 foreman and 1 technical staff equipped with a single helicopter.

These highly specialized helicopter transport personnel units can operate anywhere in the country where needed. BRIF personnel receive continuous education and training that allows them to act in the most demanding situations and the most complicated fires. The mastery of all techniques of extinction, including backburning, is essential in its performance.

In the 2019 campaign, the BRIF worked for 1 041 hours in 336 fire interventions and extinguished a total front length of 253 274 metres. The BRIF with the highest activity during this campaign was that of Tineo (Asturias), with 55 interventions combining the summer and winter campaigns.

During the winter campaign the most interventions were made by the BRIF of Ruente (Cantabria) with a total of 29; this BRIF is only operational during the winter-spring months.

Aerial means

The Ministry has an aerial means deployment managed from the Spain Forest fire Service, which covers the national forest area throughout the year. During the two periods of greatest occurrence of forest fires, winter and summer campaigns, the number of available means is strengthened. Complete information on these media is available on: https://www.mapa.gob.es/es/desarrollo-rural/temas/politica-forestal/incendios-forestales/extincion/medios_aereos.aspx

During 2019, the Ministry air forces carried out a total of 1 469 interventions in forest fire suppression, in support of the means of the respective autonomous communities. In total they flew for 4 109 hours, making 17 624 discharges. Table 36 below details the distribution of actions by the autonomous communities and in other countries.

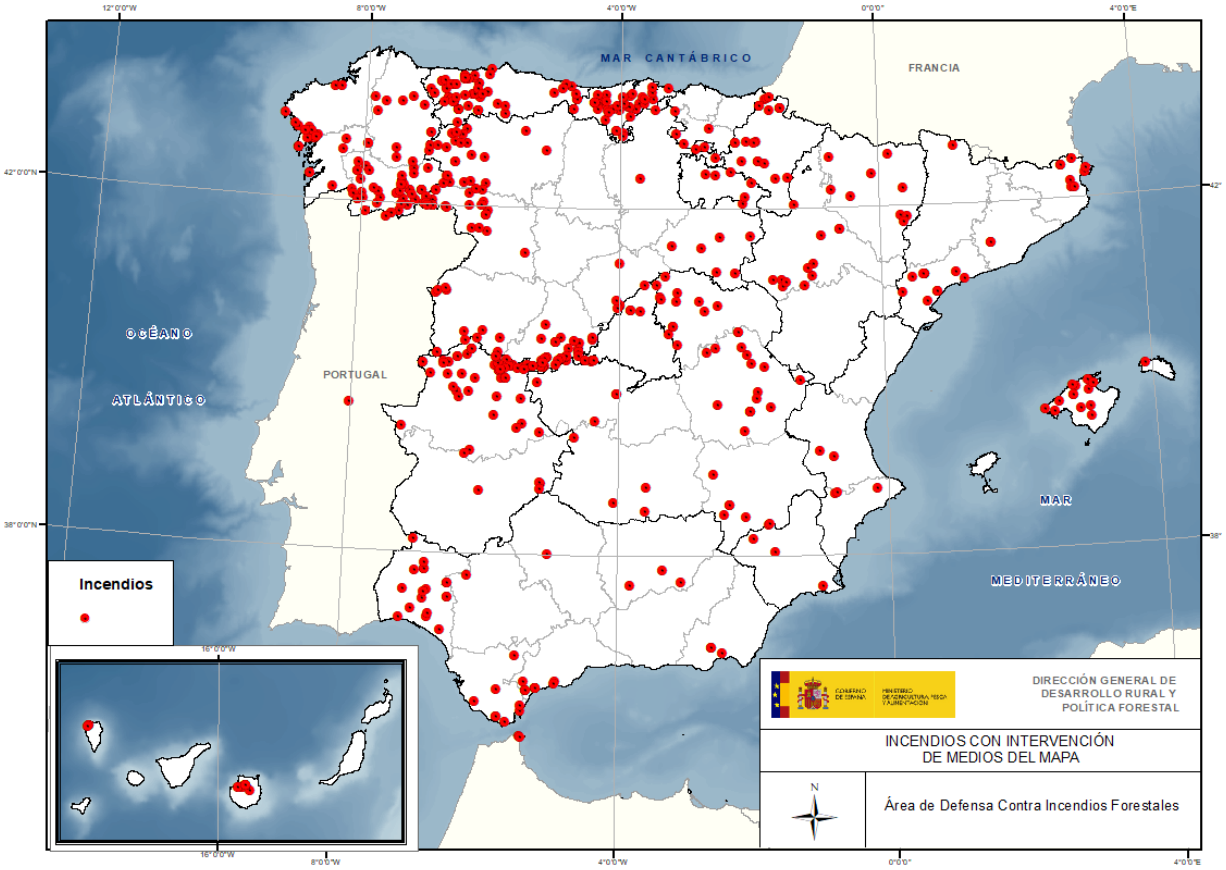


Figure 101. Location of air intervention actions made in 2019.

Table 36. Actions by autonomous communities and in other countries in 2019.

Autonomous community	Number of fires	Interventions	Hours of flight	Discharges
Andalucía	36	78	222:14	876
Aragón	19	50	149:48	696
Asturias, Principado de	50	100	281:55	1369
Balears, Illes	16	22	41:20	89
Canarias	6	70	411:43	1423
Cantabria	37	45	119:41	448
Castilla León	98	334	1120:14	5117
Castilla-La Mancha	42	135	492:54	1768
Cataluña	19	66	215:44	631
Ceuta	2	3	11:55	74
Comunidad Valenciana	5	17	50:53	110
Extremadura	55	96	246:29	1562
Galicia	80	232	566:27	2882
Madrid, Comunidad de	5	22	41:20	89
Murcia, Región de	4	7	12:10	82
Navarra, Comunidad Foral de	21	24	38:28	74
País Vasco	6	16	32:21	48
Rioja, La	6	10	5:39	17
TOTAL NACIONAL	**507**	**1464**	**4090:20**	**17567**
Portugal	2	3	7:45	14
Grecia	1	2	11:30	43

(Source: Ministry for the Ecological Transition and the Demographic Challenge, Spanish Forest Fire Service, Spain).

1.2.24 Sweden

Fire danger in the 2019 fire season

The forest fire risk was high in the spring; in fact, the largest areas with extremely high fire spread risk of the whole wildfire season 2019 in Sweden occurred in April 24 (Figure 102). In some areas in southern Sweden, there was extreme high fire danger for Swedish conditions. April was dominated by high pressure and was warm, sunny, dry and locally even record dry. From the middle of the month, the fire risk increased in large parts of southern Sweden for each passing day. However, the fire danger generally decreased during May when several front systems with precipitation passed the country.

The summer 2019 in Sweden was slightly warmer than normal, especially in southern Sweden, and the precipitation levels were in general normal. The weather was alternating with both periods of wet and dry conditions, however, the number of days with very high or extreme fire risk levels was considerably lower than 2018. Late June had very high fire spread risk after previous periods with more unstable conditions with thunderstorms (Figure 103a). In July, the fire spread risk did not reach any extreme levels as during last summer, since the relative humidity was higher, but in the end of July the fire risk increased to higher levels (Figure 103b).

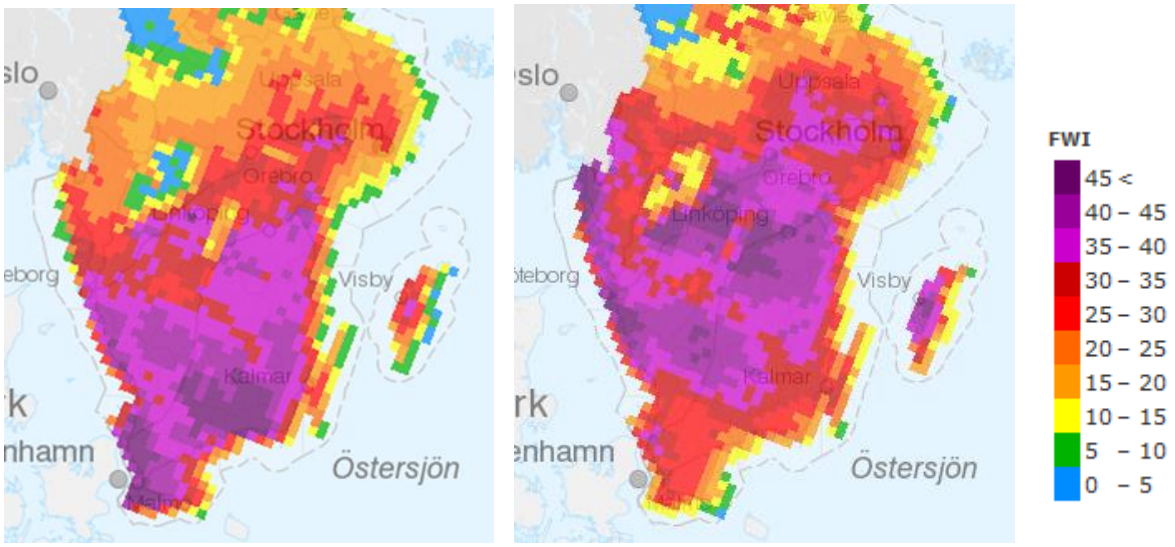


Figure 102. FWI-value 23 and 24 April 2019.

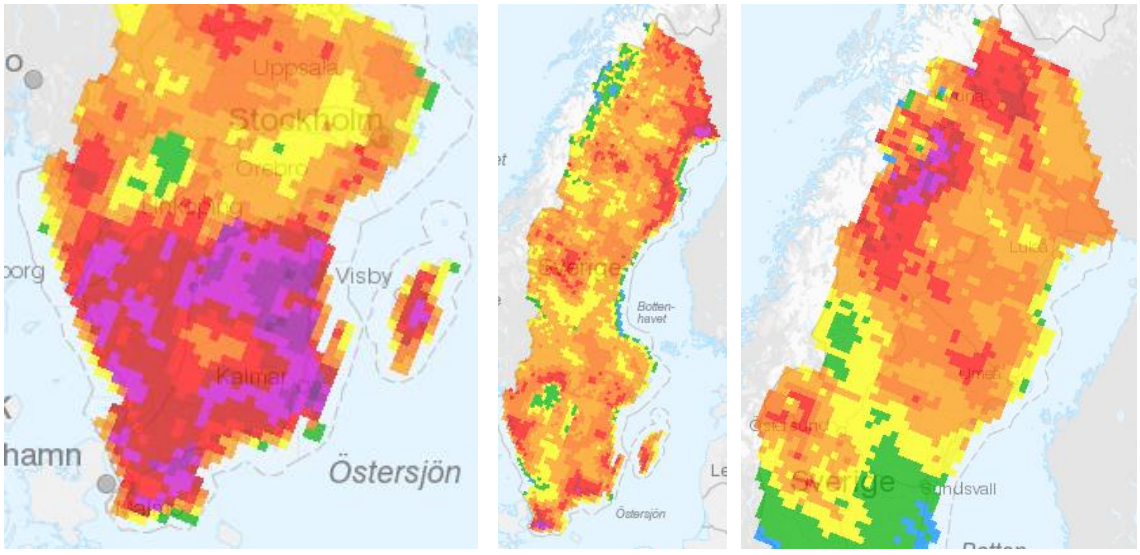


Figure 103 (a) FWI value 30 June 2019; (b) FWI value 27 July 2019; (c) FWI value 1 August 2019

The beginning of August had a high fire risk, mainly in northern Sweden (Figure 103c). Furthermore, in the last week of August a high pressure arrived with sun and, for the time of the year, very hot weather throughout the country, but due to the previously unstable weather, the fire risk values never got high.

First season with helicopters in service for extinguishing forest fires

After the extensive fires in 2018, forest fire preparedness in Sweden was strengthened. In 2019, Sweden, through MSB, had its preparedness for fighting forest fires with helicopters organised at the national level for the first time, with support from the EU. During the 2019 season, helicopter support was requested on a total of 49 occasions. Overall, helicopter operations have worked very well and have provided valuable support to the municipal rescue services.

Grass and forest fire risk (maps)

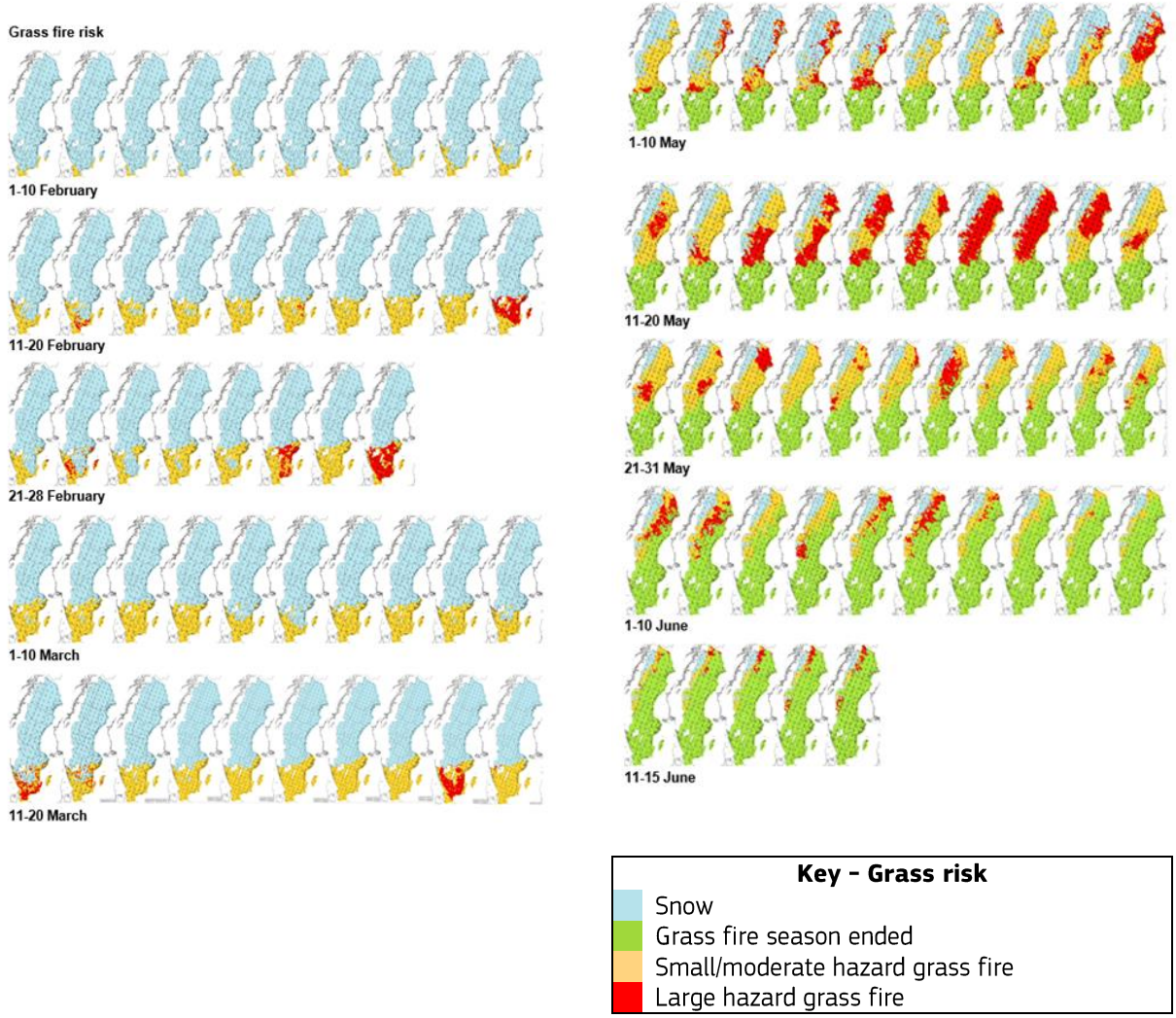


Figure 104. Maps of grass fire risk season 2019 shows periods of risk in combination with snow.

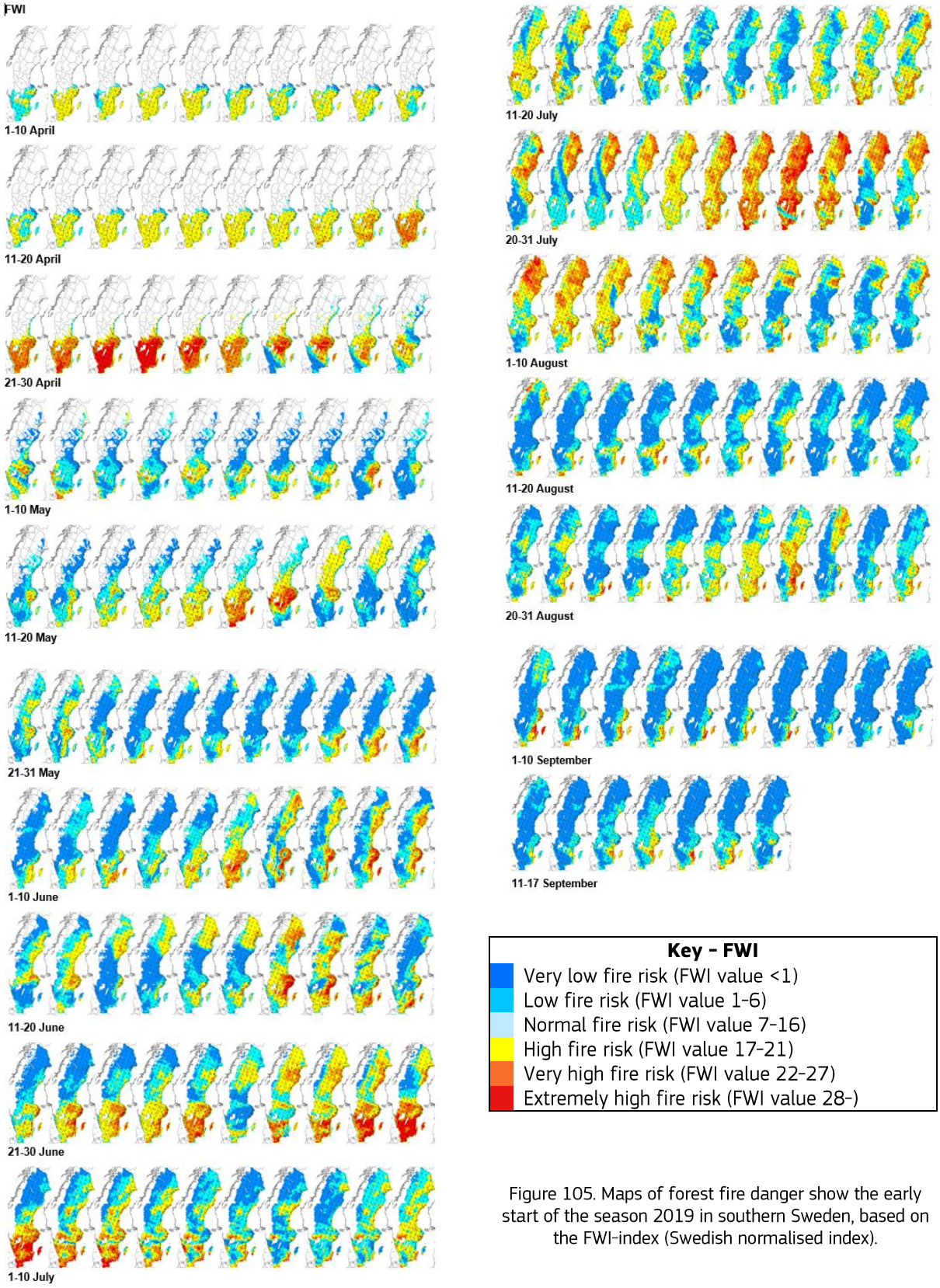


Figure 105. Maps of forest fire danger show the early start of the season 2019 in southern Sweden, based on the FWI-index (Swedish normalised index).

New phenomena noticed in the spring 2019

The wind-dispersed seed from aspen collected as a layer of white fluff in small ditches, re-entrants or valleys and the fluff burned extremely fast.

That caused many emergencies in parks and other types of green areas close to houses when children played and ignited the "white fluff", that burned nearly as fast as gun powder.

Figure 106. Images from a video when testing fire behaviour of aspen fluff in the laboratory. The fluff burned extremely fast. Residence time about 0.3 second. *Photo: Anders Granström, SLU*

Fire occurrence and affected surfaces

During 2019 the number of fires recorded was 5 483. The burned area consisted of 775 ha productive forest, 209 ha other wooded land, 125 ha other open land and 124 ha agriculture field or pasture. There were 13 fires over 10 ha and seven of those fires started in the period from the 6th to the 24th of April. The total burned area for those fires was 616 ha (50 % of the total burned area of 5 483 fires). The largest forest fire area was 227 ha.

The monthly pattern of fire numbers and burnt areas in 2019 are shown in Figure 107.

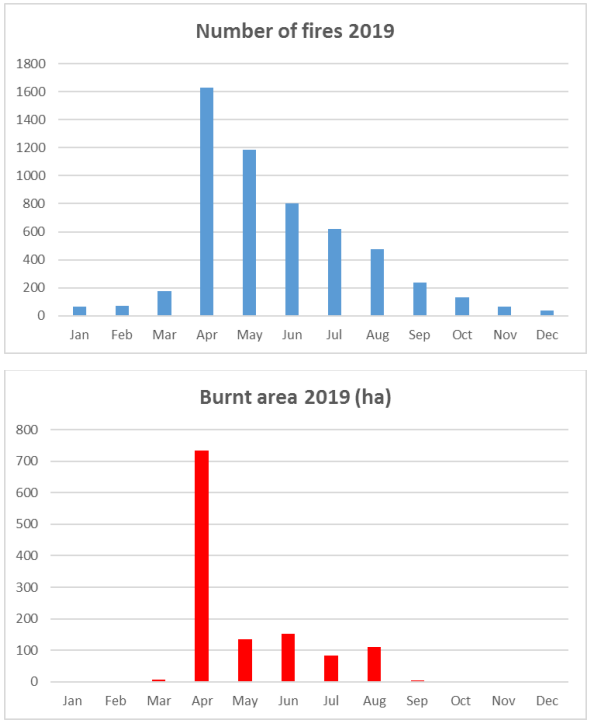


Figure 107. Total number of fires and burnt area (ha) by month in 2019.

The burnt area, number of fires and average fire size for the years 1998-2019 are shown in Figure 108.

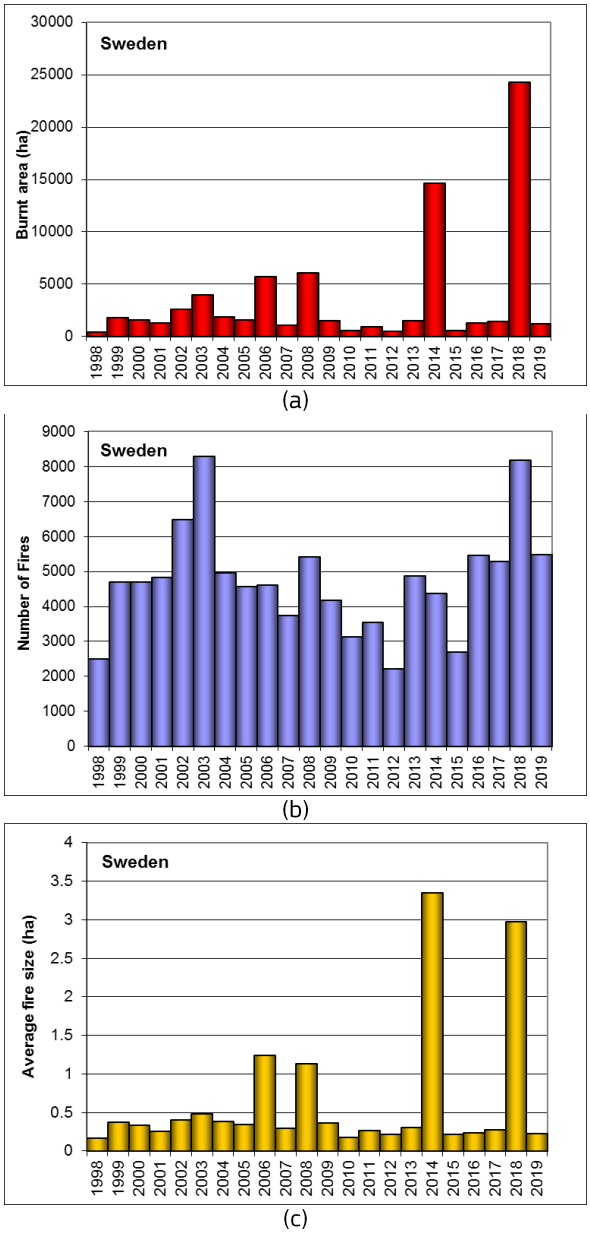


Figure 108. Burnt areas (a), number of fires (b) and average fire size (c) in Sweden from 1998 to 2019.

Fire Causes

During 2019 almost half of the fires had unknown causes (43%) and 22% were deliberate. 9% were caused by use of fire, 5% known but not specified, 5% lightning and 4% recreation.

(Source: Swedish Civil Contingencies Agency (MSB); Risk & Vulnerability Reduction Department, Natural Hazards & Critical Infrastructure Section, Sweden)

1.2.25 Switzerland

Weather conditions and state of the forests 2019

In 2019, Switzerland experienced another year with extreme weather conditions above average: combined effects of heatwaves and drought caused impacts in many forests across the country. On average, 2019 was the fifth warmest year since the beginning of measurements in 1864.

The south of the Alps experienced the second mildest winter since measurements began in 1864. January and February 2019 were significantly milder than the norm. A frequent northern foehn made a significant contribution to the mild winter south of the Alps. Due to this frequent occurrence, the winter south of the Alps was also extremely dry. In some regions, precipitation was only 30 to 40 % of the norm. In other regions, however, an often persistent and active westerly current brought above-average winter precipitation.

As a national average, the temperature in the spring of 2019 was around the 1981-2010 norm. The spring saw precipitation deficits in large parts of Switzerland. Regionally, however, significant amounts fell. Regular snowfall and an unusually cool May kept the snow cover in the Alps at a very high level.

The summer of 2019 was the third warmest since measurements began in 1864. With an average of 15.2 °C, June was the second hottest month since measurements began in 1864. In contrast to the extremely hot and dry summer of the previous year, many parts of Switzerland received sufficient precipitation this summer. The values were well within 80-100% of the 1981-2010 standard.

Switzerland experienced its sixth warmest autumn since measurements began in 1864, partly due to an extremely mild temperature in October. September was generally characterised by low precipitation and October by copious rainfall. Finally, with the heavy precipitation and the lowering of the snowfall limit in November, considerable fresh snow arrived and remained during the winter in the Alps.

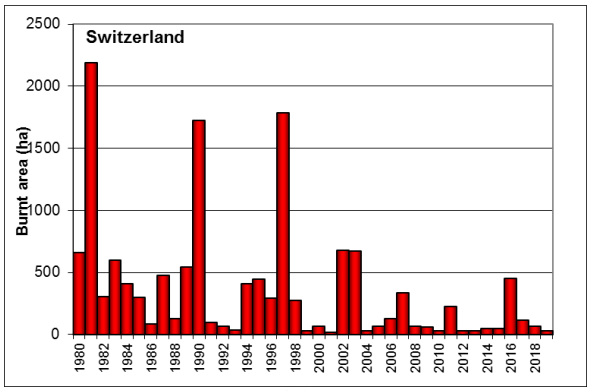
In most parts of Switzerland, the annual temperature in 2019 was 0.8 to 1.2°C above the 1981-2010 norm. In 2019, annual precipitation in Switzerland was 80-100% of the 1981-2010 norm. (Source: MeteoSwiss 2020)

Fire occurrence and affected surfaces

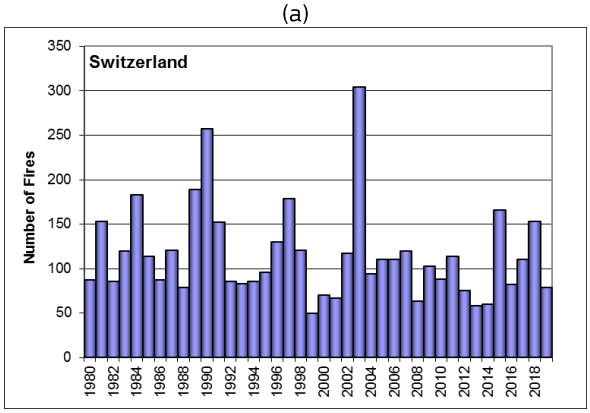
Throughout the year 2019, forest fires were reported from the cantons of Basel-Land, Bern, Grisons, Jura, Lucerne, St. Gallen, Solothurn, Ticino, Uri and Valais. There were 79 fires on a total of 30.9 hectares. The fires averaged 0.47 ha. Compared to the period from 1980 onwards, 2019 was a year with a strongly below-average forest fire area and a below-average number of forest fires. In 2019, 47% of the fires occurred in summer (May to November) and caused 15% of the forest fire area.

Fire Causes

On a long-term average, negligence is still considered the main cause of forest fires in Switzerland, especially when fires are lit outdoors. In 2019, no deaths, injuries or significant damage to buildings and infrastructure were reported. (Source: WSL Federal Research Institute).



(a)



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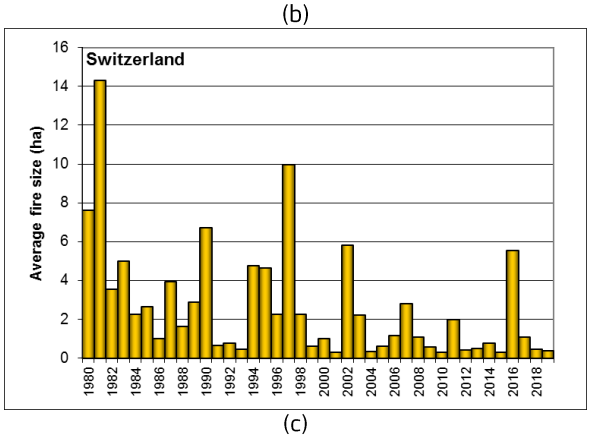


(c)

Figure 109. Burnt areas (a), number of fires (b) and average fire size (c) in Switzerland from 1980-2019.

Fire prevention activities

The federal prevention strategy in Switzerland focuses on prevention and information. It relies on the close collaboration of the Cantons (States) with the Confederation (Federal state). In accordance with the extreme weather conditions, 2019 was a very intense year for fire prevention all over Switzerland.

Because of the mild weather conditions during January and February, the fire danger remained between considerable and high in the south of the Alps until and through the spring. However, regional precipitation helped the fire danger returning to low for a couple of days every time. This also was the case for the general fire ban in the south of the Alps.

The average temperature in the spring and most of all the precipitation deficits in large parts of Switzerland saw the fire danger rise in all parts of Switzerland especially around April 2019. The northern part of the Alps however did not call for a general fire ban during the spring. The return of cool temperatures and precipitation during May reduced the fire danger until summer.

During the third warmest summer, the fire danger rose from June to July to reach a considerable or high level. However, a few precipitation events prevented the fire danger from reaching a very high level.. All parts of Switzerland called a general fire ban or conditional fire ban (no fire in forest or near forests) especially by the end of July in order to prevent wildfires during the celebration of the national day on the first of August (fireworks).

Slowly, the fire danger decreased during the autumn in different parts of Switzerland except for the Jura region in the northern part of Switzerland. The extreme conditions of 2018 in this area of calcareous ground showed disastrous drought consequences one year after. A significant number of trees dried out. By October, the return of rainfall set the fire danger at its lowest level.

The case of drought and dying trees in the Jura region in the northern part of Switzerland needed a significant communication effort at all levels (national, cantons and communities) in order for the population to avoid misunderstanding drought and fire danger.

The national website www.forest-fire-danger.ch has again registered a high number of visits, especially before the celebration of the national day on the first of August, indicating the need for such platforms for the population and the media. (Source: FOEN, Federal office for the environment)

(Sources: Federal Office for the Environment, WSL Federal Research Institute, MeteoSwiss).

1.2.26 Turkey

Fire occurrence and affected surfaces

According to data derived from the General Directorate of Forestry, Department of Forest Fire Combating, in 2019 the total burnt area was 11 332.44 hectares. The number of fires was 2 688 in the same year.

In Turkey, the coast-line, which starts from Hatay and extends through the Mediterranean and Aegean up to Istanbul, has the highest fire risk. In another words, approximately 57% (12.5 million ha) of Turkey's forest area is located in fire sensitive areas.

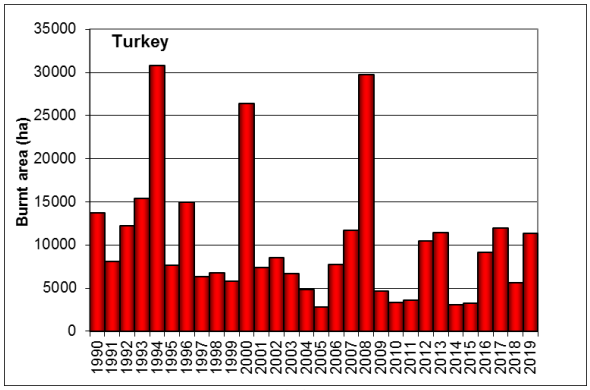
Forest fires mostly occurred during the period of March-December, particularly in June, July, August and September. When we look at the number of forest fires, we see that August ranked the highest with 523 fires but in terms of burnt area, July was the highest with 6 819.79 ha. (See Table 38). 85.5% of the forest fires occurred in four months (between July to October) and 9 692.56 hectares of forest area were damaged in this period.

Table 37 gives the forest fire statistics for Turkey 1990-2019.

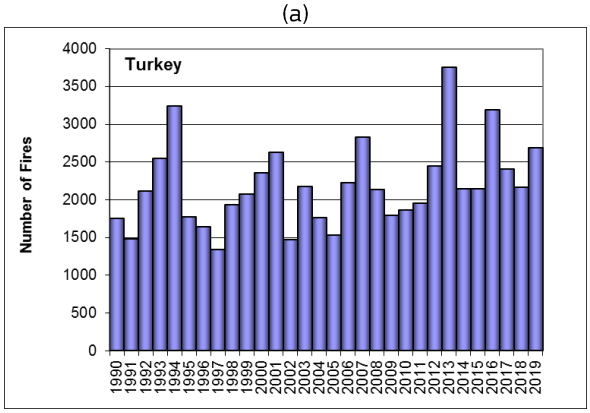
Table 37. Forest fires in Turkey 1990-2019.

Year	Fire Number	Burnt Area (ha)
1990	1750	13742
1991	1481	8081
1992	2117	12232
1993	2545	15393
1994	3239	30828
1995	1770	7676
1996	1645	14922
1997	1339	6317
1998	1932	6764
1999	2075	5804
2000	2353	26353
2001	2631	7394
2002	1471	8514
2003	2177	6644
2004	1762	4876
2005	1530	2821
2006	2227	7762
2007	2829	11664
2008	2135	29749
2009	1793	4679
2010	1861	3317
2011	1954	3612
2012	2450	10455
2013	3755	11456
2014	2149	3117
2015	2150	3219
2016	3188	9156
2017	2411	11992
2018	2167	5644
2019	**2688**	**11332**

The yearly trends in terms of numbers of fires and burnt areas in Turkey since 1990 are shown in Figure 110.



(a)



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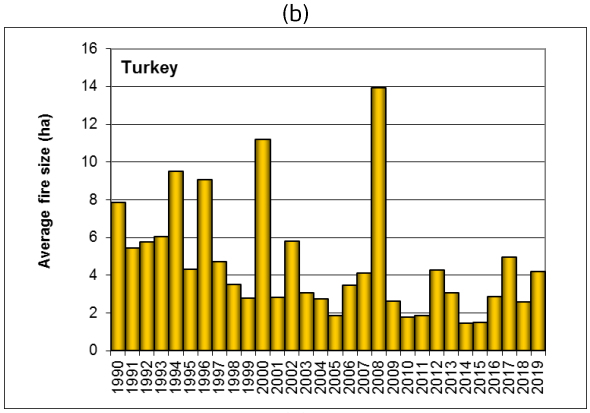


(c)

Figure 110. Burnt areas (a), number of fires (b) and average fire size (c) in Turkey from 1990 to 2019.

Fortunately, around 90% of the fire incidents were controlled before spreading. There was only one fire bigger than 1 000 hectares (4 365.2 ha in Izmir) and there was 1 fire bigger than 500 ha (540.1 ha in Mugla): Table 40.

Table 38. Monthly distribution of forest fires in Turkey 2019.

Month	Number Of Fires	Burnt Area (Ha)
Jan	10	7.78
Feb	19	18.52
Mar	112	87.66
Apr	96	74.47
May	98	123.99
Jun	273	411.89
Jul	403	1495.17
Aug	523	6819.79
Sep	461	702.29
Oct	296	675.31
Nov	253	383.13
Dec	144	532.44
TOTAL	**2 688**	**11 332.44**

Fire Causes

In Turkey, 78% of forest fires take place in forested areas up to 400 metre altitude.

These areas are:

- High populated areas
- Areas of high migration
- Areas where there are valuable lands
- Places with cadastral problems
- Tourism areas

Most of the fires in Turkey were caused by human activities (89% in total) The causes of forest fires in 2019 are shown in Figure 111.

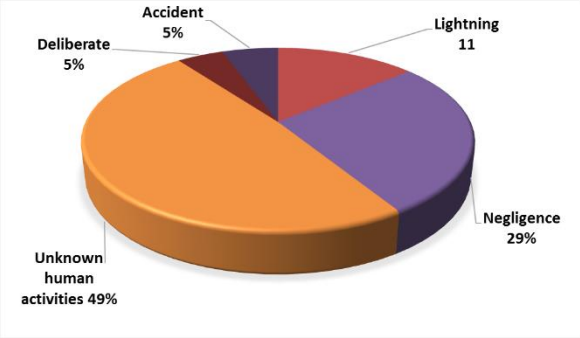


Figure 111. Fire causes in Turkey in 2019.

Fire Management

Fire management in Turkey is carried out under the responsibility of the General Directorate of Forestry (GDF). Duties are carried out by state forest enterprises functioning under regional directorates. Regardless of the high costs involved, all required activities are planned and implemented immediately. Fire management deals mainly with activities concerning early detection, prevention and control.

Early Fire Warning Systems

So far, a total of 776 fire towers have been built to detect fire and report to firefighting teams. With 230 cameras at 115 points, the fires detected in our forests in the fire sensitive zone are reported to the fire management centres and the teams are sent.

The system enables rapid detection of forest fire to visible range optical cameras (Fire management centres can also monitor the progress through these cameras)

Construction of Pools and Ponds

During 2019, for the purpose of shortening the periods of forest fire attack in forested areas where water sources are scarce, 3 102 fire pools and ponds were used.

Figure 112. Fire pool.

Fire Fighting Means

In addition to forest fires, General Directorate of Forest has been intervening in agriculture fires for the recent years, which is about 3 312 non-forest incidents in 2019.

In 2019, 3 500 technical staff, 5 650 forest preservation officers and 11 000 workers were involved in detection, communication and suppression efforts. Ground and air equipment used for firefighting in 2019 are presented in Table 3.

Table 39. Firefighting forces in Turkey in 2019.

Land Means		Aerial Means	
Bulldozer	186	Leased Helicopter	24
Grader	179	Amphibious Aircraft	5
Fire Truck	1010	Administrative helicopter	6
Water Tank	281		
First intervention vehicle	559		
Motorcycle	856		

Preventive measures

Fire sensitive Regional Forest Directorates

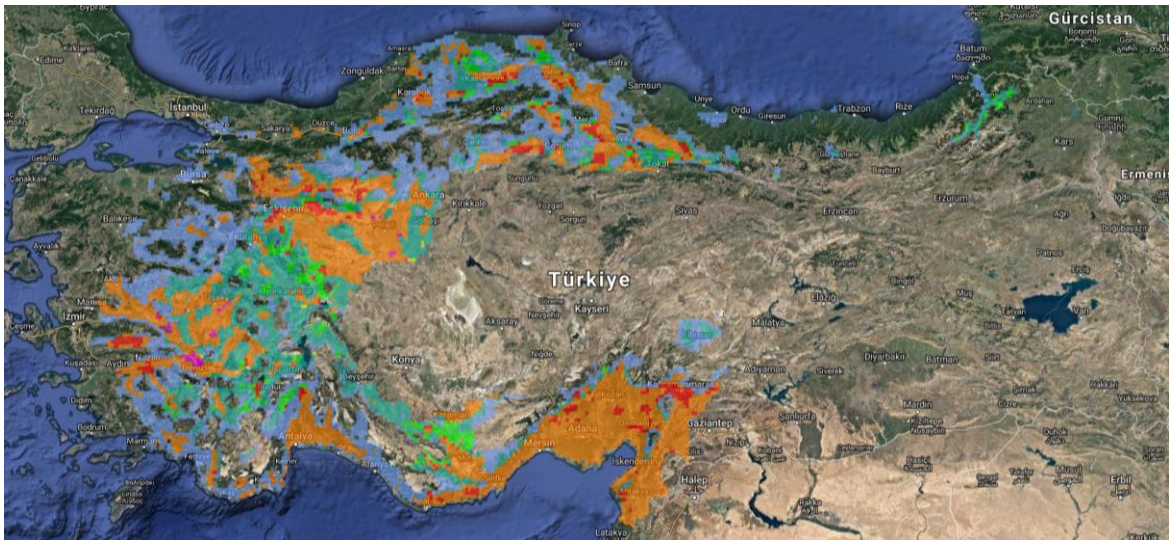
- Planting fire resistant species when rehabilitating burning areas.
- Converting existing forest to fire resistant forest. (YARDOP Project: Rehabilitation of Burned Areas and the Establishment of Forest with Fire Resistant Species Projects)
- Creating differential elements (roads etc.) in order to stop probable fires starting in settlements and agriculture lands from going towards forest.
- Planting fire-resistant species along roadsides in order to hinder forest fire from turning into crown fire.

Forest Fires Early Warning System

With the fire watch towers, our forests are monitored 24 hours a day. The automatic early warning system analyses the smoke and reports it to the centre within 15 seconds. There are also 15 unmanned smart towers in our forests.

Figure 113. The early warning system for detecting forest fires and automatic fire-finding systems established and put into service via a joint project among GDF, Bilkent University and Scientific and Technological Research Council of Turkiye(TÜBiTAK) for a decade.

230 units cameras in 115 Fire Lookout Towers are being used for fire detection.



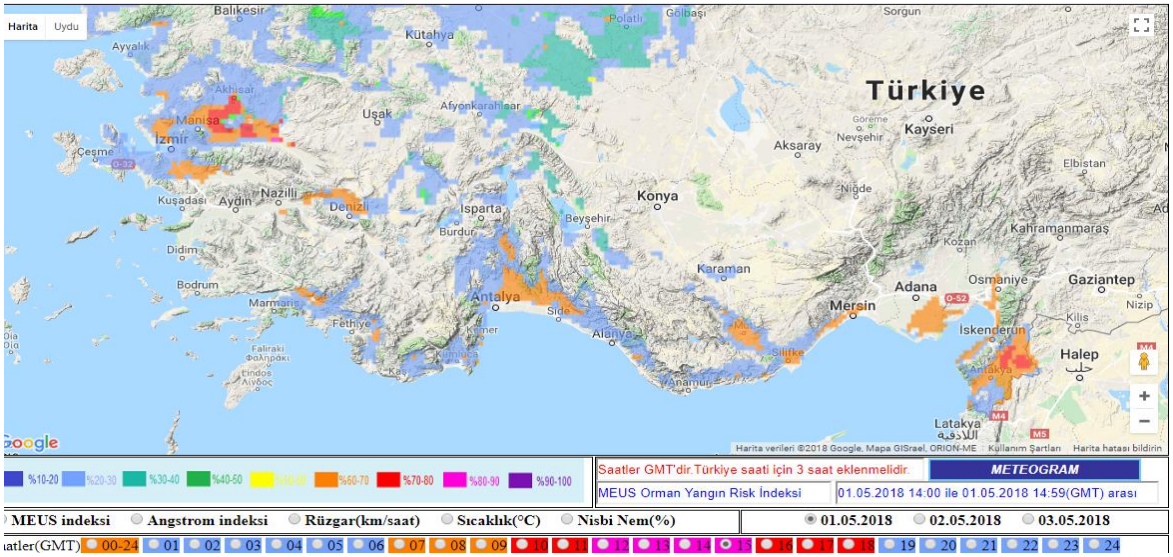


Figure 114. Example of daily fire risk map.

National Forest Fire Risk Estimations in Turkey

MEUS (Meteorological Early Warning System)

We have been using MEUS (meteorological early warning system) with wind, wind direction, temperature and humidity to create our 3-day daily fire risk maps. (Figure 6)

Fire Occurrence Prediction System

Since 2018, we have started to use Fire Occurrence Prediction System which is a GIS-based multi-criteria forest fire hazard analysis and mapping system. The system analyses the probability of starting forest fire with 12 criteria (Figure 115).

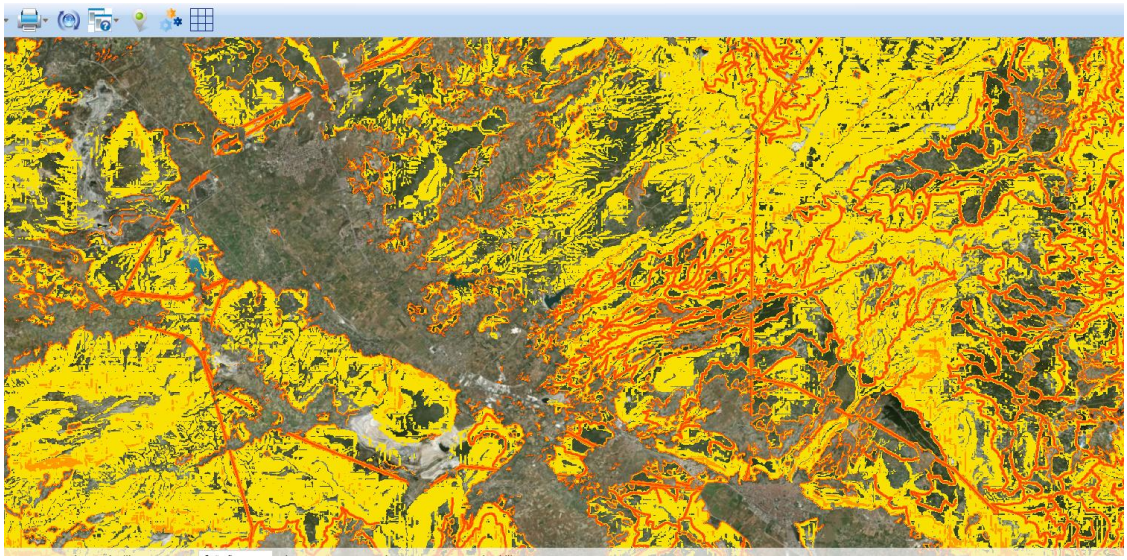


Figure 115. Fire Occurrence Prediction for Mugla Forest District in 2019

Figure 116. Forest Fire Fighting Simulator in Antalya International Training Centre.

Education, Public awareness and information campaigns.

Several education/training and awareness raising campaigns have been carried out.

Training of Technical staff.

A Fire Expert Training Program has been put into effect for personnel who will take charge in forest fires. Subjects such as fire-fighting methods, application of fire-use, first aid etc., have been given to technical staff in this training program.

In 2012 the International Forest Fire Fighting School was opened in Antalya. The facilities provided training to forest fighting teams at national and international level with a forest fire simulator (Figure 116).

Training of Technicians

Information has been given to technicians about the use and maintenance of tools used to combat forest fires, such as GPS, meteorological equipment, electronic hand tools and communication devices.

Training of Workers

Training has been given to Forest Fire Workers about fire-fighting methods, first-aid and other technical subjects.

Public awareness and information campaigns can be aggregated into 2 groups:

a) Awareness-raising activities for target groups.

- Activities for children and young people:

During 2019, conferences were held, plays were staged by Sincap Children Theatre, and brochures, books and magazines on forest were distributed to schools and other places to raise awareness about environmental, social and economic issues, fire causes and how they can be avoided.

- Activities for forest villagers, hunters and shepherds:

In our country, there are 16 000 villages located beside or inside forest areas and 6,2 million people living in these areas. Forest villagers are causing forest fires by going about their agricultural activities, so messages have been transmitted to them about the importance of human action in preventing fires.

Awareness-raising activities at national level:

- Activities for specific days and weeks. (e.g. World Forestry Day)
- Coordination meetings with local authorities.
- Cooperation with radio and television channels
- Cooperation with media and voluntary organizations
- Training of personnel working in travel agencies and tourist facilities in fire risk areas about forest fires and the preventative measures needed to be taken
- Training of soldiers and local fire departments.

Table 40. Number of fires and burnt area in 2019 by forestry regions and fire size class.

Region	<1.0 Ha		1.1 - 5.0 Ha		5.1 - 20.0 Ha		20.1 - 50.0 Ha		50.1 - 200.0 Ha		200.1 - 500.0 Ha		> 500. Ha		TOTAL	
	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area	Nr Fire	Brt Area
ADANA	148	30.1	22	43.4	3	23.5			1	62.0					174	159.1
AMASYA	57	25.8	19	50.5	4	50.9	1	23.8							81	151.0
ANKARA	39	13.7	13	27.5	3	28.4									55	69.6
ANTALYA	173	34.0	20	43.3	3	28.0	2	67.0	1	62.5					199	234.9
ARTVİN	20	10.3	3	6.4											23	16.7
BALIKESİR	61	12.2	6	17.3	3	22.6	1	22.7							71	74.8
BOLU	41	15.3	13	26.9											54	42.1
BURSA	59	10.1	18	36.2	4	37.5	2	74.8	1	145.8					84	304.4
ÇANAKKALE	79	15.4	10	25.2	1	10.6			1	50.4	1	188.9			92	290.4
DENİZLİ	5	10.2	19	3.2											24	13.4
ELAZIĞ	87	35.5	45	115.1	17	147.0	5	137.3	3	217.6					157	652.4
ERZURUM	16	9.3	22	64.5	9	98.0	1	37.7							48	209.5
ESKİŞEHİR	22	7.9	9	18.7	3	20.5	1	27.9							35	75.0
GİRESUN	39	20.9	19	40.9	6	66.7									64	128.4
ISPARTA	57	17.3	6	15.7	3	28.7			1	78.0					67	139.7
İSTANBUL	188	21.0	15	27.4	1	6.0									204	54.4
İZMİR	193	41.3	35	84.1	3	31.4	5	147.3	3	253.9			1	4346.0	240	4904.0
K.MARAŞ	122	48.8	27	72.2	6	68.1	3	96.0	1	50.2	1	291.0			160	626.3
KASTAMONU	80	23.9	14	43.4	4	43.1									98	110.3
KAYSERİ	9	4.3	8	18.5	1	12.5									18	35.3
KONYA	23	7.1	4	8.8	2	17.9	1	30.0							30	63.8
KÜTAHYA	31	2.9	5	11.7	1	5.1			1	92.5					38	112.2
MERSİN	69	20.4	15	36.3	3	27.4	2	89.7	1	187.0					90	360.8
MUĞLA	271	39.5	16	36.0	8	69.1	3	92.8	3	343.0	1	380.0	1	540.1	303	1500.4
SAKARYA	59	11.9	4	6.0	2	15.0	1	23.2							66	56.1
Ş.URFA	8	6.2	31	51.9	50	332.3	26	416.8	6	226.0					121	1033.2
TRABZON	30	18.9	28	88.7	13	123.2			2	213.0					73	443.8
ZONGULDAK	16	3.5	4	7.1											20	10.6
TOTAL	**2002**	**517.5**	**450**	**1026.7**	**153**	**1313.5**	**54**	**1287.0**	**25**	**1981.9**	**3**	**859.9**	**2**	**4886.1**	**2688**	**11332.4**

(Source: Regional Forestry Directorate of Antalya, Turkey).

1.2.27 Ukraine

General Information

The area of Ukraine is 603 628 square kilometres and is divided into 24 oblasts (regions), one autonomous republic (Autonomous Republic of Crimea), and two cities of special status: Kiev, the capital, and Sevastopol. Twenty-four oblasts (regions) and Crimea are subdivided into 490 raions (districts).

The total area of forest lands belonging to the forest fund of Ukraine is 10.4 million hectares, including 9.6 million hectares covered with forest vegetation. Total forest cover is 15.9%.

The forests of Ukraine grow in five natural and climatic zones: Polissia zone (forests), Forest-Steppe zone, Steppe zone, and two high-level zones, the Ukrainian Carpathians and the Crimea, which are significantly different in climatic conditions.

Forests of Ukraine are formed by more than 30 wood species, among which the most common are Scots pine (*Pinus sylvestris L.*), European oak (*Quercus robur L.*), European beech (*Fagus sylvatica*) and Norway spruce (*Picea abies*): Figure 117.

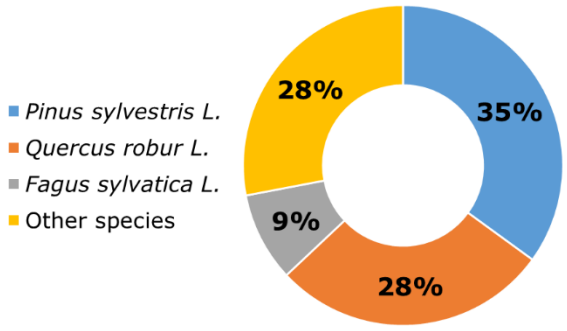


Figure 117. Distribution of forest area by species.

The most fire dangerous coniferous forests occupy 43% of the total area, in particular, pine stands – 35%, which grows in the North of Ukraine (Polissia zone) and in the South (Steppe zone) along the biggest rivers and also in the Crimea peninsula. According to the departmental subordination, the largest area of forests (about 73%) is in use by state forest enterprises coordinated by the State Forest Resources Agency of Ukraine.

Fire danger in the 2019 season

In Ukraine, 2019 was the warmest year in the last 50 years. In a large part of the country, the average air temperature deviations for this year exceeded 2 °C compared to the average long-term values for 1981-2010. June and December were the warmest months during the entire period of climatic observations in Ukraine except for some regions. However, 2019 was one of the droughtiest years: 9 of the 12 months were marked by significant rainfall deficit.

At the same time, in almost the entire area of Ukraine, except for the western regions, the deficit of precipitation was observed for 8 months in a row, from May to December. The maximum period without significant precipitation (more than 5 mm per day) reached 75 days or even more. The driest conditions during the fire season were in Cherkasy (central part of Ukraine) and Odesa (southern part of Ukraine) Oblasts (*climatic data provided by: Ukrainian Hydrometeorological Centre; climatic analysis by: Balabukh V., Ukrainian Hydrometeorological Institute, The State Emergency Service of Ukraine*).

The winter of 2018–2019 was early and snowy and with a stable snow cover. In the south of the country, the stable snow cover persisted only until mid-January 2019. The fire season of 2019 started a month earlier than usual – on March 4. The first forest fire incidents were recorded on March 4, 2019 in the south of Ukraine, on March 22, 2019 in the west, on March 29 in the north and on April 6 in the centre and east of Ukraine. Since 2018, a new fire danger assessment methodology has been implemented in Ukraine. It has 5 classes of fire danger: I – no fire danger; II – low fire danger; III – medium fire danger; IV – high fire danger; V – extreme fire danger. The distribution of days by fire danger classes during the fire season 2019 is given inTable 41. (*data provided by: State Enterprise Forestry Innovation and Analytical Centre, Pavlenko O.*)

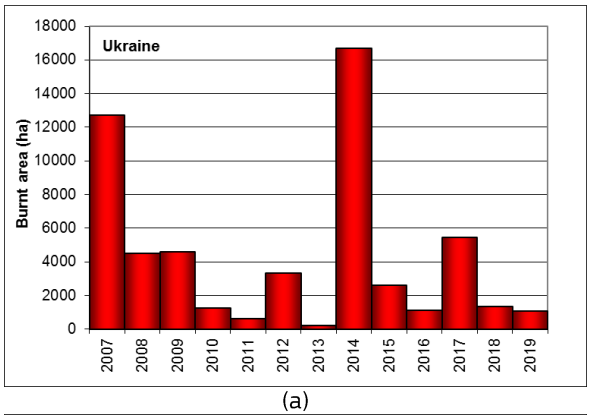
Table 41. Average Fire danger by month during 2018 and 2019 fire seasons.

Month	Year	Average КПН class	The distribution of days by fire danger classes КПН, %				
			I	II	III	IV	V
Apr	2018	3.56	21	8	9	21	41
	2019	2.89	12	18	26	34	10
May	2018	4.05	5	9	12	26	48
	2019	3.20	9	14	25	25	27
Jun	2018	3.83	5	18	15	21	42
	2019	3.88	2	6	17	23	52
Jul	2018	3.12	13	20	26	25	16
	2019	3.61	5	9	20	27	39
Aug	2018	4.39	0	10	7	24	59
	2019	3.82	3	5	21	25	46
Sep	2018	3.58	8	20	14	26	32
	2019	4.21	2	5	12	8	73
Oct	2018	3.66	6	19	15	28	32
	2019	3.30	6	14	24	27	29

During 2019, November and December were abnormally warm, the air temperature occasionally dropped below 0 °C, stable snow cover was not formed during these months. The fire season of 2019 on the territory of Ukraine actually ended with the onset of stable wet rainy weather on November 30, 2019.

Fire occurrence and affected surfaces

The comparative charts for the total burnt area in the forests, number of fires and average fire size for 2007-2019 are shown in Figure 108.



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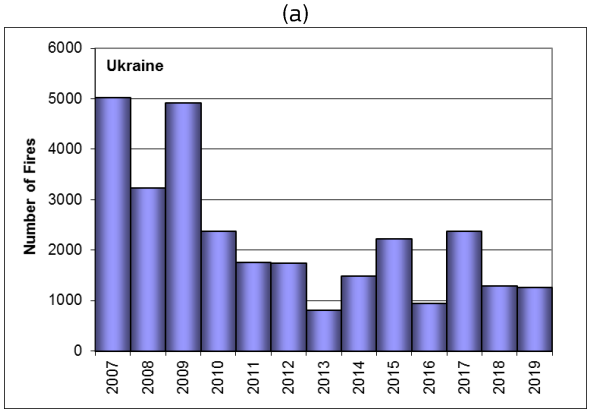

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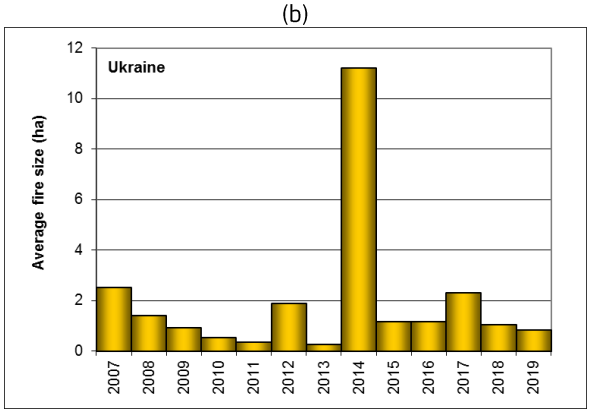
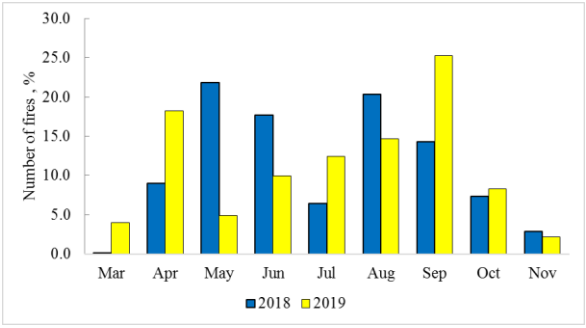


(c)

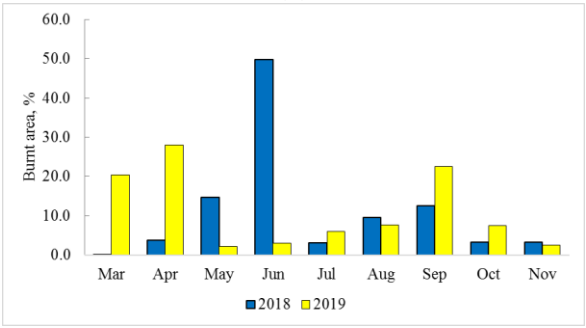
Figure 118. Burnt areas (a), number of fires (b) and average fire size (c) in Ukraine from 2007 to 2019.

During 2019 there were 1 261 forest fires with a total area of 1 065 ha (Figure 108). The largest numbers of fires were registered in the regions of Kherson (166 cases), Luhansk (110) and Dnipropetrovsk (142), Kharkiv (113 hectares) and Chernihiv (102). The largest burnt areas were registered in the regions of Zhytomyr (175 hectares), Kherson (169 hectares), Chernihiv (158) and Odesa (128). In 2019, there were 12 forest fires with a burnt area of over 5 hectares. (data provided by the State Forest Resources Agency of Ukraine). Data on forest fires reflect statistics obtained from forest users and owners, which are coordinated by the State Forest Resources Agency of Ukraine (73% of all forests in Ukraine).

In 2019, the most affected months were March and April when 48.4% of the annual total burnt area were recorded. Taking into account the number of fires, the situation was also dangerous in September and August when 25.3% and 14.7% of forest fires occurred respectively (Figure 119).



(a)



(b)

Figure 119. (a) Number of fires and (b) burnt area by month during the fire season in Ukraine in 2018 and 2019.

Economic losses

The economic losses caused by forest fires are shown in Figure 6. In 2017 they were estimated to be 43 800 000 Ukrainian hryvnia (UAH), in 2018 – 27 200 000 UAH and in 2019 – 6 700 000 UAH (Figure 120).

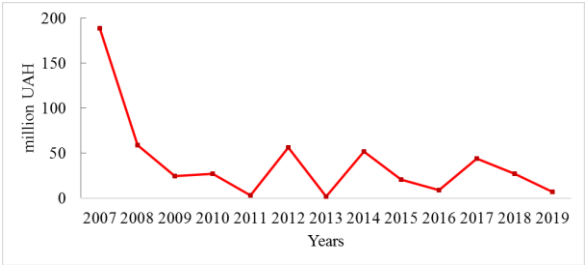


Figure 120. Economic losses caused by forest fires (data provided by the State Forest Resources Agency of Ukraine and State Service of Statistics).

Fire causes

The majority of forest fires (85%) are caused mainly by the negligence of local people. The main cause of forest fires is the violation of the fire safety requirements in forests during the period of high fire danger.

Fire fighting means and fire prevention activities

Forest fire protection is provided by 307 state forest enterprises, consisting of more than 1.7 thousand forestries and 288 forest fire stations. In the forests of the State Forest Resources Agency of Ukraine, there is a network of 491 fire and observation towers, of which 324 are equipped with television surveillance systems.

Protection of forests belonging to the scope of management of the State Forest Resources Agency of Ukraine is carried out by the State Forest Guard officers, the total number of which is 17 thousand persons, almost 14 thousand of which are directly involved in daily forest protection at the level of forestry. Direct protection of forests from fires is carried out by about 17 thousand workers of state forest protection. Technical equipment of forest fire departments includes 647 fire trucks, 433 firefighting modules on a four-wheel drive chassis and adapted equipment, over 1 000 motor pumps, 8 800 individual sprayers, 2 200 radio stations, etc.

Elimination of forest fires in the initial stage is the responsibility of the appropriate departments of forestry enterprises. If there is a threat of a large forest fire, units from the State Emergency Service of Ukraine, regional state administrations and other services are involved within their competence in order to extinguish the fire. In previous years, forest fires were mostly liquidated at the initial stage by the forces of the State Forest Guard (80%), but in 2018 and 2019, the extinguishing of fires was mainly carried out with the involvement of significant forces and means of the State Emergency Service of Ukraine (every third case of forest fire), which in turn increased the costs of their elimination.

In 2019, 44 km of firebreaks and 52.2 thousand km of fire-prevention mineralized lines (fire lines) were created, 245.7 thousand km of fire lines and firebreaks were restored.

Research Activities

In 2019, several research projects aimed at improving fire management were completed:

1) "**Improvement methodology of short- and medium rang forecasting of wildfire danger from meteorological conditions**". For the first time a method of short- and medium-term forecasting of natural fire danger under meteorological conditions was developed for Ukraine, taking into account the anthropogenic factor activity and the moisture capacity of different types of soils. Based on the created methodology, an automated system of short- and medium-term forecasting of natural fire danger under meteorological conditions in Ukraine was developed. (*Ukrainian Hydrometeorological Institute, Department of Applied Meteorology and Climatology*).

2) "**Modernization of the present forest management GIS based on up-to date geodatabase servers and GIS software platform**". A subsystem for forest fire monitoring was developed and integrated into the "Forests of Ukraine" geoportal. The subsystem allows prompt information to be made available about fire occurrence and control, as well as automatic generation of related forest fires statistical reporting. (*Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky (URIFFM), Laboratory of New Information Technologies*) (Figure 121).

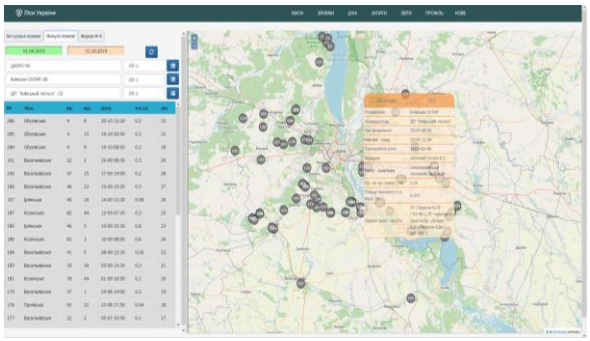


Figure 121. Subsystem for forest fires monitoring on the basis of the geoportal "Forests of Ukraine"

3) "To study the state and features of the growth of stands damaged by surface fires and to determine the criteria for predicting their degradation in the steppe conditions". Based on current and previous findings, guidelines entitled "Recommendations for forestry management to increase fire resistance of forests and methods for predicting post-fire tree mortality" were developed at the request of the State Forest Resources Agency of Ukraine (State Registration No 0115U001202).

The recommendations provide the main methodological principles for improving forest fire resistance being the most vulnerable to forest fires. A set of forestry procedures is proposed, which are aimed to mitigate the adverse effects for damaged stands. A methodology for predicting post-fire tree mortality has been developed for the tree stand level as well as for individual trees. The methodology is based on the use of basic indicators of fire damage and fire resistance of trees. (*Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky (URIFFM) – Laboratory of Forest Ecology and Steppe Branch of URIFFM*).

(Source: State Forest Resources Agency of Ukraine; Ukrainian Research Institute of Forestry and Forest Melioration, Ukraine)

1.2.28 United Kingdom

Introduction

Due to the significant processing periods for fire statistics, it is not possible to gain access to Incident Recording System data for Great Britain, gathered from Fire and Rescue Services when this report was requested. The UK report for 2019, as with last year, is therefore based on qualitative information submitted by representatives from the four devolved UK countries. European Forest Fire Information System indicates that the UK had an area burned 20 947 hectares, but this only records incidents over 30 hectares.

Parts of the UK experienced a third consecutive year of a prolonged dry period as well as several dry and very warm periods, especially in Spring. These conditions provide the ideal environment for the development and spread of large and disruptive wildfires.

Fire danger in the 2019 season

2019 was a year of extremes, with record breaking heat and rain, with notable periods of cold and windy weather. This included the warmest winter day on record (21.2˚C, Kew Gardens) in February and hottest day on record (38˚C, Cambridge) in July.

Early 2019 started with heavy snowfall and disruption in south west England despite record warm temperatures by February.

Weather during Spring was especially challenging with the mean temperature 1.3˚C above the mean average, including the hottest Easter period on record in England, Wales, Scotland and Northern Ireland as well as the lowest rainfall, especially in eastern England.

June was a significantly wet month for the United Kingdom, with Lincolnshire receiving 230% of expected rainfall for the month. However, by July temperatures included the hottest day ever recorded, linked to the heatwave across northern Europe, including Belgium, Germany and the Netherlands. In contrast, Cheshire received twice its average rainfall for the month (219%). The warm weather continued into August, resulting in summer 2019 being the 12th warmest on record since 1910 but the 7th wettest. Wet weather continued towards the end of the year.

As noted before the main spring fire season in the UK is atypical compared to southern European, especially Mediterranean countries when it is in the late summer. Again, the early wildfires in the United Kingdom have similarities with other northern European countries' spring fire seasons; e.g. Republic of Ireland, Norway, Netherlands, Sweden etc.

Using analysis of EFFIS, wildfires in 2019 resulted in the largest area burnt in the last ten years, focused on early spring especially in Wales with later significant incidents in northern Scotland (Figure 122, Figure 123). Small to moderate incidents occurred across the rest of the United Kingdom, especially northern England and south west of Scotland and in late summer in southern England.

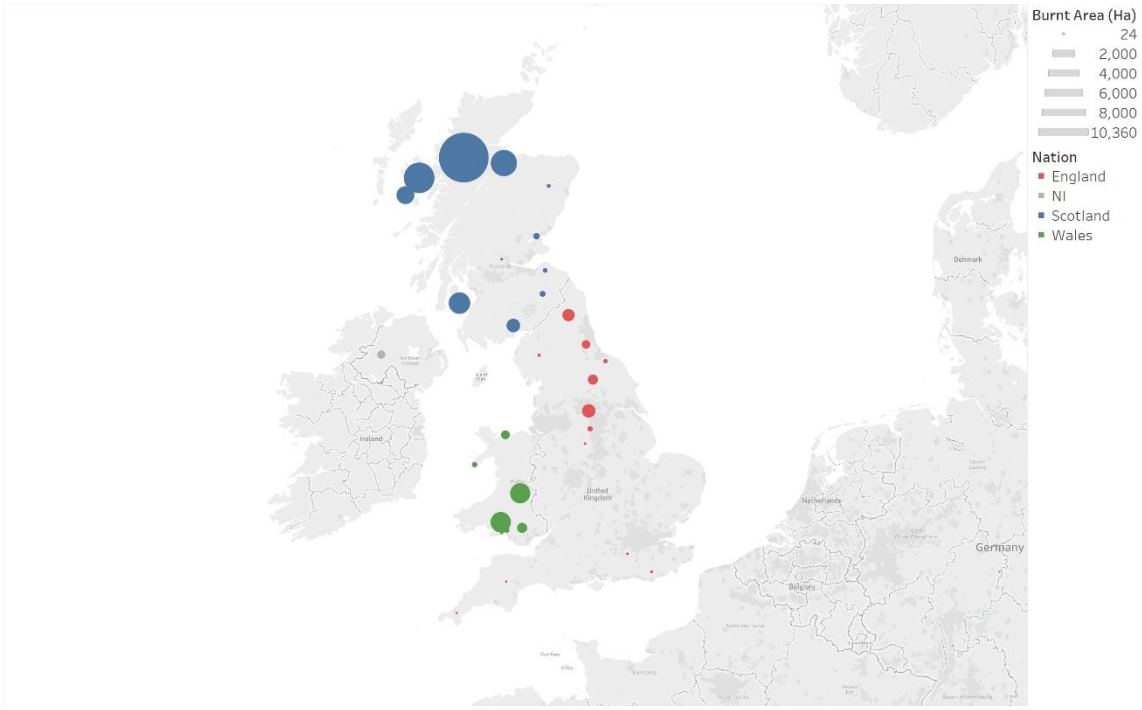


Figure 122. Location of wildfire in the United Kingdom (*Analysis by Dr Thomas Smith of London School of Economics using EFFIS data*).

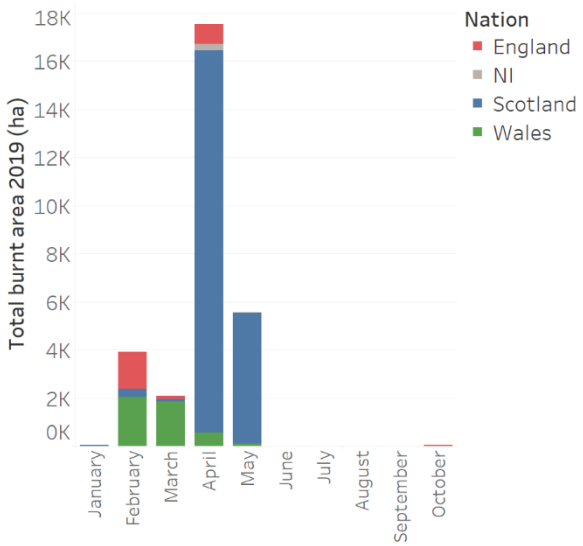


Figure 123. Area burnt by nation in the United Kingdom by month in 2019 (*Analysis by Dr Thomas Smith of LSE using EFFIS data*)

Using the definition of the National Fire Chief Council (NFCC) and National Operations Guidance (NOG) (the criteria are one or more of the following):

- ≥ 1 hectare (10 000 m²)
- ≥ 4 Appliances or vehicles
- ≥ 6 hours duration
- Flame Length of ≥1.5 m
- Serious Risk to Life, Environment, Infrastructure, Property.

England

Approximately 80 incidents met the NFCC/NOG definition. They included large fires in Cornwall (Bodmin Moor) and West Yorkshire (Marsden Moor), as well as several in Somerset (Kinsford Gate and Gupworthy Farm), Cheshire (Lyme Park) and Derbyshire (Tintwistle Low Moor).

Wales

16 incidents met the NFCC/NOG definition, including several large fires in South Wales and Mid and West Wales (Tafarn Y Garreg and Llandewi Brefi).

In May 2019 a wildfire on Kilvey Hill, Swansea which led to the excavation of six homes, requiring 45 firefighters' to control and led to dramatic scenes.

Scotland

There were 150 wildfires meeting the NFCC/NOG definition. These included landscape scale fires such as the Pauls Hill/Morayshire fire (2,800 hectares) and the Forsinard fire in Sutherland (5,500 hectares).

Fire occurrence and affected surfaces

Natural England, the government's advisor for the natural environment in England, had 22 incidents which affected UK Sites of Special Scientific Interest (SSSI). The largest were during April on Bodmin Moor, Cornwall (320 hectares) and Marsden Moor, West Yorkshire (705 hectares). In Northern Ireland six designated sites were impacted by wildfire.

Fire prevention activities and information campaigns

Northern Ireland proactively provided various press releases issued by the NI Environment Agency and NI Fire and Rescue Service during the high-risk period. This will be supported by additional awareness messages via social media accounts.

In partnership, Natural Resources Wales and South Wales Fire and Rescue Service undertook preventative measures to carry out controlled burns in a forest area near Penderyn which had been subjected to repeated deliberate burns. The controlled burns to be carried out to protect a newly restocked area.

The **Scottish Wildfire Forum** issued 11 Wildfire Hazard Assessments in 2019, with most in the late winter-spring; i.e. Feb-May period, with a peak in April.

South Wales Fire and Rescue Service hosted the **UK Wildfire Conference 2019**, at the Cardiff Stadium with the theme '*Manage the fuel, reduce the risk*'. The conference brought together over 200 UK and International delegates across government, research, Fire and Rescue, forestry and land management sectors.

As part of learning lessons from the 2018 wildfire season the Department of Food and Rural Affairs (Defra) funded England and Wales Wildfire Forum workshop to review incidents. This work has fed into policy and strategy development.

The Upland Management Group and Forestry Commission developed risk assessment processes for upland habitats helping inform future policy, regulation, and incentive approaches.

Prevention burning was undertaken on sites in the Dorset's Purbeck Hills, using a partnership of staff from across Forestry Commission, The National Trust, Royal Society for the Protection of Birds and University of Exeter

Operations of mutual assistance

No requests were made to the United Kingdom for mutual assistance for wildfire incidents during 2019.

Climate Change

2019 saw the start of the third Climate Change Risk Assessment (CCRA3) in the United Kingdom. For the first time this will include the specific development of wildfire as cross-sector risk linking to: infrastructure, built and natural environment, business, industry and international themes. Additionally, interdependencies have been mapped out for wildfire linked to existing climate drivers, hazardous events and impacts.

Research activities aimed at improving fire management

One of the key issues that stakeholders in the Scottish Wildfire Forum and England and Wales Wildfire Forum have identified and requested more research on is that of Fire Danger Rating Systems (FDRS).

Following a meeting of the **UK Wildfire Research Group** in early 2018, several members of the group submitted ideas around the issue of developing a UK FDRS to the Natural Environment Research Council (NERC) as part of their Highlight Topic process: https://nerc.ukri.org/research/portfolio/strategic/topics/

The ideas generated amongst the research community were evaluated by NERC, developed further and a select few were chosen as priority topics. In January 2019, the fifth Round of Highlight Topics was announced, which included "*Understanding the likelihood and impact of UK wildfires*". This was a major development for the UK wildfire research community as an opportunity of this size and scope for UK wildfire science had not been supported by NERC before.

NERC awarded a consortium funding for '**Toward a UK fire danger rating system: Understanding fuels, fire behaviour and impacts**'. This project aims to establish and test the scientific underpinning and key components required to build an effective, tailored UK fire danger rating system for use in establishing the likelihood and impact of current and future fire regimes.

This research project brings together expertise from seven Universities and research institutions (University of Manchester, University of Birmingham, University of Exeter, Swansea University, London School of Economics, Portsmouth University, Forest Research) and will run from 2020-2023.

The project is supported by a project steering group, which includes national and international wildfire academic experts and representatives from the wider stakeholder community, including the land management sector, Fire and Rescue Services (FRS), conservation organisations, the Met Office, and wildfire forums.

For more information. please visit the project website: www.ukfdrs.com Twitter: @ukfdrs

Scottish Government are funding research for a **Scottish Fire Danger Rating System**, led by the James Hutton Institute and University of Edinburgh along with project consultants, to establish a robust approach for adapting the Canadian Fire Weather Index (a forest fire danger rating system) to Scottish moorland vegetation types. The project will involve determining the suitability of existing system parameters and subsequent calibration of the Canadian system to Scottish vegetation, climate, land management and geographic conditions.

https://www.hutton.ac.uk/research/projects/scottish-fire-danger-rating-system-sfdrs.

2019 saw the launch of the **Leverhulme Centre for Wildfires, Environment and Society**. A collaboration between four UK universities (Imperial College London, King's College London, University of Reading and Royal Holloway, University of London), it is a ten-year, £10 million activity addressing the many challenges of wildfire, integrating approaches from the social and natural sciences. Its aims are to develop theory and advance prediction capability for wildfire; quantify its impacts on societies and economies; and initiate a process leading to better ways for people, ecosystems and wildfire to coexist. For more information please visit the project website: wildfire@imperial.ac.uk and follow on Twitter: @centrewildfires

UK partners in Pyrolife. This is a large ITN network funded by EU H2020 programme to train a new generation of fire scientists embracing diversity of knowledge, approaches, views and cultures. It started in the Autumn of 2019 and will end in summer of 2023. UK partners in Pyrolife are Nick Kettridge at the University of Birmingham and Guillermo Rein at Imperial College London.

Engagement with NFPA for wildfire research. The fire group of Guillermo Rein at Imperial College London is working with NFPA and Firewise to study the home ignition zone of European WUI homes. Under the EU Pyrolife project, the bulk of the work will be done for typical Mediterranean homes but there is interest in expanding it to UK homes. We are creating links to UK Firewise.

WUI-NITY. The group of Guillermo Rein at Imperial College and Steve Gwynne's Movement Strategies are two UK organizations taking part in WUI-NITY, an international consortium studying the evacuation of people in wildfires. Funders are NIST in USA and RAEng (Safer Complex Systems) in the UK. In the context of the ferocious wildfires in the West Coast, especially in California and Oregon, and when 500 thousand people have been evacuated from their homes, a computational tool that allows for better and faster evacuations is essential. Other partners are the University of Lund (Sweden). MRIT (Australia), NRC (Canada) and NFPA (USA).

HAZE. The group of Guillermo Rein at Imperial College continues the study of peat fires funded by ERC (EU H2020). This grant started in 2016 and will end in 2021. It has studied the ignition, spread... suppression and emission from peat fires in tropical, boreal and Arctic regions. The project studies computer modelling, laboratory experiment and field studies. The objectives are to provide an understanding of peat fires and to enable new technologies for prevention, detection and suppression.

(Source: Forestry Commission, UK).

1.3 Comparison of Southern EU countries with longer time series (1980-2019)

The long time series of forest fire data available for these 5 large southern countries (Portugal, Spain, France, Italy, and Greece) justifies a separate analysis as has been the case in previous reports.

Figure 124a shows the total burnt area per year in the five large Southern Member States since 1980. The statistics vary considerably from one year to the next, which clearly indicates how much the burnt area depends on seasonal meteorological conditions.

The total burnt area in 2019 was 194 710 ha (Figure 124a), almost double the previous year's total, but still the fourth lowest total in the last four decades. Of the five countries, Spain recorded the highest burnt area but France had a worse season compared with past years; only 2017 and 2001 had higher totals in the last 20 years.

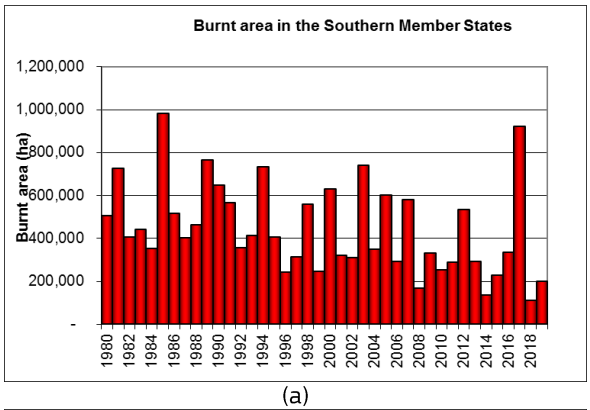
Figure 124b shows the yearly number of fires in the five southern Member States since 1980.

After the increasing trend during the 1990s, which was also partly due to the improvement in recording procedures, the number of fires was stable for around one decade, and in the last decade a decrease was observed. In 2019 the total number of fires was 32 158, slightly above 2018 but continuing the general trend downwards (see Table 42 and Annex 1 for details).

Figure 124c shows the yearly average fire size in the 5 countries since 1980. There is a clear difference in average fire size before and after 1990 (with the exception of the unusual year 2017).

This is a similar trend to that observed in the number of fires and is also partly due to the same reasons (the additional fires that are recorded thanks to the improvements in the statistical systems are the smallest ones). However, it is also largely due to the improvements of the fire protection services of the countries.

In 2019 the average fire size was just over 6 ha, well below long term averages.



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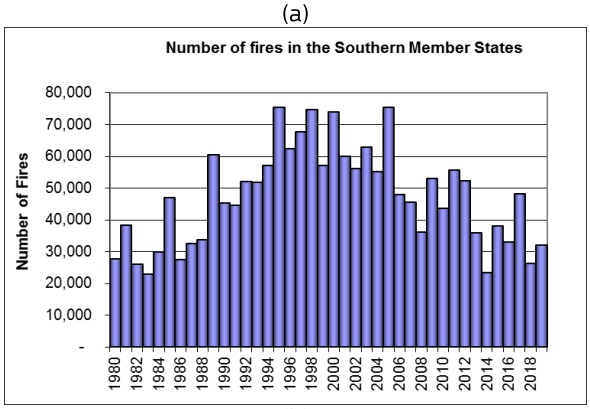

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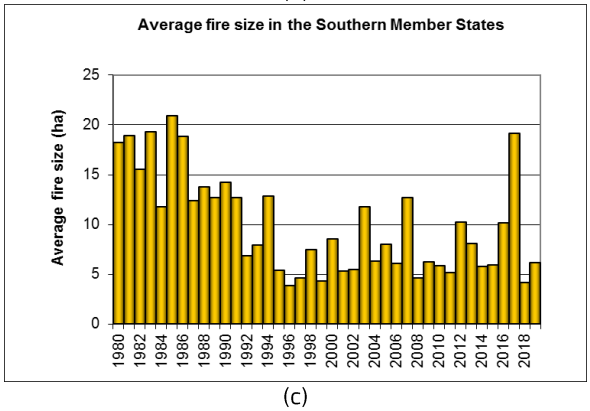


(c)

Figure 124. Burnt area (a) number of fires (b) and average fire size (c) in the five Southern Member States for the last 40 years.

Figure 125 compares the yearly averages of burnt areas, number of fires and average fire size for the periods 1980-89; 1990-1999, 2000-9 and 2010-2019 with the figures for 2019. It shows each of the 5 countries separately and also their total.

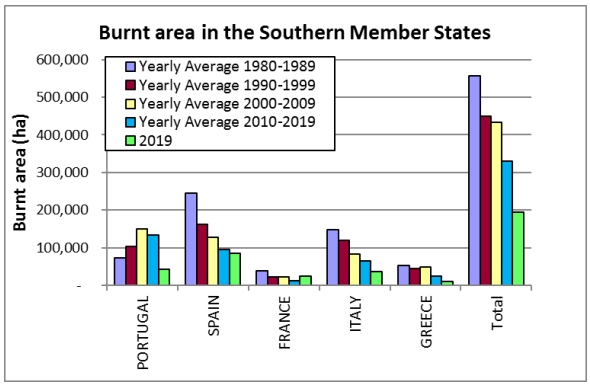
Table 42 gives a summary of the burnt areas and number of fires for the last 40 years, the average for the 1980s, the 1990s and the 2000s, and the average for the last 10 years, together with the figures for 2019 alone.

The total number of fires, burnt area and average fire size were all lower than the averages for the previous four decades. (Figure 125).

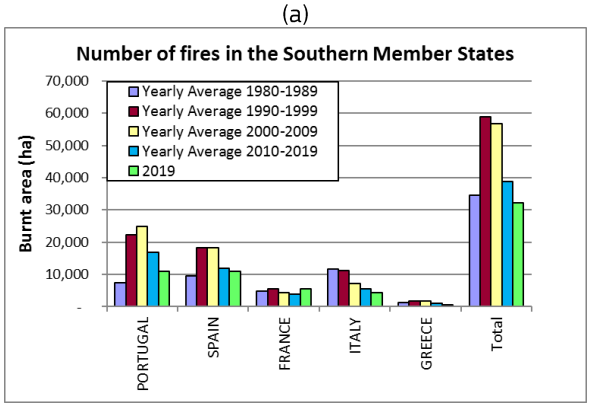
Figure 126 shows the contribution of each of the five Member States in terms of burnt areas and number of fires to the overall figures for all five countries in 2019.

Since the area of each country is different, and the area at risk within each country is also different, the comparisons among countries cannot be absolute. It should also be borne in mind that different ways of recording fires, e.g. through satellite mapping rather than ground measurements, may lead to an under-representation of the smallest fires and result in an inflated figure for average fire size.

In 2019 Spain and Portugal had equal shares in the numbers of fires at 34% each, but Spain was the most affected of the five countries in terms of burnt area.



(a)



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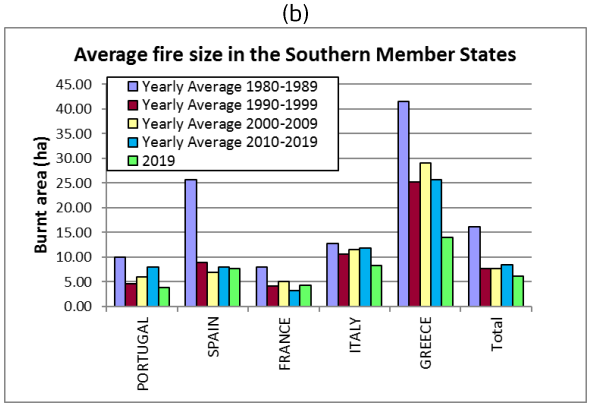
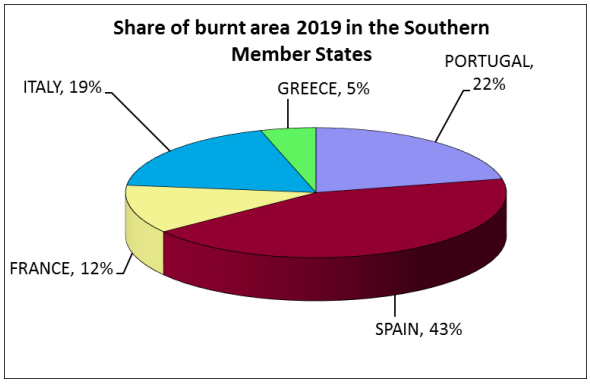
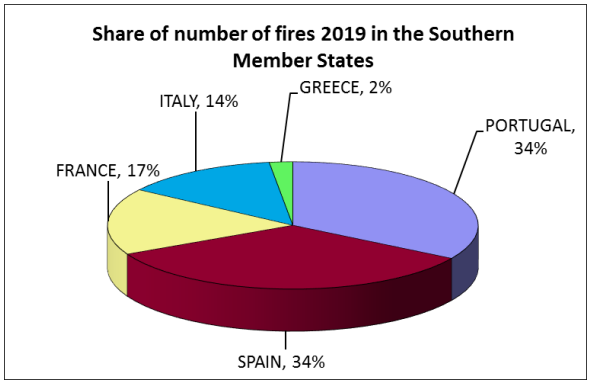


(c)

Figure 125. Burnt areas (a), number of fires (b) and average fire size (c) in the five Southern Member States in the year 2019 as compared with average values for previous decades.



(a)



(b)

Figure 126. Share of the total burnt area (a) and the total number of fires (b) in each of the Southern Member State for 2019.

Table 42. Number of fires and burnt area in the five Southern Member States in the last 40 years.

Number of fires	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE	TOTAL
2019	**10 832**	**10 883**	**5 435**	**4 351**	**657**	**32 158**
% of total in 2019	34%	34%	17%	14%	2%	100%
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2009	24 949	18 369	4 418	7 259	1 695	56 690
Average 2010-2019	16 800	11 860	3 865	5 420	946	38 890
Average 1980-2019	17 845	14 474	4 683	8 854	1 413	47 269
TOTAL (1980-2019)	713 805	578 954	187 305	354 173	56 516	1 890 753

Burnt areas (ha)	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE	TOTAL
2019	**43 084**	**83 963**	**23 477**	**36 034**	**9 153**	**194 710**
% of total in 2019	22%	43%	12%	19%	5%	100%
Average 1980-1989	73 484	244 788	39 157	147 150	52 417	556 995
Average 1990-1999	102 203	161 319	22 735	118 573	44 108	448 938
Average 2000-2009	150 101	127 229	22 362	83 878	49 238	432 809
Average 2010-2019	134 308	94 514	12 475	63 907	24 220	329 424
Average 1980-2019	115 024	156 962	24 182	103 377	42 496	442 041
TOTAL (1980-2019)	4 600 962	6 278 499	967 288	4 135 077	1 699 826	17 681 651

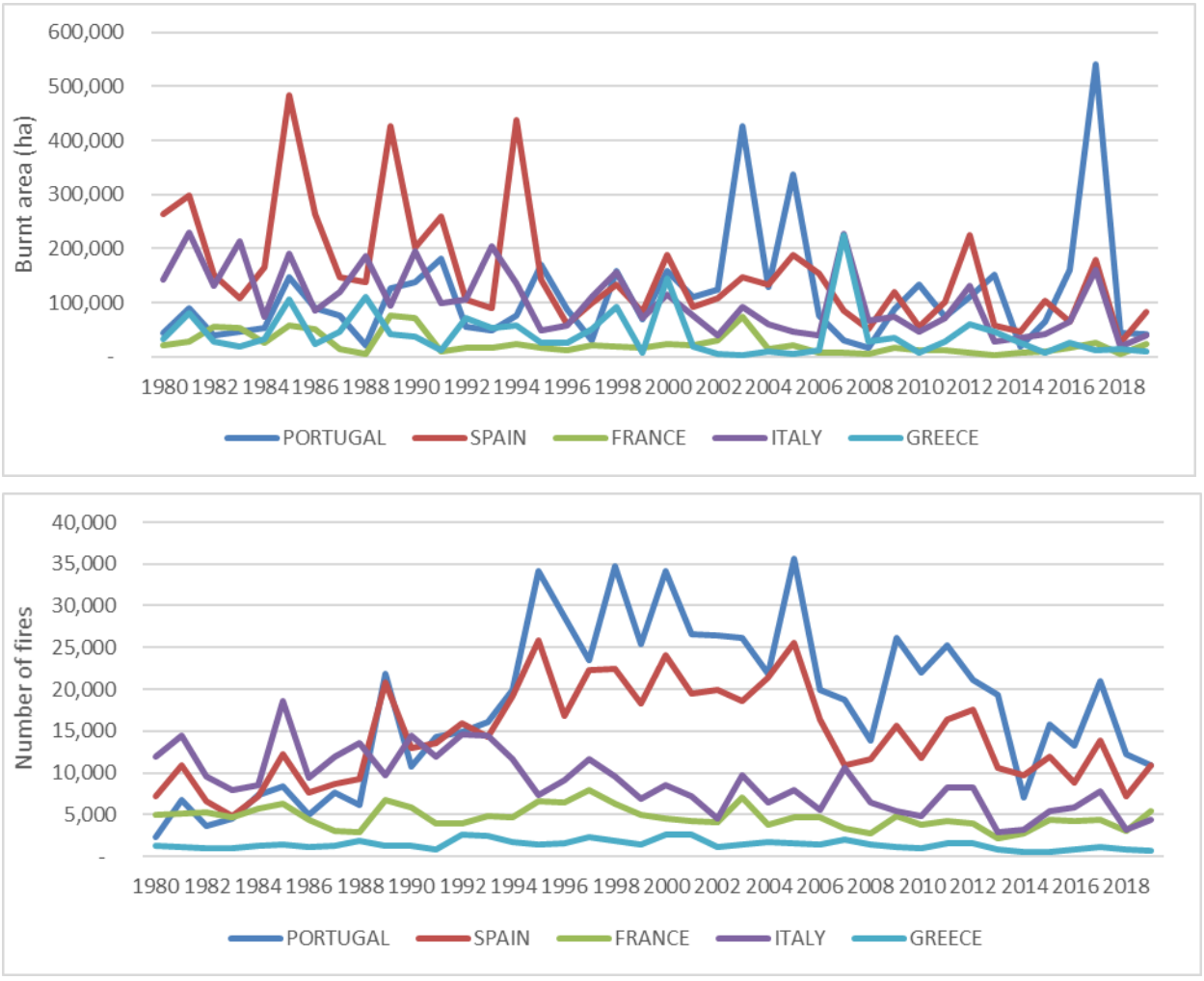
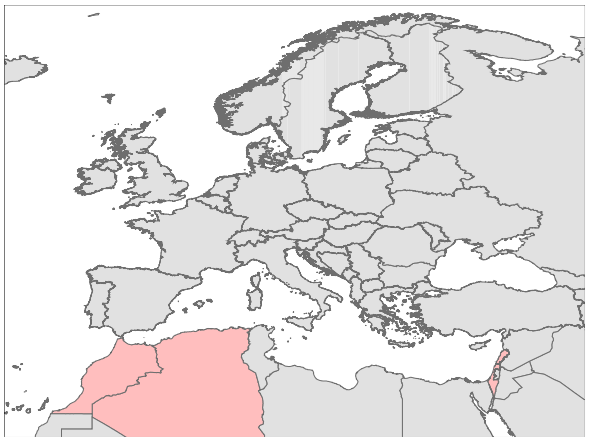


Figure 127. Time series showing the comparative number of fires and burnt area in the 5 large EU-Med countries.

1.4 Middle East and North Africa Countries



1.4.1 Algeria

Introduction

In Algeria, forests, reforestation, scrubland (maquis and garrigue) occupy a total area of around 4 100 000 ha. Nevertheless, each year an average of 36 000 ha of vegetation cover is affected by fire, which remains the major degradation factor of these green spaces.

Indeed, the Algerian forest is directly linked to the Mediterranean climate which characterizes all of northern Algeria; these forests are heterogeneous and unevenly distributed according to the distribution of meso-climates, orography and anthropogenic action.

In addition, these environmental characteristics give the Algerian forest a particular vulnerability and fragility, accentuated by massive exploitation which has lasted for millennia. As a consequence, the forests themselves are quite small, and large areas are replaced by degradation formations, such as maquis, garrigue, scrub and grassland. This degradation of the forest has resulted in a significant imbalance between existing and potential areas.

Fire danger in the 2019 fire season

The summer 2019 season was characterized by relatively high temperatures following the numerous periods of heatwaves from the south of the country. In fact, these so-called "Sirroco" periods characterized by dry and very hot Saharan winds, which lead to a the rapid drying out of the vegetation and a high exposure to the risk of fire, were quite frequent during the summer season 2019, in particular, during the end of July and the beginning of August; consequently the risk of forest fires was at very high levels during these periods.

However, despite these phases of high risk, during the 2019 season the average area burned per fire (forest-maquis-scrub), remained close to the annual average of the last decade (18 000 ha).

Below is a summary diagram (Figure 128) illustrating the average areas burned per fire over the past eight years.

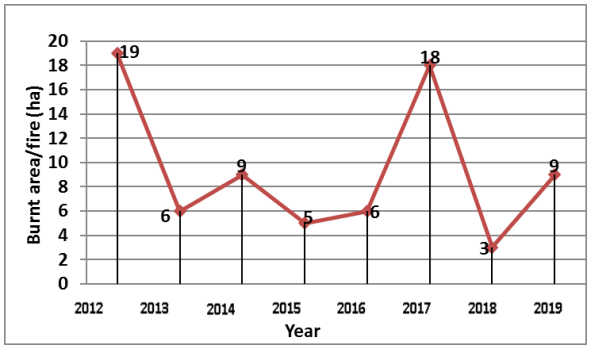


Figure 128. Average burnt area per fire for the last 8 years (ha/fire).

Fire occurrence and affected surfaces

The overall area of forests, maquis and scrub affected by fire during the 2019 campaign is estimated at 21 048 hectares, from a total number of 2 278 fires. In fact, the overall area burned in 2019 has increased significantly compared to that of the previous year (2018).

The distribution of the overall area burned, by type of vegetation (Figure 129), shows that scrubland was most affected by fire; in fact, almost half of the total burnt area was made up of brushwood. The other half of the total burnt area is made up of forests and maquis.

The monthly distribution of the burnt areas shows that the month of August is the period which experienced the most damage in terms of the total area burned. This is mainly due to the large number of heatwaves recorded during this month. The month of July also saw significant damage, followed respectively by the June, September and October with smaller areas burned.

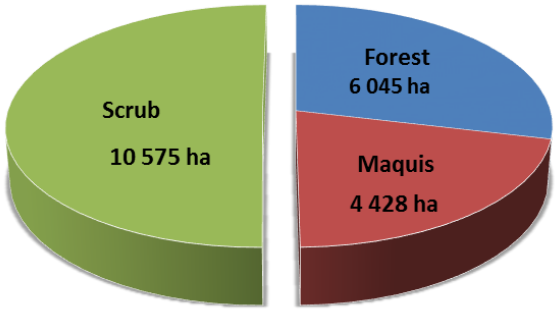


Figure 129. Burnt area in 2019 classified by vegetation type.

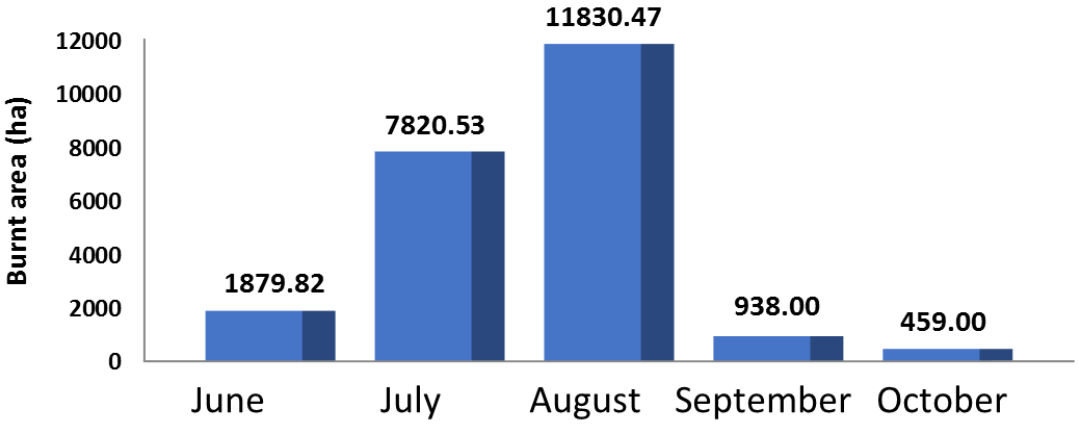


Figure 130. Burnt areas and number of fires during the five months of the fire season in 2019.

Forest fire prevention in 2019

The 2019 forest firefighting campaign saw massive preparation by the various sectors concerned. In particular, in terms of preventive work, raising citizens' awareness and setting up organizational systems to deal with forest fires. Below, a list of the main actions carried out:

1. Awareness actions:

- Organization of awareness tours ('proximity meetings') for farmers and the rural population on the risk of fires in forests and harvests.
- Organization of exhibitions and open days, in particular for schoolchildren, in order to instil in them the culture of prevention.
- Dissemination of leaflets and brochures containing preventive fire safety instructions against fire risk.
- Sensitization of the general public on the risks related to forest fires, through news flashes and radio broadcasts.

2. Preventive actions:

- Maintenance of fire protection trenches in the forests.
- Maintenance of road verges, railways and areas under high tension lines crossing forests.
- Maintenance of forest tracks.
- Construction of new water points in the forests.

3. Organizational Actions:

- Update of forest fire plans for the 40 wilayas affected by the risk of forest fire.
- Strengthening civil protection intervention units located near forest areas with human and material resources.

4. Intersectoral Coordination Actions:

- Organization of 'forest fire fighting' simulation exercises in coordination with the sectors concerned.
- Establishment, by the national meteorological office, of a new forest fire risk index, launched on an experimental basis for the benefit of sectors concerned with prevention and control.
- Establishment of operational committees responsible for coordinating control operations at national, Wilaya, Daira and Commune levels.
- Installation of community committees composed of farmers and citizens, who play an important role in prevention and first intervention in isolated and remote localities.

Monitor, alert, and response reinforcement

The system put in place to ensure surveillance, alert and first intervention in the forest areas was provided by the forest services. However, massive interventions on forest fires were carried out by the civil protection intervention units.

The civil protection has also implemented a reinforcement system, made up of 37 mobile forest fire columns, judiciously located at the level of the wilayas, to provide support as soon as possible to the intervention units. Ten other small mobile columns belonging to the forest conservation services were also put into service to cover the maximum forest area.

Local measures were also mobilized by civil protection in certain critical areas, in particular, close to large plots to be harvested during the threshing-harvest season and inside sensitive forests that are heavily frequented by citizens for recreation.

Below is a representative diagram of the overall national system (Figure 131), deployed by the different sectors concerned to support the campaign against forest fires for the year 2019.

Loss of human life

During the fire season of 2019, no deaths were recorded among citizens or firefighters. Only a few cases of minor injuries were reported during the interventions.

Mutual assistance operations between states

Algeria did not request any international assistance in the fight against forest fires of the 2019 season, and the intervention means of the Directorate General of Civil Protection did not participate in any intervention operation outside Algerian territory.

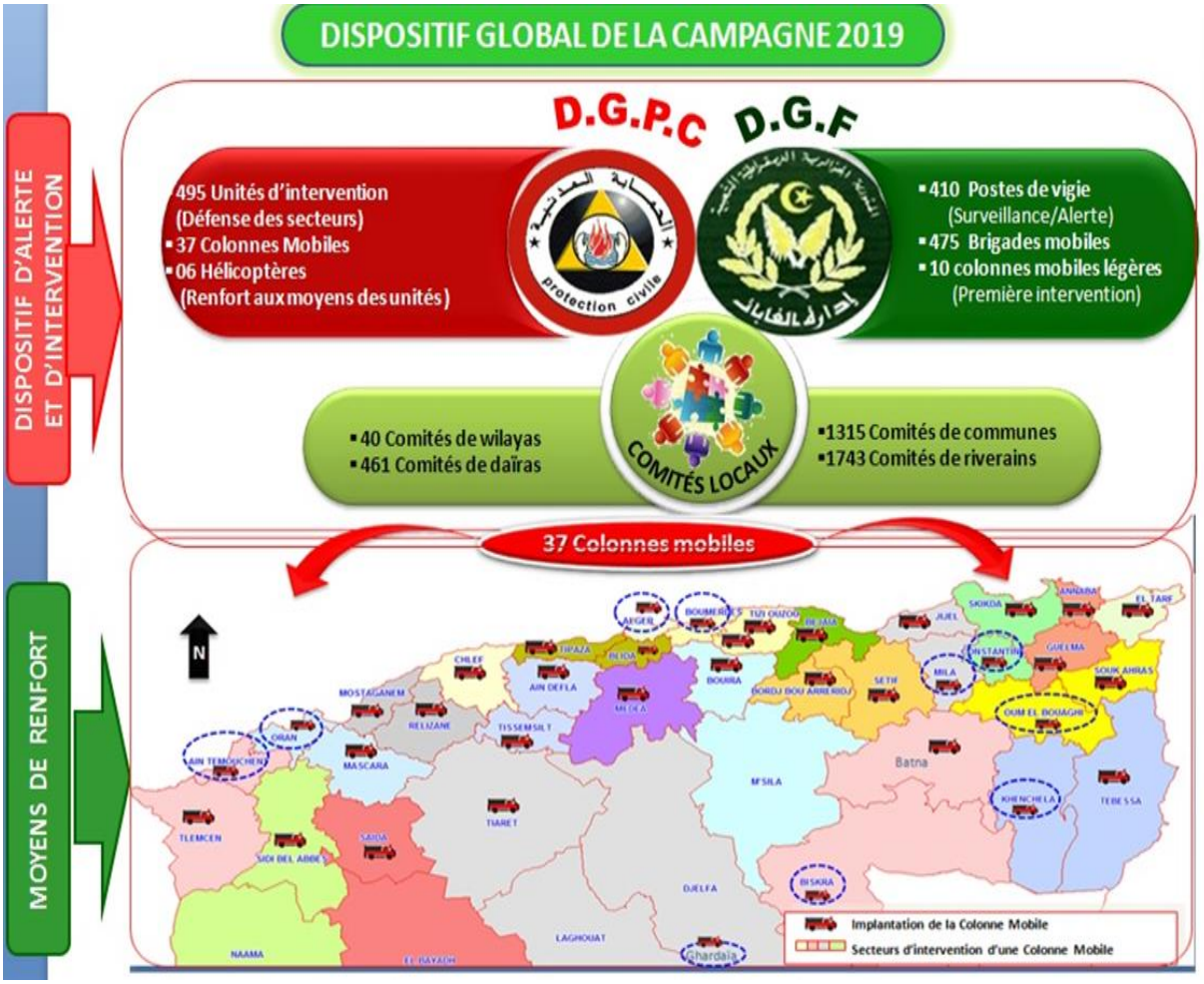


Figure 131. Resources used in the 2019 season in Algeria.

(Source: Direction Générale de la Protection Civile; Direction Générale des Forêts, Algeria).

1.4.2 Israel

Israel forest fire season 2019 campaign

The challenge of forest and bush fires in Israel during the 2019 fire season, focused on the months of May and November.

During these months, Israel experienced extreme weather conditions, with the combined effect of heatwaves and strong easterly winds, which affected the intensity of forest fires (Figure 132).

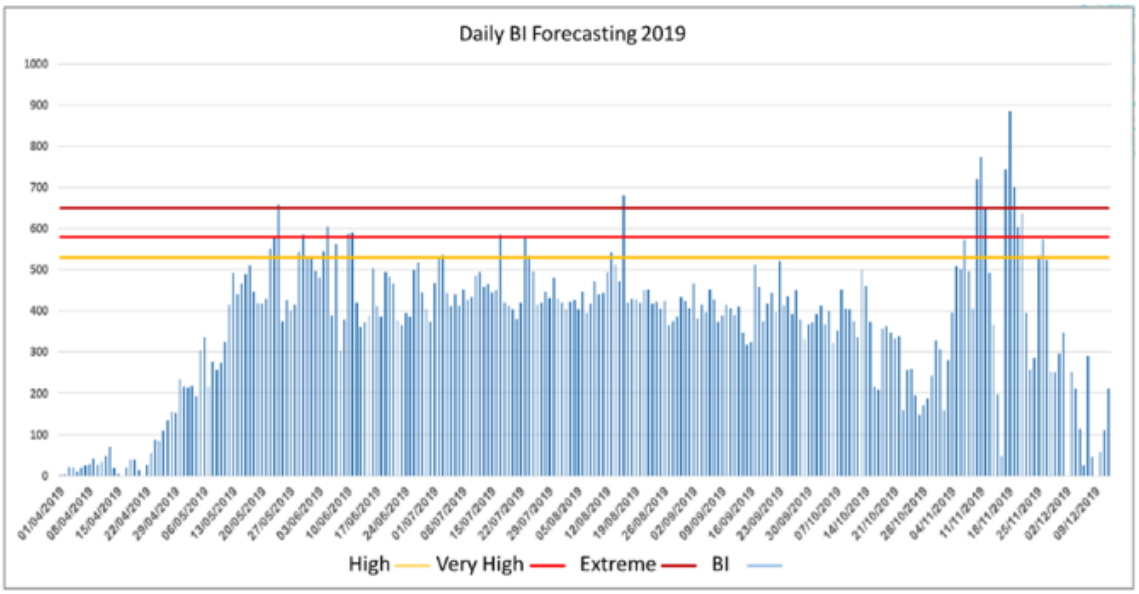


Figure 132. Daily forest fire forecasting 2019 (*Source: Mr. Yiftah Ziv, Israel Meteorological Service*).

Fire occurrence and affected surfaces

The number of forest fires remained unchanged from the previous year. However, the amount of area burned increased by 60% due to the intensity of the fires (Figure 133, Figure 134).

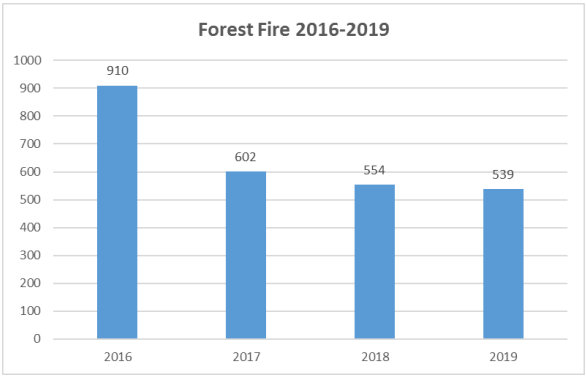


Figure 133. Number of fires in Israel 2016-2019.

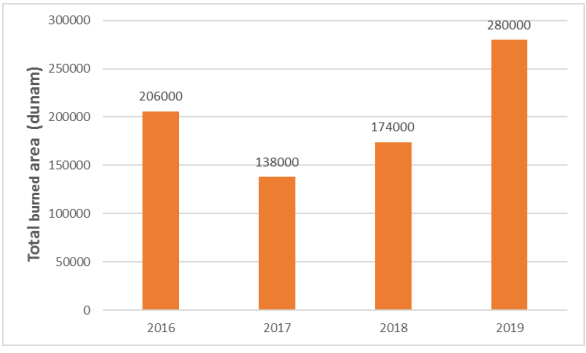


Figure 134. Burnt area in Israel 2016-2019.

Operations of mutual assistance

Several major fires that occurred in May, caused a lot of damage. Dozens of houses burned down.

To extinguish the fires, Israel received international assistance from Greece, Croatia, Italy, Cyprus and Egypt. The main damage was suffered by the villages of Mevo Modiin (Figure 135) and Kibbutz Harel,

Injuries and loss of human life

There were no casualties or deaths among civilians or firefighters in 2019, as a result of forest and bush fires.

Figure 135. Mevo Modien after the fire 23.05.2019.

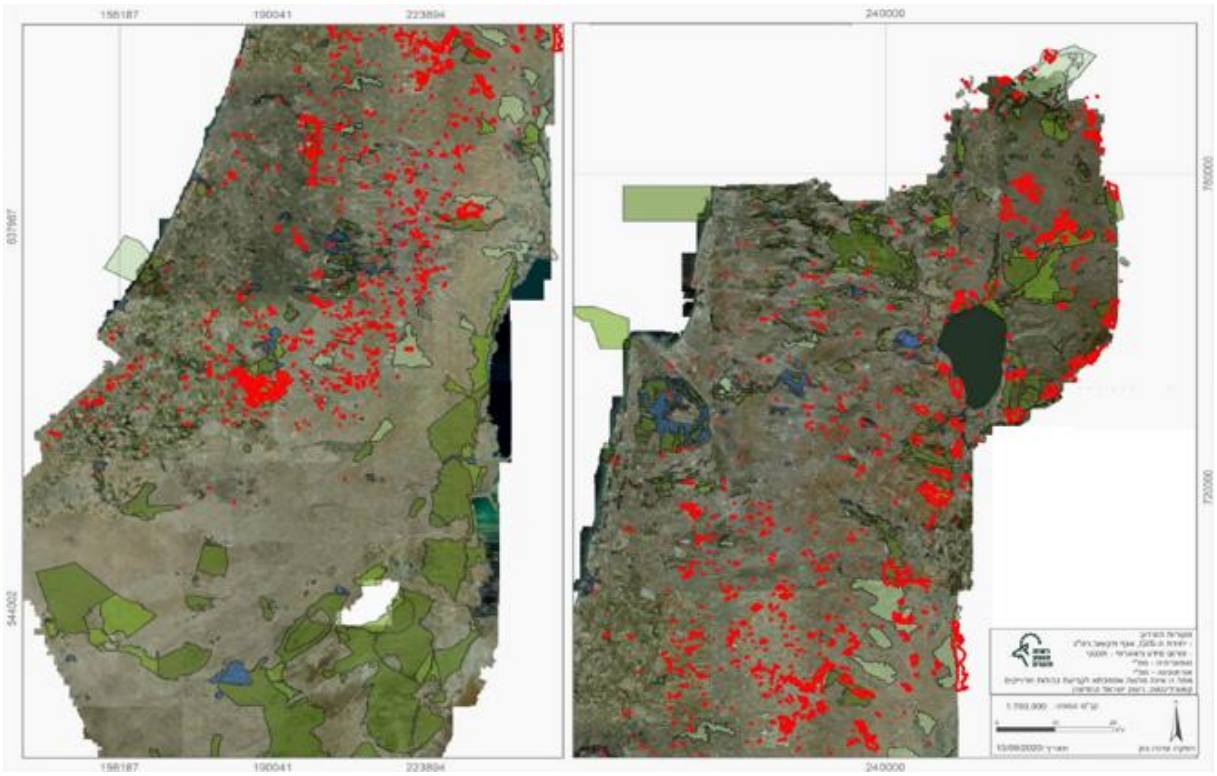


Figure 136.. Mapping of fire sites (Nature and Parks Authority)

(Source: Fire and Rescue Commission, Ministry of Public Security, Israel).

1.4.3 Lebanon

Lebanon's annual forest fire reports are completed within the framework of a collaborative work between the Ministry of Environment (MOE) and the Land and Natural Resources Program, Institute of the Environment, University of Balamand (LNR-IOE-UOB). The presented information is mostly based on the 2019 fire report (MOE/UOB, 2020) from which reported fires were based on field inspections only. Many other fires may have not been initially visited in the field, therefore remaining un-reported. In addition, Mitri *et al*. (2020) conducted a post-fire impact assessment of the 2019 fires in Lebanon using satellite images and field surveys. The main results of this assessment are presented accordingly.

Fire danger in 2019

In 2019, Lebanon experienced a series of disastrous wildfires. The most damaging fires broke out on Sunday 13 October and quickly spread over large forested areas particularly in the Chouf region and other areas to the south of Beirut. In addition, the fires severely damaged residential areas in which four houses were completely burned. A large number of residents were ordered to evacuate their homes at night. Smoke plumes caused by the fires reached the suburbs of the capital Beirut and the coastal city of Saida.

A row of burned-out cars destroyed by forest fires in Damour (south of Beirut).
Credit: Wael Hamzeh/EPA, via Shutterstock).

Fire season Overview

The calculated start date of the fire danger season for 2019 was the 23rd of May, and the calculated end date was November 15. The peak month (i.e., in number of fires) was July. A total of 194 fires were reported, affecting a total area of 3 155 ha (Figure 137).

The following graphs show the occurrence of fires in relationship to monthly precipitation and mean monthly temperature (Figure 138, Figure 139).

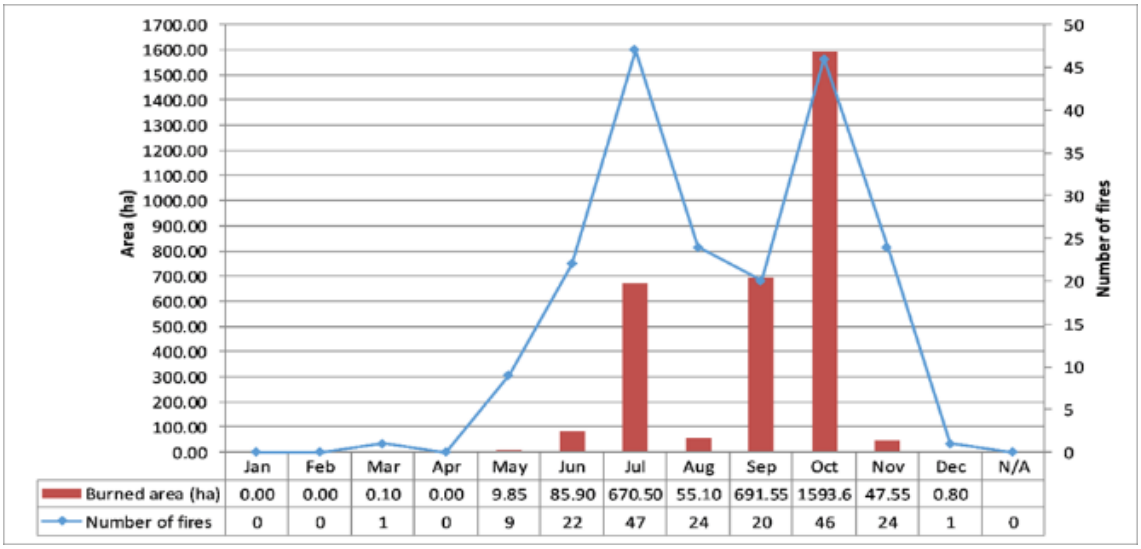


Figure 137. Monthly distribution of fire occurrence and fire affected areas in 2019 (source: MOE/UOB, 2020).

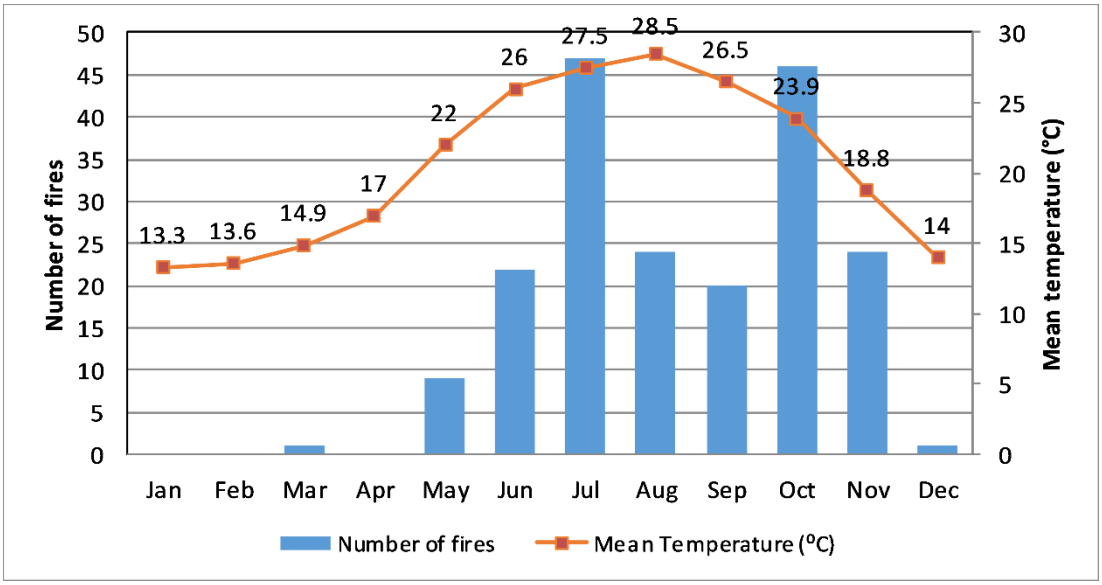


Figure 138. Number of fires in relation to mean temperature.

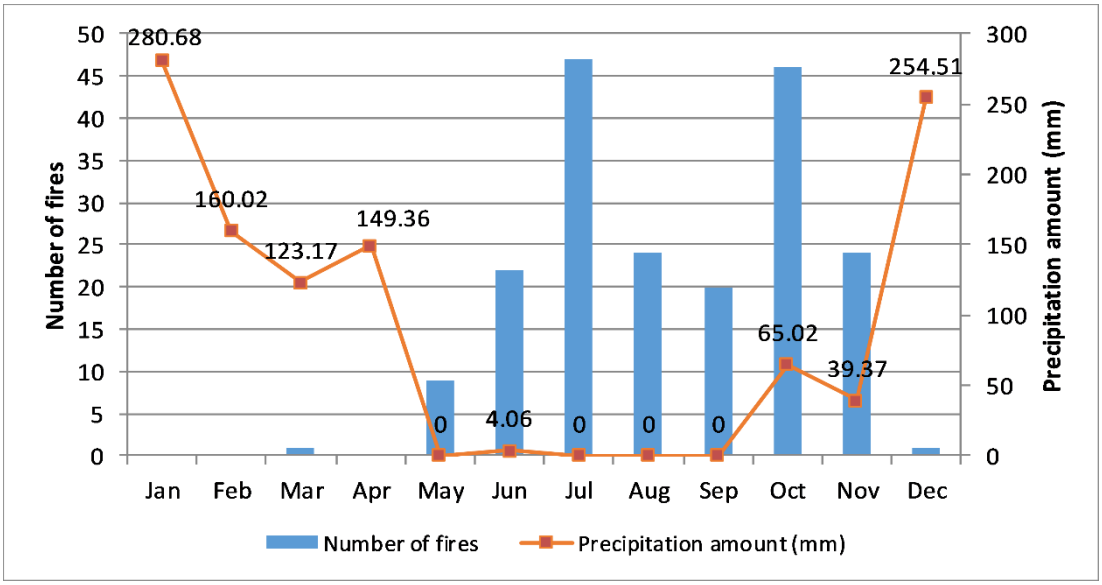


Figure 139. Number of fires in relation to precipitation.

Observation data are reported by the weather station 401030 (OLBA) – Latitude: 34.45 and Longitude: 35.8 at an altitude of 5 m above sea level. . These observations are presented for display purposes only and not for use in correlation analysis. en.tutiempo.net/climate/ws-401030.html

Land use type

The main land cover/land use of fire affected areas (Figure 140) included agricultural land (66.61%), forest/woodlot (22.06%), and grassland (6.52%), among others.

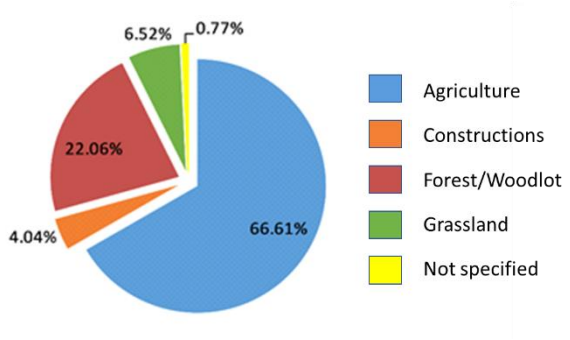


Figure 140. Land-use of fire affected areas (source: MOE/UOB, 2020).

Affected fuel type

A total of 74.71% of affected fuel types (Figure 141) was mixed agriculture-forests, followed by mixed forests (15.31%) and broadleaved forest (4.66%)

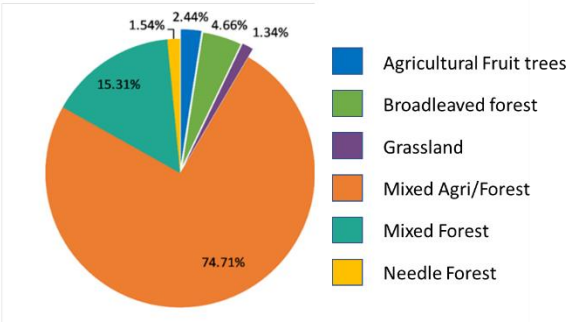


Figure 141. Distribution of fuel type affected by fires (source: MOE/UOB, 2020).

Causes of fire

Arson was reported as the main cause of fires for 63 % of the reported fire events. Furthermore, 9 % of causes attributed to activities in nature, 5 % of causes were due to landfills, while 19 % of fires had unknown causes (Figure 142).

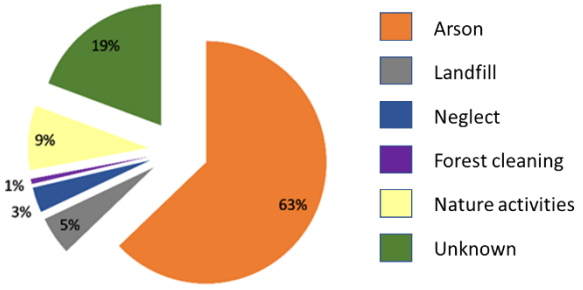


Figure 142. Distribution of main fire causes (source: MOE/UOB, 2020).

Intervention time

It was observed that 53% of first interventions in fire suppressions occurred within the first 20 minutes after the reporting time, while 22% of interventions happened after 20 minutes and before 1 hour from the reporting time (Figure 143).

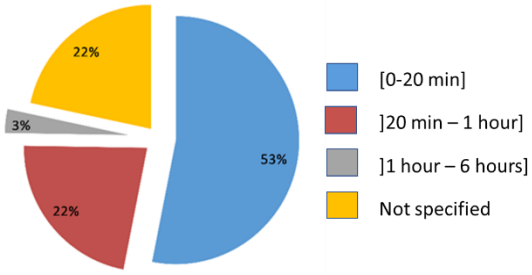


Figure 143. Times for intervention after reporting fires (source: MOE/UOB, 2020)

Fire duration

The largest number of fires lasted between 1 and 2 hours (48%). A total of 26% of fires lasted between 2 and 5 hours, and 12% of fires lasted between 5 and 12 hours. It was also observed that 5% of fires lasted between 12 and 24 hours. Only 2% of fires lasted more than 24 hours, therefore affecting relatively large vegetated lands (Figure 144).

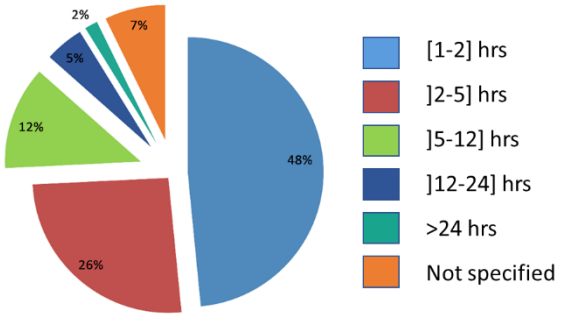


Figure 144. Fire duration (source: MOE/UOB, 2020).

Resources employed in fire suppression

The following human and technical resources were involved in fire suppression of reported fires (Table 43):

Table 43. Human and technical resources involved in fire control throughout 2019 (source: MOE/UOB, 2020).

	Number				Lebanese Army helicopters used
	Small Cars	Water Tanks	Other Cars	Human Resources	
Civil Defense	122	357	18	729	18
Army	46	6	13	471	
Internal Security	108	4	10	359	
Ministry of Agriculture	3	2	0	24	
NGO	27	22	5	145	
Local Resident	0	0	0	651	
Total	**306**	**391**	**46**	**2379**	

Injuries and losses of human lives

One civilian reportedly died in the Chouf area while volunteering to extinguish a fire. A total of 50 civilians and 5 firefighters were affected by non-fatal injuries.

Operations of mutual assistance

Lebanon requested assistance from the EU Civil Protection Mechanism (EUCPM) on October 15. A total of 6 firefighting planes have been offered and accepted by the Lebanese authorities. These included 2 Canadairs CL-415 (rescEU) from Greece, 2 Canadairs CL-415 (rescEU) from Italy, and 2 planes from Cyprus (initially mobilized on a bilateral basis). One Emergency Response Coordination Centre (ERCC) Liaison Officer has been deployed to support the Lebanese national authorities and facilitate the operations of the EUCPM aerial assets. In addition, Jordan and Turkey offered to support Lebanon's firefighting efforts.

Climate change

It has been noticeable that Lebanon has been increasingly affected by extreme weather events. Associated impacts are revealed by an increase in forest fire incidents and pest and disease outbreaks (AFDC, 2019). The occurrence and spread of the October large fires were driven by a heatwave with both maximum and minimum temperature exceeding historical averages for October (Figure 8).

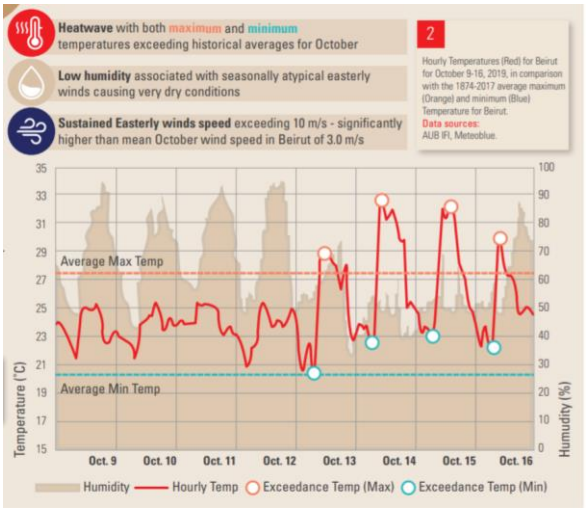


Figure 145. Beirut mid-October temperature and humidity plot. *(Source: IFI-AUB, 2019)*

Implementing plans and strategies on climate change and its effect on forests and forest fires is limited in Lebanon mainly due to lack of sufficient financial resources (AFDC, 2019). In addition, controlled trials on climate adaptation measures and climate mitigation policies to assess their effectiveness are not well developed or implemented.

However, Lebanon became a member of the NDC Partnership on March 25, 2019. Lebanon submitted its National Determined Contribution (NDC) under the United Nations Framework Convention on Climate Change (UNFCCC) in September 2015, which "strives to both build resilience and improve adaptation as the country lowers its emissions, taking advantage of the synergies between adaptation and mitigation". It also highlights the emerging challenges that Lebanon is facing as the country addresses climate change and sustainable development. In this context, Lebanon has been working with the NDC Partnership Support Unit on defining its approach of engagement with the Partnership and identifying its support needs for NDC implementation. Accordingly, the Government organized a kick-off workshop on Wednesday 31 July 2019 in Beirut, engaging government stakeholders and partners.

Research activities aimed at improving fire management

Firelab (Mitri *et al.*, 2017; Mitri *et al.*, 2014), a web-based application for fire danger forecast system in Lebanon, was further improved in 2019. This includes the production of daily forecasts all over Lebanon using the national fire risk map in combination with a Fire Weather Index (FWI) as communicated by EFFIS. Currently, the Firelab system produce daily fire danger forecasts combining Lebanon's fire risk map with the FWI as computed from the ECMWF model (8 km), which provides 1 to 9 day forecasts, and from the MeteoFrance model (10 km), which provides up to 3 day forecasts.

Mitri *et al.*, (2020) assessed the impact of 2019 fires at the landscape level and provided recommendations for post-fire management. More specifically, the specific objectives of work included among others 1) mapping of all areas burned in 2019 using satellite images (Figure 9); 2) mapping vegetation fire severity; and 3) developing restoration and rehabilitation plans for large fires. The methodology of work comprised the combined use of satellite data and field data (i.e., the composite burn index) for assessing fire severity. In addition, a model for mapping post-fire degradation risk was developed using a Geographic Information System (GIS). The minimum number of identified fires was 117 and the minimum extent of delineated burned areas was 2 679 ha (Figure 146).

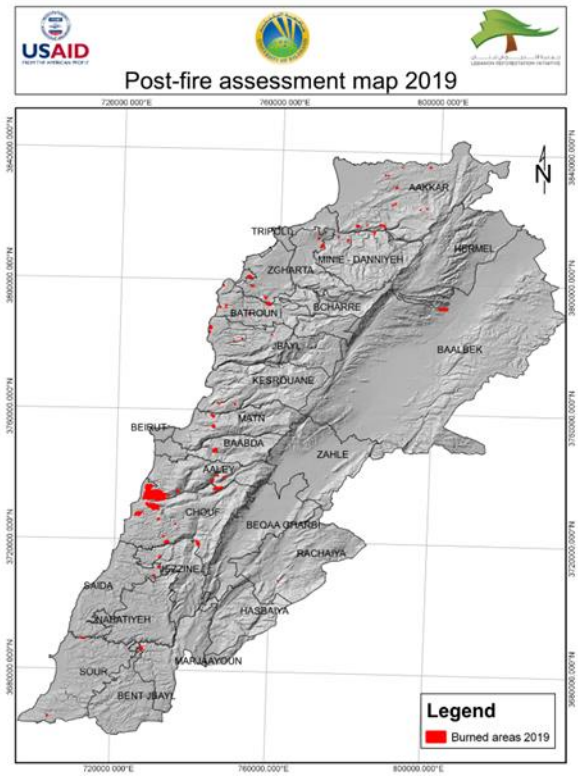


Figure 146. Burned areas map of the 2019 fires*

*Map produced in January 2020 by the Land and Natural Resources Program at the Institute of Environment at the University of Balamand (LNR-IOE-UOB) under the "Livelihoods in Forestry" (LIF) project funded by the United States Agency for International Development (USAID) and implemented by the Lebanon Reforestation Initiative (LRI). Projection: UTM WGS 84 – Zone 36 North.

References:

AFDC, 2019. State of Lebanon's Forests 2018 (Mitri, G., Ed). Association for Forests, Development and Conservation /Ministry of Agriculture/Ministry of Environment//United Nations Development Programme/International Union for Conservation of Nature/Lebanon Reforestation Initiative, Beirut.

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Mitri, G., Jazi, M., Antoun, E., McWethy, D., Kahaleh, R., and Nader, M. (2014. The development of a web-based application for improved wildfire risk management in Lebanon. In "Advances in forest fire research" (D. X. Viegas, ed.), pp. 1276-1280. Imprensa da Universidade de Coimbra, Portugal.

Mitri, G., Saba, S., Nader, M., and McWethy, D. (2017). Developing Lebanon's fire danger forecast. International Journal of Disaster Risk Reduction 24, 332-339.

MOE/UOB, 2020. State of Lebanon's wildfires in 2019. Beirut, Lebanon.

(Source: Land and Natural Resources Program, Institute of the Environment, University of Balamand, Lebanon).

1.4.4 Morocco

Background

In over 9 million hectares of forest domain representing more than 20% of the national area, forest formations in Morocco cover an area of 5 814 000 ha (broadleaves, conifers…) and 3 318 260 ha of *stipa tenacissima* (Figure 147), and are distributed among the different bioclimatic zones, from semi-arid to humid.

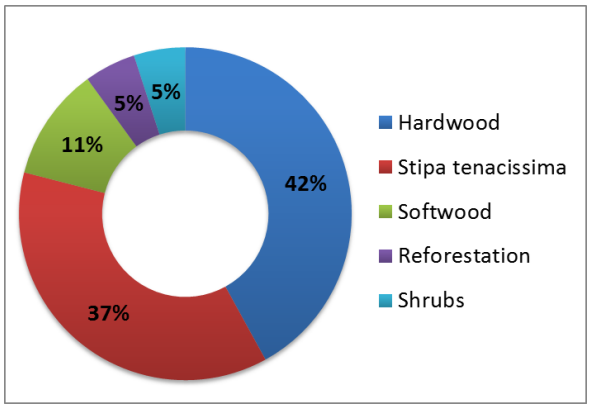


Figure 147. Composition of forest land in Morocco

As in Mediterranean countries, forested areas in Morocco are subject to a recurrent risk of fires that is favoured by the extreme flammability of forest species during the summer. The consequences of this risk are prejudicial in terms of social, economic and environmental components. Indeed, the forest land is an open space where access (except rare situations) is free. Riparian forest populations live in a subsistence economy (using forests for their needs of construction wood and firewood, various non-timber forest products, and pasture). Consequently, forests are under a very strong human pressure.

Through the analysis of annual reports of forest fires during the years 1960 to 2019, an average of 299 fires per year is calculated for an annual average area affected of 3 009 ha (HCEFLCD, 2020).

Although limited compared to the average area burned in other countries with similar conditions, especially the Mediterranean, this area is important in view of the major roles played by forests and the difficulties of their reconstruction and regeneration with regard to the national socio economic and environmental context.

To face the recurring and imponderable phenomenon of fire, a National Plan of Prevention and Fight against forest fires (in French: *Plan Directeur de Prévention et de Lutte Contre les Incendies "PDCI"*) was adopted with the participation of all institutional partners concerned by this issue: Ministry of the Interior (MI), High Commission of Forests, Water and combating Desertification (HCEFLCD), Ministry of Equipment and Transport (MET), Royal Gendarmerie (GR), Civil Protection (PC), Agency for Economic and Social Development for Northern Provinces and Prefectures (ADPN) and the Administration of Land Conservation, Cadastre and Mapping (ACFCC). The plan focuses on the actions of equipment and forest management for fire prevention, risk prediction, monitoring and warning and also on the coordinated operations to fight against forest fires.

Despite the efforts made at different levels by all institutions involved in forest fire management in Morocco, the system calls for continuous improvements, not only in terms of prevention and prediction, but also in terms of operational and organizational interventions.

Fire occurrence and affected surfaces

From 1960 to 2019

Through the analysis of the available data on forest fires in Morocco during the period 1960 to 2019, a total of 16 402 outbreaks of fire (Figure 149) and a total area damaged (but not lost) of 172 290 ha are reported, giving an average of 299 fires per year for an annual average area of 3 009 ha affected, with maxima of 11 000 ha in 1983 and 8 660 ha in 2004 (Figure 149). The absolute minimum is recorded in 2002 with 593 ha.

It should also be noted that, globally and since 1960, the trend of fire numbers and area affected by forest fires has never stopped increasing; but the shapes of the increases are not similar. Indeed, the increase in fire number has been continuous from an average of 410 between 2000-2009, to 474 forest fires in the last decade (2010-2019).

The period from 1960 to 1974, represents the portion where fire number and area burned are at the lowest levels (154 fires and 2 073 ha) compared to the averages for the period covering 1975 to 2014 (331 fires and 3 442 ha).

We note that the area affected per fire, which reached a value of 5-9 ha during the period 2010-2019, has decreased by 50% compared to the national average recorded since 1960, which is 12 ha per fire (Figure 150 below).

2019 fire season

During 2019, a total of 529 fires was recorded, affecting an area of 3 232 ha, an average of 6.11 ha per fire.

Both the number of fires and the total burnt area have increased in comparison to the average for the last decade, by 12% and 10% respectively (Figure 148).

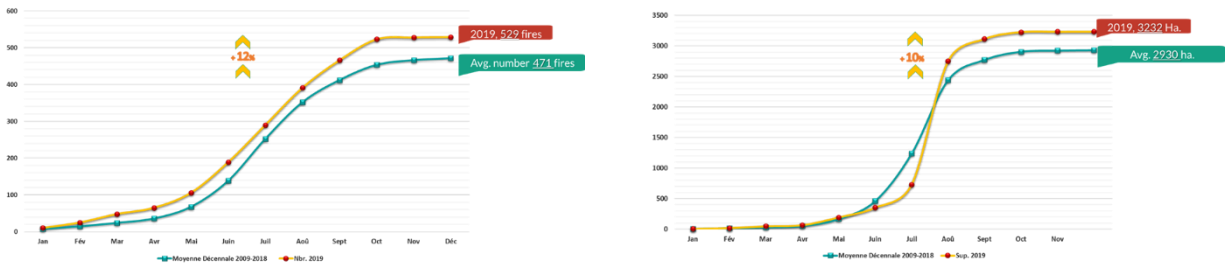


Figure 148. Evolution of number of fires (left) and burned area (right) in 2019 compared to the last decade.

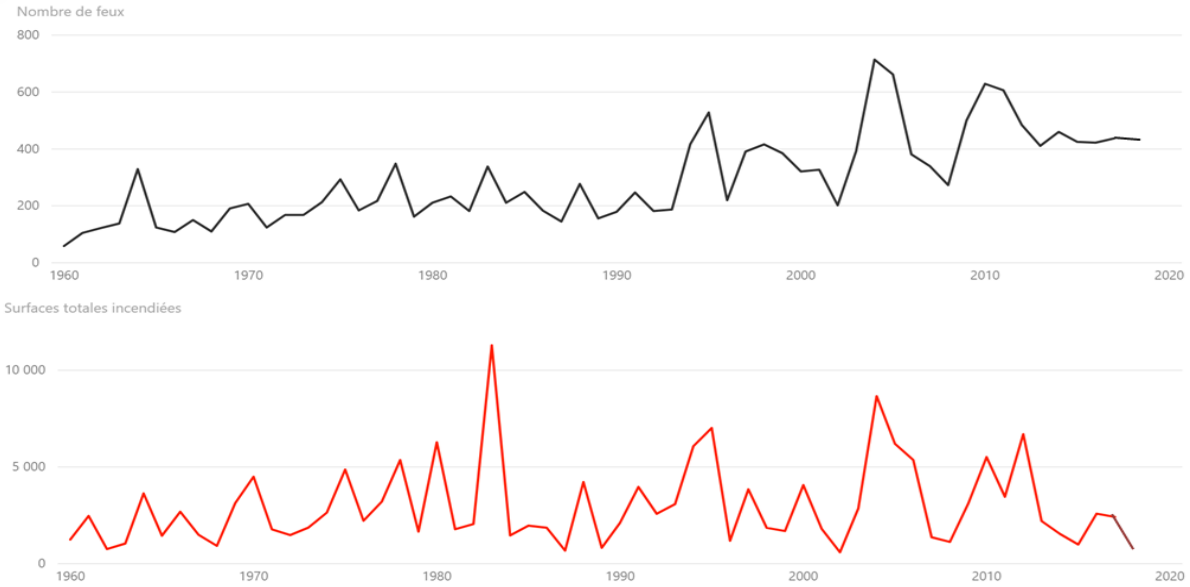


Figure 149. Evolution of forest fire number (top) and area (bottom) from 1960 to 2019 (HCEFLCD, 2019)

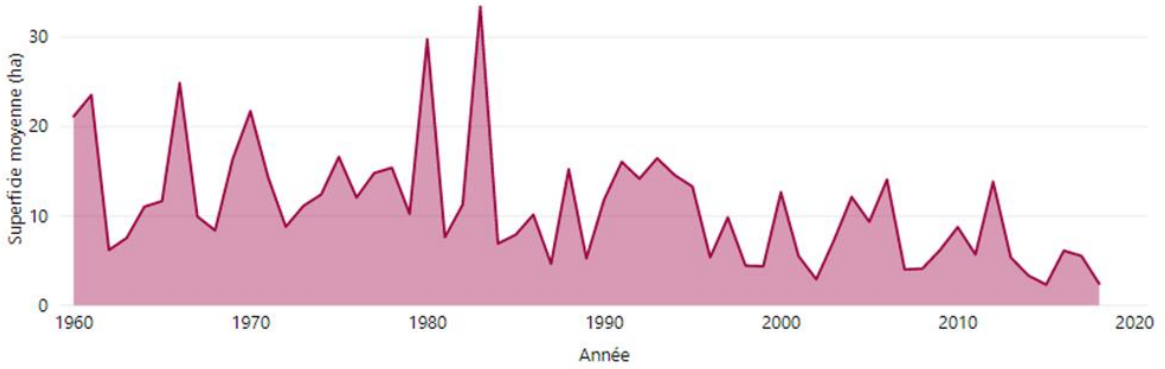


Figure 150. Evolution of area affected per fire from 1960-2019.

The distribution of fires recorded in 2019 (Table 44), based on the type of vegetation affected, is as follows:

- For wooded land, an area of 1 387 ha (35% of the total area burned) was affected by 108 fires (20% of the total number of fires);
- The shrub and herbaceous covers were affected by 122 fires that covered an area of 1 531 ha, equivalent to 23% respectively of the total number of reported fires and 47% of the total area burned.
- For wooded stands, Pines are in first place with an area of 786 ha affected, equivalent to 24% of the total area burned in this category, followed by Thuja trees with an area of 278 ha affected (9%).

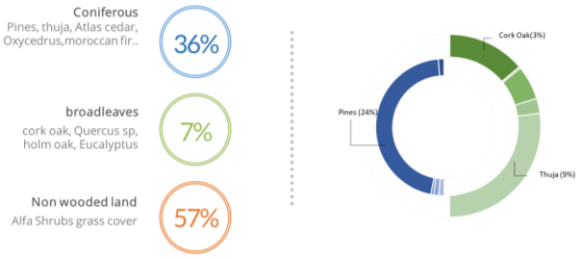


Figure 151. Distribution of fires, based on the type of vegetation affected in 2019.

Table 44. Distribution of fires, based on the type of vegetation affected in 2019.

Category		Species	Burnt Area (ha)	% Area	Number of fires	% Number	Total cover (ha)	% cover burnt
Wooded	broadleaves	cork oak	103.66	3.21	29	5.48	295855	0.035
		Eucalyptus	64.92	2.01	17	3.21	1330898	0.005
		holm oak	58.33	1.80	36	6.81	19223	0.303
		Other hardwoods (Carob, Arbutus, Oleaster)	2.50	0.08	6	1.13	1235624	0.000
		Other oaks (Zeen, Tauzin, Kermes)	1.40	0.04	1	0.19	1110641	0.000
		Acacia	0.18	0.01	1	0.19	N/A	N/A
		Argan	0.01	0.00	1	0.19	91510	0.000
	Broadleaves Total		***231.01***	***7.15***	***91***	***17.20***	***4083751***	***0.006***
	Coniferous	Pines (Aleppo, Maritime, Pignon)	786.81	24.34	61	11.53	110490	0.712
		Thuja	278.30	8.61	20	3.78	12991	0.214
		Juniper	59.18	1.83	9	1.70	679366	0.009
		Other conifers (Fir, Tamarix)	11.12	0.34	7	1.32	586169	0.002
		Other conifers	11.01	0.34	2	0.38	N/A	N/A
		Cedar	1.14	0.04	9	1.70	55729	0.002
	Coniferous Total		***1147.56***	***35.50***	***108***	***20.42***	***1561745***	***0.073***
Wooded Total			***1378.57***	***42.65***	***199***	***37.62***		
Non Wooded		Secondary species	1531.79	47.39	122	23.06	N/A	N/A
		Herbaceous cover	268.70	8.31	196	37.05	N/A	N/A
		Alfa	53.30	1.65	12	2.27	2316862	0.002
Non-Wooded Total			***1853.79***	***57.35***	***330***	***62.38***		
Grand Total			**3232.36**	**100**	**529**	**100**	**7962358**	**0.041**

The data relating to the distribution of fires according to size classes of affected areas are represented in Table 45. Indeed, 91% of reported fires were under control with the speed and efficiency required, since the area affected did not exceed 5 ha for each fire. It is also noted that only 3 fires (0.5% of the total number of fires) affected an area of over 100 hectares, representing over 64% of the total area burned.

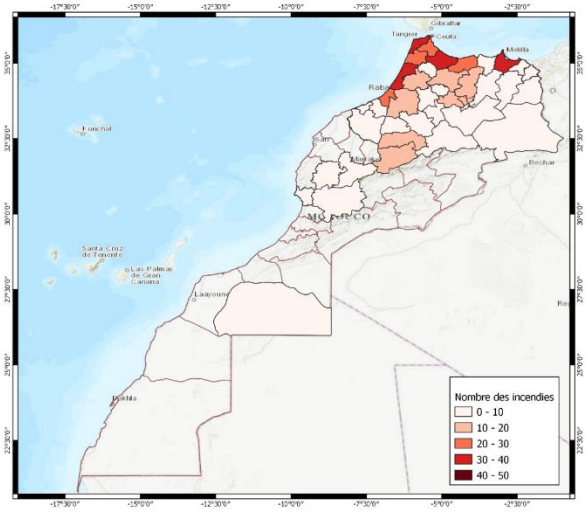


Figure 152. Geographic Distribution of fires according to the affected area classes

Table 45. Distribution of fires according to classes of affected areas.

Size Class (ha)	Number		Area (ha)	
	Count	%	Area	%
0-5 ha	483	91.30	307.41	9.51
5-10 ha	13	2.46	95.32	2.95
10-20 h	17	3.21	245.85	7.61
20-50 ha	11	2.08	360.78	11.16
50-100 ha	2	0.38	175.00	5.41
100-500 ha	1	0.19	238.00	7.36
>500 ha	2	0.38	1810.00	56.00
Total	**529**	**100**	**3232.36**	**100**

Loss of human lives

No lives were lost in the 2019 season.

Distribution of fires

The data showing the distribution of fires by forest region are reported, below, in Figure 153 and Figure 154.

the Rif region (Tanger, Tetouan, Chefchaouen...) ranks first in terms of area affected with 1 570 ha (49 % of the total area recorded nationally) and the Oriental region ranks second with 903 fires (28% of the total number)

The occurrence of fires is concentrated in the provinces of Rif and Pre-Rif (including Tangier and Tetouan); this situation is favoured by the terrain, the high sensitivity of forest stand types (pine, cork oak matorral...) and the intense human pressure on land resulting from the use of fire as a practice of cleaning land for their cultivation.

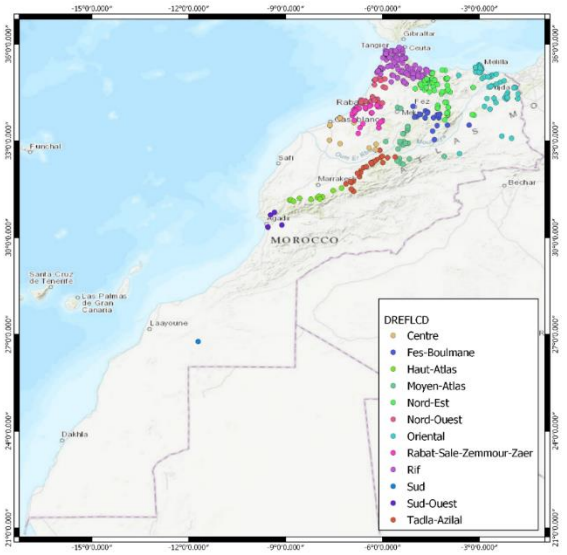


Figure 153. Location of the forest fires recorded in 2019 in Morocco.

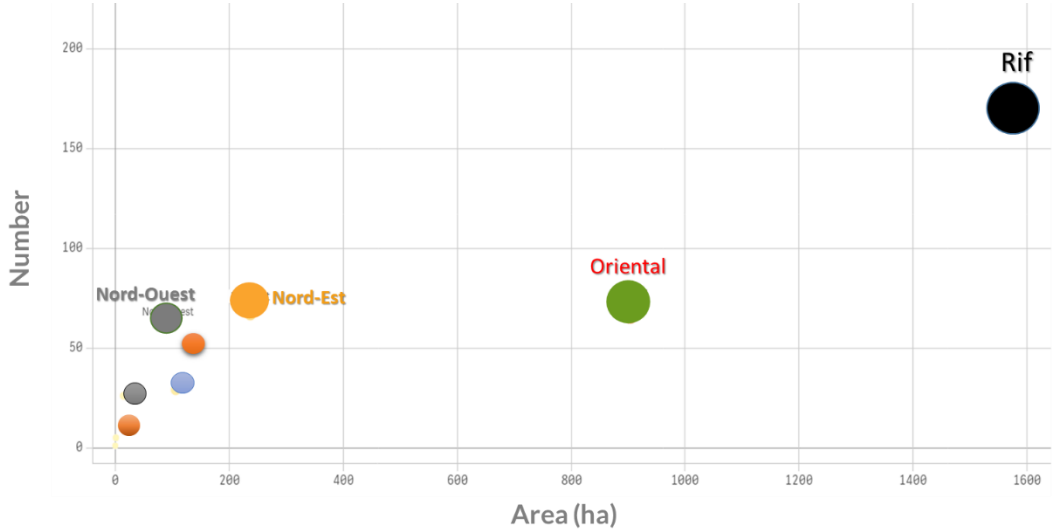


Figure 154. Number of fires and burnt area by forest region.

Firefighting means

The means mobilized by the different departments in 2019 in Morocco for the operations against forest fires, are as follows:

Activities	Department	Quantity
Monitoring and alerts	High Commission of Forests, Water and combating Desertification	**1350** watchers
	Ministry of the Interior	**1280** watchers
Ground intervention	High Commission of Forests, Water and combating Desertification	**332** forest fighters with **95** vehicles for the first intervention
	Civil Protection	[Total Estimated at 370 persons with CCF, CCR, CCI and other engines]
	Auxiliary Forces	[Estimated at 430 persons]
	Royal Armed Forces	[Estimated at 520 persons]
Aerial control	Royal Gendarmerie	**18** Turbo Trush aircraft
	Royal Air Forces	**5** Canadairs CL415

(Source: Service de la Protection des Forêts, Haut-Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification, Morocco).

2 The European Forest Fire Information System (EFFIS)

The European Forest Fire Information System (EFFIS) has been established jointly by the European Commission services (DG ENV and JRC) and the relevant fire services in the EU Member States and European countries (Forest Services and Civil Protection services). Research activities for the development of the system initiated at JRC in 1998 and the first EFFIS operations were in the year 2000.

In 2003, EFFIS was embedded in the new Regulation (EC) No 2152/2003 (Forest Focus) of the European Council and Parliament on monitoring of forests and environmental interactions until it expired in 2006. Since then EFFIS operated as a voluntary system of information on wildfires until 2015, when it became part of the EU Copernicus program, under the Emergency Management Services.

Acting as the focal point of information on forest fires, EFFIS supports the national services in charge wildfire management. Currently, the EFFIS network is made of 43 countries in Europe, Middle East and North Africa. EFFIS provides specific support to the Emergency Response Centre (ERCC) (formerly Monitoring and Information Centre (MIC)) of Civil Protection as regards near-real time information on wildfires during the fire campaigns and assists other DGs through the provision both pre-fire and post-fire information on wildfire regimes and impacts. It provides information that supports the needs of the European Parliament with regards to wildfire management, impact in natural protected areas and harmonized information on forest fires in the EU.

EFFIS also centralises the national fire data that the countries collect through their national forest fire programmes in the so-called EFFIS Fire Database. The EFFIS web services6 allow users to access near-real time and historical information on wildfires in Europe, Middle East and North Africa.

EFFIS provides a continuous monitoring of the fire situation in Europe and the Mediterranean area, and regularly sends updates to EC services during the main fire season. The information about the on-going fire season is continuously updated on the EFFIS web site (up to 6 times, daily), which can be interactively queried7. EFFIS provides daily meteorological fire danger maps and forecasts of fire danger up to 9 days in advance, updated maps of the latest active fires, wildfire perimeters and post-fire evaluation of damage.

The EFFIS module for the assessment of meteorological forest fire danger is the EFFIS Danger Forecast. This module forecasts forest fire danger in Europe, part of North Africa and the Middle East, on the basis of the Canadian Fire Weather Index (FWI), allowing a harmonized evaluation to be made of the forest fire danger situation throughout Europe and neighbouring countries.

The damage caused by forest fires in Europe and neighbouring countries is estimated using the EFFIS Rapid Damage Assessment module. Since 2000, cartography of the burned areas is produced every year through the processing of satellite imagery. In the year 2003, due to the availability of daily satellite imagery from the MODIS sensor on board the TERRA and AQUA satellites, the RDA provided frequent updates of the total burnt area in Europe. In 2007, the RDA was updated twice a day and currently, since 2016, it is updated 3 times a day. Further to the mapping of burnt areas, the analysis of which types of land cover classes are affected by fires is performed. This module uses MODIS satellite imagery with a ground spatial resolution of about 250 metres, which permits the mapping of fires of around 30 ha or larger. The burned area mapped by EFFIS corresponds, on average, to around 75% to 80% of the total area burnt in Europe each year.

[6] http://effis.jrc.ec.europa.eu

[7] see http://effis.jrc.ec.europa.eu/current-situation

2.1 EFFIS Danger Forecast: 2019 results

The EFFIS Danger Forecast was developed to support the Commission's Directorate-General for the Environment and the forest fire-fighting services in the EU Member States. From 2002, at the request of the Member States, operation of the EFFIS Danger Forecast was extended to six months starting on 1 May and ending on 31 October, and in 2006 to nine months, from 1 February to 31 October. From 2008 the EFFIS Danger Forecast system has run continuously throughout the year without interruption.

The geographic extent has been enlarged over the years from the initial extent that covered only the Mediterranean region. Now the system covers the whole of Europe and MENA (Middle East & North Africa) countries.

The meteorological data used to run the model has also changed during the years. At the beginning the system started using forecasted data provided by MeteoFrance with a spatial resolution of around 50 km. Then over time other providers were included, such as DWD (Deutscher Wetterdienst) and ECMWF (European Centre for Medium-Range Weather Forecast) and the resolution has improved. Now the system runs with three different data sets from three providers: ECMWF (the primary), Meteo France and DWD; with a spatial resolution in a range from around 10 km to 25 km.

In this chapter the fire danger trends assessed by EFFIS in the different countries during the 2019 fire season are presented, comparing them with previous years.

Through the Danger Forecast module of EFFIS the situation has been continuously monitored and the risk level analysed and mapped.

The following figures show fire danger through 2019 as determined by the average FWI values assessed during the fire season in the individual countries.

In 2019 many countries saw higher than average FWI values relatively early in the year.

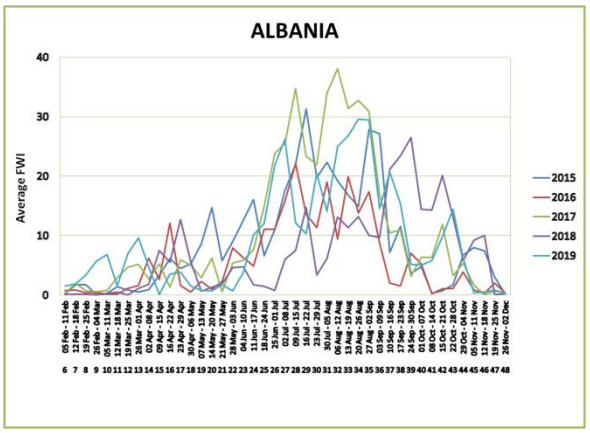
The graphs show the weekly averages of FWI over entire countries; therefore local peaks might have been flattened, especially in those countries such as France or Italy, where there are strong differences in fire danger level with changing latitudes; nevertheless the general trend is depicted providing relevant information about the fire danger level and trends of the year.

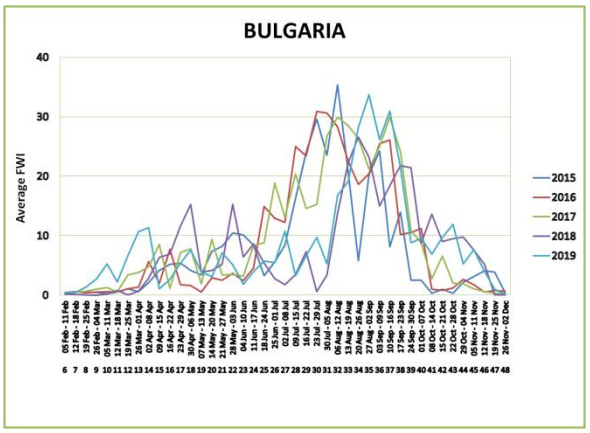
To allow a better comparison with past seasons, the curves of 2015-2018 are presented in conjunction with 2019 for all countries.

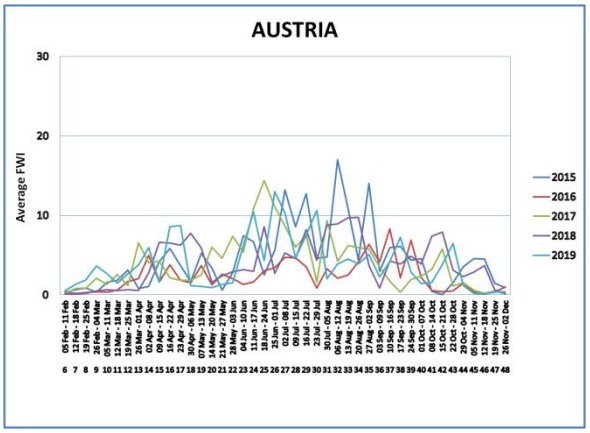
The countries analysed are those participating in the EFFIS network for which data are available, and are presented in alphabetic order within the two groups (European countries and MENA countries) in the graphs that follow.

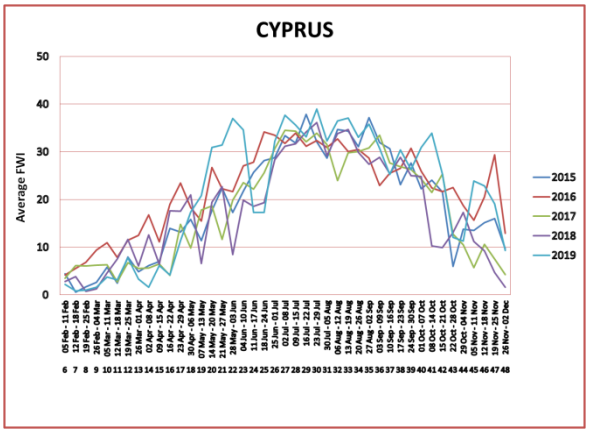
NOTE: In order to make the graphs more readable, 4 colour-coded scales have been used to present the FWI: **0-30** for the most northern countries where fire danger rarely reaches high levels; **0-40** for central countries, **0-50** for the Mediterranean and Turkey, and **0-75** for the MENA countries.

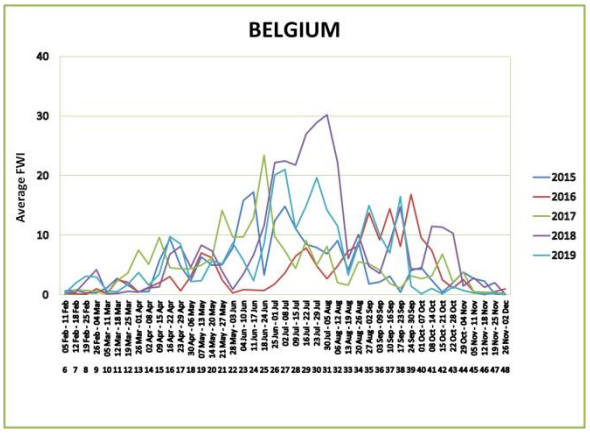
NB. Due to a change in methodology in calculating the 2019 totals, values for MENA countries are higher than in previous years.

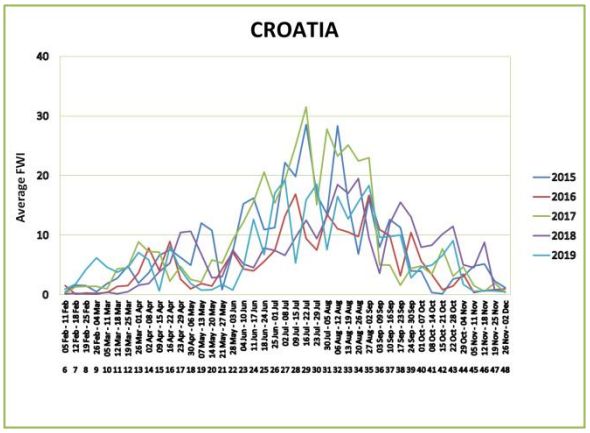

ALBANIA
Average FWI
2015
2016
2017
2018
2019

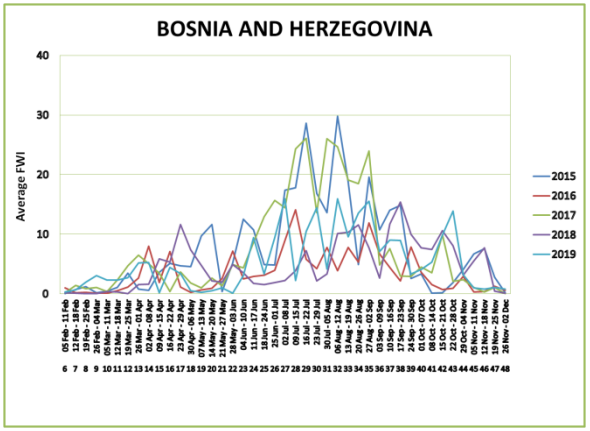

BULGARIA
Average FWI
2015
2016
2017
2018
2019

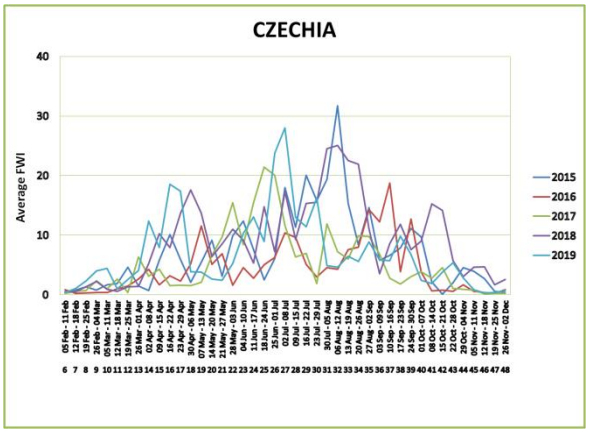

AUSTRIA
Average FWI
2015
2016
2017
2018
2019

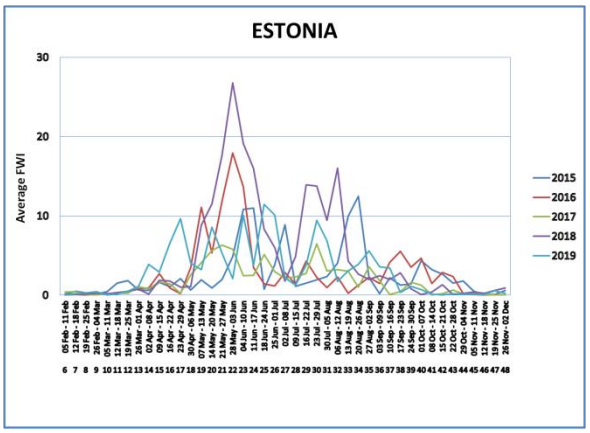

CYPRUS
Average FWI
2015
2016
2017
2018
2019

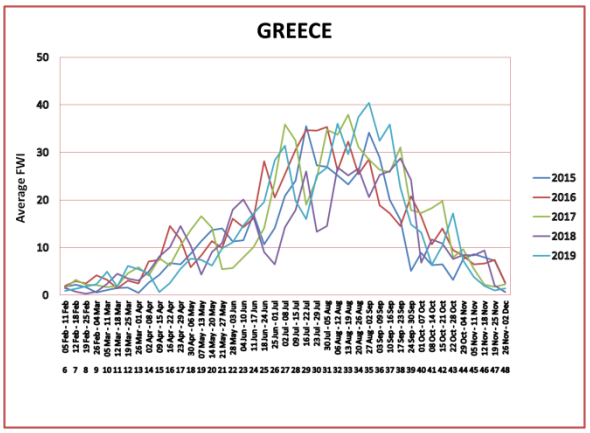

BELGIUM
Average FWI
2015
2016
2017
2018
2019

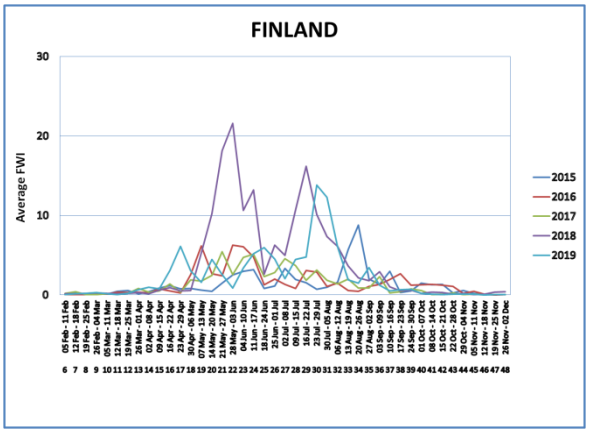

CROATIA
Average FWI
2015
2016
2017
2018
2019

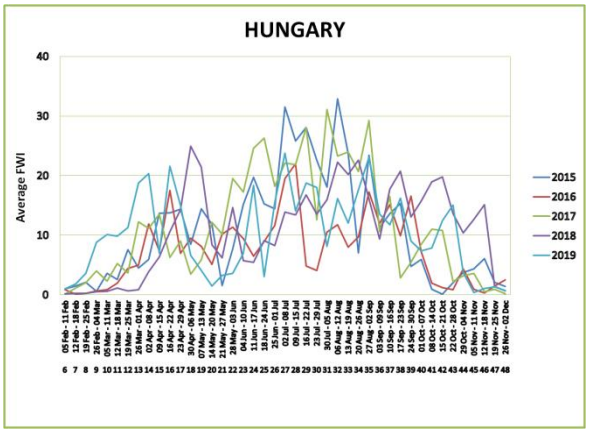

BOSNIA AND HERZEGOVINA
Average FWI
2015
2016
2017
2018
2019

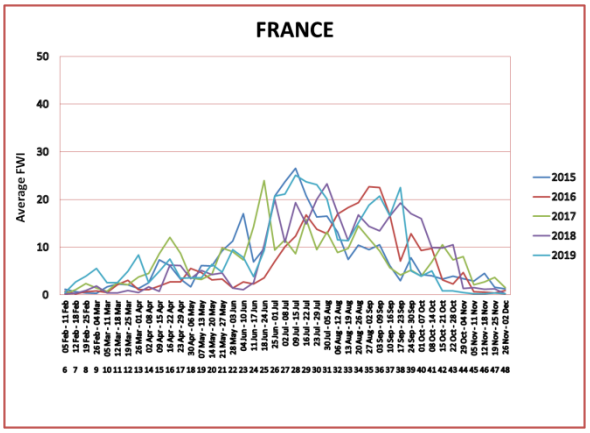

CZECHIA
Average FWI
2015
2016
2017
2018
2019

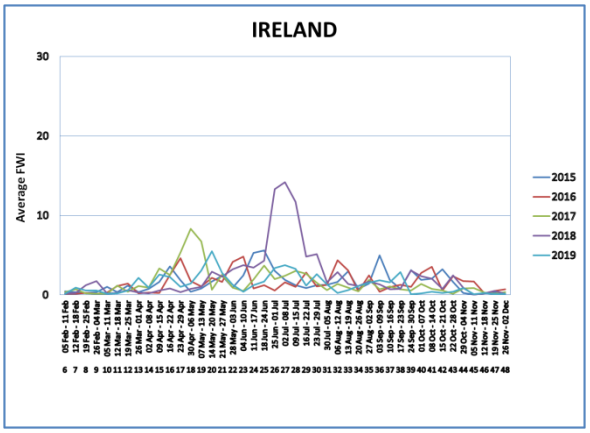

ESTONIA
Average FWI
2015
2016
2017
2018
2019

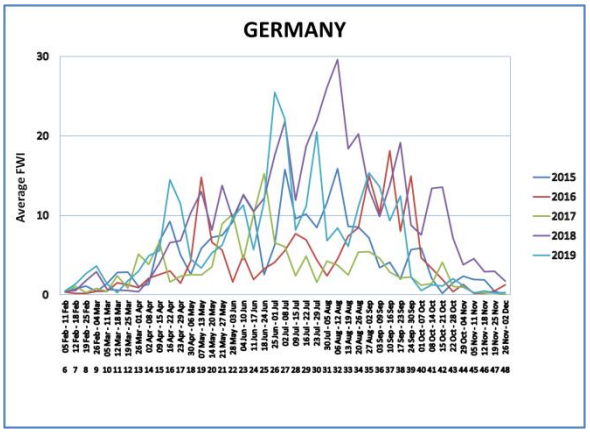

GREECE
Average FWI
2015
2016
2017
2018
2019

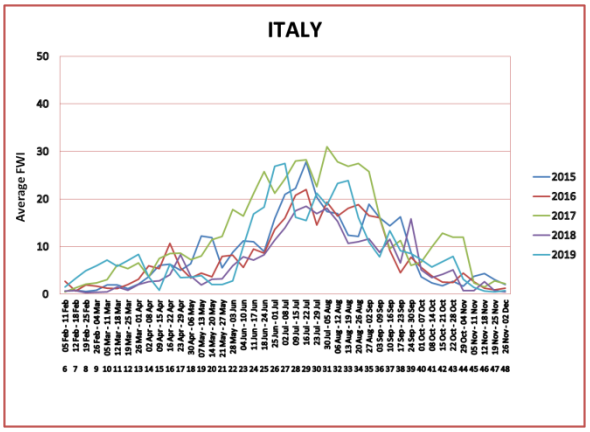

FINLAND
Average FWI
2015
2016
2017
2018
2019

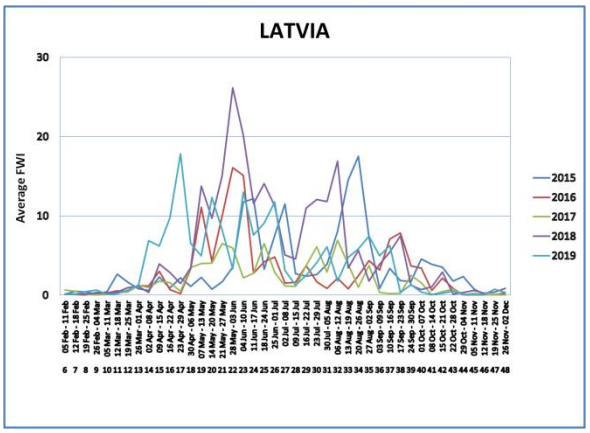

HUNGARY
Average FWI
2015
2016
2017
2018
2019

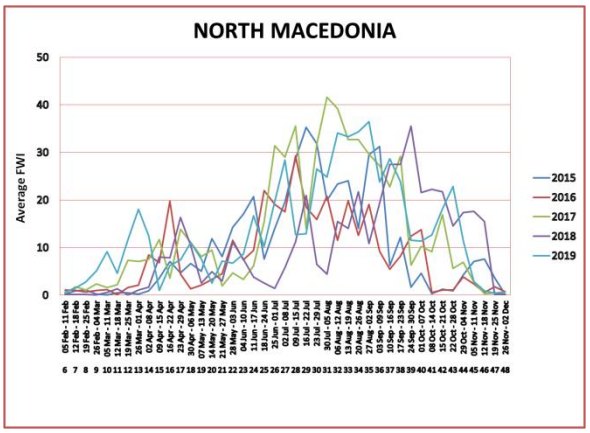

FRANCE
Average FWI
2015
2016
2017
2018
2019

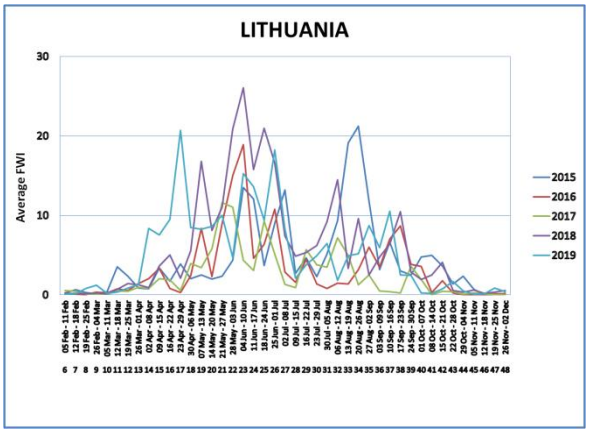

IRELAND
Average FWI
2015
2016
2017
2018
2019

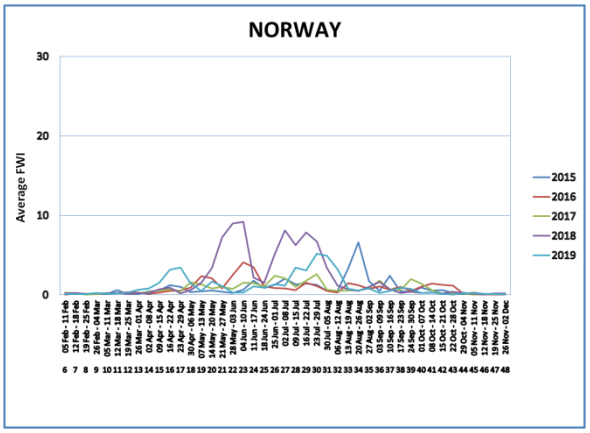

GERMANY
Average FWI
2015
2016
2017
2018
2019

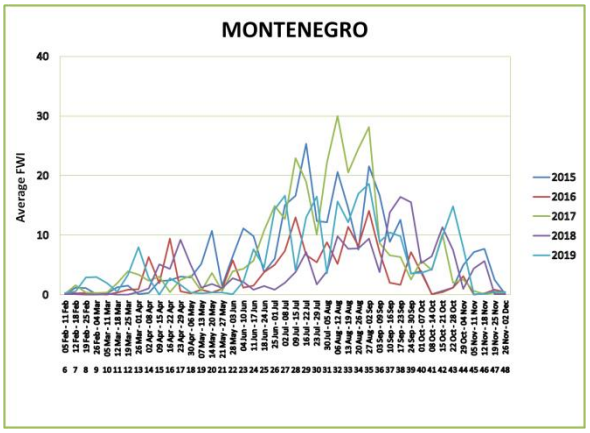

ITALY
Average FWI
2015
2016
2017
2018
2019

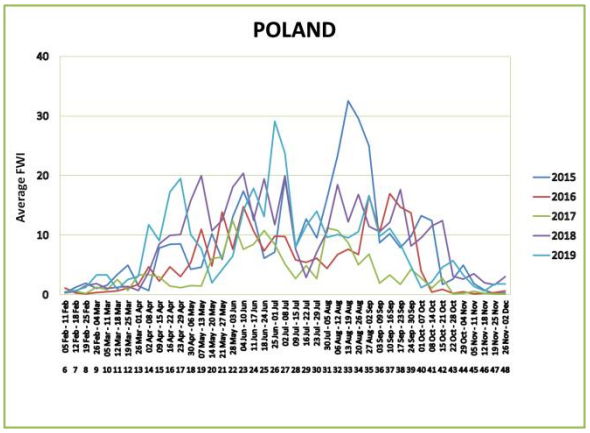

LATVIA
Average FWI
2015
2016
2017
2018
2019

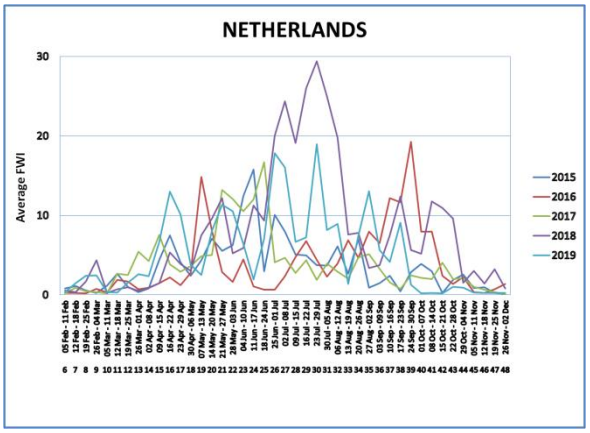

NORTH MACEDONIA
Average FWI
2015
2016
2017
2018
2019

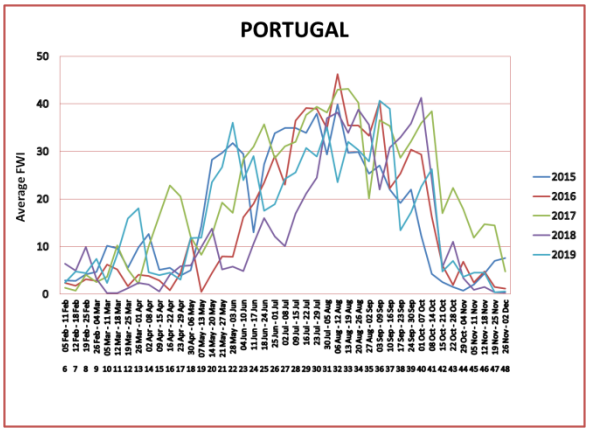

LITHUANIA
Average FWI
2015
2016
2017
2018
2019

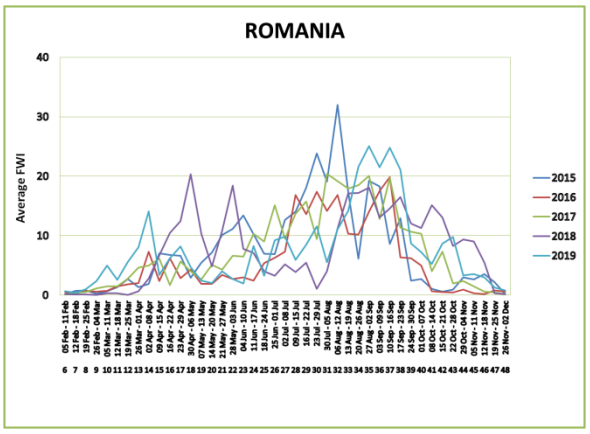

NORWAY
Average FWI
2015
2016
2017
2018
2019

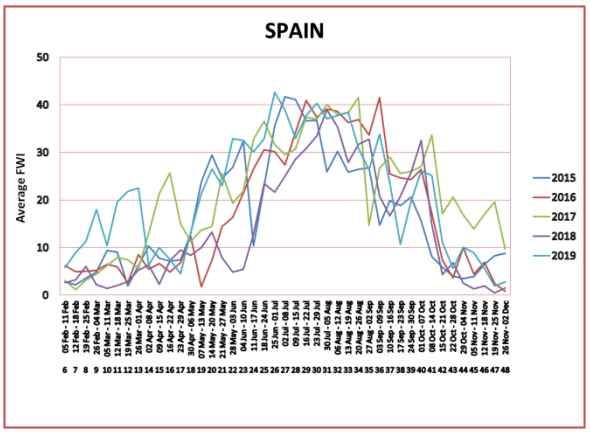

MONTENEGRO
Average FWI
2015
2016
2017
2018
2019

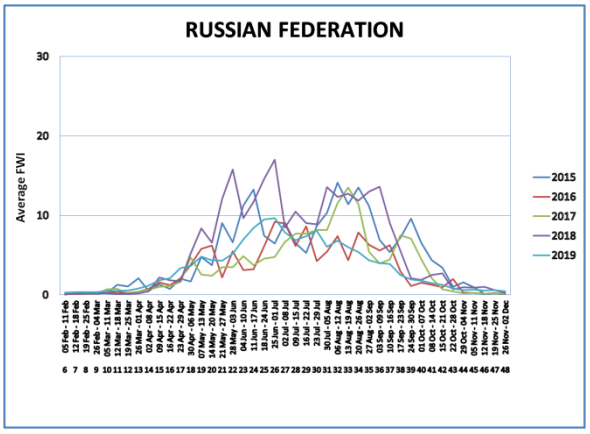

POLAND
Average FWI
2015
2016
2017
2018
2019

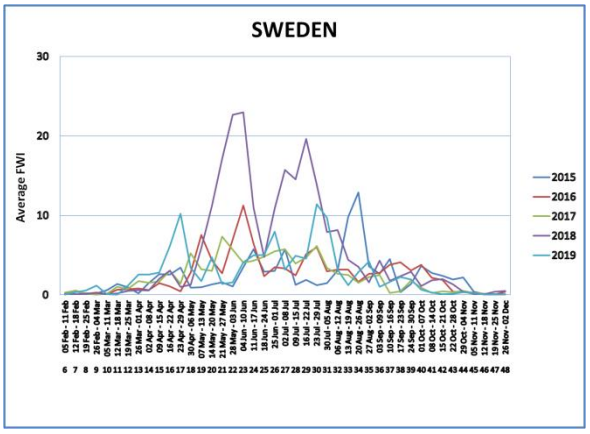

NETHERLANDS
Average FWI
2015
2016
2017
2018
2019

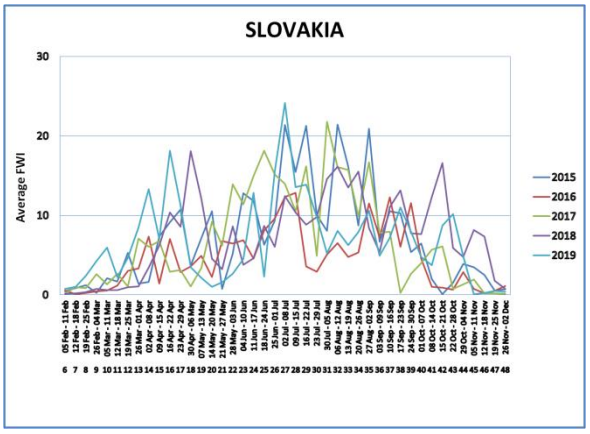

PORTUGAL
Average FWI
2015
2016
2017
2018
2019

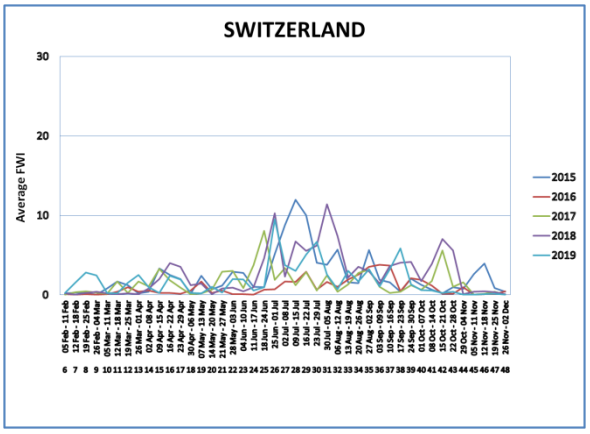

ROMANIA
Average FWI
2015
2016
2017
2018
2019

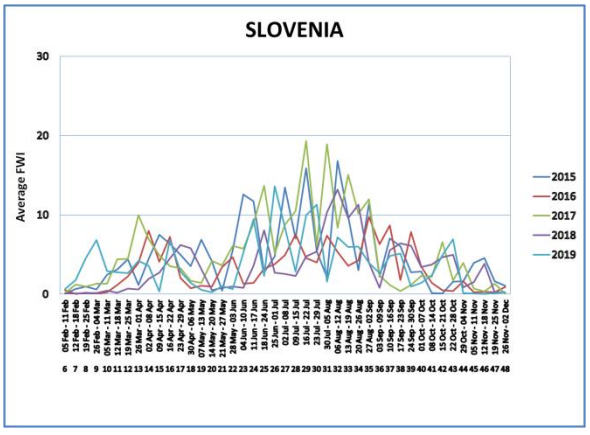

SPAIN
Average FWI
2015
2016
2017
2018
2019

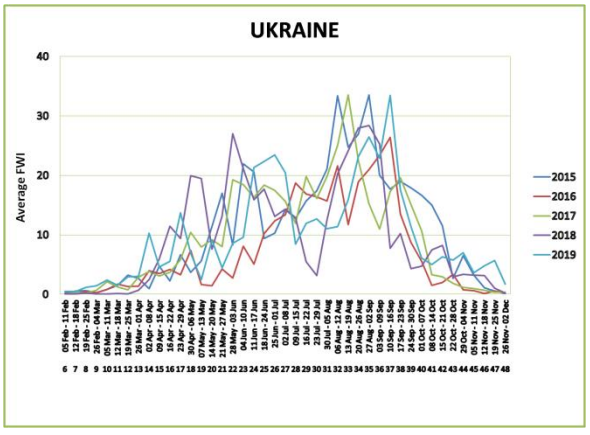

RUSSIAN FEDERATION
Average FWI
2015
2016
2017
2018
2019


SWEDEN
Average FWI
2015
2016
2017
2018
2019

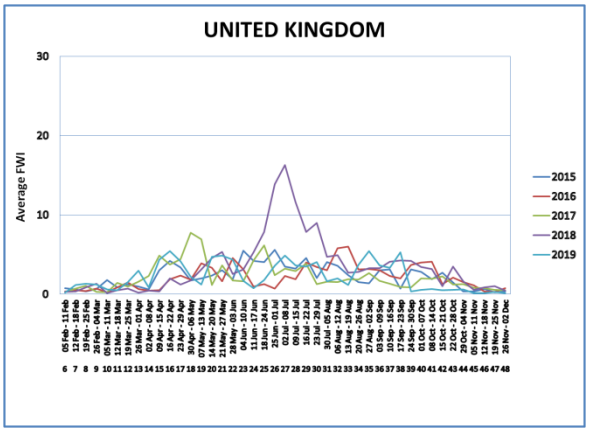

SLOVAKIA
Average FWI
2015
2016
2017
2018
2019

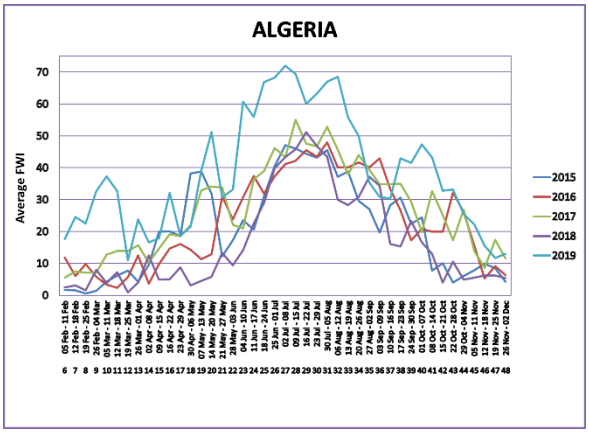

SWITZERLAND
Average FWI
2015
2016
2017
2018
2019

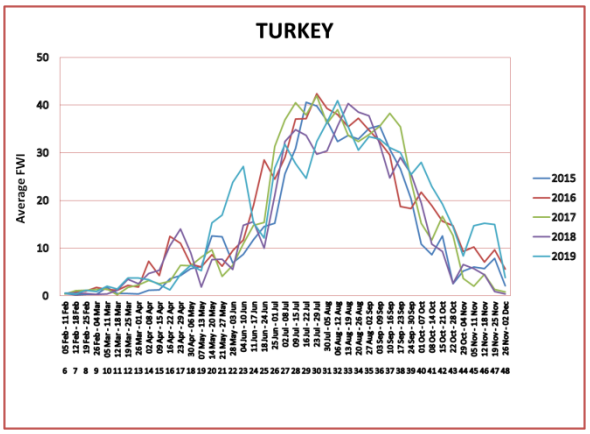

SLOVENIA
Average FWI
2015
2016
2017
2018
2019

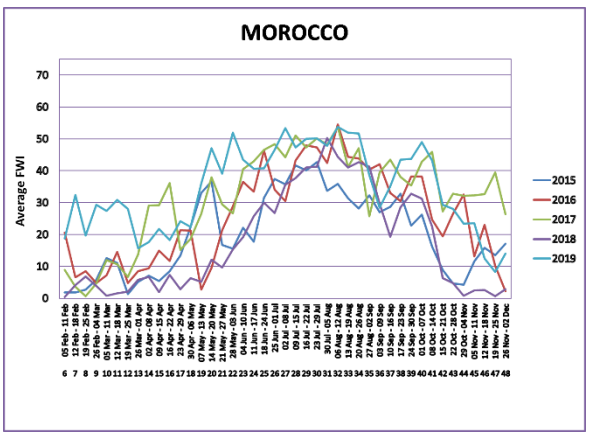

UKRAINE
Average FWI
2015
2016
2017
2018
2019

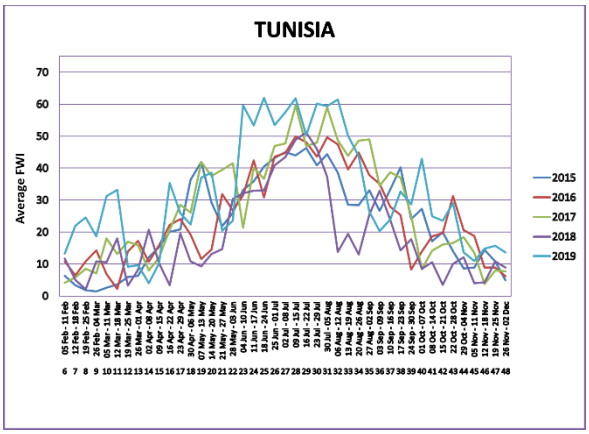
MENA Countries











**N.B* *Values for MENA countries are not directly comparable between 2019 and previous years because of a change in methodology in calculating the totals.*

As mentioned previously, weekly country averages tend to flatten local fire danger peaks, which as a consequence become less evident, especially in those countries such as France or Italy, where there are strong differences in fire danger level with changing latitudes.

Therefore, to show more clearly the seasonal changes in FWI in the larger EU Mediterranean countries, i.e. Portugal, Spain, France, Italy and Greece, their territory has been further divided for fire danger reporting, according to the map shown in Figure 155. The division criteria are mainly administrative and should be taken as provisional, since other fire risk reporting sub-regions, with a specific focus on environmental criteria, might be proposed in the future.

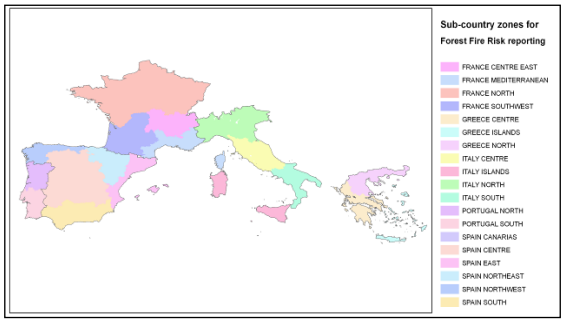


Figure 155. Sub-country regions identified for fire danger trend reporting in the five largest Mediterranean Member States.

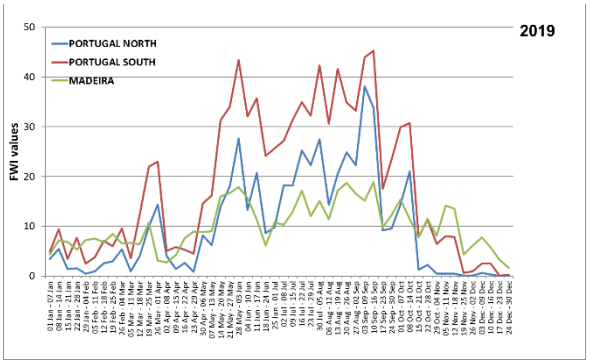


Figure 156. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Portugal.

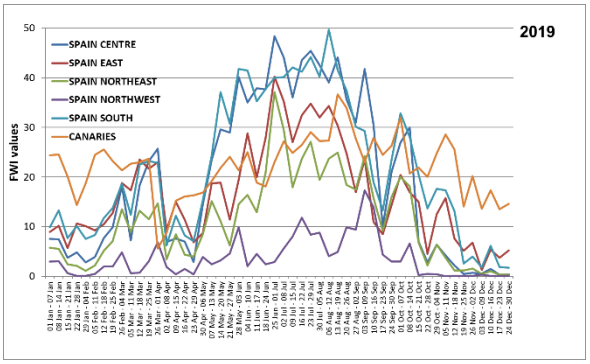


Figure 157. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Spain.

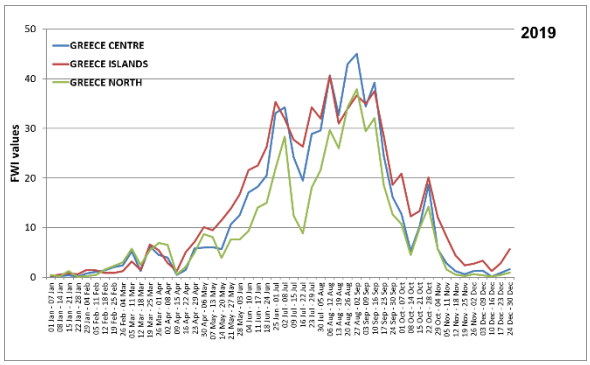


Figure 158. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Greece.

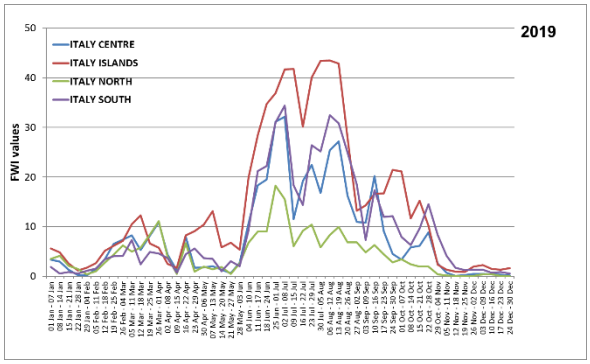


Figure 159. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Italy.

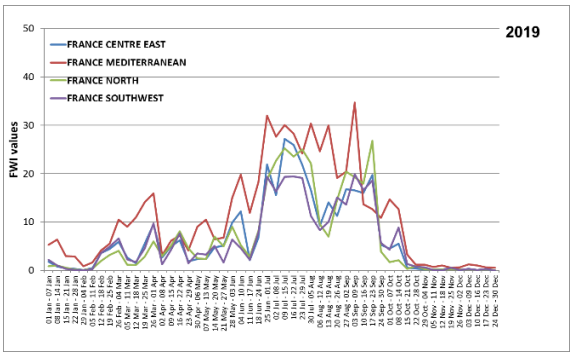
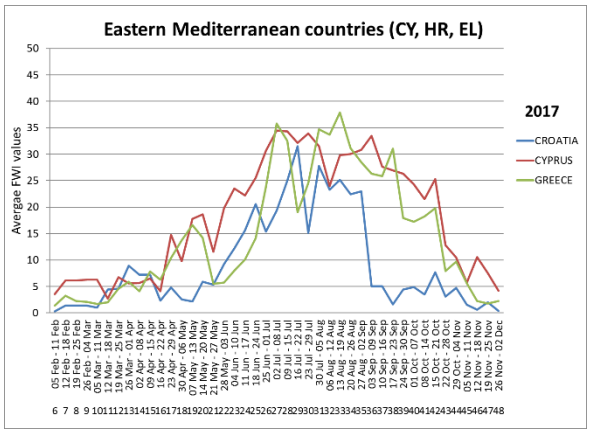
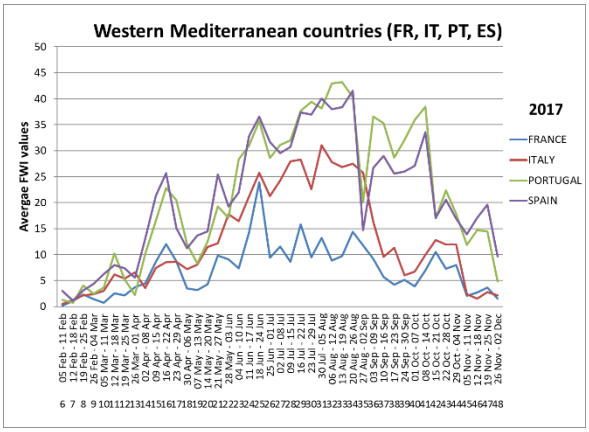
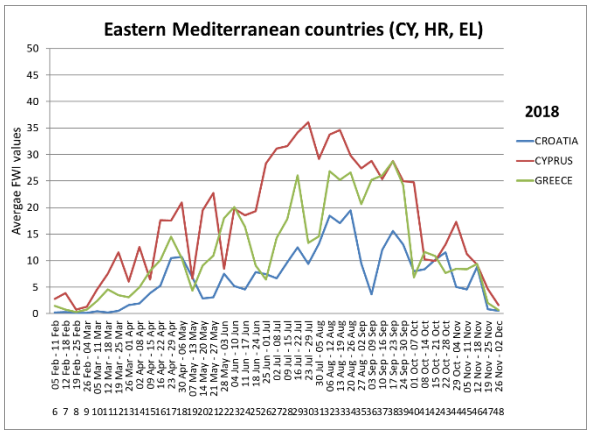


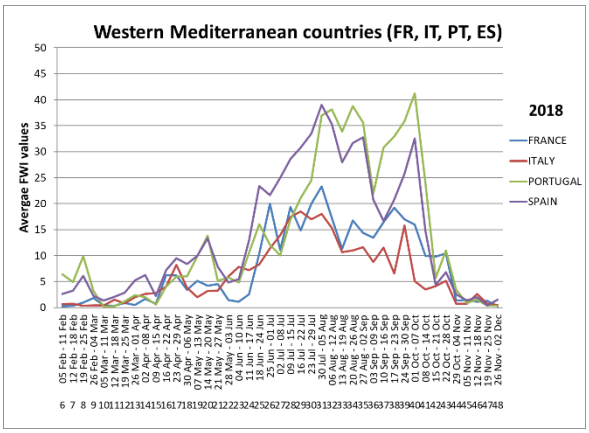
Figure 160. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for France.

To facilitate the comparison among the different countries in EU, in the next graphs (Figure 161 to Figure 167), the fire danger trends as determined by FWI are shown for countries grouped by main bioclimatic type (e.g. Mediterranean, temperate or boreal). Data are given for 2017-2019.









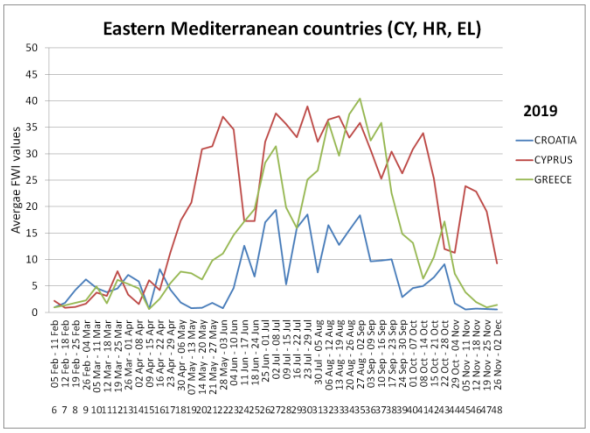


Figure 161. Fire danger trends 2017-2019 in eastern EU Mediterranean countries (CY, HR, EL).

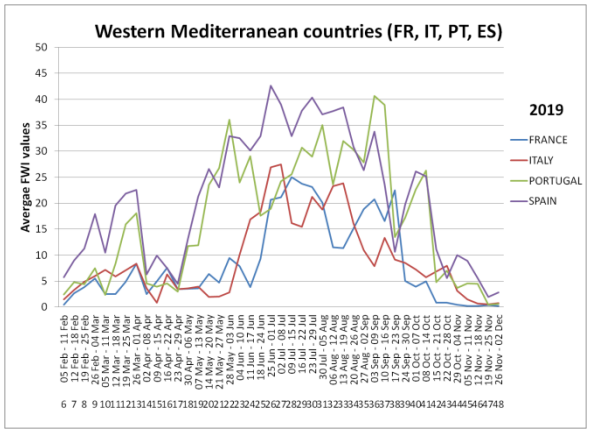
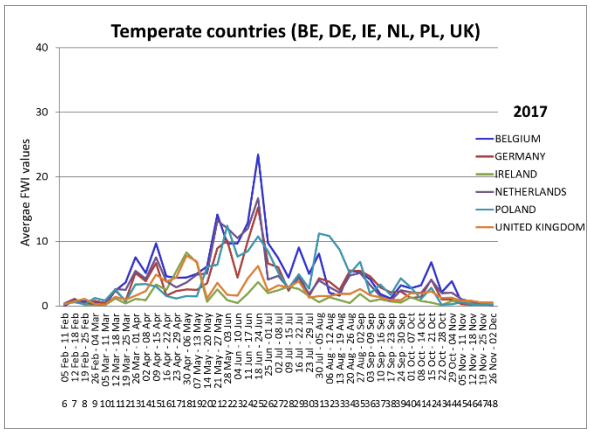
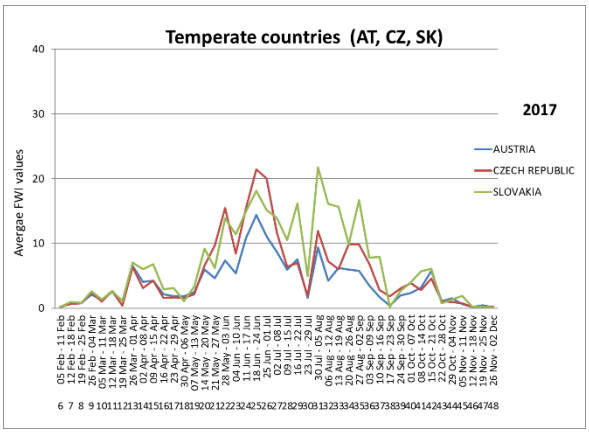
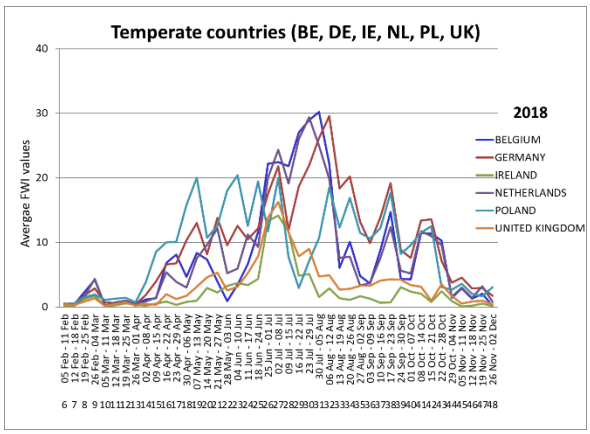
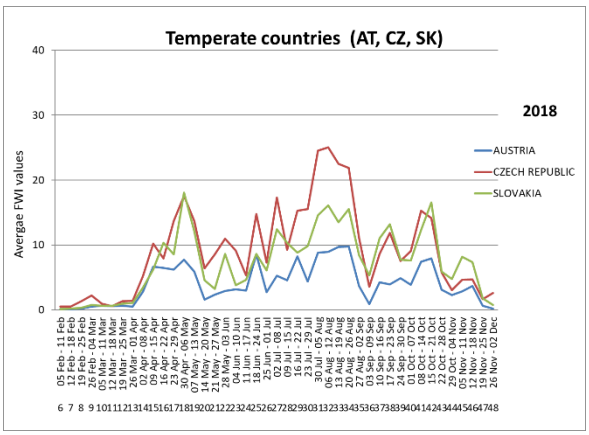


Figure 162. Fire danger trends 2017-2019 in western EU Mediterranean countries (FR, IT, PT, ES).









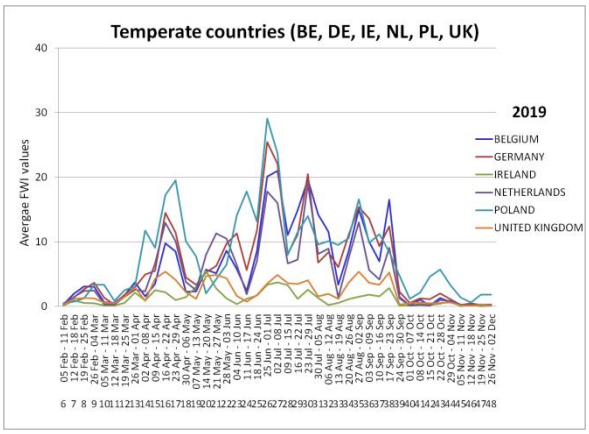


Figure 163. Fire danger trends 2017-2019 in some northern EU temperate countries (BE, DE, IE, NL, PL, UK).

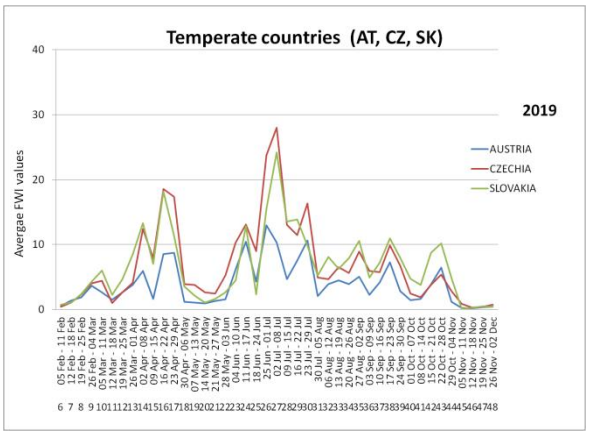
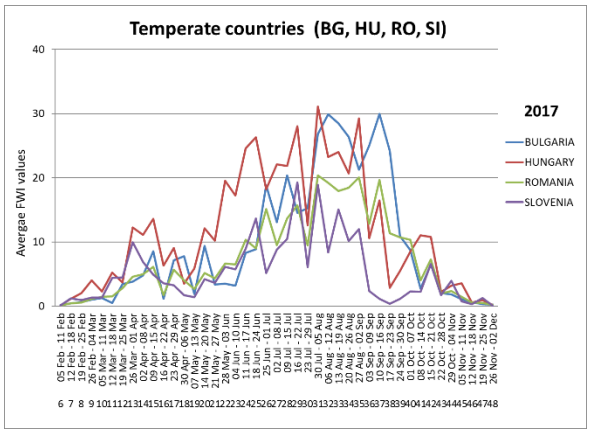
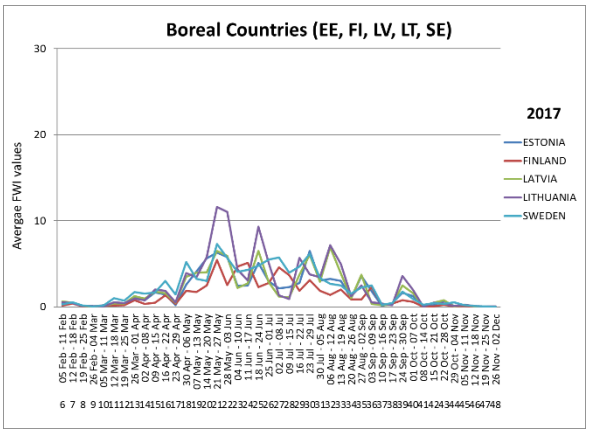
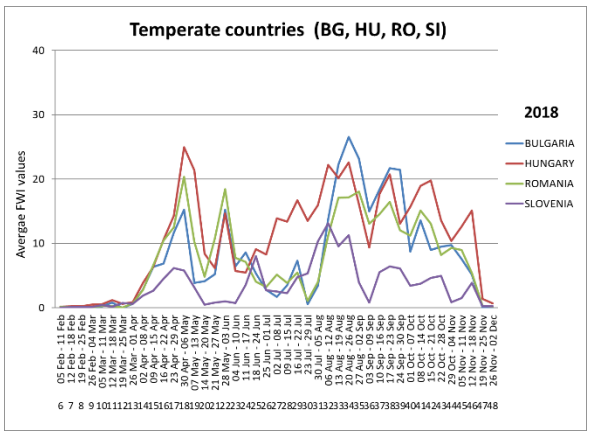
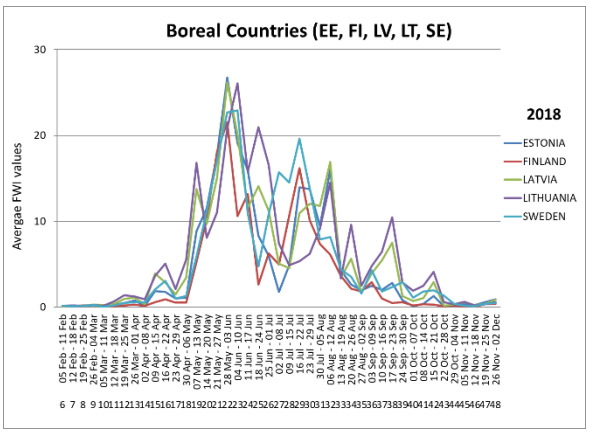


Figure 164. Fire danger trends 2017-2019 in some central EU temperate countries (AT, CZ, SK).









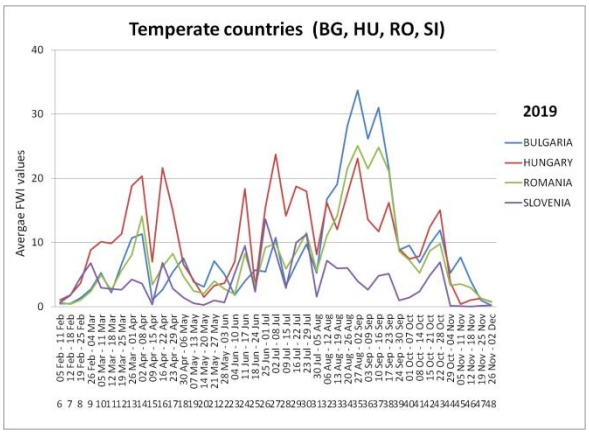


Figure 165. Fire danger trends 2017-2019 in some eastern EU temperate countries (BG, HU, RO, SI).

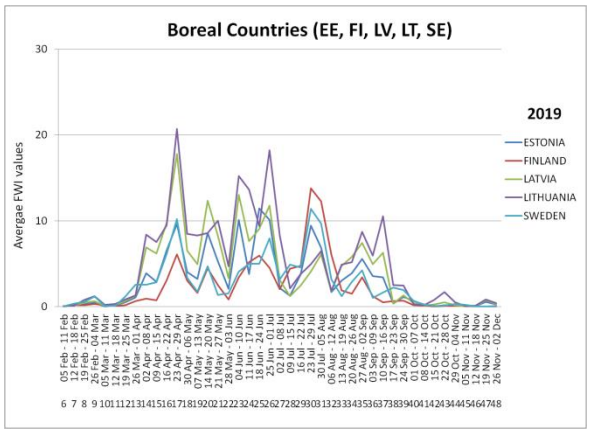
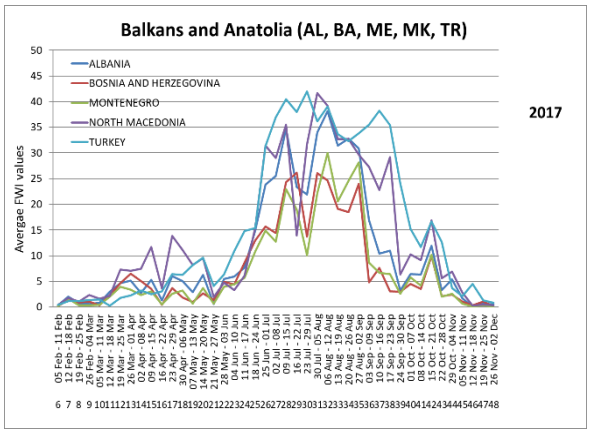
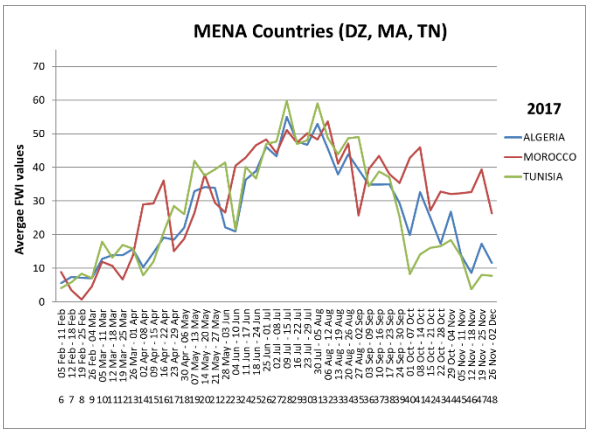
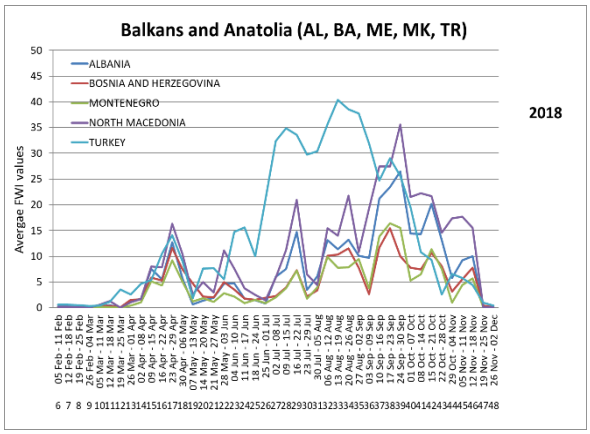
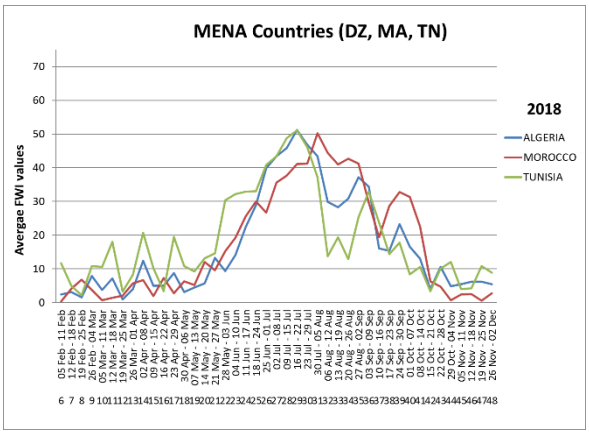


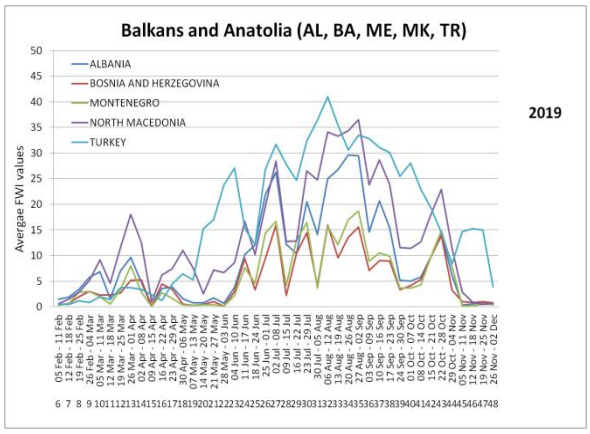
Figure 166. Fire danger trends 2017-2019 in some EU boreal countries (EE, FI, LV, LT, SE).











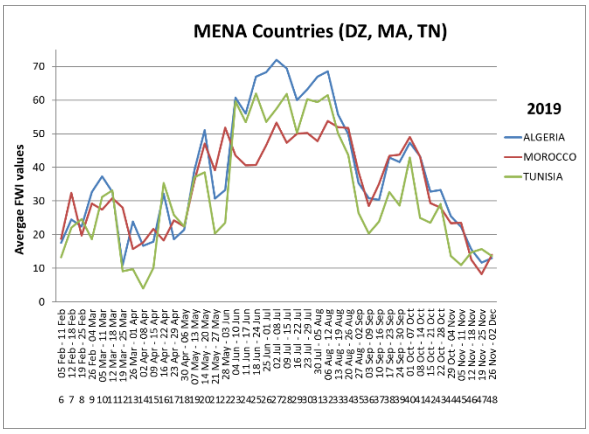


Figure 167. Fire danger trends 2017-2019) in the Balkans and Anatolia (AL, BA, ME, MK, TR).

Figure 168. Fire danger trends 2017-2019 in MENA countries (DZ, MA, TN)*

As in previous years, the Member States gave very positive feedback on the danger assessment activity, as part of the European Forest Fire Information System. This dialogue with users and other stakeholders is bound to result in an improved civil protection and forest fire service across Europe, and helps meet the EU's aim of providing environmental information and services that can be combined with other global environmental information products, in support of the Copernicus (formerly Global Monitoring for Environment and Security - GMES) initiative.

N.B *Values for MENA countries are not directly comparable between 2019 and previous years because of a change in methodology in calculating the totals.*

2.2 The EFFIS Rapid Damage Assessment: 2019 results

The Rapid Damage Assessment module of EFFIS was set up to provide reliable and harmonized estimates of the areas affected by forest fires during the fire season. The methodology and the spatial resolution of the satellite sensor data used for this purpose allows all fires of about 30 ha or larger to be mapped. In order to obtain the statistics of the burnt area by land cover type the data from the European CORINE Land Cover 2016 (CLC) database were used. Therefore, the mapped burned areas were overlaid with the CLC data, making it possible to derive damage assessment results comparable for all the EU countries.

EFFIS Rapid Damage Assessment is based on the analysis of MODIS satellite imagery. The MODIS instrument is on board both the TERRA (morning pass) and AQUA (afternoon pass) satellites. MODIS data has 2 bands with spatial resolution of 250 metres (red and near-infrared bands) and 5 bands with spatial resolution of 500 metres (blue, green, and three short-wave infrared bands). Mapping of burnt areas is based mainly on the 250 metre bands, although the MODIS bands at 500 metres resolution are also used, as they provide complementary information that is used for improved burnt area discrimination. This type of satellite imagery allows detailed mapping of fires of around 30 ha or larger. Although only a fraction of the total number of fires is mapped (fires smaller than 30 ha are not mapped), the analysis of historical fire data has determined that the area burned by wildfires of this size represents in most cases the large majority of the total area burned. On average, the area burned by fires of at least 30 ha accounts for about 85% of the total area burnt every year in the Southern EU.

Since 2008, EFFIS has included Northern African countries in the mapping of burned area, following the agreement with FAO Silva Mediterranea, the FAO statutory body that covers the Mediterranean region.

The results for each of the countries affected by forest fires of over 30 ha are given in the following paragraphs in alphabetical order, followed by a section on the MENA countries.

The total area burned in 2019, as shown by the analysis of satellite imagery, is shown in Table 46. These figures may also include agricultural and urban areas that were burned during the forest fires. Figure 169 below shows the scars caused by forest fires during the 2019 season.

In 2019 fires of greater than 30 ha were observed in 40 countries and a total burnt area of 789 730 ha was mapped, nearly four times more than in 2018. The season was unusual in that a considerable portion of the burnt area was mapped early in the season before the traditional summer peak, and the land cover type most affected was Other Natural Land, instead of Forest/Other Wooded Land as in past years (Figure 173 on page 132).

Table 46. Areas burned by fires of at least 30 ha in 2019 estimated from satellite imagery.

Country	*Area (Ha)*	*Number of Fires*
Albania	11838.92	111
Algeria	48512.35	164
Austria	38.12	1
Belgium	314.88	4
Bosnia & Herzegovina	28936.57	144
Bulgaria	13827.93	90
Croatia	11959.75	75
Cyprus	625.44	6
Czech Republic	52.5	2
Denmark	107.69	2
France	45234.58	370
Germany	2054.48	14
Greece	11111.63	70
Hungary	601.67	10
Ireland	2895.54	23
Israel	1867.43	12
Italy	39655.43	448
Kosovo under UNSCR 1244	10898.56	89
Latvia	49.42	1
Lebanon	2315.02	21
Libya	716.36	8
Lithuania	235.3	4
Montenegro	11284.37	86
Morocco	4811.13	26
North Macedonia	31703.07	158
Norway	4653.51	35
Palestinian Territory	1288.88	6
Poland	181.75	6
Portugal	34661.4	222
Romania	73444.17	242
Serbia	17385.78	114
Slovakia	24.64	1
Slovenia	105.92	2
Spain	66405.55	424
Sweden	538.4	10
Syria	193619.44	303
The Netherlands	20.81	1
Tunisia	3209.97	26
Turkey	83146.25	396
United Kingdom	29395.13	137
TOTAL	**789729.7**	**3864**

Figure 169. Burnt scars produced by forest fires during the 2019 fire season.

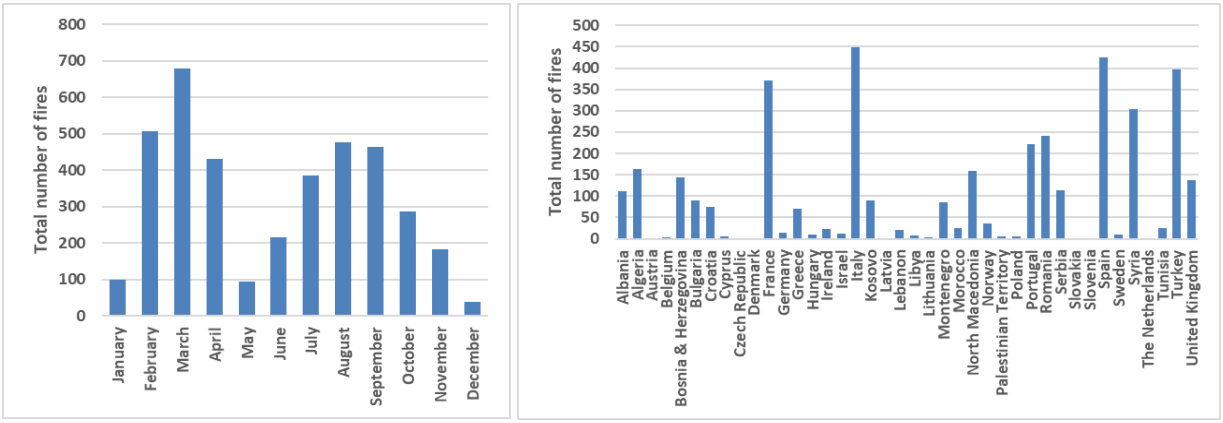


Figure 170. Total number of fires >30 ha by month and country in 2019.

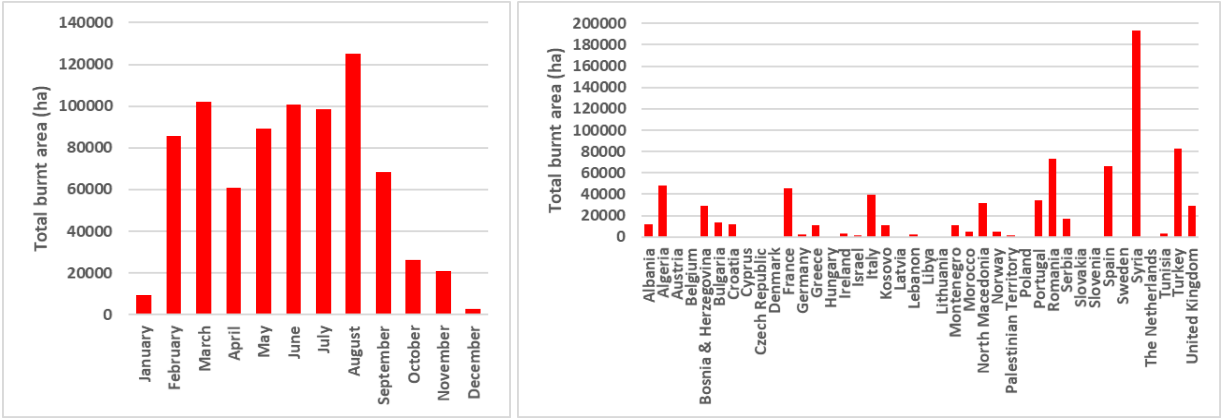


Figure 171. Total burnt area of fires >30 ha by month and country in 2019.

Damage to Natura2000 sites

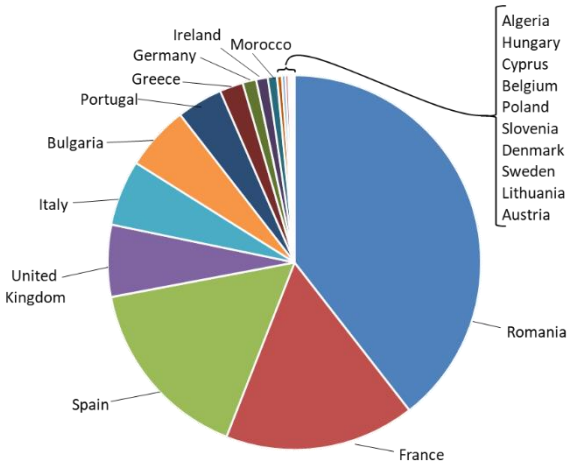
Of particular interest is the analysis of the damage caused by fires to the areas protected within the Natura2000 network, as they include habitats of especial interest which are home for endangered plant and animal species.

The category of Natura2000 areas only exists in the countries of the European Union. Information on other protected areas outside the EU is presented for those countries for which the information is available. The area burnt within the Natura2000 and other protected sites is presented below.

Country	*Area (Ha)*	*% of Natura2000 Area*	*Number of Fires*
Austria	38.12	0.003	1
Belgium	314.54	0.082	4
Bulgaria	9006.46	0.24	60
Cyprus	419.74	0.258	3
Czech Republic	30.26	0.003	2
Denmark	90.59	0.024	2
France	26640.73	0.388	238
Germany	1875.72	0.034	10
Greece	3318.41	0.093	45
Hungary	525.55	0.026	7
Ireland	1658.38	0.182	17
Italy	9172.51	0.159	141
Lithuania	82.18	0.01	2
Poland	113.67	0.002	3
Portugal	6413.2	0.336	86
Romania	63673.33	1.495	164
Slovenia	105.92	0.015	2
Spain	25959.92	0.189	205
Sweden	83.11	0.001	2
Netherlands	20.81	0.004	1
UK	10041.97	0.57	53
EU28 total	159585.15	- - -	1048
Algeria	644.52	0.387	7
Morocco	1243.62	0.163	2
TOTAL	**161473.3**		**1057**

The total burnt in protected areas in 2019 was 161 473 ha, over three times that recorded in 2018 and one of the worst in the last 6 years (only 2017 was worse). Romania was the most affected country in 2019, accounting for around 40% of the total Natura2000 burnt area, mostly occurring in the Delta Dunarii Nature Reserve. Burnt areas in protected areas in France and Spain account for around 16% each.

Summary	Total Area (Ha)
EU28	**333542.12**
Other European countries	**199847.03**
Middle East and North Africa	**256340.58**
Natura2000 and protected sites	**161473.29**



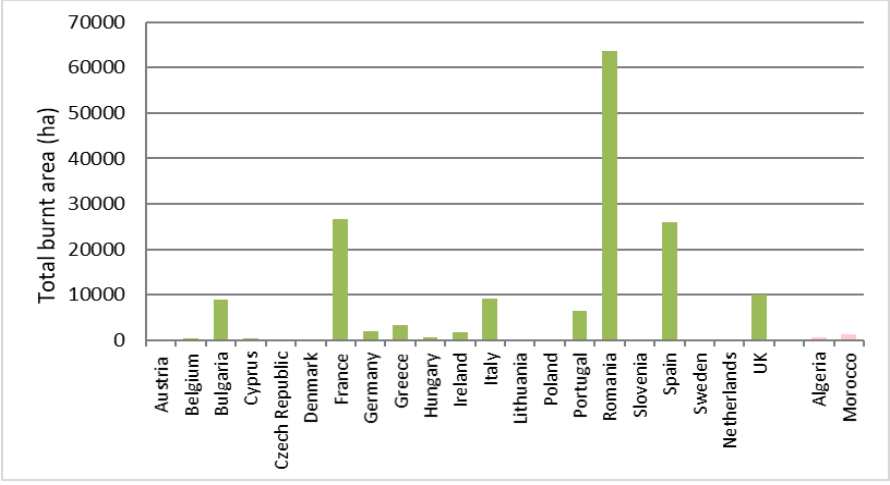


Figure 172. Burnt area in Natura2000 sites and other protected areas in 2019.

Affected land cover types

31% of the burnt area in 2019 was in Forest and Other Wooded Land, as identified by the CORINE Land Cover Type classification system (Figure 173).

Unusually in 2019 the greatest proportion of burnt area (50%) occurred in Other Natural Land. The historic average proportion burnt in Forest and Other Wooded Land is around 45%.

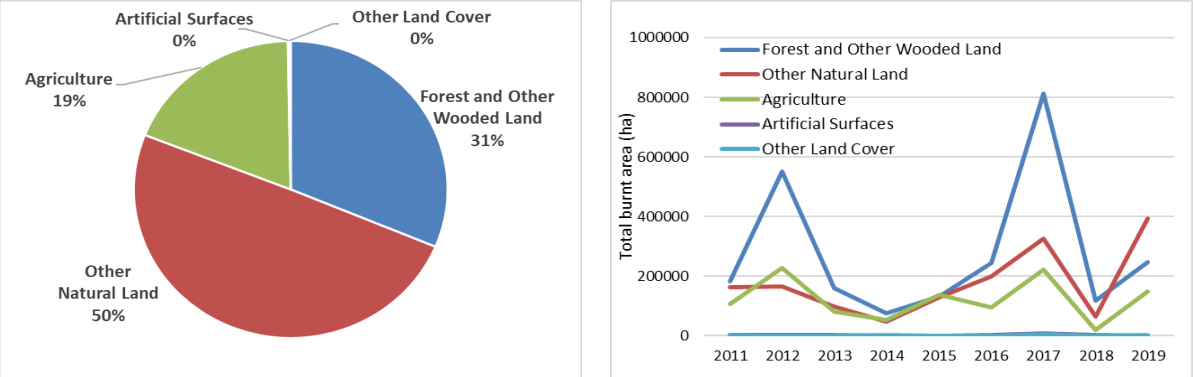


Figure 173. a) Proportions of land cover types affected in 2019 (all countries); b) Total burnt area by land cover type 2011-2019 (all countries).

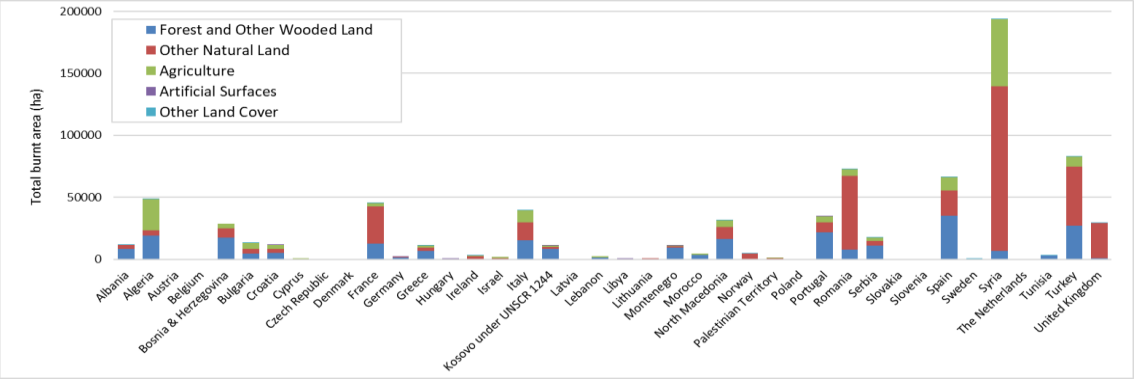


Figure 174. Burnt area in each country in 2019 by CORINE land class

European countries

In 2019, 24 of the EU28 countries were affected by fires of over 30 ha: (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom), burning 333 542 ha in total (around 2.5 times the amount that was recorded in 2018).

Of this total, 159 585 ha (48%) were on Natura2000 sites in 21 of the member states. In 2019, Romania was the most affected country European country, both in terms of total burnt area and affected Natura2000 sites, mostly because of some very large fires in the Danube delta. Italy recorded more fires than any other EU28 country, as shown by Figure 170 and Figure 171 above.

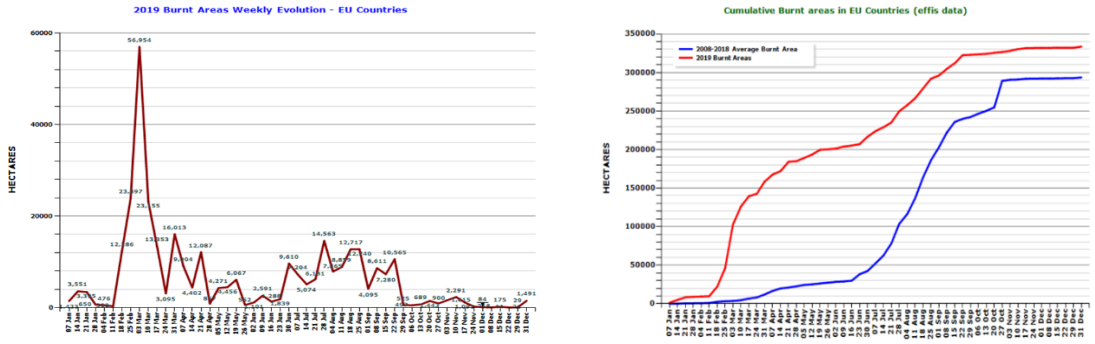


Figure 175. Burnt area weekly evolution and cumulative burnt area in 2019 (European Union countries).

Burnt areas are split into different land cover types using the CLC 2016 database unless otherwise specified.

2.2.1 Albania

Albania's 2019 fire season was somewhat worse than 2018, although still far below the total burnt area mapped in 2017. There were 111 fires of over 30 ha in 2019, burning a total of 11 839 ha. There was quite a lot of activity early in the season, although two-thirds of the damage occurred in August and September. The burnt area scars left by the 2019 fires in Albania can be seen in Figure 176.

Table 47. Distribution of burnt area (ha) in Albania by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	8271.12	69.86
Other Natural Land	3175.65	26.82
Agriculture	378.94	3.2
Artificial Surfaces	6.15	0.05
Other Land Cover	7.04	0.06
TOTAL	**11838.9**	**100**

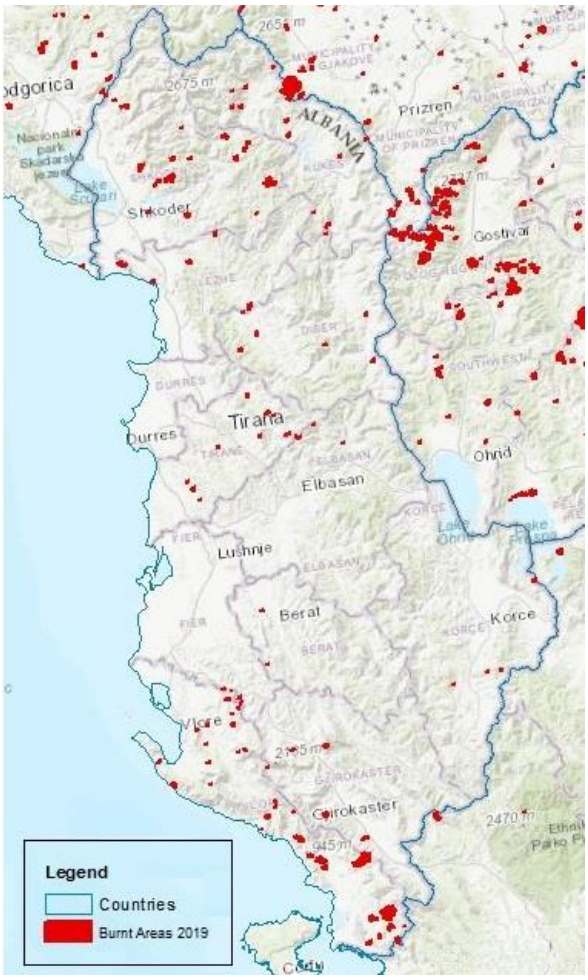


Figure 176. Mapped burnt areas in Albania in 2019.

2.2.2 Austria

In July a fire of 38 ha affected a Natura2000 site in Forest and Other Wooded Land

2.2.3 Belgium

There were 4 fires over 30 ha which burnt a total of 315 ha between February and August. The largest one was mapped at 200 ha in August. The fires all occurred in Other Natural Land, on Natura2000 sites.

2.2.4 Bosnia and Herzegovina

In Bosnia-Herzegovina the season's total was nine times that recorded in 2018, although still well under the burnt area mapped in 2017. Most of the damage occurred early in the season between February and April. In total there were 144 fires over 30 ha mapped in the year, which burned a total of 28 937 ha. Visible fire scars caused by forest fires in Bosnia-Herzegovina can be seen in Figure 177 below.

Table 48. Distribution of burnt area (ha) in Bosnia-Herzegovina by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	17346.36	59.95
Other Natural Land	7726.09	26.7
Agriculture	3864.09	13.35
TOTAL	**28936.54**	**100**

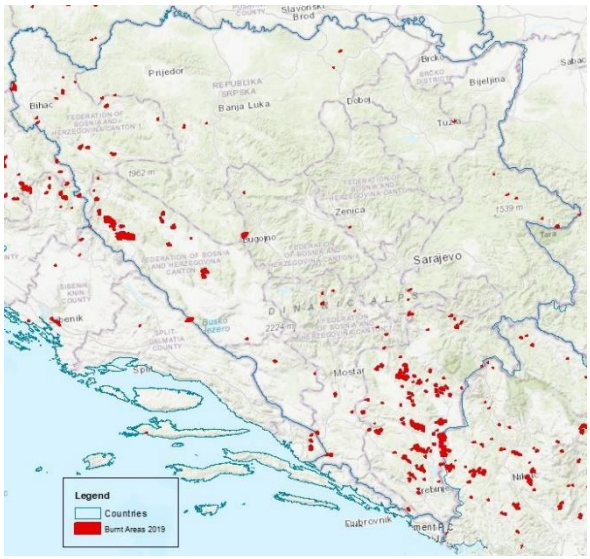


Figure 177. Mapped burnt areas in Bosnia and Herzegovina in 2019.

2.2.5 Bulgaria

Bulgaria's fire season was the worst recorded since 2012. 90 fires over 30 ha burned a total of 13 828 ha from February to December, with peaks in March and September. Seven fires were over 500 ha in size. Of the annual total, 9 006 ha occurred on Natura2000 sites, amounting to 65% of the total and 0.24% of Natura2000 land. The scars caused by these fires can be seen in Figure 178.

Table 49. Distribution of burnt area (ha) in Bulgaria by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	4952.23	35.81
Other Natural Land	3755.07	27.16
Agriculture	4765.12	34.46
Artificial Surfaces	21.16	0.15
Other Land Cover	334.35	2.42
TOTAL	**13827.91**	**100**

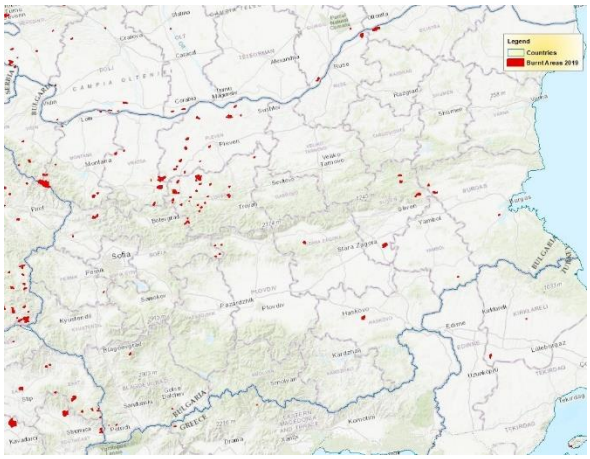


Figure 178. Mapped burnt areas in Bulgaria in 2019.

2.2.6 Croatia

The mapped burnt area total of 11 960 ha in Croatia in 2019 was almost 10 times the amount recorded in 2018, although still far below the 2017 figures. 75 fires over 30 ha were mapped between January and July, with the majority occurring early in the season in February and March. The worst hit region was Licko-senjska province, with two fires over 1 000 ha and a third one of nearly 900 ha at the end of February. The scars caused by these fires can be seen in Figure 179.

Table 50. Distribution of burnt area (ha) in Croatia by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	5165.92	43.19
Other Natural Land	3222.17	26.94
Agriculture	3481.82	29.11
Artificial Surfaces	89.84	0.75
TOTAL	**11959.74**	**100**

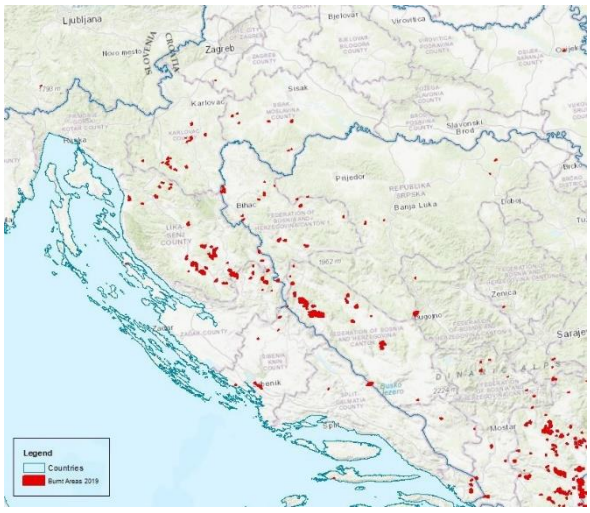


Figure 179. Mapped fire scars in Croatia in 2019.

2.2.7 Cyprus

The fire season in Cyprus was similar to the previous two years, with a mild season leading to a total burnt area of 625 ha. Of this total, 420 ha occurred on Natura2000 sites, around two-thirds of the total and 0.258% of the Natura2000 area of the country.

Table 51. Distribution of burnt area (ha) in Cyprus by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	445.11	71.17
Other Natural Land	54.74	8.75
Agriculture	125.59	20.08
TOTAL	**625.44**	**100**

2.2.8 Czech Republic

Two fires, totalling 52.5 ha, were mapped in the Czech Republic in April and November, all on Other Natural Land. Of the total, just over half (30 ha) occurred on Natura2000 sites, amounting to 0.003% of the Natura2000 area of the country.

2.2.9 Denmark

For the third year, fires of over 30 ha were mapped in Denmark. Two fires burned a total of 108 ha in April and May. 85% of this total (91 ha) occurred on Natura2000 land, which amounts to 0.024% of the Natura2000 area of the country.

Table 52. Distribution of burnt area (ha) in Denmark by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	24.86	23.08
Other Natural Land	82.83	76.92
TOTAL	**107.69**	**100**

2.2.10 France

France suffered the worst year for a decade and was the third most affected EU country. The total mapped burnt area of 45 235 ha was greater than the past seven years combined. Three-quarters of the burnt resulted from a number of very large fires in the Pyrénées-Atlantiques early in the season in February (Figure 181). The largest of these burned 2 417 ha, and there were 13 other fires of over 500 ha, of which 11 were in the Pyrénées-Atlantiques (Figure 180).

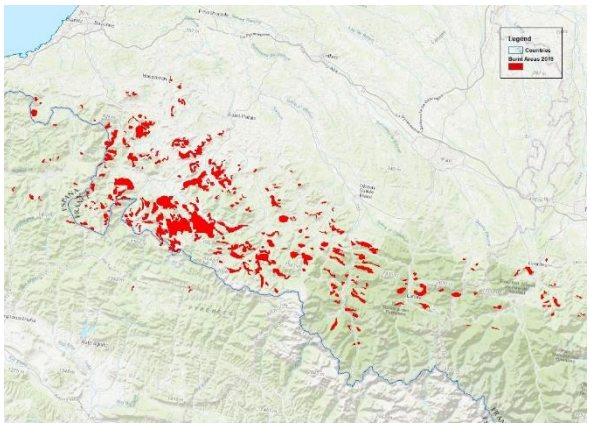


Figure 180. Fires scars caused by the early season fires in the Pyrénées-Atlantiques.

Of the annual total, 26 641 ha were on Natura2000 sites, corresponding to 59% of the total area burned, and 0.388% of the total Natura2000 areas in the country.

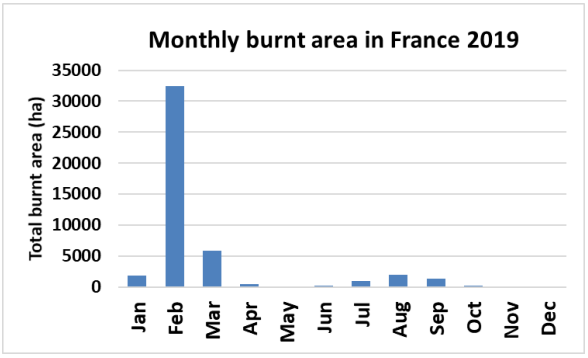


Figure 181. Monthly mapped burnt areas in France in 2019.

Table 53 presents the distribution of the mapped burnt area by land cover type. The burnt scars left by the fires occurring in the southern region of the country are shown in Figure 182.

Table 53. Distribution of burnt area (ha) in France by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	12946.15	28.62
Other Natural Land	29502.30	65.22
Agriculture	2769.12	6.12
Artificial Surfaces	5.33	0.01
Other Land Cover	11.63	0.03
TOTAL	**45234.52**	**100**

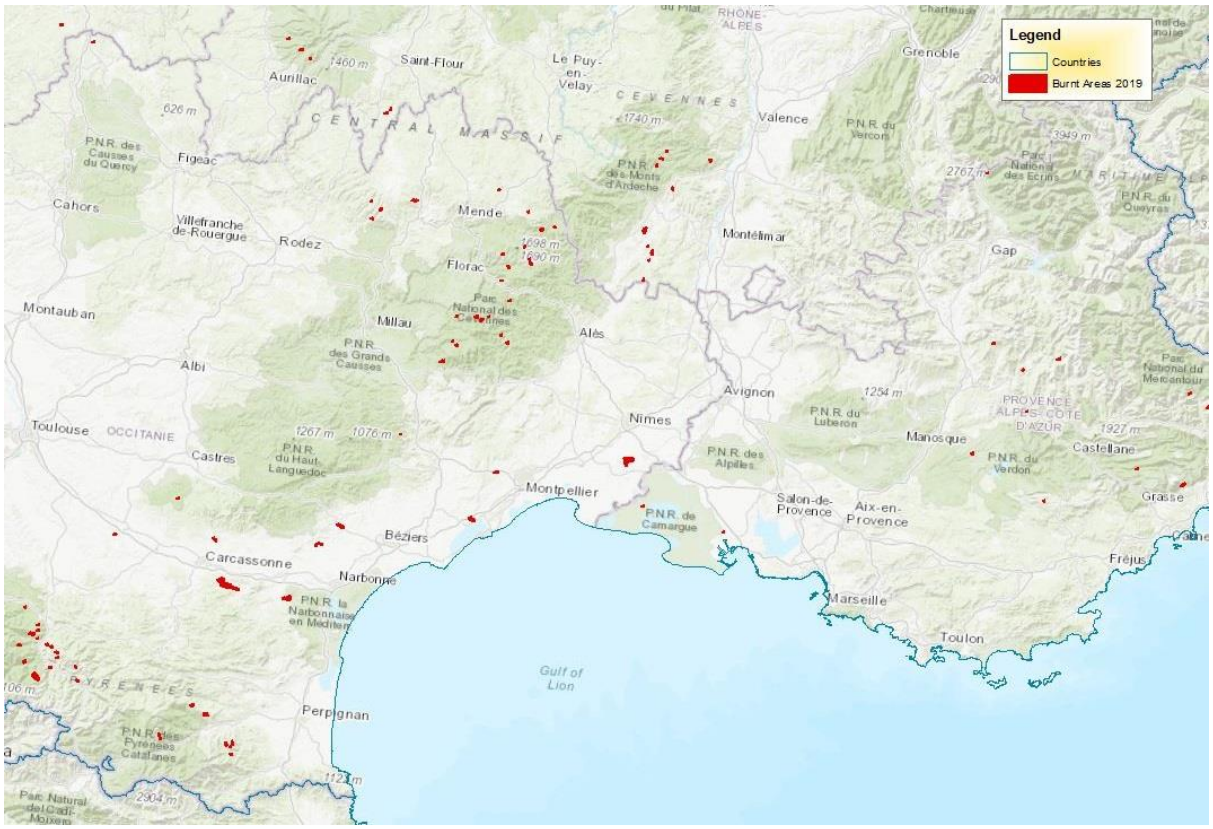


Figure 182. Visible burnt area scars in the South of France in 2019.

2.2.11 Germany

The fire season in Germany was less extreme than 2018, but worse than in previous years. The total burnt area of 2 054 ha was just over half that recorded in the previous year, but well above longer term averages. 14 fires over 30 ha occurred between April and August, but almost all of the damage occurred in June and July, including two of over 500 ha in the northern half of the country. Of the annual total, 1 876 ha occurred in Natura2000 sites, amounting to 91% of the total and 0.034% of the Natura2000 area in the country.

Table 54. Distribution of burnt area (ha) in Germany by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	1401.74	68.23
Other Natural Land	639.62	31.13
Agriculture	3.63	0.18
Artificial Surfaces	9.49	0.46
TOTAL	2054.48	100

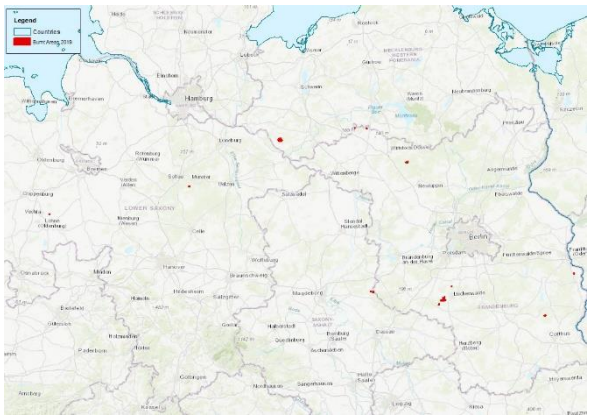


Figure 183. Fire scars in northern Germany in 2019.

2.2.12 Greece

In terms of burnt area, the fire season in Greece was similar to that of 2018. There were 70 fires over 30 ha which affected a total area of 11 110 ha. Half of the damage occurred in August, including the largest fire of the season in Greece, which burned 2 889 ha in Euboea province. There were also 5 other fires of over 500 ha.

Of the total, 3 318 ha occurred on Natura2000 sites, amounting to 30% of the total and 0.093% of the total Natura2000 area of Greece.

Table 55 presents the distribution of the mapped burnt area by land cover type. Figure 184 shows the burnt area scars in Greece.

Table 55. Distribution of burnt area (ha) in Greece by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	7023.02	63.21
Other Natural Land	2405.95	21.66
Agriculture	1680.77	15.13
Artificial Surfaces	0.1	0
Other Land Cover	0.36	0
TOTAL	**11110.19**	**100**

Figure 184. Burnt area scars in Greece in 2019.

2.2.13 Hungary

In Hungary 10 fires over 30 ha were mapped, one in March and the rest in April when 90% of the damage occurred. Of the 602 ha total, 526 ha occurred on Natura2000 sites, representing 87% of the burnt total and 0.026% of the Natura2000 area in the country.

Table 56. Distribution of burnt area (ha) in Hungary by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	61.59	10.24
Other Natural Land	498.48	82.85
Agriculture	41.04	6.82
Artificial Surfaces	0.56	0.09
TOTAL	**601.67**	**100**

Figure 185. Mapped burnt area scars in Hungary 2019.

2.2.14 Ireland

The fire season in Ireland was very similar to that of 2018, with 2 896 ha affected by 23 fires of over 30 ha. The fire season started in January, and most of the damage occurred early, in February and April. The largest fire of the year burned 730 ha in Annagary in the north-west of the country, while most of the rest of the damage was around the Dublin region. 57% of the burnt area (1 658 ha) was recorded in Natura2000 sites, corresponding to 0.182% of the total Natura2000 land in the country. The most affected land type was Other Natural Land, as shown in Table 57.

Table 57. Distribution of burnt area (ha) in Ireland by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	82.46	2.85
Other Natural Land	2692.31	92.98
Agriculture	100.84	3.48
Other Land Cover	19.92	0.69
TOTAL	**2895.54**	**100**

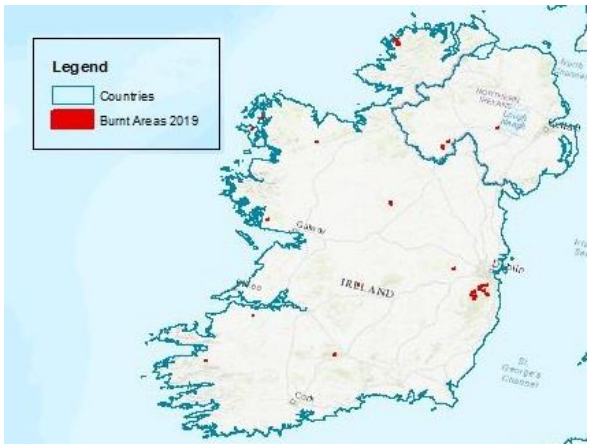


Figure 186. Burnt area scars in Ireland in 2019.

2.2.15 Italy

Italy was again the country with the most fires over 30 ha mapped, with 448 fires burning 39 655 ha throughout the year from January to December, and it was the fourth most affected EU country in terms of burnt area. However, many of the fires were relatively small, so the total burnt area was close to the long-term average.

Table 58. Distribution of burnt area (ha) in Italy by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	15587.51	39.31
Other Natural Land	14403.79	36.32
Agriculture	9424.24	23.77
Artificial Surfaces	219.8	0.55
Other Land Cover	20.03	0.05
TOTAL	**39655.38**	**100**

The season started early, and some of the largest fires of the year were seen in the north of the country in January and March, including one of 1 903 ha in Vercelli province (Figure 187).

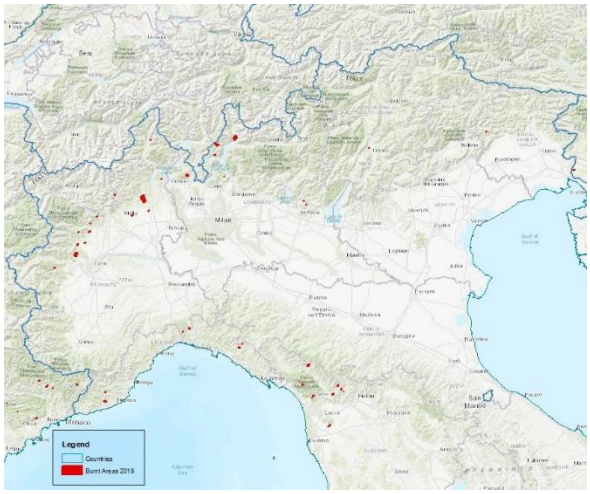


Figure 187. Burnt area scars in northern Italy in the early months of 2019.

However, two-thirds of the damage occurred in the summer months, when large fires were mapped in Sicily, Sardinia and the southern regions. Of the year's total, 9 173 ha occurred on Natura2000 sites, corresponding to 23% of the total and 0.159% of the Natura2000 land in Italy. Table 58 presents the distribution of the mapped burnt area by land cover type.

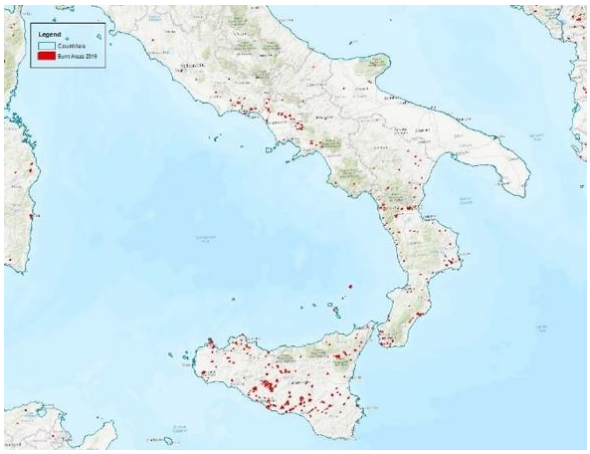


Figure 188. Burnt area scars in Sicily and central/southern regions of Italy in 2019.

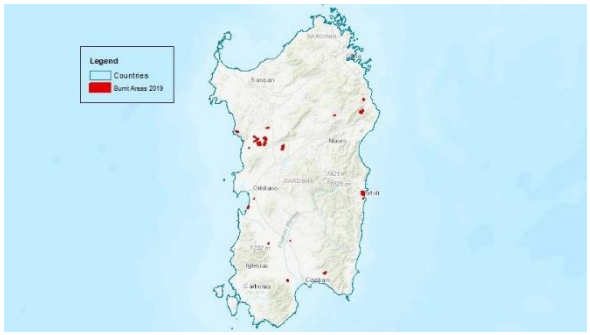


Figure 189. Fire scars in Sardinia in 2019.

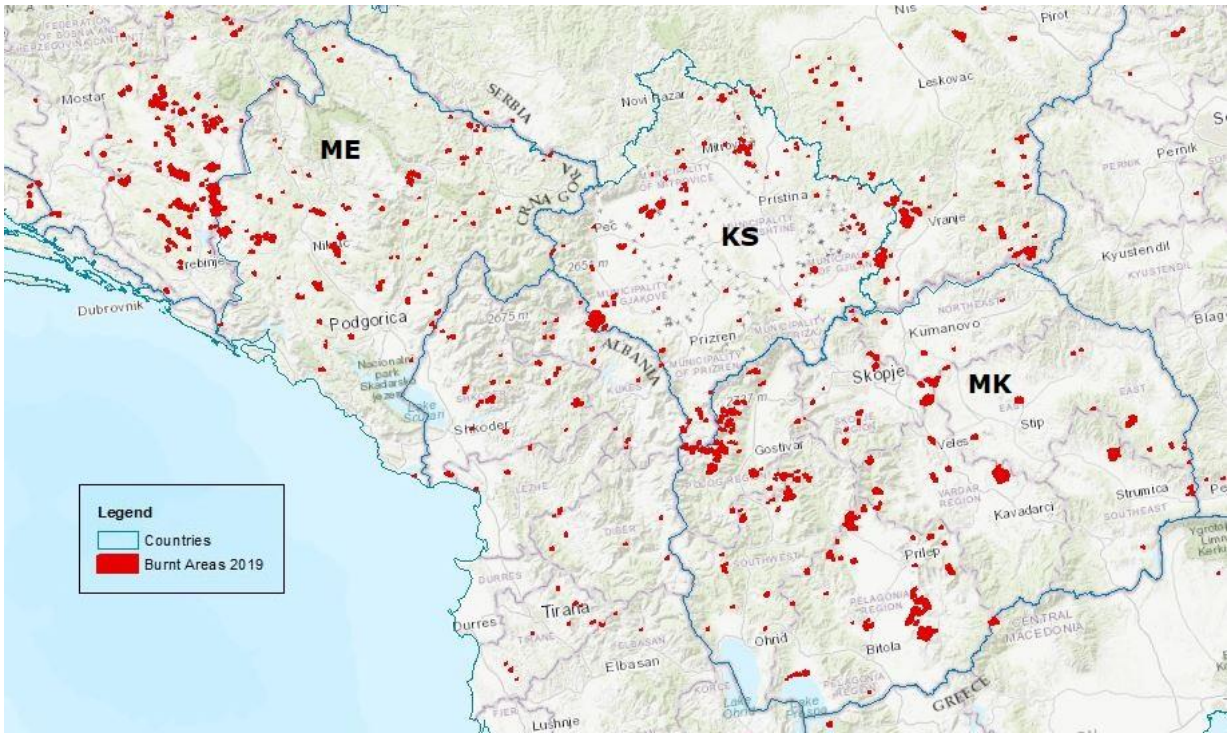


Figure 190. Mapped burnt area scars in Montenegro (ME), Kosovo under UNSCR 1244 (KS) and North Macedonia (MK) in 2019.

2.2.16 Kosovo under UNSCR 1244

The fire season in Kosovo was the worst for several years, with a greater burnt area mapped than in the last six years combined. 89 fires of over 30 ha burned a total of 10 899 ha, almost eight times the 2018 total. Fires occurred from March to November, with most of the damage occurring early in the season. Table 59 shows the classification of the burnt area by land type and Figure 190 shows the mapped burnt area scars.

Table 59. Distribution of burnt area (ha) in Kosovo by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	8447.5	77.51
Other Natural Land	1456.57	13.36
Agriculture	994.39	9.12
Artificial Surfaces	0.1	0
TOTAL	**10898.55**	**100**

2.2.17 Latvia

After a bad year in 2018, Latvia's fire season was very quiet, with only one fire of around 50 ha mapped in May. No Natura2000 land was affected.

Table 60. Distribution of burnt area (ha) in Latvia by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	38.17	77.24
Other Natural Land	11.24	22.76
TOTAL	**49.42**	**100**

2.2.18 Lithuania

Lithuania, a country not usually affected by large fires, had an unusual year where 4 fires over 30 ha were mapped in April and June. Of the total 235 ha burnt area, 82 ha (35%) occurred on Natura2000 land, amounting to 0.01% of the Natura2000 area of the country.

Table 61. Distribution of burnt area (ha) in Lithuania by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	167.97	71.39
Other Natural Land	67.33	28.61
TOTAL	**235.3**	**100**

2.2.19 Montenegro

The burnt area total of 11 284 ha from 86 fires in Montenegro was over twice the amount recorded in 2018, but close to the long-term average. Fires were recorded through the year from February to November, with most of the damage (82%) occurring early in the year in March and April. Figure 190 shows the mapped burnt area scars.

Table 62. Distribution of burnt area (ha) in Montenegro by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	9467.25	83.9
Other Natural Land	1244.57	11.03
Agriculture	566.09	5.02
Artificial surfaces	6.43	0.06
Other Land Cover	0.03	0
TOTAL	**11284.36**	**100**

2.2.20 The Netherlands

In the Netherlands a fire burned 20.81 ha in May, all in Other Natural Land. No Natura2000 was affected.

2.2.21 North Macedonia

North Macedonia had the worst year for a decade, beating even the total mapped in the extreme year of 2017. Fires of over 30 ha were recorded throughout the year, with two peaks, one in March when 30% of the damage occurred, and a second late in the year from September to November (Figure 191). The burnt area scars are displayed in Figure 190 above.

Table 63. Distribution of burnt area (ha) in North Macedonia by land cover types in 2019.

Land cover	*Area burned*	*% of total*
Forest/Other Wooded Land	16555.28	52.22
Other Natural Land	9469.78	29.87
Agricultural Areas	5617.97	17.72
Other Land Cover	60.02	0.19
TOTAL	**31703.05**	**100**

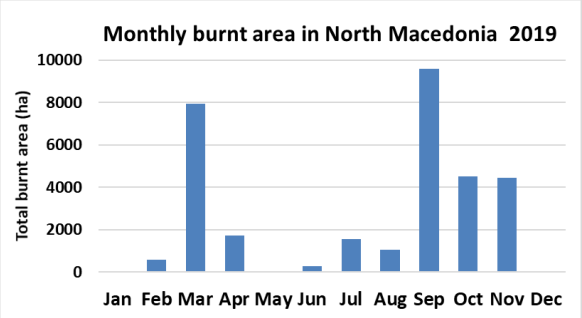


Figure 191. Monthly mapped burnt area in North Macedonia in 2019.

2.2.22 Norway

Norway's fire season was the worst for several years. 35 fires over 30 ha burned 4 654 ha in April and May. 90% of the damage occurred on Other Natural Land, as shown in Table 64.

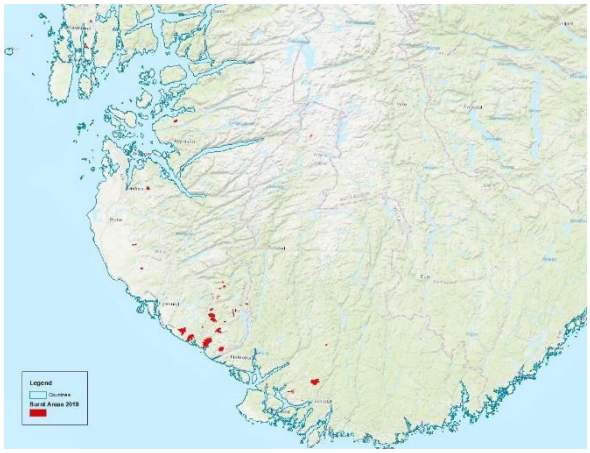


Figure 192. Fire scars in the south of Norway 2019.

Table 64. Distribution of burnt area (ha) in Norway by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	418.91	9
Other Natural Land	4215.55	90.59
Agriculture	18.15	0.39
Other Land Cover	0.9	0.02
TOTAL	**4653.51**	**100**

2.2.23 Poland

There were 6 fires over 30 ha in Poland burning a total of 182 ha, less than half the amount mapped in 2018. Of the total, 114 ha (63%) occurred on Natura2000 sites, corresponding to 0.002% of the Natura2000 area of the country.

Table 65. Distribution of burnt area (ha) in Poland by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	55.51	30.54
Other Natural Land	100.26	55.17
Agriculture	25.97	14.29
TOTAL	**181.75**	**100**

2.2.24 Portugal

In 2019 Portugal had a relatively quiet year. The total burnt area was comparable with that of 2018 and below the long-term average. 222 fires over 30 ha burned a total of 34 661 ha, the lowest mapped since 2014. Fires were recorded in every month except November, with two peaks in July and September. There were 11 fires over 500 ha, including one of nearly 10 000 ha in Amendoa in Pinhal Interior Sul province, the second largest fire mapped in Europe in 2019.

The mapped burnt areas in Portugal in 2019 can be seen in Figure 193. Of the mapped total, 6 413 ha occurred on Natura2000 sites, corresponding to 18.5% of the total area burnt, and 0.336 % of the total Natura2000 areas in Portugal. The distribution of the mapped burnt area by land cover type is shown in Table 66.

Table 66. Distribution of burnt area (ha) in Portugal by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	21670.25	62.52
Other Natural Land	8435.43	24.34
Agriculture	4483.22	12.93
Artificial Surfaces	72.47	0.21
TOTAL	**34661.37**	**100**

Figure 193. Burnt area scars in Portugal in 2019.

2.2.25 Romania

In 2019 Romania was unusually the most affected European country, with a total burnt area of 73 444 ha from 242 fires, the highest amount by a large margin for several years. Most of the damage occurred early in the year in Other Natural Land in Tulcea province on the east of the country, although there was also significant damage in the south-western regions. The largest fire mapped in Europe was over 10 000 ha and occurred in March in Sfantu Gheorghe, Tulcea. Fires were mapped throughout the year but 85% of the damage occurred in February and March (Figure 195).

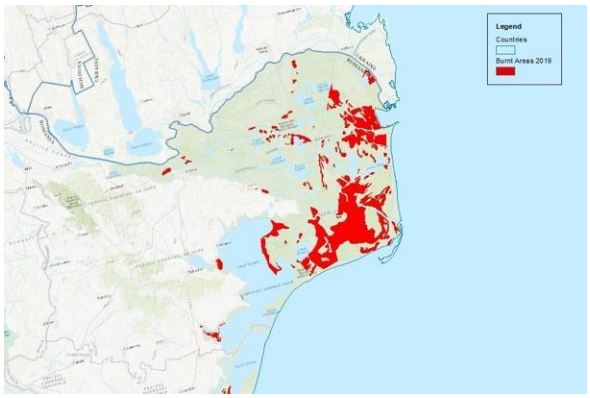


Figure 194. Detail of fire scars in the Danube Delta in 2019.

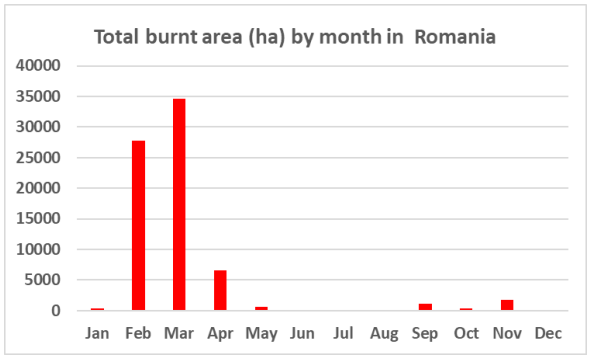


Figure 195. monthly burnt area in Romania 2019.

Of the total, 63 673 ha (87%) of the mapped burnt area was on Natura2000 sites. This represents 1.495% of the total Natura2000 area of Romania, and was the highest loss of protected land in Europe in 2019. Table 67 presents the distribution of the mapped burnt area by land cover type.

Table 67. Distribution of burnt area (ha) in Romania by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	7804.03	10.63
Other Natural Land	59396.62	80.87
Agriculture	5339.02	7.27
Artificial Surfaces	11.67	0.02
Other Land Cover	892.8	1.22
TOTAL	**73444.14**	**100.01**

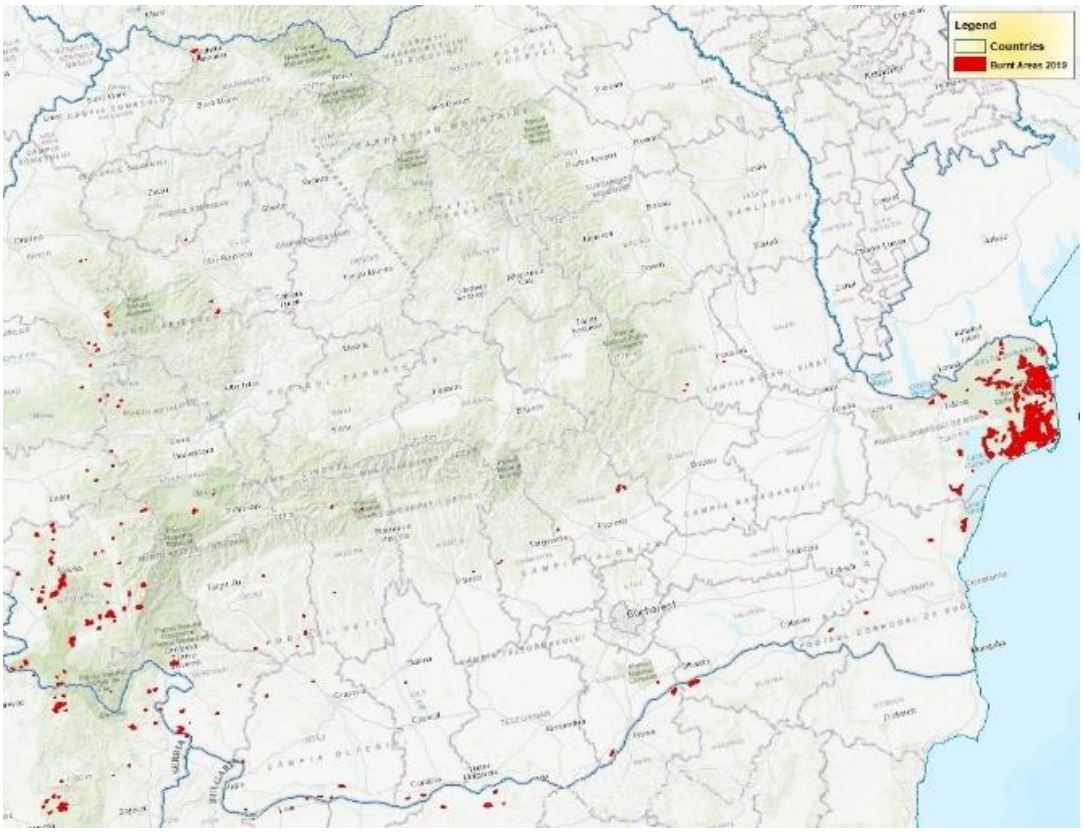


Figure 196. Burnt area scars in Romania in 2019.

2.2.26 Serbia

In common with some other eastern parts of the continent, Serbia experienced the worst fire season for several years. The mapped total burnt area of 17 386 ha was three times that recorded in 2018, and more than the previous 5 years combined. 114 fires over 30 ha were mapped between February and November, with two peaks: one in March/April and a late second peak in November.

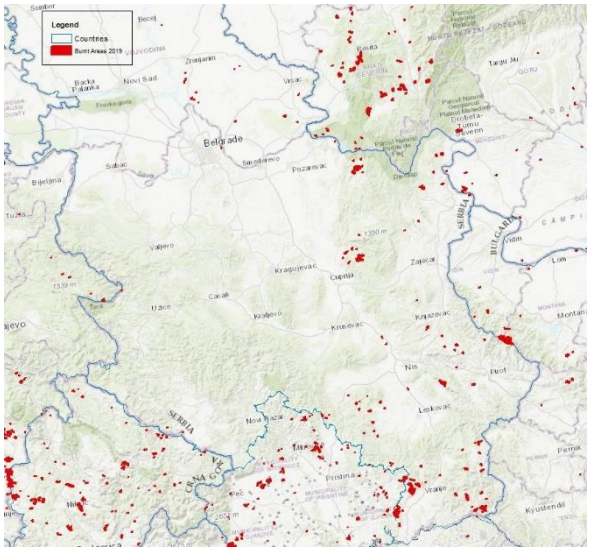


Figure 197. Burnt area scars in Serbia in 2019.

Table 68. Distribution of burnt area (ha) in Serbia by land cover type in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	10881.89	62.59
Other Natural Land	4222.96	24.29
Agriculture	2261.74	13.01
Artificial Surfaces	0.14	0
Other Land Cover	19.03	0.11
TOTAL	**17385.76**	**100**

2.2.27 Slovakia

In June a fire of 24.64 ha was mapped in Other Natural land. No Natura2000 land was affected.

2.2.28 Slovenia

There were two fires mapped in Slovenia: one in March and the other in August. Both were in Natura2000 areas, amounting to 0.015% of the Natura2000 area of the country.

Table 69. Distribution of burnt area (ha) in Slovenia by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	80.57	76.07
Other Natural Land	25.35	23.93
TOTAL	**105.92**	**100**

2.2.29 Spain

Spain was the second most affected European country after Romania, in terms of burnt area. The total of 66 406 ha mapped from 424 fires over 30 ha was over 5 times greater than that recorded in 2018, although close to the long-term average. Fires were mapped in every month of the year, with two peaks; one early in the year in February/March, affecting northern regions, and the other in the traditional summer season July/August.

The largest fire of the year occurred in Gran Canaria and burned almost 9 000 ha, and there were 12 other fires larger than 500 ha.

Figure 198. Fire scar in Gran Canaria in 2019.

Of the total burnt area mapped in 2019, 25 960 ha were on Natura2000 sites, corresponding to 39% of the total area burned, and 0.189% of the Natura2000 areas in Spain.

Table 70 presents the distribution of the mapped burnt area by land cover type. The most noticeable fires in Spain during 2019 are shown in Figure 200.

Table 70. Distribution of burnt area (ha) in Spain by land cover type in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	35131.18	52.9
Other Natural Land	20292.47	30.56
Agriculture	10859.55	16.35
Artificial Surfaces	84.63	0.13
Other Land Cover	37.66	0.06
TOTAL	**66405.5**	**100**

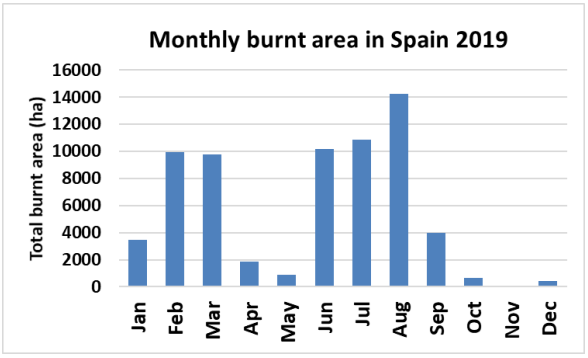


Figure 199. Monthly mapped burnt area in Spain in 2019.

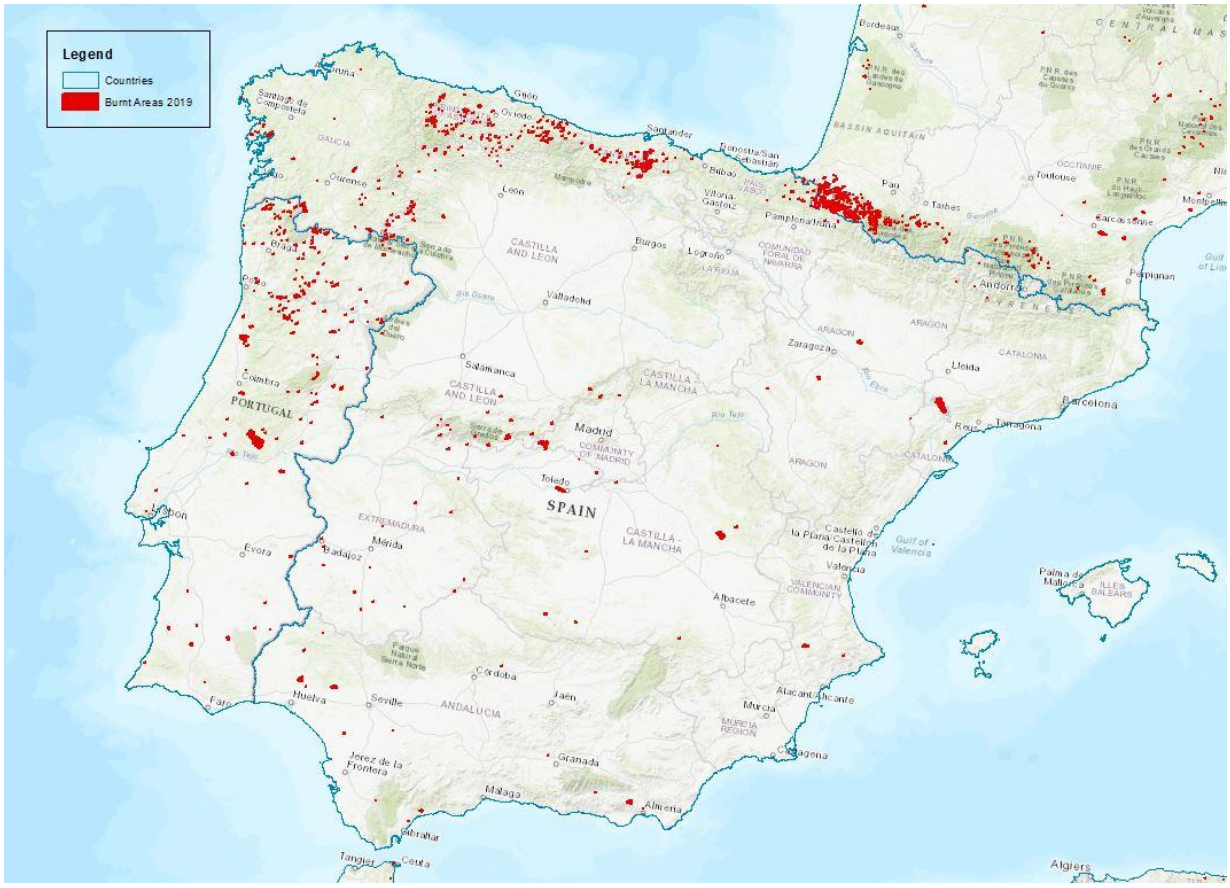


Figure 200. Fire scars in Spain in 2019.

2.2.30 Sweden

After the worst fire season in memory in 2018, Sweden's 2019 fire season was more typical of previous years. There were 10 fires over 30 ha mapped, burning a total of 538 ha between April and August. 83 ha of this total was on Natura2000 land, amounting to 15% of the total and 0.001% of the Natura2000 area of the country. Most of the burnt area occurred in Forest and Other Wooded Land (Table 71).

Table 71. Distribution of burnt area (ha) in Sweden by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	439.83	81.69
Other Natural Land	88.23	16.39
Agriculture	10.29	1.91
Other Land Cover	0.05	0.01
TOTAL	**538.39**	**100**

2.2.31 Turkey

Turkey was the second most affected country across Europe, Middle East and North Africa in 2019. The burnt area total was 83 146 ha from 396 fires over 30 ha, around twice that recorded in 2018. Fires were mapped between March and December, although over 50% of the damage occurred in August. The most affected land type was Other Natural Land. Table 72 presents the distribution of the mapped burned area by land cover type. The visible scars from forest fires in the south-east of the country are shown in Figure 201.

Table 72. Distribution of burnt area (ha) in Turkey by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	27201.56	32.72
Other Natural Land	47643.28	57.3
Agriculture	8159.45	9.81
Artificial Surfaces	55.01	0.07
Other Land Cover	86.92	0.1
TOTAL	**83146.22**	**100**

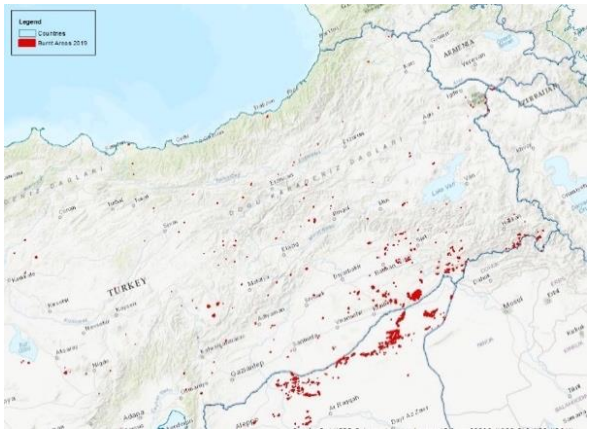


Figure 201. Burnt area scars in Turkey in 2019.

2.2.32 United Kingdom

For the fourth year in a row, the annual burnt area increased in the UK. The season lasted for the first six months of the year, peaking in April when almost half of the damage occurred. In total there were 137 fires of over 30 ha, which burned a total of 29 395 ha, over 50% more than in 2018 and the most for at least 8 years. Eleven of the fires were more than 500 ha, including one of over 5 000 ha in Scotland. Of the total, 10 042 ha occurred on Natura2000 land, amounting to 34% of the total burnt area and 0.57% of the Natura2000 land in the UK. As is usual for the UK, Other Natural Land was by far the most affected land type (Table 73).

Table 73. Distribution of burnt area (ha) in the UK by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	1045.21	3.56
Other Natural Land	28122.58	95.67
Agriculture	56.81	0.19
Artificial Surfaces	165.76	0.56
Other Land Cover	4.76	0.02
TOTAL	**29395.12**	**100**

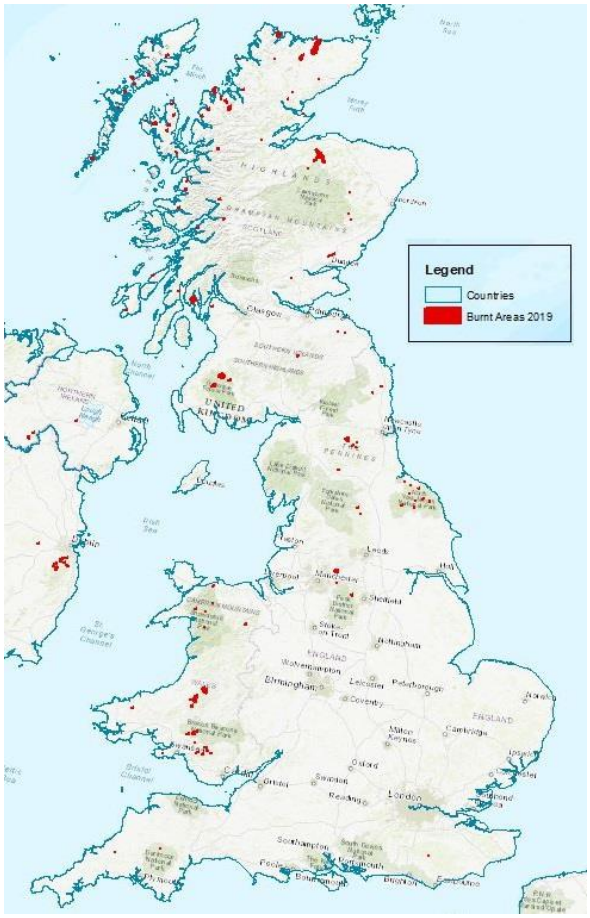


Figure 202. Burnt area scars in the UK in 2019.

2.3 Middle East and North Africa

The 2019 fire season in North Africa and the Middle East was the worst seen for 10 years, mostly as a result of some extremely large fires in Syria. In general, the North African countries experienced average conditions while those in the Middle East were worse than usual.

2.3.1 Algeria

The total mapped burnt area in Algeria was lower than the long term average. 164 fires over 30 ha were mapped for a total burnt area of 48 512 ha. Fires were recorded between June and October, with half of the damage occurring in August. 644 ha of protected areas were burnt, amounting to 0.387% of the protected land of Algeria. The Globcover land cover map from ESA was used to split the burnt area into different land type categories, harmonised with CLC terminology, and the distribution of burnt area by these land cover types is given in Table 74.

The burnt scars left by these fires can be seen in Figure 204 below.

Table 74. Distribution of burnt area (ha) in Algeria by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	19072.46	39.31
Other Natural Land	4299.96	8.86
Agriculture	25135.16	51.81
Artificial Surfaces	4.37	0.01
Other Land Cover	0.38	0
TOTAL	**48512.33**	**99.99**

2.3.2 Israel

Twelve large fires were mapped in Israel, burning a total of 1 867 ha between May and November. Over half of the fires were in May. Almost two thirds of the land type affected was agricultural areas.

Table 75. Distribution of burnt area (ha) in Israel by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	588	31.49
Other Natural Land	147.39	7.89
Agriculture	1132.04	60.62
TOTAL	**1867.43**	**100**

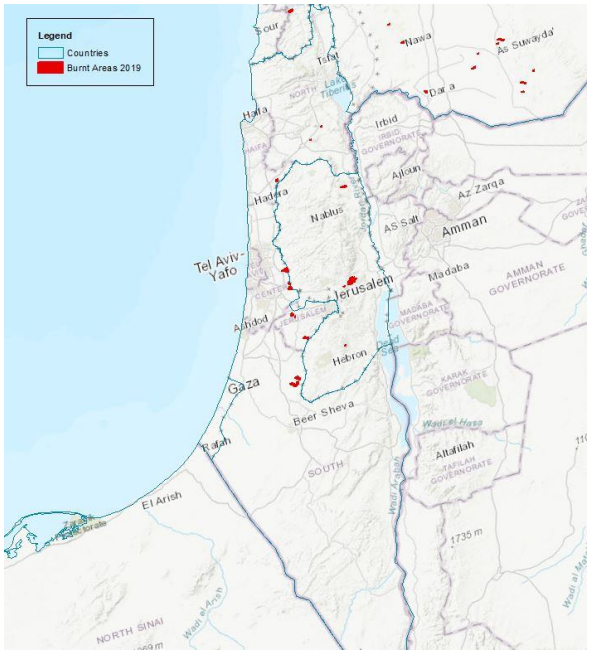


Figure 203. Mapped burnt area scars in Israel in 2019.

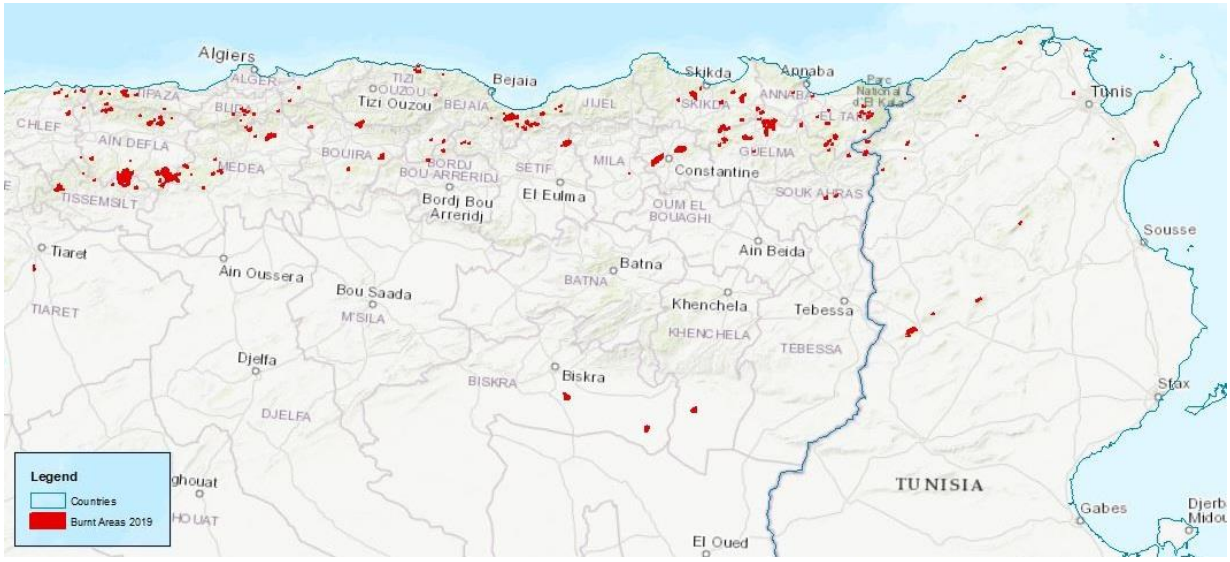


Figure 204. Mapped burnt area scars in northern Algeria and Tunisia in 2019.

2.3.3 Lebanon

Lebanon's fire season was by far the worst for a number of years, mostly as a result of several large fires in Forest and Other Wooded Land unusually late in the season in October. Table 76 presents the distribution of the mapped burnt area by land cover type using the Globcover land cover map, harmonised with CLC.

Table 76. Distribution of burnt area (ha) in Lebanon by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	1276.77	55.15
Other Natural Land	245.42	10.6
Agriculture	792.83	34.25
TOTAL	**2315.02**	**100**

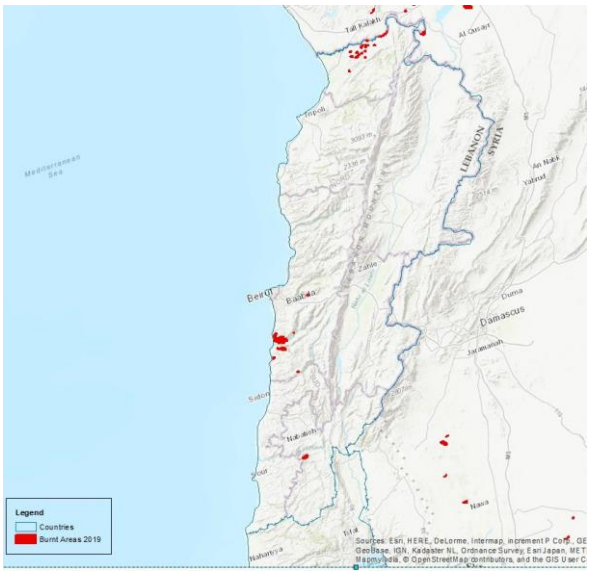


Figure 205. Mapped burnt area scars in Lebanon in 2019.

2.3.4 Libya

Eight fires over 30 in Libya were mapped between May and December, covering a total of 716 ha, over twice as much as in 2018. Two-thirds of the damage occurred in May and June. Table 77 presents the distribution of the mapped burnt area by land cover type using the Globcover land cover map, harmonised with CLC.

Table 77. Distribution of burnt area (ha) in Libya by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	81.59	11.39
Other Natural Land	527.05	73.57
Agriculture	59.33	8.28
Artificial Surfaces	48.4	6.76
TOTAL	**716.36**	**100**

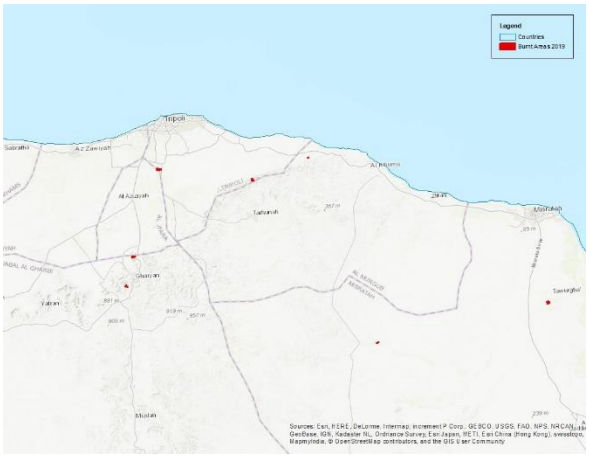


Figure 206. Mapped burnt area scars in Libya in 2019.

2.3.5 Morocco

The fire season in Morocco similar to that of 2016 and 2017, after a very good year in 2018. There were 26 fires over 30 ha mapped, which burnt a total of 4 811 ha between June and October, with most of the damage occurring in August/September. Of the annual total, 1 244 ha occurred in Protected Areas, amounting to 26% of the total burnt in the year and 0.163% of the total protected areas of the country. The distribution of burnt area by land cover types, using Morocco's own land cover map but with terminology harmonised with CLC, is given in Table 78 and the burnt area scars left by the fires are shown in Figure 207.

Table 78. Distribution of burnt area (ha) in Morocco by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	3597.24	74.77
Other Natural Land	128.9	2.68
Agriculture	1084.99	22.55
TOTAL	**4811.13**	**100**

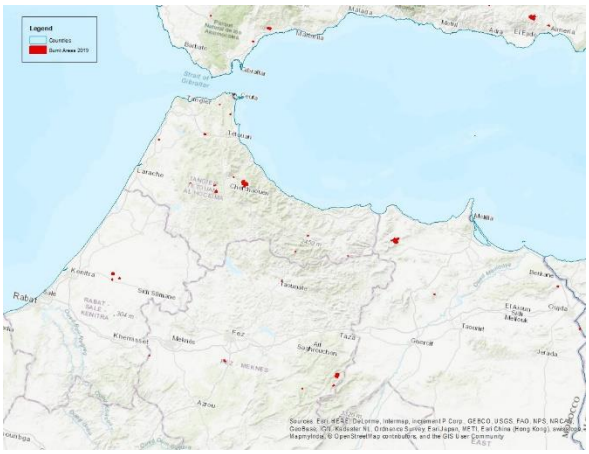


Figure 207. Mapped burnt area scars in Morocco in 2019.

2.3.6 Syria

The total mapped burnt area in Syria was the highest recorded across Europe, Middle East and North Africa, by a significant margin. The fire season lasted from May to November, with three-quarters of the damage occurring in May and June. There were 303 fires over 30 ha mapped, resulting in a total burnt area of 193 616 ha. The average fire size was very high, and there were 63 fires over 500 ha, two of which were over 10 000 ha, the largest two burnt areas recorded anywhere over the entire area covered. The Globcover land cover map, harmonised with CLC, was used to split the burnt area into different land type categories, showing that the most affected land type was Other Natural Land (Table 79).

Table 79. Distribution of burnt area (ha) in Syria by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	6911.02	3.57
Other Natural Land	132490.51	68.43
Agriculture	54202.3	27.99
Other Land Cover	12.38	0.01
TOTAL	**193616.2**	**100**

2.3.7 Tunisia

Tunisia had a better than average fire season, although the total burnt area was higher than in 2018. A total of 26 fires over 30 ha were mapped, resulting in a total burnt area of 3 210 ha, almost all of them occurring in July and August and affecting mostly Forest and Other Wooded Land. Figure 204 on page 144 shows the burnt scars left by these fires. The distribution of burnt area by land cover types using Tunisia's own land cover map but with terminology harmonised with CLC, is given in Table 80.

Table 80. Distribution of burnt area (ha) in Tunisia by land cover types in 2019.

Land cover	Area burned	% of total
Forest/Other Wooded Land	2874.31	89.54
Other Natural Land	59.36	1.85
Agriculture	256.91	8
Artificial Surfaces	15.14	0.47
Other Land Cover	4.24	0.13
TOTAL	**3209.96**	**100**

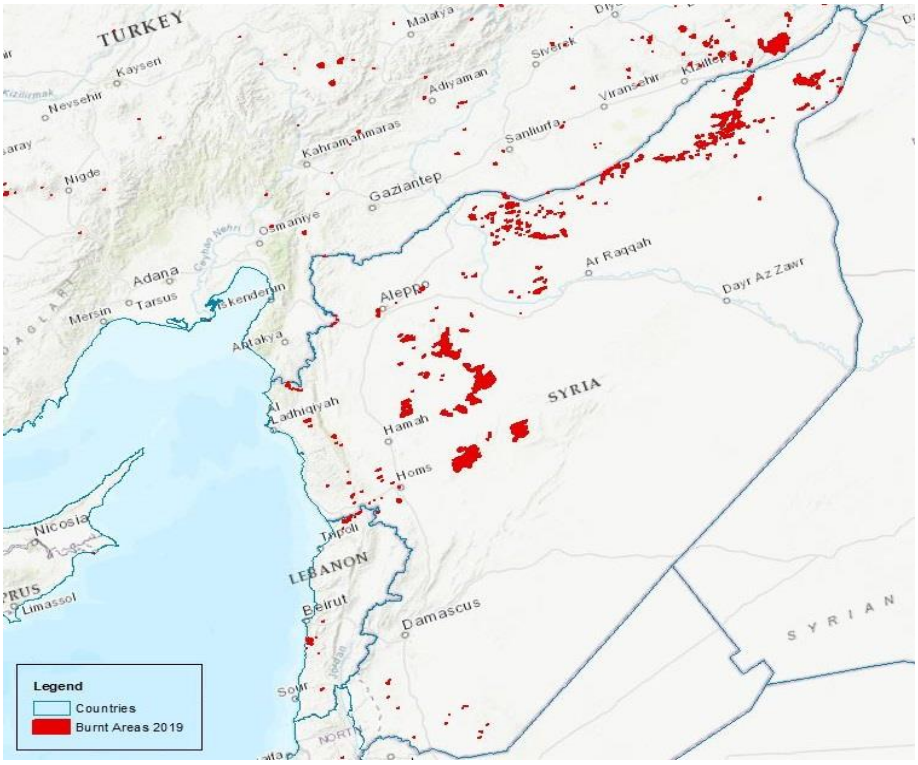


Figure 208. Mapped burnt area scars in Syria in 2019.

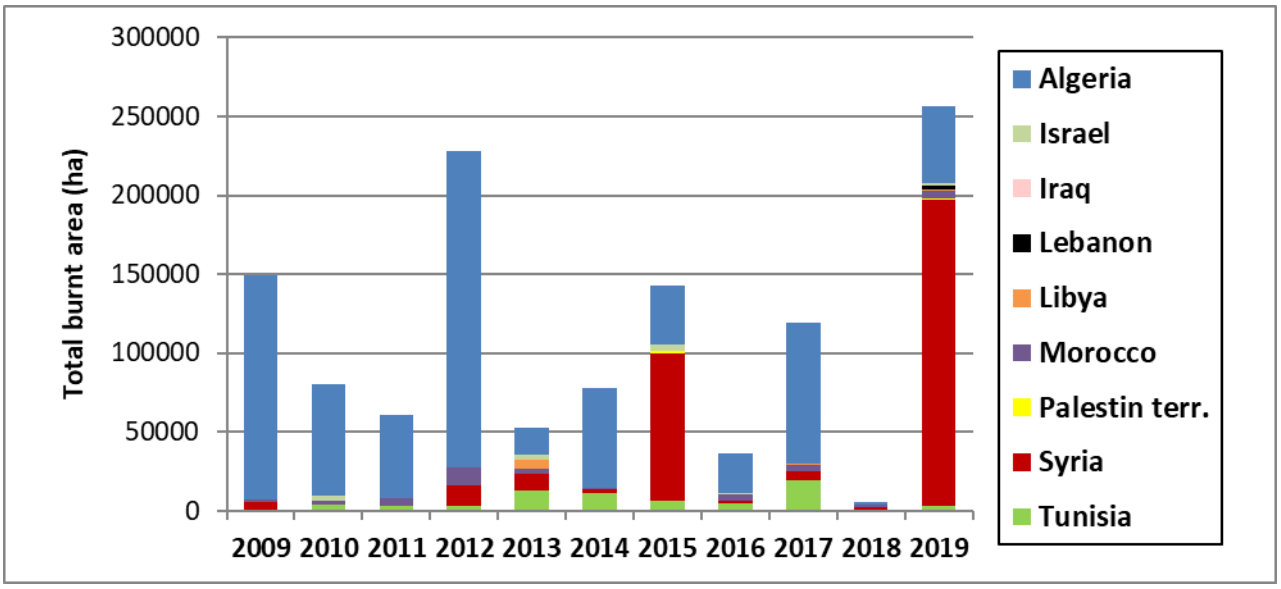


Table 81. Overview of fires in the MENA region in the last 11 years.

2.4 EFFIS Applications

2.4.1 The Current Situation Application

The current situation allows the user to view and query map layers, giving an indication of the fire situation across Europe for the current date and surrounding short term time frame.

The application is normally updated between March and October.

In the Fire Danger Forecast section ① two different sources and 8 different indices can be displayed, for the current day and up to 8 days in the future.

The Rapid Damage Assessment ② allows the user to display active fire information and burnt area information from two sources.

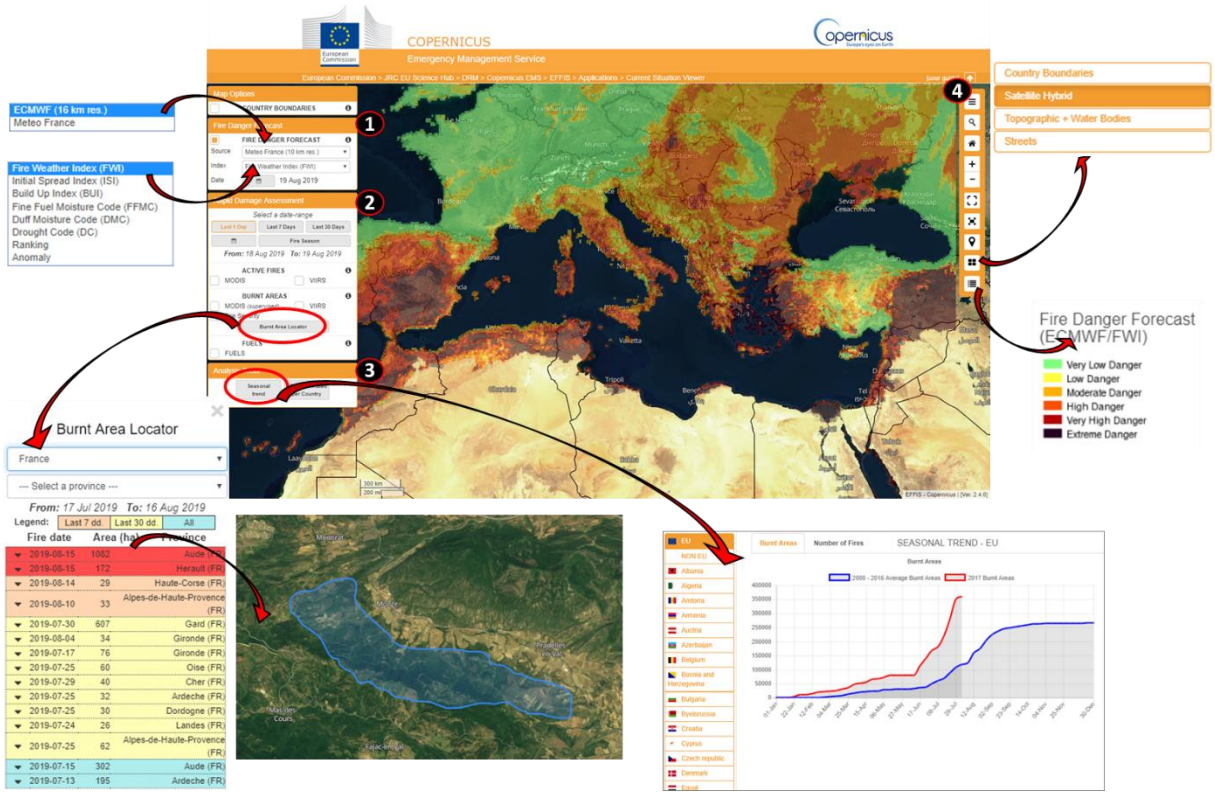
In the Analysis Tools section ③ there is a Burnt area locator, where the burnt area for the whole area or for a given country/region can be displayed. A close-up view of the individual fire perimeter is shown if the user clicks on a specific fire.

The Seasonal Trend button displays the current cumulative burnt area or number of fires mapped in EFFIS, alongside the long term average.

A tool bar ④ has a number of controls for changing the view and displaying the legend.

This application can be accessed at

http://effis.jrc.ec.europa.eu/static/effis_current_situation/public/index.html



2.4.2 The Fire News Application

The purpose of this application is to display geo-located news items about forest fires from a number of sources. News items are added to the map daily by team members during the fire season. The resulting list can be sorted by any of the displayed variables and filtered by date, size class or country.

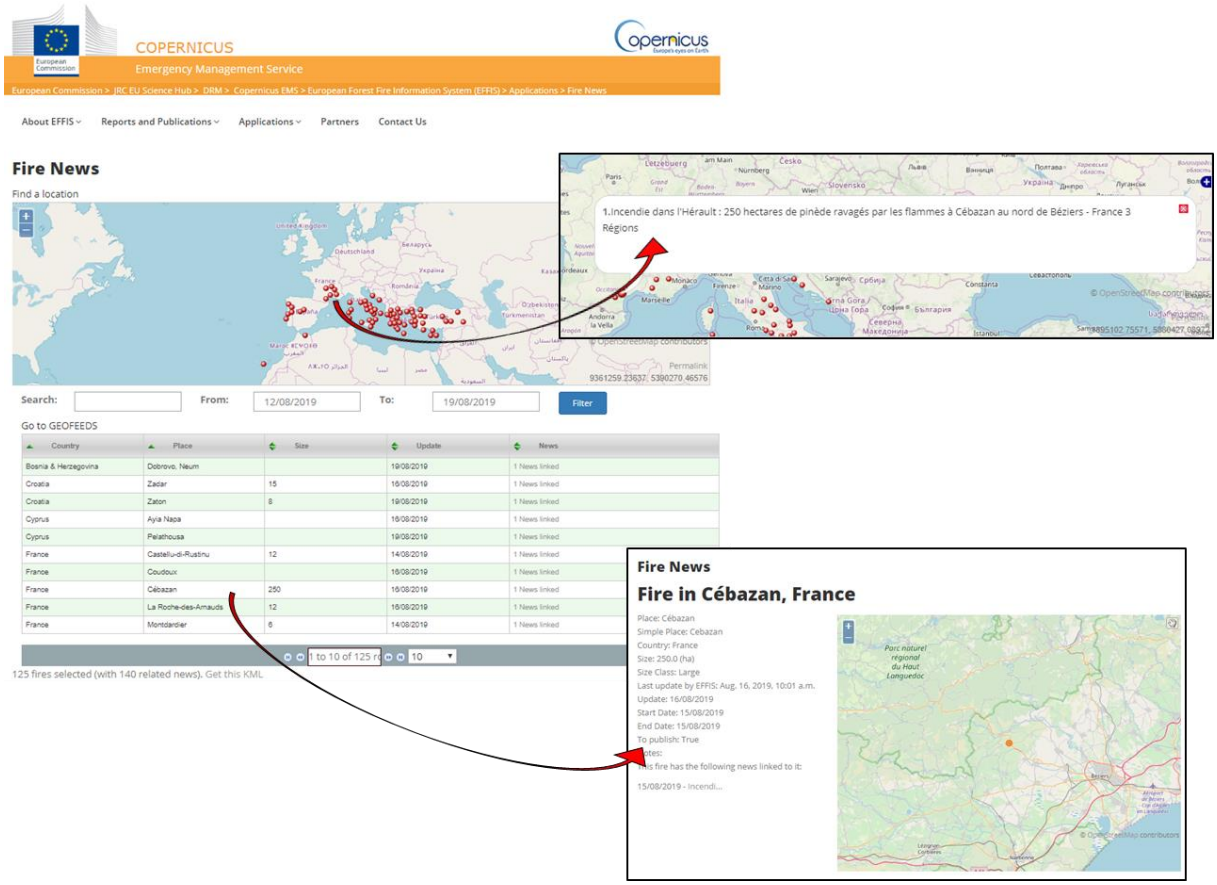
[**N.B.** *It is important to note that not all fires are displayed here: only those reported in the media with an identifiable location. Fires are not always reported individually (or at all) in the press, and the space devoted to them depends on other current world events*].

Clicking on a point on the map gives a link to the original news item associated with that point.

Clicking on the name in the list gives a table with details of the fire and a close-up of the map.

By default the display shows fires occurring in the last week, but the **From** and **To** boxes can be used to select other time periods – even for past years. The Search box allows the user to narrow down the display from among the total selected in the date filters.

This application can be accessed at http://effis.jrc.ec.europa.eu/applications/fire-news/



2.4.3 The EFFIS Fire Database

The Fire Database is an important component of EFFIS, containing the forest fire information compiled by countries in Europe, Middle East and North Africa.

The Regulation EEC No 804/94 [11] (now expired) established a Community system of information on forest fires for which a systematic collection of a minimum set of data on each fire occurring, the so called "Common Core", had to be carried out by the Member States participating in the system. This regulation was replaced by the Forest Focus regulation in 2003.Following the Forest Focus regulation (EC) No 2152/2003 [7], concerning monitoring of forests and environment interactions in the Community, the forest fire common core data was continued to be recorded in order to collect comparable information on forest fires at Community level.

Since 2000 the forest fire data provided each year by individual EU Member States and other countries in Europe, Middle East and North Africa are checked, stored and managed by JRC within EFFIS. In 2012 the 4 MENA countries submitted data for entry into the database, bringing the number of countries now contributing to 27 (Algeria, Bulgaria, Croatia, Cyprus, Czech, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Lebanon, Morocco, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia and Turkey). The database currently contains 2.86 million individual fire event records (2.12 million forest fires).

Access to the information

The individual records are not made available as they are owned by the country authorities who supply the data; however, users can request custom annual or monthly summaries of burnt area or number of fires by country, NUTS2 or NUTS3 region from the point of contact.

More detailed information about the database can be found in the technical report "*The European Fire Database: Technical specifications and data submission*" EUR26546 EN [12], which can be downloaded from:

http://effis.jrc.ec.europa.eu/reports-and-publications/effis-related-publications/

Table 82. Information requested for each fire event.

ID	Unique Fire identifier	FIREID
TIME OF FIRE	Date of first alert [YYYYMMDD]	DATEAL
	Time of first alert [HHMM]	TIMEAL
	Date of first intervention [YYYYMMDD]	DATEIN
	Time of first intervention [HHMM]	TIMEIN
	Date of fire extinction [YYYYMMDD]	DATEEX
	Time of fire extinction [HHMM]	TIMEEX
LOCATION OF FIRE	Province Code (national nomenclature)	PROVCODE
	NUTS3 code	NUTS3
	Commune Code (national nomenclature)	CODECOM
	Commune Name (national nomenclature)	NAMECOM
	Latitude [decimal degrees]	NORTH
	Longitude [decimal degrees]	EAST
SIZE OF FIRE (Ha)	Burnt Area FOREST	BAFOR
	Burnt Area OTHER WOODED LAND	BAOW
	Burnt Area OTHER NON WOODED NATURAL LAND	BAONW
	Burnt Area AGRICULTURE AND OTHER ARTIFICIAL LAND	BAAGR
CAUSE OF FIRE	Certainty of knowledge of Presumed Cause (New EU code)	CAUSE_KNOWN
	Presumed Cause (New EU categories code)	CAUSE_EU
	Presumed Cause (Country detailed categories code)	CAUSE_CO

General notes on Table 83: 2019 data are still undergoing validation checks and are not presented.

The totals given in this table do not always match the published number of fires for a number of reasons:

1. Purely agricultural fires are stored in the database if submitted by the country, but are excluded from forest fire calculations;
2. Some countries do not report detailed records for the whole of their territory and the information is only available in summary form.

Table 83. Summary of data records stored in the Fire Database.

	BG	CH	CY	CZ	DE	EE	ES	FI	FR	GR	HR	HU	IT	LT	LV	NL	PL	PT	RO	SE	SI	SK	TR	DZ	LB	MA	TN
1980		87																2349									
1981		153																6730									
1982		86																3626									
1983		120								945								4542									
1984		183								1184								7356									
1985		114					12235		3732	1417			12931					8441									75
1986		87					7514		2657	1088			6115					5036									89
1987		121					8816		2116	1234			8506					7705									207
1988		79					9440		2240	1798			9785					6131									158
1989		189					20250		3321	1203			8328					21896									70
1990		257					12914		3297	1283			11560					10745									118
1991		152					13529		2372	1036			7580					14327									97
1992		86					15956		2708	2008			10044					14954									182
1993		83					14253		4766	2707			14317					16101									183
1994		86			706		19249		4728	1955			7153				24361	19983									131
1995		96			525		25557		6539	1494			5505				23816	34116			44						13
1996		130			822		16586		6401	1527	2363		6064				23582	28626		4854	47						13
1997		179			276		22320		8001	2271	2648		11608				25068	23497		7057	55						98
1998		121			592		22003		6289	605	4096		9565				21342	34676		2503	143						-
1999		50			794		17943		4881	513	2592		6956				32646	25477		4707	55						-
2000		70	285		930		23574		4343	1469	5477		8609				31809	34109		4708	100						-
2001		67	299		373		19099		4259	1313	2505		7227				24511	27982		4831	60						-
2002		117	243		278		19929		4097	572	3428	429	4607				38154	28738		6490	64						-
2003		304	427		1238		18616		7023	622	4904	373	9716				79013	26941		8282	227						-
2004		94	221	957	300		21396		3767	739	1704	104	6341	430	647		36315	26945	34	4955	50	153					-
2005	251	110	185	653	299	65	25492	2631	4698	718	2180	150	7918	267	365		46542	40965	64	4573	74	287	1530				-
2006	393	110	172	697	717	248	16334	6314	4608	764	2210	97	5651	1444	1929		35630	23647	105	4618	106	238	2227			347	216
2007	1479	120	111	809	435	64	10932	2813	3382	1226	3759	603	10736	245	426		31303	23956	478	3787	129	463	2706			304	292
2008	582	63	114	470	560	71	11656	3161	2781	1071	228	502	6648	272	716		35786	18619	91	5420	68	182	2135			267	259
2009	314	103	91	520	575	47	15642	2746	4808	354	181	608	5423	471	890		30912	29218	190	4180	122	347	-			487	199
2010	222	88	133	731	525	30	11722	3100	3828	540	131	109	4884	106	319		24443	25013	70	3120	33	123	1861			597	264
2011	635	114	85	1341	515	24	16417	2871	4283	953	279	2021	8181	137	373		39011	38118	340	3534	114	303	-			568	262
2012	876	75	78	1555	451	5	15978	1050	3713	-	570	2657	10345	81	162		53907	30740	911	2213	168	517	2449	5036	99	484	493
2013	408	58	135	671	355	15	10797	2864	2061	-	137	761	2077	119	420		25652	27372	118	4907	75	233	3755	-	-	411	-
2014	151	60	68	870	251	91	9806	3637	1729	-	43	1042	1821	155	695		38115	11387	83	4374	35	153	-	-	-	460	-
2015	439	166	87	1738	594	67	11810	1644	2891	-	176	1069	5424	247	704		60176	23175	250	2700	93	242	-	-	-	425	-
2016	584	82	119	899	407	84	-	2101	2761	-	176	452	-	98	641		25791	16104	174	5454	90	136	-	-	-	422	-
2017	513	110	-	988	176	61	-	2263	3201	-	328	1454	-	80	423	321	25193	21006	447	5276	108	162	-	-	-	437	-
2018	222	153		2033	1216	230	-	4401	1616	-	57	530	-	211	972	949	33227	12253	158	8181	32	262	-			343	-

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All reports from past years can be found in

http://effis.jrc.ec.europa.eu/reports-and-publications/annual-fire-reports/

Annex – Summary Tables of Fire Statistics

Statistics on burnt area divided into forest and non-forest area are supplied in the individual country reports, where available.

NOTE

Every effort is made to ensure that the published figures are correct. However, at the time of printing some data are provisional and may be changed in the future. Where there is a discrepancy between figures published in different reports, the later report should be taken as the definitive version.

Table 84. Number of forest fires in five Southern Member States (1980-2019)

Year	*PORTUGAL*	*SPAIN*	*FRANCE*	*ITALY*	*GREECE*	*TOTAL*
1980	2 349	7 190	5 040	11 963	1 207	27 749
1981	6 730	10 878	5 173	14 503	1 159	38 443
1982	3 626	6 545	5 308	9 557	1 045	26 081
1983	4 539	4 791	4 659	7 956	968	22 913
1984	7 356	7 203	5 672	8 482	1 284	29 997
1985	8 441	12 238	6 249	18 664	1 442	47 034
1986	5 036	7 570	4 353	9 398	1 082	27 439
1987	7 705	8 679	3 043	11 972	1 266	32 665
1988	6 131	9 247	2 837	13 588	1 898	33 701
1989	21 896	20 811	6 763	9 669	1 284	60 423
1990	10 745	12 913	5 881	14 477	1 322	45 338
1991	14 327	13 531	3 888	11 965	858	44 569
1992	14 954	15 955	4 002	14 641	2 582	52 134
1993	16 101	14 254	4 769	14 412	2 406	51 942
1994	19 983	19 263	4 618	11 588	1 763	57 215
1995	34 116	25 827	6 563	7 378	1 438	75 322
1996	28 626	16 771	6 401	9 093	1 508	62 399
1997	23 497	22 320	8 005	11 612	2 273	67 707
1998	34 676	22 446	6 289	9 540	1 842	74 793
1999	25 477	18 237	4 960	6 932	1 486	57 092
2000	34 109	24 118	4 603	8 595	2 581	74 006
2001	26 533	19 547	4 309	7 134	2 535	60 058
2002	26 488	19 929	4 097	4 601	1 141	56 256
2003	26 195	18 616	7 023	9 697	1 452	62 983
2004	21 870	21 396	3 775	6 428	1 748	55 217
2005	35 697	25 492	4 698	7 951	1 544	75 382
2006	19 929	16 354	4 608	5 634	1 417	47 942
2007	18 722	10 936	3 364	10 639	1 983	45 644
2008	13 832	11 655	2 781	6 486	1 481	36 235
2009	26 119	15 643	4 800	5 422	1 063	53 047
2010	22 026	11 721	3 900	4 884	1 052	43 583
2011	25 221	16 414	4 500	8 181	1 653	55 929
2012	21 176	17 503	4 105	8 252	1 559	52 595
2013	19 291	10 626	2 223	2 936	862	35 938
2014	7 067	9 771	2 778	3 257	552	23 425
2015	15 851	11 928	4 440	5 442	510	38 171
2016	13 261	8 817	4 285	5 818	777	31 933
2017	21 002	13 793	4 403	7 855*	1 083	48 136
2018	12 273	7 143	3 005	3 220	793	26 434
2019	**10 832**	**10 883**	**5 435**	**4 351**	**657**	**32 158**
% of total in 2019	**34%**	**34%**	**17%**	**14%**	**2%**	**100%**
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2009	24 949	18 369	4 418	7 259	1 695	56 690
Average 2010-2019	16 800	11 860	3 865	5 420	946	38 890
Average 1980-2019	17 845	14 474	4 683	8 854	1 413	47 269
TOTAL (1980-2019)	713 805	578 954	187 305	354 173	56 516	1 890 753

Table 85. Burnt area (hectares) in five Southern Member States (1980 – 2019)

Year	*PORTUGAL*	*SPAIN*	*FRANCE*	*ITALY*	*GREECE*	*TOTAL*
1980	44 251	263 017	22 176	143 919	32 965	506 328
1981	89 798	298 288	27 711	229 850	81 417	727 064
1982	39 556	152 903	55 145	130 456	27 372	405 432
1983	47 811	108 100	53 729	212 678	19 613	441 931
1984	52 710	165 119	27 202	75 272	33 655	353 958
1985	146 254	484 476	57 368	190 640	105 450	984 188
1986	89 522	264 887	51 860	86 420	24 514	517 203
1987	76 269	146 662	14 108	120 697	46 315	404 051
1988	22 434	137 734	6 701	186 405	110 501	463 775
1989	126 237	426 693	75 566	95 161	42 363	766 020
1990	137 252	203 032	72 625	195 319	38 594	646 822
1991	182 486	260 318	10 130	99 860	13 046	565 840
1992	57 011	105 277	16 593	105 692	71 410	355 983
1993	49 963	89 267	16 698	203 749	54 049	413 726
1994	77 323	437 635	24 995	136 334	57 908	734 195
1995	169 612	143 484	18 137	48 884	27 202	407 319
1996	88 867	59 814	11 400	57 988	25 310	243 379
1997	30 535	98 503	21 581	111 230	52 373	314 222
1998	158 369	133 643	19 282	155 553	92 901	559 748
1999	70 613	82 217	15 906	71 117	8 289	248 142
2000	159 605	188 586	24 078	114 648	145 033	631 950
2001	111 850	93 297	20 642	76 427	18 221	320 437
2002	124 411	107 464	30 160	40 791	6 013	308 839
2003	425 726	148 172	73 278	91 805	3 517	742 498
2004	129 539	134 193	13 711	60 176	10 267	347 886
2005	338 262	188 697	22 135	47 575	6 437	603 106
2006	75 510	155 345	7 844	39 946	12 661	291 306
2007	31 450	86 122	8 570	227 729	225 734	579 605
2008	17 244	50 322	6 001	66 329	29 152	169 048
2009	87 416	120 094	17 000	73 355	35 342	333 207
2010	133 090	54 770	10 300	46 537	8 967	253 664
2011	73 813	102 161	9 400	72 004	29 144	286 522
2012	110 231	226 125	8 600	130 814	59 924	535 694
2013	152 756	58 985	3 608	29 076	46 676	291 101
2014	19 929	46 721	7 493	36 125	25 846	136 114
2015	64 443	103 200	11 160	41 511	7 096	227 410
2016	161 522	65 817	16 093	65 503	26 540	317 898
2017	540 630	178 234	26 378	161 987	13 393	895 738
2018	44 578	25 162	5 124	19 481	15 464	109 808
2019	**42 084**	**83 963**	**23 477**	**36 034**	**9 153**	**194 710**
% of total in 2019	**22%**	**43%**	**12%**	**19%**	**5%**	**100%**
Average 1980-1989	73 484	244 788	39 157	147 150	52 417	556 995
Average 1990-1999	102 203	161 319	22 735	118 573	44 108	448 938
Average 2000-2009	150 101	127 229	22 362	83 878	49 238	432 809
Average 2010-2019	134 308	94 514	12 475	63 907	24 220	329 424
Average 1980-2019	115 024	156 962	24 182	103 377	42 496	442 041
TOTAL (1980-2019)	4 600 962	6 278 499	967 288	4 135 077	1 699 826	17 681 651

Table 86. Number of forest fires in other countries (1990-2019)

Country / Year	Algeria	Austria	Bulgaria	Croatia	Cyprus	Czech Rep.	Estonia	Finland	Germany	Hungary	Latvia	Lebanon	Lithuania	Morocco	Netherlands	North Macedonia	Norway	Poland	Romania	Russian Federation	Slovakia	Slovenia	Sweden	Switzerland	Turkey	Ukraine
1990	-	-	-	-	-	-	-	-	-	-	604	-	-	179		-	-	5756	131	-	-	-	-	257	1750	-
1991	-	-	73	-	-	-	-	-	1846	-	225	-	-	247		-	-	3528	42	-	-	-	-	152	1481	-
1992	-	-	602	325	-	-	-	-	3012	-	1510	-	1180	182		-	-	11858	187	-	-	-	-	86	2117	-
1993	-	113	1196	372	-	-	-	-	1694	-	965	-	634	187		-	-	8821	159	-	-	-	-	83	2545	-
1994	-	108	667	181	-	-	-	-	1696	-	763	-	715	417		-	-	10705	121	-	366	-	-	86	3239	-
1995	-	55	114	109	-	1331	-	-	1237	-	582	-	472	528		-	-	7678	62	-	254	-	-	96	1770	-
1996	-	24	246	305	-	1421	-	1475	1748	-	1095	-	894	220		-	-	7923	72	-	662	-	-	130	1645	-
1997	-	40	200	305	-	1398	-	1585	1467	-	768	-	565	391		-	-	6817	37	-	535	-	-	179	1339	-
1998	-	71	578	441	-	2563	-	370	1032	-	357	-	258	416		-	-	6165	59	-	1056	-	2503	121	1932	-
1999	-	16	320	223	-	1402	-	1528	1178	229	1196	-	1022	385		-	-	9820	138	-	426	-	4707	50	2075	-
2000	-	41	1710	706	285	1499	158	826	1210	811	915	-	654	321		-	-	12426	688	-	824	-	4708	70	2353	-
2001	-	58	825	299	299	483	91	822	587	419	272	-	287	327		-	117	4480	268	-	311	-	4831	67	2631	-
2002	-	108	402	176	243	604	356	2546	513	382	1720	-	1596	202		-	213	10101	516	-	570	60	6490	117	1471	-
2003	-	243	452	532	427	1754	111	1734	2524	375	900	-	885	392		-	198	17087	203	-	872	224	8282	304	2177	-
2004	-	71	294	204	221	873	89	816	626	104	647	-	468	714		-	119	7006	34	-	153	51	4955	94	1762	-
2005	-	86	241	147	185	619	65	1069	496	150	365	-	301	662		-	122	12049	64	-	287	73	4573	110	1530	-
2006	-	133	393	181	172	697	250	3046	930	97	1929	-	1545	381		-	205	11541	105	-	237	112	4618	110	2227	-
2007	-	256	1479	345	111	805	64	1204	779	603	425	-	251	340		652	65	8302	478	-	463	140	3737	120	2829	5024
2008	-	186	582	275	114	470	71	1456	818	502	700	-	301	273		573	171	9090	91	-	182	74	5420	63	2135	3231
2009	-	139	314	181	91	514	47	1242	763	608	823	-	471	501		80	109	9162	190	-	347	120	4180	104	1793	4922
2010	-	146	222	131	133	732	30	1412	780	109	316	-	104	629		99	62	4680	70	32300	127	32	3120	88	1861	2368
2011	2487	274	635	280	85	1337	24	1215	888	2021	360	-	142	606		523	49	8172	340	20851	303	114	3534	114	1954	1761
2012	5110	264	876	569	78	1549	5	417	701	2657	162	-	81	484		483	24	9265	911	19535	517	168	2213	75	2450	1743
2013	2443	202	408	137	135	666	15	1452	515	761	422	-	123	411		186	42	4883	116	9754	233	75	4878	58	3755	806
2014	4629	147	151	43	68	865	91	1660	429	1042	698	-	155	460		62	133	5245	83	17058	153	35	4374	60	2149	1486
2015	2383	293	429	177	87	1748	67	745	1071	1069	704	107	247	425		106	29	12257	250	12238	242	93	2700	166	2150	2225
2016	3150	148	584	151	119	892	84	933	608	452	641	260	98	422		60	345	5286	174	10089	136	90	5454	81	3188	945
2017	2992	271	513	329	92	966	61	881	424	1454	423	92	80	433	321	301	264	3592	447	10051	162	108	5276	110	2411	2371
2018	797	159	222	54	131	2033	-	2427	1708	530	972	41	211	343	949	19	887	8867	158	-	262	32	8181	153	2167	1297
2019	2278	235	668	123	99	1963		1458	1523	2088	1107	194	279	529	548	251	261	9635	425	-	210	84	5483	79	2688	1261

Table 87. Burnt area (hectares) in other countries (1990 – 2019)

Country / Year	Algeria	Austria	Bulgaria	Croatia	Cyprus	Czech Rep.	Estonia	Finland	Germany	Hungary	Latvia	Lebanon	Lithuania	Morocco	Netherlands	North Macedonia	Norway	Poland	Romania	Russian Federation	Slovakia	Slovenia	Sweden	Switzerland	Turkey	Ukraine
1990	-	-	-	-	-	-	-	-	-	-	258	-	-	2188		-	-	7341	444	-	-	-	-	1723	13742	-
1991	-	-	511	-	-	-	-	-	920	-	69	-	-	3965		-	-	2567	277	-	-	-	-	96	8081	-
1992	-	-	5243	11131	-	-	-	-	4908	-	8412	-	769	2579		-	-	43755	729	-	-	-	-	65	12232	-
1993	-	88	18164	20157	-	-	-	-	1493	-	570	-	274	3078		-	-	8290	518	-	-	-	-	37	15393	-
1994	-	129	18100	7936	-	-	-	-	1114	-	326	-	279	6072		-	-	9325	312	-	-	-	-	408	38128	-
1995	-	92	550	4651	-	403	-	-	592	-	535	-	321	7018		-	-	5403	208	-	-	-	-	446	7676	-
1996	-	7	906	11214	-	2043	-	433	1381	-	927	-	478	1185		-	-	14537	227	-	-	-	-	293	14922	-
1997	-	28	595	11122	-	359	-	1146	599	-	448	-	226	3845		-	-	6766	68	-	-	-	-	1785	6316	-
1998	-	110	6967	32056	-	1132	-	131	397	-	211	-	93	1855		-	-	4222	137	-	-	-	422	274	6764	-
1999	-	6	8291	6053	-	336	-	609	415	756	1544	-	494	1688		-	-	8629	379	-	557	-	1771	30	5804	-
2000	-	42	57406	68171	8034	375	684	266	581	1595	1341	-	352	4064		-	-	7089	3607	-	904	-	1552	70	26353	-
2001	-	25	20152	16169	4830	87	62	187	122	-	311	-	113	1806		-	895	3466	1001	-	305	-	1254	21	7394	-
2002	-	162	6513	4853	2196	178	2082	590	122	1227	2222	-	746	593		-	221	5210	3536	-	595	161	2626	681	8514	-
2003	-	189	5000	27091	2349	1236	207	666	1315	845	559	-	436	2858		-	942	21551	762	-	1567	2100	4002	673	6644	-
2004	-	20	1137	3378	1218	335	379	358	274	247	486	-	253	8660		-	117	3782	123.7	-	157	138	1883	31	4876	-
2005	-	14	1456	3135	1838	227	87	495	183	3531	120	-	51	6198		-	346	5713	162	-	524	280	1562	67	2821	-
2006	-	86	3540	4575	1160	53	3096	1617	482	625	3387	-	1199	5360		-	3829	5657	946	-	280	1420	5710	127	7762	-
2007	-	61	42999	20209	4483	316	292	576	256	4636	272	-	38	1367		32665	128	2841	2529	-	679	128	1090	337	11664	12731
2008	-	27	5289	7343	2392	86	1280	830	538	2404	364	-	112	1127		5915	3174	3027	373	-	118	75	6113	68	29749	4521
2009	-	72	2271	2900	885	178	59	576	262	6463	646	-	287	3108		1307	1329	4400	974	-	510	177	1537	60	4679	4575
2010	-	50	6526	1121	2000	205	25	520	522	878	92	-	21.5	5511		737	769	2126	206	2300000	192	121	540	27	3317	1239
2011	13593	89	6883	15555	1599	337	19	580	214	8055	115	-	293	3460		17308	121	2678	2195	1636232	403	288	945	225	3612	612
2012	99061	60	12730	24804	2531	634	3	86	269	13978	90	-	20	6695		10021	60	7235	6624	1900000	1683	1006	483	30	10455	3311
2013	13396	110	3314	1999	2835	92	79	461	199	1955	217	-	25	2207		3027	47	1289	421	1416659	270	66	1508	29	11456	220
2014	43125	108	916	188	669	536	78	881	120	4454	591	-	162	1540		846	770	2690	217	3738207	192	18	14666	46	3117	16677
2015	13010	154	4313	9416	652	344	83	143	526	4730	615	753	71	992		1798	143	5510	1671	2875350	353	65	594	47	3219	2625
2016	18370	24	6340	7100	3205	141	123	310	283	974	467	1871	26	2585		450	1884	1451	675	2419254	175	526	1288	454	9156	1101
2017	53975	31	4569	48543	428	170	33	460	395	4933	265	264	53	2414	232	5619	525	1023	2459	1459099	295	441	1433	118	11993	5474
2018	2312	19	1453	1506	1136	492	-	1228	2349	906	2864	643	110	841	639	95	3279	2696	1341	-	248	20	24310	69	5644	1367
2019	21048	20	5620	2180	733	520	-	565	2711	6541	805	3155	200	3232	250	4834	3077	3572	2496	-	462	154	1233	31	11332	1065

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