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Commission

JRC TECHNICAL REPORT

Advance EFFIS Report on Forest Fires in Europe, Middle East and North Africa 2019

2020

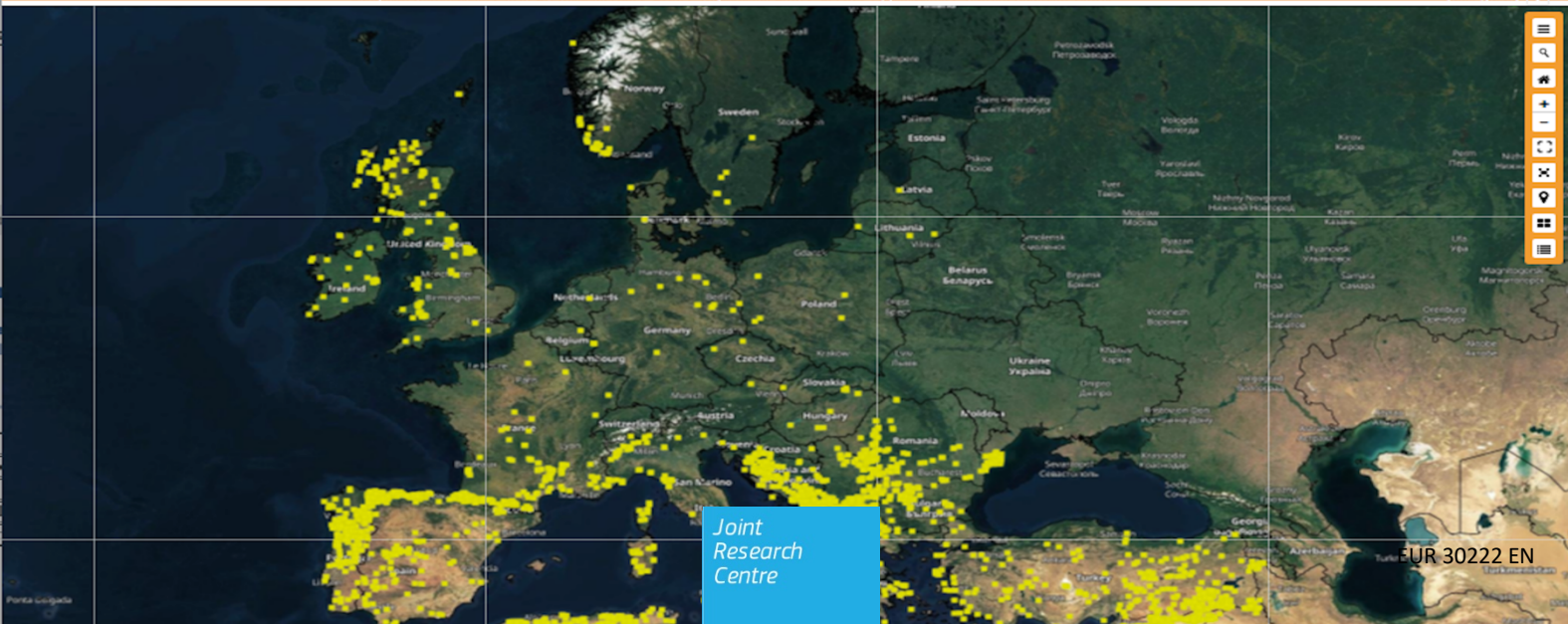


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Cover image: EFFIS – Distribution of burnt areas mapped in 2019

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1 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 services¹ 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 queried². 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.

¹ <http://effis.jrc.ec.europa.eu>

² see <http://effis.jrc.ec.europa.eu/current-situation>

1.1 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.

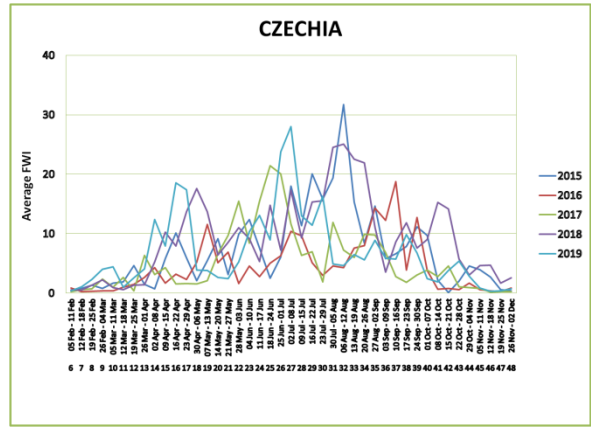
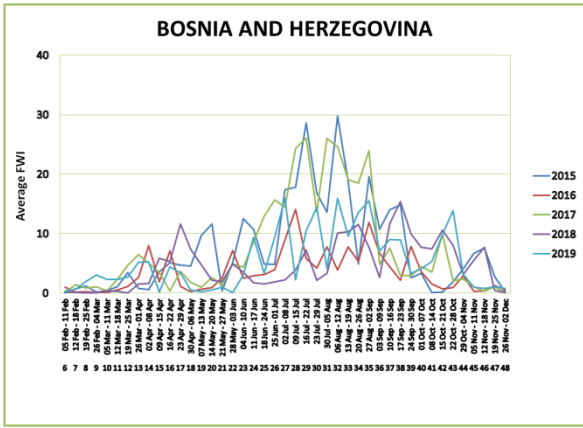
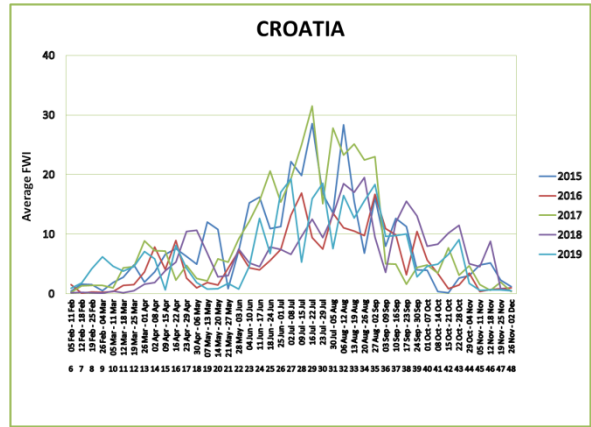
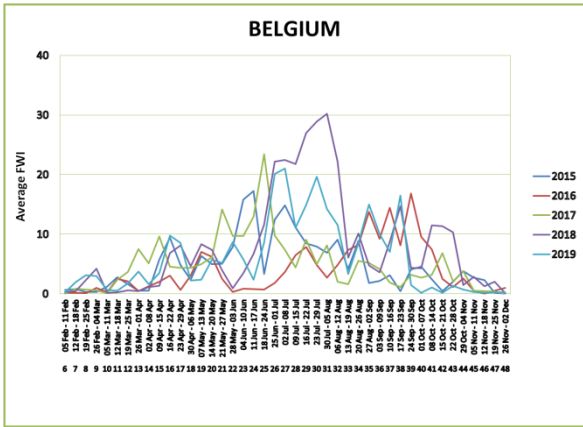
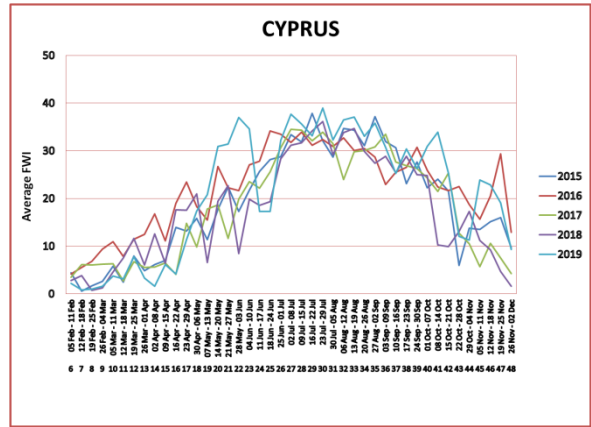
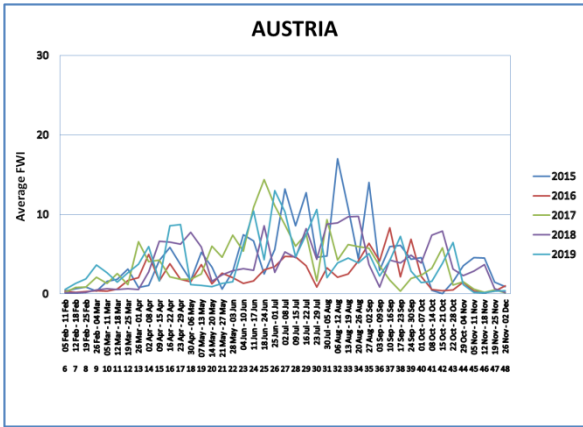
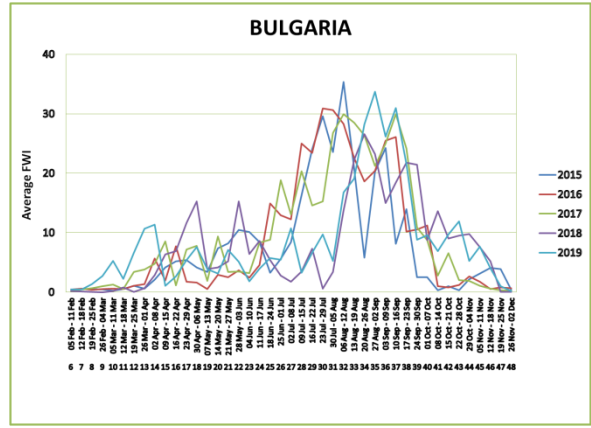
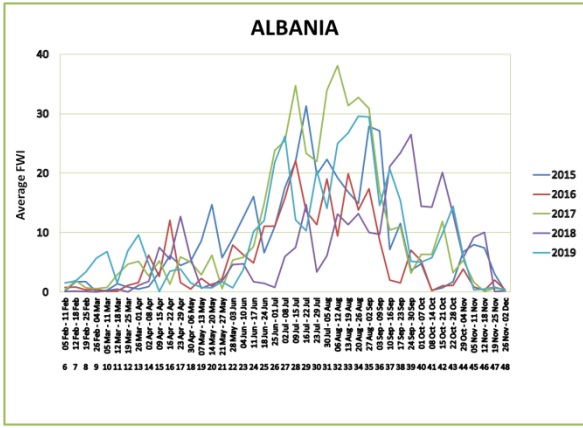
The graphs show the weekly averages of FWI over entire countries; therefore local peaks might have been flattened, especially in those countries such as France or Italy, where there are strong differences in fire danger level with changing latitudes; nevertheless the general trend is depicted providing relevant information about the fire danger level and trends of the year.

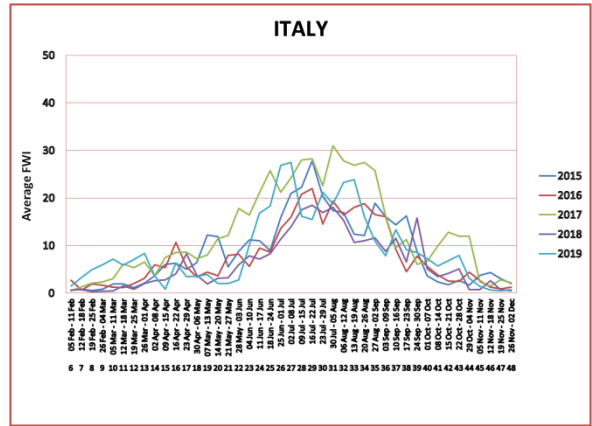
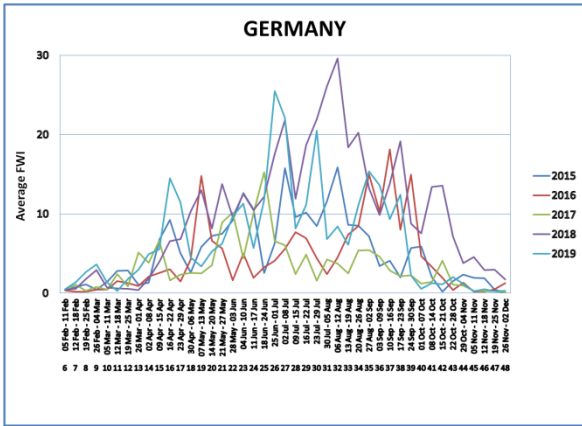
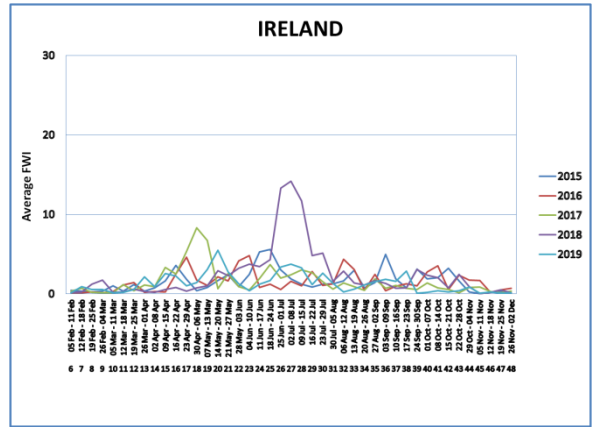
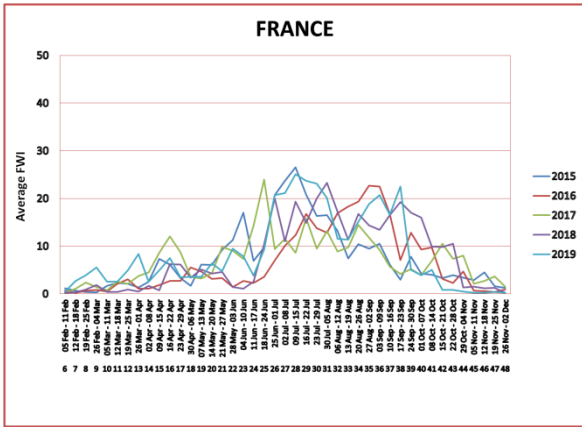
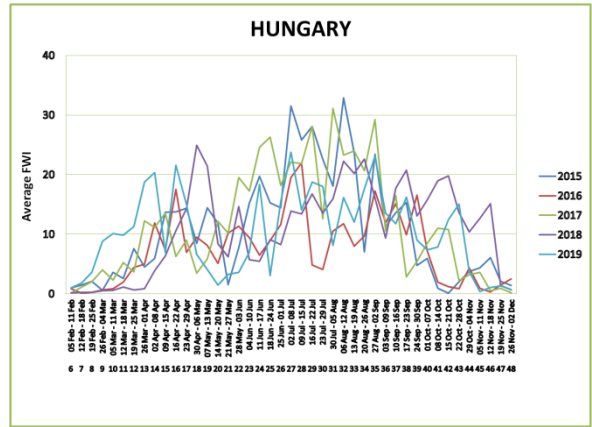
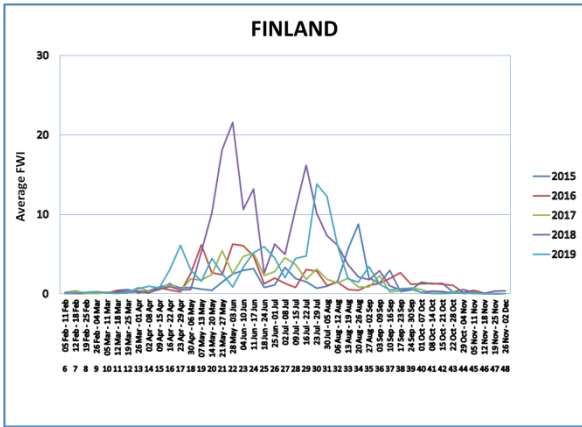
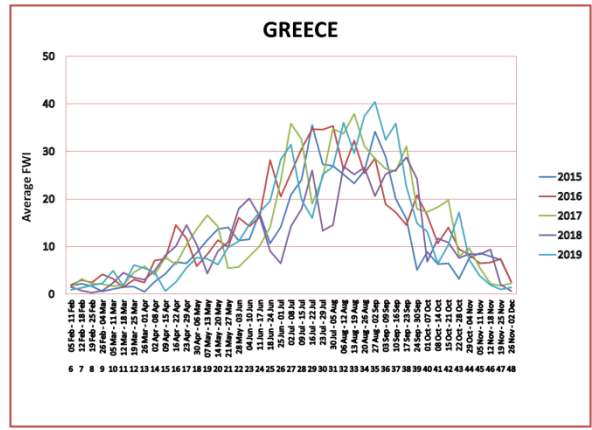
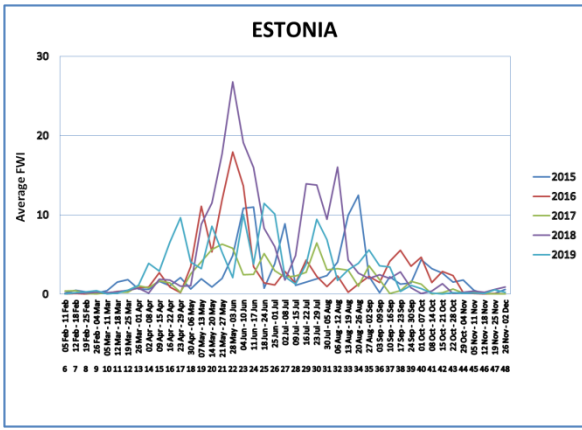
To allow a better comparison with past seasons, the curves of 2015-2017 are presented in conjunction with 2018 for all countries.

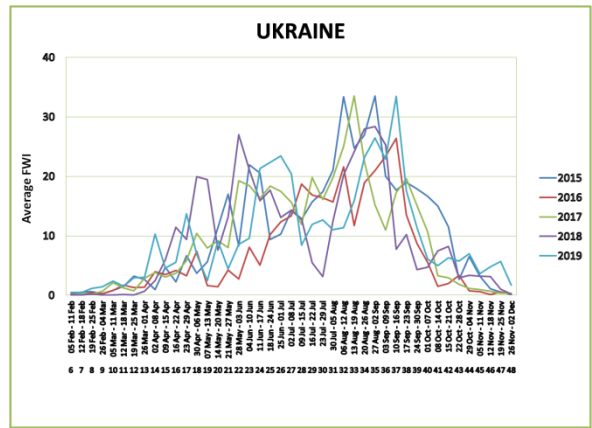
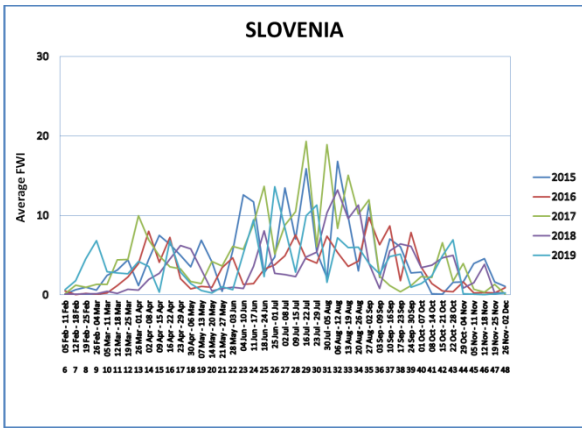
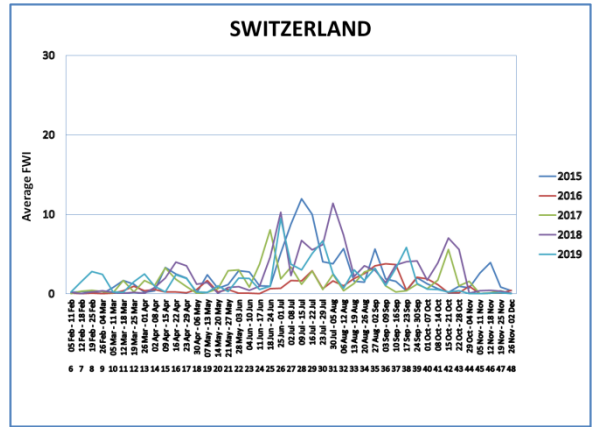
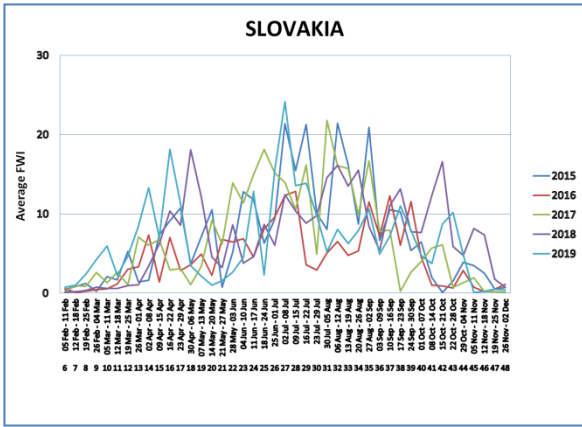
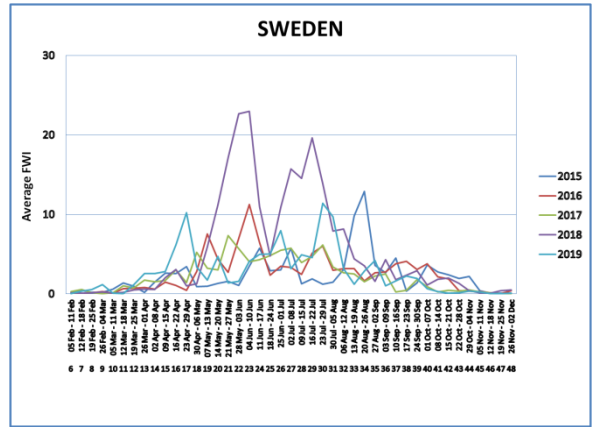
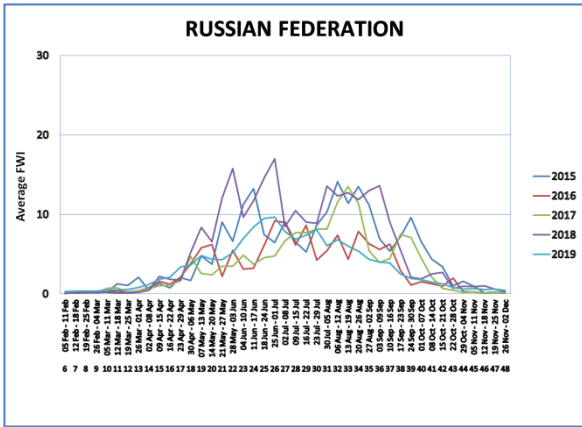
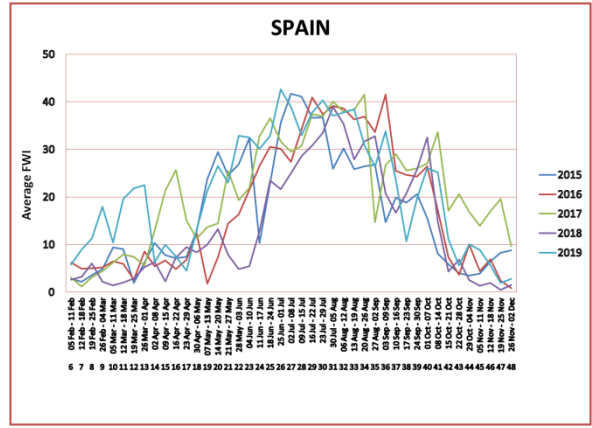
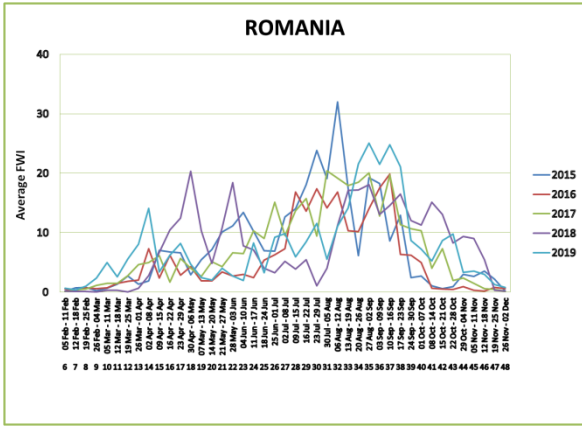
The countries analysed are those participating in the EFFIS network for which data are available, and are presented in alphabetic order within the two groups (European countries and MENA countries) in the graphs that follow.

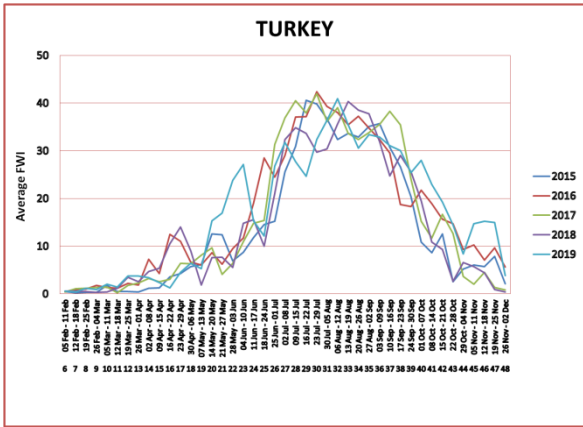
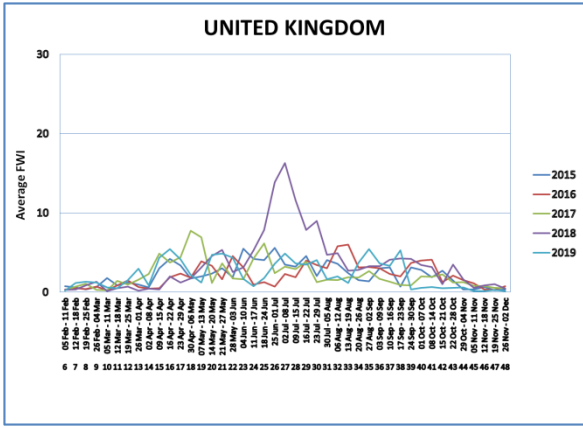
NOTE: In order to make the graphs more readable, 4 colour-coded scales have been used to present the FWI: 0-30 for the most northern countries where fire danger rarely reaches high levels; 0-40 for central countries, 0-50 for the Mediterranean and Turkey, and 0-75 for the MENA countries.

NB. Due to a change in methodology in calculating the 2019 totals, values for MENA countries are higher than in previous years.

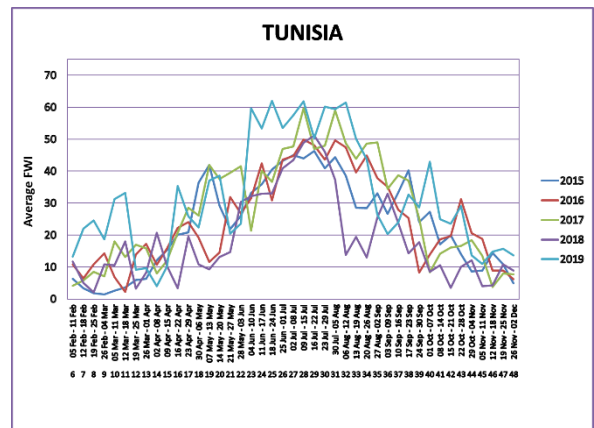
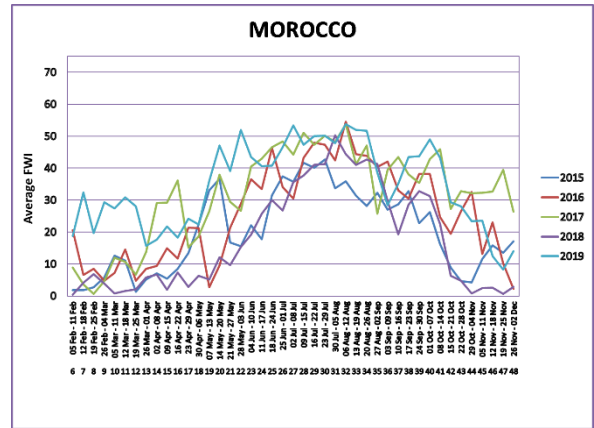
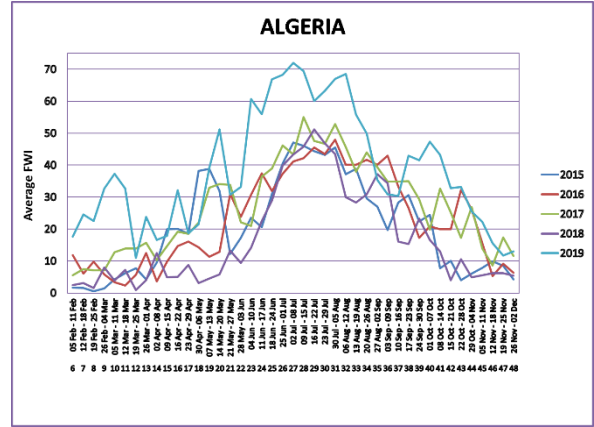








MENA Countries



*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 1. 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.

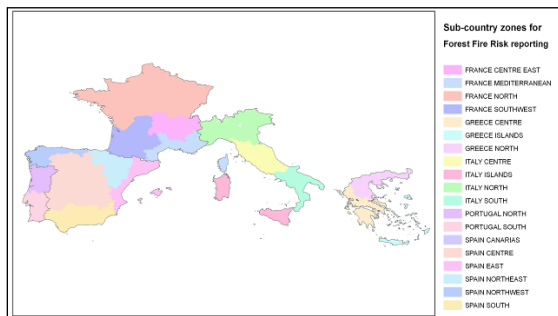


Figure 1. Sub-country regions identified for fire danger trend reporting in the five largest Mediterranean Member States.

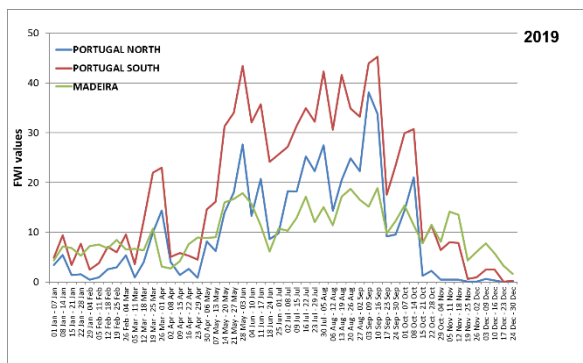


Figure 2. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Portugal.

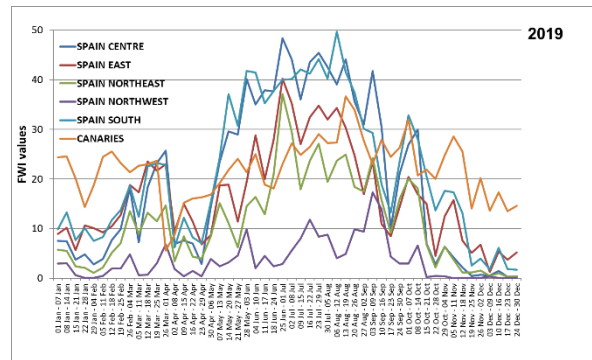


Figure 3. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Spain.

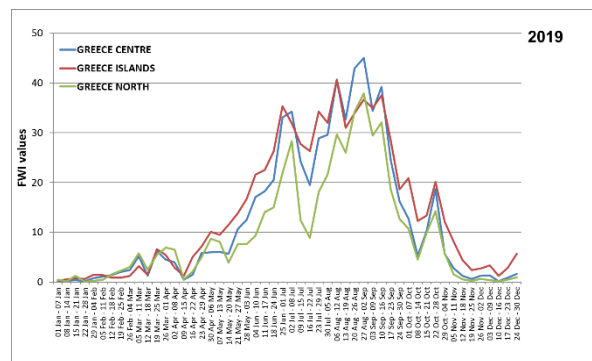


Figure 4. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Greece.

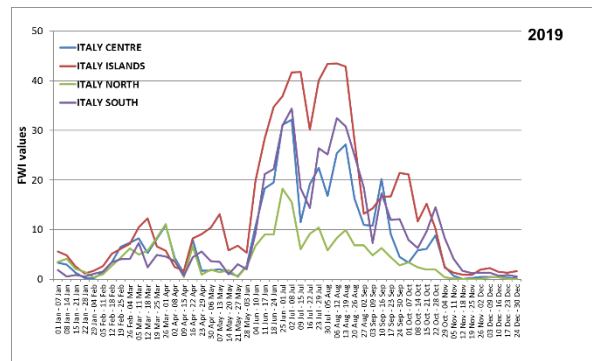


Figure 5. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for Italy.

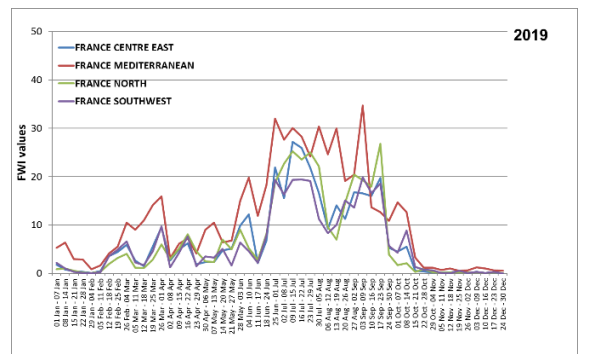


Figure 6. Fire danger trends in 2019 as determined by the Fire Weather Index (FWI) in the regions identified for France.

To facilitate the comparison among the different countries in EU, in the next graphs (Figure 7 to Figure 13), 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.

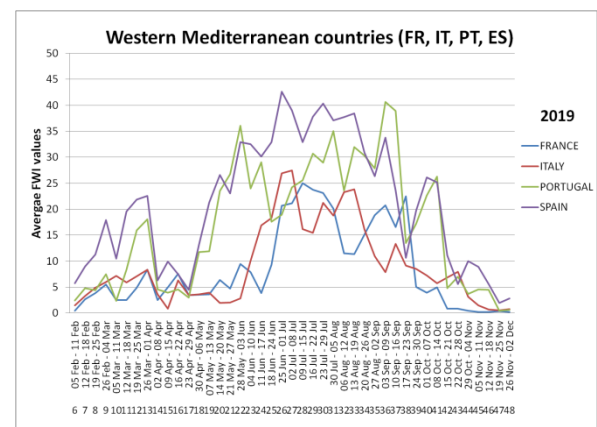
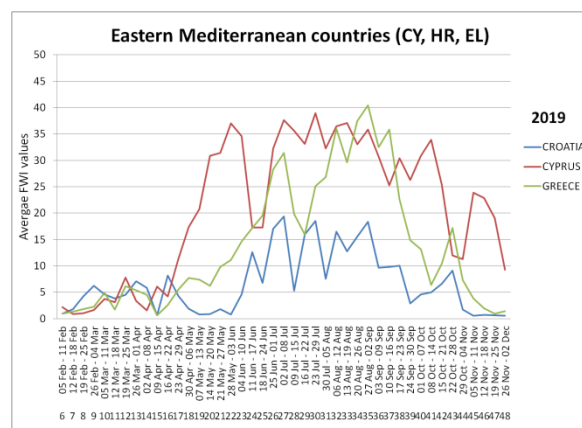
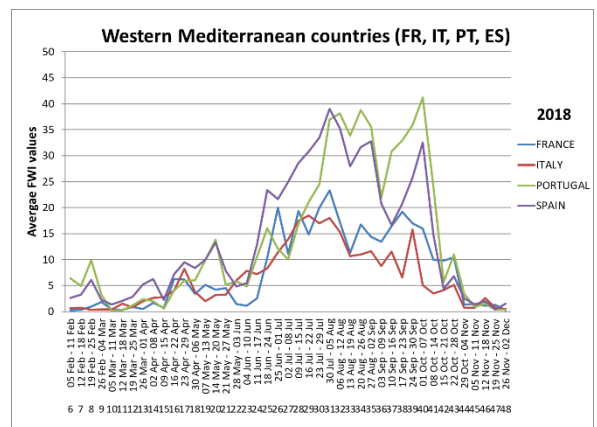
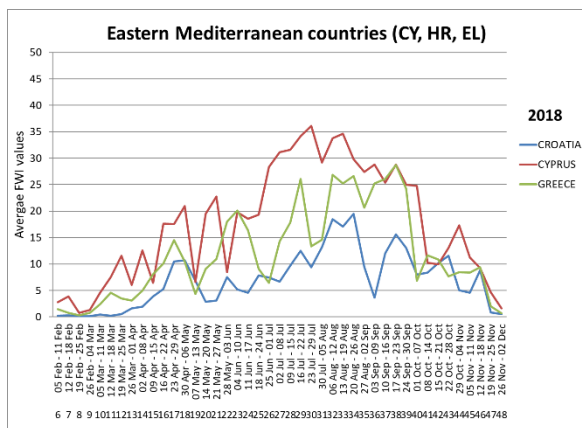
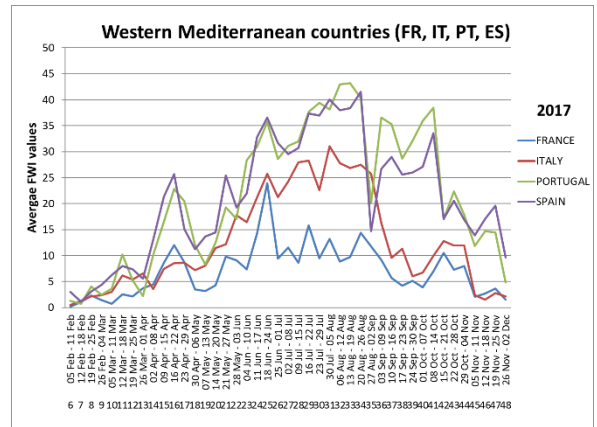
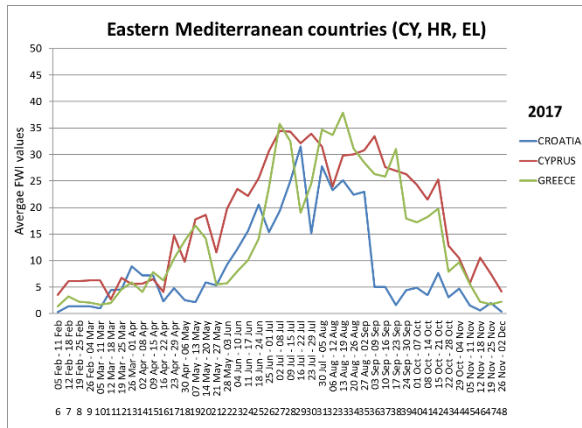


Figure 7. Fire danger trends 2017-2019 in eastern EU Mediterranean countries (CY, HR, EL).

Figure 8. Fire danger trends 2017-2019 in western EU Mediterranean countries (FR, IT, PT, ES).

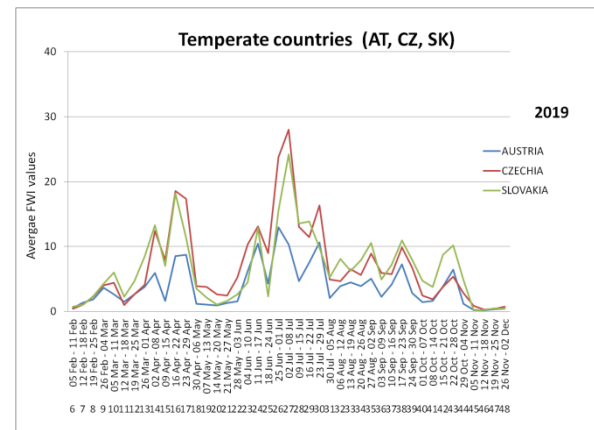
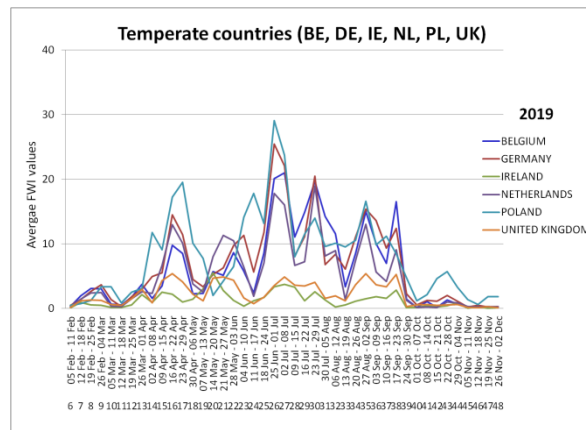
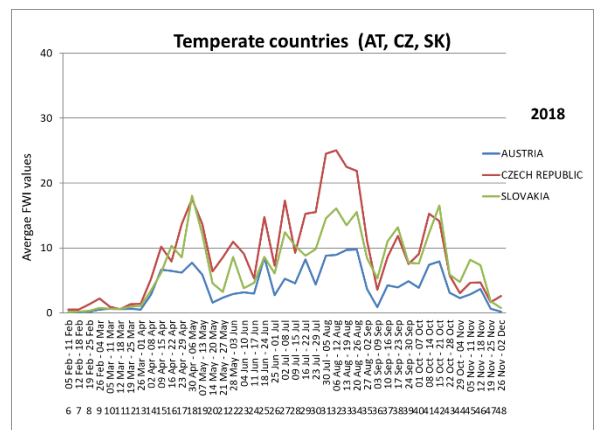
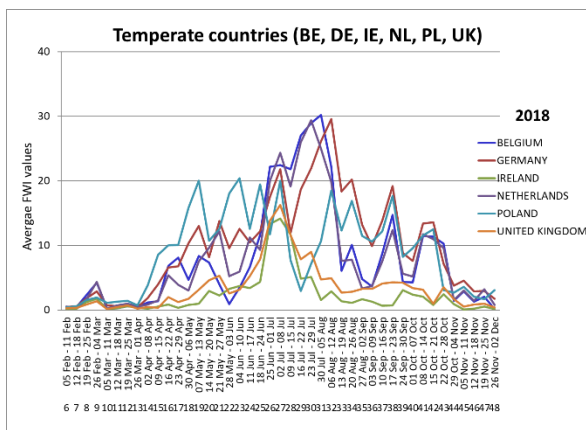
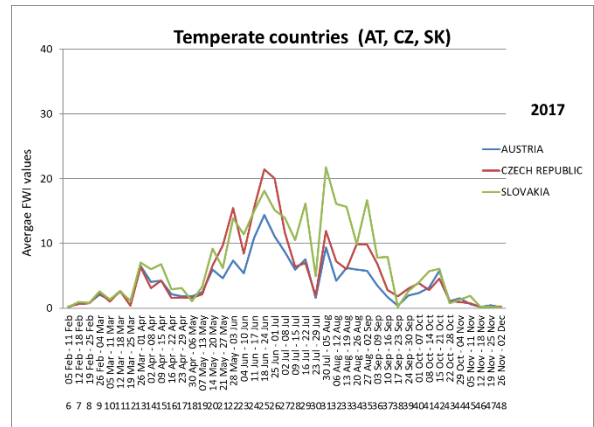
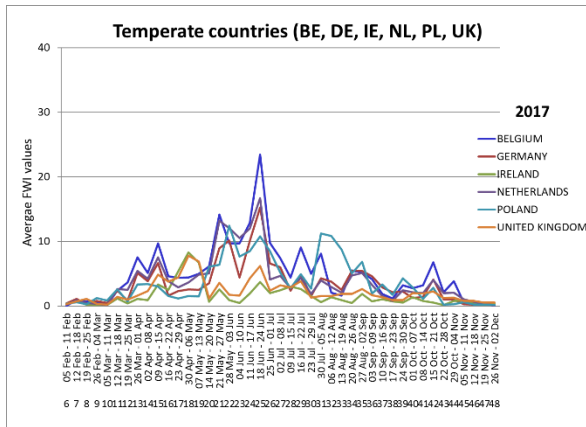


Figure 9. Fire danger trends 2017-2019 in some northern EU temperate countries (BE, DE, IE, NL, PL, UK).

Figure 10. Fire danger trends 2017-2019 in some central EU temperate countries (AT, CZ, SK).

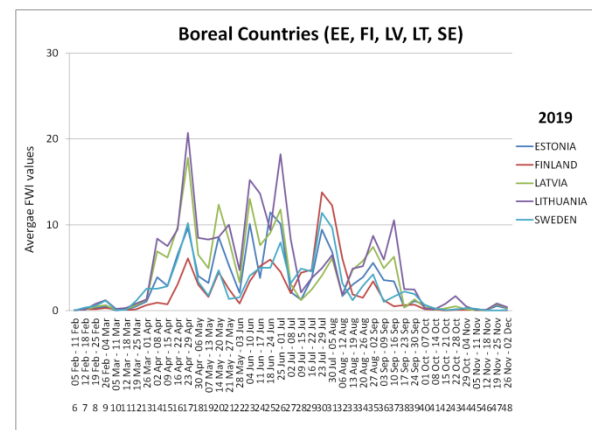
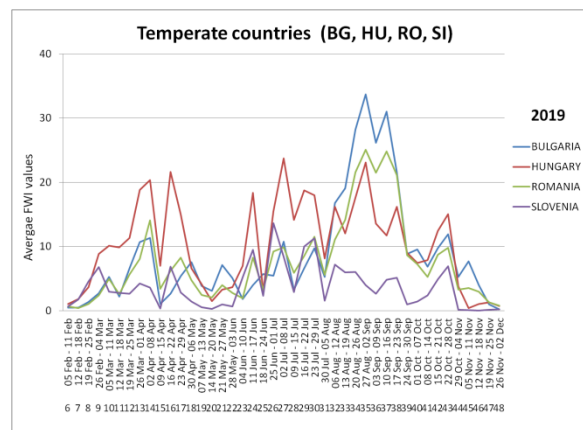
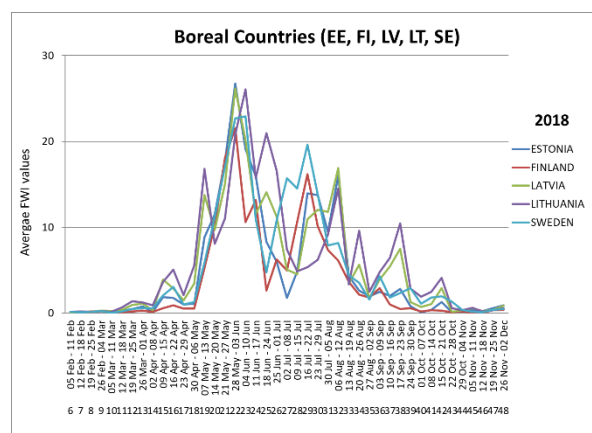
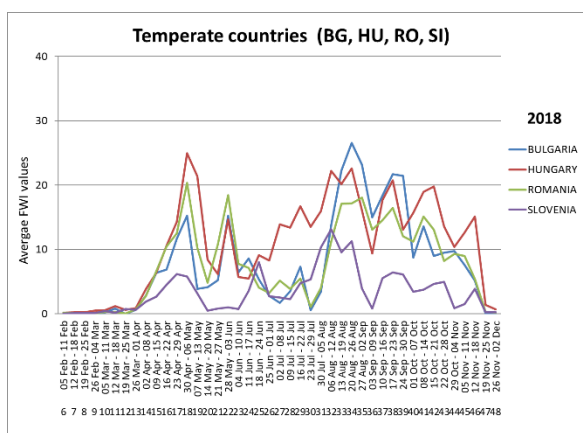
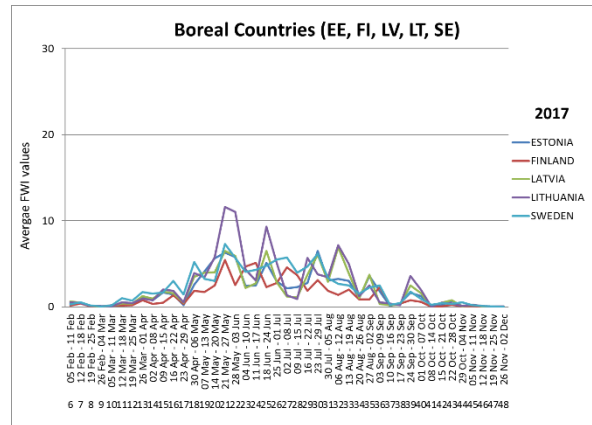
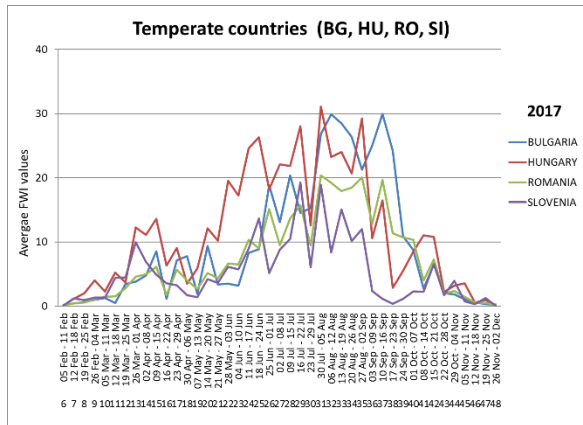


Figure 11. Fire danger trends 2017-2019 in some eastern EU temperate countries (BG, HU, RO, SI).

Figure 12. Fire danger trends 2017-2019 in some EU boreal countries (EE, FI, LV, LT, SE).

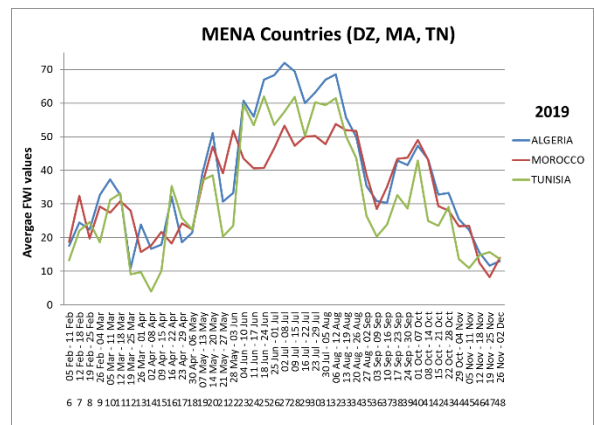
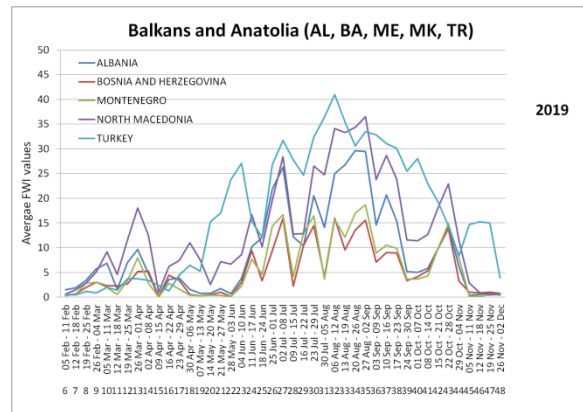
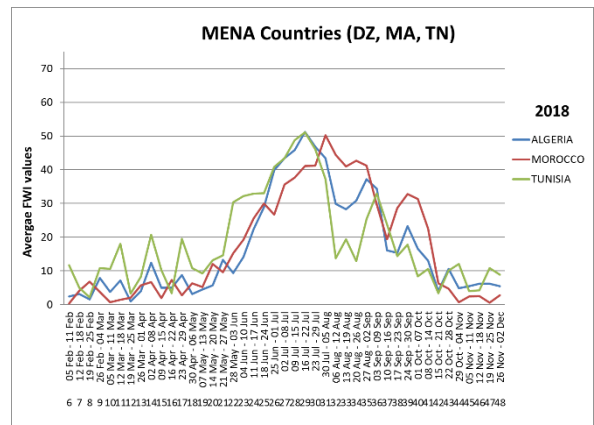
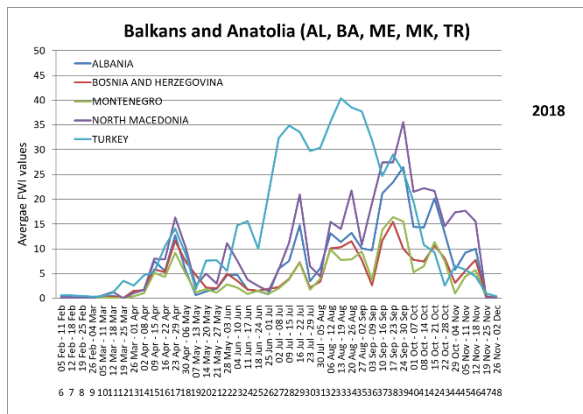
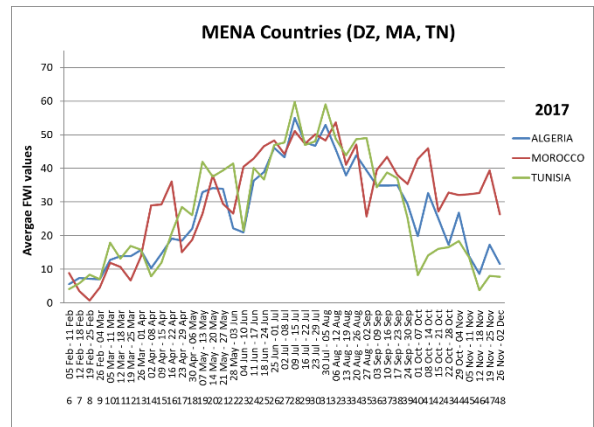
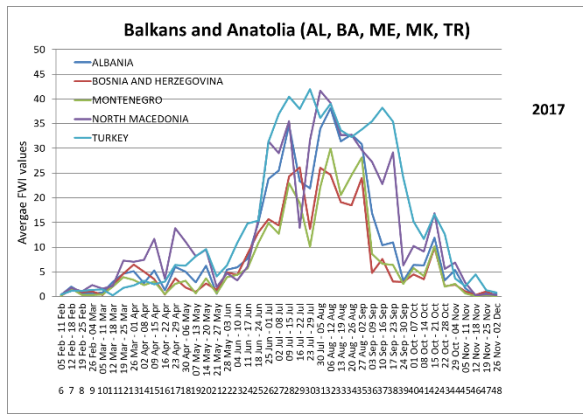


Figure 13. Fire danger trends 2017-2019) in the Balkans and Anatolia (AL, BA, ME, MK, TR).

Figure 14. 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.

1.2 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 1. These figures may also include agricultural and urban areas that were burned during the forest fires. Figure 15 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 19 on page 18).

Table 1. 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 15. Burnt scars produced by forest fires during the 2019 fire season.

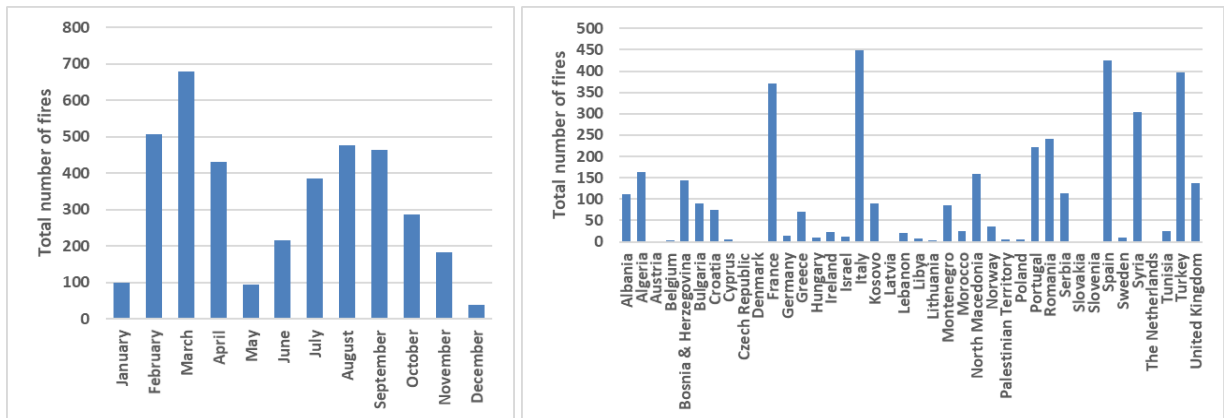


Figure 16. Total number of fires >30 ha by month and country in 2019.

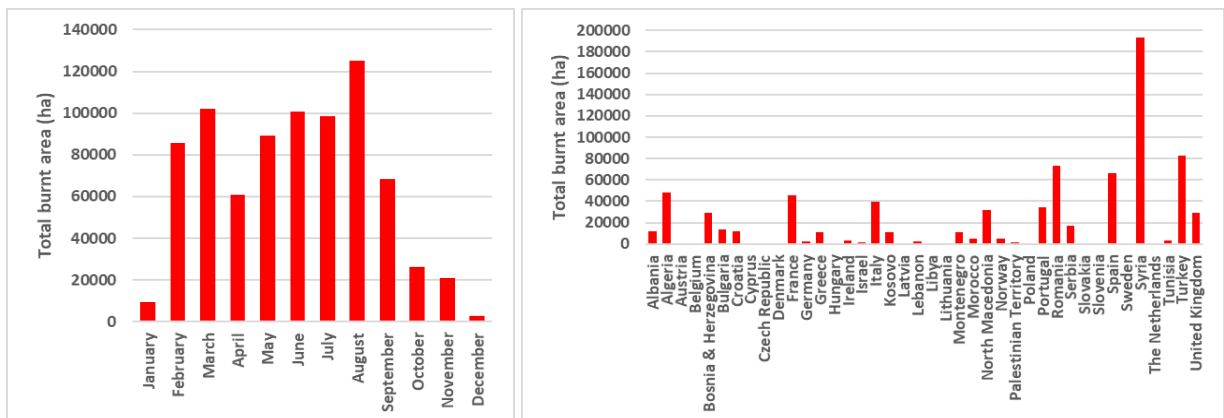


Figure 17. Total burnt area of fires >30 ha by month and country in 2019.

Damage to Natura2000 sites

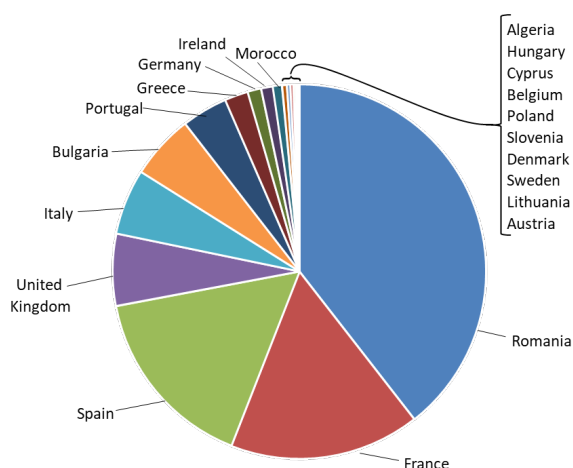
Of particular interest is the analysis of the damage caused by fires to the areas protected within the Natura2000 network, as they include habitats of especial interest which are home for endangered plant and animal species.

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

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



The total burnt in protected areas in 2019 was 161 473 ha, over three times that recorded in 2018

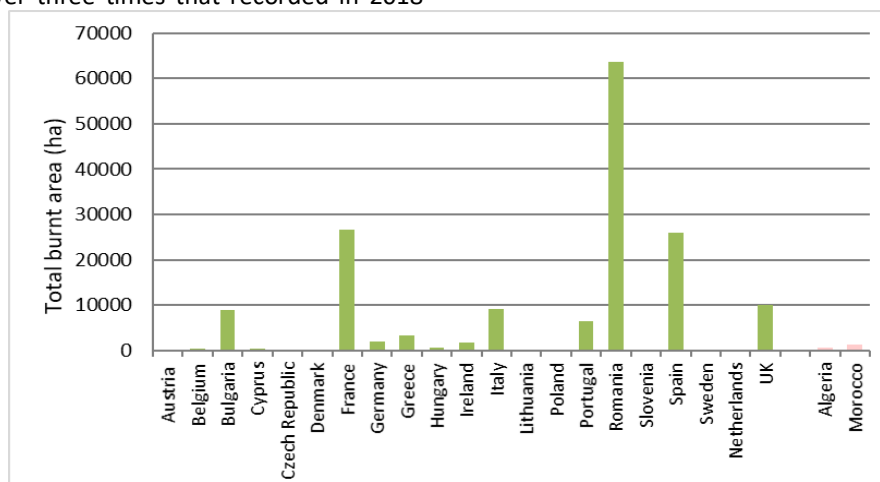


Figure 18. Burnt area in Natura2000 sites and other protected areas in 2019.

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 19).

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%.

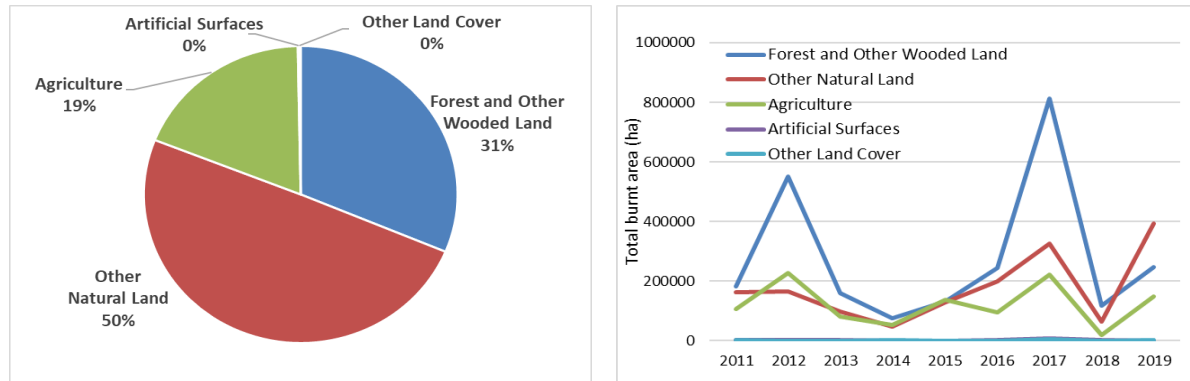


Figure 19. a) Proportions of land cover types affected in 2019 (all countries); b) Total burnt area by land cover type 2011-2019 (all countries).

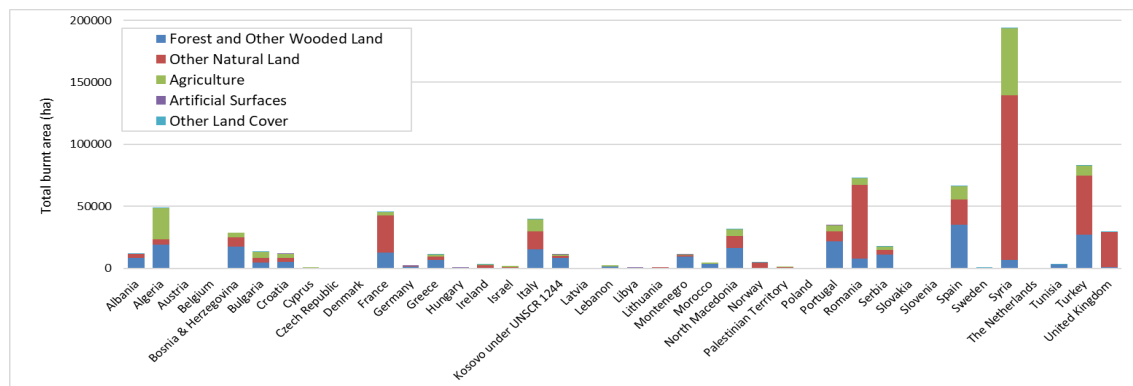


Figure 20. Burnt area in each country in 2019 by CORINE land class

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 16 and Figure 17 above.

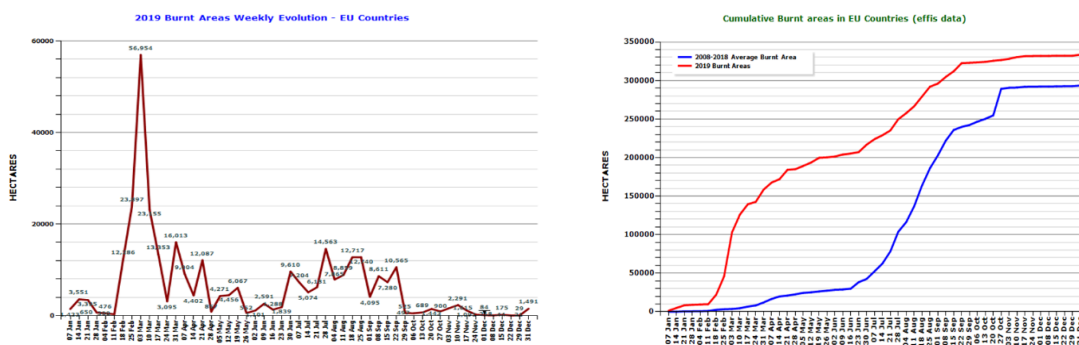


Figure 21. Burnt area weekly evolution and cumulative burnt area in 2019 (European Union countries).

Burnt areas are split into different land cover types using the CLC 2016 database unless otherwise specified.

1.2.1 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 22.

Table 2. Distribution of burnt area (ha) in Albania by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

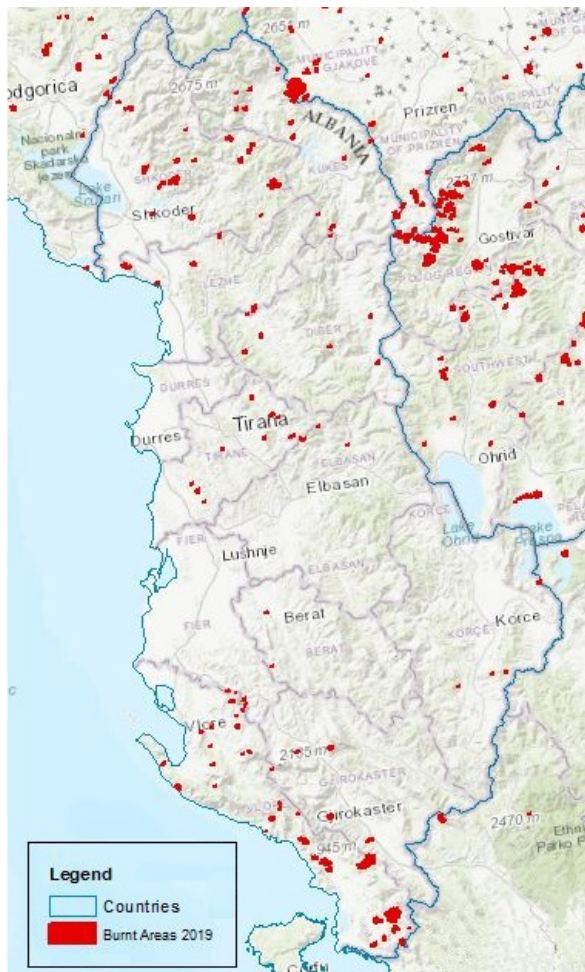


Figure 22. Mapped burnt areas in Albania in 2019.

1.2.2 Austria

In July a fire of 38 ha affected a Natura2000 site in Forest and Other Wooded Land

1.2.3 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.

1.2.4 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 23 below.

Table 3. Distribution of burnt area (ha) in Bosnia-Herzegovina by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	17346.36	59.95
Other Natural Land	7726.09	26.7
Agriculture	3864.09	13.35
TOTAL	28936.54	100

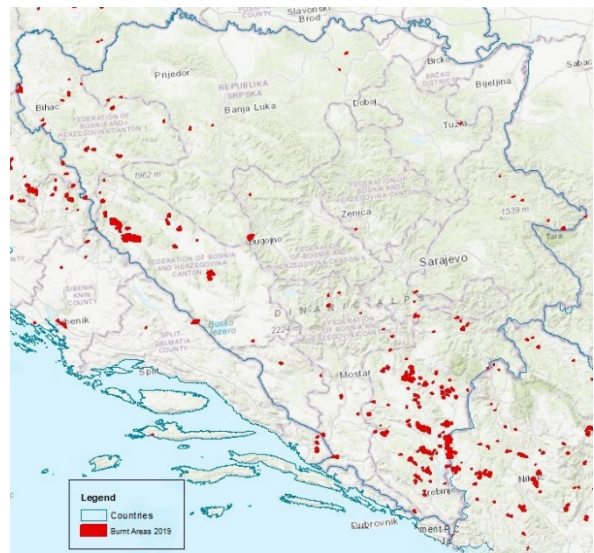


Figure 23. Mapped burnt areas in Bosnia and Herzegovina in 2019.

1.2.5 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 24.

Table 4. Distribution of burnt area (ha) in Bulgaria by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

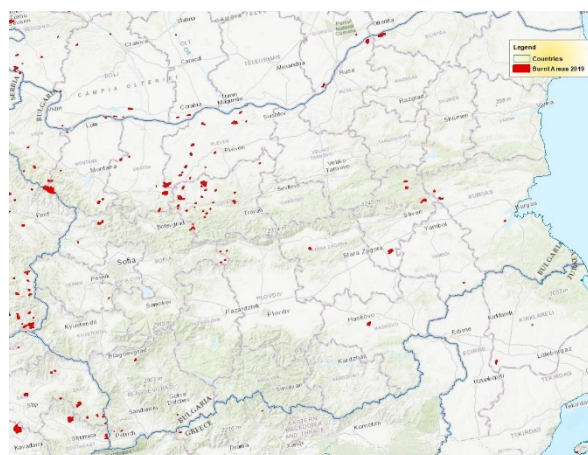


Figure 24. Mapped burnt areas in Bulgaria in 2019.

1.2.6 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 Lickosenjska 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 25.

Table 5. Distribution of burnt area (ha) in Croatia by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

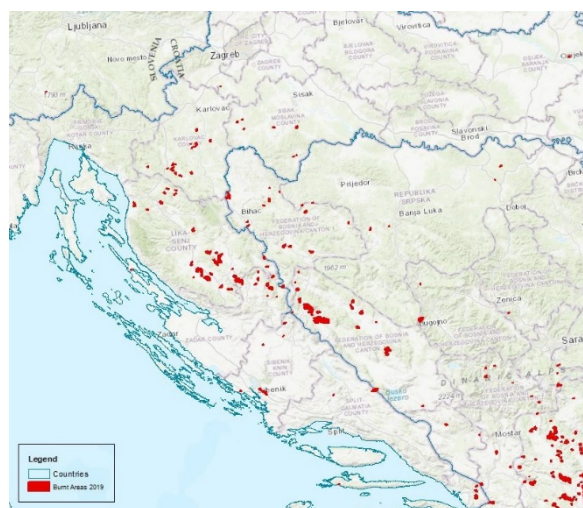


Figure 25. Mapped fire scars in Croatia in 2019.

1.2.7 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.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	445.11	71.17
Other Natural Land	54.74	8.75
Agriculture	125.59	20.08
TOTAL	625.44	100

Table 6. Distribution of burnt area (ha) in Cyprus by land cover types in 2019.

1.2.8 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.

1.2.9 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 7. Distribution of burnt area (ha) in Denmark by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	24.86	23.08
Other Natural Land	82.83	76.92
TOTAL	107.69	100

1.2.10 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 27). 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 26).

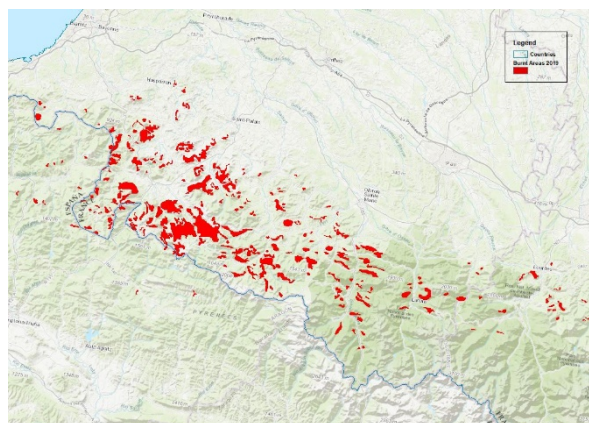


Figure 26. Fires scars caused by the early season fires in the Pyrénées-Atlantiques.

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.

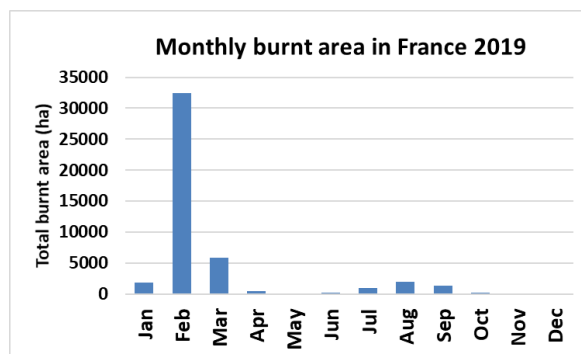


Figure 27. Monthly mapped burnt areas in France in 2019.

Table 8 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 28.

Table 8. 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

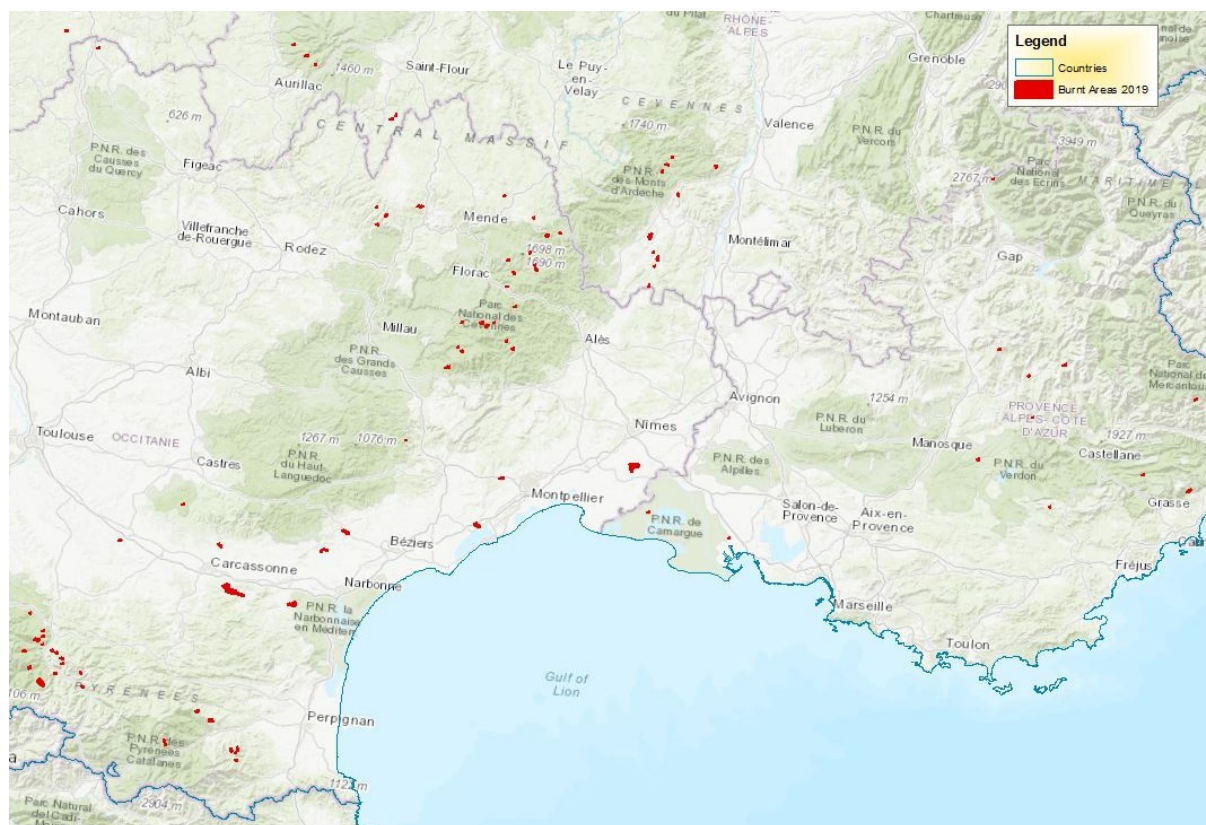


Figure 28. Visible burnt area scars in the South of France in 2019.

1.2.11 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 9. Distribution of burnt area (ha) in Germany by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

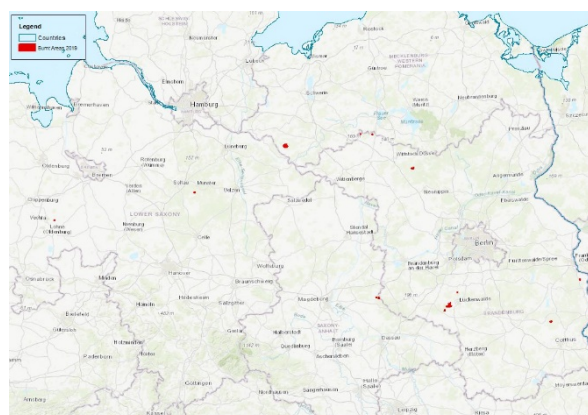


Figure 29. Fire scars in northern Germany in 2018.

1.2.12 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 10 presents the distribution of the mapped burnt area by land cover type. Figure 30 shows the burnt area scars in Greece.

Table 10. Distribution of burnt area (ha) in Greece by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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 30. Burnt area scars in Greece in 2019.

1.2.13 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 11. Distribution of burnt area (ha) in Hungary by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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 31. Mapped burnt area scars in Hungary 2019.

1.2.14 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 12.

Table 12. Distribution of burnt area (ha) in Ireland by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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 32. Burnt area scars in Ireland in 2019.

1.2.15 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 13. Distribution of burnt area (ha) in Italy by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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 33).

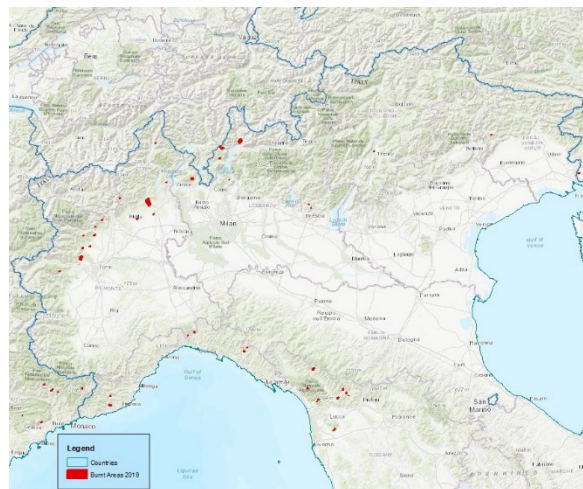


Figure 33. Burnt area scars in northern Italy in the early months of 2019.

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 13 presents the distribution of the mapped burnt area by land cover type.



Figure 34. Burnt area scars in Sicily and central/southern regions of Italy in 2019.



Figure 35. Fire scars in Sardinia in 2019.

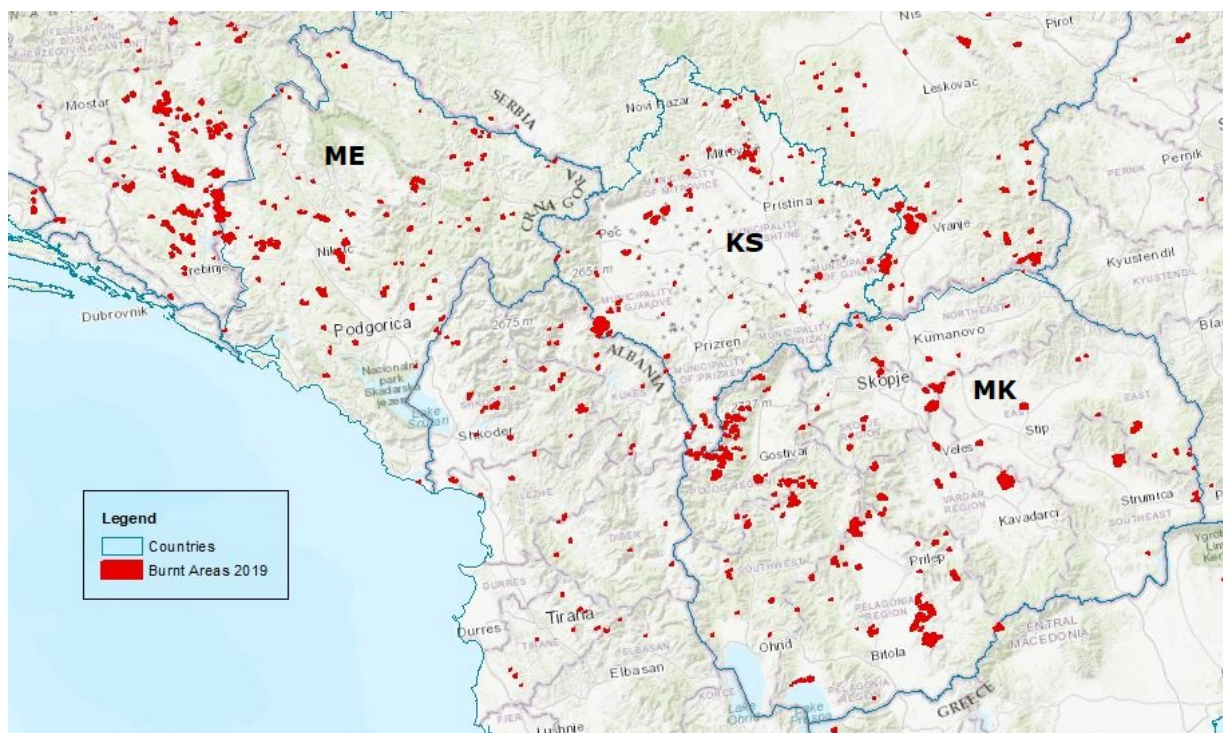


Figure 36. Mapped burnt area scars in Montenegro (ME), Kosovo under UNSCR 1244 (KS) and North Macedonia (MK) in 2019.

1.2.16 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 14 shows the classification of the burnt area by land type and Figure 36 shows the mapped burnt area scars.

Table 14. Distribution of burnt area (ha) in Kosovo by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.2.17 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 15. Distribution of burnt area (ha) in Latvia by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	38.17	77.24
Other Natural Land	11.24	22.76
TOTAL	49.42	100

1.2.18 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 16. Distribution of burnt area (ha) in Lithuania by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	167.97	71.39
Other Natural Land	67.33	28.61
TOTAL	235.3	100

1.2.19 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 36 shows the mapped burnt area scars.

Table 17. Distribution of burnt area (ha) in Montenegro by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.2.20 The Netherlands

In the Netherlands a fire burned 20.81 ha in May, all in Other Natural Land. No Natura2000 was affected.

1.2.21 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 37). The burnt area scars are displayed in Figure 36 above.

Table 18. Distribution of burnt area (ha) in North Macedonia by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

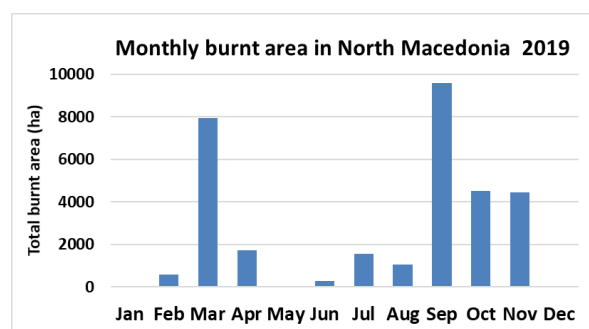


Figure 37. Monthly mapped burnt area in North Macedonia in 2019.

1.2.22 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 19.



Figure 38. Fire scars in the south of Norway 2019.

Table 19. Distribution of burnt area (ha) in Norway by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.2.23 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 20. Distribution of burnt area (ha) in Poland by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	55.51	30.54
Other Natural Land	100.26	55.17
Agriculture	25.97	14.29
TOTAL	181.75	100

1.2.24 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 39.

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 21.

Table 21. Distribution of burnt area (ha) in Portugal by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

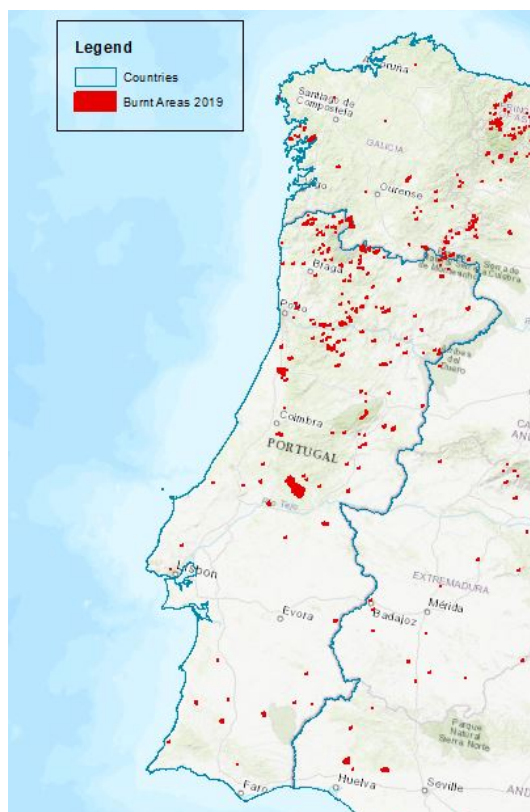


Figure 39. Burnt area scars in Portugal in 2019.

1.2.25 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 41).

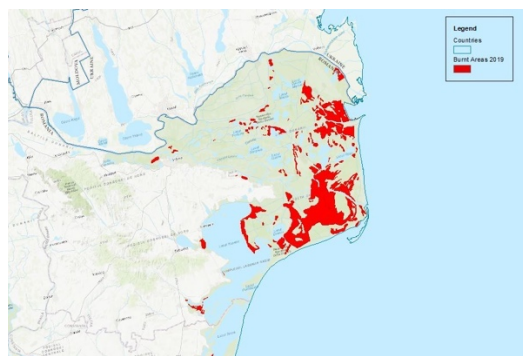


Figure 40. Detail of fire scars in the Danube Delta in 2019.

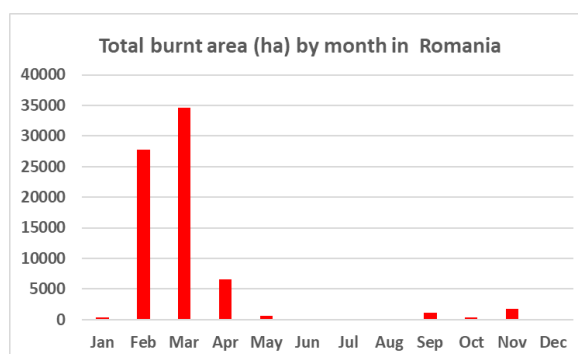


Figure 41. monthly burnt area in Romania 2019.

Of the total, 6 3673 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 22 presents the distribution of the mapped burnt area by land cover type.

Table 22. Distribution of burnt area (ha) in Romania by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

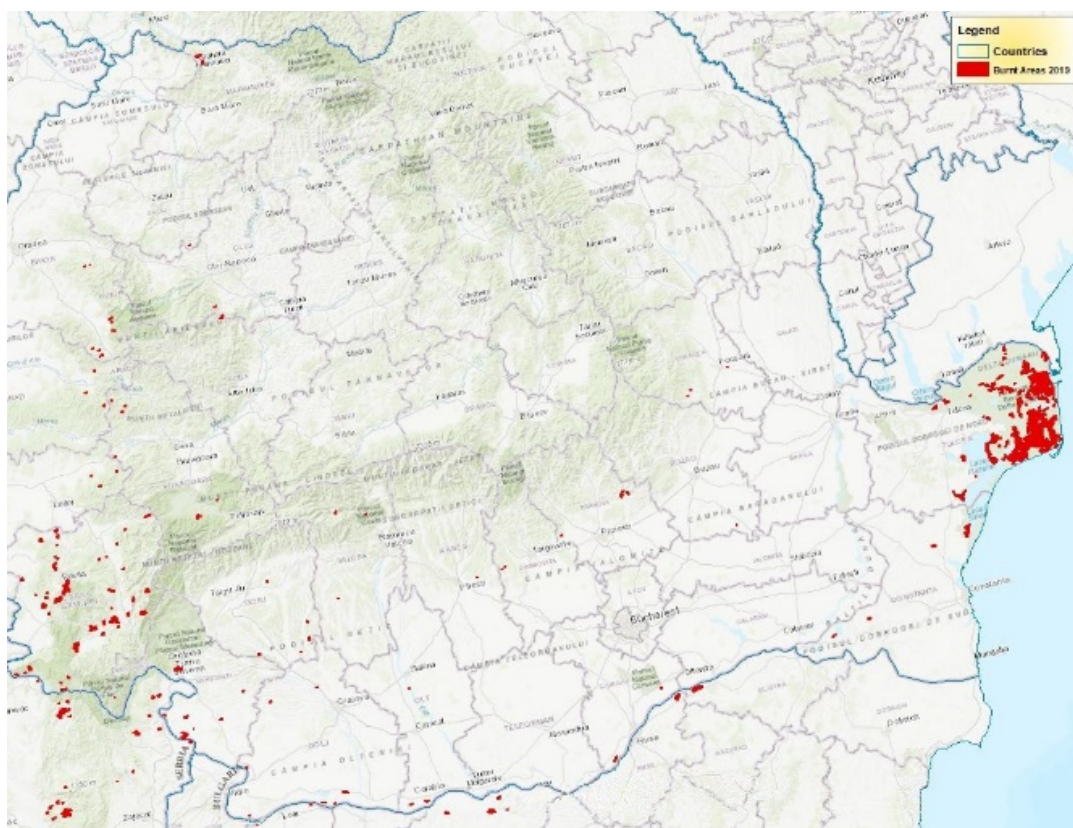


Figure 42. Burnt area scars in Romania in 2019.

1.2.26 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.

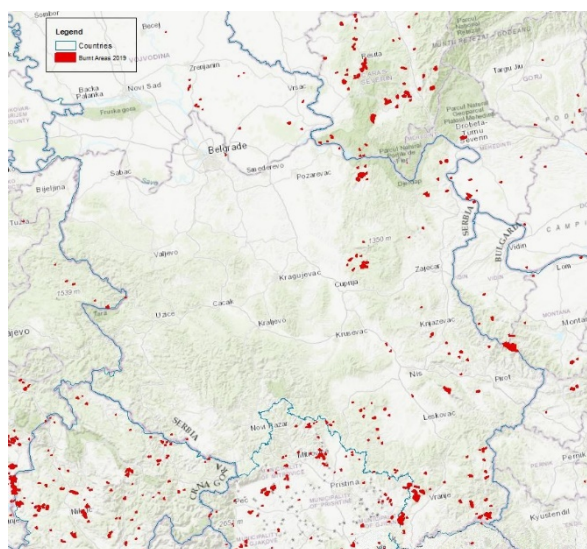


Figure 43. Burnt area scars in Serbia in 2019.

Table 23. Distribution of burnt area (ha) in Serbia by land cover type in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.2.27 Slovakia

In June a fire of 24.64 ha was mapped in Other Natural land. No Natura2000 land was affected.

1.2.28 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 24. Distribution of burnt area (ha) in Slovenia by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	80.57	76.07
Other Natural Land	25.35	23.93
TOTAL	105.92	100

1.2.29 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 44. 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 25 presents the distribution of the mapped burnt area by land cover type. The most noticeable fires in Spain during 2018 are shown in Figure 46.

Table 25. 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

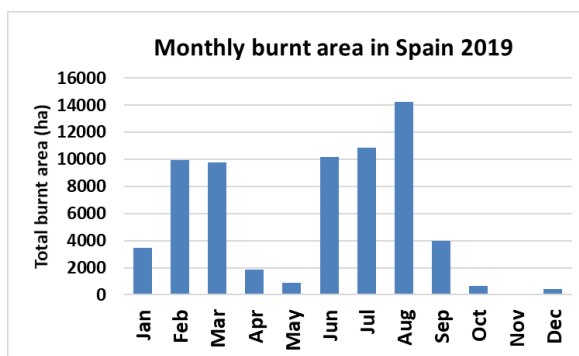


Figure 45. Monthly mapped burnt area in Spain in 2019.

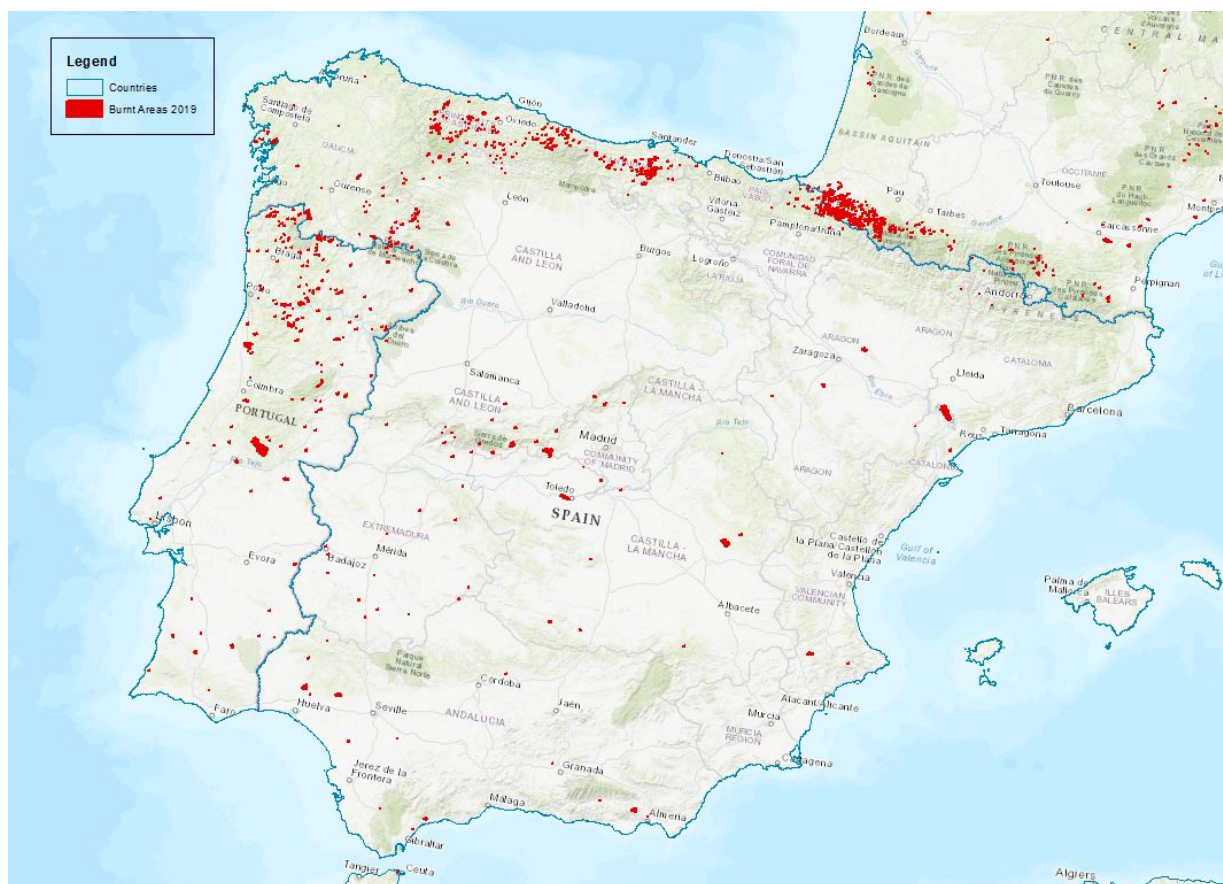


Figure 46. Fire scars in Spain in 2019.

1.2.30 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 26).

Table 26. Distribution of burnt area (ha) in Sweden by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.2.31 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 27 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 47.

Table 27. Distribution of burnt area (ha) in Turkey by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

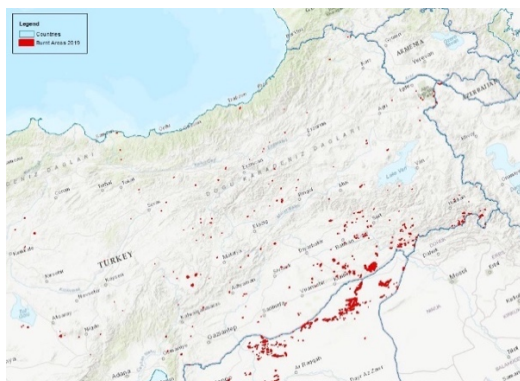


Figure 47. Burnt area scars in Turkey in 2019.

1.2.32 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 28).

Table 28. Distribution of burnt area (ha) in the UK by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

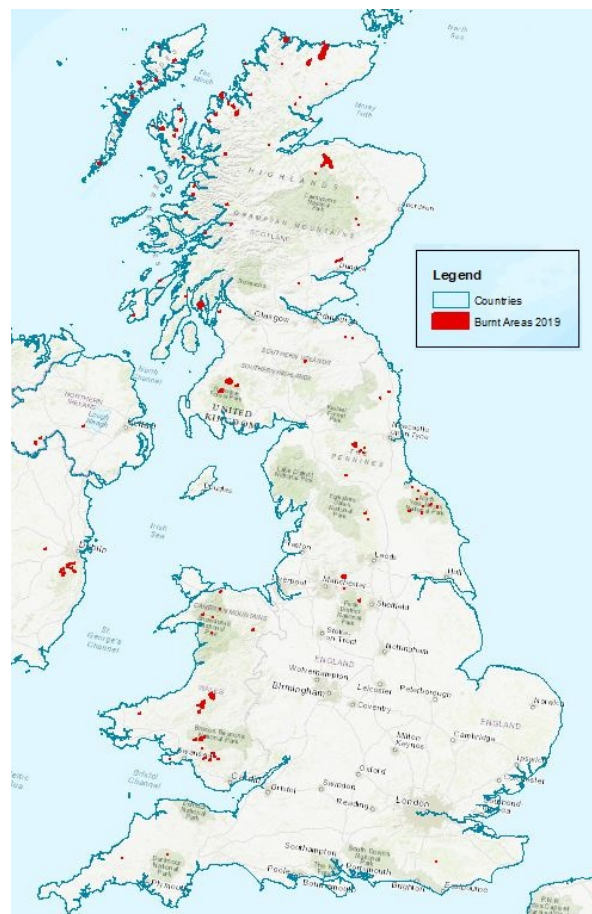


Figure 48. Burnt area scars in the UK in 2019.

1.3 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.

1.3.1 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 29.

The burnt scars left by these fires can be seen in Figure 50 below.

Table 29. 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

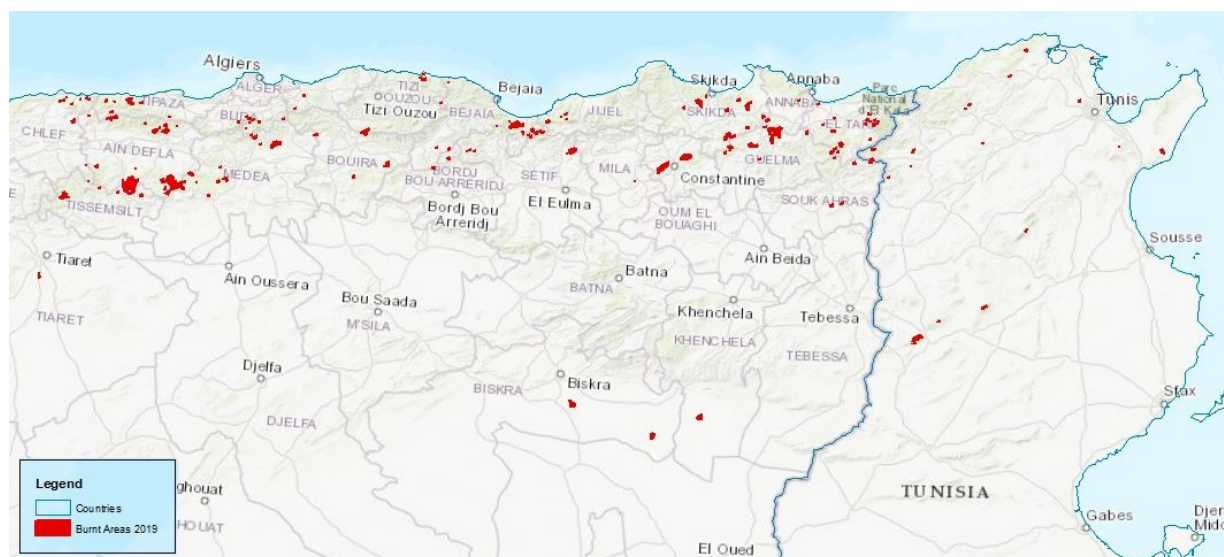


Figure 50. Mapped burnt area scars in northern Algeria and Tunisia in 2019.

1.3.2 Israel

Twelve 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 30. 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

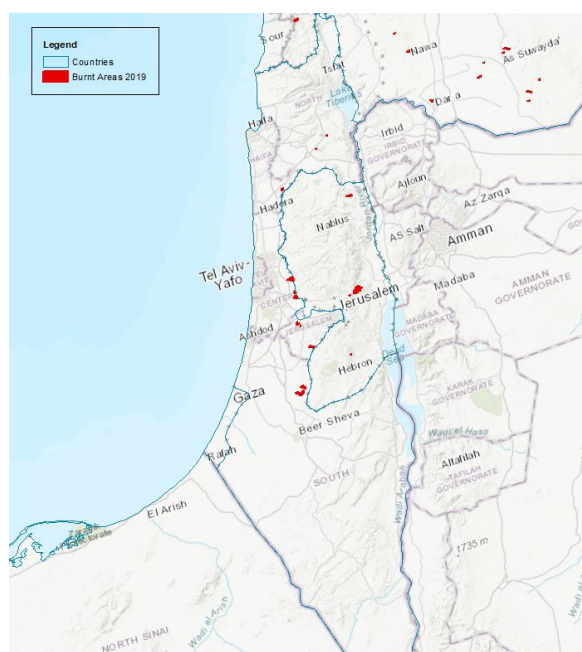


Figure 49. Mapped burnt area scars in Israel in 2019.

1.3.3 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 31 presents the distribution of the mapped burnt area by land cover type using the Globcover land cover map, harmonised with CLC.

Table 31. Distribution of burnt area (ha) in Lebanon by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	1276.77	55.15
Other Natural Land	245.42	10.6
Agriculture	792.83	34.25
TOTAL	2315.02	100

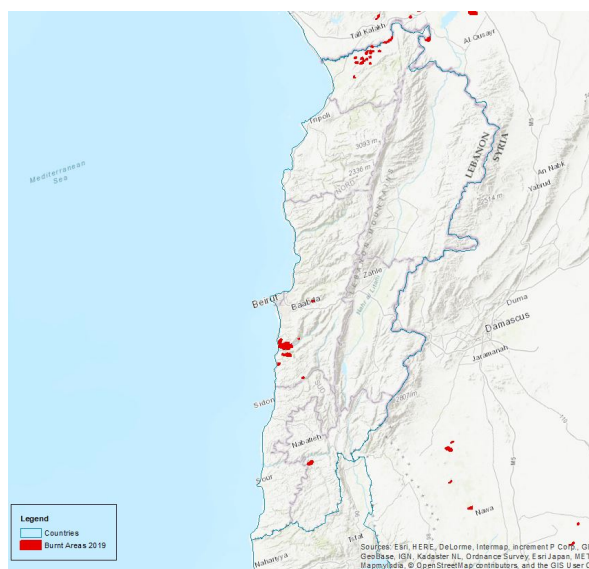


Figure 51. Mapped burnt area scars in Lebanon in 2019.

1.3.4 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 32 presents the distribution of the mapped burnt area by land cover type using the Globcover land cover map, harmonised with CLC.

Table 32. Distribution of burnt area (ha) in Libya by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

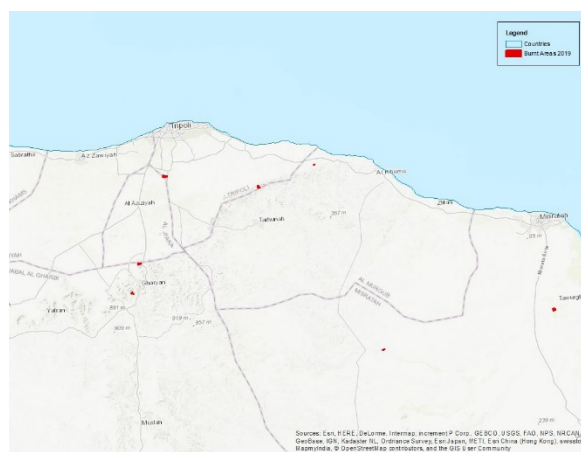


Figure 52. Mapped burnt area scars in Libya in 2019.

1.3.5 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 33 and the burnt area scars left by the fires are shown in Figure 53.

Table 33. Distribution of burnt area (ha) in Morocco by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Forest/Other Wooded Land	3597.24	74.77
Other Natural Land	128.9	2.68
Agriculture	1084.99	22.55
TOTAL	4811.13	100

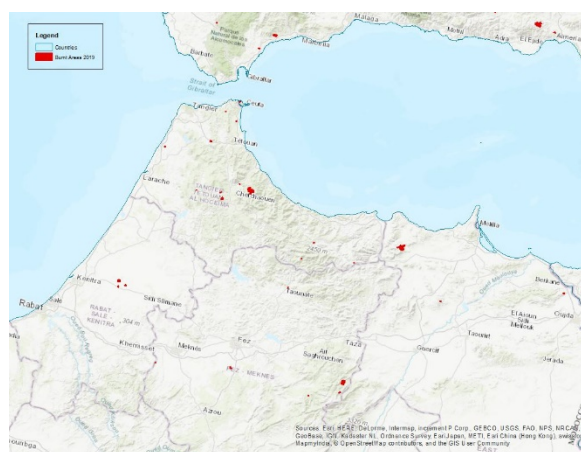


Figure 53. Mapped burnt area scars in Morocco in 2019.

1.3.6 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 34).

Table 34. Distribution of burnt area (ha) in Syria by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

1.3.7 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 50 on page 30 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 35.

Table 35. Distribution of burnt area (ha) in Tunisia by land cover types in 2019.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
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

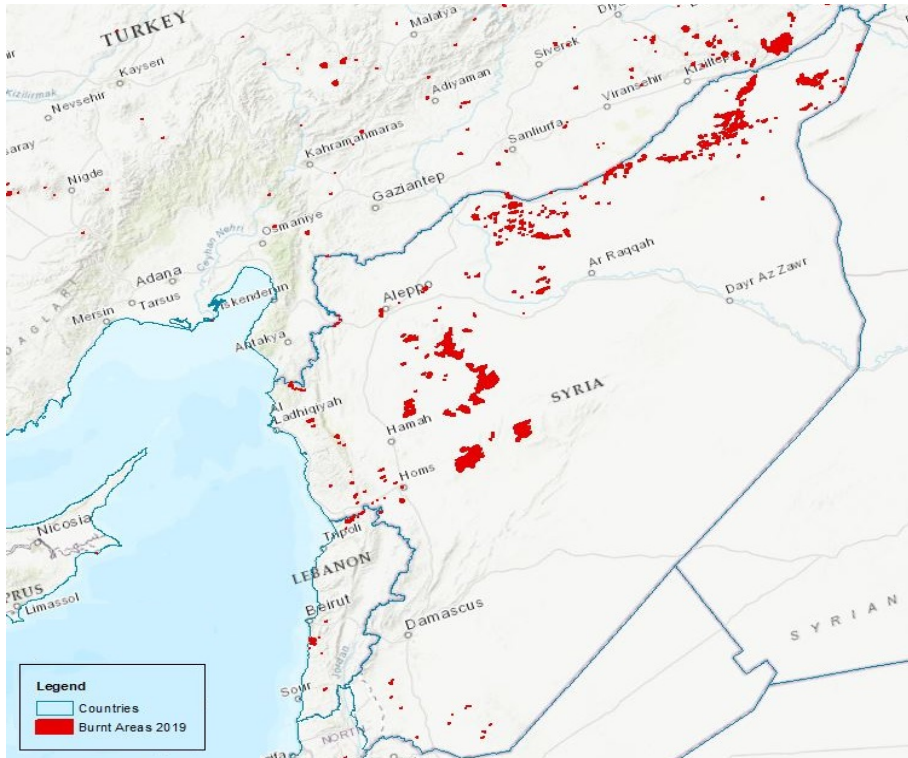


Figure 54. Mapped burnt area scars in Syria in 2019.

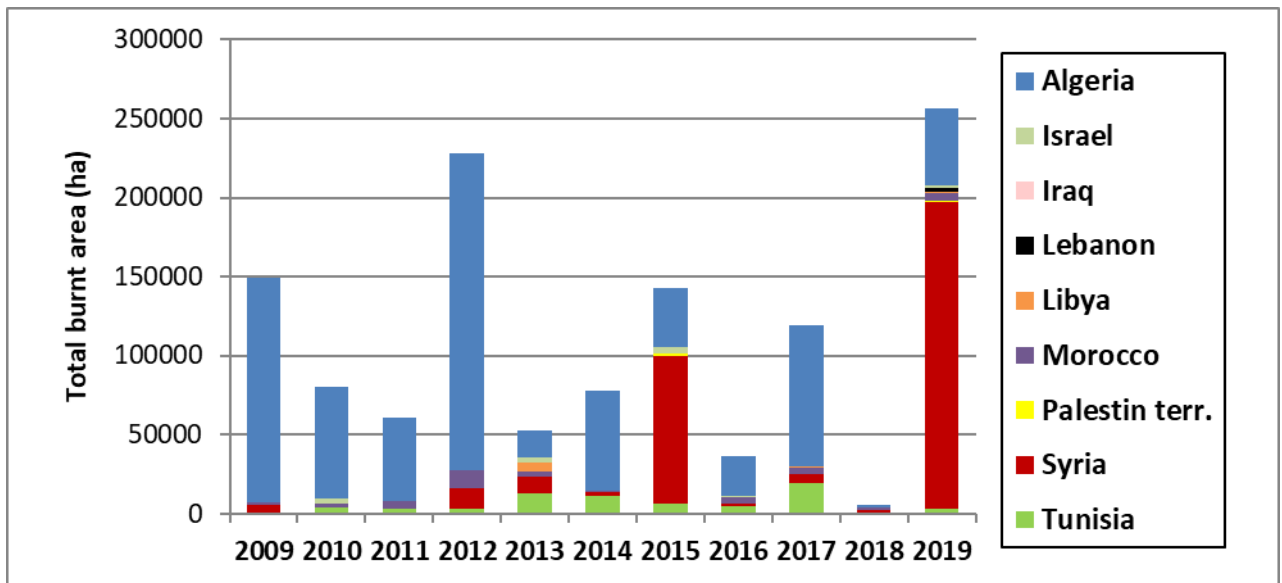


Table 36. Overview of fires in the MENA region in the last 11 years.

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