



JRC TECHNICAL REPORT

Forest Fires in Europe, Middle East and North Africa 2022

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Huge wild fires affected the Trieste Karst area between Italy and Slovenia in July 2022. The cross-border firefighting operations, conducted by the Italian and Slovenian forces and hindered by the presence of unexploded ordnance from the First World War, lasted 14 days. The fire destroyed over 4 000 hectares of forest with a rate of spread, intensity and destructive capacity unknown for this area.

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Forest Fires in Europe, Middle East and North Africa 2022

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Abstract

This report contains the annual summary of the fire season of 2022 with official figures provided by 34 contributing countries for the number of fires, burnt areas and fire prevention efforts, and the analysis of fire danger and areas mapped in the European Forest Fire Information System (EFFIS).

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Preface: ‘Forest Fires in Europe, Middle East and North Africa 2022’

For the third consecutive year so far, unprecedented wildfires have caused tragic loss of human life and significant environmental and economic damage across Europe and beyond. Whilst efforts by the European Commission and the EU Member States have greatly improved prevention, preparedness and firefighting, forest fires are still a major fear for people across Europe.

2022 was the second-worst year in the EU in terms of the area burned by wildfires. Nearly 900 000 hectares of natural land, roughly the area of Corsica, was affected by fire. This had a heavy impact on the EU's biodiversity reservoir, the Natura2000 network. About 43% of the total burnt area (approximately 365 000 ha) was part of Natura2000 sites. The threat to these precious, and in some cases irreplaceable, ecosystems is enormous and cannot be quantified in solely economic terms. It may take many years for these habitats and their plant and animal species to recover. Human casualties of wildfires in 2022 were limited in the EU thanks to prevention measures put in place by the EU and its Member States, and the enhanced preparedness and firefighting operations of the fire management services.

Some data on wildfires in 2023 are already available. They show that the total burnt area so far this year is smaller than in 2022, but that wildfires have still already burned about 500 000 ha of natural land in the EU. In addition, 2023 has again seen wildfires that were impossible to bring under control by traditional firefighting means, including a fire near the city of Alexandroupolis in the Greek region of East Macedonia and Thrace, which was the largest single wildfire recorded in the EU since the European Forest Fire Information System¹ (EFFIS) started recording in 2000. Thanks to the EU's extensive preparation efforts and upgraded response capacities, the 18 firefighting planes and helicopters deployed to combat the flames all came from the EU's collective reserve *rescEU* fleet.

Preventing and mitigating impacts

As the threat of wildfires increases annually, the EU is taking clear and comprehensive steps to tackle and mitigate the impact of wildfires across the continent and beyond. The EU Strategy on Adaptation to Climate Change², adopted in 2021, sets out the pathway to prepare for the unavoidable impacts of climate change, while the EU Forest Strategy,³ published the same year, complements the existing guidelines for prevention of wildfires⁴ by highlighting the importance of strengthening resilience of Europe's forests. These guidelines call for more biodiversity-friendly adaptive forest management practices and the restoration of degraded forest ecosystems, in order to increase forest resilience and reduce the risks of wildfires. They also call for the management of vegetation, to avoid the accumulation of what could become easily inflammable fuel on the ground, lowering wildfire risk and facilitating firefighting interventions if wildfires do occur. Moreover, the EU Nature Restoration Law will help to ensure that the adaptive capacity of Europe's ecosystems is constantly being improved, and the new proposal for a Forest Monitoring Law will lead to timely, accurate and comparable forest data allowing for better prevention of and preparedness for wildfires and other forest disturbances.

Building Europe's response capacity

The unprecedented wildfires sweeping Europe in the last 3 years are clear evidence of the devastating effects of the climate crisis, which is not only increasing the areas affected by fires but also prolonging the duration of the fire season beyond the traditional summer period. The high frequency and intensity of wildfires in this new, prolonged fire season poses a new challenge to national firefighting services across Europe, as aerial firefighting becomes more challenging and ground operations become difficult or even impossible.

In the face of this new, more dangerous risk landscape, the EU is scaling up its firefighting efforts with a boldly strengthened range of collective tools to keep people safe during longer and more challenging wildfire seasons. In the summer of 2023 Europe doubled the *rescEU* firefighting air fleet, the reserve of collective EU capacities developed as a strategic safety net to be used when national capacities are overwhelmed or when multiple Member States face a single crisis. This means that, when wildfires raged across Europe this summer, 28 planes and helicopters from the *rescEU* fleet were ready to support national firefighters wherever they were needed.

These expanded resources are all coordinated by the Emergency Response Coordination Centre (ERCC), the EU's emergency response hub operating 24/7 in Brussels. This year the ERCC launched a dedicated firefighting coordination cell, the Wildfires Support Team, to deal with the new realities of longer, more dangerous wildfire seasons. This vital work is enhanced by daily access to early warning and monitoring systems from the Joint Research Centre, enabling the ERCC to track ongoing wildfires and make swift and informed decisions.

¹ <https://effis.jrc.ec.europa.eu/>

² https://climate.ec.europa.eu/eu-action/adaptation-climate-change/eu-adaptation-strategy_en

³ https://ec.europa.eu/environment/strategy/forest-strategy_en

⁴ <https://op.europa.eu/en/publication-detail/-/publication/4e6cc1f1-8b8a-11eb-b85c-01aa75ed71a1>

Collectively, these increased capacities do not just fulfil Commission President Ursula von der Leyen’s 2022 commitment to bolster Europe’s firefighting capacity. They reinforce the science-based approach and cutting-edge abilities of the EU Civil Protection Mechanism, ensuring that Europe is prepared for the future.

Addressing the cause of wildfires

Roughly 96% of wildfires in the EU are caused by human actions, meaning education and awareness-raising campaigns are another essential part of the picture. It is crucial Europe’s population is prepared for more frequent and intense wildfires as the climate crisis worsens. Prevention measures must target all sectors of the population, including rural communities in direct contact with natural areas, as well as the particularly vulnerable population that lives in the ‘wildland urban interface’.

Scientists have identified tackling wildfire ignitions and spread, and the planning and managing the landscape, as the two main actions that are key to reducing wildfire risk. Other measures include better information on wildfire risk areas in Europe⁵ and new risk management practices such as those recommended under the new EU Forest Strategy. Alongside these efforts, the development of early warning and information systems must pave the way for evidence-based policymaking to protect Europe’s forests, restore those already damaged by wildfires and minimise the number of human casualties each summer.

A comprehensive approach towards integrated wildfire management requires a strong and continuous collaboration between the EU institutions and national wildfire management services, especially through mechanisms such as the Commission Expert Group on Forest Fires and the European Forest Fire Information System (EFFIS). The Joint Research Centre continues to improve its early warning and monitoring systems for wildfires: EFFIS in Europe and the Global Wildfire Information System⁶ at global level. Furthermore, exchanges of good practices, experience and information among countries continue to prove essential for a coordinated approach to prevention and effective firefighting.

Preparing for the future

As climate crisis worsens and the devastation of recent years’ fires grows, it becomes increasingly clear that Europe’s wildfire seasons will continue to worsen. To maintain a liveable future and survive this brutal new normality, both national and European wildfire response capacities must continue to be strengthened and expanded.

Only through better information and strong cooperation across the EU will it be possible to tackle the growing wildfire threats and their potentially devastating effects amplified by climate change. This latest instalment in the ‘Forest Fires in Europe, Middle East and North Africa’ series provides invaluable insights into our current situation, describing national fire management activities and the actions taken at both national and European levels during the fire campaigns in 2022. It is a valuable source of information that supports evidence-based policymaking and the design of current and future initiatives to mitigate wildfire effects both in the EU and internationally.



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⁵ <https://publications.jrc.ec.europa.eu/repository/handle/JRC130136>

⁶ <https://qwis.jrc.ec.europa.eu/>

Executive summary

This issue of the EFFIS annual report on forest fires for the year 2022 is the 23rd in the series. This report is consolidated as highly appreciated documentation of the previous year's forest fires in Europe, Middle East and North Africa. The section on national reporting gives an overview of the efforts undertaken at national and regional levels in the majority of countries in the European Forest Fire Information System (EFFIS) network. This is followed by information from EFFIS on the evolution of fire danger in the European and Mediterranean regions and the damage caused by fires in the 43 countries on the network.

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 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.

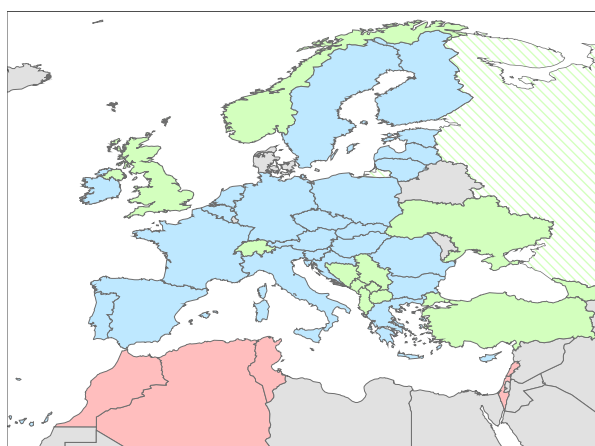


Figure 1. EFFIS network (blue: EU; green: non-EU; pink: MENA).

On the European Commission side, EFFIS was initiated by the Joint Research Centre in collaboration with the DG Environment. Due to the strong support by the Expert Group on Forest Fires, which constitutes the network of fire management experts from the countries, 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 Parliament⁷. 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. Data from EFFIS is used for the analysis of wildfire regimes under future climate change scenarios, in support to the DG CLIMA initiatives. 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 over 414 000 users from 197 countries in 2021.

Currently, the EFFIS network constitutes 43 countries, including 25 EU Member States (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the Netherlands), 13 European non-EU countries (Albania, Bosnia & Herzegovina, Republic of North Macedonia, Georgia, Kosovo, Montenegro, Norway, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom), and 5 MENA countries (Algeria, Israel, Lebanon, Morocco and Tunisia). [Russia is temporarily excluded from the network].

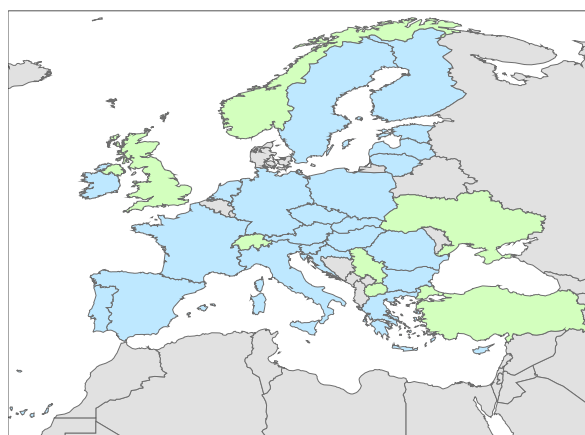
⁷<http://www.europarl.europa.eu/plenary/en/parliamentary-questions.htm>

1 Forest Fires in 2022: Country reports from National Fire Services

1.1 Introduction to the 2022 fire season

Table 1. Overview of the number of fires and burnt areas as reported by the contributing countries in 2022⁸.

Country	Number of fires			Burnt area (ha)			Notes
	2022	2012-21 average	2022 as % of average	2022	2012-21 average	2022 as % of average	
Algeria	1607	2891	56	27685	40832	68	
Austria	217	212	102	550	62	887	
Bulgaria	516	470	110	8126	4766	171	
Croatia	245	184	133	24226	12639	192	
Cyprus	89	103	87	685	2011	34	
Czechia	2473	1428	173	1715	382	448	
Estonia	26	75	35	20	112	18	
Finland	1129	1246	91	267	564	47	
France	22796	4368	522	70301	13710	513	
Germany	2397	889	270	3058	737	415	
Greece	962	910	106	18807	32181	58	
Hungary	2731	1245	219	20947	4392	477	
Italy	6529	5199	126	71694	72815	98	
Latvia	369	616	60	217	673	32	
Lebanon	22	137	16	79	1265	6	Average 2015-2021
Lithuania	81	148	55	53	74	71	
Morocco	499	446	112	22762	2914	781	
Netherlands	916	551	166	220	442	50	Average 2017-2021
North Macedonia	50	163	31	199	3355	6	
Norway	1275	325	393	2455	1080	227	Change in method of recording fires in 2016
Poland	6999	6895	102	2853	3478	82	
Portugal	10390	15553	67	110097	125831	87	
Romania	1021	347	294	13153	2316	568	
Serbia	66	113	58	1053	3645	29	
Slovakia	297	223	133	1210	431	280	
Slovenia	217	88	247	4059	254	1599	
Spain	10507	10616	99	267947	94249	284	
Sweden	5189	4795	108	912	4720	19	
Switzerland	115	95	122	322	89	364	
Türkiye	2160	2715	80	12799	22685	56	
Ukraine ⁹	1098	1539	71	18100	10675	170	



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 Member States and 7 other non-EU members of the EFFIS network.

⁸ Some countries do not report precise figures for fire numbers/burnt area and are not included in this table.

⁹ 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).

1.2.1 Austria

Fire danger in the 2022 fire season

2022 brought a fire-prone March, a slightly above-average number of forest fires and the largest forest fire area in 120 years.

The year 2022 started in Austria with a dry January. A prolonged dry spell began at the end of February. By the end of March, only a few millimetres of precipitation had fallen across the country. In addition, it was often warmer than average. The result was numerous forest fires, with a peak in the last two weeks of March. A particularly large number of forest fires were caused by the spreading of hot ashes. A total of 82 forest fires were recorded in March. In the last twenty years, only in 2012 were there more forest fires in this month (99 at that time). An explosive grenade on a military training area caused an exceptional fire, which was probably the largest continuous vegetation fire in Austria since the end of the 19th century. Result: A burnt area of about 800 hectares, of which about 400 hectares were forested.

The following April had average temperatures and slightly below average precipitation. There were no long dry spells. May was warm, but precipitation was evenly distributed in space and time. There were hardly any wildfires in both months. May was followed by the fourth warmest June on record – but again with no increase in forest fires due to the abundant rainfall.

In July and August the number of forest fires increased, supported by several heat waves. There were 30 wildfires in July and nearly 40 in August. September was cool and humid and no significant wildfires were recorded. Although the last three months of the year were too warm and regionally too dry, there were again hardly any forest fires.

A total of 217 forest fires were recorded in Austria in 2022. This is slightly above the average of the last twenty years. About 550 hectares of forest area were damaged by fire, probably the largest burnt area for more than a hundred years.

Fire occurrence and affected surfaces

The regional distribution of forest fires in 2022 reflects the long-term trend. There were 48 forest fires in Styria, 47 in Lower Austria, 35 in Carinthia and 27 each in Upper Austria and Tyrol. For Upper Austria this means an above average number of forest fires. The lowest number of forest fires were recorded in Vorarlberg (7) and Vienna (3). Regional hotspots of fire activity were the valleys in the western Alps and the eastern pre-alpine landscape.

The monthly distribution of forest fires reflects the temporally dry conditions during the year. In March,

82 fires were recorded – the highest number for March in 10 years – and after a decrease in May (10 fires) the summer months of July and August with some heat waves led to 69 documented forest fires. A wet and cold September brought only two uncontrolled forest fires. At the end of the fire season in October only four fires were recorded.

The area burnt by forest fires in Austria in 2022 was about 550 hectares, which is much higher than in recent years. This was mainly due to three large fires (all on military training areas) with a total burnt forest area of more than 500 ha. Considering all other vegetation fires (fields, reeds, grassland), more than 1 200 ha of vegetation (12 km²) were burnt in 2022. This is also the highest value for decades.

The yearly trends in terms of numbers of fires, burnt areas and average fire size since 1993 are displayed in Figure 2.

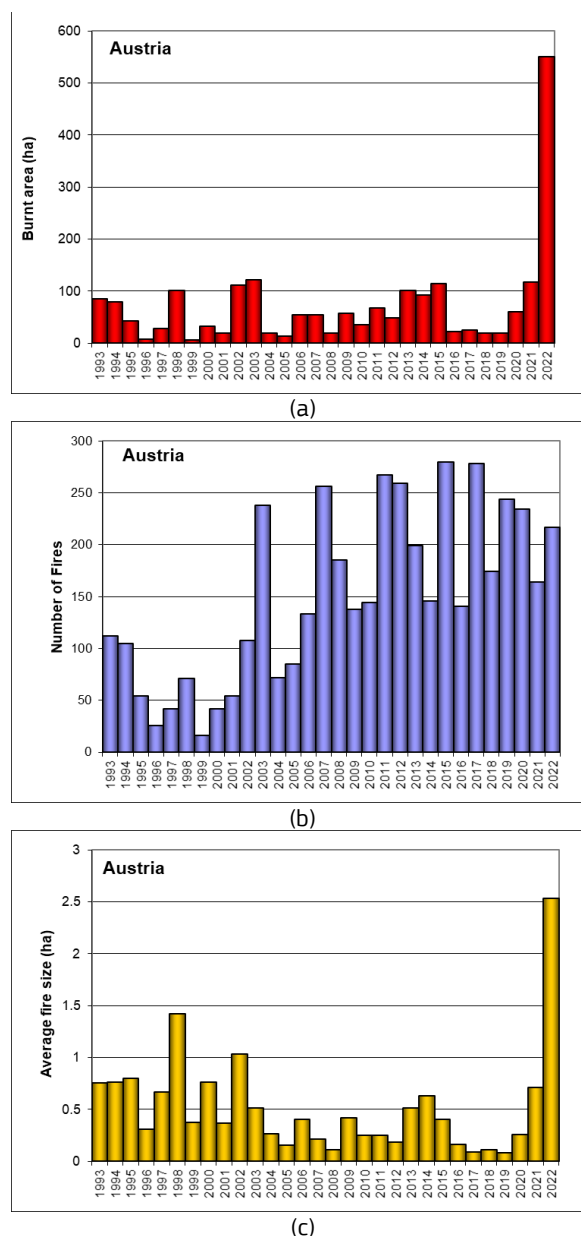


Figure 2. Burnt areas (a), number of fires (b) and average fire size (c) in Austria from 1993 to 2022.

Fire causes

Most forest fires in 2022 were caused by human activities. Human influence was the most likely cause of 178 fires (82%). Negligence (e.g. discarded cigarettes, hot ashes, fires out of control) was the cause of more than 50% of all fires. Cigarettes were suspected to be the cause in about 20% of fires and hot ashes in about 15%. Arson was suspected in 10% of all forest fire events. Some fires were also caused by power lines, sparks from trains or the exact human cause remained unknown. The other 39 forest fires (18%) that were not caused by human activity were ignited by lightning strikes, which is close to the long-term average (17%). The majority of naturally caused fires remained incipient or very small fires, similar to recent years.

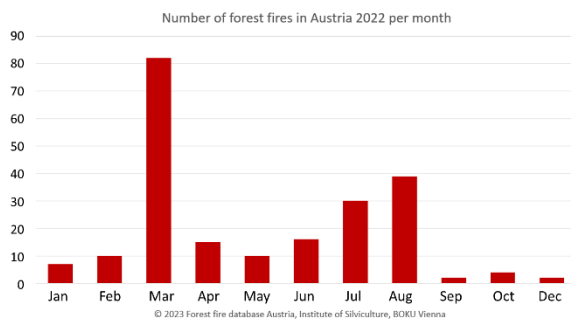


Figure 3. Number of fires by month in Austria in 2022.

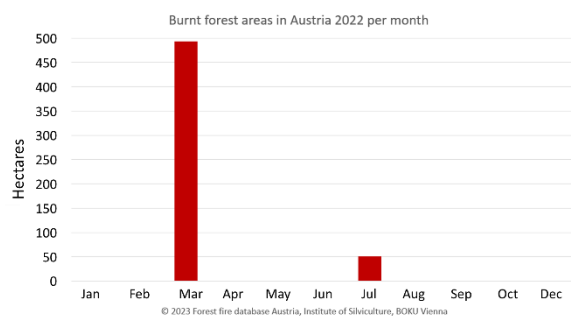


Figure 4. Burnt area in ha by month in Austria in 2022.

Injuries and loss of human life

There were only minor injuries and no deaths in the ranks of the fire brigades. In 2022, nine people were injured in wildfires, most of them firefighters. A forest owner died in March 2022 while trying to stop a fire in his forest. There were no other fatalities recorded.

Fire fighting means

The Austrian fire brigades continued to procure their specific equipment, including tools and clothing, as well as containers with forest firefighting equipment that can be transported either by truck or by aerial vehicles for fighting forest and wildland fires. At the Tyrolean Centre of Competence for Forest Fire Fighting (Tyrolean Fire Academy), joint training courses were held for members of all nine provincial fire brigade associations in the fields of "forest fire fighting on the ground" and "command and control for aerial forest fire fighting".

The Fire Academy in Carinthia now has a training facility where specific forest fire fighting operations can be taught. In all nine provinces, there are specially trained units for fighting forest fires, in particular as ground air support units. The teams have special training in equipment such as extinguishing containers for use in helicopters and auxiliary equipment for use in alpine areas. Some provinces are equipped with special forest fire trucks and pickup trucks.

Unmanned aerial vehicle (UAV) are becoming a standard tool for fire brigades to assess wildfires and use sensory data to support decision making.

The main challenge in fighting the fires in March and April was the presence of ammunition-laden terrain. Due to the risk of unexploded ordnance, no fire-fighting operations could be carried out without appropriate protection against shrapnel. The Austrian Armed Forces fire brigades, specially trained to fight fires in areas contaminated by ammunition, as well as the volunteer fire brigades alerted from the surrounding areas, had to use – in addition to the standard procedures and equipment – splinter-protected fire engines and counter-fire.

Operations of mutual assistance

In Austria, forest fires are fought by the local fire brigades. The local fire brigades are supported by the regional structures of the fire brigade associations (e.g. disaster relief units and specialised units). Aerial resources (helicopters, planes) are provided by the Ministry of the Interior (Mol), the Ministry of Defence (MoD) and private companies. There is close cooperation between these partners, including joint trainings and exercises.

Fire prevention activities and information campaigns

With the Forest Fund Act 2020, the Austrian government has approved a €350 million investment and relief package for agriculture and forestry to support Austria's forests, thus creating for the first time an economic basis for systematically addressing the issue of forest fires in Austria. The funds can now be used until 2027 to set up short- and long-term prevention measures and to implement integrated forest fire management in Austria.

https://www.parlament.gv.at/PAKT/VHG/XXVII/BNR/BNR_00092/index.shtml.

In 2022, the Institute of Silviculture at the University of Natural Resources and Life Sciences, Vienna, completed a comprehensive assessment of Austria's forest fire hazard at the municipal level. A more detailed assessment of the forest fire danger at the community level was developed, based on an extensive database with different datasets. As a result, five basic maps for the assessment of the forest fire danger were published:

1. the meteorological danger of forest fire occurrence;
2. the socio-economic hazard of forest fire occurrence;
3. the natural hazard of lightning ignited fires;
4. the danger of fire occurrence according to the vegetation;
5. the fire exposure of settlements and infrastructures.

The five basic maps can be combined with different weightings in order to carry out a forest fire hazard assessment at municipality level for different purposes (rising public awareness, fire management planning, etc.).

Accompanying the various media reports on devastating wildfires in Europe, a media campaign communicating five basic rules for behaviour in the case of increased wildfire risk was launched in Austria.

Climate change

Climatic conditions and how they impacted the fire season

The Austrian forest fire regime can have very different characteristics depending on the seasonal weather conditions. Due to climate change and the assumed increase in duration and intensity of droughts and heat waves in the summer months, more intense forest fire seasons are expected in the future.

National adaptation strategies / plans

With the Forest Fund Act 2020 and other project activities (e.g. AFFRI 2, CONFIRM), several measures are planned to adapt Austrian forests to climate change; e.g. by developing recommendations for forest owners and forest companies for adaptive forest management to reduce the forest fire risk or by raising public awareness. In addition, a national action plan is being implemented to better understand, prevent and suppress forest fires in Austria.

The Austrian Federal Ministry of Agriculture, Forestry, Regions and Water Management has launched a joint commitment of the national forest fire stakeholders to prepare for the challenges of increasing forest fire risk in the coming years. The "Hotspot Forest" action programme aims to develop an integrated wildfire management in Austria that is able to adapt to climatic and behavioural changes that influence the fire risk. Factors such as an increase in droughts and heat waves, as well as changes in recreational activities, are likely to increase the number and intensity of forest fires in the near future. The Action Programme focuses on three targets:

- (i) Researching and understanding forest fires,
- (ii) Preventing and fighting forest fires together and
- (iii) Disseminating and implementing knowledge on forest fires.

Each target includes different actions that combine short, medium and long-term measures to mitigate the effects of climate change on the ecosystem. The involvement of 17 institutions in the development process underlines the high political and social importance of the wildfire issue.

Research activities aimed at improving fire management

In spring 2022, several projects funded by the Austrian Forest Fund Act 2020, Measure 6 - Forest Fire Prevention, started under the leadership of the Institute of Silviculture, BOKU Vienna. Within the framework of IGNITE, the assessment of the ignition danger of forest fires occurring in Austria is to be improved. EMERGE aims at optimizing the state of knowledge on fuels in Austria, and therefore improving the models on fire spread and fire intensity. FIREDATA aims to harmonize the documentation of forest fires in Austria and to ensure the establishment of case studies on burnt forest sites. In the project Austria Fire Futures (AFF), led by a research group at the International Institute for Applied Systems Analysis (IIASA), the future development of fire hazard in Austria will be assessed.

(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

Fire occurrence and affected areas

According to the Executive Forest Agency database in 2022, the number of forest fires in Bulgaria was 516 and the burnt area is estimated to be 8 126 ha, with 644.6 ha of them burned by crown fires. The average size per forest fire in 2022 increased to 15.7 ha. The biggest forest fire affected 877 ha of forest territories. The largest number and area burnt by forest fires were reported in Regional Forest Directorate /RFD/ Kardzhali (50 fires and 1 861 ha), RFD Sliven (28 fires and 1 372 ha) and RFD Lovech (50 fires and 1 023 ha). More than 52% of all burnt forest areas in the country are concentrated in these three RFDs.

Distribution of the burnt areas in 2022 according to ownership is:

- State forest - 67%,
- Municipal forest – 12%
- Private forest – 21%.

The main causes for the forest fires during 2022 are as follows:

- Carelessness – 321 in number (62%);
- Arson - 16 in number (3%);
- Natural - 21 in number (4%);
- Unknown - 158 in number (31%).

The direct losses by forest fires in 2022 are estimated at 500 000 Euro, although the average losses for the last 10 years total about 1 000 000 Euro.

Fire prevention activities

Activities for forest fire prevention are priority of the Ministry of Agriculture 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 action plan for forest fire fighting. Based on those documents, to reduce the risk of fires in forest areas and improving interaction in combating them, the Plan "Fire Safety and Protection of the Population" (GDPBZN) was signed by the executive director of the Executive Forest Agency and the director of the General Directorate, for interaction between the two institutions in February 2022.

During the summer forest fire campaign on the Balkan Peninsula in Greece, Türkiye, North Macedonia and Albania, forces and means from Austria, Bulgaria, Germany, Italy, Romania, France, Croatia, Czechia, Sweden, etc. were involved through the "rescEU" mechanism. The Bulgarian General Directorate "Fire Safety and Protection of the Population" helped Greece with 2 teams from the module for extinguishing forest fires in the period 1-31 July 2022.

Table 2. Forest fire statistics for Bulgaria 2013-2022.

Year	Total number of fires	Burnt area (ha)	Fire causes (number)		
			Human activities	Natural	Unknown
2013	408	3314	334	12	62
2014	151	916	128	3	20
2015	429	4313	335	12	82
2016	584	6340	472	22	90
2017	513	4569	433	14	66
2018	222	1453	201	7	14
2019	668	5619	550	8	110
2020	499	5258	350	13	136
2021	349	3143	238	28	83
2022	516	8126	337	21	158
Mean	434	4305	338	14	82

The total number of fires, burnt area and average fire size from 1991 to 2022 is presented in Figure 5 and forest fire statistics including causes are in Table 2.

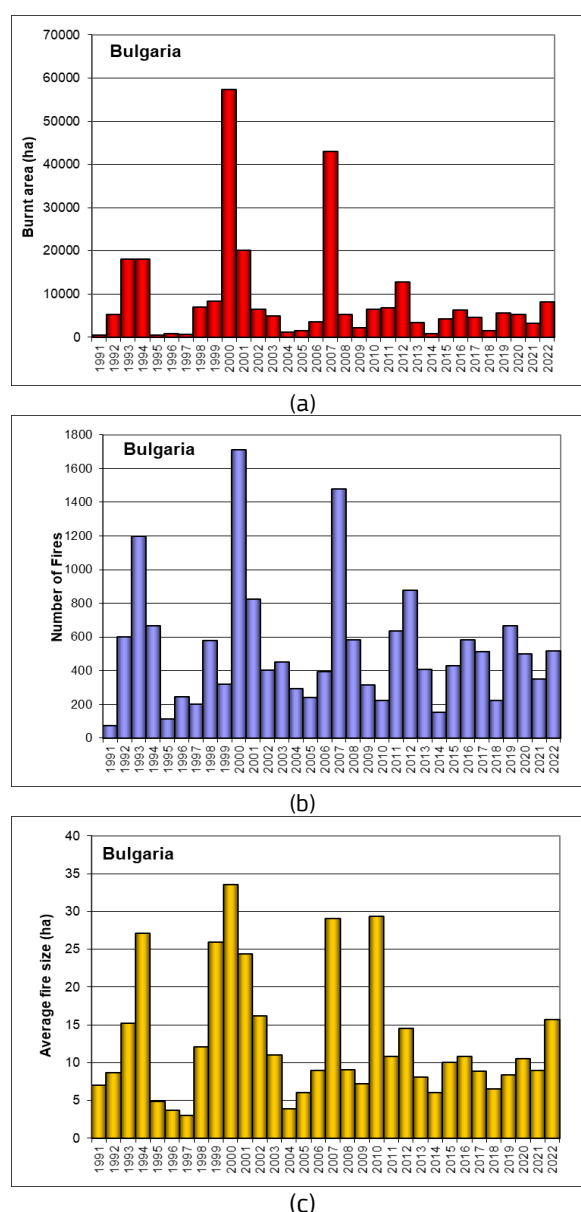


Figure 5. Burnt areas (a), number of fires (b) and average fire size (c) in Bulgaria from 1991 to 2022.

(Source: Executive Forest Agency, Bulgaria).

1.2.3 Croatia

Fire occurrence and affected surfaces

In the period from 01/01 until 31/12/2022 a total of 245 fires burned 24 226 ha of forest and other land owned by the Republic of Croatia and private forest owners (state and private forests and agricultural lands that were burned as part of forest fires).

This is a year with an average number of fires and an above-average burnt area.

It is important to point out that in 2022, most fires occurred in March, a total of 122 or 51% of all fires by number, i.e. 17 200 ha of burnt area or 71% in terms of area.

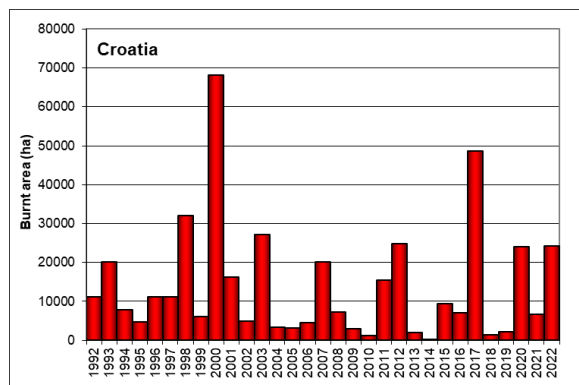
In the area of state forests managed by Hrvatske šume d.o.o., in 2022 there were 238 fires and 17 760 ha were burned (Table 3).

Table 3. Number of fires and burnt area (in state forests managed by Hrvatske šume d.o.o.) by forest administration in karst and continental area.

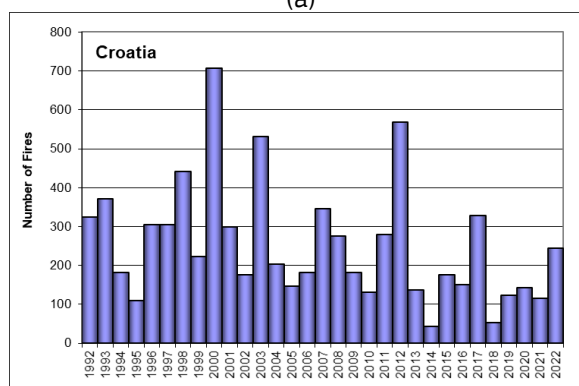
Forest administration	Number of fires	Burned area ha
DELNICE	8	14
SENJ	3	12
GOSPIĆ	15	8 053
BUZET	26	304
SPLIT	97	7 326
Total (karst area)	149	15 709
VINKOVCI	1	4
OŠIJEK	4	73
NAŠICE	2	16
POŽEGA	7	14
BJELOVAR	7	4
KOPRIVNICA	6	5
ZAGREB	6	14
SISAK	7	106
KARLOVAC	13	528
OGULIN	14	64
DELNICE	3	4
SENJ	2	6
GOSPIĆ	11	1 150
NOVA GRADIŠKA	4	26
Total (continental area)	87	2 014
Overall	238	17 760

It can be seen that the highest number of fires (97) occurred in the area of Forest administration Split (41% of the number of fires and 41% of the total burnt area).

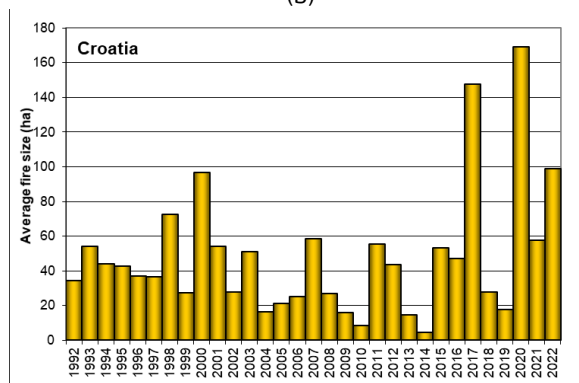
The trend of number of fires, burnt area and average fire size can be seen in Figure 6.



(a)



(b)



(c)

Figure 6. Burnt areas (a), number of fires (b) and average fire size (c) in Croatia from 1992 to 2022.

Table 4. Number of fires and burnt area by type of fire (all forests in the Republic of Croatia).

Type of fire	Number of fires	Burnt area (ha)
Ground fire (low)	169	17 642
Canopy fire (high)	4	25
Underground fire	1	19
Combined fire	67	6 517
Unclassified	4	23
Overall	245	24 226

Table 5. Number of fires according to who reported them.

Person reporting fire	Number of fires
Employees of the Hrvatske šume d.o.o.	139
Police	5
Firefighters	6
Citizens	94
Unclassified	1
Overall	245

Table 6. Assessment of damage to wood stock.

	Karst	Continent	Overall
Partially burned wood (m ³)	75 000	28 000	103 000
Completely burnt wood (m ³)	33 000	3 000	36 000
Damaged wood stock - amount of damage (EUR)	2 156 214.75	1 903 510.52	4 059 725.26

Table 6 provides an overview of the assessment of damage to wood stock for all forests (state and private), calculated according to the current methodology. This methodology does not cover the assessment of damage to agricultural lands that have been burned as part of forest fires.

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

1.2.4 Cyprus

Review of the 2022 season

After the disastrous 2021 fire season, 2022 has been a relatively light year for forest fires in Cyprus. Both fire ignitions and burnt area showed a significant decrease compared to previous years.

Fire danger in the 2022 fire season

In January 2022, the weather in Cyprus was wet. The mean air temperature was about 0.5°C below normal and the area average precipitation was 159% of normal.

In February the weather was dry and relatively warm. The mean air temperature was 1.5°C above normal and the average precipitation was 57% of normal.

In March the weather was dry. The mean air temperature was 2.5°C below normal and the area average precipitation was 72% of normal.

In April the weather was extremely dry and hot. The mean air temperature was about 2.5°C above normal and the area average precipitation was 0% of normal.

In May the weather was relatively hot and extremely dry. The mean air temperature was about 1.0°C above normal and the area average precipitation was 19% of normal.

In June the weather was relatively wet and normal to relatively hot. The mean air temperature was 1.0°C above normal and the area average precipitation was 110% of normal. Unstable weather conditions occurred during certain periods of the month, giving isolated thundery showers in several areas.

In July the weather was dry and normal to hot. The mean air temperature was 1.0°C above normal and the area average precipitation was 0% of normal.

In August the weather was normal to relatively hot and dry. The mean air temperature was about 0.5°C above normal and the area average precipitation was 28% of normal. Relatively high temperatures were recorded during certain days of the month, almost in all areas of Cyprus.

In September, the weather was relatively hot and relatively dry. The mean air temperature was 1.0°C above normal and the area average precipitation was 84% of normal.

In October, the weather was extremely wet and relatively hot. The mean air temperature was 1.0°C above normal and the area average precipitation was 288% of normal.

In November the weather was relatively warm and near normal with regards to precipitation. The mean air temperature was about 1.5°C above normal and the area average precipitation was 94% of normal.

In December the weather was warm and dry. The mean air temperature was about 2.5°C above normal and the area average precipitation was 32% of normal.

Fire occurrence and affected surfaces

During 2022, Cyprus experienced 89 forest fires that burned 685 hectares, mostly forest and other wooded land. Of these, 5 fires were over 50 ha in size.

Table 7. Number of forest fires and burnt areas in Cyprus from 2018 to 2022.

Year	Number of fires	Burned area (ha)		
		Total	Forest and other wooded land	Agriculture and other artificial land
2018	131	1136	997	139
2019	99	733	494	239
2020	108	1305	1002	303
2021	111	6612	4791	1821
2022	89	685	433	252

Major fires in 2022

Vouni fire

The most destructive forest fire of the year started at 16:00 of July 19, near Vouni community, Limassol District. The blaze burned 183 ha, mostly of shrubland and agricultural crops. Houses and other infrastructure in the area were seriously damaged or completely destroyed.

Pelathousa fire

The fire started on August 22, 2022 and burned 101 ha of forest, other wooded land and agricultural crops.

Fire causes

Out of the 89 forest fires that occurred in Cyprus during 2022, 23 forest fires (26%) were of unknown origin. Regarding forest fires with known cause, most fires were intentionally set (35 fires - 53%). A percentage of 8% is due to natural causes (lightning), whilst the remaining percentage, amounting to 39%, is attributed to human negligence.

The trends regarding both the number of fires and burnt areas over the last 23 years (2000-2022) are shown in Figure 7.

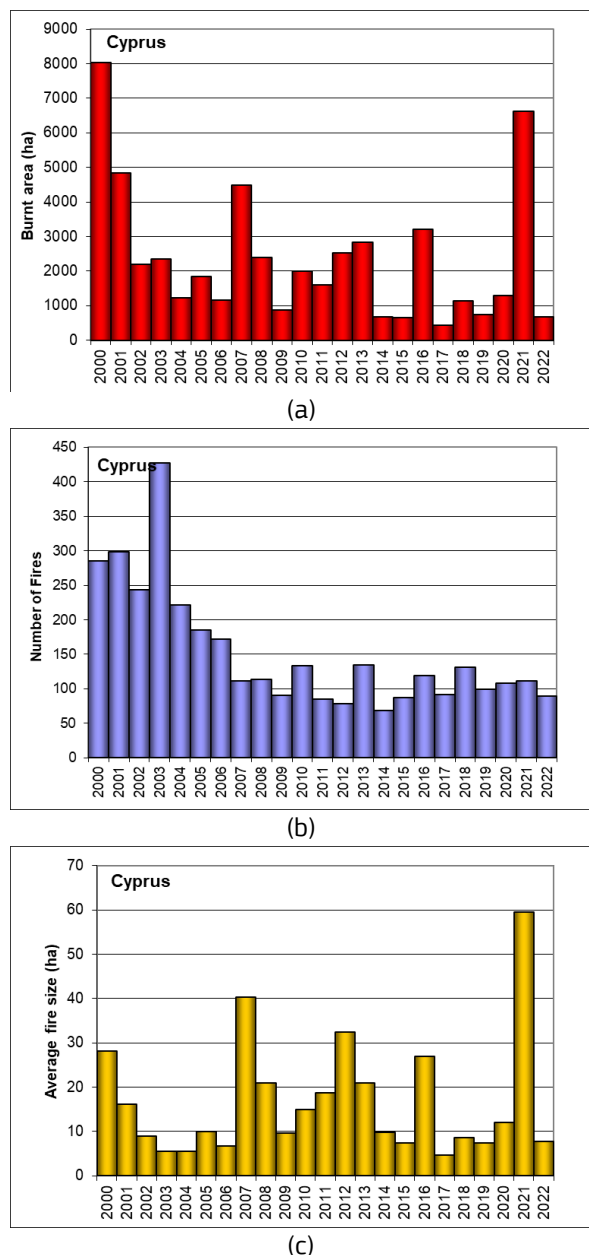


Figure 7. Burnt areas (a), number of fires (b) and average fire size (c) in Cyprus from 2000 to 2022.

Fire fighting means

The aerial firefighting means that were available during the 2022 fire season, consisted of 8 primary aerial assets of which, 6 were light type firefighting airplanes and 2 were medium type firefighting helicopters. In addition, light type helicopters were available for use as secondary aerial assets and for aerial coordination purposes, if needed.

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. Preparedness and emergency response capabilities of the firefighting forces remained at the highest level, throughout the fire season. For fire detection purposes, 47 lookout stations operated throughout the fire season and air and ground patrol missions were executed. Moreover, enlightenment activities aiming to raise public awareness, were implemented.

Injuries and loss of human lives

There were no casualties during the fire suppression operations.

Operations of mutual assistance

There were no operations of mutual assistance during 2022.

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

1.2.5 Czechia

Fire occurrence and affected surfaces

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

In 2022 a total number of 2 473 forest fires were recorded and about 1 715 ha of forest areas were burned. The total number of fires was almost twice as much as than the 10 years average (2013-2022) of 1 521. The burnt area was also significantly above the 10 year average of 491 ha. The 2022 fire season was more severe than 2021. Considering total numbers, it was one of the worst fire seasons in the last 20 years. The fires were very often concentrated according to the usual fire risk level over the country (Figure 8).

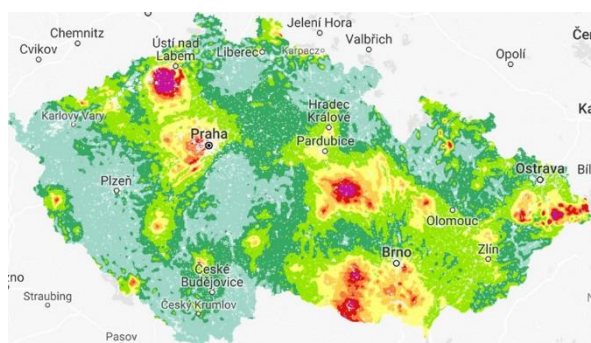


Figure 8. Forests with high risk level, usual situation (Source: Czech Academy of Sciences, project CzechAdapt).

Table 8. Number of fires, burnt area, economic losses and casualties in Czechia 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
2020	2081	484	0.7	10	2	21
2021	1517	411	0.3	7.1	0	15
2022	2473	1715	2.1	12	0	63

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

Fire causes

The main causes for the forest fires are usually:

- Negligence 52%
- Human caused 33%

Injuries and loss of human lives

There were no people killed but 63 people were injured due to forest fires in 2022. In total, there were 239 people injured and 7 people killed in the last 10 years due to forest fires.

The trends regarding the number of fires and burnt areas from 1995 to 2021 are shown in Figure 9.

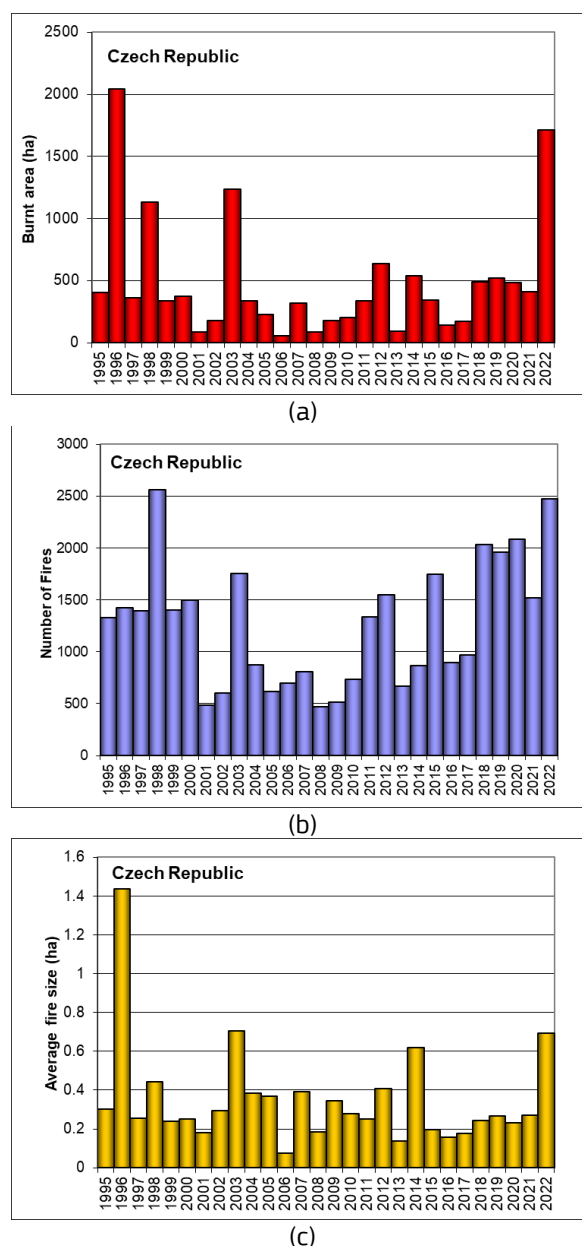


Figure 9. Burnt areas (a), number of fires (b) and average fire size (c) in Czechia 1995-2021.

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

1.2.6 Estonia

Fire occurrence and affected surfaces

In 2022, 26 forest fires and wildfires were recorded, burning 19.8 ha in total.

Table 9. Forest fires in Estonia 2005-2022.

Year	Number	Area (ha)			
		Forest	Non-forest	Total	Average
2005	65	74.6	10.3	84.9	1.3
2006	248	1243.0	779.0	2637.7	10.6
2007	64	58.2	234.2	292.4	4.6
2008	71	299.7	979.5	1279.3	18.0
2009	47	42.9	16.5	59.4	1.3
2010	30	20.7	4.1	24.8	0.8
2011	24	15.5	3.8	19.3	0.8
2012	5	2.5	-	2.5	0.5
2013	15	33.4	45.1	78.5	5.2
2014	91	67.0	9.8	76.8	0.8
2015	67	82.7	0.4	83.1	1.2
2016	84	117.7	5.2	122.9	1.5
2017	61	24.6	8.4	33.0	0.5
2018	230	418.5	11.0	429.5	1.9
2019	143	56.5	12.7	69.2	0.5
2020	24	119.8	70.7	190.5	7.9
2021	32	32.5	0.02	32.5	1.0
2022	26	19.8	-	19.8	26

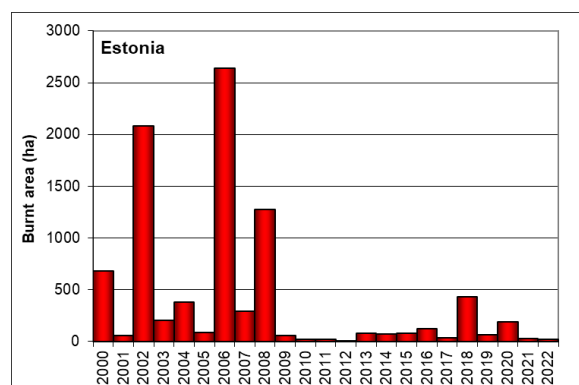
The first forest fire in 2022 was recorded in April, the last one in September. The largest forest fire of 2021 occurred in April with an area of 6.38 ha, and was the only fire of the year with an area larger than 5 ha..

The burnt area, number of fires and average fire size for the years 2000-2022 are shown in Figure 10.

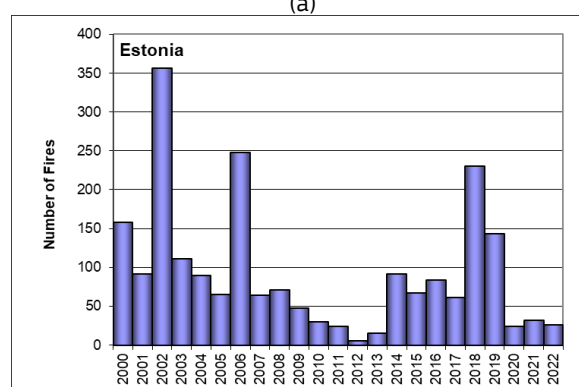
Comment about the data collection routine in Estonia.

The Estonian Environment Agency is involved in two ways:

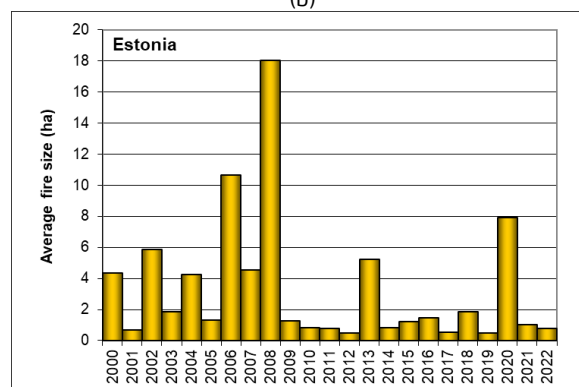
- We carry out the on-site measurement of the forest fire areas (results are used in GHG reporting for LULUCF sector). We do it next spring (so this spring we measured the forest fire areas of 2022). We select for the field-work areas bigger than 0.1 ha but measure the burnt area on-site even if it happens to be less than 0.1 ha. We get the initial list of forest fires from the open data source of the Estonian Rescue Board. Until the year 2019 we had an access to the emergency call centre logs (it was possible to assess better what was burning and what was the cause). It provided the opportunity to include small-size forest fires as the result of the desktop analysis exercise. From the data you can see that this is not anymore the case for since 2020. Despite our efforts we have not been granted official access to rescue call logs until now.
- We compile national statistics on forest fires and publish those in our Forestry Statistics Yearbook.



(a)



(b)



(c)

Figure 10. Burnt areas (a), number of fires (b) and average fire size (c) in Estonia from 2000 to 2022.

Fire causes

In 2022, 12 of the 26 fires were of unknown origin, one was caused by lightning and the rest were of human origin, mostly vegetation management.

(Source: The Estonian Environment Agency, Estonia).

1.2.7 Finland

Fire danger in the 2022 season

Based on information from the Finnish Meteorological institute, the overview from summer 2022 was quite a normal and average year in Finland. July was warm and dry in the whole of Finland. August was quite a normal Finnish late summer month. September was also quite dry, which is not normal in Finland. Fire warnings (number of Forest fire warnings) from the past 25 years are presented below in Figure 11.

Fire occurrence and affected surfaces

The number of forest fires in 2022 in Finland was at a normal average level. There were 2 265 wildfires in Finland last year of which 1 129 of them were reported as forest fires. The total burned area was around 369 ha of which ca. 267 ha occurred in forest area. The average burned forest area per fire was 0.24 ha.

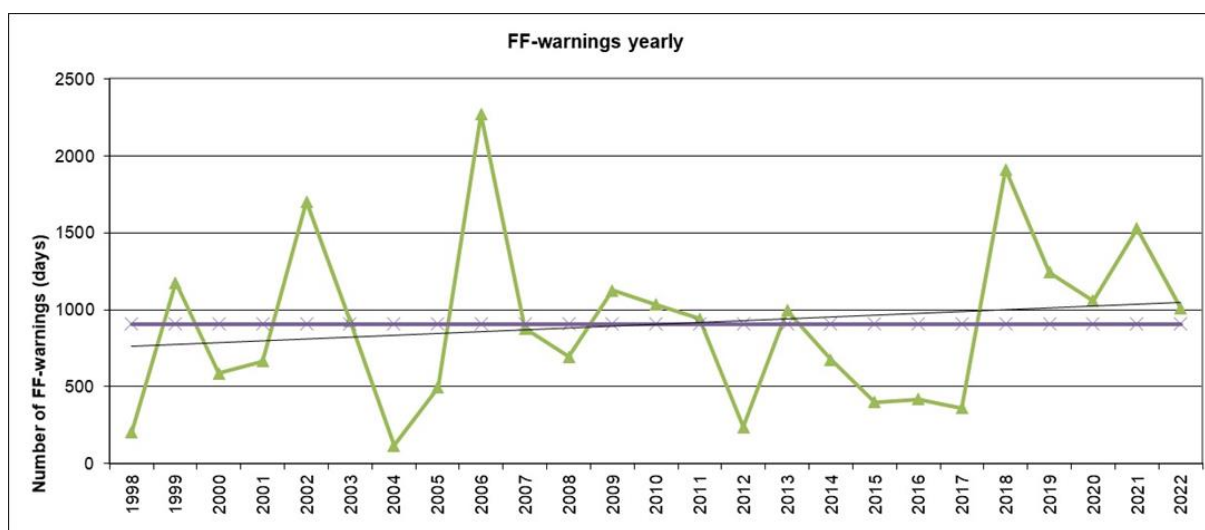


Figure 11. Number of Forest fire warnings from the past 25 years.

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.
- There is a goal to improve HNS (Host Nation Support) systems for forest fires.
- Continue 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.)
- First aerial forest fire fighting exercise with rescEU capacities (two fire bosses from Sweden) was organized in Jämijärvi in May 2022.

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.

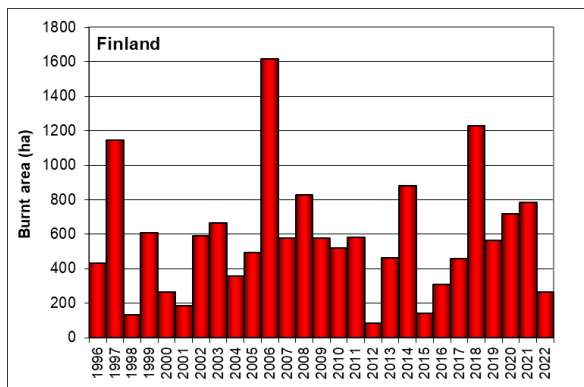
Loss of human lives

One person died in Finland in 2022 and one person was injured with burns in two different wildfires.. Some of the wildfires caused damage to the buildings and a few wildfires were caused by fires from buildings or vehicles.

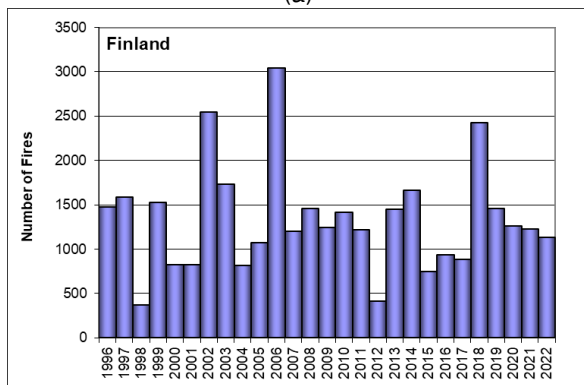
Fire prevention activities and information campaigns

- 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.

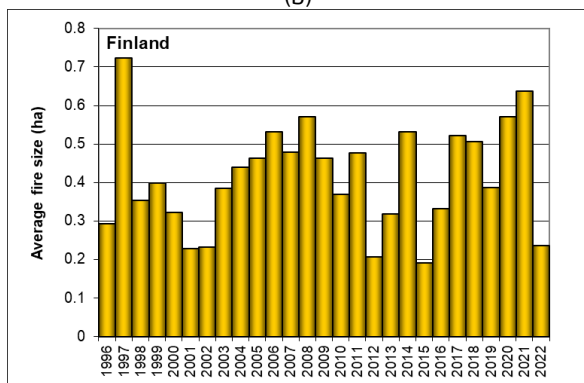
The yearly trends in terms of number of fires and burnt area from 1996-2022 in Finland are shown in Figure 12 and Figure 13.



(a)



(b)



(c)

Figure 12. Burnt areas (a), number of fires (b) and average fire size (c) in Finland from 1996 to 2022.

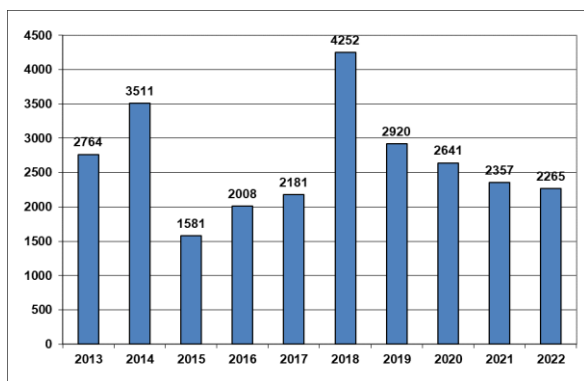


Figure 13. Total number of wildfires including forest fires from 2013-2022.

Climate Change

Climatic conditions and how they impacted the fire season

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.

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

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.

Research activities aimed at improving fire management

A few new research and development projects in Finland started in year 2022.

Other development goals in future:

- Northern European co-operation (Aerial forest fire fighting with RescEU forces continues);
- ensure early warning systems;
- co-operation with rescue services;
- new innovative solutions and equipment.

Operations of mutual assistance

There was information sharing between neighbouring countries and the EU.

(Source: Ministry of the Interior, Finland).

1.2.8 France

Fire danger in the 2022 fire season

In France as a whole, the winter was relatively mild, with no real winter cold spell, a general lack of snow cover and an average precipitation deficit of around 25%. In France, it was the fifth consecutive season marked by a precipitation deficit and higher-than-normal temperatures. During the winter, France experienced 32 consecutive days without significant precipitation between January 21 and February 21 (a record since 1959 for all seasons combined).

As a result, soils remained drier than normal. At the end of February, the dry situation of these soils corresponded to a normal mid-April situation on average in France. Soil dryness was particularly marked in a large part of the southeast quarter of the country.

This situation created favourable conditions for the development of wildfires, resulting in greater and earlier-than-usual operational activity in January-February, particularly in the Mediterranean hinterland. However, there were no major fires, but a significant number of medium size fires, between 20 - 100 ha.

This winter drought continued into spring, but was not offset by a few localized, light rainfalls. Outbreak activity remained high, with numerous outbreaks occurring whenever the weather was a little warmer and windier, including 2 more significant episodes at the end of March and the beginning of April, with an upsurge in fires, particularly in the hinterland, and several notable fires throughout France.

After an exceptionally short period of calm, the summer season began in June, with temperatures well above seasonal norms and several heat waves, including a very marked one from June 16 to 19. A number of sometimes violent storms were insufficient to reduce the risk over the long term.

As a result, operational activity got off to a very early start at the beginning of June, with a large number of fires (particularly crop fires in the northern half of the country) and several large-scale incidents in the south, south-west and west of France.

Unfavourable weather conditions persisted in July and into mid-August, with virtually no precipitation over the entire country (an average deficit of 85%, making July the driest month since 1959 and the second driest month of all, behind March 1961), culminating in two heatwaves around July 14 and early August (with many heat records broken in western France).

The situation in 2022 was comparable to two extreme historical events: the drought of 1976 (less marked in the south) and the heatwave of 2003 (less marked in the north-west). The only slightly less unfavourable factor was a lower-than-average number of days with strong winds.

These extreme weather conditions led to unprecedented desiccation of vegetation in several départements, resulting in defoliation with leaf and needle drop and even death of some shrubs, as well as early hardening of many trees.

As a result, operational activity was very high, with a sharp increase in the number of fires covering several hundred hectares. These "big fires" mobilized the resources of the firefighting teams and the civil security services, with the use of numerous reinforcements. Extremely unfavourable weather conditions made firefighting more difficult and often took longer than usual, with many fires reigniting. The intensity of the fires was particularly high (sometimes reaching the point of consuming humus, with a strong impact on the soil and roots), even in unusual sectors and stands (e.g. a 40-hectare fir fire in the Vosges massif, or almost 1 000 hectares due to 3 fires at the beginning of August in the Jura massif).

This was followed by a rainy spell from August 13 to 15. Rain fell across part of the country from west to east, bringing amounts ranging from a few millimetres to over 50 mm. These rains helped to limit or halt several fires in progress. Even though part of the country did not benefit from this rainfall, and the cumulative amounts were not enough to make up for the deep drought, there was a clear reduction in operational activity.

The month of September was then marked by several more or less widespread rainy periods, initially over the 2/3 northern and eastern parts of France, but a large south-western third (from the Atlantic coast to the Mediterranean coast) remained sparsely showered for a long time, and it was not until the end of the month that heavier precipitation finally calmed the situation.

Operational activity remained low to average in the west and south of France, but in the middle of the month (from the 12th to the 16th), a southerly wind that was sometimes quite strong brought very hot Saharan air up over France, causing a new peak of operational activity in the southwest with several notable fires.

The vegetation, however, having suffered badly from the summer conditions, remained sensitive for some time, and there were still a few notable fires in the south in October, before November and December finally saw a real respite.

Fire occurrence and affected surfaces

The merger of the databases in 2023 (previously separated into 3 databases covering respectively part of the southern zone - the so-called "Prometheus" zone, part of the south-western zone - the Landes area, and the rest of France) now makes it possible to obtain comparable statistics between the different zones, by reconstituting certain histories and accounting for all vegetation fires outside forests in the same way.

The final tally (after correction of certain database errors) is an exceptional 70 301 ha affected by fire in France, for a total of 22 796 fires.

This figure is almost twice the average in terms of number of fires (only 1.5 times for forest fires alone, but more than 5 times in the northern half), and more than 4 times the average in terms of burnt area (more than 5 times for forest fires alone, and more than 16 times in the south-west).

The year 2022 is a record year compared with the last 16 years, except in the southeast where it only ranks 2nd in surface area (22 986 ha 2017) and third in number (12 541 fires in 2017 and 10 546 fires in 2012).

The breakdown by zone and type of fire is shown in Table 10 and Table 11 below:

Table 10. Burnt area in hectares.



	2022			Adjusted mean 2006-2021		
	Forest fire	Other vegetation fire	Total	Forest fire	Other vegetation fire	Total
South-East	18 476	2 495	20 971	7 875	1 935	9 810
South-West	31 414	1 638	33 052	1 193	872	2 065
Rest of mainland France	8 352	7 732	16 084	1 410	2 062	3 472
Overseas territories*	33	160	194	720	530	1 251
Total France	58 275	12 025	70 301	11 199	5 399	16 598

Table 11. Number of fires.

	2022			Adjusted mean 2006-2021		
	Forest fire	Other vegetation fire	Total	Forest fire	Other vegetation fire	Total
South-East	2 164	7 725	9 889	1 852	6 732	8 583
South-West	654	2 182	2 836	511	908	1 419
Rest of mainland France	1 398	8 638	10 036	461	1 377	1 838
Overseas territories*	15	20	35	231	181	412
Total France	4 231	18 565	22 796	3 055	9 198	12 252

* Oversea territories = Réunion, Mayotte, Guyane

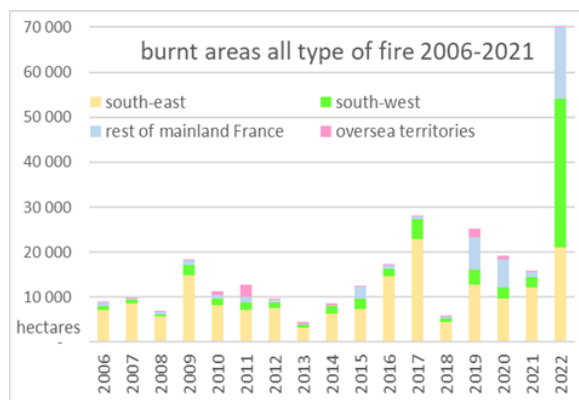
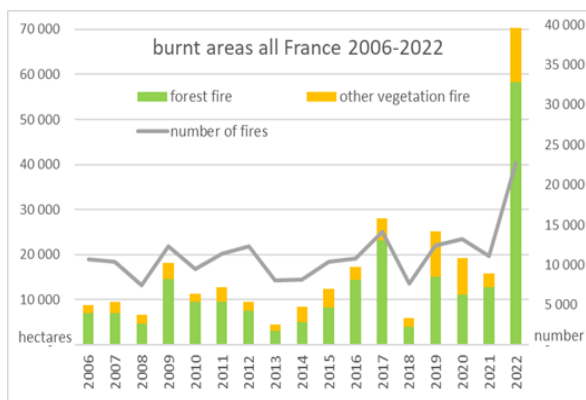


Figure 14. Burnt areas in France according to vegetation types and geographic areas.

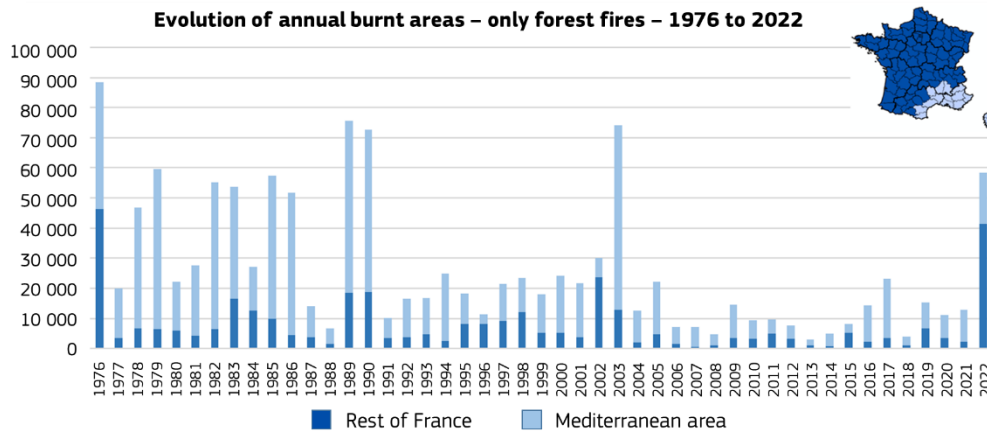


Figure 15. Burnt area evolution comparing Mediterranean area with rest of France.

If we look at Figure 15, which is based on less detailed data, we can see that 2022 remains lower for France as a whole than the record years of 1976, 1989, 1990 and 2003, and is at levels often reached in the 1976-1990 period, when prevention and control measures were not as well developed. However, a closer look reveals that the Mediterranean region, which was the main contributor in this period, has a smaller share of the total in 2022 than the rest of France, where the level is comparable to the 1976 record.

Seasonal distribution:

Activity is above average at the beginning of the year. The summer season starts a month earlier, and from May to September 5 consecutive months reach new monthly records in numbers or burnt area or both. The end of the year then returns to the usual norm.

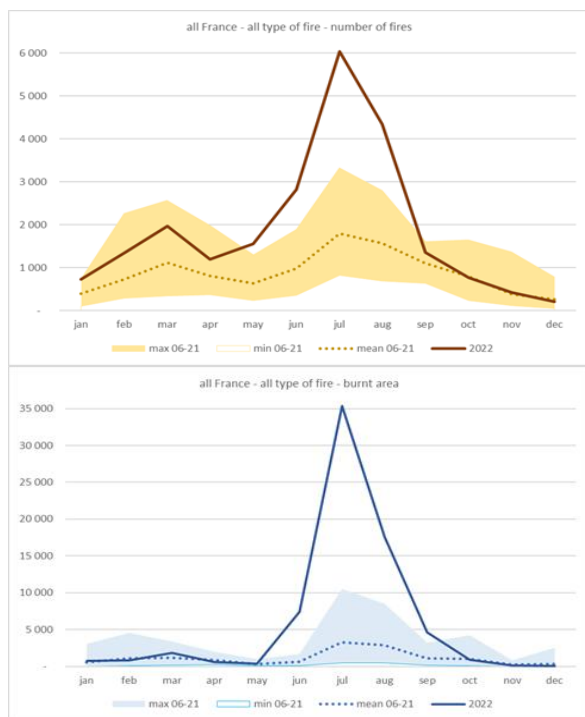
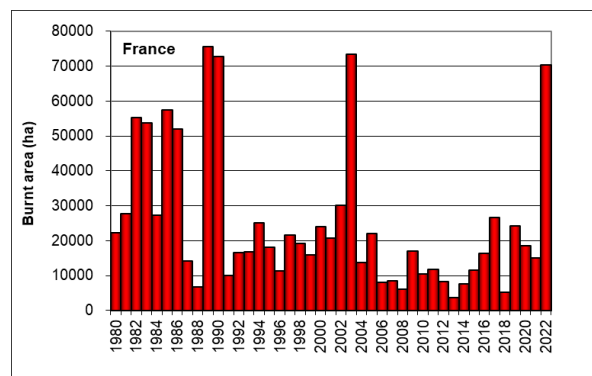
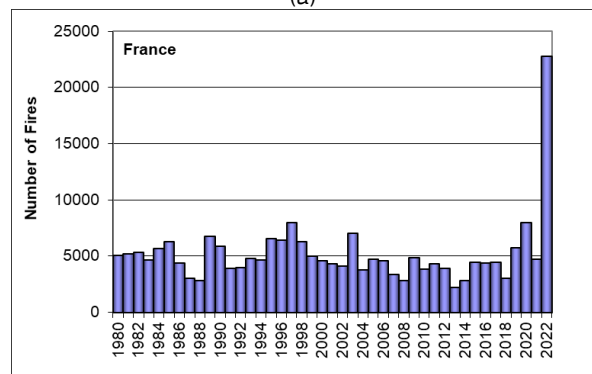


Figure 16. Monthly numbers of fires (top) and burnt area (bottom) in France in 2022.

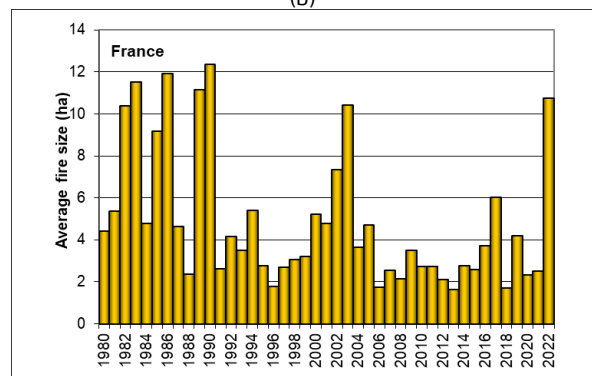
The yearly trends in terms of numbers of fires and burnt areas in France since 1980 are displayed in Figure 17.



(a)



(b)



(c)

Figure 17. Burnt areas (a), number of fires (b) and average fire size (c) in France from 1980 to 2022.

Large fires:

In 2022, there was a record 245 fires over 20 ha (average 2006-2021: 78 fires, previous record in 2019: 180 fires), including 55 fires over 100 ha (average 2006-2021: 17 fires, previous record in 2019: 42 fires), 10 of which were over 1 000 ha (average 2006-2021: 2 fires, previous record in 2017: 8 fires).

Among these, the Landiras fire in Gironde, with a total of 19 676 ha burnt over its 2 phases, is the second largest fire to have broken out in France in the last 50 years (behind the Perthus fire in the Pyrénées-Orientales in July 1986, which covered 22 812 ha, of which only 2 168 ha were in France, the rest having spread to Spain), and the largest fire to have spread entirely within France (the previous record dates back to July 1989 in Corsica, when a complex of several fires merged to cover a total of 13 096 ha).

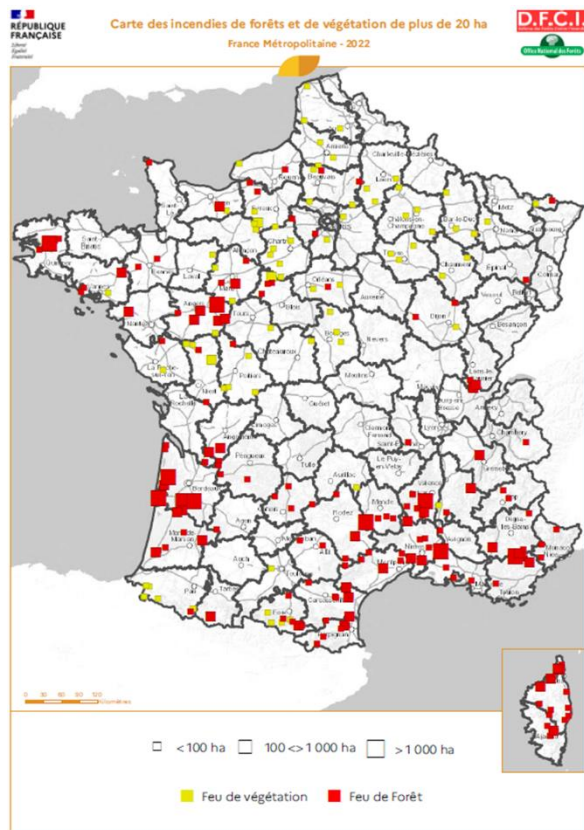


Figure 18. Spatial distribution of the largest fires (greater than 20 ha) by fire type.

Southeastern France:

The year 2022 was characterized by a marked precocity: a well above-average number of fires in January-February, with numerous fires in the mountains linked to the lack of snow cover, followed by a record month of June with activity at a level usually seen in July-August. The summer as a whole was well above average, without setting any new records, and ended with an exceptionally calm September. This season saw exceptionally high activity in the hinterland.

Southwest France:

The year 2022 will go down as a historic one in southwest France: the region saw an extraordinary number of wildfires and a high level of overall activity during the summer.

The total number of fires was 3 066, destroying 32 908 hectares of vegetation. This last figure is marked by four major fires, which accounted for 87% of the area burned. Of these, two started within a few hours of each other on July 12 at La Teste de Buch (5 709 hectares) and Landiras (12 552 hectares).

These fires progressed dynamically for around ten days, before being contained by the fire-fighting system. During this period, additional emergency forestry work and edge monitoring were carried out. Another fire occurred in Landiras on August 9, destroying a further 7 123 hectares. A final major event brought the season to a close on September 12 in Saumos, destroying 3 248 hectares. This very dry summer ended with a rainy spell at the end of September.

These four fires rank at the top of the list of the largest fires recorded since 1989 in the South-West. Only the fires at Le Porge (18/07/1989 at 3 637 hectares) and Salaunes (31/03/1990 at 5 179 hectares) come before the Saumos fire, which ranks fifth.

As for the monthly summer records for area burnt (June to September), they have all been well exceeded. Examples include July 2015 (1 076 hectares), which was well below the 18 000 hectares recorded in July 2022, and August 2012 (744 hectares), which was exceeded by over 8 100 hectares in August 2022.

In addition, seven other departments out of the twelve in the Nouvelle-Aquitaine region recorded an above-average burned area since 2006. It should also be noted that over 1 000 hectares of vegetation, mainly crop fires, were recorded in the departments of Deux-Sèvres and Vienne.

Analysis of fire outbreaks:

In terms of the number of fires started, the year began on an average scale for winter (Basque mountains) and spring fires, with limited burnt areas.

However, the cumulative number of fire starts reached maximum levels from May onwards, and then reached new all-time highs in July (+24 fires) and especially August (+220 fires). Annual activity is above the norm in 11 of the 12 departments in the Nouvelle Aquitaine region.

Fire causes

Only 6 312 fires, or 33% of the total, have a known cause. This percentage, higher than the 2006-2021 average of 26% of fires with a known cause, reflects progress in the search for causes. Of these fires with a known cause :

- 330 were attributed to a natural cause (lightning), i.e. 1% of all fires or 2% of fires with a known cause, which is below the average of 7% of fires with a known cause, and a far cry from the 2006 record (580 fires or 23% of known causes).
- 4 119 fires were accidental, i.e. 22% of all fires, or 67% of fires with a known cause, which is close to the average.
- 1 863 fires were of deliberate origin, i.e. 10% of all fires or 31% of fires with a known cause, which is slightly higher than the average of 27% of known causes.

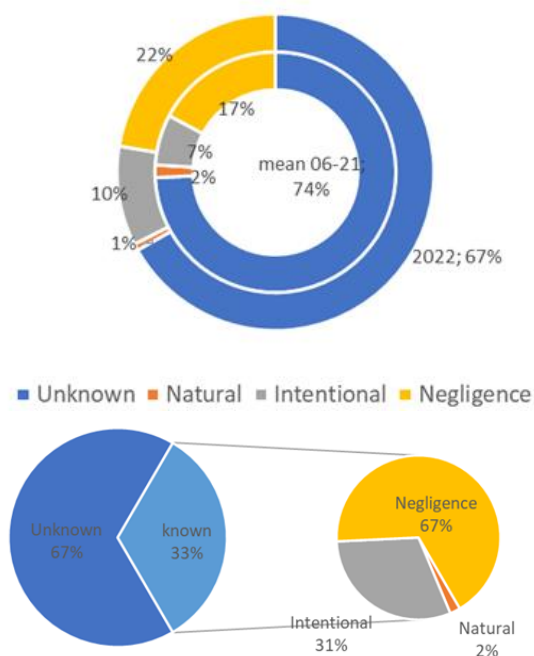


Figure 19. Fire causes in France in 2022.

Forestry operations to complement fire-fighting operations:

In parallel with the firefighting operations, foresters organized within DFCI Aquitaine were present in the field to contribute their historic technical know-how and implement various actions under the direction of the directors and commanders of emergency operations.

For more than 54 days, a total of 1 073 volunteers were permanently on hand to coordinate the action. The following actions were carried out:

- Watering using 224 mobile tankers and 78 refurbished tanker trucks
- Water transport using 179 tonnes and tankers
- Creation of support zones (removal of vegetation) using 159 forestry machines, with up to 75 machines working simultaneously on 14 sites.
- Clean-up using 20 bulldozers.

These various projects enabled the creation of 237 kilometres of support zones that could be used by fire-fighting resources.



Figure 20. Forestry operations in France 2022.

Fire fighting means

The effectiveness of the fire-fighting system depends on its ability to detect fires early and intervene without delay, in line with the strategy of rapid attack on incipient fires. This mode of action is based on the predictive mobilization of fire-fighting resources during periods of risk. Ongoing cooperation with Météo France and the *Office National des Forêts* (French National Forestry Office) provides precise information on the level of foreseeable danger, enabling the anticipation of fire danger more effectively and adjust the operational response more reactively in the event of a fire outbreak.

As a result, the national forest and wildland fire-fighting system was reinforced between June and September. To this end, the Ministry of the Interior and Overseas France deployed an operational base consisting of :

- 600 military personnel from civil protection units, reinforced by 50 military personnel from the Ministry of the Armed Forces, notably capable of deploying helicopter-borne firefighting capabilities, terrain management and the application of ground retardant additives;
- 24 intervention columns (1 600 firefighters) ready to reinforce local resources within the framework of national solidarity coordinated by the General Directorate for Civil Security and Crisis Management;
- A fleet of 19 water bomber aircraft, comprising 12 CL415s and 7 DASHs;
- Two heavy water bomber helicopters (4-tonne carrying capacity);
- reconnaissance and coordination aircraft and 35 Dragon helicopters for rescue and command.

In view of the particularly unfavourable conditions, the extension of the fire risk to the whole country and the very high intensity of the fires, the national fire-fighting system had to be reinforced. In all, more than 40 columns were deployed (up to 3 000 firefighters) to reinforce local resources. Eight additional water-bombing helicopters were requisitioned.

All in all, 339 of the most significant fires required the deployment of national resources, for which the figures during the summer season are as follows:

Sécurité Civile water bomber aircraft (GASC)

- Flight hours on fire: 2 948.7
- Flight hours on armed aerial watch: 776.9
- Water releases: 5 516
- Drops with foam: 1 531
- Airdrops using retardant: 1 372, for which 3 044 tonnes of retardant were consumed.

Water bomber helicopters (HBE)

- 2 HBEs involved in national operations ;
- 5 heavy HBEs requisitioned;
- 3 light HBEs requisitioned;
- 817 flight hours, including 752 operational flight hours;
- 5 737 airdrops (4 630 for heavy HBEs and 1 061 for light HBEs).

Land resources

- 13 operational sections/detachments, including 9 in Corsica;
- 90 forest fire operations (FDF), including 4 involving the Heliborne Detachment;
- 60 km of retardant barriers installed, representing 502 m³ of retardant consumed;
- 70 km of trails and firebreaks created.

Requests to the European Union's Civil Protection Mechanism (MPCU)

France activated the European Union's Civil Protection Mechanism (MPCU) to deal with the fires affecting the forests of southern and south-western France in particular. Ground and air reinforcements were made available in the following format:

- 65 German fire-fighters, 24 vehicles ;
- 73 Austrian firefighters, 14 vehicles;
- 77 Romanian firefighters, 14 vehicles;
- 146 Polish firefighters, 49 vehicles;
- 12 Swiss firefighters, 4 vehicles (bilateral cooperation, excluding MPCU).
- Air assets from Greece (2 Canadair), Italy (2 Canadair) and Sweden (2 Air-Tractor).

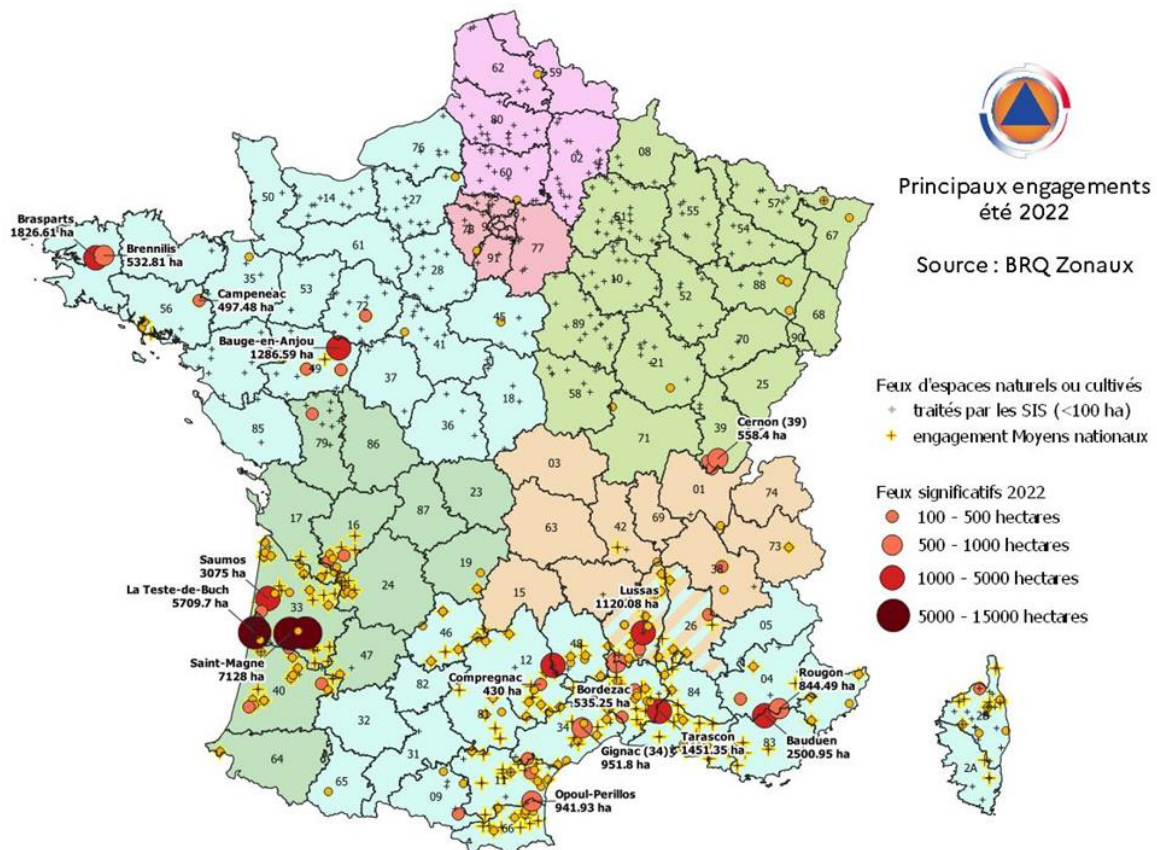


Figure 21. Main commitments of national resources.

Political consequences

This exceptional season gave rise to a great deal of feedback and political awareness, resulting in announcements by the French President in October 2022:

- Simplification of compulsory brush clearance regulations
- Increased forestry resources dedicated to prevention (patrols, enforcement of regulations, etc.)
- Improved communication and public awareness
- Improved weather forecasts
- National mapping of communes exposed to fire risk
- Reinforcement of fire-fighting resources (equipment for fire-fighters, creation of a fourth military civil security unit, improvement of the air fleet: + 4 canadairs, + 2 heavy helicopters, helicopter rental, small aircraft for armed aerial surveillance).
- Ecological forest planning and reforestation strategy

Most of these measures should be operational by the 2023 season.

Impact on human lives

The year 2022 was marked by the death of two firefighters as a result of illness while responding to fires. There were also 4 serious injuries (1 civilian seriously burned, 1 firefighter seriously burned and 2 firefighters involved in a vehicle accident on their way back from a fire) and many minor injuries among firefighters.

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

1.2.9 Germany

Fire occurrence and affected surfaces

According to the data supplied by the authorities, in 2022 a total of 2 397 forest fires were reported in Germany, corresponding to a burnt area of 3 058 ha (1 187 ha in deciduous forests and 1 871 ha in coniferous forests). The number of fires and the total burnt area were both significantly higher than was recorded in 2021.

In 2022 the most affected province (Land) in terms of both numbers of fires and total burnt area was Brandenburg. However, Sachsen lost the greatest area of broadleaved forest (Table 12, Figure 22). Three Länder (Bremen, Hamburg and Schleswig-Holstein) did not record any fires.

Table 12. Burnt area in total and by forest type, and total number of fires, Federal Republic of Germany, 2022.

	Burnt area (ha)			Number of fires
	Coniferous forest	Broadleaved forest	Total	
Baden-Württemberg	13.13	11.66	24.79	123
Bayern	138.81	75.68	214.49	145
Berlin	50.38	10.38	60.75	31
Brandenburg	984.92	440.74	1425.66	523
Bremen	0.00	0.00	0.00	0
Hamburg	0.00	0.00	0.00	0
Hessen	105.21	16.86	122.07	266
Mecklenburg-Vorpommern	12.49	0.85	13.34	67
Niedersachsen	112.75	31.97	144.72	451
Nordrhein-Westfalen	16.34	58.32	74.66	204
Rheinland-Pfalz	23.73	41.80	65.52	106
Saarland	3.40	2.44	5.84	28
Sachsen	304.63	480.80	785.43	217
Sachsen-Anhalt	89.73	8.62	98.35	164
Schleswig-Holstein	0.00	0.00	0.00	0
Thüringen	15.40	6.96	22.35	72
Germany	1870.90	1187.06	3057.96	2397

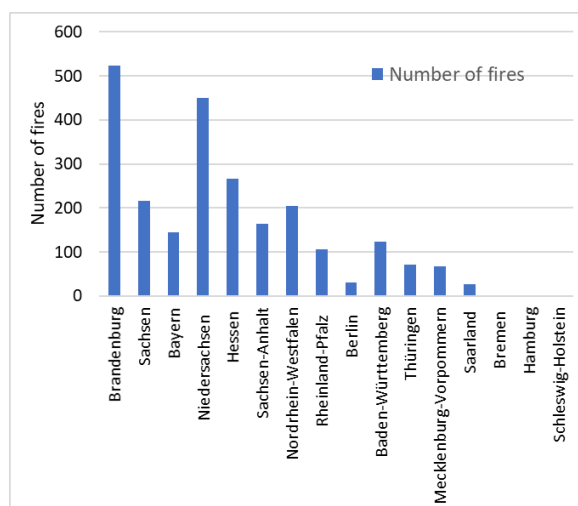
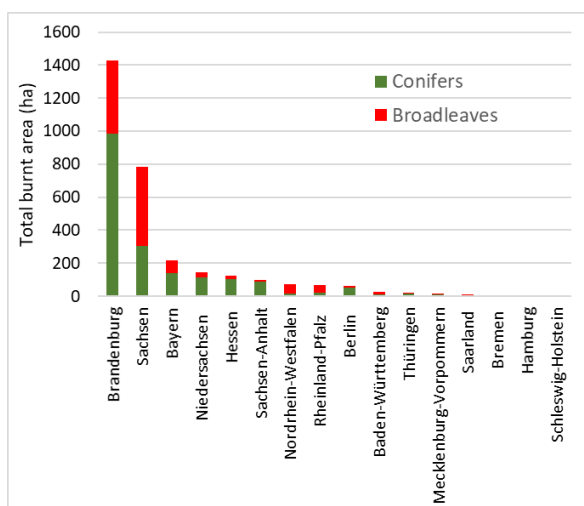


Figure 22. Burnt area (left) and number of fires (right) in Germany in 2022 by Land, ordered by total burnt area.

In 2022 over three-quarters of the damage occurred in June and July (Figure 23).

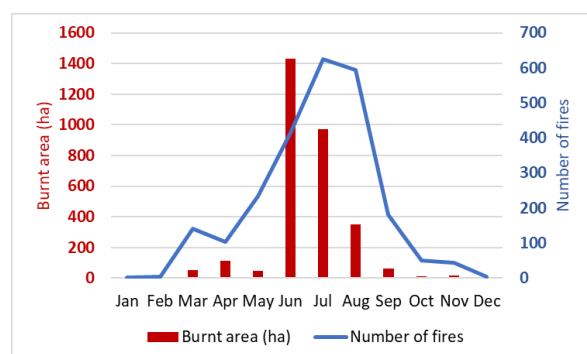


Figure 23. Number of fires and burnt area by month in Germany in 2022.

The economic damage caused by forest fires in 2022 is estimated to be around 5.13 million Euro (Table 13). This is significantly above the figures for the last two years and also above the long-term average from 1991 to 2021, which is 1.87 million Euro. The cost per hectare burnt in 2022 was estimated at 1 681 Euro/hectare.

Table 13. Losses from forest fires in Germany in 2020-2.

	Year			
	2020	2021	2022	
Total volume of non-recoverable wood (1000m ³ overbark)	Sawlog size	149.1	8.1	299
	Other	61.7	12.9	226
	Total	210.7	21	525
Total value (1000 Euro)	Wood & other tangible losses ¹⁾	1596	659	4851
	Other ²⁾	598	11	285
	Total	2194	670	5136

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.

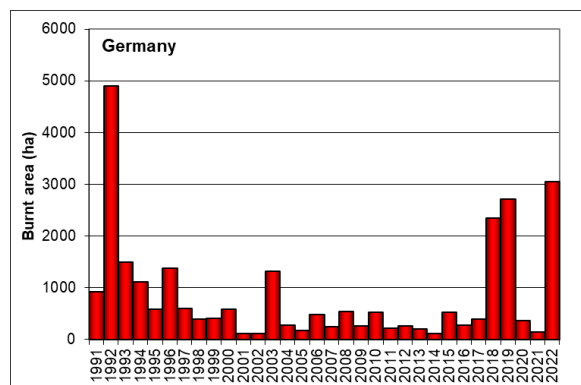
2) Other damage according to material value method (Koch) or other comparable cost estimates.

In 2022, approximately 6.17 million Euro were spent on prevention and control measures (Table 14).

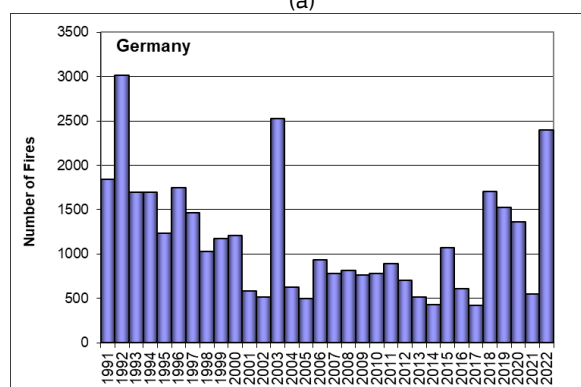
Table 14. Expenditure on forest fire prevention and control.

Expenditure (1000 Euro)	2020	2021	2022
Forest service	4883	5499	5537
Other (public and private)	195	527	633
Total	5078	6026	6170

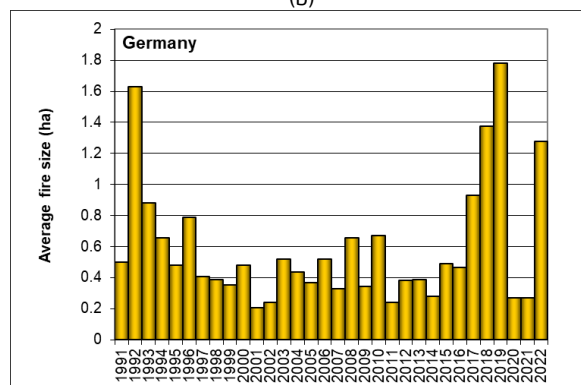
The trend of the burnt areas, number of fires and average fire size in Germany for the years 1991-2022 are shown in Figure 24.



(a)



(b)



(c)

Figure 24. Burnt areas (a), number of fires (b) and average fire size (c) in Germany from 1991 to 2022.

Burnt areas and numbers of fires categorised by land and ownership type are detailed below in Table 15 and Table 16.

Table 15. Type of land.

	2020	2021	2022
Coniferous	269.82	95.46	1870.90
Non-coniferous	97.84	52.35	1187.06
Total	367.66	147.81	3057.96
Number of fires	1360	548	2397

Table 16. Type of ownership

	2020	2021	2022
Public	169.25	88.86	1683.95
Private	198.41	58.95	1374.01
Total	367.66	147.81	3057.96
Number of fires	1360	548	2397

Fire causes and impacts

The main causes of forest fires during 2021 are shown in Figure 25 and Table 17.

Within the category of accident/negligence fires, the majority (74) were caused by the general public (campers, visitors, children etc.): Table 18.

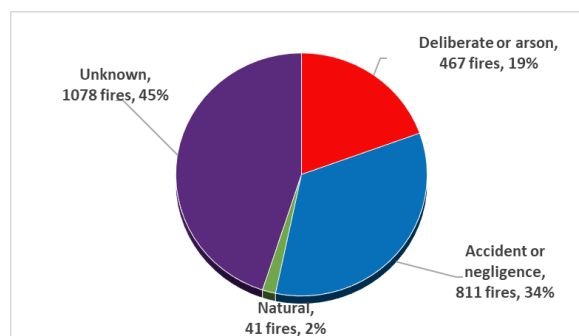


Figure 25. Main causes of forest fires in 2022.

Table 17. Main causes of fires in 2020-2022.

	Number of fires			Burnt area (Hectares)		
	2020	2021	2022	2020	2021	2022
Arson	253	92	467	40.81	20.05	1102.30
Negligence (total)	374	160	811	113.53	76.46	657.71
Natural causes (lightning)	32	7	41	11.89	0.48	7.59
Unknown causes	701	289	1078	201.43	50.82	1290.37
Total fires	1360	548	2397	10.26	147.81	3057.96

Table 18. Detailed breakdown of negligence causes in 2020-2022.

	Number of fires			Burnt area (Hectares)		
	2020	2021	2022	2020	2021	2022
Agricultural operations	21	16	66	5.80	9.83	127.77
Logging and forest operations (including prescribed burning)	54	25	73	4.46	3.22	15.74
Other industrial activities	0	1	2	0.00	0.08	0.55
Communications (railways, electricity lines, etc)	10	7	20	20.28	0.17	6.99
General public (campers, other visitors, children)	177	74	363	48.34	19.70	157.70
Other (including military, etc.)	112	37	287	34.65	43.46	348.95

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

1.2.10 Greece

Fire danger in the 2022 fire season

The forest fire season for 2022 in Greece started out with temperatures above normal level for the whole country and with precipitation levels lower than normal.

However, even though June, July and August were characterized as warm months for most parts of the country, the unstable weather conditions during certain periods of those months gave local showers and isolated thunderstorms that caused damage. The precipitation amounts were higher than normal levels in most parts of central and north mainland especially in July, and recorded extreme values for a long period in the Meteorological Stations of Kalamata and Skiros Island apart from the South Aegean area and Crete.

Fire occurrence and affected surfaces

According to the data supplied by the local Forest Services, the most notable forest fires for 2022 are listed below:

- 19th July Penteli, in Attica area
- 20th July Rethymno, in Crete
- 21st July National Park of Dadia in Evros area.
- 23rd July Vatera, in Lesvos
- 22nd October Papikio Mountain, in Rhodope area

During the 2022 forest fire season, a total number of 962 forest fires were recorded in Greece, with a total affected burnt area of 18 806.77 hectares on wooded and non-wooded forest land. More specifically, 17 561.51 hectares were burned on wooded forest land and 1 245.26 hectares were reported on non-wooded forest land. The most of fire incidents (710) resulted in less than 1.00 hectare of burnt area.

According to the current provisional results, there is a significant reduction not only in the total number of fire incidents in the 100-500 ha size class with sixteen (16) fire incidents compared to the previous 2021 fire season which had twenty-five (25) fire incidents, but also in the >500 hectares size class where ten (10) fire incidents were recorded, compared with nineteen (19) fire events in 2022 (Figure 26, Table 19)

The yearly trends in terms of numbers of fires, burnt areas and average fire size in Greece from 1980 are shown in Figure 26.

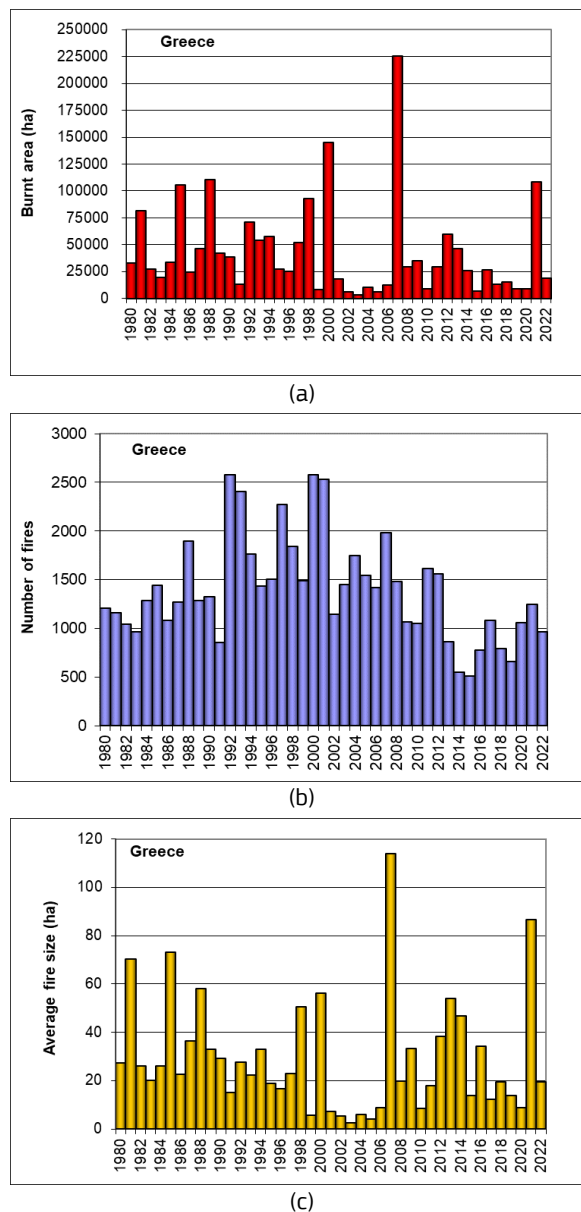


Figure 26. Burnt areas (a), number of fires (b) and average fire size (c) in Greece from 1980 to 2022.

Table 19 shows the number of fires and burnt area in Greece in 2022. These numbers are still provisional and are likely to rise when the compilation of fire data will be completed.

Table 19. Number of fires and burned area in 2022 by Inspection of Forest Policy Implementation.

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	191	130	42	14	3	2	7373.53	7271.45	102.08
Epirus & Western Macedonia	151	120	24	7	0	0	220.79	181.81	38.98
Thessaly and Central Greece	265	213	40	9	2	1	1753.17	1078.07	675.10
Peloponnese, Western Greece & Ionian	201	146	29	20	5	1	3340.54	3246.51	94.03
Attica	48	29	9	5	4	1	2678.40	2655.40	23
Crete	81	59	12	7	0	3	1119.99	929.89	190.10
Aegean	25	13	6	2	2	2	2320.35	2198.38	121.97
TOTAL	962*	710	162	64	16	10	18806.77*	17561.51	1245.26

* Figures are still provisional and are likely to rise when the compilation of fire data is completed.

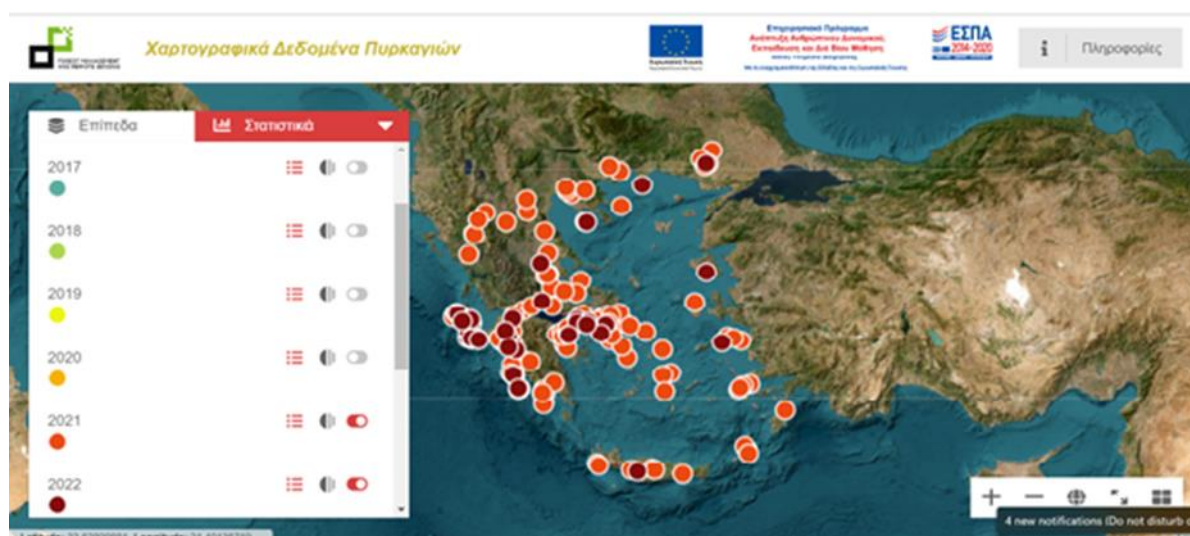


Figure 27. Map with the most notable fire locations in Greece in 2021 and 2022. (Source: Aristotle University of Thessaloniki- Laboratory of Forest Management and Remote Sensing, <http://epadap.web.auth.gr>).

Fire fighting means and information campaigns

In 2022 the Fire Brigade personnel consisted of 20 362 people, 11 301 of whom were permanent personnel of the Fire Brigade dealing also with structural fires, 2 436 personnel with a five-year contract and 2 428 seasonal personnel hired for the forest fire suppression activities. Furthermore, 105 civil service staff, 3 583 volunteer fire fighters, 9 private helicopter pilots and 500 people of the new body of personnel in Fire Brigade, the forest rangers, especially trained in forest fires, were also involved.

The Fire Brigade of Greece has a total of 3 574 vehicles of various types. These vehicles are distinguished as follows:

Firefighting vehicles	2086
Support vehicles	1116
Special vehicles	234
Motor cycles	164
Total	3600

The aerial means used during the 2022 campaign are shown in Table 20.

Table 20. Aerial means participating in the 2022 campaign.

National fleet		
Type	Number	Availability 2022 (max)
Aircraft CL-415	7	6
Aircraft CL-215	13	9
Aircraft PEZETEL	18	18
Helicopter SUPER PUMA AS 332 L1	2	2
Helicopter BK 117 CL	3	3
Helicopter CHINOOK	3	3
Helicopter SUPER PUMA of Greek army	1	1
Aircraft C-130	1	1
Helicopter SUPER PUMA of Greek police force	2	2
Total	50	45
Leased air means		
Type	Availability 2022	
Medium Press Helicopters	20	
Heavy Duty Helicopters	9	
Lightweight Type of Aircraft	15	
Total	44	

Injuries and loss of human lives

During the firefighting period of 2022, twenty-five (25) Fire fighters and two (2) citizens were injured and one (1) citizen was killed.

Fire Prevention Activities

The Ministry of Environment and Energy through the General Directorate for the Forests and the Forest Environment and in collaboration the regional Forest Services, carried out fire protection work by the implementation of anti-fire protection projects, mainly consisting of the maintenance of forest roads and fire protection zones but also of the cleaning, thinning and pruning of vegetation in forests and woodland areas. Moreover, cleanups were also held in some archaeological areas (with the coordination of the Greek Ministry of Culture) in urban forests, of the Attica Region and in the municipal parks of Athens Capital.

More specifically, 8 000 hectares of forests and woodland areas were cleaned up, 12 000 km of forest roads were maintained and 1 600 km of fire protection zones were created or maintained.

Climate Change

Climatic conditions and how they impacted the fire season

According to the climatological historical data, the year of 2022 was the 5th warmest year on record and simultaneously the 5th driest year since 1960. The two warmest years were 2018 and 2010.

On the other hand, unstable weather conditions prevailed in Greece with extraordinary large amounts of precipitation, especially the summer months for most parts of the country, reducing the fire danger, apart from the period between 15th of July and 15th of August when Greece was faced with large fire incidents.

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

1.2.11 Hungary

Fire danger in the 2022 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.

The FWI had a high value in mid-February in Hungary. During the spring fire season, the FWI value was above the 90th percentile for several weeks due to the extreme drought. Extreme values developed during the summer fire season and several large-scale fires occurred during this period. The FWI value fell below average at the end of August due to a rainy period. A total fire ban was ordered for 74 days in spring and throughout the summer for 94 days due to high fire danger.

The spring and summer of 2022 were extremely dry. The fire season began at the end of February depending on spring rainfall in the first part of this decade. This trend has been changing in the last three years. Due to the extraordinary lack of rainfall, the number of forest fires increased from the second week of February, and until the end of April, high numbers of fire events were registered both daily and weekly. 2.5 times more forest fires occurred in the spring period of 2022 than the ten-year average. There were some days in March and July when several fires occurred at the same time. This caused a logistical problem for the fire department. Rainfall at the end of April eased the drought. However, from the middle of the summer, a long-lasting drought developed as a result of a persistent heat wave. The extreme heat wave also affected the number of fire incidents. The burnt area was four times the average of the last 10 years. As a result of extreme drought, not only the dead biomass but also the moisture content of the living vegetation decreased significantly. The moisture also disappeared from the deeper layers of the fuel, so the fires could burn with more energy. Last summer 26 big fires were registered.

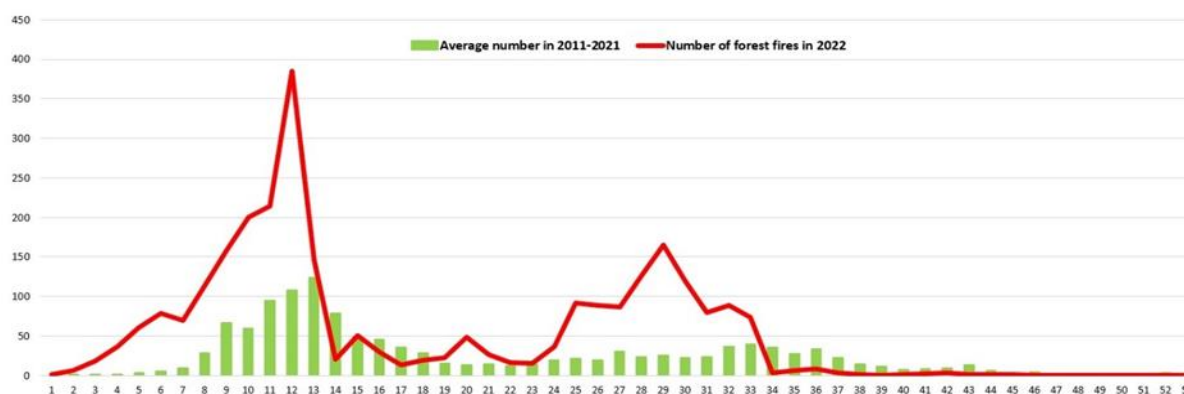


Figure 28. Average number of forest fires per week in Hungary 2022.

Fire occurrence and affected surfaces

Forest fires data are collected in close cooperation with the disaster management authority. Data are collected on the spot by fire fighters, who have been uploading the database day by day. Forest fires 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. Data from 2011-2022 are shown in Table 21.

Table 21. Number of fires and burnt areas.

Year	Total number of wildfires	Forest fires		Other land types
		Number	Burned area (ha)	Number
2011	8 436	2 021	8 056	6 415
2012	15 794	2 657	14 115	13 137
2013	4 424	761	1 955	3 663
2014	5 535	1 042	4 454	4 493
2015	5 057	1 069	4 730	3 988
2016	2 531	452	974	2 079
2017	6 782	1 454	4 934	5 328
2018	2 981	530	906	2 451
2019	7 296	2 088	6 541	5 208
2020	4 339	1 239	2 895	3 100
2021	4 350	1 154	2 413	3 196
2022	8 687	2 731	20 947	5 956

A total of 2 731 forest fires were registered in 2022. This is an extreme value, the highest one since 2011. The average area burned is 7.7 hectares. It is 3.5 times larger than in the previous two years. The yearly trends in terms of number of fires and burnt areas between 2011 and 2022 are shown in Figure 29.

A total of 1 656 forest fires occurred in spring which is 60% of all forest fires in 2022. Most of spring fires (43%) burn 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 other social-economic factors add to forest fire danger. A total of 1 005 forest fires occurred in the summer period. There were 26 fire events that burnt more than 50 hectares fire last summer.

With GIS analysis, we can say that the majority of forest fires do not ignite inside the forest, but in the agricultural area adjacent to it. We have found that 54% of the fires occurred in a 500 metre zone around residential areas. 85% of all forest fires are no further than 2 km from residential areas in 2022.

Table 22. Classification of fires by size class in Hungary in 2022.

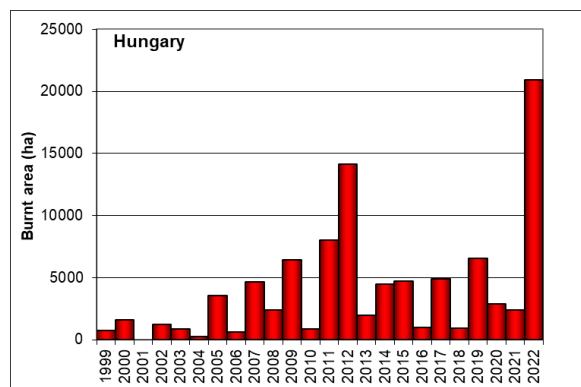
Classification of burnt area	Number of forest fires	Burnt area (ha)
less than 1 ha	1 896	564
1 – 50 ha	764	7 297
50 – 100 ha	38	3 132
100 – 500 ha	31	6 441
more than 500 ha	2	3 513
Total:	2 731	20 947

98% of forest fires were surface fires this fire season, when surface litter and other dead vegetal parts and smaller shrubs burnt down. The average rate of fires smaller than 1 hectare is almost 70%. Statistical analysis shows that the number of forest fires under 0.5 ha has been increasing in the last decade. In particular, the increase in the number of spot fires under 1 000 m² is significant (Table 22).

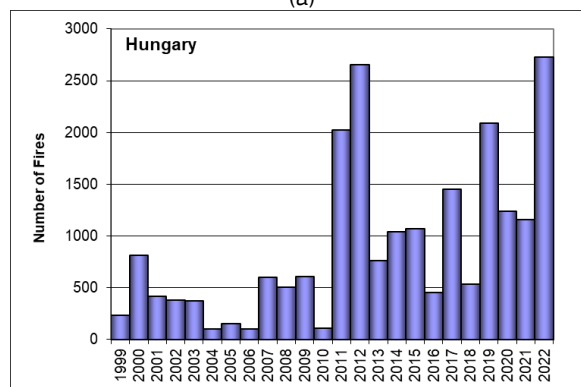
Analyzing the statistics we can see that a total of 5 091 hectares of forest land were burned or affected by forest fire during 2022. In addition, more than 11 589 hectares of grass vegetation and 4 589 hectares of other wooded land were destroyed in forest fires (Table 23).

Table 23. Fires by forest type

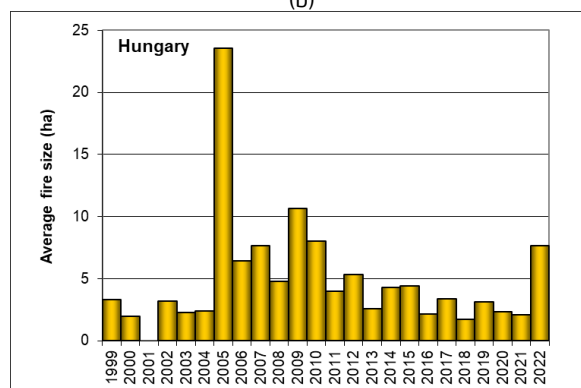
Forest type	Total burnt area (ha)
Forested land	5 091
Other wooded land	4 589
Other land	11 297
Total	20 977



(a)



(b)



(c)

Figure 29. Burnt areas (a), number of fires (b) and average fire size (c) in Hungary from 1999 to 2022.

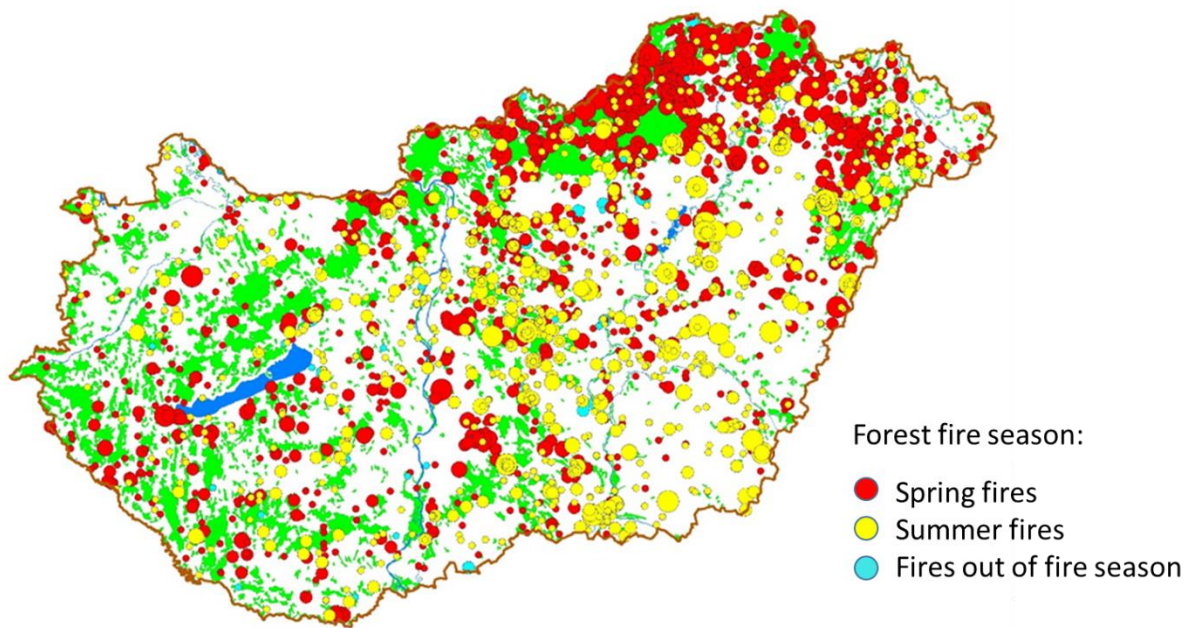


Figure 30. Locations of forest fires in Hungary in 2022.

Operations of mutual assistance

Fire service equipment was not heavily damaged. The Hungarian Defence Forces provided mutual assistance with two MI-17 helicopters to a forest fire in Slovenia in the karst region near the Italian border in July.

Fire prevention activities and fire information campaigns

Forest fire prevention is carried out in cooperation with the forestry authority and the National Directorate General for Disaster Management, based on community and domestic legislation.

The forestry authority also participates in the work of the Forest Fire Working Group of the National Fire Prevention Committee. An evaluation of the fire season was carried out at a web conference organised by the fire service at the end of the year. The National Food Chain Safety Office has delegated experts to the Disaster Risk Assessment System project, which is implemented by National Directorate General for Disaster Management. The new fire cause scheme developed by JRC has been incorporated into the national forest fire information system.

Fire fighting means

85% of fires were usually extinguished in less than an hour after arrival at the fire. The fire service arrived at the fire in 30 minutes on average.

Injuries and loss of human lives

Two civilians died in forest fires in 2022.

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.

Climate conditions and how they impacted the fire season

According to the analysis of the National Meteorological Service, both spring and summer average temperatures rose by more than 1.5 degrees compared to the base period (1980-2010). The national average of the annual mean temperature rises significantly based on the linear trend estimation of the long-time series starting from 1901. The number of hot summer days also increased. The amount of annual precipitation also decreased slightly. 81% of the usual amount of precipitation fell, but its distribution was very extreme both in space and time. Comparing the four seasons, compared to the last 100 years, the amount of precipitation decreased the most in spring. There was no precipitation in the first three months of this year. The first significant rainfall event was on the last day of March. The amount of summer precipitation has not decreased dramatically, but there are significant differences in its distribution. The number of rainy days also decreased. This summer there was a severe drought in July and August. There was a lot of rain in September, but in October a drought again developed.

National adaptation strategy

The forestry authority has proposed a review of forest fire prevention plans at the national and county levels. The criteria and content of the review has been compiled by the forest authority following the suggestions and best practices published in the issue of the European Commission Expert Group on Forest Fire. This review is being carried out by the relevant authorities.

Research activities aimed at improving fire management

Based on the guide prepared by the forestry authority, the fire cause scheme developed by the JRC was adapted to the forest fire data collection system. A user guide was also prepared for the application of the new system. The new scheme has been applied in data gathering from July 1, 2022. No trend can be detected yet. However, the main causes of forest fires can already be detected from the data gathering. The distribution of the causes of forest fires that can be detected from the data gathering shows a similar way as in member states examined in EFFIS. Those fires where information about the cause of the fire is available were investigated in 2022. Causes of forest fires that can be detected in the negligence group: cigarettes, Other negligent use of fire, Waste management, Vegetation management, and agricultural burnings. Causes of fires in Accident group: Electrical power, Railroads (Railways), Vehicles. The natural fire causes amounted to 1% in the last

decade. The increase in the proportion of natural fires was due to drought in 2022.

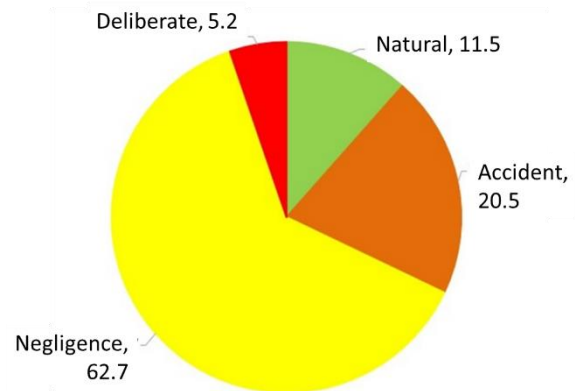


Figure 31 Proportion of causes of forest fires (excluding cases without any information) in 2022.

Fire season summary

- total number of wildfires 8 687 with 31 188 ha burnt area
- 2 731 forest fires with 20 947 ha burnt area
- 1 656 forest fires in Spring
- Total fire ban in Spring (12.02 – 26.04)
- Total fire ban in Summer (22.06 – 27.09)
- 140 large fires (< 30 ha)
- dead people

Mutual assistance in Slovenia 4 days in July.

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

1.2.12 Ireland

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

Fire occurrence and affected surfaces

Based on available Copernicus data, during 2022 it is estimated that approximately 3 000 ha of land was affected by fire, including < 100ha of forest lands. The forest land affected comprised 49 ha of state owned and private commercial forest.

Table 24. Estimated total losses in 2022.

Forest	Non-Forest
100 ha	2 900 ha

Fire danger during the 2022 fire season

Fire risk conditions for 2022 were largely in line with typical conditions with the exception of the summer heatwave period that occurred during July 2022. The DAFM Forest Fire Danger Rating System was activated in early March 2022 with a Condition Yellow notice. A further ten Condition Orange Notices were issued between April and September 2022, in line with prevailing weather and fire risk conditions. No Condition Red notices were issued during 2022. The most significant phases of fire risk occurred during April and later during July, following a short heatwave period.

Fire prevention activities

The Fire Danger Rating system developed by Met Eireann (Irish National Weather Service) was used operationally to produce fire Danger Notices throughout 2022. This system worked well during initial testing during 2021 season and operationally throughout 2022.

Promotion of land management activities aimed at vegetation management and fuels reduction in upland areas, continued through the network of European Innovation Partnership EIP-AGRI Projects, including the Curlew EIP project and the in the development of the new Nationwide ACRES Agri-environment programme.

Several landowners had penalties imposed under farm payment schemes by DAFM as an outcome of fire damage occurring during 2021, where burning was found to have taken place outside of the legally permitted period. Following similar penalty impositions during 2021, there was a marked increase in controlled burning activity by landowners during February 2022 ahead of the closed season. Similarly, there was a noticeable decrease in agricultural burning activity during the closed season. One individual appeared before the District Court in relation to an illegal burning incident in Co. Galway during 2020 and received a €750 fine and was

banned from driving for 2 years. The offence occurred contrary to Section 40 of the Wildlife Act, 1976. This case received widespread publicity following the judgement.

Fire Activity

Fire activity in Ireland is primarily monitored through three Regional Emergency Control Centres covering Southern, Western and Eastern Regions.

2022 saw generally reduced levels of agricultural burning activity during the main risk season, and a greater focus of fire activity on non-agricultural land types, particularly lands with public access.

Notable incidents:

A significant fire involving up to 400 ha of lowland raised bog occurred outside Galway city at Curraghline, and impacted road traffic operation on the nearby N84 National Road. This fire impacted on an area of peatland being managed primarily for Curlew Conservation.

A suburban wildfire in Killiney, Dublin threatened several residences and resulted in injury to two Firefighters in July 2022. This fire required significant resources to suppress, including the use of aerial means. This type of severe urban interface incident is comparatively rare in Ireland and serves to demonstrate that urban interface fires are possible in Ireland where suitable conditions permit.

Fire Suppression

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

Ground operations during 2022 were augmented by 3 Helicopters (2 X EC120, 1 X AS365) sourced from private sector contractors with additional medium lift helicopter support (AW 139, EC135) available from the Irish Defence Forces where required.

International Assistance

No international assistance operations took place during 2022.

Loss of human lives

There were no deaths or structure losses reported following forest fires during 2022. Two Firefighters were injured fighting an urban interface fire in Dublin on 25th July, 2022.

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

1.2.13 Italy

Fire danger

In 2022, the mean fire danger in Italy during the fire season (July to September) was above the average (period 1988-2020), corresponding to 92% of the highest FWI in 2007 (Figure 32, left). Note that FWI does not display a strong trend over the period of analysis (red dotted line - Figure 32, left).

A significant proportion of the inter-annual change in total burnt area in Italy is explained by changes in fire weather (Figure 32, right). A change in FWI from one year to the next is correlated with the corresponding change in burnt area, with 2022 showing below average changes for both FWI and burnt area.

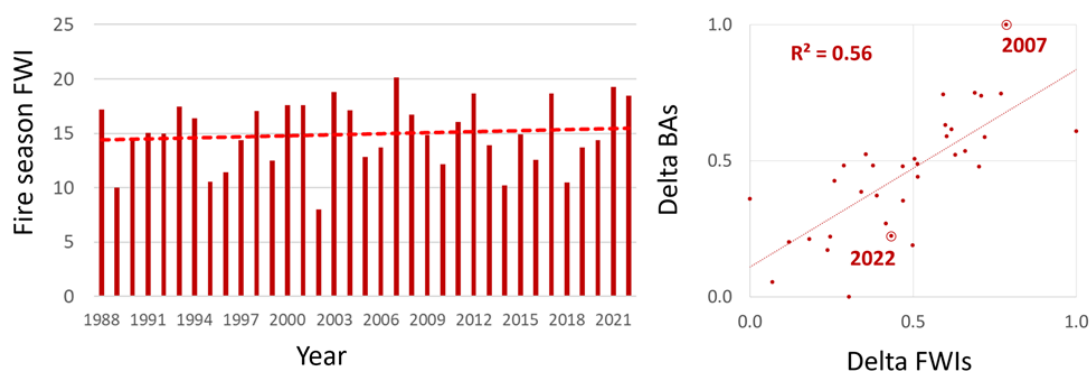


Figure 32. Mean daily fire weather in Italy during the fire season (July-September) from year 1988 to 2022. The red dotted line indicates the linear trend over the period of analysis (left). Total burnt area in Italy for years 1988-2022 as a function of mean daily fire weather during the fire season (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 2022 are evidenced by a double circle. Fire weather was indexed using the FWI according to the Global fire danger re-analysis (Vitolo et al. 2019).

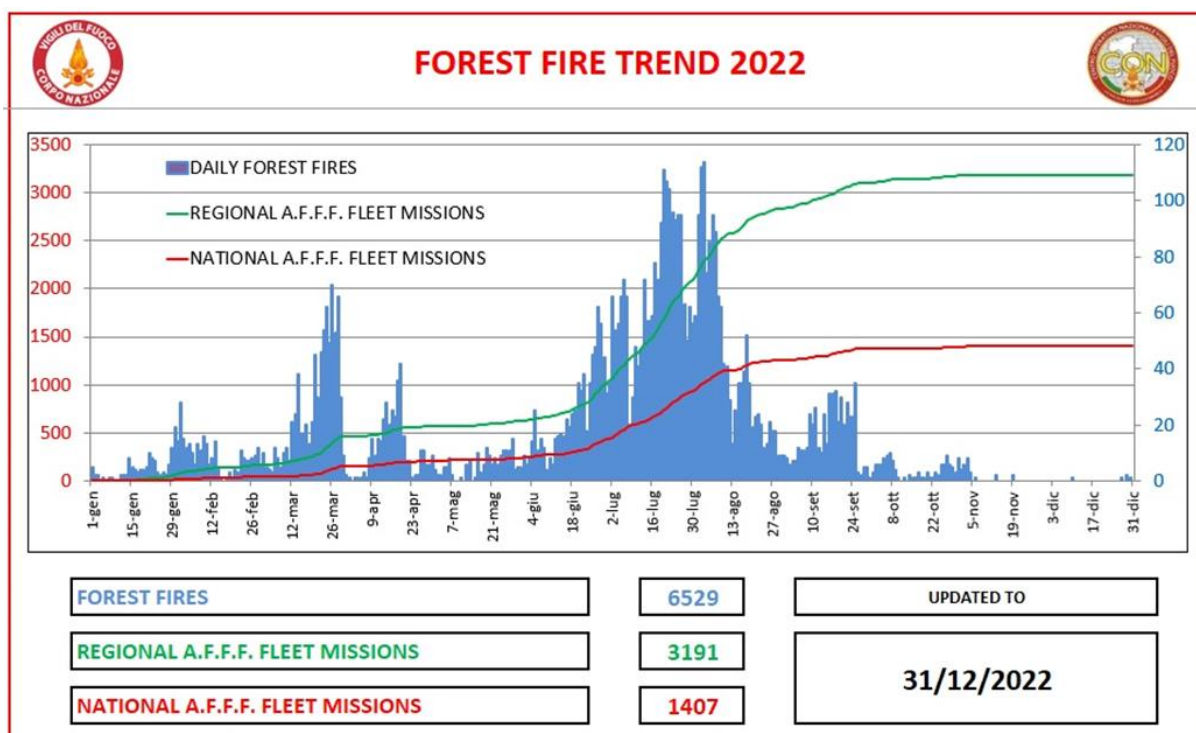


Figure 33. Daily number of forest fires in 2022; number of missions of forest fire fighting aircraft.

Fire occurrence and affected surfaces

In 2022 Italy was affected by a total of 6 529 forest fires. The number was higher than the previous year: +9.1%. On the contrary the burnt area was greatly reduced, from 151 964 hectares of 2021 to 71 694 of 2022 (-52.82%). Consequently, the average area per fire was less than half, passing from 25.4 ha in 2021 to 10.9 ha in 2022. Analysing data at region level, it is evident that such a decrease is common to almost all the southern and central regions. Sicilia, Puglia, Calabria were still the most affected regions (with more than 55% of the burnt area), followed by Lazio, Campania e Toscana. It has to be mentioned that Umbria, which was usually marginally affected by the fire phenomenon, was instead characterized by a strong incidence of forest and vegetation fires. It is also worth mentioning the data for Lombardia and Piemonte, which experienced a significant number of events during the winter season.

High temperatures and drought have significantly contributed to the number of fires recorded. On the opposite, the low number of windy days during winter and summer contributed to the containment of the extension of the surfaces affected by the fires.

Looking at the burnt area we can put in evidence that the overall surface is split almost equally between forest and non-forest areas.

Table 25. Number of fires and burnt area in Italy by region in 2022.

	Num. fires	% share of fires	Forest	Non-forest	Total	Av. fire size
ABRUZZO	43	0.7	165.8	121.1	286.9	6.7
BASILICATA	147	2.3	721.5	1050.0	1771.5	12.1
BOLZANO	104	1.6	16.9	5.9	22.8	0.2
CALABRIA	685	10.5	5277.9	1212.4	6490.3	9.5
CAMPANIA	412	6.3	3055.8	626.8	3682.6	8.9
EMILIAR.	198	3.0	413.1	132.4	545.5	2.8
FRIULI	105	1.6	1151.3	195.4	1346.7	12.8
LAZIO	423	6.5	5058.3	1458.5	6516.8	15.4
LIGURIA	243	3.7	1049.2	140.2	1189.4	4.9
LOMBARDIA	486	7.4	1123.6	588.8	1712.4	3.5
MARCHE	49	0.8	30.4	43.0	73.4	1.5
MOLISE	56	0.9	175.0	159.9	334.9	6.0
PIEMONTE	380	5.8	1740.0	888.0	2628.0	6.9
PUGLIA	286	4.4	1349.9	3110.2	4460.1	15.6
SARDEGNA	990	15.2	1234.4	8307.1	9541.5	9.6
SICILIA	1083	16.6	8780.4	15780.7	24561.1	22.7
TOSCANA	571	8.7	2064.8	1771.2	3836.0	6.7
TRENTO	40	0.6	159.7	2.2	161.9	4.0
UMBRIA	122	1.9	863.6	474.2	1337.8	11.0
VALLE D'AOSTA	9	0.1	51.9	37.6	89.5	9.9
VENETO	97	1.5	984.5	113.6	1098.1	11.3
TOTAL	6529	100	35468.0	36219.2	71687.2	11.0

The yearly trends in terms of numbers of fires and burnt areas in Italy since 1980 are shown in Figure 34.

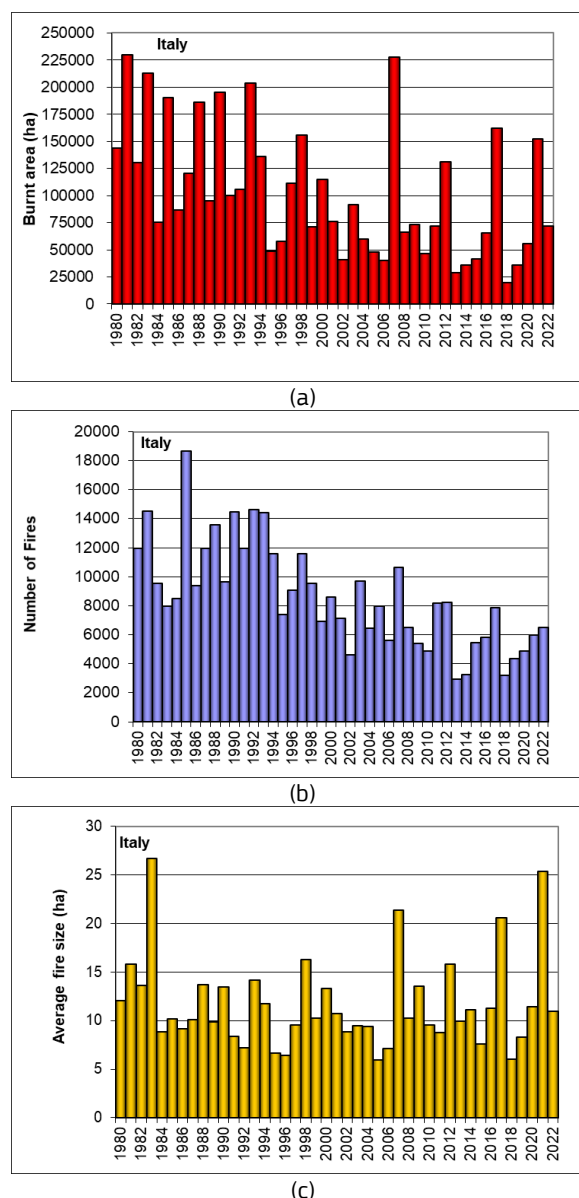


Figure 34. Burnt areas (a), number of fires (b) and average fire size (c) in Italy from 1980 to 2022.

Fire causes

Some 2% of forest fires are due to natural causes (lightning). This phenomenon is growing in the north-east of the country. With regard to man-made and intentional fires, the most frequent motivations are the renewal of pastures, while further reasons are linked to hunting activity, social unrest and pyromania. Unintentional causes are mainly due to activities of burning plant debris generated by agricultural activities as well as to recreational activities.

The ignitions are distributed uniformly throughout all the days of the week, with greater frequency during the hottest hours of the day (12.00 – 17.00). Fires affected mainly hilly territories with vegetation characterized by Mediterranean shrub. Often these areas have been already affected by fires in the previous 5 years.



Figure 35. Burnt area in Sardinia

Fire-fighting means

According to the National Law, the local Authorities “Regioni” 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 regional system is managed by a Common Operational Room. Regions can sign specific agreements with the National Fire Corps (C.N.VV.F.) to carry out the activity of forest firefighting. The State coordinates, through the Unified Air Operational Center (COAU), the National Forest Firefighting Air Fleet: 18 Canadair CL415 (a further CL 415 was sadly destroyed in a flight accident at the end of October 2022 in Sicilia, killing the two pilots) and 6 heavy helicopters Erickson S64, all of them owned and managed by the National Fire Corps. During the summer campaign, some military helicopters and others medium-sized helicopters from C.N.VV.F. are available too.



Figure 36. The Erickson S64 during the scoop with the sea snorkel.

Regional air fleets include some 70 helicopters operated by private companies. Sardinia also rented a Super Puma helicopter with the bambi-bucket; this helicopter is also used by Regional Forest Corps to move the back-fire crews. Puglia Region was the only one to rent planes (2 AT 802 F Fire Boss).

In the course of 2022, regional aircrafts were engaged on 3 191 missions; National assets received 1 407 requests (42% of which were submitted by Sicilia and Calabria).



Figure 37. The Super Puma helicopter in action in Sardinia.

In Italy, ground crews (hand crews and engine crews) make a large use of pick-up trucks with a small water tank (400-600 litres) able to move on the narrow roads of the Italian network covering hills and mountains. The National Fire Corps usually employs pick-ups too, and provides also heavy fire engines to refill smaller means.

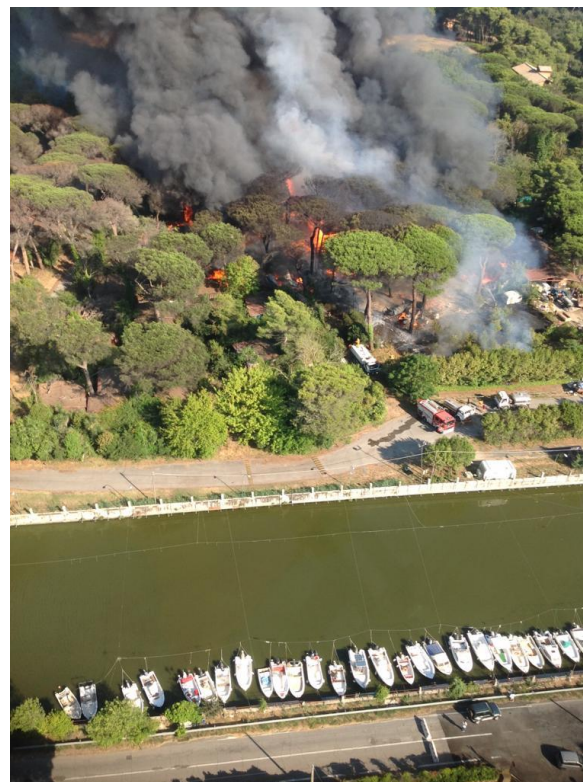


Figure 38. Firefighting in 2022.

Hand crews and engine crews work in close collaboration with the small and medium helicopters. Often, in the mountain areas, ground crews set up mobile water points for helicopters using removable tanks refilled by heavy fire engines. When the road network does not allow them to reach the fire front with trucks, ground crews, especially in the northern part of the country, use long fire hose lines to control the flames on the flanks and for mop up operations. If the road networks is not dense enough to allow for the use of hoses, the crews use hand-tools like rakes, beaters, shovels, hoes, etc. Blowers are frequently used especially in the pastures

When possible, according to safety conditions, and in particular to the knowledge of the places, ground crews work during the night with hand-tools and hoses too, taking advantage of the lower temperature and higher air humidity.



Figure 39. Firefighting in 2022.

After the 2017 fire campaign, one of the worst in the history of the Country, the Italian Government decided to increase the ground and air resources of the National Fire Corps with a 10-year funding scheme aimed to improve the response of the State to wildfires. Having acquired heavy and medium helicopters, and light pick up for the narrow roads network of the rural areas, C.N.VV.F. is going now to complete a new procurement of heavy forest fire trucks.

The ever-increasing use of drones in forest fires fighting is worth mentioning. UAS (Unmanned Aircraft System) are used by all the component of the Forest fire fighting System for patrolling, assessment, monitoring, mapping burnt area as an orthomosaic when the wildfire is put out, and investigation. In Italy the use of drones in forest fires fighting is under the coordination of the Incident Commander who is in charge of all technical activities for fighting wildfires.



Figure 40. Heavy fire trucks.

In the wildfire scenario National Fire Corps use drones to assess the ongoing situation and manage the operations in WUI areas when the wildfire is close to infrastructure or urban sites, especially in the night when the manned aircraft do not have the possibility to fight the fire. But one of the most useful activities for the National Fire Corps is to use drones to look for hot spots during mop-up operations. These flights can be done with a thermal camera, with the possibility to geo-reference the hot-spot, which can then be positioned on a map. The processed data are made available early in the morning to the Incident Commander to deploy ground teams on specific targets.

The Italian National Fire Corps drone service currently has 15 bases, 150 pilots and 100 drones (both multirotor and fixed wing). As a Government Organization, Italian Fire Department has specific rules to use drones to support technical rescue operations.

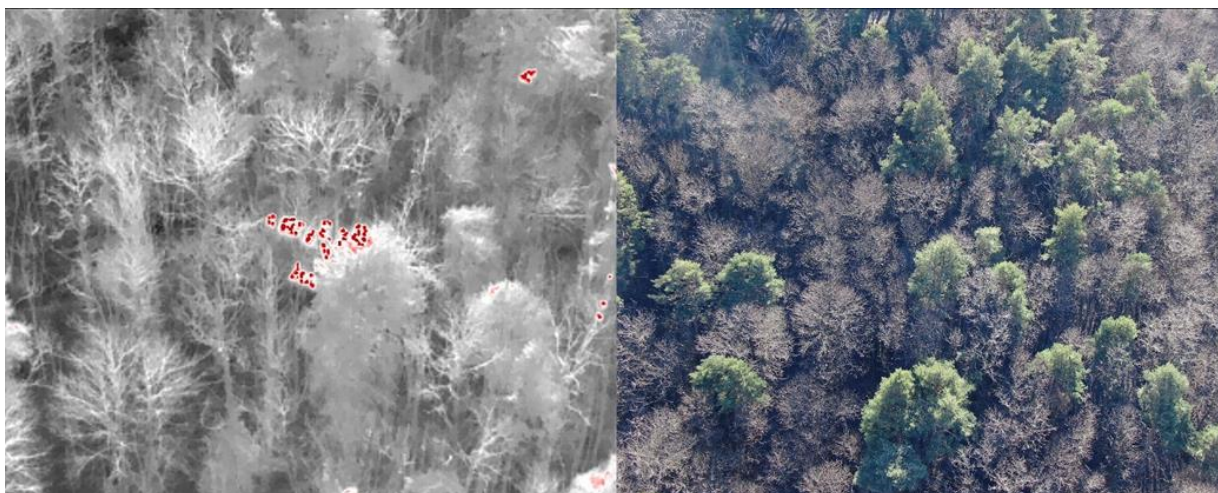


Figure 41. Hot spots revealed in aerial view by thermal camera compared with optical camera, both installed on the same UAS.



Figure 42. Drone flying activity is closed when manned forest fire fighting aircraft operations are in progress.

Fire prevention activities and information campaigns

Fire prevention in Italy involves several actors at both regional and national levels. Regional forest agencies are in charge of setting the Regional Fire Management plan (RFM-plan) where fire prevention activities are programmed (Art. 3, Law 353/2000), usually for the following 5 years. Planned activities include: i) the maintenance of the road and fuelbreak network to support firefighting; ii) the realization of pyrosilviculture interventions in blocks (i.e., variable retention harvest, prescribed burning) to increase forest ecosystem services resistance and resilience; iii) information campaigns targeted at citizens with both short-term (e.g., fire danger rating) and long-term goals (e.g., increasing risk awareness). In some regions, local fire prevention plans complement the RFM-plan in high fire risk territories defining the spatiotemporal distribution and resources for fuel management activities for a period of 10 years, including extraordinary interventions with the aim to improve the forest vegetation structures and its resistance and resilience to fire disturbance.

The main funding scheme to finance prevention interventions in Italy, as defined by both RFM-plans and Specific Fire Prevention Plans, remains the measures and interventions co-financed by the EAFRD fund, of the Rural Development Program (RDP) of the European Commission:

https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/rural-development_en.

For the new programming phase of the Common Agricultural Policy (CAP) 2023-2027, Regulation (EU) No 2115 of 2021 defines the European Commission's New Delivery Model. The tool to outline this new approach is the CAP National Strategy Plan (NSP). The new EU Regulation has re-proposed, in a single measure (SRD12 - *Investments for the prevention and restoration of forest damage*) direct support for interventions for the prevention of damage (Submeasure SRD12.1) and the restoration of damaged forests (SRD12.2).

Submeasure SRD12.1:

Provides for investments aimed at carrying out prevention interventions, essential to ensure the maintenance of the national forest heritage and its protection from natural disasters, adverse weather conditions or catastrophic events, including fires, hydrogeological instability, storms, floods, attacks by harmful organisms and plant diseases.

Submeasure SRD12.2:

Provides for investments aimed at carrying out interventions for the ecological and functional restoration and/or recovery of forest ecosystems affected by natural disasters, adverse weather conditions or catastrophic events, including fires, hydrogeological instability, storms, floods, attacks by harmful organisms and plant diseases.

Despite an average annual increase in the number of fires and forest areas affected by fires, compared to the previous programming period (2014-2020/22), there was a significant reduction in the resources committed by the regions for prevention and restoration interventions at national level. A financial commitment co-financed by the European EAFRD fund of €200 000 000 is planned and the intervention will be activated by all regional administrations, except for the autonomous province of Trento and Campania region which provide their own resources to carry out similar interventions.

Overall, therefore, there is a financial commitment reduced by 60% compared to the previous programming phase 2014-2020/22.

In 2022 National Fire Corps (C.N.VV.F.) and National Association of Italian Municipality (ANCI) presented a booklet aimed to give information about safety to the citizens who live in houses close to forest and natural areas (WUI). The handbook, drawn up by the Central Prevention Directorate of the National Fire Brigade, illustrates in a simple way how to evaluate the characteristics of plant species according to their response to fire, the distance from buildings and all the other factors that can increase or reduce exposure to the risk of damage to structures. The booklet, aimed at non-experts but also useful for professionals, illustrates how to evaluate the safety of the home with respect to vegetation fires in urban-rural interface areas. The booklet is accompanied by a brochure that shows some good practices to improve home safety against wildfire risk (Figure 43).



Figure 43. Safety handbook and brochure.

Injuries and loss of human lives

According to the National Fire Corps data (through the official reporting system 'Stat-Ri-web'), in 2022 four casualties were due to forest fires; three of them were first responders: two Canadair pilots who fell with their aircraft in Sicilia in October, and one Forest Fire fighting volunteer who died in Friuli V.G in July. The fourth casualty was a farmer who had an accident driving his tractor, while he was trying to contain the fire in his own property.

Ten civilian casualties were attributed to vegetation fires (non-forest fires); in several cases the victims were elderly people who were using fire to eliminate plant residues.

International assistance operations in 2021

During 2022, five forest fire fighting missions were carried out by the Italian AFFF module on request by the EU Civil Protection Mechanism. two Canadair CL 415 aircraft of the National Fire Corps were engaged in the following missions (Table 26):

Table 26. International assistance operations in 2022.

Country	Date	Type and number of air means	Number of flights	Hours of flight	Number of drops
Portugal	13-16/07/2022	2 Canadair CL 415	16	42.20	179
Czechia	27-28/07/2022	2 Canadair CL 415	10	12.25	42
Czechia	05-08/08/2022	2 Canadair CL 415	10	30.12	86
France	12-13/08/2022	2 Canadair CL 415	6	12.43	33
Germany	04-09/09/2022	2 Canadair CL 415	22	55.24	123

It should be noted that half of the interventions of the Italian AFF RESCUE module were carried out in Central European countries such as Germany and Czechia.

At the end of January 2022, on request of the Swiss authorities and on behalf of the bilateral cross-border agreements, Italian aircraft were deployed on the area of Monte Gambarogno, Alpe di Neggia in the municipality of Indemini in Canton Ticino (Switzerland), to fight vegetation fires that developed close to border with the province of Varese (Italy). More specifically, on 01/02/2022, four Canadair CL 415 aircraft and one Italian firefighter UAS crew (Unmanned Aircraft System) were deployed. Italian UAS flight activity was mainly deployed in the period 2-15 February 2022, to map hot spots with a thermal imaging cameras sensor (with no manned flights over the area), in order to allow the Swiss Incident Commander to manage ground firefighting operations in daylight (Figure 44).



Figure 44. Assisting in the Ticino fire.

It is also of extreme interest to note the collaboration in the field between Italy and Slovenia for a series of severe forest and WUI fires with extreme behaviour that started in the second half of July 2022, in the “Carso” border area. The operations were carried out for 2 weeks in an area dense with unexploded ordnance from the First World War.

Climate change

The climate in 2022 in Italy was very warm, breaking records to date in terms of temperatures and with persistent drought, particularly in the central and northern regions of the country.

In more detail, 2022 was the warmest in the series since 1961, with an anomaly value compared to the 1991-2020 period of +1.23°C. The year 2022 also marks the ninth consecutive year in which there is a positive anomaly compared to the average temperature of the reference period.

With reference to the monthly data, it can be noted that all months of the year with the exception of March and April registered temperatures higher than the baseline average, with average temperatures exceeding the baseline of 3°C in June and 2°C in July.

Rainfall, on the other hand, registered an annual figure 22% below the average, setting a new negative record for the series of data registered since 1961. In particular, in the first seven months of the year, the rainfall accumulations were 39% below the averages. The drought trend eased with the anomalous figure of August, a month with rainfall that exceeded the average for the period by almost 70%, followed then by the months in the latter part of the year, which were wetter than average with the only exception of November.

The CDD (Consecutive Dry Days) drought index registered peaks in some areas of Sicily and Sardinia, whereas the periods of no rain reached about 160 and 130 days, respectively.

The combination of these of two climatic data, temperature and rainfall, impacted on the peak of major fires requiring the deployment of national fleet aircraft, which fell between the last ten days of June and the first ten days of August. In fact, several major rainfall events, registered in the first half of August in different parts of the country, raised the moisture content of the fuel, reducing its ability to burn.

Climatologists highlight the problems linked to the ongoing climate change, which impact also on the forest fires phenomena: ranging from the increase of the areas at risk of summer fires, extended to the northern regions, as well as the increase of the winter fires impact to some regions of the south, up to the change in the fire regime, with a significant prolongation of the fire period (from May to late October for the summer campaign), implying extreme events outside the ordinary periods of the Forest Fire Fighting campaigns. The last years, albeit with different declinations, suggest that this process is ongoing, with regards, in particular, to the lengthening of the fire seasons and the occurrence of extreme events outside the usual seasons.

In 2022 the fires began in January in the Alpine area of Lombardia and, in the following months, spread to Piemonte, Liguria, Trentino Alto Adige, Veneto, Friuli V.G., Emilia Romagna, Toscana, Lazio and Campania. Two peaks were recorded during the "winter" campaign: one in mid-March, which could be considered as average, the other in mid-April: a period that we could consider anomalous. There was no solution of continuity between the winter campaign and the summer campaign, as, from the month of May, Calabria, Sicilia and Lazio began to burn. In the month of June, the number of events grew significantly, reaching the summer peak in the second half of July-early August. From August 15th the phenomenon decreased significantly although it continued until the month of October. Going deeper into the analysis, it came out that in the second half of July an unusual series of fires was recorded in the Alpine regions: Friuli, Veneto, Trentino, Lombardia and Piemonte were affected by a series of rather significant events, which required the activation of the state fleet, which is usually concentrated in the southern regions at that time of year; the vast fires in the Carso Triestino, which developed both in Italian and Slovenian territory, the fires in Veneto in the Longarone area, the fires in Trentino Alto Adige, with multiple deployments of the state fleet, constitute an anomaly which undoubtedly indicate that something is changing.

The trend of the forest fire phenomenon in 2022 was also predicted by EFFIS (European Forest Fires Information System) from the first months of the year. Seasonal forecasts in terms of temperature and precipitation anomalies, in fact, highlighted this trend over the course of the year that is well represented in the graph in Figure 33, which highlights the different peak moments recorded and the continuity of the phenomenon over time (10 months).

Wildfire campaigns are no longer well defined in terms of time and space, and are often complicated by contemporary hydrogeological events. The borderlines between forests and agricultural lands are no longer well defined. In the marginal areas, fields are no longer cultivated, and transition shrub stands are growing, creating suitable areas for the fast spreading of fires. For these reasons, the protective effect of cultivated areas is decreasing and, in the worst years, like 2007 or 2017, agricultural areas are no more fire lines to stop wildland fires; on the contrary, they become areas which allow a faster spread of fires to the forests. Noteworthy, fires involving agricultural areas, including those with transition shrubs stands, are growing and their number exceeds forest fires. This evolution also increasingly challenges the response system.

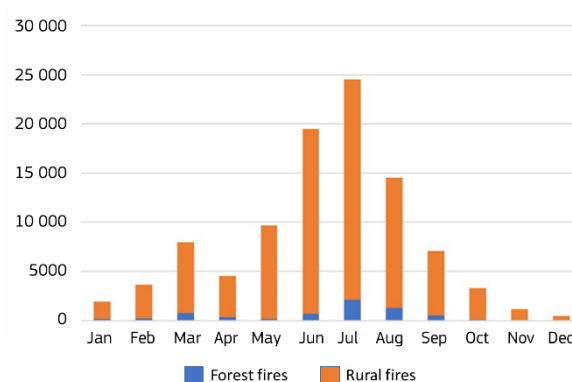


Figure 45. Monthly distribution of rural fires (forest and non-forest vegetation fires) in 2022.

The figures show the comparison between the rural fires (the sum of forest and non-forest vegetation fires corresponding to code 301 of the C.N.VV.F. statistics) and forest fires (according to the definition of law 353/ 2000). The number of non-forest fires is much higher: over 92 000 rural fires of which almost 6 500 are forest fires.

2022 in Italy was characterized by large fires in the urban-rural interface areas. During the summer many important fires threatened the suburbs areas of the cities: the Carso area around Trieste, endangering motorway and railway; the rural area of Massarosa in Toscana, which required mass evacuations. Even large cities, as Roma and Palermo, were impacted by the fires. In particular, Roma experienced several fires at the same time in the suburb, and in some cases also in the green areas within the city (Pineta Sacchetti)

After the National Mobilization of 2021, the most affected regions of the South (Sicilia, Sardinia, Calabria, Puglia) signed special agreements with the northern region of the Country, so that the northern Forest fires Volunteers Organizations moved to the southern areas for the summer period, to support the local System in patrolling and attacking the fires.



Figure 46. wildland urban interface fires during the summer of 2022.

In addition to the instruments foreseen by the agreements with the Regions, the C.N.VV.F. kept its attention high through its national mobilization procedure: during the summer campaign, on the basis of the national fire susceptibility bulletin issued daily by the Civil protection Department, over 800 Forest Fire Fighting modules were pre-alerted, for a total of 8 000 Fire-fighters. 111 modules of these were effectively employed into emergencies in progress, mainly in the centre and the north of the country, so confirming the non-ordinary nature of the situation.

During the summer of 2022, the National Corps also launched the project "Rural fire stations of the C.N.VV.F.", to open a network of 31 fire stations, distributed in, or close to, the protected areas at greatest risk of forests and vegetation fires, so as to ensure shorter times to deploy forces to protect for environment listed areas and to bring assistance and rescue services to the population living in these areas.

In the summer of 2022, seven rural fire stations became operational in Sardinia, Sicilia, Calabria, Basilicata, Puglia, Campania and Abruzzo. A further three became operational in the Northern regions for the winter campaign. The activation of all the 31 planned departments will be completed within a three-year period.

Research activities aimed at improving fire management

Several studies aiming at improving fire management in Italy were published in 2022. Bacciu *et al.* (2022a), proposed a novel "systemic fire management framework" encompassing disaster risk reduction, community engagement, adaptive management for resilience, and adaptive governance. Salis *et al.* (2022) showed that increasing land abandonment substantially raised burn and high flame length probability, and fire size at the landscape level in a Mediterranean region, increasing the likelihood of large and fast-spreading events. Elia *et al.* (2022) identified seven distinct pyroregion clusters, shaped by bio-physical and anthropogenic drivers. Notably, a North-South gradient played a crucial role, driven by both climatic variations and socioeconomic factors, shaping wildfire regimes across the studied regions. Using the Random Forest Classifier algorithm, Trucchia *et al.* (2022) developed a machine learning model to create national-scale susceptibility maps for Italy at a 500 m spatial resolution, considering both winter and summer seasons. Cilli *et al.* (2022) presents an eXplainable Artificial Intelligence (XAI) framework for estimating wildfire occurrence using a Random Forest model with Shapley values for interpretation. Findings highlighted influential drivers like Fire Weather Index and Normalized Difference

Vegetation Index. Carrà *et al.* (2022a, 2022b) assessed the effects of prescribed burning in *Quercus frainetto* forests investigating both natural regeneration processes and soil surface runoff. A study involving 271 experts from various European countries aimed to understand forest fire causes (Tedim *et al.* 2022). Agricultural burning, deliberate fire for profit, and vegetation management ranked highest. Negligence was a common cause, while malicious fire setting was overestimated, with country-specific variations. Aragonenses *et al.* (2022) proposed a European fuel classification system with 85 fuel types, grouped into six categories, including forests, shrublands, grasslands, croplands, wetlands, and urban areas. The study created a publicly available map with 20 fuel categories at 1 km resolution. A study deepened how the European Union Rural Development Program (RDP) contributed to wildfire risk mitigation from 2007 to 2017, linking RDP expenditure at municipal levels to fire activity indicators. Findings showed a limited association between RDP spending on fire-related measures and reduced wildfire activity (Colonico *et al.* 2022). Utilizing Google Earth Engine and over 1 000 fire records from Italy and France (2004–2017), and random forest models, Costa-Saura *et al.* (2022) developed an approach to predict fire severity. Topography, vegetation, and burning conditions are explored as explanatory factors. Machine learning explains 75% of rdNBR variability, emphasizing their value for mapping fire severity in risk assessments. Nolè *et al.* (2022) examines wildfire severity and post-fire recovery patterns across European forests (2004–2015) using spectral metrics. RRI indicated a slower post-fire recovery rate compared to NDVI, with a decreasing trend over time, suggesting delayed vegetation recovery across European forests. Francini *et al.* (2022) developed a semi-automated procedure, 3i3D-GEE, in Google Earth Engine for regional to global forest disturbance mapping (including fire) and sample-based area estimation and applied this procedure to Italy's forests (2018). This tool supports nations' reporting for international commitments including those related to burnt area assessment.

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(Sources: *Comando Carabinieri per la Tutela Forestale - Nucleo Informativo Antincendio Boschivo; Italian National Fire Corps – Forest fire Fighting Service; Ministry of Agriculture, Food Sovereignty and Forests – General Directorate of Mountain Economy and Forests, Italy*).

1.2.14 Latvia

Fire danger in the 2022 fire season

In 2022, the forest fire-fighting period was set from 2 May and lasted until 12th of September.

Fire occurrence and affected surfaces

Overall, in 2022 there was a relatively low fire risk. In the reporting year, 391 forest land fires were detected and extinguished, of which 220.94 ha of forest land was affected, including 68.68 ha of new coppices. The biggest forest fire occurred on April 22, 2022 in the territory of the Riga Regional Forestry Administration at the NAF Adazi Landfill, where 52.26 ha of forest land burned.

The average forest fire area in 2022 was 0.56 ha.

Table 27. Number of fires and burnt areas by month in 2022.

Month	Number of forest fires	Burnt area (ha)
January	0	0
February	1	0.0021
March	37	10.4595
April	60	97.0314
May	107	87.824
June	21	2.7784
July	29	6.088
August	78	12.0085
September	15	0.8683
October	15	0.0626
November	5	0.0335
December	1	0.06
Total*	369	217.2163

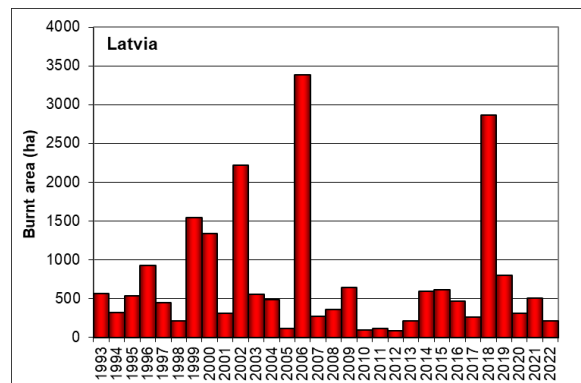
*Excluding 22 other fires dealt with by State Forest Service

Fire prevention measures in 2022 cost 156 661 Euro (Table 28).

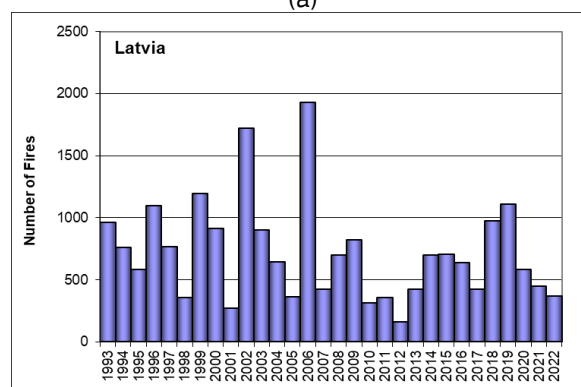
Table 28: Expenditure on fire prevention measures in Latvia in 2022.

Title	Costs, EUR
<i>Latvian State forest</i>	
Creating new fire breaks, 0 km	
Existing fire break cultivation, 2975 km	78991
Water point, warning sign renovation	77670
Total	156661
<i>Riga City Forest</i>	
Creating new fire breaks, 0 km	
Existing fire break cultivation, 548km	

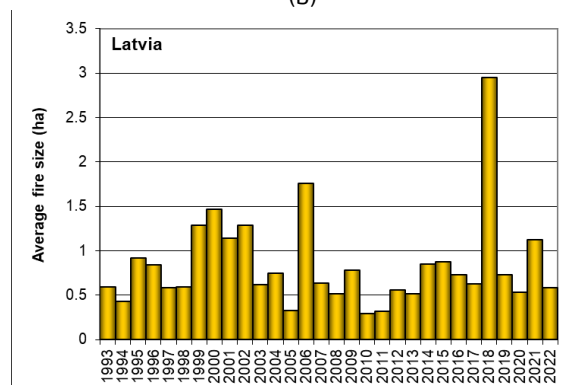
The yearly trends in terms of number of fires and burnt area during the last 28 years in Latvia are shown in Figure 47.



(a)



(b)



(c)

Figure 47. Burnt areas (a), number of fires (b) and average fire size (c) in Latvia from 1993 to 2022.

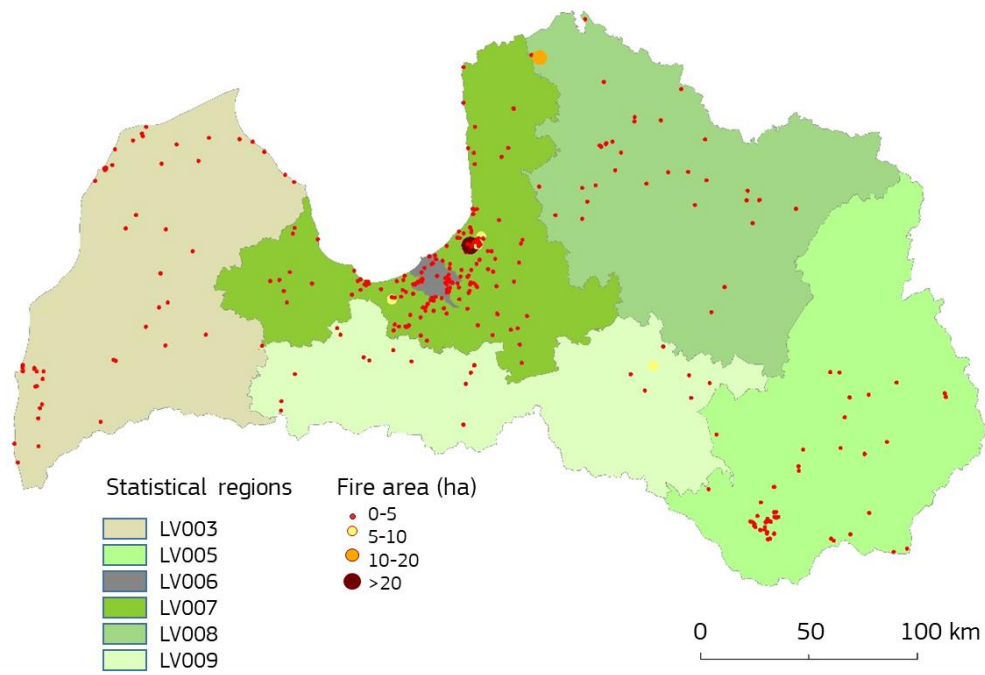


Figure 48. Map of forest fire locations in Latvia in 2022.

Preventive measures

The Service uses a network of fire observation towers (178 fire observation towers) to ensure fire protection. The State Forest Service has installed a Remote Fire Detection and Monitoring System (RFDMS) on 12 fire observation towers in the Riga Regional Forest, which will operate for the third year.

In the summer of 2022, the Service provided jobs for seasonal employees in 328 positions (tower duty officers, drivers of specialized fire trucks, forest firefighters, forest fire station managers, operational duty officers).



Figure 49. Volvo FMX 6X6 tanker truck.

New equipment

In 2022, the Service purchased 4 new Mercedes Benz UNIMOG 4023 forest fire truck. In total, the Service has 17 Mercedes Benz UNIMOG 4000 and 18 Mercedes Benz UNIMOG 4023 forest fire trucks to ensure the rapid detection, control, and elimination of forest fires. Additionally, the Service has purchased 5 Volvo FMX 6X6 tanker trucks with a water capacity of 10 m³, which will significantly facilitate the liquidation of forest fires (Figure 49, Figure 50). The service also has at its disposal 85 Toyota Hilux SUVs equipped with extinguishing equipment. In addition to the existing 10 quadricycles, 6 Polaris Sportsman 6x6 quadricycles were purchased.



Figure 50. Volvo FMX 6X6 tanker truck.

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

1.2.15 Lithuania

Fire danger in the 2022 fire season

The number of wildfires and the total burnt area was higher than in 2021. The increase in the area of forest fires was influenced by 4 open forest fires in the spring. The first fire in 2022 was recorded in March, the last one in November.

Fire danger during the fire season 2022 was characterized by high temperature levels and high wind levels. A heat wave in Lithuania occurred in July and August. The number of fires was influenced substantially by the weather conditions in spring and summer. The most notable forest fires for the 2022 season are listed below.

Date	Burnt area, ha
03/04/2022	9.26
18/04/2022	9.86
02/07/2022	4.90
20/04/2022	3.66

Fire occurrence and affected surfaces

In 2022, according to the data of the State Forest Enterprise, 81 forest fires occurred damaging 53.26 ha of forest, of which 39.77 ha was in State forest, and 13.49 ha covered forest fires in private forests. (In 2021 46 forest fires occurred, burning 11.01 ha). In 2022, 10 forest fires were bigger than 1 ha, with a total burnt area over 38.32 ha. The highest number of forest fires occurred in August, and the highest burned forest area was in April.

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 298 times, according to reports of forest fires.

Economic costs

The total damage was estimated to be 31 070 euro.

The yearly trends in terms of number of fires and burnt area since 1992 in Lithuania are shown in Figure 51.

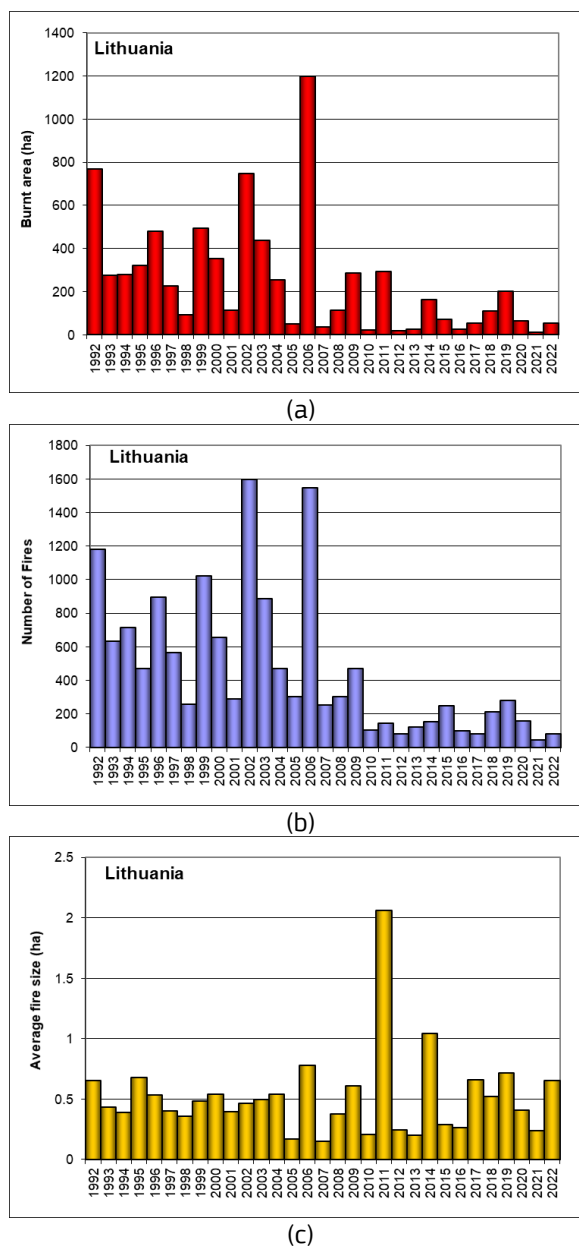


Figure 51. Burnt areas (a), number of fires (b) and average fire size (c) in Lithuania from 1992 to 2022.

Fire prevention activities

The State Forests Enterprise organizes the establishment of a uniform system of state fire prevention protection measures. Contracts between 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 3.40 million Euro from their own funds in 2022, and 12 000 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.

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 2022.

Climate Change

In 2022, the average air temperature in Lithuania was 7.9 °C, i.e. 0.5°C higher than the standard 1991-2020 climate norm (SKN), which is 7.4°C.

The coldest month of 2022 was December with a negative air temperature of 2.6°C. June and especially August were very warm, at 17.3 and 20.4°C, respectively. August was the warmest August since 1961.

The winter of 2021/2022 was warmer than usual – the average air temperature was -0.8°C. Summer was much warmer than usual (1.2°C anomaly).

The year 2022 was a little drier than usual in Lithuania – 674 mm of precipitation fell on average,

95% SKN (1991-2020 precipitation SKN is 695 mm). The annual amount of precipitation in the entire territory of the country varied from 495 to 886 mm.

After the last three drier years, the average precipitation during the 2021 was close to the norm at 701 mm.

The driest month of the year was March – the precipitation was only 2 mm (5% SKN). Just a little more than half of the norm, 51-54% of SKN, precipitation was recorded in August, October and November. September was also dry, making it four consecutive months significantly drier than normal. The remaining seven months were wetter than the SKN, and a particularly large deviation from the norm was recorded in February, 162% of the SKN, 70 mm. Wetter than usual was the April-July period, when 16-45% more precipitation than normal fell. The first and last months of the year were wet.

During 2022, 23 natural and 2 catastrophic meteorological extremes and 13 natural hydrological extremes were registered, of which 7 were related to the flow of rivers and 6 to very high water levels. More than half of these extremes were registered in summer and were local. However, the winter was distinguished not only by natural, but also by the number of very strong winds that reached catastrophic values – 6 SMR and 2 KMR were recorded.

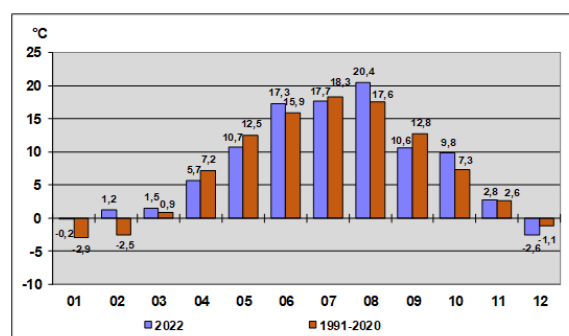


Figure 52. Average air temperature in the months of 2022 and the standard climate norm.

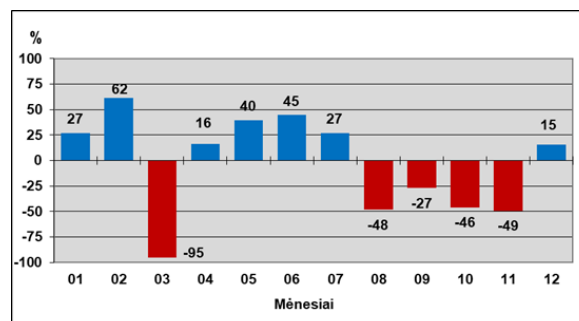


Figure 53. Deviation of the average air temperature from the standard climate norm for the months of 2022.

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

1.2.16 The Netherlands

Fire danger in the 2022 fire season

After a wet year in 2021, the fire danger in 2022 was higher than average for a long period. This was the fourth year out of the last five years where long(er) periods of drought dominated the spring and summer in The Netherlands, resulting in elevated fire danger and multiple ignitions.

Fire occurrence and affected surfaces

In 2022, 916 wildfires were reported. That is well beyond the average of wildfires between 2017 and 2021 (550 per year), since the wildfire statistics were set up again in The Netherlands..

As outlined in the 2017 EFFIS report (San Miguel Ayanz *et al* 2018), all wildfires are included in our count, regardless of their size or of the fuel type (forest, heathland, cropland, etc.) they burn in. This means that also fires of 10-100 m² are counted. As these (very) small fires cannot be readily identified using satellite analysis, the surface area of fires is estimated from photo and video material, or in the field, although this is not systematically done for all fires. Ground-based estimates of wildfire size were available for 207 out of 916 fires recorded in 2022 (23%), and amounted to 220 hectares. The remaining 709 wildfires that are not included in this surface area estimate are all very small (less than 0.1 hectare). With 220 hectares counted on the ground, the total estimated surface area burned by wildfire in 2022 is lower than the average of 2017-2021 (442 ha per year). Neither the total fire count nor the surface area of 220 ha includes controlled management burns. Several large management burns were performed at two military sites between 27 February and 5 March 2022. The size of these burns was such that they were visible in EFFIS, and the total area burned in these large controlled burns was 203 hectares. Outside of military terrain controlled burns can also take place but generally at a much smaller scale (~0.5 hectare).

The vegetation type in which wildfires occur is registered for most larger wildfires (fires that exceed ~100 m²) based on field observation, ground-based imagery and news reports. In 2022, 16 hectares (7%) of the affected area was forest, 191 hectares (84%) was other non-wooded land (mostly heathland and peatland) and 13 hectares (6%) was agricultural land.

The largest wildfire in 2022 was a fire in the 'Mariapeel', a peat bog in the south of The Netherlands. This fire had a large potential, because it exceeded the suppression capacity already in the early morning. The incident commander quickly scaled up resources including a handcrew, drone team and aerial support, sent resources to best and worst-

case scenario holding lines, and waited for a window of opportunity and started preparations by carrying out tactical burns. Finally, the fire was contained at a total burned surface of about 41.5 hectares.

Most challenging were a few days with over 20 wildfires in the whole of The Netherlands. Luckily, almost all of these fires were brought under control very quickly. Characteristic was the 19th of July, when the United Kingdom was hit by very bad fire weather which caused a lot of (wild)fires. This day was also one of the busiest days of the year in The Netherlands in terms of wildfire activity, with a relative humidity that dropped to 9% in Maastricht and temperatures above 39 degrees Celcius. Despite this, no major incidents occurred. A Wageningen University study is currently comparing the fires in the UK and the Netherlands during this heatwave, to draw lessons learned.

Fire causes

Fire cause investigation is not systematically done for wildfires in the Netherlands. The information available on fire causes in 2022 is therefore based on 7 official fire cause investigations performed by the Wildfire Cause and Origin Investigation Team as well as a large number of informal assessments. In 2021, the Netherlands Fire Service has started a database with a questionnaire for wildfires. Fire investigators and fire officers can put relevant information about fire causes and fire behaviour in this database

For 909 out of 916 fires, the cause was not investigated by the Wildfire Cause and Origin Investigation Team. Yet, in 187 cases the cause of the fire was deemed certain based on the conditions encountered. Most of the fires with an identified cause ignited due to the use of weapons (on military exercise sites, 152 of all fires) or by humans. In some cases the local fire investigators from the police or fire department did the research. For 679 fires (74% of total), the cause was not assessed or listed at all, while 93 fires (10% of total) were informally assessed. In 90 of these latter cases the cause was informally assessed and identified; in 3 cases the cause was informally assessed but uncertain.

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 great majority of fires caused by human behaviour (deliberate or accidental).

Figure 47 shows the total burnt area, number of fires and average fire size in The Netherlands for the last 5 years.

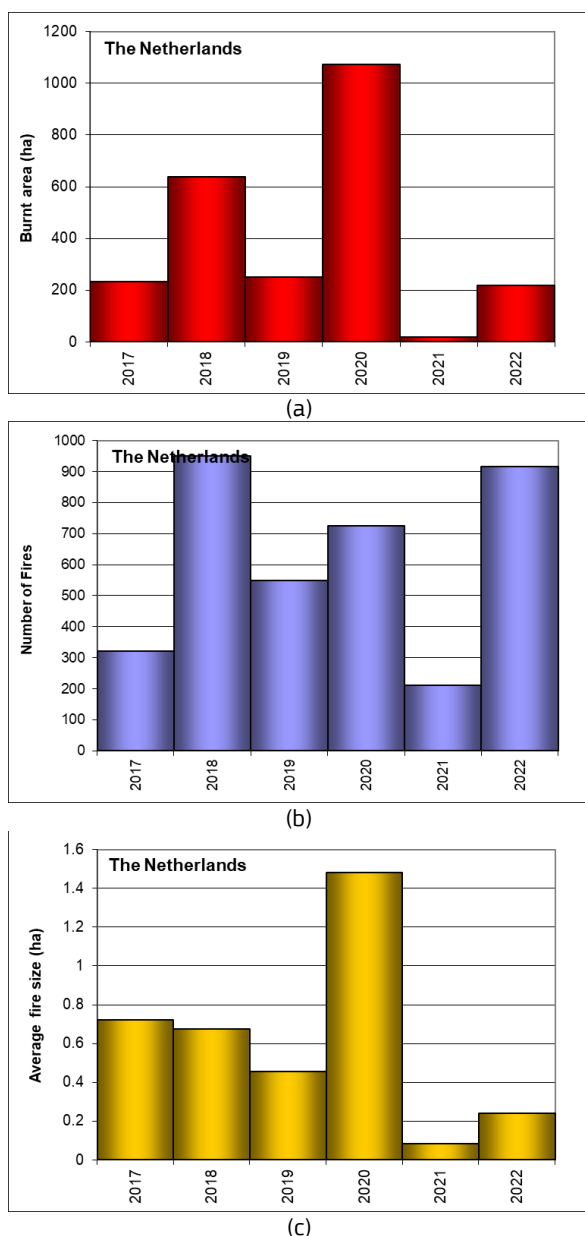


Figure 54. Burnt areas (a), number of fires (b) and average fire size (c) in The Netherlands from 2017 to 2022.

Fire fighting means

In 2022, 2 224 fire engines were sent to extinguish the wildfires, with an average of ~2.5 engines per fire. In addition, the suppression activities were supported by a total of 984 water trucks (with a capacity of at least 10 m³ per water tender).

At least 20 times, an Unmanned Aerial Vehicle from the Fire Department was used to make thermal images of the spread of the wildfires. The Wildfire Tactical Advisors were deployed eight times. The Fire Bucket Operations team was deployed twice: for a 4-ha fire in a dune area near Ouddorp, in the west of The Netherlands and for the peat fire in the Maria Peel. The Handcrew was deployed seven times in 2022.

Fire prevention activities and information campaigns

Currently, there are a lot of activities regarding wildfire management going on in The Netherlands. After the large fires in the Deurnese Peel and Meinweg National Park in 2020 and the examples of very bad conditions in neighbouring countries (UK and Germany in 2022, Belgium in 2021), the attention for wildfire management is increasing considerably, at both the political and the operational level. In the National Risk Analysis (*Rijksbrede Risicoanalyse*, 2022), uncontrollable wildfires are now classified with a very high probability and a severe impact, which makes wildfires one of the nine highest ranked risk types (out of more than 60 risk types) in The Netherlands.

Two major projects started at the end of 2022:

Taskforce Wildfire Management. The aim of the taskforce is to set up a long-term plan for wildfire management in The Netherlands. There are three main themes:

1. Prevention and risk management,
2. Smart suppression and capacity building and
3. Research and development of knowledge.

Next to making a long-term plan, the taskforce also aims to arrange structural financing for wildfire management.

National Crisis Plan. In collaboration between the board of Fire Chiefs and the Ministry of Justice and Safety, the national crisis plan will be updated. In this is included how uncontrollable wildfires can be prevented and how the operations are organized during a – or multiple – wildfire(s).

In the beginning of 2023, another project has started: the first steps toward a National Wildfire Action Centre (*Landelijk Actiecentrum Natuurbranden*) are being made. This centre will coordinate emergency management during wildfires, monitoring fire danger and where necessary gathering a team of experts to organize sub-regional assistance during wildfires and work out scenarios of the possible fire spread and impact. In the (near) future, wildfire analysts will be trained to join in the National Action Centre.

Injuries and losses of human lives

Two injuries (smoke inhalation) were reported during the 2022 wildfire season

Operations of mutual assistance

The Netherlands Fire Service did not provide mutual assistance in 2022. Likewise, there was no need for formal assistance from neighbouring countries, other than regular cross-border assistance within the border area of The Netherlands, Germany and Belgium.

Climate change

Climatic conditions and how they impacted the fire season

According to the Dutch Royal Meteorological Institute (KNMI) 2022 was, for the fourth time in five years, dry and warm. The highest rain deficit was measured on 5 Sept 2022, with a record-breaking 318 mm of rain deficit. The extreme drought was not only a result of less precipitation in the spring and summer, but was also caused by a much higher amount of sunshine than average. With 2 233 hours of sunshine, 2022 set a new record for the hours of sunshine in one year, exceeding the average with more than 450 hours.

Total precipitation in 2022 was slightly less than average (729 versus 795 mm), but there was a big difference between the northern part of The Netherlands (856 mm at Terschelling) and the eastern part (593 mm in Hupsel).

Table 29. Summary of weather conditions in 2022 (KNMI, 2022). Source: <https://www.knmi.nl/nederland-nu/klimatologie/maand-en-seizoensoverzichten/2021/jaar>

Weather conditions	Year 2022	Normal
Ice days with max. temp. < 0°C	2	8
Frost days with min. temp. < 0°C	30	53
Warm days with max. temp. > 20°C	112	93
Summer days with max. temp. > 25°C	35	28
Tropical days with max. temp. > 30°C	9	5
Hours of sunshine	2233	1774
Precipitation (mm)	729*	795

* This is the average amount of rainfall over the whole of The Netherlands.

National adaptation strategies

None in 2022.

Practical and applied research

In 2022, a study (*Natuurbrandsignaal '23*) was initiated by a consortium formed by the Netherlands Institute for Public Safety, Wageningen University and Research, the Royal Meteorological Institute, Deltares and VU University Amsterdam. In this research the developments in the wildfire risk of The Netherlands were described, based on a collation of information from previous studies as well as additional meteorological analyses. The publication in early 2023 (Verhoeven et al, 2023) was accompanied with a targeted media campaign which generated a great deal of attention in the media as well as in politics.

In addition, a study was published on wildfire scenarios (Kok et al, 2023), which allows organizations and partners that are involved in wildfire management to base their knowledge and capacities on wildfire events that have occurred in the Netherlands since 2009. In the scenarios, a variety of impacts is described, including an indication of the suppression and repair costs, firefighting capacity that is needed and impact on the society. Options to organize wildfire management in a better way are also in this report.

Regarding landscape management, the Vereniging Bos en Natuur Eigenaren (Association of Forest and Nature Owners) are finalizing a revision of a practical information guide for land managers regarding fire management. In addition, a publication is forthcoming from the forest service (Staatsbosbeheer) together with Wageningen University in which common methods in forest and nature management are evaluated in terms of fire risk and fire prevention.

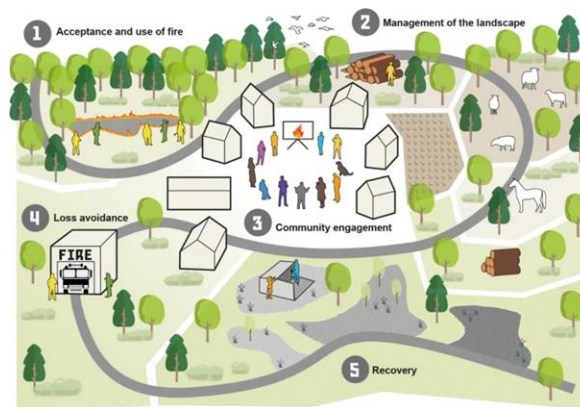


Figure 55. The common themes of a fire resilient landscape: acceptance and use of fire, management of the landscape, community engagement, loss avoidance and recovery (Newman Thacker et al 2023).

Lambrechts et al address three core lessons that fire management can learn from Dutch water management, being a holistic approach, focused on adaptive management, to create resilient landscapes through stakeholder participation (Figure 56 below).



Figure 56. Living with water and fire – what fire management can learn from Dutch water management. (Lambrechts et al 2023).

Ongoing EU projects focused on improving fire management in the Netherlands are:

- the PyroLife Innovative Training Network (Wageningen University, Stoof), PyroLife in which current Netherlands-focused PhD projects and associated Master studies consider 1) past, present and future fire danger; 2) fire behaviour; 3) spatial design of fire resilient landscapes; 4) fire policy; 5) traditional fire knowledge and uses, and 6) lessons that can be learned from Dutch adaptive water management.
- FIRE-RES, a GreenDeal project on integrated fire management with a Germany-Netherlands Living Lab (Wageningen University, Stoof & De Vries), focusing on governance, risk awareness, learning, amongst other things using serious games and multi-stakeholder assessments.
- SEMEDFIRE (Wageningen University, Stoof, De Vries and Warner), a knowledge exchange for integrated fire management between Mediterranean and temperate European countries.

Other academic research and student projects

Shudong Zhang, PhD student at Vrije Universiteit Amsterdam, found that exotic pines (black pine, *Pinus nigra*) in the coastal dune area of The Netherlands, when losing vitality because of drought effects, were attacked by honey fungus, which led to the trees becoming more flammable. This was partly due to the fungus lowering the wood density, but also due to direct effects of the fungus on flammability of deadwood at a given wood density. These findings are also relevant for the management and species choice of other forest stands with exotic tree species that are not adapted to the current and future climate in NW Europe, with more frequent drought episodes.

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(Source: Netherlands Institute for Public Safety, Netherlands Fire Service; Department of Environmental Sciences, Wageningen University, Netherlands).



Figure 57. Tactical fire used by a Handcrew to contain a fire in the Mariapeel in southern Netherlands. (Photo: Edwin Kok).

1.2.17 Norway

Fire danger in the 2022 fire season

Norway replaced the WBKZ-system with the FWI – Fire Weather Index in 2021, adapted to Norwegian conditions. Weather parameters encompass a range of factors, including air temperature, humidity, precipitation, wind, and snow.

The standard fire season typically spans from March to September. However, variations are anticipated given the length of the country, stretching 1 750 km from south to north. This diversity can result in divergent conditions, such as flooding in one region of Norway while another area contends with a high forest fire index.

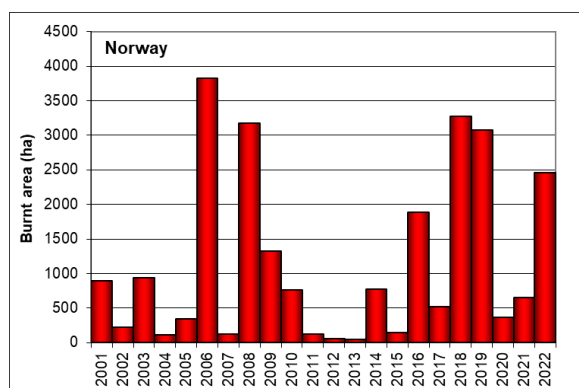
Initiating in the south-west during March and April, the fire season gradually extends southward and eastward as the season progresses. The western regions primarily encounter brush fires, while in the southern areas, swiftly drying pine trees on impoverished soil constitute the most prevalent fire risk. The largest forested regions are concentrated in the eastern part of Norway.

The season did not experience any prolonged periods of high forest fire danger. The overall forest fire danger (FWI) indicates that there were instances of forest fire danger in three intervals during May, July and August in the eastern part of Norway. There have also been intermittent periods of dry vegetation with potential for spread in the northern part of Norway and on the Finnmark Plateau.

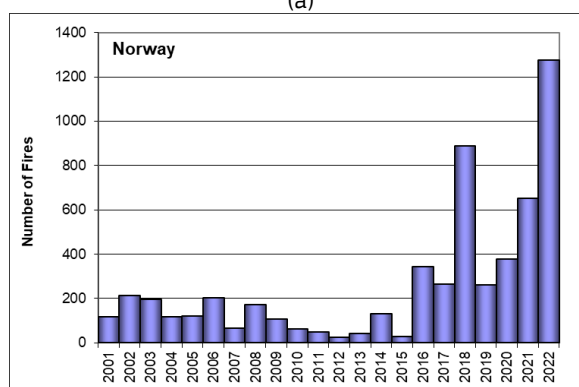
Fire occurrence and affected surfaces

In 2020 there were 1 275 forest fires recorded in Norway; 694 ha of productive forest and 1 761 ha of other wooded land.

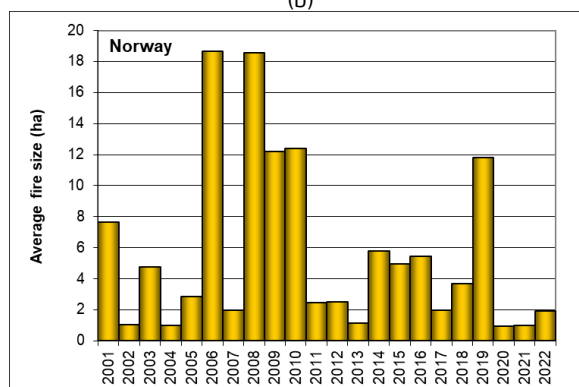
The trends regarding both the number of fires and burnt areas from 2000-2022 are shown in Figure 7.



(a)



(b)



(c)

Figure 58. Burnt areas (a), number of fires (b) and average fire size (c) in Norway from 2001 to 2022.

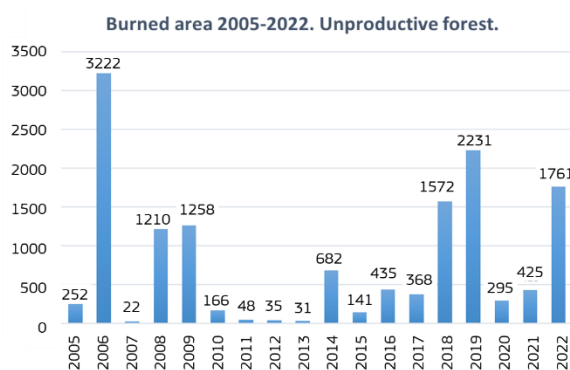
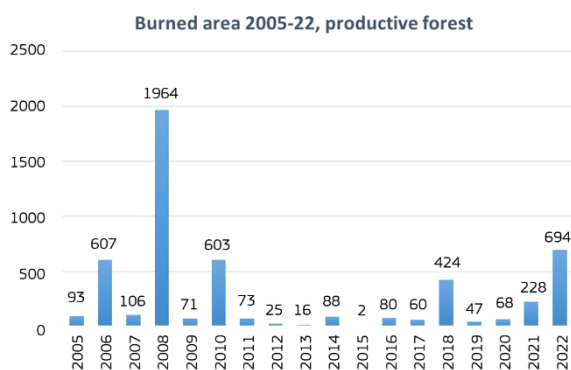


Figure 59. Burnt area of productive/unproductive forest in Norway 2005-2022.



Figure 60. Photo: Dag Botnen.

Fire fighting means

The Directorate for Civil Protection have a partnership with a private helicopter company. In the period of April 15 to September 15, one helicopter is on standby in the eastern part (Torp). With a network of 8 strategic bases spread across Norway and agreements with other entities, the company's reach is extensive. The number of helicopters on standby increases if the Fire Risk is high.

For 2022, the helicopter(s) were used in 44 fires: 77 helicopters 225 hours in the air in total.

To ensure effective response during major forest fire outbreaks, the Directorate for Civil Protection has instituted a proficient expert team that supports the local fire chief officer when the helicopter is requested.

Norwegian fire services consist of approximately 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, there are established groups only for fighting forest fires. These groups are managed by the fire services.

Fire prevention activities and information campaigns

In Norway, the municipalities are responsible for the Fire Services, which encompass both prevention and preparedness concerning forest fires. Nevertheless, certain activities are on a national level and are followed up by the Directorate for Civil Protection.

The responsibilities: Directorate for Civil Protection include:

- Framing regulations and legislation for the population in general and Fire Services particularly. Using fires in forests or wildlands is prohibited by law from April 15th to September 15th in Norway.
- Manage and maintain agreements with air resources, coordinating the deployment and quantity of helicopters.
- Managing and upholding agreement with the forest fire management support group.
- Developing and sustaining a statistical reporting system for fires known as BRIS.
- Facilitating the Norwegian Forest Fire Committee, comprised of members representing the Directorate for Civil Protection, Fire Services, The Norwegian Meteorological Institute, Insurance agencies, Aerial resource providers, and Fire Associations.

The responsibilities: Norwegian Meteorological Institute include:

- Providing information on the forest fire index through the internet and providing information through television (Forecast) when the forest fire index is high.

The responsibilities: Fire Service, municipalities include:

- Prevention: risk analysis, aerial and ground monitoring, skill building exercises, information campaigns and controlled prescribed burning.
- Preparedness: focusing on effective handling of fires, particularly emphasizing initial attack approaches, considering the fire's potential impact.

Fire causes

The primary triggers of forest and wildland fires are typically man-made. Examples: burning debris or grass in the spring, activities related to forestry, ignition by purpose etc.

The primary natural cause is lightning during thunderstorms. These occurrences can lead to fires either instantaneously, or they might manifest the following day, ignited by the drying process.

Climate change

Climatic conditions and how they impacted the fire season

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. in particular regarding plans to adapt the forest sector to climate change in order to limit forest fire risks.

The Directorate for Civil Protection is still working with analysis to adapt the national preparedness to large forest fires. It will at a later stage be made a preventive analysis.

Research activities aimed at improving fire management

Project: Wildland-Urban Interface (WUI) Fire Risk
Period: January 2016 – December 2024
Owner: Western Norway University of 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.

Project: Treeads, funded by EUs Horizon 2020
Period: December 2021 – May 2025
Owner: Rise Fire Research as

Contact: Kemal S. Arsava, project coordinator
Description: TREEADS aims to increase environmental sustainability and urban/rural ecosystems safety through redefining and reinforcing forests protection and management by developing and validating an innovative, sustainable and applied holistic wildfire management approach.

In addition, there are several projects in Europe that have Norwegian partners (e.g. Fire Res).

Operations of mutual assistance

None.

Injuries and loss of human lives

None.



Figure 61. Photo: Arjen Kraaijeveld.

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

1.2.18 Poland

Fire danger in the 2022 season

The meteorological conditions determined the forest fire danger risk trend in the year 2022 and favoured the occurrence of forest fires, especially at the beginning of the fire season. The diagrams (Figure 62-Figure 68) show the variations of air temperatures, precipitation, pine (*Pinus sylvestris* L.) litter moisture, relative air humidity, and the national degree of forest fire danger risk (NDFDR) in the 2022 fire season (April-September) and average degree of forest fire danger for the forecast zones. They also present the number of fire outbreaks.

The average monthly air temperature in the 2022 season was 15.8°C at 9.00 a.m. and 20.8°C at 1.00 p.m. It was lower than the average temperature of the last decade (2012-2021), which was 16.5°C and 21.3°C respectively. In 2021, it was 15.6°C and 20.1°C respectively. In April, the coolest month of the 2022 season, the average temperature was 7.2°C at 9.00 a.m. and 11.7°C at 1.00 p.m. These temperatures were 0.8°C higher at 9.00 a.m. and 0.9°C higher at 1.00 p.m. than in 2021.

In May, the average air temperature increased to 15.1°C at 9.00 a.m. and up to 19.6°C at 1.00 p.m. June, July and August were similar in terms of temperatures, which were respectively 20.3°C, 20.0°C and 20.9°C at 9.00 a.m. and for 1.00 p.m. it was 25.1°C, 24.5°C and 26.8°C.

The warmest month of the 2022 season was August. In September, the air temperature dropped to 11.5°C at 9.00 a.m. and 17.1°C at 1.00 p.m. The maximum air temperature occurred on 21 July at 1.00 p.m. and was 33.8°C.

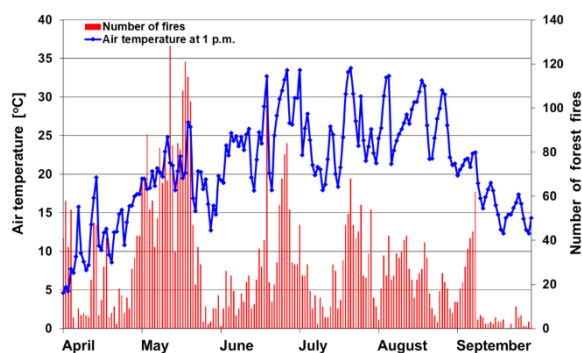


Figure 62. Air temperatures and numbers of forest fires in fire season 2022.

The average daily precipitation in the 2022 season was 1.9 mm (0.5 mm less than in the 2021 season). By comparison, the mean daily rainfall in 2012-2021 was 2.1 mm. The highest mean daily rainfall occurred in August, amounting to 2.4 mm/day. The maximum value of precipitation (16.0 mm/day) in the 2022 season was recorded on 31 July.

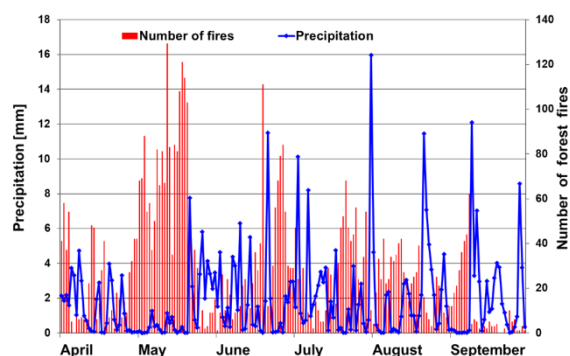


Figure 63. Precipitation and numbers of forest fires in fire season 2022.

The average moisture content of pine litter (*Pinus sylvestris* L.), an indicator combustible material in Polish forests, was 28.5% at 9.00 a.m. and 23.3% at 1.00 p.m., which is below the flammability threshold for dead ground cover, which is 30%. In the 2020 and 2021 seasons, they were 22.1% and 32.9% and 23.9% and 27.6%, respectively. For comparison, in the last decade, covering the years 2012-2021, they were at the level of 31.0 and 25.4%, respectively. In May 2022, the lowest values were recorded (25.1% and 20.8%, respectively). In April and September, the litter moisture was above the average for the 2022 season. The highest average litter moisture was in April (33.4% and 28.0%, respectively) and September (37.7% and 33.4%).

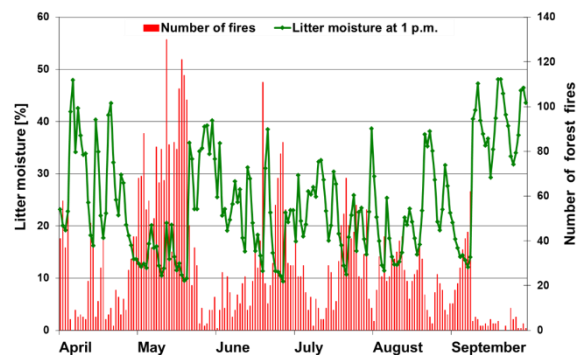


Figure 64. Litter moisture and numbers of forest fires in fire season 2022.

The average relative humidity in the 2022 season was 71.2% at 9.00 a.m. and 51.4% at 1.00 p.m. It was lower than the value of the average relative humidity in 2012-2021 for 9:00 a.m. and 1.00 p.m. (76.0% and 55.6%, respectively). For comparison, in 2021 it was 80.8% and 60.1% respectively.

The lowest values (below the average for the 2022 season) at 9.00 a.m. was recorded in May (65.9%). The highest morning relative humidity values for the season occurred in August (80.8%) and September (91.8%). In the afternoon observation period, air humidity was below the average for the season in May (40.0%). The highest afternoon values of relative air humidity occurred in August (54.5%) and September (65.9%).

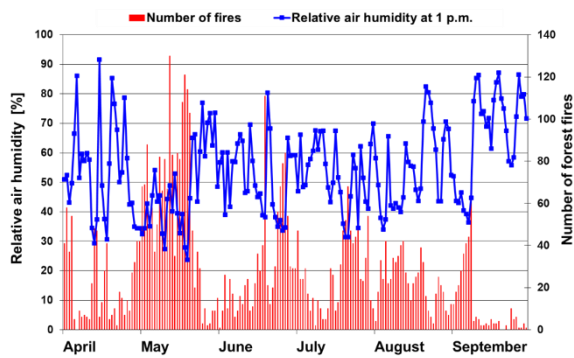


Figure 65. Relative air humidity and numbers of forest fires in fire season 2022.

In Poland, the degree of forest fire danger is determined for 60 prognostic zones, which have been separated on the basis of, among others, the presence of large dense forest complexes, homogeneity in terms of climate, habitat conditions, frequency and size of forest fires and the presence of large urban agglomerations. This degree is determined at 9.00 a.m. and 1.00 p.m. on the basis of measurements of meteorological parameters:

- air temperature and relative humidity,
- daily precipitation total,
- moisture content of the pine litter.

The determination of the degree of forest fire danger is carried out by the organisational units of the State Forests using their own automated network of meteorological measuring points in the forest areas.

The average national degree of forest fire danger (NDFDR) in the four-degree scale (0, 1, 2, and 3) reached 1.1. at 9 a.m. and 1.3 at 1 p.m. It was a little higher compared to the 2021 season, when it was 0.9 and 1.5 respectively. This means that the fire danger in the whole analysed period was low.

The greatest forest fire danger appeared in May, when NDFDR reached 1.5 at 9 a.m., and 1.7 at 1 p.m.

The percentage of occurrence in the third level of forest fire danger in the afternoon was 32.1% in May, 20.4% in June and 18.0% in April. The lowest forest fire danger was in September, when NDFDR reached 0.5 at 9 a.m. and 0.3 at 1 p.m., and the percentage of occurrence in the third level of forest fire danger was 0.1 in the morning, and 6.1% in the afternoon.

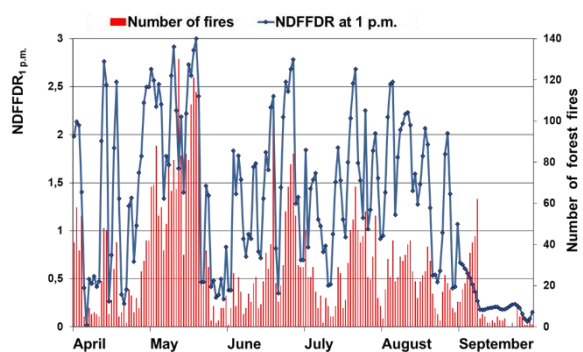


Figure 66. The National Degree of Forest Fire Danger Risk and numbers of forest fires in fire season 2022.

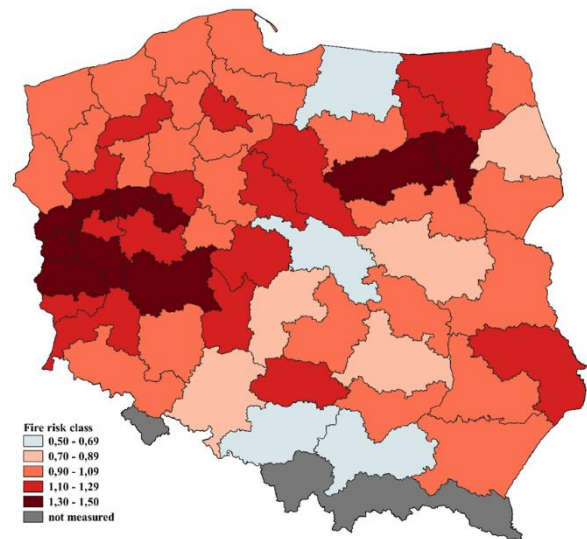


Figure 67. Average degree of forest fire danger for forecast zones in the fire season in 2022.

Fire occurrence and affected surfaces

In 2022 in Poland, a total of 6 999 fires broke out (4 806 in forest and 2 193 in other non-wooded natural land), over 3 704 more than in 2021 (3 295 fires), with a surface area of 2 852.74 ha (2 207.65 forest and 645.09 ha other non-wooded natural land), over 1 959.00 ha more than in the last year (893.74 ha) - Table 30 and Figure 70.

The greatest proportion of fires occurred in May (25.19%; i.e. 1 763) - Figure 68. This was followed by March (21.06%) and June (13.07%). The lowest number of fires in the fire season (April - September) occurred in September (4.71%) and April (8.87%). 73.77% of fires occurred in the fire season.

The largest number of fires in 2022, similar to last year, occurred in Mazowieckie Province (1 475 - 21.07%). The lowest number of forest fires occurred in Opolskie Province (120) and Warmińsko-mazurskie Province (178). These data are illustrated in Figure 71-Figure 73.

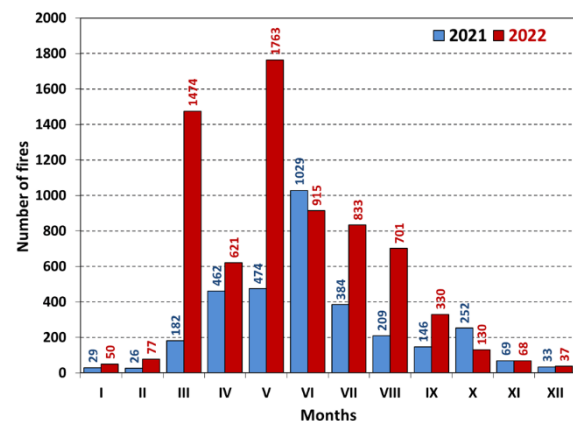


Figure 68. Distribution of number of forest fires by months in 2021 and 2022 in Poland.

The largest burnt forest areas and other non-wooded natural land were recorded in:

- Mazowieckie Province (600.82 ha),
- Lubuskie Province (267.32 ha),
- Świętokrzyskie Province (241.03 ha).

The smallest area was in Opolskie Province (23.36 ha) and Pomorskie Province (45.94 ha).

Small fires; i.e. with a surface area of less than or equal to 1 ha, represented 94.23% of all the fires in 2022 (Figure 69), with the burnt area amounting to 32.32%.

Fires with a surface area of between 1 ha and 10 ha represented 36.91% of the burnt area, with their number representing only 5.39%. In 2022, there were no large fires (> 10 and ≤ 100 ha) recorded.

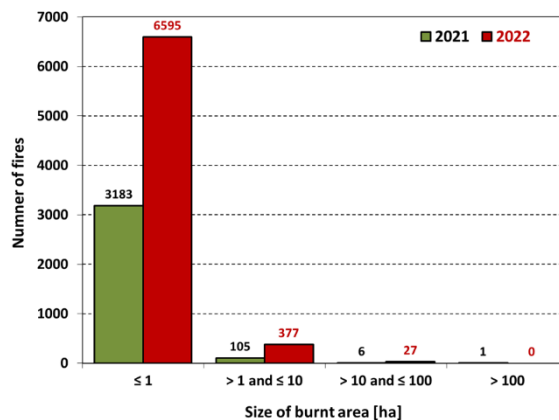


Figure 69. Distribution of the number of forest fires by size of burnt area in the years 2021 and 2022 in Poland.

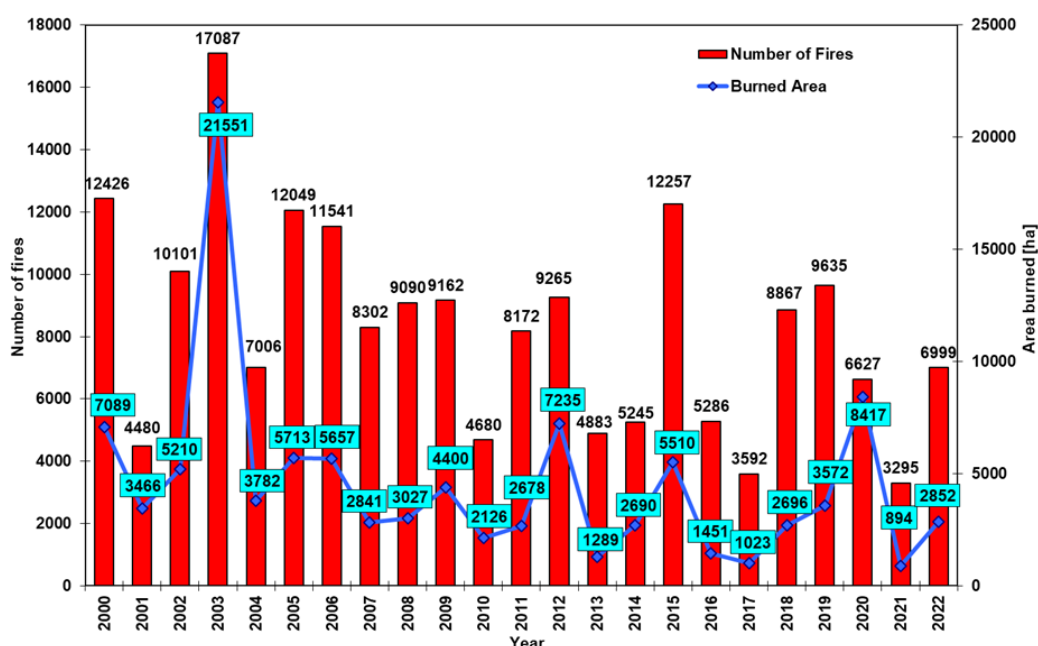


Figure 70. Total number of fires on high forest and area burned in Poland in the period 2000-2022.

Table 30. Forest fires in Poland in the period 2007-2022.

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
2020	4 458	2 169	6 627	1 842.34	6 574.30	8 416.64
2021	2 243	1 052	3 295	575.42	318.32	893.74
2022	4 806	2 193	6 999	2 207.65	645.09	2 852.74

28 – warmińsko-mazurskie, 30 – wielkopolskie,
32 – zachodniopomorskie).

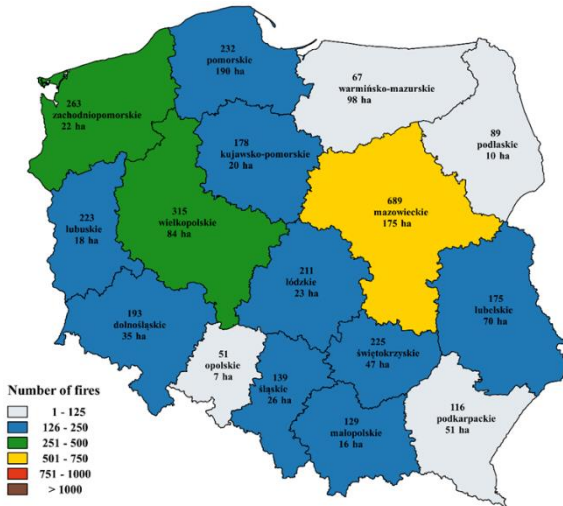


Figure 71. Number of forest fires and burned areas by provinces (NUTS2) in 2021.

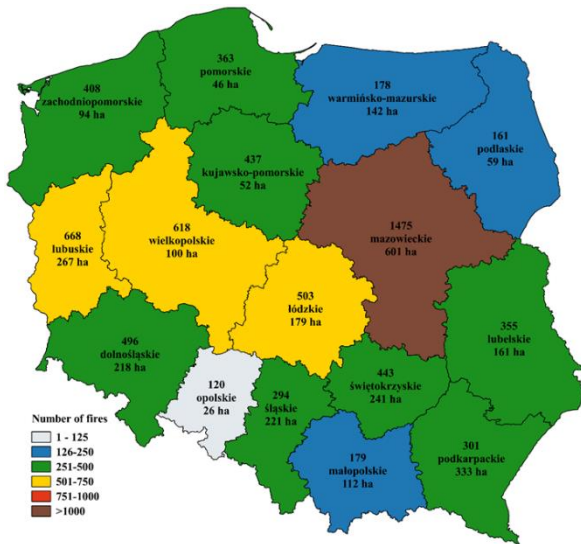


Figure 72. Number of forest fires and burned areas by provinces (NUTS2) in 2022.

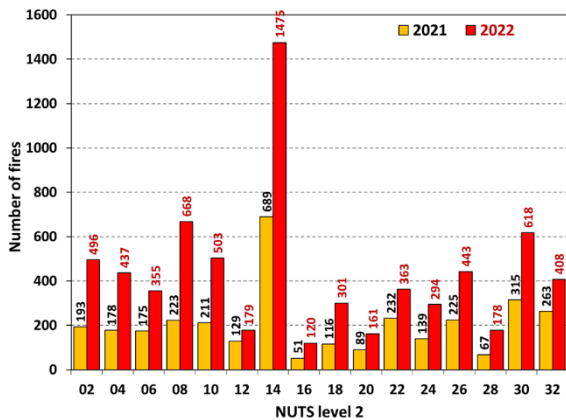
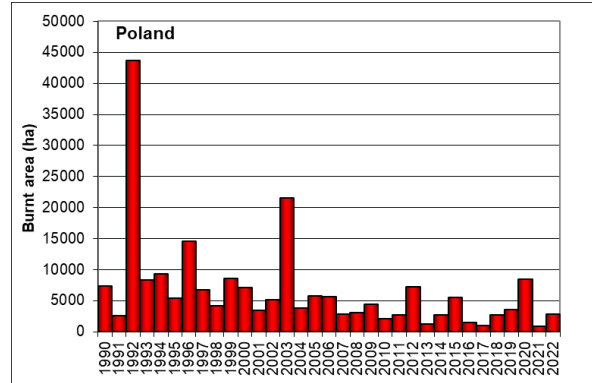
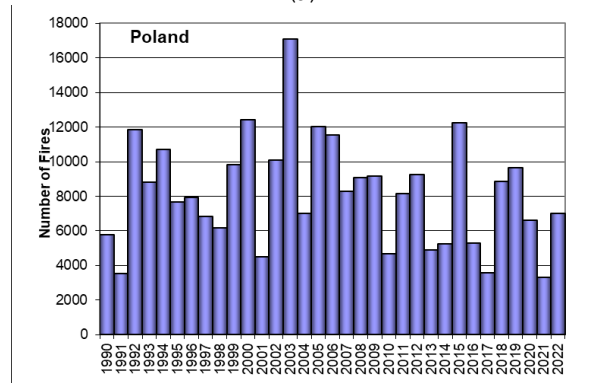


Figure 73. Distribution of the number of forest fires by province (NUTS2) in 2021 and 2022 in Poland.
(02 - dolnośląskie, 04 - kujawsko-pomorskie,
06 - lubelskie, 08 - lubuskie, 10 - łódzkie,
12 - małopolskie, 14 - mazowieckie, 16 - opolskie,
18 - podkarpackie, 20 - podlaskie, 22 - pomorskie,
24 - śląskie, 26 - świętokrzyskie,

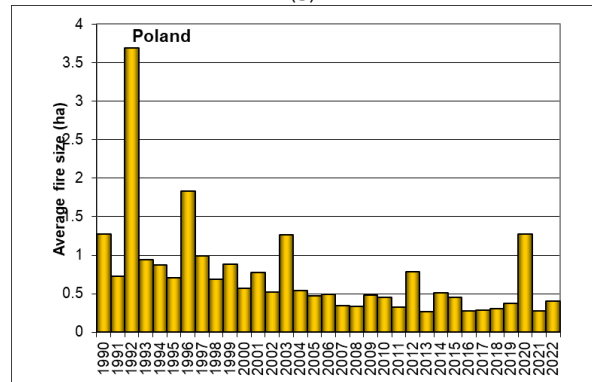
The burnt area, number of fires and average fire size for the years 1990-2022 are shown in Figure 74.



(a)



(b)



(c)

Figure 74. Burnt areas (a), number of fires (b) and average fire size (c) in Poland from 1990 to 2022.

Fire causes

Human activity was the main cause of forest fires; specifically arson represented almost half of the fires (40.93%), followed by negligence (27.88%) and accident (4.56%), whereas unknown causes accounted for 25.8% (Figure 75).

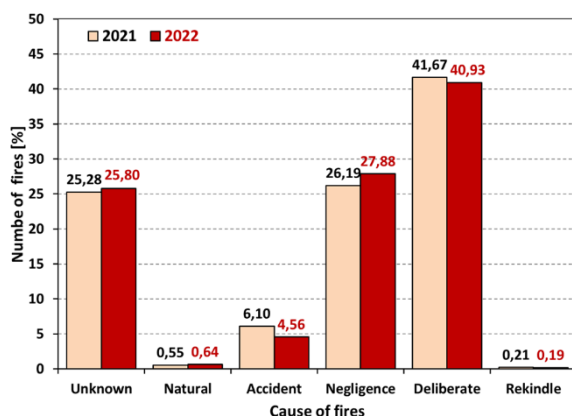


Figure 75. Distribution of the number of forest fires by causes in 2021 and 2022 in Poland.

Fire fighting means and information campaigns

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

- 33 fire suppression airplanes, 5 helicopters and 5 patrol aircraft
- 330 ground light patrol vehicles,
- 4 medium and 2 heavy fire vehicles,
- 249 pumps, including 147 floating ones.

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 2022, as part of information and promotion activities, the following measures in the State Forests NFH were taken:

- about 7 700 lectures in schools, youth camps and at country-meetings,
- 899 interviews were provided on the radio and the television,
- 41 000 posters, information leaflets and calendars related to forest fires were disseminated,
- 3 889 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 3 158 km of fuel breaks and building 57 km of new fuel breaks; in addition, forests were cleaned over a surface area of 16 000 ha, by reducing the quantity of inflammable biomass.

The observation system of the State Forests NFH consisted of:

- 711 fire protection lookout towers, including 382 (53.73 %) equipped with a system of TV cameras;
- 5 patrol airplanes, 33 fire suppression airplanes and 5 helicopters;
- 330 ground light patrol vehicles, including 322 with suppression modules.

The effectiveness rate of fire detection by fire protection lookout points was 35%, airplanes detected 3% of fires and civilians notified of 58%. The other 4% of fires were detected by fire protection patrols.

The communication and alarm network in the State Forests NFH consisted of: 5 698 radio-telephones, including 970 base sets, 1 955 mobile sets and 2 773 hand held sets, as well as 78 converters to the frequency band used by the State Fire Service.

Water supply for fire suppression purposes was provided by 11.3 thousand water supply points, including 4.0 thousand natural points and 2.5 thousand artificial ones. Moreover, water was supplied by more than 4.8 thousand hydrants located in the vicinity of forests.

In 2022, the fire protection costs incurred by the State Forests NFH amounted to 122 122 million PLN, including 31 462 million PLN for fire aviation.

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

<https://bazapozarow.ibles.pl>.

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).

1.2.19 Portugal

Fire danger in the 2022 season

The information and maps regarding fire hazard are produced annually by the Portuguese nature conservation and forest service (ICNF – *Instituto da Conservação da Natureza e das Florestas*) in the beginning of the year. The 2022 fire hazard map (Figure 76) showed the Portuguese mainland regions that were predicted as most exposed to wildfires, located mainly at interior of the Centre and North regions and in Algarve.

This map contains not only the wildfire hazard scaled from 1 to 5 for each 25 metre pixel, but also the delimitation of TPGI (“territories with potential for large wildfires”), which are forest lands that, cumulatively: i) have 500 hectares or more, ii) have a high or very high wildfire hazard (top two classes) and iii) did not burn in the last 10 years.

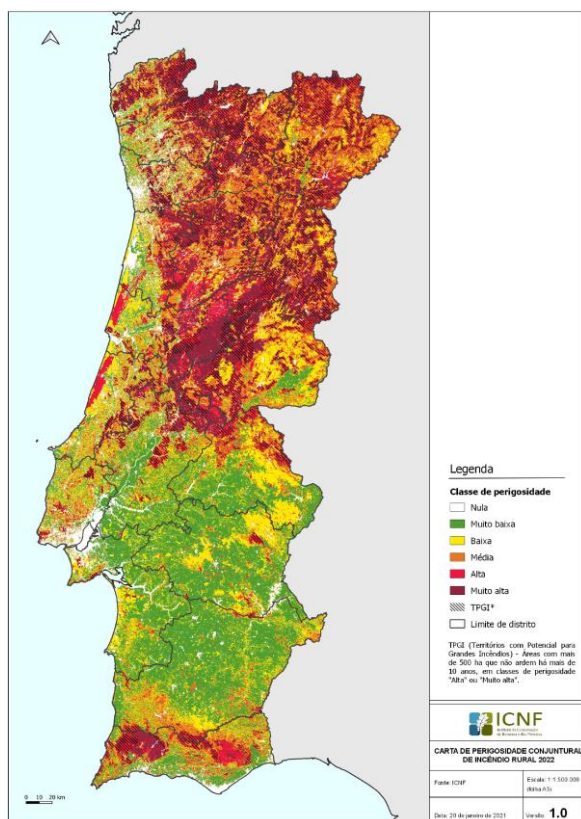


Figure 76. 2022 fire hazard map.

A local and daily wildfire danger evaluation is published for each of the 278 municipalities of Portuguese mainland territory (Figure 77) by the Portuguese meteorological services (IPMA - *Instituto Português do Mar e da Atmosfera*). This evaluation combines the annual wildfire hazard map (Figure 76) with the meteorological forecast for each day (FWI index).

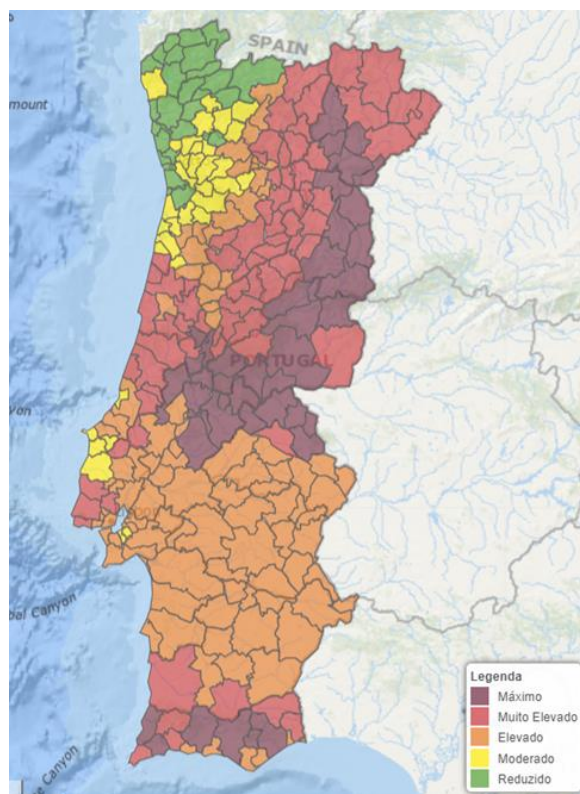


Figure 77. Example of evaluation of the daily wildfire danger for a summer day in 2022 (17th of August). Source: IPMA.

The evolution of fire danger in 2022 was strongly influenced by the severe drought affecting almost the entire territory, with the exception of the autumn months. The August 2022 Palmer Drought Severity index (PDSI) map for the Portuguese mainland is shown in Figure 78. Most of the country was in severe drought (61%) and the rest in extreme drought (39%), in result of the abnormally dry months of January, February, May and June.

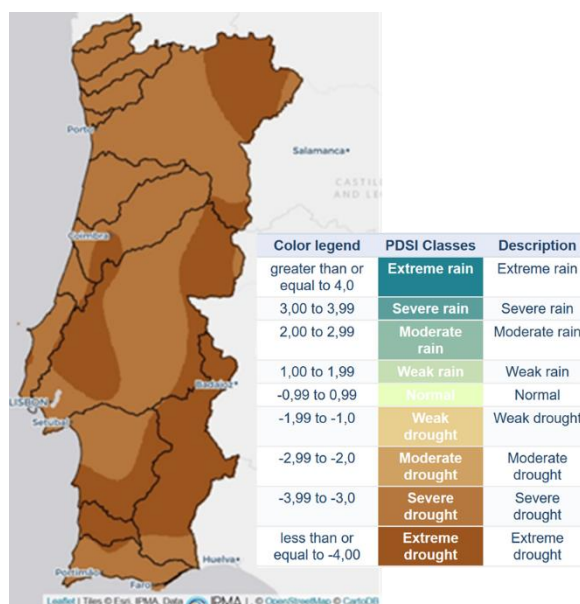


Figure 78. Palmer Drought Severity index (PDSI) for the Portuguese mainland (August 2022). Source: IPMA.

Fire occurrence and affected surfaces

In Portuguese mainland (NUTS 1 PT1) the burnt area in 2022 was 110 097 ha (Table 31). The burnt area is 13% less than the average of the previous decade which was 125 831 ha. The biggest wildfire in 2022 occurred at the Serra da Estrela Natural Park (Centre region) and resulted in 24.3 thousand hectares burned (Figure 79).

Regarding the number of wildfires, in 2022 there was a total of 10 390 fires, which represents a decrease of 33% when compared to the average of fires in the last decade. Nevertheless, it represents an increase of 27% when compared with 2021, mainly due to the extreme drought conditions.

Table 31. Number of wildfires and burnt area in Portugal mainland territory from 2012 to 2022.

Year	Number of wildfires	Burnt area (ha)
2012	25 352	117 985
2013	23 129	160 387
2014	9 388	22 820
2015	19 643	67 200
2016	16 104	167 808
2017	21 006	539 921
2018	12 274	44 578
2019	10 832	42 085
2020	9 619	67 170
2021	8 186	28 360
Annual average 2012-2021	15 553	125 831
2022	10 390	110 097

In Madeira's archipelago (PT3), 49 wildfires were recorded in 2022. The total burnt area in this region was 86 ha (55 ha in forest and other wooded lands and 31 ha in shrublands).

In the Azores' archipelago (PT2) a total of 144 wildfires were recorded in 2022. The total burnt area in the Azores was not collected, but it is rather small when comparing to Madeira or Mainland territories.

Table 32. Wildfires in Portugal Mainland (monthly distribution).

Month	Number of fires	Burnt area (ha)			
		Forest and other wooded land	Shrublands	Agricultural land	Total
January	694	1413	4593	108	6114
February	1015	420	1763	63	2246
March	289	62	229	13	305
April	642	513	645	43	1201
May	941	496	643	126	1265
June	902	289	238	246	774
July	2601	27399	15980	6462	49841
August	2211	24137	18778	3831	46746
September	721	533	559	108	1200
October	357	46	328	25	399
November	13	0	5	0	6
December	4	0	1	0	1
TOTAL	10390	55309	43761	11027	110097

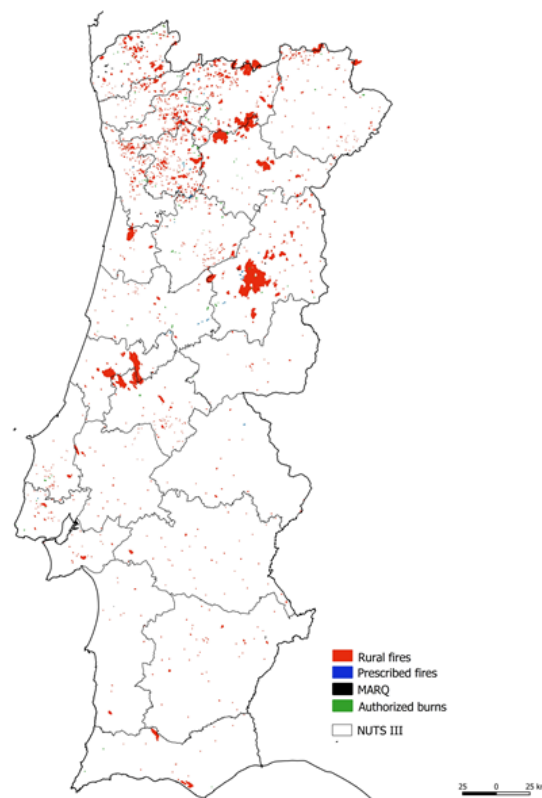


Figure 79. Burnt areas in 2022 in Portuguese Mainland territory.

The most affected NUTS II regions in 2022 were the Centre and North regions, each with a total burnt area around 52 thousand hectares. The combined burnt area of these two regions represents 96% of the total burnt area (Table 33).

Around 46% of the total number of fires in 2022 occurred in July and August (Table 32). Wildfires in these two summer months represent around 88% of the 2022 total burnt area.

Table 33. Number of fires and burnt areas in Portugal in 2022 (NUTS2).

PT1 - NUTS 2 Region	Number of fires	Burnt area (ha)			
		Forest and other wooded land	Shrublands	Agricultural land	Total
North	6272	23648	25838	3013	52499
Centre	2491	29202	16697	6939	52838
Lisbon	474	418	318	269	1005
Alentejo	942	740	294	646	1680
Algarve	211	1301	614	161	2076
TOTAL	10390	55309	43761	11027	110097

Within an approach analyses that seeks to remove the effect of meteorology in the assessment of the annual burnt area extension, for each rural fire in 2022 was assigned a "weighted burnt area" value, obtained from the average of the burnt area of all fires (for the decade 2012-2021) of the respective DSR class in the respective district. In result, a total value of "weighted burnt area" (for the year 2022) of 104 957 hectares was estimated.

This value reflects the total burned area that would be obtained if all fires from 2022 followed the historical average "behaviour" given the meteorological severity of the day/place in which they occurred.

The actual burnt area value (110 097 ha) corresponds to 105% of the "weighted burnt area", which means that the burnt area in 2022 is slightly above the "expected" burnt area considering the year's meteorological severity.



Figure 80. With 24 334 hectares, the fire in the Serra da Estrela Natural Park was the largest in 2022 and the largest ever recorded in that mountainous area, and its suppression involved thousands of firefighters and a large amount of equipment. The Natural Park fire complex of 2022 (with a total of 27 340 ha), along with the other large fires of 2022 in the Centre and North regions, were the subject of assessment by the Portuguese "lessons learned" system and also of study by an independent panel of experts appointed by the Ministry of Internal Administration, who produced a broad set of recommendations, which are being implemented by the various agencies.

The yearly trends in the number of fires and burnt areas in Portugal is shown in Figure 81.

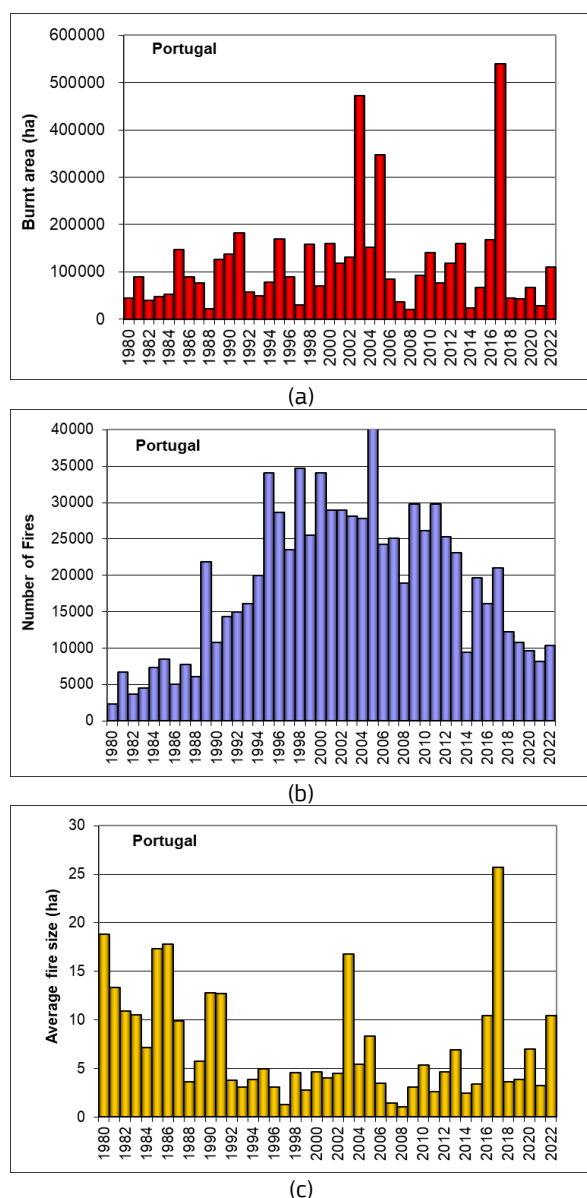


Figure 81. Burnt areas (a), number of fires (b) and average fire size (c) in Portugal 1980-2022.

Fire causes

Of the 10 390 occurrences registered in 2022, the National Republican Guard proceeded with the investigation of causes for 10 052 wildfires (97%), of which 3765 were of unknown origin (Figure 82).

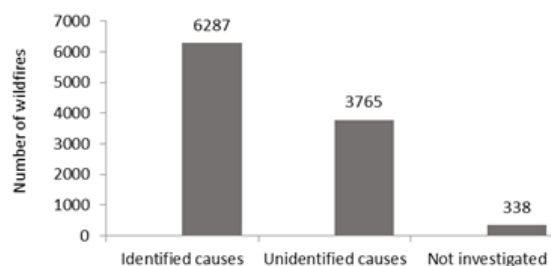


Figure 82. Wildfires 2022 causes investigation

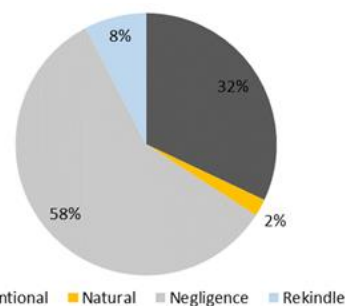


Figure 83. Main causes of rural fires 2022.

The use of fire for renewal of pastures in mountainous regions still has a strong impact on the amount of burnt areas. In 2022 the application for fire permits allowed a more controlled use of fire (see “Assistance phone-line and burning permit”) and the project “MARQ” (short for “Support mechanism for pastoral burning”) helped 30 shepherds and treated more than 400 hectares of grazing lands with prescribed burnings.

Fire fighting means

During the most critical phase of 2022 [July-September period], the Special Organization for Rural Fires Suppression (DECIR), coordinated by the national civil protection authority (*Autoridade Nacional de Emergência e Proteção Civil – ANEPC*) and expressed in the National Operational Directive (DON) n. 02/2022, included a total of 12 917 firefighters and other personnel, 2 833 vehicles and 60 firefighting aircraft. 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 suppression is essential for the initial stages and for reducing the intensity of the fronts of fire, making possible a faster and safer intervention of terrestrial resources. Due to an increase of the season severity the level of commitment of firefighting aircrafts was much higher than in 2021, with a total of 7 591 missions and 8 931 hours spent.

Fire prevention activities and information campaigns

Planning

In 2022, the implementation of the National Action Program (PNA) continued. The PNA develops the strategic options defined in the National Integrated Plan for Rural Fire Management (approved and published in June 2020), namely programs, projects and initiatives that materialize the four strategic guidelines: increasing the value of rural areas; value the rural environment; modify behaviours; manage risks efficiently.

The National Plan's vision is "Protect Portugal from severe rural fires" and, despite the likely increase of the fire risk, the targets for the 2020-2030 planning horizon are:

- the loss of lives in fires, although possible, is rare;
- the ratio of fires extending across more than 500 ha is below 0.3% of the total number of fires;
- the cumulative burned area over a period of a decade is less than 660 000 ha (to be revised by 2023).

In December, the first 3 regional action programs were approved (for the North, Centre and Lisbon regions) and also during 2022 the public awareness, lessons learned and professional qualification national subcommittees were implemented.

In 2022 Portugal invested 529 million euros (M€) in governance and management of rural fire risk, not counting the involvement of local administration and landowners. This investment was 8% more than in 2021 and represents a sharing of 61% (324 M€) in prevention and 39% (205 M€) in suppression. It is worth highlighting the evolution since 2017, when total expenditure amounted to around 143 M€, with 20% allocated to prevention and 80% to suppression.

Forest fuels management

Forest fuels management is one of the key-actions in the forest fire prevention domain. In 2022, a total area of 73 248 ha were managed, of which almost 2 thousand with prescribed burning, and 7 900 ha of shaded fuelbreaks were implemented.

Water reservoirs

During 2022, 681 water reservoirs (including water tanks) had maintenance and improvement works and 21 new water reservoirs were created.

Forest roads

In 2022, around 3 thousand kilometres of forest roads were created or under heavy maintenance.

"Portugal Chama" campaign

In 2022, the "*Portugal Chama*" ("Portugal is Calling") awareness campaign proceeded. Its main message is the individual responsibility in order to promote,

among citizens, a more adequate behaviour and practices towards the reduction of the high number of ignitions and the increase of the territory resilience to fires.

It is a comprehensive nationwide campaign (mainly on TV, radio, printed press and social media), however it focuses on the most relevant causes of rural fires, both in terms of the number of occurrences and in terms of the burnt area (heap burnings, renewal of pastures in mountain grazing areas, use of machinery and recreational activities and leisure in rural areas).

The Campaign, which began in June 2022, included the broadcast of 256 TV spots, 27 540 radio spots (national, regional and local) and 235 printed press advertisements.

"Safe village – safe people" program

In 2022, the "Safe Village" and "Safe People" programs continued, jointly promoted with the municipalities and civil 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 risk behaviours and self-protection measures to be adopted. Within the scope of these programs, in 2022 these programs already have accumulated since 2018, a total of 2 230 villages involved (2 724 with identified places of refuge/shelter), designated 2 084 local security officers and prepared 890 evacuation plans. In the context of raising awareness of populations and in the frame of process of modernizing the warning system, in particular when predicting the occurrence of high-severity weather episodes, a notification system was applied in collaboration with mobile operators by sending SMS messages. In the context of rural fires risk, on 3 summer extreme meteorological episodes, a total of 10 million SMS were sent to the population of the districts at extreme risk.

Automatic daily emails service

ICNF provides an automatic daily email distribution service that provides useful information to all agents involved in wildfire prevention and suppression operations. Among the information that is daily spread within this service, stands out two email types:

- "*Locais críticos*" – This email provides the daily forest hazard information for the user's region, showing the places (list and map) where the fire hazard is expected to be worst. The fire hazard is estimated with an algorithm that combines meteorological forecast with structural fire hazard, local ignition and burnt area historical statistics, among other variables.
- "*Perigo de reacendimento*" – This email provides a list and map of the recently extinguished fires that are, simultaneously, more likely to rekindle and are expected to do more damage.

Assistance phone-line

During 2022 the official assistance phone line continued. Around 90 thousand calls were received from citizens, mainly to obtain information and help with the web application that analyses fire hazard and gives individual authorization to the use of fire in vegetation debris burning and pasture renewal. The official phone line also provides information on fuel management prescriptions around houses and other infrastructures in order to reduce the fire risk.

The burning permit application processed 1 030 678 permits in 2022 (with a maximum of 13 962 permits processed in just one day, on November 2nd) and has around 623 thousand registered users. The permits are granted if the local weather forecast analyses shows that the burning can be executed in a safe way. This programme is considered to be a very important tool in reducing the number of fires (and burnt area), as burnings are one of the most significant cause of wildfire in Portugal.

Post-fire management

In 2022, there were 29 burnt areas with more than 500 ha, and 22 emergency stabilization reports were produced, for a total of 86 283 ha. The total investment amounts to 15.4 M€, with the projects being carried out mainly by local authorities, communal lands and hunting areas managers and environmental NGOs.

The preliminary versions of the most urgent reports covered an area of 53 000 ha of the Serra da Estrela Natural Park and large burnt areas in eight other municipalities and were prepared in August and September, in close coordination with the local forest technical offices (GTF) and forestry producers' organizations. A special ecological and socio-economic recovery program was also approved for the Serra da Estrela Natural Park and neighbouring regions.

From the 12th to the 13th of September (extratropical cyclone Danielle), and later on the 21st of September, intense rains caused flash floods in Sameiro and Vale da Amoreira villages, located in the mouths of two torrential streams tributary of Zêzere River, which led to the intervention of civil protection services and a great mobilization of ICNF resources (including "storm patrol teams") to treat the debris and the municipal and forest road network.

Injuries and loss of human life

Regarding the impact of fires on the loss of human lives, there is a downward trend after 2017, and in 2022 there were 4 fatalities, of which 2 were operational (1 pilot of an amphibious fire suppression aircraft after the aircraft he was piloting crashed on 15/07/2022 and 1 firefighter due to sudden illness during fire suppression operations on 17/08/2022) and 2 civilians involved in agriculture/shrubland burnings that, due to lack of control, led to rural fires, as was the case of the majority of civilian casualties in the last 5 years.

Operations of mutual assistance

In 2022, under the Portuguese-Spanish bilateral agreement in cross-border initial attack procedures, there were intervention of Spanish resources in 19 fires in Portuguese territory, engaging 10 firefighting aircrafts, 25 vehicles and 92 firefighters, and one national support with 1 firefighting aircraft in the Serra da Estrela wildfire. Portugal deployed 150 firefighters, 41 vehicles and 4 firefighting aircrafts to 3 wildfires near the border line, in the Spanish provinces of Cáceres, Zamora and Pontevedra.



Figure 84. The Lama Grande fire covered more than 2 300 hectares of forest areas in Portugal and Spain on January 28 and 29, affecting the Montezinho Natural Park in the far north of Portugal. The prompt intervention of "storm patrol" teams before and during heavy precipitation days made it possible to protect the road network and substantially reduce the risk of erosion.

(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); Ministry of the Presidency, Agency for Integrated Rural Fire Management (AGIF); Regional Government of the Azores, The Azores Regional Civil Protection and Fire Service; Regional Government of Madeira, Institute for Forests and Nature Conservation, Portugal).

1.2.20 Republic of North Macedonia

Fire danger in the 2022 fire season

The number of wildfires and the total burnt area was low. The number of fires was influenced substantially by the weather conditions in summer. The majority of fires occurred during the summer months. Overall, there was a low average forest fire risk for the 2022 season.

Fire occurrence and affected surfaces

During the year 2022 there were 441 fires of which 50 were forest fires, affecting in total an area of 198.8 ha. The agricultural affected area was 459 ha and the total affected area was 657.8 ha. The average of forest fires was 11.3% of the total numbers of fires were forest fires.

The comparative charts for burnt area, number of fires and average fire size for the years 2007-2022 as well as the number of fires and burnt area according to types of fires for the year 2022 are shown in in Figure 85 and Figure 86.

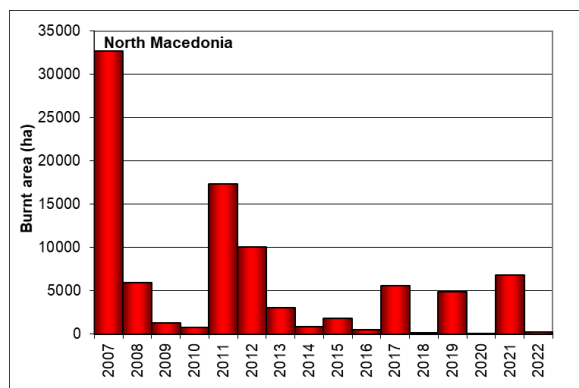
Loss of lives

No casualties were reported in North Macedonia during the forest fires season of 2022.

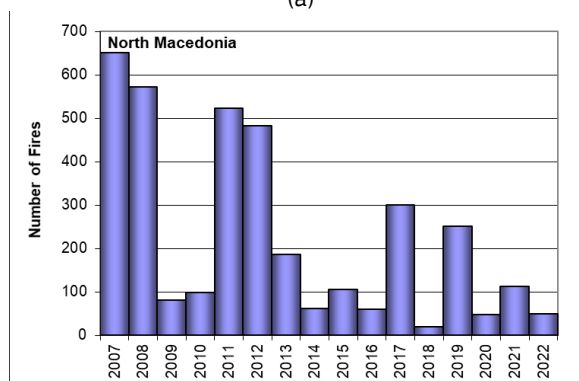
Climate Change

The climate is changing and it is evident over the whole territory of the country. The Ministry of agriculture, forestry and water economy develops a national fire management committee.

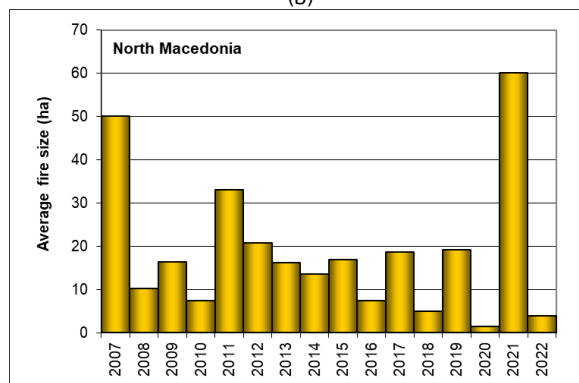
National plans provide mitigation and adaptation measures for climate change, and any other information that the government considers relevant to achieving the UN climate change goal. Rural fire management actions play a central role in national policies to combat and adapt to climate change.



(a)

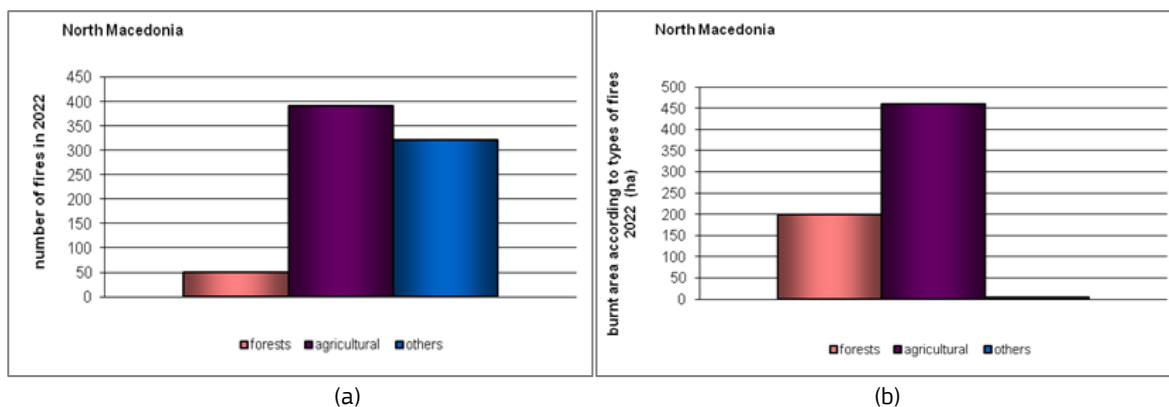


(b)



(c)

Figure 85. Burnt areas (a), number of fires (b) and average fire size (c) in the North Macedonia from 2007 to 2022.



(a)

(b)

Figure 86. Number of fires (a) and burnt area (b) according to the type of fires in 2022.

Table 34. Report from the Department for specialized air services for 2022.

Date (2022)	Flight type	Aircraft	Operational region	Number of flights	Fuel consumed	Water dropped
22/07	Forest Fire	Z3-BGT	Near by Mitrashinci, Budinarci, Berovo municipality	6	838	15000
23/07	Forest Fire	Z3-BGT	Near by Berovo region	6	988	15000
27/07	Fire	Z3-BGT	Army polygon Krivolak, Negotino region	3	648	7500
08/08	Forest Fire	Z3-BGT	Municipality Dojran, Village -Furka	13	941	32500
02/11	Forest Fire	Z3-BGV Z3-BGT Z3-BGV	Municipality Kicevo, Village Bachiste	21	1967	52500
03/11	Forest Fire	Z3-BGV Z3-BGT Z3-BGV	Municipality Makedonski Brod Village:Oreovec, Rusijaci	12	2331	30000

Fire prevention activities and information campaigns

The Sector for prevention, planning and development started the preparations for the upcoming fire season in December 2021. The preparations began with updating the planning documents, and checking the condition of equipment for extinguishing fires and the condition of the protection and rescue forces. The problems were noted and approaches were taken to resolve them. The prevention activities start conducting prevention and preparation meetings before the season of forest fires. The PC "National forests" and its subsidiaries create the Annual operational plan for forest fire management.

This year between 1 and 17 March, 2022, the staff of the Protection and Rescue Directorate (PRD) together with PC "National forests" including the 35 Regional departments, conducted a campaign on the reduction of risks from forest fires.

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 in picnic places where posters with steps of forest fire protection were placed.

Fire prevention and firefighting activities were undertaken along with a public information campaign. 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 performance by integrating additional data sources.

PC "National forests" developed a public awareness campaign for forest fires prevention under the slogan "Summer without fires". Several actions were taken, following some main strategic axes: National and regional awareness campaigns in the media, warning for hazardous behaviours, promoted by the National Authority for Civil Protection, the National Forest Authority and municipalities.

In the public information domain, the National Authority of Civil 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 the FWI and its forecast. The PRD also provided its partners with an online service for FWI mapping.

School Campaigns

During 2022 there were presentations in schools giving information to raise awareness on environmental issues, social and economic factors caused by fires, its causes and how it can be avoided. 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.

The Ministry of Interior, through its organizational units, conducts a preventive activity regarding fire in open spaces. During meetings, leaflets with practical advice for greater protection were distributed to the citizens.

Operations of mutual assistance

Protection and rescue forces with Rapid response teams (RRT) from the Department of Operations and Logistics operated in the following regions: Berovo, Valandovo, Negotino, Makedonski Brod, Kicevo.

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

1.2.21 Romania

Meteorological characteristics during 2022

The average temperature in the country, 10.6°C, was 1.0°C higher than the median of the standard climatological interval (1991-2020). Positive deviations were recorded in nine of the 12 months of the year, the average monthly temperature in the country being higher than the median of the standard reference interval (1991-2020) with values between 0.7°C (May) and 2.6°C (December). In the rest of the months, the deviation was negative and had values between 0.1°C, in September and 1.8°C, in March.

The year 2022 is on the third place in the list of the warmest years in Romania, a top based on data from 129 weather stations with a complete line between 1961 and 2022. This ranking is also confirmed by the analysis based on the calculated average temperature per country from data from 29 full-array weather stations from 1900 to 2022.

The maximum temperature in 2022 reached the value of 41.7°C and was registered in Calafat, on 23.07.2022. The minimum temperature in 2022 varied between -26.2°C, at Poiana Stampei and -6.3°C, at Calafat, both recorded on January 25.

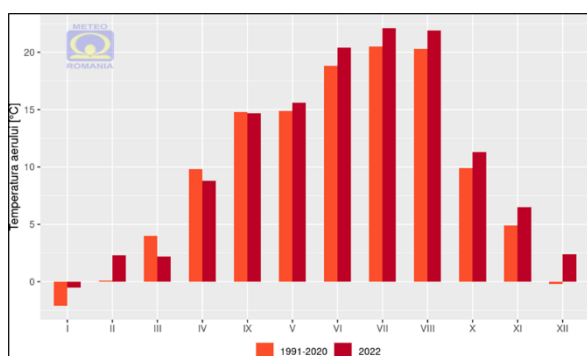


Figure 87. The national mean monthly temperature in Romania in 2022, compared with the standard climatological normal (1991-2020)

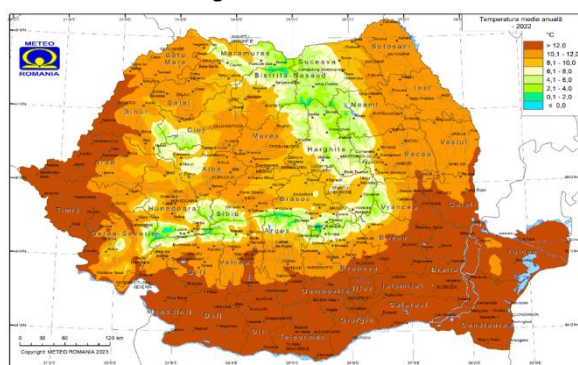


Figure 88. Annual mean air temperature in 2022 in Romania.

The total amount of precipitation in 2022, average for the country, 553.2 mm, was 18% lower than the standard reference interval (1991-2020). The deviation values of the monthly amount of precipitation were negative in eight of the 12 months of the year and varied between 6% (December) and 68% (October). In the rest of the months, they were positive, between 33% (November) and 65% (September).

The year 2022 is on the tenth place in the top of the driest years, a top based on the values regarding the annual amount of precipitation, average for the country. The country average was calculated from data recorded at 128 full-line weather stations over the period 1961–2022.

In the top of the driest years, made on the basis of the values of the average annual amount per country calculated from the data recorded from 29 meteorological stations with a complete string in the period 1900-2022, the year 2022 is in 20th place. This difference between the two rankings results from the existence of very dry years between 1900 and 1960.

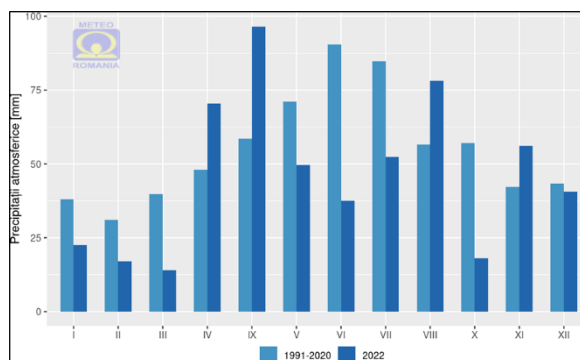


Figure 89. National mean monthly precipitation amount in Romania in 2022, compared with the standard climatological normal (1991-2020).

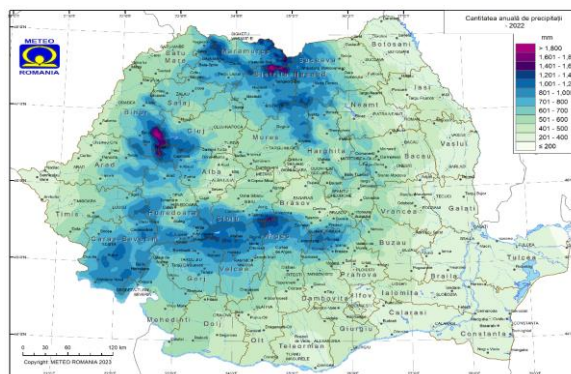


Figure 90. Annual mean precipitation quantity in 2022 in Romania.

In 2022, the total amount of precipitation varied between 159.7 mm, recorded at the Sulina meteorological station, and 1967.1 mm at Stâna de Vale. In most areas this was below 600 mm. Values between 600 and 800 mm were recorded in the north and west of Oltenia, in the south and east of Banat, in the eastern half of Crişana, in Maramureş and in the mountainous areas. At altitudes above 1 500 m the total amount of precipitation exceeded 1 000 mm. Amounts of precipitation below 400 mm were recorded at the weather stations in Dobrogea, in areas in the south and east of Muntenia, in the south-east and north-east of Moldova and in Dobrogea. In the Danube Delta, the values dropped below 250 mm.

The highest amount of precipitation that fell in 24 hours (mm), recorded in 2022, was 186.8 mm, at the weather station Rânca, on September 2, and the lowest was 0.1 mm, at Baia Mare, on March 31.

Fire occurrence and affected surfaces

Unlike the year 2021 when we had only 278 forest fires and 2 101 ha affected, primarily due to the rainy spring, which is the time when the population traditionally used to burn dry vegetation on pastures, in the year 2022, due to a very dry winter without precipitation, and a dry spring (from February to April) combined with strong winds, there were 1 021 forest fires that affected 13 152.93 hectares of forest. It has been the worst year ever since we have recorded data.

The first fire occurred in Romania on 17th of January and the last was reported on 10th of November. Thus, at the national level, 1021 forest vegetation fires were recorded, affecting 13 152.95 ha, of which:

- 1 016 fires occurred on 13 141.45 ha in the national forest;
- 5 fires occurred on 11.50 ha in forest vegetation, located on land outside the forest.

As a result of the fires, at national level an estimated damage of 550.22 thousand Euro occurred, burning 332.81 thousand seedlings of plantations and natural regenerations plus 7 150.74 cubic meters of standing or under operation timber.

The burnt area, number of fires and average fire size for the years 2000-2019 are shown in Figure 91.

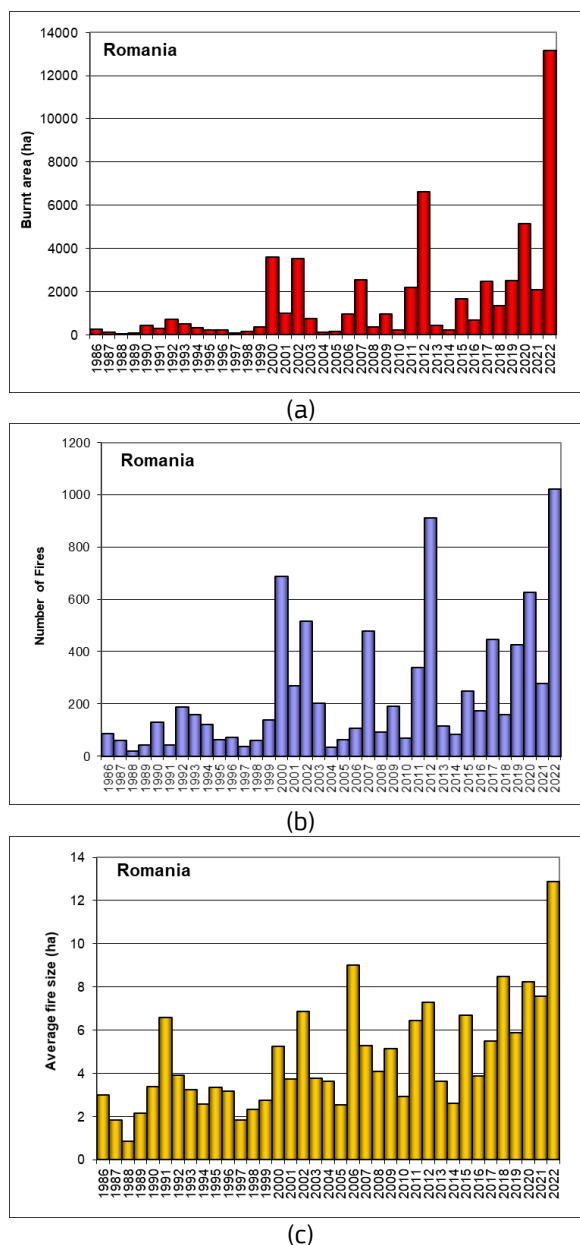


Figure 91. Burnt area (a), number of fires (b) and average fire size (c) in Romania from 1986 to 2022.

A summary of the number of fires and total burnt area by cause, land ownership and fire type is presented in Table 35-Table 37.

Table 35. Causes of forest fires.

Cause of fire	EFFIS code	Number of fires	Burnt area (ha)
Unknown	100	239	2682.23
Lightning	201	1	4.00
Electrical power	301	4	11.07
Railways	302	1	2.00
Self-ignition	306	1	1.00
Other accident	307	11	33.38
Vegetation management	411	679	9509.25
Agricultural burnings	412	48	594.20
Waste management	413	7	9.11
Recreation	414	4	6.70
Cigarettes	422	11	70.60
Hot ashes	423	1	15.30
Other use of glowing object	424	1	0.90
Conflict (revenge)	512	1	37.00
Vandalism	513	5	60.60
Crime concealment	515	3	101.73
Rekindle	600	4	13.88

Table 36. Nature of the affected property.

Property type	Number of fires	Burnt area (ha)
State public property	649	8397.84
Communities public property	137	1961.25
Private property	319	2782.36
Forest vegetation, located on land outside the forest	5	11.50

(80 fires occurred on lands belonging to several forms of ownership)

Table 37. Type of fire.

Fire type	Number of fires	Burnt area (ha)
Litter fires	276	2055.15
Mixed fires (litter, canopy, underground)	2	45.99

In the year 2022, the most forest fires occurred in the month of March, namely 705 fires that affected 10 608 ha, and in this month, the period in which the most fires occurred was between March 20 and 31 (649 fires that affected a surface of 10 429ha). The maximum surface area of 1800 ha from 57 fires occurred on March 25. In contrast, no fire was recorded between 09 and 19 June. Also, a period in which no fires were recorded was November 11 and until the end of 2022.

In 2022, a total number of 124 forest vegetation fires were recorded, which lasted for longer than 24 hours, of which we highlight the one in the area of Vladimir (Gorj county) which was extinguished after 5 days.

The remaining 123 fires were extinguished after 1-4 days (in Gorj, Caraş Severin, Mehedinţi, Hunedoara, Sibiu counties). The largest area affected by a single fire was 334.17 ha, in Vladimir commune, Gorj county. The largest amount of woody material that was burned in a fire was 5 402 cubic meters of mostly softwood (pine species).

Fire fighting means and fire prevention activities

The firefighting actions involved a total of 20 570 people, of which:

- Forest rangers – 5 256 people;
- Military and civilian fire-fighters – 6826 people;
- Policemen and gendarmes - 761 people.

In 2022, legislative changes were made regarding the tightening of penalties for burning vegetation in the sense that the burning of stubble, reeds, brushwood and grassy vegetation in areas is considered a crime and is punishable by imprisonment from 3 months to one year or a fine protected and from the lands subject to ecological restoration if they were likely to endanger human, animal or plant life or health.

It also constitutes a misdemeanour and is sanctioned with a fine from 1 500 euros to 3 000 euros, for persons, and from 10 000 euros to 20 000 euros, for legal persons, the violation of the obligation of owners and holders of land with title or without title not to burn and to prevent the burning of stubble, peat, forest litter, reeds, scrub or herbaceous vegetation.

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

1.2.22 Serbia

Introduction

According to the previous national forest inventory from 2007, the total forest area in the Republic of Serbia (without data for the administrative province of Kosovo and Metohija) covers 2 252 400 ha. State-owned forests represent 53% of the forested area whilst 47% is in private ownership.

The most dominant forest types are broadleaved forest with beech and oaks as a main species, while coniferous forest types cover less than 20% of the total forested area. The elevation in Serbia ranges from 28 to 2 169 m.

Annual air temperature varies from 11°C for altitudes of up to 300 m to 6°C for altitudes over 1 000 m. Lower regions receive from 540-820 mm of precipitation while higher regions with altitudes above 1 000 m receive from 700-1 000 mm of precipitation on average.

Fire occurrence and affected surfaces

The 2022 fire season was calmer than an average fire season in Serbia. Only 66 forest fires were recorded with more than 1 053 ha of burnt area in total and with an average burnt area size of 15.9 ha (Figure 92).

The biggest forest fire, covering 200 ha of burnt area, was recorded in the forest district Sokobanja, which is situated in the central part of Serbia. Usually, Serbia has two peaks of forest fire activity. The first one occurs in March or April and the second one in July and August, depending on the season. Contrary to previous fire season in 2021, when the highest fire activity was recorded in July and August, the highest fire activity within season 2022 was recorded in March and April with 630 ha of burnt area (Figure 93b).

Table 38. Number of fires and burnt area in Serbia.

Year	Number of fires	Burnt area (ha)	Average burnt area
2012	318	13226.44	41.59
2013	46	1131.83	24.61
2014	23	599.19	26.05
2015	68	1474.24	21.68
2016	45	843.29	18.74
2017	222	4756.80	21.43
2018	62	1501.92	24.22
2019	189	9871.73	52.23
2020	81	1417.43	17.50
2021	75	1633.53	21.78
2022	66	1052.99	15.95

The yearly trends in the number of fires, burnt areas and fire size in Serbia are shown in Figure 92.

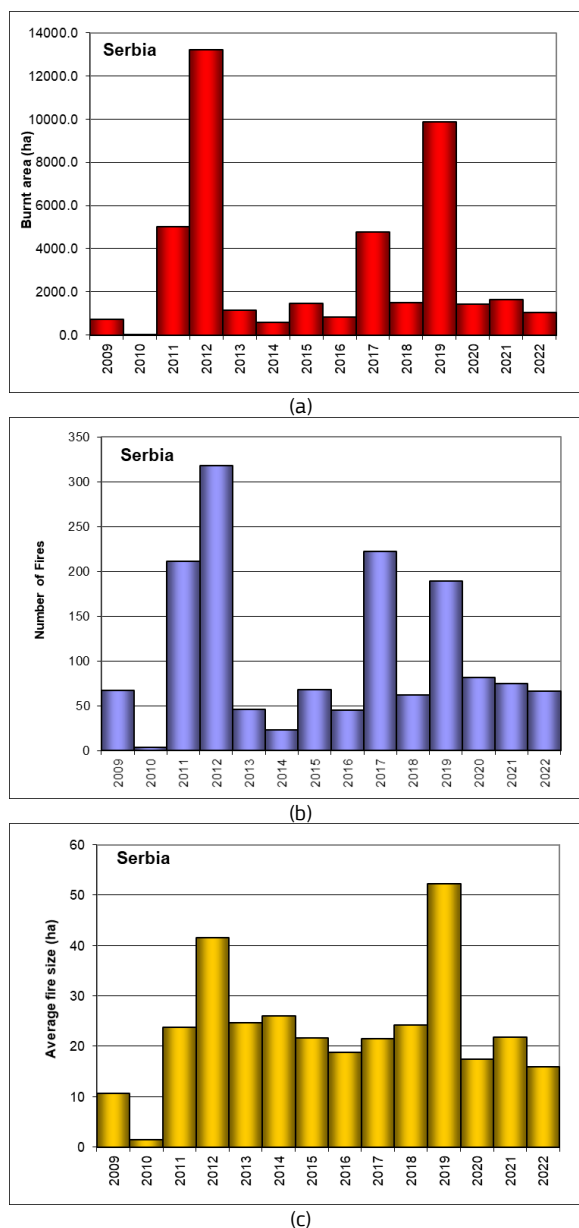


Figure 92. Burnt area (a), number of fires (b) and average fire size (c) in Serbia from 2009 to 2022.

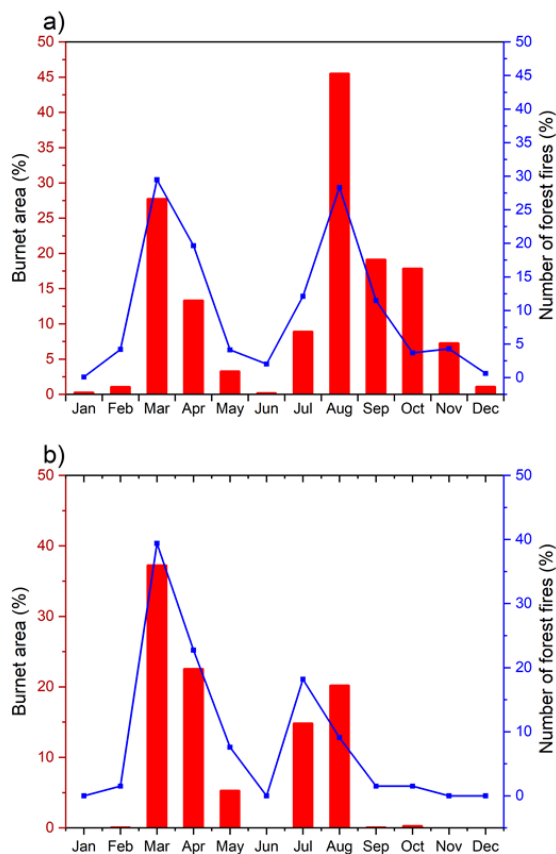


Figure 93. Monthly distribution of forest fires: a) for the years 2012-2022, b) season 2022.

Fire prevention activities and information campaigns

Information about the FWI is provided by the Republic Hydrometeorologica Service of Serbia on a daily basis for each administrative unit in Serbia at the NUTS2 level. Fire danger activities are prohibited during the fire season in all forests. State Forest Enterprises starts a campaign in the public media about the forest fire danger each year before the fire season. The Forest Directorate, as a part of the Ministry of Agriculture, Forestry and Water Management invested in the maintenance and establishment of new fuel breaks at a cost of 38 500 and 10 000 euros respectively, before the 2022 fire season.

Injuries and losses of human lives

During the 2022 season there were no losses of human lives in forest fires.

Fire causes

The main cause of the forest fire was negligence during the previous decade [59.2%], while in the 2022 fire season, unknown reason was reported as the major cause [49%] followed by negligence [44%] (Figure 94).

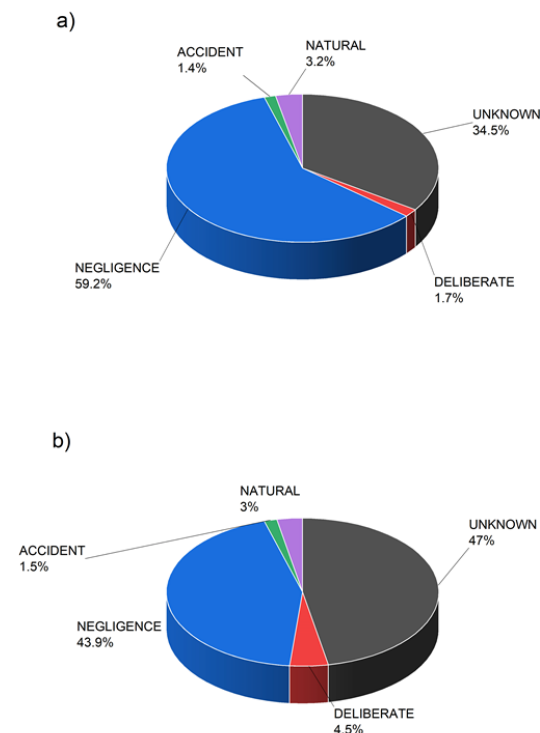


Figure 94. Causes of forest fire: [a] for the years 2012-2022; [b] season 2022.

Firefighting means.

All firefighting measures are under the responsibility of the Sector for Emergency Situations, which is a part of the Ministry of Internal Affairs in Serbia. The operational core of the Sector consists of members of operational fire and rescue units. At any moment, 3 280 of them are ready to react. The seat of the Sector for Emergency Situations consists of several departments including the Directorate for Fire and Rescue Units and Civil Protection. At the local level, the Sector has 27 organizational units, four Emergency Situations Administrations in Belgrade, Kragujevac, Nis and Novi Sad, and 23 Departments for Emergency Situations all around Serbia. Along with the ground troops and firefighting vehicles, at least four helicopters are available for fire suppression if it is needed from the other parts of the Ministry of Internal Affairs in Serbia.

Operations of mutual assistance.

Serbia assisted Slovenia in combating the large forest fire during July 2022. A team of 13 Serbian Ministry of Internal Affairs representatives, consisting of members from the Helicopter Unit and the Sector for Emergency Situations, were dispatched to combat the forest fire at Renski Vrh. They employed two Agusta Bell 212 helicopters, each capable of carrying 1.5 tons of water.

Climatic conditions and how they impacted the fire season.

During the 2022 fire season, the highest daily air temperature (40.6°C) was recorded on July 23 in Smederevska Palanka.

The highest number of tropical days, a total of 72 days, was recorded in Veliko Gradiste and Leskovac. In other parts of Serbia, 40 to 70 tropical days were recorded, which is 14 to 33 tropical days more than the average number for the reference period 1981-2010.

In the eastern and western parts of Serbia, the year 2022 received below average amounts of precipitation. It was rainy in Dimitrovgrad, Kopaonik, and Smederevska Palanka, Pozega experienced a very dry climate, while Valjevo also faced extremely dry conditions.

The annual precipitation varied, ranging from 469.7 mm in Sombor to 918.4 mm in Loznica. In mountainous areas, the precipitation ranged from 694.6 mm at Crni Vrh to 1 186.1 mm at Kopaonik. Valjevo had its second driest year in 2022, while Pozega ranked as the fourth driest in the past 97 years. On June 11, the highest daily precipitation of 76.4 mm was recorded in Loznica.

Similarly, to the 2021 fire season, four heat waves were recorded in Serbia during the summer of 2022. The first heat wave occurred from June 1 to 6 and affected the southern, eastern, and central regions of Serbia. Subsequently, a second heat wave took place from June 27 to July 5, primarily impacting the northern and some eastern parts of the country. A third heat wave was observed from July 20 to 27, affecting the central and southwestern areas of Serbia. Finally, a fourth heat wave occurred exclusively in Novi Sad, lasting from August 15 to 19. (<https://www.hidmet.gov.rs/data/klimatologija/eng/2022.pdf>).

National adaptation strategies / plans

The Serbian Law on climate change was adopted on 18 March 2021, and its implementation will establish a system for reducing greenhouse gas emissions and ensuring adaptation to changed climate conditions. The law fulfils the obligations under the UN Framework Convention and the Paris Agreement and harmonizes domestic legislation with European Union regulation.

Research activities aimed at improving fire management

During 2022, no new research activities were supported by the Forest Directorate.

Sources: Forest Directorate - Ministry of Agriculture, Forestry and Water Management, Centre for Forest Fire Research - University of Belgrade Faculty of Forestry.

1.2.23 Slovakia

Fire danger in the 2022 fire season

The year 2022 was about 1.5 to 2.5°C warmer than the long-term average (1951-1980) in Slovakia; i.e. the temperature was extremely above normal. In Hurbanovo, the average air temperature was 12.2°C, 2.3°C more than the long-term average (1951-1980). In Košice, 11.0°C, 2.5°C more than the long-term average (1951-1980). In Poprad by 2.0°C more than the long-term average (1951-1980), in Oravská Lesná by 1.7°C more than the long-term average (1951-1980). On Lomnický štít, it is 1.5°C more than the long-term average (1951-1980). In Chopok, it is 1.8°C more than the long-term average (1951-1980). In Kamenica nad Cirochov, 2.2°C more than the long-term average (1951-1980).

The total precipitation for the year 2022 reached 84% in Hurbanovo, 79% in Košice, 85% in Poprad, and 105% in Oravská Lesná of the long-term average (1951-1980).

In the whole of Slovakia, rainfall was on average about 609 mm, which is about 81% of the long-term average, (with a higher temperature, there is also a higher potential evaporation, therefore the year 2022 was dry to very dry in several places in Slovakia. In addition, precipitation totals were both temporal and territorially very unevenly distributed).

Fire occurrence and affected surfaces

In 2022, according to the records of the Fire Engineering and Expertise Institute of the Ministry of the Interior of the Slovak Republic ("PTEU"), 297 forest fires were registered with a total burnt area of 1 209.56 ha. The damage caused by the fires was calculated at EUR 1 196 510. Compared to 2021, the number of fires is significantly higher (2021/101), the total burnt area is also significantly higher compared to 2021 (2021/158.94 ha).

No people were killed and one person was injured in the forest fires.

The most fires were registered in the districts of Gelnica (47 fires), Spišská Nová Ves (44 fires), Košice surroundings (16 fires)

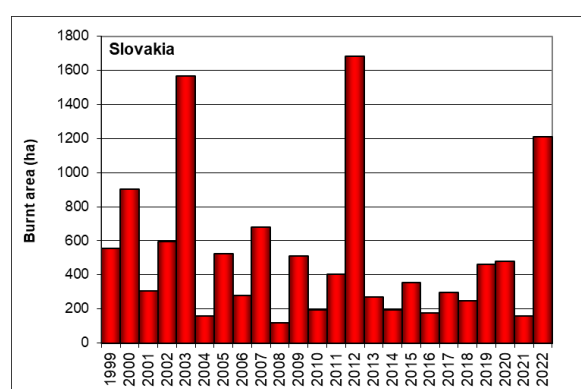
The highest areas damaged by forest fires were registered in the districts of Rimavská Sobota (368.18 ha), Gelnica (299.3 ha), Spišská Nová Ves (136.16 ha)

The greatest damage was caused by forest fires in the districts of Košice and its surroundings (€713 900), Žilina (€150 500), Gelnica (€702 220).

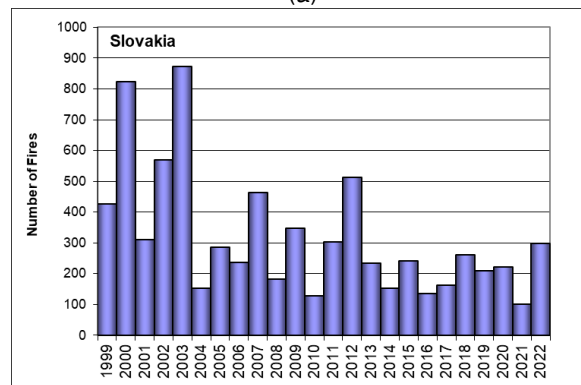
Forests burned most often in the months of March (115 fires), July (51 fires), and June (37 fires).

The most extensive fire was registered on 28/03/2022 in the vicinity of the village of Helcmanovce, district of Gelnica and affected 140 ha of mixed forest and adjacent grasslands. The cause of the fire was the burning of grass and dry vegetation. The damage caused was estimated at only €40 000.

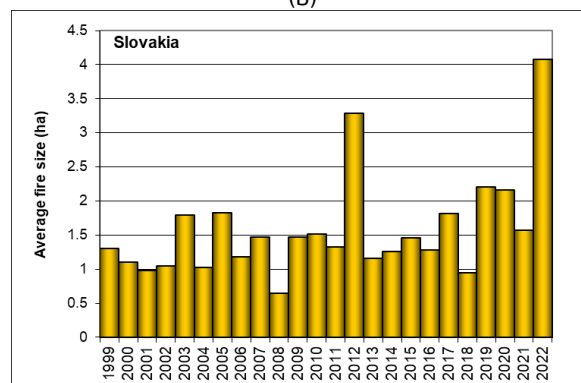
The total number of fires, burnt area and average fire size from 1991 to 2022 are shown in Figure 95 and the number of fires and burnt area by month in 2022 are presented in Figure 97.



(a)



(b)



(c)

Figure 95. Burnt areas (a), number of fires (b) and average fire size (c) in Slovakia from 1999 to 2022.

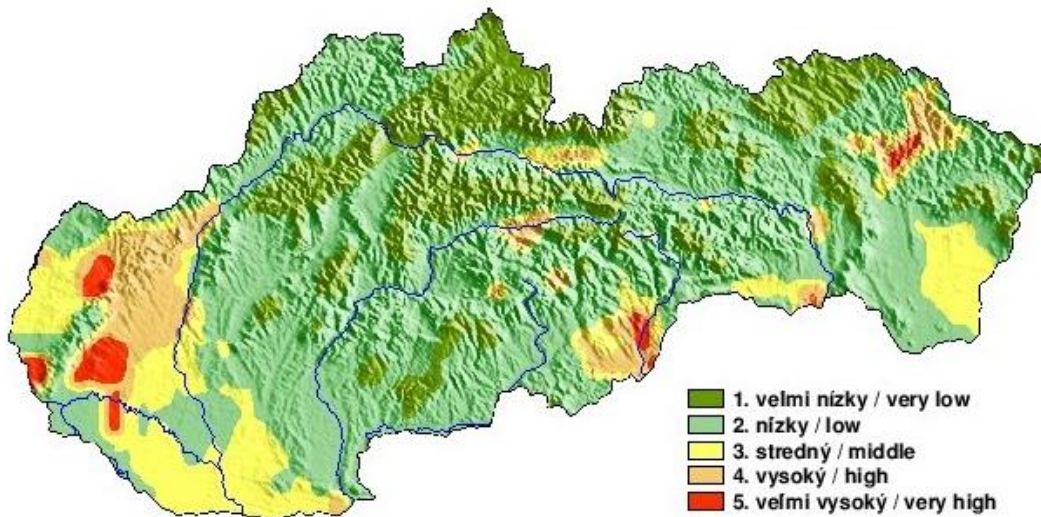


Figure 96. Information on the forest fire index - Slovak Hydrometeorological institute.

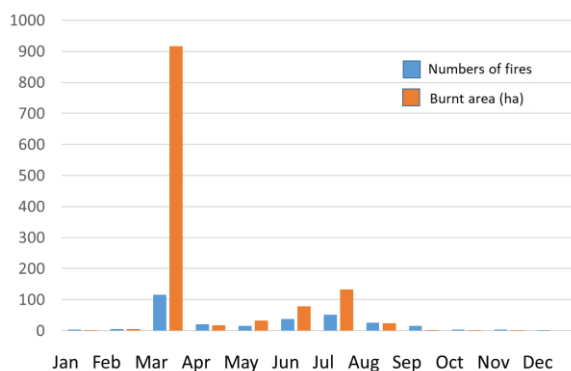


Figure 97. Number of fires and burnt area by month in Slovakia 2022.

Fire causes

Forest fire causes in 2021 are shown in Figure 98, and causes for the years 2011–2022 are presented in Table 39.

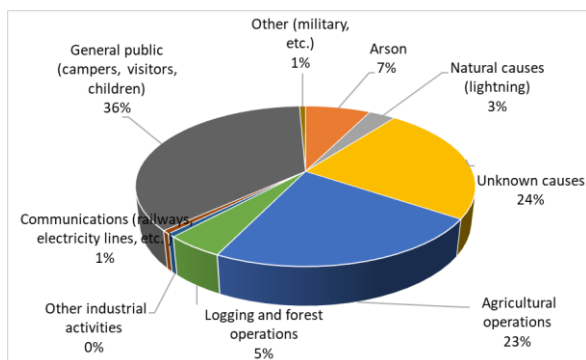


Figure 98. Causes of forest fires in 2022.

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 2022 fire season, one person was reported injured in Slovakia.

Table 39. Forest fire causes for the years 2011-2021 (number of fires).

	Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<i>Basic information</i>	Total fires	517	233	153	242	136	162	262	210	221	101	297
<i>Known causes (Human)</i>	Arson	42	33	26	23	12	11	19	7	18	8	22
	Negligence (see also B below)	409	177	112	167	98	108	179	156	113	63	195
<i>Known causes (Natural)</i>	Lightning	8	4	2	12	0	10	9	4	0	6	9
<i>Unknown</i>	Unknown	58	19	13	40	26	33	55	43	36	24	71
<i>Supplementary information: Total negligence</i>	Agricultural operations	135	26	24	26	21	20	19	25	39	8	10
	Logging/forest operations	56	15	18	21	14	21	37	27	5	27	14
	Other industrial activities	1	7	1	5	0	0	1	28	1	1	2
	Communications (railways, electricity lines, etc.)	7	3	1	2	1	2	2	3	7	2	2
	General public (campers, other visitors, children)	208	125	67	110	62	65	119	72	113	24	72
	Other (military, etc.)	2	1	1	3	0	0	1	1	2	2	2



Figure 99. Fire fighting in Slovakia in 2022. (Source: TASR).



Figure 100. Fire fighting in Slovakia in 2022. (Source: TASR).



Figure 101. Fire fighting in Slovakia in 2022. (Source: TASR).

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

1.2.24 Slovenia

In 2022, according to the data of the Forest Service, 217 forest fires were reported, with a total burnt area of 4 058.65 ha, of which 3 173 ha were in forest (Table 40). 30 of the 217 fires were over 1 ha, and the average fire size was 18.7 ha.

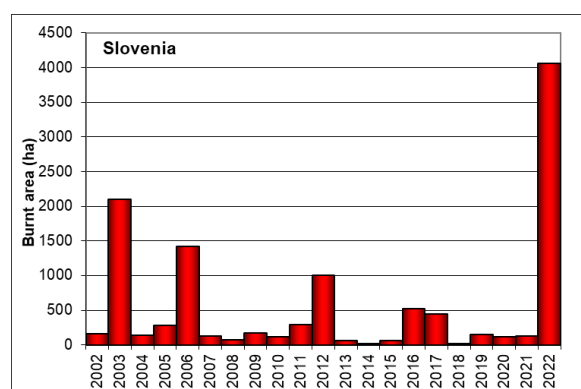
Table 40. Number of fires and burnt area in Slovenia 2022.

Number of fires	< 1 ha	185
	≥ 1 ha	30
	≥ 100 ha	1
	≥ 500 ha	1
	Total	217
Burnt area	Woodland	3 172.94
	Bushes	16.14
	Non woodland	869.57
	Total	4 058.65

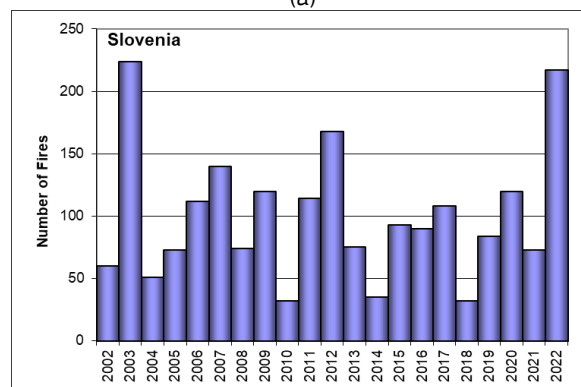
Figure 102 shows the trends in terms of number of fires and burnt area during the last 21 years in Slovenia. As was the case in previous years, the most affected region was Sežana, which included the two largest fires of the year and accounted for 95% of the total burnt area, and 41% of the number of fires (Table 41, Figure 104).

Fire causes

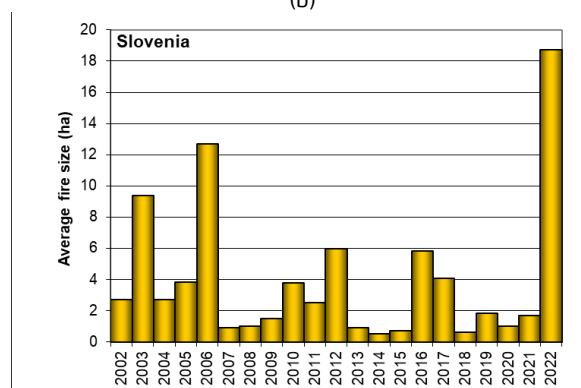
In 2022, 76 fires (35%) were of unknown origin. Of the remaining fires, 59 (27%) were deliberately started, 12 (6%) were of natural origin and the remaining 70 (32%) were reported as accidental or negligent, mostly because of agricultural burnings.



(a)



(b)



(c)

Figure 102. Burnt areas (a), number of fires (b) and average fire size (c) in Slovenia from 2002 to 2022.

Table 41. Number of fires and burnt area by forest management unit in Slovenia in 2022.

Region	Number of fires					Burnt area (ha)			
	<1 ha	≥1 ha	≥100 ha	≥500 ha	Total	Forest	Scrub	Non wooded	Total
Tolmin	10	3	0	0	13	33.64	16.02	0.66	50.32
Bled	6	0	0	0	6	1.73	0.00	0.16	1.89
Kranj	12	2	0	0	14	65.52	0.07	7.59	73.18
Ljubljana	39	6	0	0	45	21.87	0.00	1.51	23.38
Postojna	6	1	0	0	7	7.38	0.00	0.04	7.42
Kočevje	3	0	0	0	3	1.27	0.00	1.19	2.46
Novo mesto	8	3	0	0	11	5.97	0.05	2.06	8.08
Brežice	1	1	0	0	2	2.33	0.00	0.20	2.53
Celje	14	3	0	0	17	7.48	0.00	1.18	8.66
Nazarje	0	0	0	0	0	0.00	0.00	0.00	0.00
Slovenj Gradec	3	1	0	0	4	2.64	0.00	0.10	2.74
Maribor	5	1	0	0	6	4.90	0.00	0.45	5.35
Murska Sobota	0	0	0	0	0	0.00	0.00	0.00	0.00
Sežana	78	9	1	1	89	3018.21	0.00	854.43	3872.64
Total	185	30	1	1	217	3172.94	16.14	869.57	4058.65

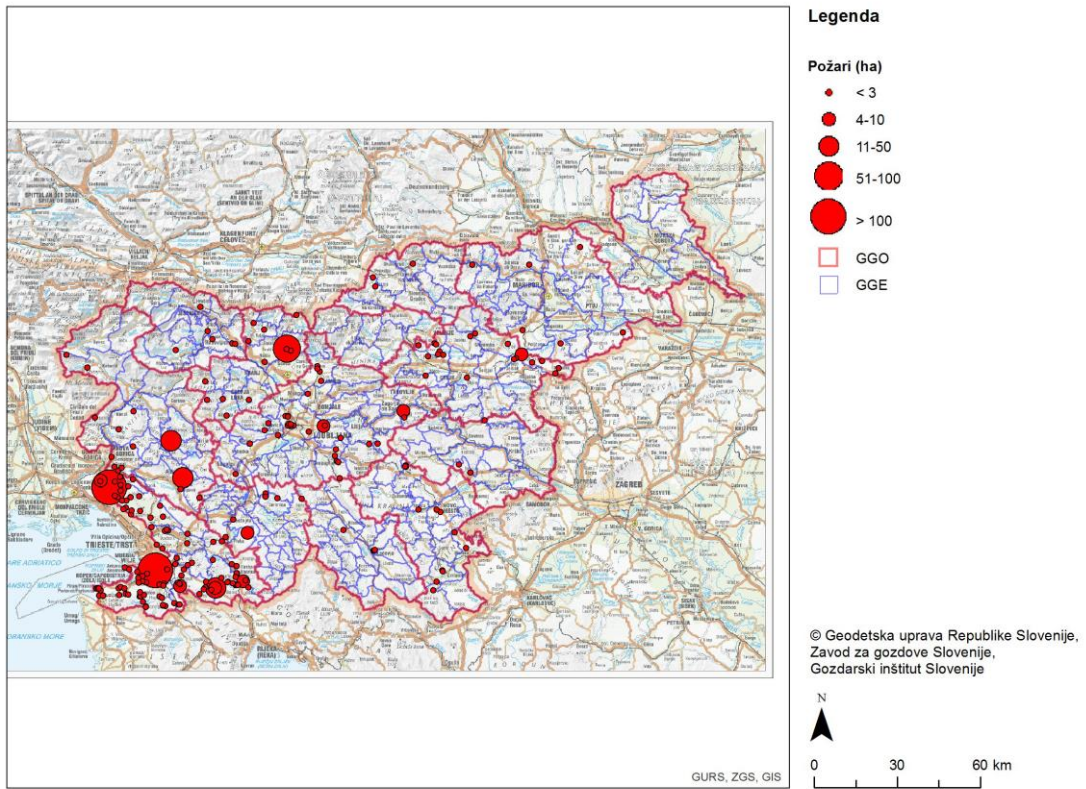


Figure 103. Map of fires in Slovenia in 2022.

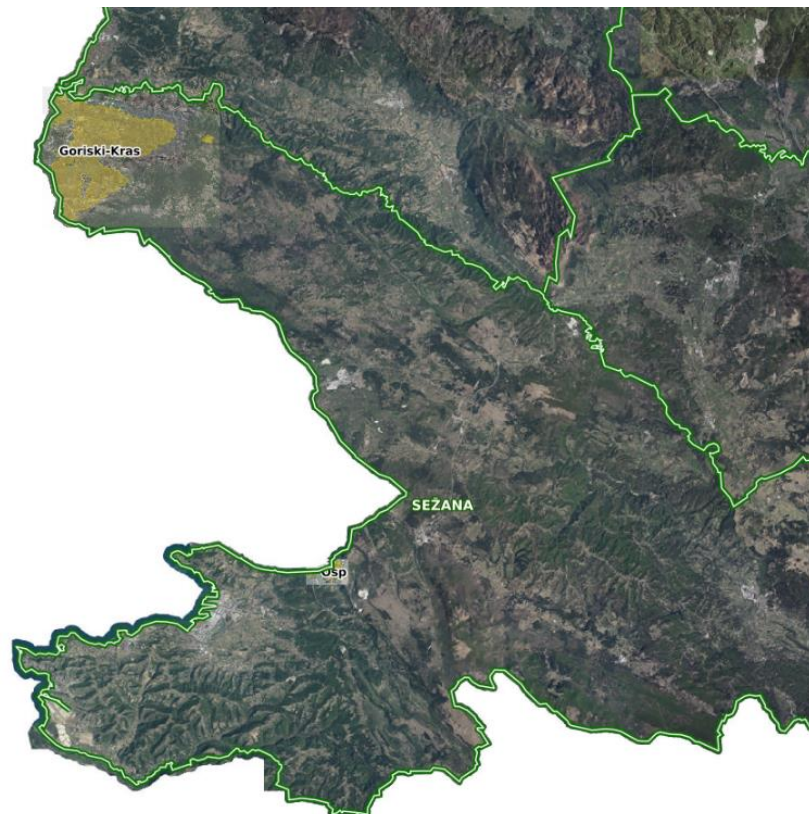


Figure 104. Plotted polygons for fires on the Goriška Karst and above Osp.

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

1.2.25 Spain

Fire danger in 2022

According to the State Meteorological Agency (AEMET), the year 2022 in Spain was extremely warm, with an average temperature of 15.4°C in the peninsula. 2022 has been the warmest year of the historical record, which started in 1961.

It should be noted that the year was extremely warm in almost all regions of the peninsula and in the Balearic Islands. In the Canary Islands, the year was very warm overall, with some variability between zones.

During 2022, there were three heat waves in the Iberian Peninsula and the Balearic Islands, and two in the Canary Islands. Between 9 and 26 of July there was a remarkable heat wave that affected the peninsula, with an exceptional duration and intensity. The other two heat waves in the peninsula occurred in these periods: 12-18 June and 30 July-15 August. The Canary Islands were affected by two successive heat waves during 9-11 and 24-26 July.

Regarding rainfall, 2022 was very dry in most of Spain, becoming the 6th driest year since 1961, and the 4th in the 21st century.

This meteorological situation had a direct correlation with the development of the large fires that occurred in the peninsula last summer.

Number of fires and affected surfaces

The provisional statistics for the period between January 1 and December 31, 2022, are compiled with the information sent by the Autonomous Communities on a weekly basis during the high-risk season (i.e., from 1st June to 15th October) and monthly for the rest of the year.

Number of forest fires

According to these data, the total number of fires has decreased by 1.03% compared to the average of the last decade, with an increase of 1.45% in the number of small fires (area <1 ha) and a decrease of 6.01% in larger fires (area ≥ 1 ha), respectively.

Table 42. Number of fires in 2022 compared with 10 year average.

	Average 2012-2021	2022
Number of fires <1ha	7091	7194
Number of fires ≥1ha	3525	3313
Total	10616	10507

Table 43. Burnt area in 2022 compared with the 10 year average.

Burnt area (ha)	Average 2012-2021	2022
Wooded land	29869.58	115175.32
Non-wooded land	64379.00	152771.57
Forest	94248.58	267946.89

Burnt areas

Regarding the burnt areas, there was an increase compared to the 10-year average of 285.59% in wooded lands, 237.30% in non-wooded lands and 184.30% in forest areas (sum of wooded and non-wooded lands). The year 2022 depicts the first position of the decade in terms of affected forest area.

The yearly trends in terms of numbers of fires and burnt areas during the last 42 years in Spain are shown in Figure 105.

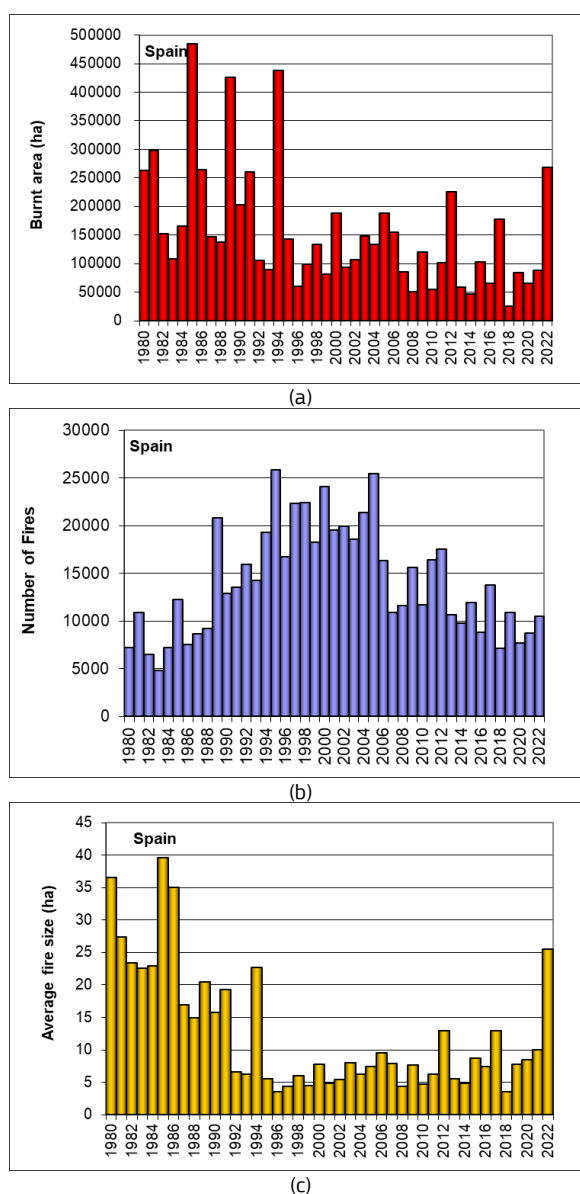


Figure 105. Burnt areas (a), number of fires (b) and average fire size (c) in Spain for the last 43 years.

Large fires

According to the provisional statistics compiled by the relevant departments in the Autonomous Communities, during 2022 there were 57 large forest fires (*Grandes Incendios Forestales*, GIF), a category which includes fires affecting more than 500 hectares. 55 of them took place during the high-risk season (i.e., from 1st June to 15th October).

In total, the GIFs accounted for 80.78% of the total burnt area (the highest percentage of the decade), but only 0.54% of the total number of fires that occurred in the year.

Regarding the incidence of GIF by geographic regions, both the Interior Communities and the Northwest experienced 40% of the GIF, accounting for 77.81% of the total burnt area by GIF.

Burnt area caused by GIF represented more than 80% of the affected area in all the regions. In particular, the forest area affected in the Canary Islands was produced almost entirely (98.88%) by the GIF that occurred in Los Realejos (S.C. Tenerife).

Of the 57 large fires, 46 (81%) had consequences on the population or their assets, and 37 (65%) required the activation of the Emergency Military Unit (*Unidad Militar de Emergencias*, UME) for their suppression. 53 (93%) of these large fires required participation of the means of the Ministry for the Ecological Transition and Demographic Challenge (*Ministerio para la Transición Ecológica y el Reto Demográfico*, MITECO).

It is worth noting that, during 2022, at least 9 GIF were caused by lightning. These large fires produced 47.25% of the total burnt area.

Meteorology is a determining factor for the origination and propagation of forest fires. In 2022, there were three heat waves in the peninsula. During these periods, 47 GIFs occurred (82%), burning 88% of the area affected by GIF, in particular:

- 12-18 Jun: 4 GIF, affecting 33 980 ha;
- 9-26 Jul: 28 GIF, affecting 111 750 ha;
- 30 Jul-14 Aug: 15 GIF, affecting 45 493 ha.

Table 44. Large fires (>500 ha) in 2022.

Province	Municipality of origin	Start date	Burnt area (ha)
Zamora	Hermisende	28/01	1421.13
Zamora	Lubián	25/02	503.00
Málaga	Júzcar	8/06	4553.53
Lleida	Artesa de Segre	15/06	2504.90
Zamora	Riofrio de Aliste	15/06	24073.86
Zaragoza	Nonaspe	16/06	1110.00
Toledo	Toledo	17/06	1738.00
Navarra	Arguedas/Valtierra	19/06	2060.38
Navarra	Legarda/Guirquillano	19/06	6247.64
Teruel	Castejón de Tornos	20/06	1350.00
Navarra	Gallipienzo/San Martín de Unx	20/06	6598.64
Valencia	Venta del Moro	3/07	1330.60
Cáceres/salamanca	Ladrillar (Cc)/Monsagro (Sa)	11/07	10438.58
Salamanca	Candelario	11/07	507.90
Cáceres	Casas de Miravete	14/07	2728.90
Málaga	Mijas	15/07	1788.33
Ourense	Carballeda de Valdeorras/Riodolas	14/07	12607.23
Lugo	A Pobra do Brollón/Saa	14/07	12768.22
Ourense	Vilariño de Conso	15/07	6999.36
Zamora	Figueruela de Arriba	15/07	1151.32
Ciudad Real	Montiel	15/07	799.08
Zamora	Roelos de Sayago	15/07	648.84
Segovia	Navafria	15/07	758.51
Ávila	Cebreros	16/07	4071.92
Zamora	Losacio	17/07	26181.96
Barcelona	El Pont de Vilomara i Rocafort	17/07	1502.64
Zaragoza	Ateca	18/07	11004.10
León	Ponferrada	17/07	1405.60
Zamora	Villaseco	18/07	589.28
Guadalajara	Valdepeñas de la Sierra	19/07	2478.29
Ourense	Oímbra (Rabal)	18/07	1931.08
Ourense	Oímbra (Videferre)	17/07	901.33
S.C. Tenerife	Los Realejos	21/07	2739.30
Burgos	Quintanilla del Coco	24/07	1819.69
Zamora	Losacino	24/07	690.80
Guadalajara	Humanes	25/07	974.62
Ciudad Real	Almadén	25/07	1563.74
Ciudad Real	Malagón	25/07	1819.05
Huelva	Almonte	26/07	880.79
Toledo	Sevilleja de la Jara	29/07	538.50
Ourense	Verín	3/08	706.76
Pontevedra	Caldas de Reis	4/08	561.39
A Coruña	Boiro	4/08	2058.75
Ávila	Santa Cruz del Valle	5/08	1495.32
León	Boca de Huérgano	7/08	1154.85
Ourense	Carballeda de Valdeorras/Casaio	9/08	526.45
Ourense	Chandrexa de Queixa	9/08	616.22
Ourense	Laza/Camba	9/08	2828.18
Cáceres	Santibañez el Alto	10/08	910.36
Ourense	O Irixo	10/08	508.65
Alicante	Vall d' Ebo	13/08	10609.05
Zaragoza	Añón de Moncayo	13/08	5213.16
Castellón	Costur	14/08	734.51
Castellón/Valencia	Bejis	15/08	16944.63
Ourense	Lobeira	24/08	625.20
Granada	Los Guajares	8/09	4439.63
Vizcaya/Burgos	Balmaseda (Vi) /Valle de Mena (Bu)	23/10	728.00
Total burnt area			216441.75

The two large fires with the widest burnt area were also the ones with major consequences for the population and their assets:

- Riofrío de Aliste (Zamora): started on June 15 and was the second largest forest fire of the year, devastating an estimated area of 24 074 ha. 2 690 people from 26 municipalities had to be evacuated, many of whom required shelter, and one municipality was confined. An intervener was injured. There was damage to houses, railway cuts and 7 roadblocks, 2 of them on the State Network. For its suppression, UME was activated, together with regional means and MITECO.
- Losacio (Zamora): the largest fire of the year started on July 17, and affected 26 182 ha. Four people sadly died (one of them belonged to the suppression teams) and twelve were injured (nine of them belonged to the suppression teams). 2 700 people from 20 municipalities had to be evacuated, and one municipality was confined. There was damage to houses, railway cuts and 7 roadblocks, 2 of them on the State Network. The forest fire required the activation of the UME together with regional means and MITECO. Moreover, a Forest Fires Assessment and Advisory Team (FAST) coordinated by MITECO participated in suppression operations during this fire. The FAST team also participated in other large fire occurring in Cebreros (Ávila) on July 16.



Figure 106. Drop of a high-capacity amphibious aircraft (MITECO) in Nonaspe (Zaragoza) fire, 18/06/2022.
Source: Ministry for the Ecological Transition and Demographic Challenge, Wildland Fire Management Service, Spain.

Geographical distribution of forest fires

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

CANARY ISLANDS: includes the entire Canary archipelago.

INTERIOR COMMUNITIES: includes the provinces of the rest of the non-coastal autonomous communities, except León and Zamora, as well as the Basque Country.

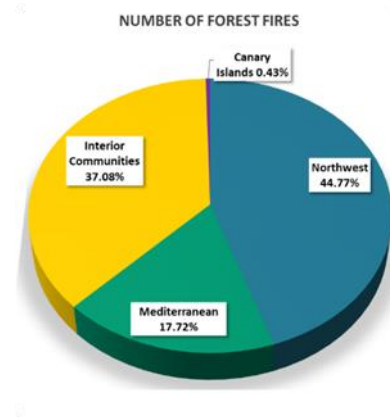
The Northwest region suffered the highest number of fires, with 44.77% of the annual total. It is followed by the Interior Communities (37.08%), the Mediterranean region (17.72%) and, finally, the Canary Islands with less than 1% of the total number of fires.

Regarding the burnt area, the Northwest region depicts 49.04% of the total, followed by the Interior Communities (30.23%), the Mediterranean region (19.70%), and the Canary Islands (1.03%). The geographical distribution of forest fires was very dependant of large fires.

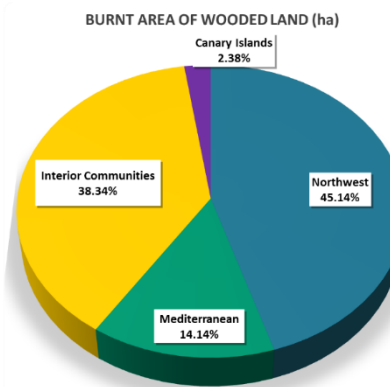
Considering the wooded land, the highest percentage of burnt area occurred in the Northwest region, reaching 45.14%, leaving the remaining 55% distributed among the rest of the regions.

The distribution of the total number of fires and burnt area by geographical area is shown in Figure 107.

a)



b)



c)

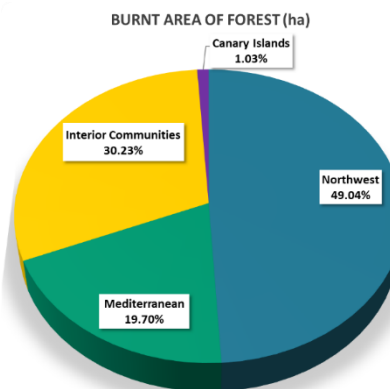


Figure 107. Number of forest fires (a), burnt area of wooded land (b), and burnt area of forest (c) in 2022 by geographic region.

Civil Protection in forest fires

Loss of human life and injuries

In 2022, we regret to report the death of four people (one of them belonged to the suppression teams) during Losacio (Zamora) fire, which started on July 17.

In 27 forest fires, at least 92 people had to be assisted by health services, 48 of them belonging to the suppression teams.

Damage to infrastructure

Due to the continuity of the houses with the forest, the risk of so-called Urban-Forest Interface Fires causes damage to houses and other infrastructures. Thus, in 2022, 29 forest fires caused damage to infrastructures.

Evacuations and disruption to transport

Preventive evacuations were carried out in 94 fires, affecting more than 30 000 people, highlighting:

- 2 500 evacuees, Pujerra (Málaga), June 8
- 2 690 evacuees, Riofrío de Aliste (Zamora), June 15
- 1 400 evacuees, Legarda/Guirguillano (Navarra), June 18
- 1 100 evacuees, San Martín de Unx/Gallipienzo (Navarra), June 19
- 1 050 evacuees, Ladrillar/Monsagro (Cáceres/Salamanca), July 11
- 1 500 evacuees, Mijas (Málaga), July 15
- 2 000 evacuees, Cebreros (Ávila), July 16
- 2 700 evacuees, Losacio (Zamora), July 17
- 1 750 evacuees, Ateca (Zaragoza), July 18
- 1 500 evacuees, Añón de Moncayo (Zaragoza), August 13
- 1 580 evacuees, La Vall d'Ebo (Alicante), August 13
- 2 200 evacuees, Bejís (Castellón), August 15

In 81 fires, roads were cut, mostly regional and local, but on 39 occasions the State Road Network was affected. In 20 forest fires, the railroad network was interrupted.

Operations of mutual assistance

In 2022, as in previous years, the Protocol between Spain and Portugal on technical cooperation and mutual assistance in Civil Protection matters and the Additional Protocol on mutual aid in border areas was applied and thus support was given to Portugal as follows:

Support with State means

- Bragança, July 27. MITECO gave support in this cross-border fire by sending 1 high-capacity amphibious aircraft and 1 high-capacity helicopter.
- Covilhã (Castelo Branco), August 11. MITECO gave support in this cross-border fire by sending 1 high-capacity amphibious aircraft.

Support with regional means in cross-border fires

- Castilla y León intervened 8 times in cross-border fires: 5 of them were on the border with Zamora and 3 with Salamanca.
- Galicia intervened in 6 fires: 4 of them were on the border with Ourense and 2 with Pontevedra.
- Extremadura intervened in 3 fires on the border with Badajoz.

These mutual aid protocols also imply aid from Portugal in the Spanish territory, which materialised in the following operations:

Support with Portuguese means in cross-border fires in Spanish territory

- Castilla y León, on 2 occasions.
- Extremadura, on 1 occasion.
- Galicia, on 1 occasion.

During 2022, there were no cross-border operations with France.

RESCEU programme

For the fourth consecutive year, Spain collaborated with the Union's Civil Protection Mechanism to support other countries that request it, within the RescEU program, with two high-capacity amphibious aircrafts, available from June 15 to October 31.

During this period, two requests for help to mobilise these resources were received:

- Portugal: in the zone of Ourém (Santarém) y Escalhão (Guarda), 2 aircrafts (10-11 July) and a liaison team with 2 members of the Emergency Military Unit (UME).
- France requested means in August 9 but it was not possible to give assistance in this occasion due to the unavailability of MITECO aircrafts.

State means for prevention and suppression

Integral Prevention Teams (*Equipos de Prevención Integral de Incendios Forestales, EPRIF*) and Prevention and Assessment Teams (*Equipos de Prevención y Análisis de Incendios Forestales, EPAIF*)

In 2022, MITECO deployed 17 Integral Prevention Teams (EPRIF) and 7 Prevention and Assessment Teams (EPAIF).

17 EPRIFs were operational during 2022: 4 annuals centred in prevention all year and 13 operational during off-summer months.

EPRIFs mainly work 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.

From January 2022, 7 EPAIF were put in place, bringing together prevention and assessment activities. During low risk season, they work on prevention tasks. In summer season, they associate with Assessment and Planning Mobile Units (UMAP)

vehicles) in order to participate in suppression activities, such as giving support to Autonomous Communities or MITECO's Operational Centre by elaborating risk bulletins, meteorological assessments or post-fire analyses. Three of these teams also work on suppression during the winter-spring season.

It is worth mentioning that, during 2022, these teams treated 1 032.05 hectares by performing 145 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 in the forest areas. A total of 680 plots were prepared for burning, although the weather conditions did not allow all of the work to be completed.

Preventive Work Brigades (*Brigadas de Labores Preventivas, BLP*)

The 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 at the end of December.

During these two work periods, they carried out fire prevention work on more than 1 400 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 600 workers distributed in the 10 Preventive Work Brigades carried out preventive forestry work close to the surroundings of BRIF bases. As already noted, the BLPs also work from time to time in support of EPRIFs in the execution of prescribed burns.

The Preventive Work Brigades also collaborate in suppression activities. During 2022, the BLP carried out 30 actions in 17 forest fires.

Reinforcement Brigades in Forest Fires (*Brigadas de Refuerzo en Incendios Forestales: BRIF*)

MITECO deploys 5 BRIF-i during the winter-spring campaign in the Northwest of the Peninsula, and 10 BRIFs during the summer campaign distributed throughout the national territory.

In the summer campaign the BRIF are composed of three teams, each comprising two foremen and 14 specialists under the command of one technician. For transport and support for fire suppression they have two transport and suppression helicopters with 1 200 litres 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 seven specialists, one foreman and one technician equipped with a single helicopter.

These highly specialised 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 suppression, including backburning, is essential in their performance.

In 2022 campaign, the BRIF worked for 2 513 hours in 507 fire operations and suppressed a total front length of 610 846 metres. The BRIF with the highest activity during this campaign was that of Tineo (Asturias), with 72 operations summing up the summer and winter campaigns.

During the winter campaign, the BRIF of Ruate (Cantabria) operated 22 times. This BRIF is only operational during the winter-spring months.



Figure 108. BRIF of Daroca working on the suppression of Laspuña (Huesca) fire, 28/08/2022. (Source: Ministry for the Ecological Transition and Demographic Challenge, Wildland Fire Management Service, Spain).

Aerial means

The Wildland Fire Management Service of MITECO coordinates the deployment of the State aerial means, which cover the national forest area throughout the year. During the two periods of highest occurrence of forest fires, winter-spring and summer campaigns, the number of available means is strengthened. Complete information on these means is available on:

https://www.miteco.gob.es/es/biodiversidad/temas/incendios-forestales/extincion/medios_aereos.aspx

During 2022, MITECO's aerial means carried out a total of 2 590 operations in 571 forest fires, in support of the Autonomous Communities and other countries. In total, they flew for 9 502 hours, making 40 163 drops. Table 45 details the number of State aerial means operations in support of the Autonomous Communities and other countries.

Table 45. Number of State aerial means operations in support of the Autonomous Communities and other countries in 2022.

Autonomous community	Number of fires	Interventions	Hours of flight	Drops
Andalucía	59	143	490:19	2546
Aragón	34	196	785:11	3090
Asturias, Principado de	62	97	226:20	1256
Balears, Illes	9	8	6:44	12
Canarias	6	42	232:20	1134
Cantabria	36	33	133:55	657
Castilla León	93	611	2372:36	9643
Castilla-La Mancha	45	126	383:00	1520
Cataluña	28	95	304:49	875
Ceuta	1	2	7:20	50
Comunidad Valenciana	11	205	1053:00	3927
Extremadura	23	242	913:48	5146
Galicia	125	635	2026:14	8111
Madrid, Comunidad de	2	7	25:17	72
Murcia, Región de	2	18	71:28	272
Navarra, Comunidad Foral de	22	88	311:42	1339
País Vasco	7	22	68:23	220
Rioja, La	3	12	47:25	196
NATIONAL TOTAL	568	2582	9459:51	40066
Other countries: Portugal	3	8	42:50	97
TOTAL	571	2590	9502:41	40163

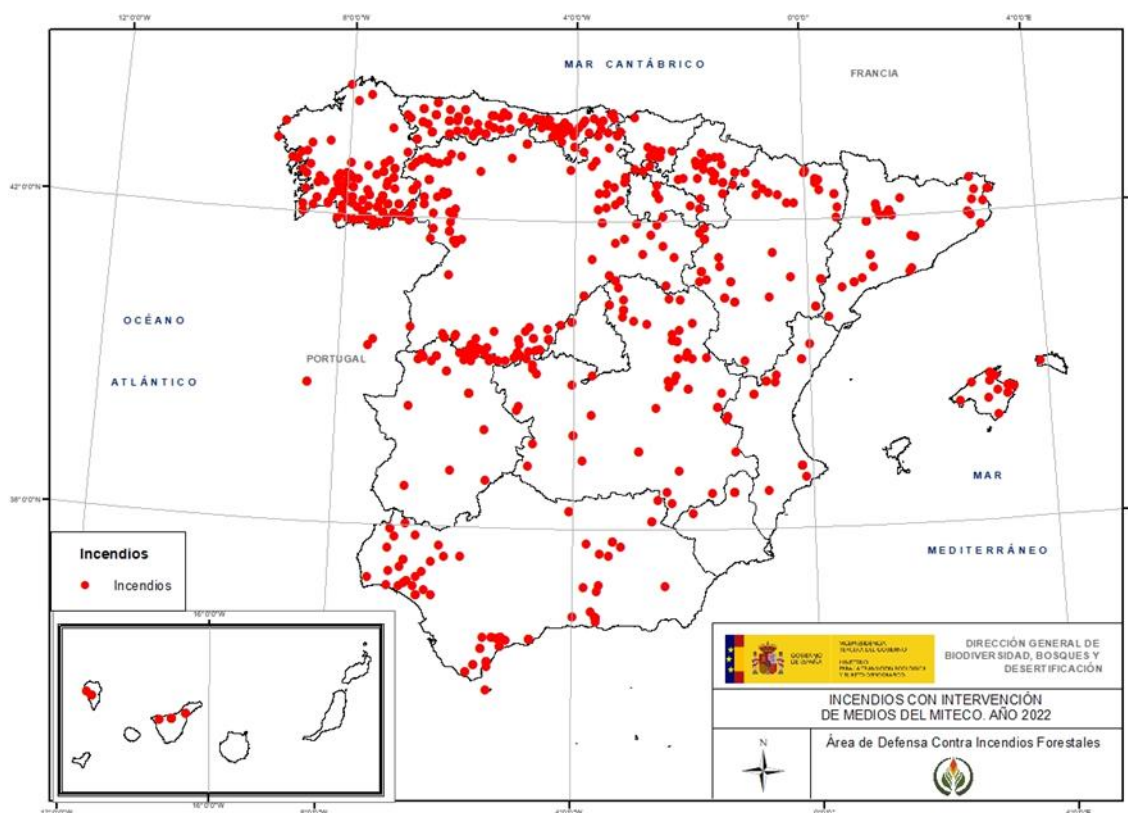


Figure 109. Location of forest fires with the intervention of MITECO means of suppression during 2022.

Other prevention activities

Training and awareness actions against forest fires

During 2022, the traveling exhibition entitled “50 years of knowledge and prevention of forest fires”, created in 2019 to commemorate 50 years of the National Forest Fire Statistics (*Estadística General de Incendios Forestales*, EGIF), was shown in various centres and public spaces of several provinces.

Artificial intelligence techniques for the analysis and prediction of forest fires

During 2022, ARBARIA project continued. This is a computer system for the analysis and prediction of forest fires making use of artificial intelligence techniques associated with Machine Learning and Deep Learning. It has been developed together with the Ministry of Agriculture, Fisheries and Food.

ARBARIA uses historical data on forest fires that have occurred in Spain in recent decades and open data related to meteorology and socioeconomic factors. Applying two different algorithmic models, ARBARIA makes it possible to explain and predict the weekly occurrence of fires at the provincial level, as well as to identify patterns of forest fire causality associated with the socioeconomic characteristics of each municipality. The predictive and explanatory capacity of both models provides valuable information for prevention and suppression actions.

Coordination and planning actions

Joint Commission, Ministry of Defence - Ministry for the Ecological Transition and Demographic Challenge

During 2022, two meetings of the Joint Commission were held in order to coordinate the operational, maintenance and availability needs of the Canadair aircrafts owned by MITECO and operated and maintained by the Group 43 of the Air Forces. Meetings were held on February 17 and December 15, respectively, to agree on the deployment and renewal of the aircraft fleet, as well as to analyse aspects of the 2022 campaign.

Committee for the Fight against Forest Fires (CLIF)

This is a technical committee for coordination between the competent administrations in the management of forest fires, chaired by the Deputy Director General for Forest Policy. During 2022, there were two ordinary meetings, before and after the summer season (June 9 and November 23, respectively), and one extraordinary meeting on September 29 to address subjects related to the *Royal Decree-law 15/2022, of August 1, that adopts urgent measures on forest fires*.

Centre for the Coordination of National Information on Forest Fires (CCINIF)

In accordance with Royal Decree-law 11/2005, the main functions of the CCINIF are to channel and make available to all the competent public administrations and in real time, all the available information related to: evolution of fire risk; material, technical and personal means available at all times; and forest fires, once they occur.

Information on operations involving the MITECO's State means is updated twice a day on the webpage. Likewise, the operations of the State means in the forest fires that occurred the previous day are published daily, and the link to the fire risk map published by the State Meteorological Agency for the next seven days is shown.

This information can be consulted updated daily at the following link:

<https://www.miteco.gob.es/es/biodiversidad/temas/incendios-forestales/estadisticas-actuaciones.aspx>

National Wildfire Preparedness Programme

Regarding to the preparedness actions promoted in 2022 by MITECO in the frame of this Programme, we can highlight the following:

- Joint exercises: MODEX international exercise in León (May 2022) gathered teams from five countries and two Autonomous Communities (Galicia and Extremadura), along with the resources of Castilla y León and MITECO. 300 people attended the joint exercise.
- Expert exchanges: an exchange on emergency organization in simultaneity situations was held in Santiago de Compostela (A Coruña) in October 2022. Representatives from 14 Autonomous Communities, SEPRONA (Guardia Civil), Group 43 of the Air Forces and the Emergency Military Unit attended the exchange.

Forest Fires Assessment and Advisory Team (FAST):

the team is formed by fire experts mainly from the Autonomous Communities and the State Administration, and they carry out assessment and advisory missions. During 2022, the FAST team participated in international assessment missions in Brazil, Dominican Republic and Argentina. In the national context, the team participated in suppression activities in two large fires: Losacio (Zamora) and Cebreros (Ávila).

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

1.2.26 Sweden

Fire danger in the 2022 fire season

The grass fire season started in March in southern Sweden and ended mid-June in the northernmost parts. The number of days with grass fire risk were similar to previous years.

The forest fire season started early in southern Sweden, and there was significant overlap with the grass fire season during May in central and southern Sweden. The spring was initially dry, and FWI levels increased during late April to reach high values already on May 2nd in parts of southern Sweden. Strong winds contributed to the high FWI values during May, and most of the larger fires of the year occurred during April and May (see section *Fire occurrence and affected area*)

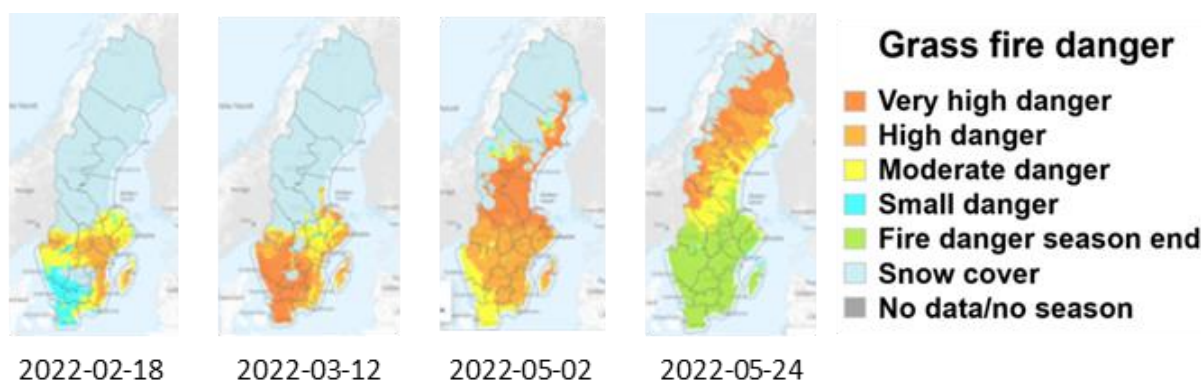


Figure 110. Maps representing the grass fire danger in February, March, early May and late May.

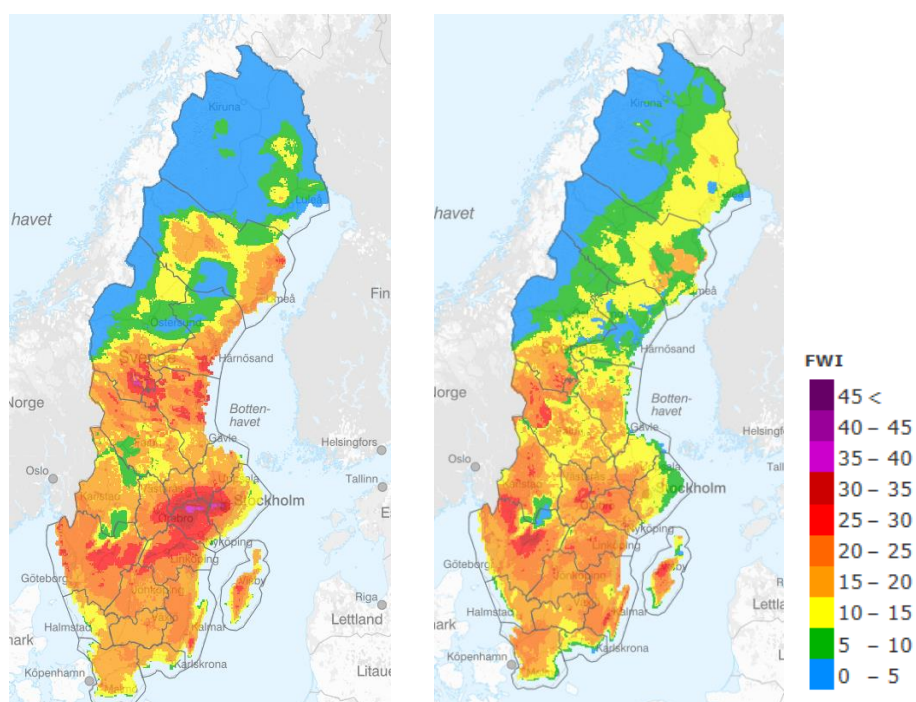


Figure 111. FWI values on 2 and 9 May 2022.

The variation between different parts of the country was significant during the summer of 2022. Much of northern Sweden received more precipitation than average, lowering fire danger levels for much of the summer. The weather in the south-eastern parts of the country was in contrast dryer than average, and fire danger levels in some of these areas were constantly high from May to September.

June and August were warmer than average. On July 21, temperatures reached 37.2 °C in south-eastern Sweden which is the highest level since 1947, not far from the highest temperatures ever recorded in Sweden. Despite this, July was on average slightly colder than normal over most of Sweden.

During 16-17 of August, thunderstorms with many lightning strikes caused a number of forest fires in the southeast of Sweden (see section *Fire occurrence and affected area*).

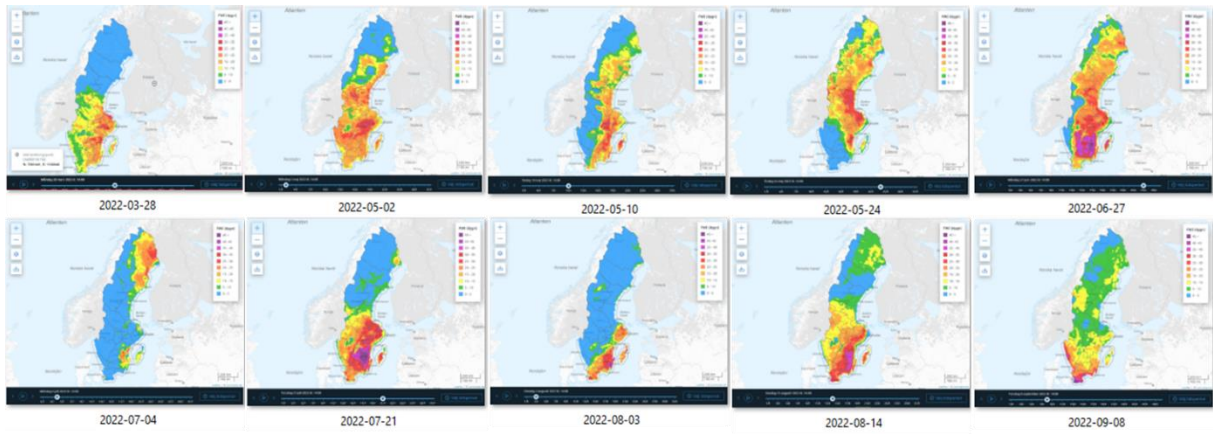


Figure 112. Maps of fire weather index (FWI) for representative days during the fire season show that the conditions in the south-eastern part of Sweden were consistently dry for most of 2022 while the rest of Sweden had more variable fire weather.

Activations of national resources and assistance to rescEU 2022

In 2022, the national airborne reinforcement resources were requested on 93 occasions to wildfires in Sweden. Overall, the airborne resources provided a fast and valuable support to the municipal rescue services. The resources were reallocated on a daily basis to locations with the highest fire risk. The number of activations has continued to increase as the rescue services have become more acquainted with requesting and using the airborne resources.

The Swedish rescEU resources (2 Air tractor Fire boss scooping planes) were activated on two occasions to assist in wildfires in Czechia and France.

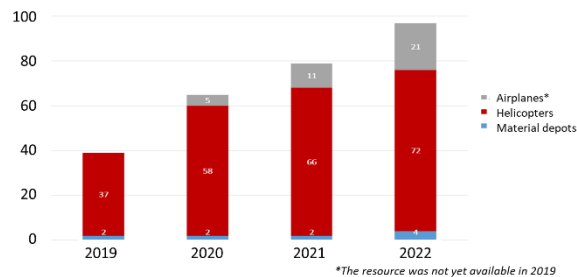


Figure 113. The number of activations of national resources (primarily airborne reinforcement) have continued to increase from 2019-2022 in Sweden.

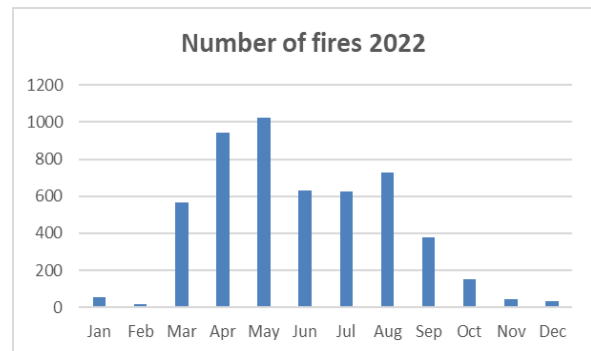
Fire occurrence and affected surfaces

The number of fires recorded during 2022 was 5 189. The burnt area consisted of 419 ha productive forest, 236 ha other wooded land, 102 ha other open land and 155 ha agriculture field or pasture.

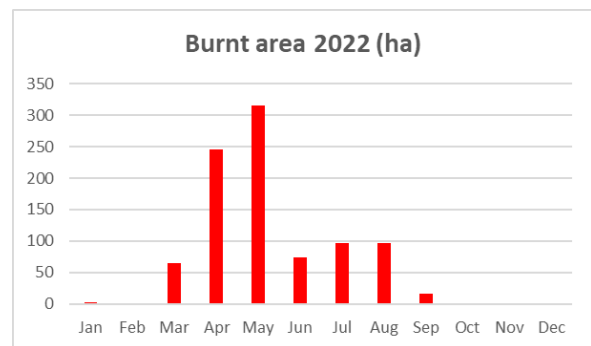
There were 12 fires equal to or larger than 10 ha. None of the fires exceeded 100 ha. The largest forest fire covered 80 ha and occurred on April 30th.

Five of the largest fires started in the period from the 26th of March to the 30th of April and six in the period of 2nd May to the 18th of May. The only fire larger than 10 ha during the summer months occurred on June 17th. The total burned area for those 12 fires was 292 ha (32% of the total burned area of 5 189 fires).

The monthly pattern of fire numbers and burnt areas in 2022 are shown in Figure 114.



(a)



(b)

Figure 114. Number of fires (a) and burnt area (b) per month in 2022.

The burnt area, number of fires and average fire size for the years 1998-2022 are shown in Figure 115.

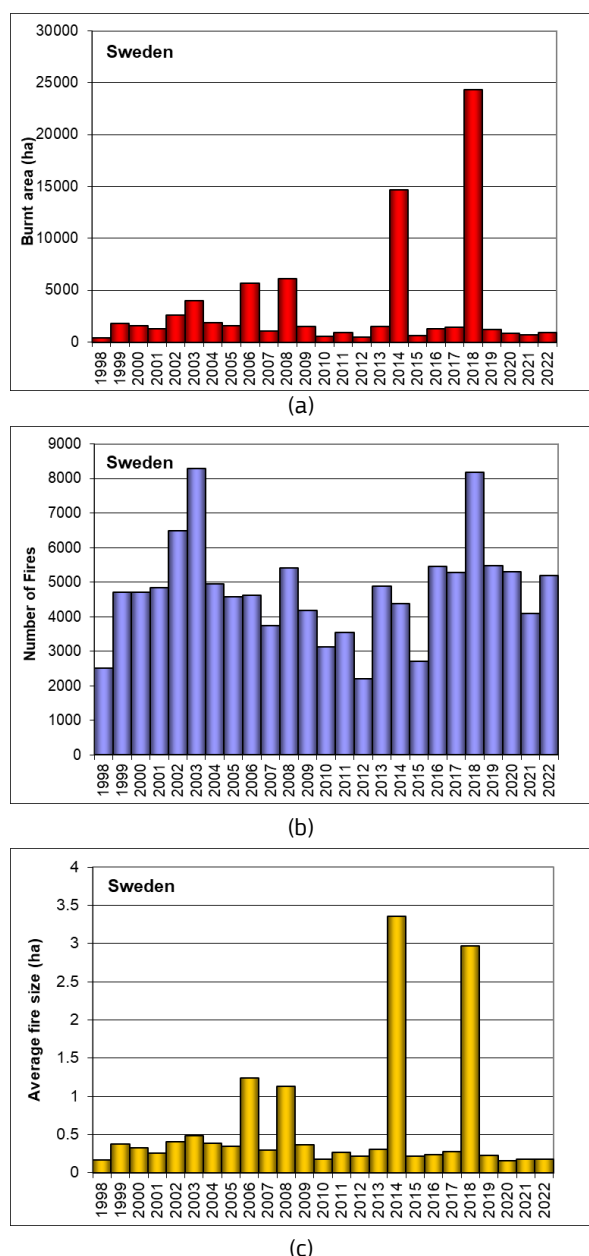


Figure 115. Burnt areas (a), number of fires (b) and average fire size (c) in Sweden from 1998 to 2022.

Injuries and loss of human life

During 2022, one civil person died in connection with wildfires. Furthermore, 23 civilians were injured, 11 of which were transported to healthcare.

Fire causes

During 2022 almost half of the fires had unknown causes (46 %) and 15% were deliberate. 14% were caused by use of fire, 5% known but not specified, 5% recreation and 4% lightning.

Climate change

The large differences in fire weather between years makes trends due to climate change difficult to identify over the relatively short time period where data is available. There seems to be a certain increase in the length of the season, where fire seasons start earlier and end later. The amount of snow cover also seems to decrease in southern Sweden. Further research is necessary to identify changes with more certainty.

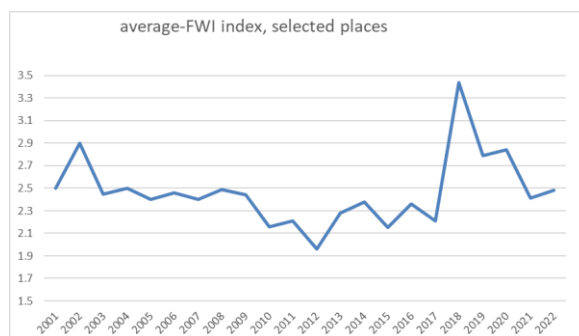


Figure 116. FWI-index for 2001-2022 at selected locations in Sweden. Research indicates that Sweden may on average have had lower FWI values during the last 20 year period than during the previous 40 year period, but projections indicate that both danger levels and the length of the fire season will increase going forward.

Early spring fire detected by satellite before public alarm

On May 9, 2022, a fire started that threatened several buildings. The fire spread quickly to cover an area of 20 hectares. Helicopters assisted with suppression of the fire in the more inaccessible parts of the terrain.



Figure 117. The left image above shows the narrow road over which the fire initially spread. The fire area and arrow showing the direction of fire spread and the buildings at risk of fire.



Figure 118. The municipal rescue service received assistance from the state with helicopters and a forest fire depot with extra equipment.

Fires in late summer caused by lightning

Lightning strikes caused a difficult situation at the end of the season in the southeast of Sweden. The ground fuels were very dry after a long period without rain, when thunderstorms brought a large number of lightning strikes that ignited a large number of forest fires.

The rescue services in the worst affected areas registered half of the entire year's number of vegetation fires in their district during the most intense two days, but managed to keep all fires small with support from national aerial resources and good regional cooperation. All the available national aerial resources were activated during those days. There were about 80 fires during a period of 5 days in south-eastern Sweden. Rain followed a few days later, causing local flooding that helped suppress the fires but strained municipal resources further in other ways.

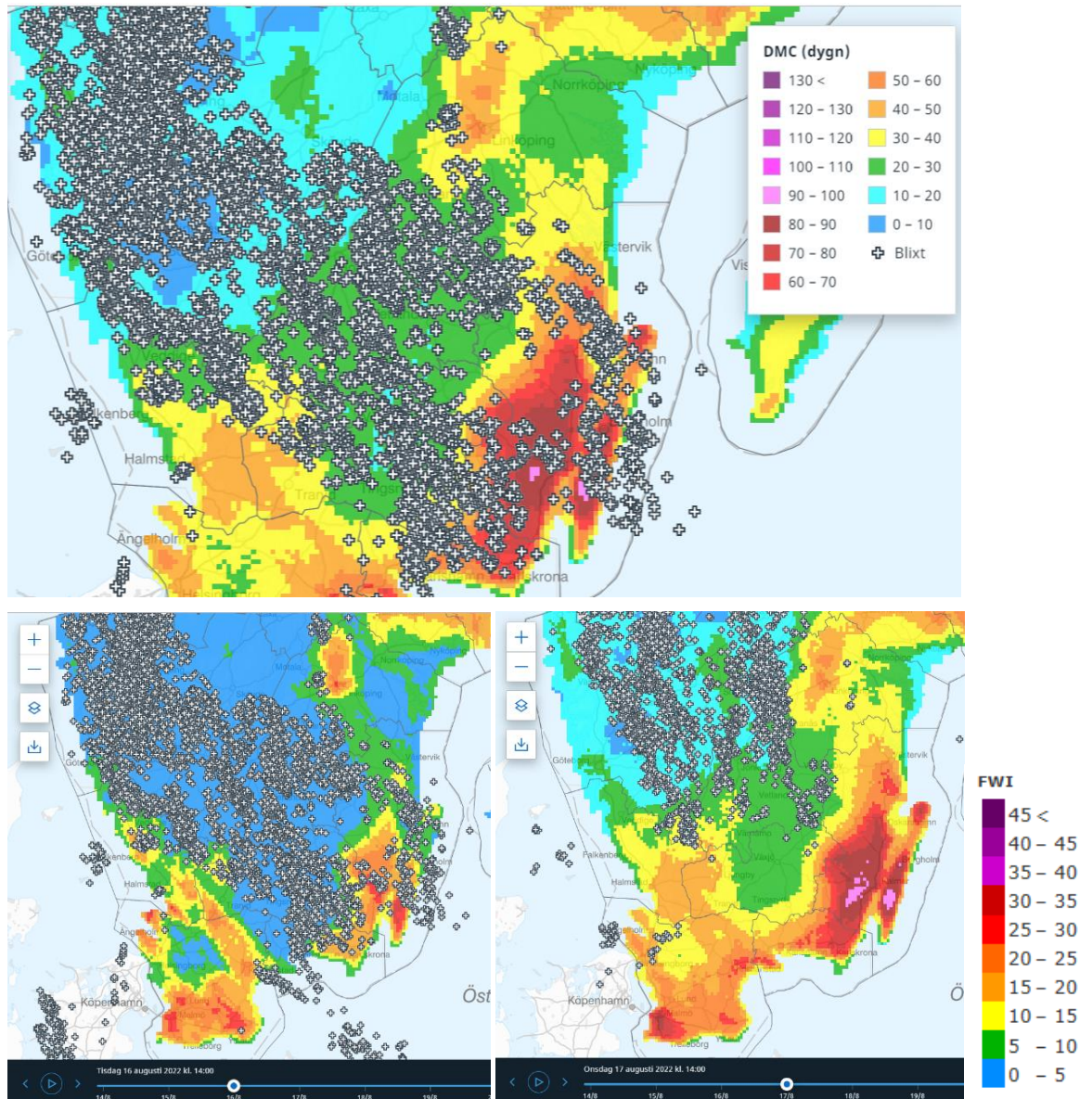


Figure 119. During the middle of August, severe thunderstorms occurred in southern Sweden. The ground fuels were very dry after a long drought, and the lightning strikes ignited many forest fires. About ten flying resources worked on fires on the worst days along with ground forces for final extinguishment of the fires. The maps show lightning registrations (marked with a cross). The top map shows the 16th of August with DMC values as background, the two bottom maps show the 16th and 17th of August with daily FWI values as background.

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

1.2.27 Switzerland

Weather conditions and state of the forests 2022

The year 2022 was the warmest and regionally the sunniest year since the beginning of the weather measurements in 1864.

The Winter 2021 / 2022 was warm with an average of 1.1 °C above the normal 1991-2020. On the southern side of the Alps it was the fourth to fifth sunniest and throughout dry Winter since the start of weather reporting. Only the Winter 1980/81 was drier on the southern side of the Swiss Alps. At the northern side of the Alps precipitation reached 90% of the 1991-2020 normal.

The spring was mild and sunny. With 2.6 degrees temperatures above the normal, May was the second warmest one since reporting started. Similarly, the Spring was also very sunny with a sunshine duration between 150 to 160% compared to the standard 1991 to 2020. Precipitation was very low and regionally one of the driest springs since the start of the weather measurements.

There were three prolonged heat waves in the summer of 2022. With 2.3°C above the normal 1991-2020 the summer was the second warmest after 2003 (+3°C above the normal). The first heat period started very early in June in the northern part of Switzerland, followed by a second period in the middle of July, and a last one at the beginning of August. In addition to the lack of precipitation, which regionally reached only 60 to 80% of the normal 1991-2020, the summer was very sunny. Due the high evaporation rate and less precipitation, wildfire danger was high.

The autumn of 2022 was again very warm (1.7°C above the normal 1991-2020) with peak temperatures in October of 3 to 4.5°C above the normal 1991-2020. On the northern side of the Alps the precipitation reached regionally 130% of the normal 1991-2020) At the southern side of the Alps there was only 60 to 90% of the precipitation, and regionally only 50%.

The end of the year 2022 was cool with snowfall down to the lowlands. At the year change 2022/2023, temperatures rose up again to 14 to 16°C.

Fire occurrence and affected surfaces

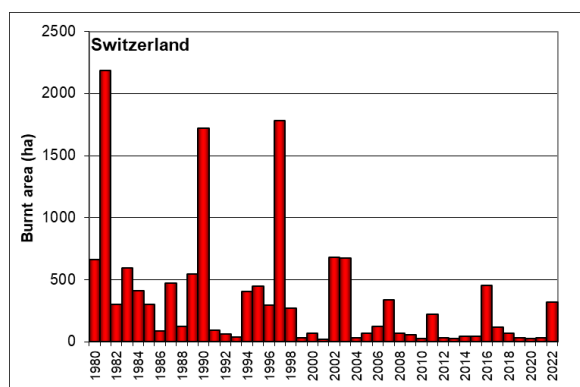
Due the prolonged drought on the southern side of the Alps, the wildfire activity started early with some small fires, followed by the biggest fire of the year in the night of January 30 at the Monte Gambarogno, on the Italian Swiss border. The fire was due to negligence and burned nearly 200 hectares of forest and grassland.

A few weeks later another wildfire of 92 hectares, ignited by the railway, occurred in Verdasio (Centovalli).

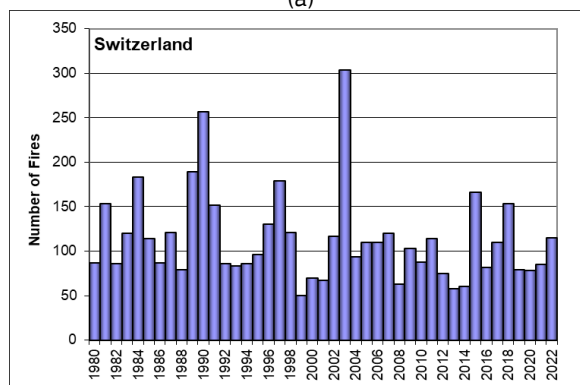
On the northern side of the Alps, wildfire activity was characterised by much smaller fires during the 2022 wildfire season.

In total 322.45 hectares burnt in 2022 and 115 wildfires are known.

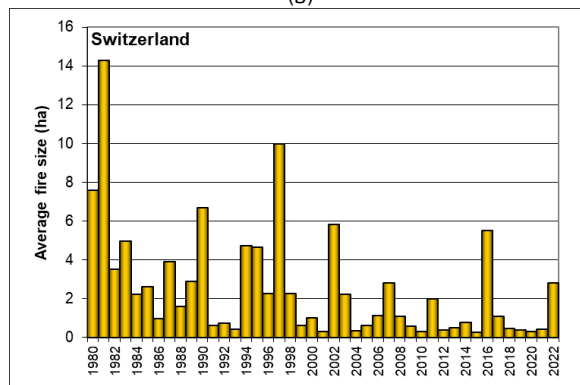
The winter half year was the main wildfire season in 2022, with 59 known wildfires and the majority of area burnt with 304.13 ha.. In the summer season, 56 wildfires occurred for a total area burnt of 18.32 ha.



(a)



(b)



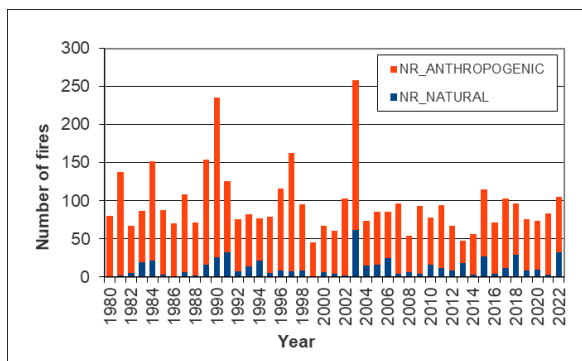
(c)

Figure 120. Burnt areas (a), number of fires (b) and average fire size (c) in Switzerland from 1980-2022.

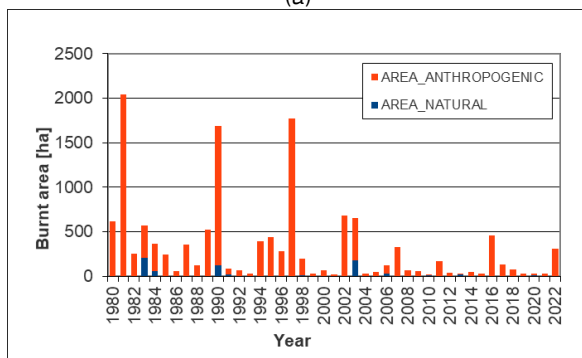
Fire Causes

The main cause of the wildfires was negligence, whereas during the summer of 2022, 32 lightning-ignited wildfires occurred.

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



(a)



(b)

Figure 121. Number of fires (a) and burnt area (b) by cause of fire (anthropogenic/natural)

Fire prevention activities

Due to the very dry conditions in late Winter and Spring in most parts of Switzerland, the wildfire danger was high from Spring 2022. In particular on the southern side of the Alps the wildfire danger level was very high, inducing an early fire ban. In the summer, wildfire danger increased again due to the three heat waves in relevant parts of Switzerland, where it reached high danger levels that imposed fire bans. This situation continued in parts of Switzerland into autumn. Only at the end of autumn / beginning of winter, precipitation relaxed the wildfire danger.

The Federal Office for the Environment (FOEN) introduced the national wildfire danger information and warning systems (called IGNIS) as an overall decision support system for the wildfire danger warning based on the Canadian FWI System. In addition to that, fire prevention communication was enhanced and measures to enhance the nationwide wildfire management have been started.

Loss of human life

No loss of life or major damage to buildings were reported in 2022.

1.2.28 Türkiye

Fire occurrence and affected surfaces

In Türkiye, the coastline, 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 Türkiye's forest area is located in fire sensitive areas (Figure 123).

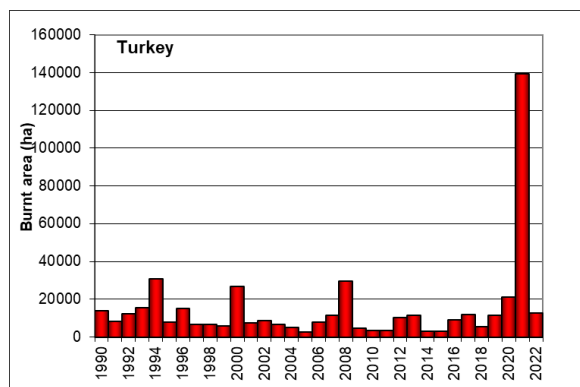
According to data derived from the General Directorate of Forestry, Department of Forest Fire Combating, in 2022 the total burnt area was 12 799 hectares. The number of fires was 2 160 in the same year.

Forest fires mostly occurred in March-December, particularly in June, July, August and September. When we look at the number of forest fires, July is the highest month with 334 fires and 2 398 ha (Table 47). Table 46 gives the forest fire statistics for Türkiye 1990-2022.

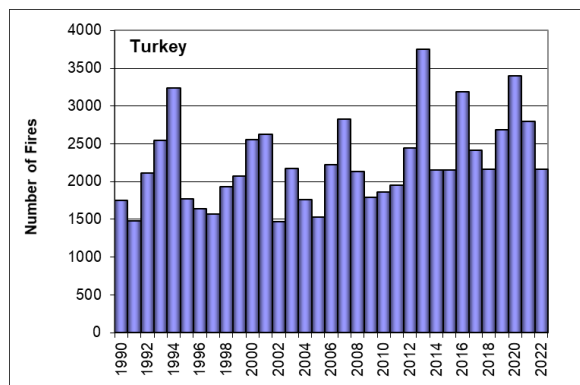
Table 46. Forest fires in Türkiye 1990-2022.

Year	Fire Number	Burnt Area (ha)
1990	1750	13742
1991	1481	8081
1992	2117	12232
1993	2545	15693
1994	3239	30828
1995	1770	7676
1996	1645	14922
1997	1569	6517
1998	1932	6764
1999	2075	5804
2000	2555	26653
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	3517
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
2020	3399	20971
2021	2793	139503
2022	2160	12799

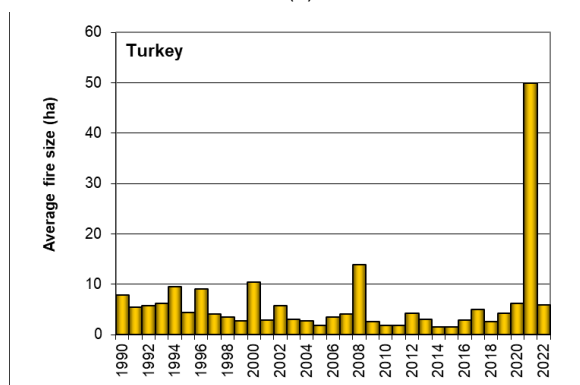
The yearly trends of numbers of fires and burnt areas in Türkiye since 1990 are shown in Figure 122.



(a)



(b)



(c)

Figure 122. Burnt areas (a), number of fires (b) and average fire size (c) in Türkiye from 1990 to 2022.

Table 47. Monthly distribution of forest fires in Türkiye 2022.

Month	Number Of Fires	Burnt Area (Ha)
Jan	20	12
Feb	21	6
Mar	85	57
Apr	194	982
May	246	147
Jun	214	4 589
Jul	334	2 398
Aug	325	397
Sep	320	3 445
Oct	211	649
Nov	163	112
Dec	27	5
TOTAL	2 160	12 799

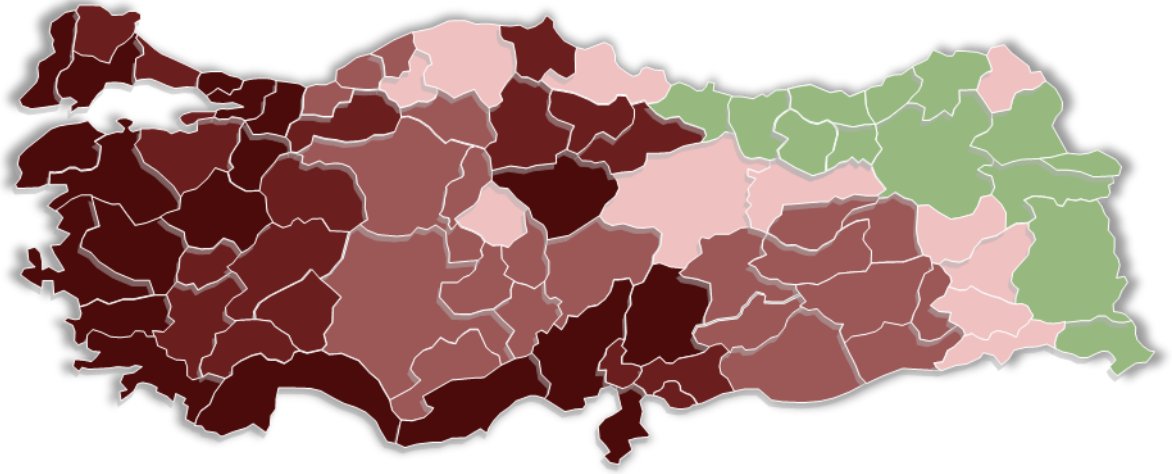


Figure 123. Türkiye Forest Fire Sensitive Map.



Figure 124. Agricultural fire in 2022.

In addition to forest fires, the General Directorate of Forest has been intervening in agricultural fires in recent years, which is about 3 087 non-forest incidents in 2022.

Fire Causes

In Türkiye, 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 Türkiye were caused by human activities (83% in total). The causes of forest fires in 2022 are shown in Figure 125.

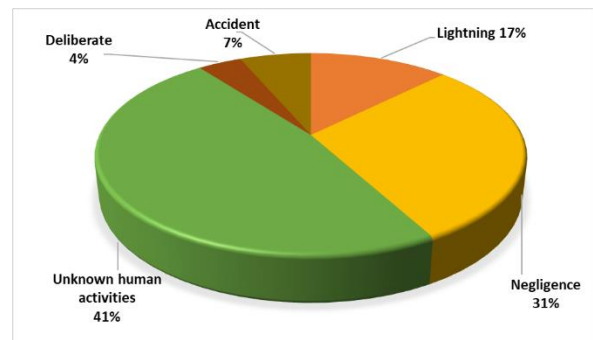


Figure 125. Fire causes in Türkiye in 2022.

Fire Management

Fire management in Türkiye 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.



Figure 126. Fire Management Centre in Ankara.

The most important factor that brings success in forest fires is early notice of forest fires, then early and effective response to the fire.

Türkiye is one of the countries that uses new generation technologies most effectively, such as artificial intelligence and machine learning in forest fires. In cases of combating forest fires, Türkiye are using cameras, UAV (Unmanned aerial vehicles) and a Decision Support System supported with artificial intelligence to help spot and manage them.

With the Decision Support System, the probability of fire is estimated and possible causes of forest fires are determined.

The infrastructure of this system consists of the behaviour patterns of forest fires that have occurred from the past to the present, the experience of the employees and the technical studies of the scientists.

By integrating these into the system, a fire behaviour prediction system is formed and the predicted response methods against possible fires are modelled in real time by combining machine learning and artificial intelligence support. This system supports managers in the coordination and decision making of forest fires.

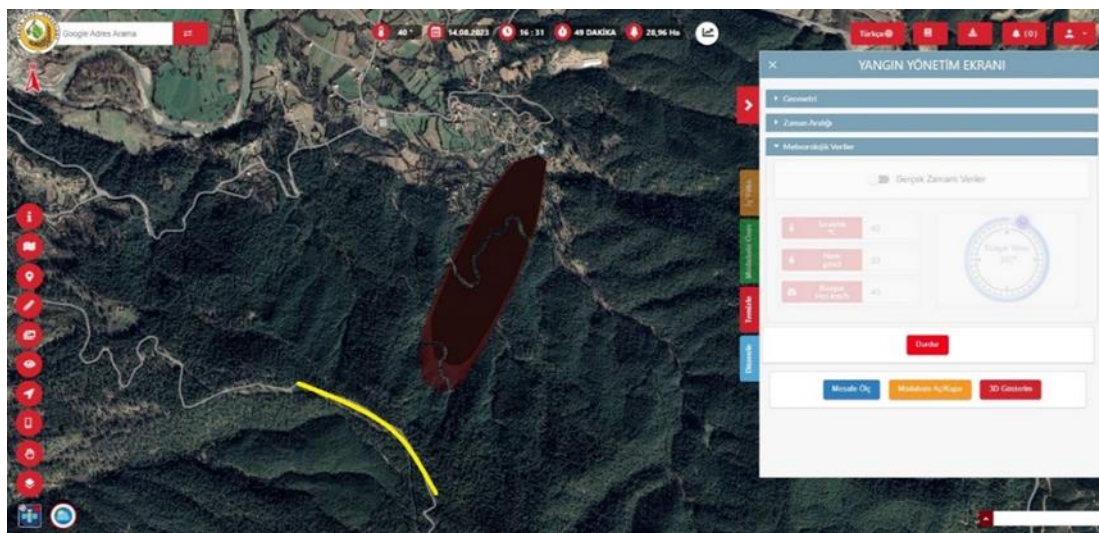


Figure 127. Decision Support System.

Early Fire Warning Systems

So far, total of 776 fire towers have been built to detect fires and report to firefighting teams. With 368 cameras at 184 points, fires detected in our forest in the fire sensitive zone area are reported to the fire management centres and teams are sent. In addition, forest fires are detected early thanks to 81 unmanned towers equipped with cameras and software.

The system enables rapid detection of forest fire to visible range optical cameras. (Fire Management Centres can also monitor the progress through these cameras. Figure 128).



Figure 128. The camera images from fire towers.

We have 6 UAV's stationed in Muğla, Manisa, Antalya, Adana, Kütahya and Çanakkale, and during the fire season, the UAVs make continuous observations for fire detection and fire management. With the UAV, 3 million hectares of land can be scanned against fires in 1 minute. Base stations have been installed on UAV's in order to meet the communication needs in places where there is no GSM coverage area.

Fire detection can be done easily with thermal cameras. Thermal cameras have been found to be very useful for dangers in the ongoing fires at the decision stage. With these tools, the managers are guided in the detection and management of forest fires.



Figure 129. The camera images from unmanned aircraft.

Construction of Pools and Ponds

During 2022, for the purpose of shortening the periods of forest fire attack in forested areas where water sources are scarce, 4 630 fire pools and ponds were used.

With these water sources, the water intake times of the helicopters were shortened (Figure 130).



Figure 130. Fire pools and ponds.

Fire Fighting Means

In 2022, 21 000 personnel were involved in fire detection, communication and extinguishing activities. Ground and air equipment used for firefighting in 2022 are presented in Table 48.

Table 48. Firefighting forces in Türkiye in 2022.

Land Means		Aerial Means	
Bulldozer	188	Leased Helicopter	61
Grader	301	Aircraft	21
Fire Truck	1240	Administrative helicopter	6
Water Tank	320	Staff	24 959
First intervention vehicle	2453	Volunteer	118 000
Motorcycle	465	Administrative Aircraft	2

Preventive measures

Fire sensitive Regional Forest Directorates

- Construction of fire prevention facilities: Between settlements or agricultural areas and forests, strips are created with fire resistant species. Thus, fires originating from settlements or agricultural lands are prevented from spreading to forests.
- By making silvicultural interventions in forests, it is ensured that the combustible material is reduced and the forests become resistant to fire.
- Fire safety roads and lanes are built and these lanes are maintained every year. In this way, physical barriers are created against forest fires on the one hand, and new fronts are created where fire can be intervened on the other.
- In order to reduce the combustible material load of our forests, cleaning of combustible materials on the roadsides and pruning of trees are carried out.



Figure 131. Preventive measures.

MEUS (Meteorological Early Warning System)

We have been using the MEUS (meteorological early warning system) with wind, wind direction, temperature and humidity to create our 3-day daily fire risk maps. (Figure 6). Measures are increased by evaluating hourly changes and relative risks.

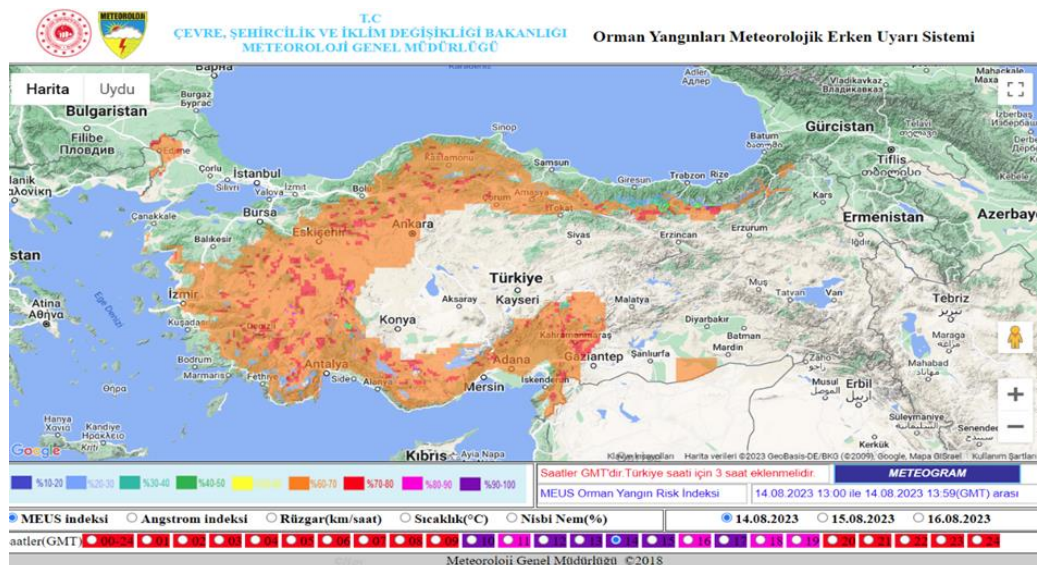


Figure 132. Example of daily fire risk map.

Education, Public awareness and information campaigns.

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

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.



Figure 133. International Forestry Training Centre in Antalya.

In Antalya International Forestry Training Centre for Personnel Training; a total of 4 300 OGM personnel were trained, including 1 248 forest engineers for Fire Specialization Training, 1 073 sprinkler operators for advanced driving techniques, and 1 979 forest guards. Within the scope of the Fire Management System Training, 238 people from 16 different countries were trained, and 744 people were trained within the scope of other trainings. A total of 5 270 people received training at the Training Centre.

Awareness-raising activities for target groups.



Figure 134. Awareness-raising activities in schools.

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.
- We reach our citizens through education and awareness-raising activities in schools throughout the year.

Table 49. Number of fires and burnt area in 2022 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		500.1 - 800 Ha		800.1 - 1500.0 Ha		> 1500 ha		TOTAL	
	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area	Nr Fire	Br Area
ADANA	97	12.9	7	14.61	3	40.3	0	0.0	0	0.0	1	418.7	0	0.0	0	0.0	0	0.0	108	486.5
AMASYA	38	8.2	6	14.08	3	36.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	47	59.2
ANKARA	32	2.9	1	2.00	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	33	4.9
ANTALYA	156	26.2	14	27.97	7	53.7	1	26.0	1	66.8	0	0.0	0	0.0	0	0.0	0	0.0	179	200.7
ARTVIN	9	0.9	2	6.92	1	11.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	12	18.9
BALIKESİR	79	13.4	8	17.54	2	24.6	1	28.3	1	97.4	0	0.0	0	0.0	0	0.0	0	0.0	91	181.2
BOLU	17	3.5	2	3.61	1	8.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	20	15.1
BURSA	70	13.3	7	14.29	1	12.1	0	0.0	2	240.9	0	0.0	0	0.0	0	0.0	0	0.0	80	280.6
ÇANAKKALE	114	18.2	12	24.64	3	42.0	1	28.0	0	0.0	1	490.0	0	0.0	0	0.0	0	0.0	131	602.8
DENİZLİ	45	13.7	4	11.90	0	0.0	0	0.0	0	0.0	1	261.9	0	0.0	0	0.0	0	0.0	50	287.4
ELAZIĞ	24	9.0	22	48.08	4	31.9	3	78.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	53	167.3
ERZURUM	19	3.9	4	12.35	0	0.0	0	0.0	1	116.4	0	0.0	0	0.0	0	0.0	0	0.0	24	132.7
ESKİŞEHİR	16	1.8	1	2.50	2	30.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	19	35.3
GİRESUN	16	4.7	5	13.09	4	36.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	25	54.6
HATAY	48	9.2	5	13.60	2	21.4	0	0.0	1	77.5	0	0.0	0	0.0	0	0.0	0	0.0	56	121.6
ISPARTA	35	4.1	3	4.09	1	13.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	39	21.3
İSTANBUL	73	13.3	17	44.10	2	16.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	92	73.4
İZMİR	232	53.9	44	101.52	7	69.3	4	130.3	4	319.9	2	625.3	0	0.0	0	0.0	0	0.0	293	1300.3
K.MARAŞ	78	14.5	4	11.21	1	15.9	1	29.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	84	70.6
KASTAMONU	36	3.6	1	1.50	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	37	5.1
KAYSERİ	14	2.1	3	4.27	1	8.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	18	15.0
KONYA	4	0.6	0	0.00	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.6
KÜTAHYA	54	4.4	2	3.41	0	0.0	0	0.0	0	0.0	1	268.1	0	0.0	0	0.0	0	0.0	57	275.9
MERSİN	89	14.4	6	17.76	2	25.1	0	0.0	0	0.0	0	0.0	0	0.0	2	2060.9	0	0.0	99	2118.1
MUĞLA	250	36.3	15	36.89	2	19.4	1	34.1	3	285.1	0	0.0	1	540.7	0	0.0	1	4392.5	273	5344.9
SAKARYA	52	12.2	6	14.66	1	5.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	59	32.6
ŞANLIURFA	56	18.7	26	66.34	17	159.7	2	52.0	1	90.4	0	0.0	0	0.0	0	0.0	0	0.0	102	387.16
SİNOP	5	0.2	1	2.00	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	2.2
TRABZON	19	6.3	4	12.89	1	6.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	24	25.4
ZONGULDAK	17	3.0	0	0.00	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	17	3.0
National Park	25	5.8	1	2.00	1	6.4	0	0.0	0	0.0	1	460.0	0	0.0	0	0.0	0	0.0	28	474.2
TOTAL	1819	335.3	233	549.8	69	695.3	14	406.1	14	1294.3	7	2523.9	1	540.7	2	2060.9	1	4392.5	2.16	12798.7

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

1.2.29 Ukraine

On the early morning of February 24, 2022, a full-scale invasion of the Russian Federation into Ukraine began. Intensive shelling and bombing as well as active combats on the ground resulted in an increase in frequency and burnt area of wildfires. Both sides (the Russian invasion forces and the Ukrainian Military Forces) were actively using forests and windbreaks as shelter for masking of one's forces and military means as well as for fortification settings. Usually the largest forest fires in Ukraine occurred in locations where pine forests dominate, but this year spatial distribution of forest fires were determined more by the front line and the combat intensity (Figure 135).

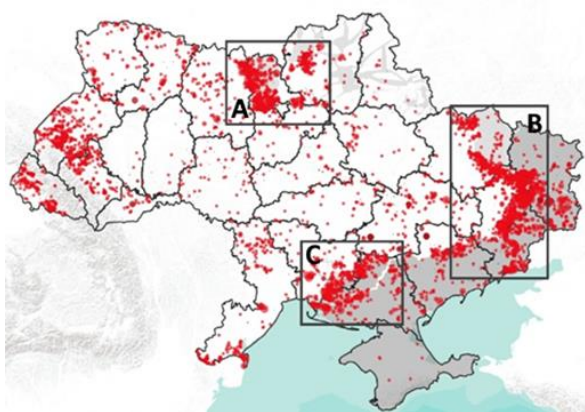


Figure 135. Landscape fires spatial distribution in 2022.
A - battle for Kyiv B - Eastern front C – South front.
(Based on European Forest Fire Information System (EFFIS) data)

Therefore, the existing war has had an extreme impact on changing the current fire regime in Ukraine and its main drivers, especially anthropogenic ones due to increasing of fire sources in landscapes because of shelling and dramatic demographic changes – as millions of people moved to safer regions of Ukraine. Large area of forest lands in Ukraine remain without fire prevention treatments and without any protection due to the high risk to firefighter's lives, especially in occupied territories and areas close to the frontline. Over 0.5 million hectares of forests that are managed by forest enterprises, institutions and organizations that are coordinated by the State Forest Resources Agency in the territory controlled by Ukraine were designated as contaminated by mines and UXO – it has had a serious impact on fire management effectiveness, both for now and for years in to come. The situation regarding forest contamination by UXO on temporarily occupied territories of the forest fund (Autonomous Republic of Crimea, part of Donetsk, Zaporizhzhya, Luhansk, Mykolaiv, Kharkiv and Kherson regions) remains unknown. Huge areas of forests still need demining – this means that this area has serious limitations in fire prevention and fire suppression, about 1.7 million hectares of forests are

considered as affected by the military aggression of the Russian federation.

Suppression of forest fires in the initial stage is usually the responsibility of the appropriate departments of forestry enterprises (branches of SE "Forests of Ukraine"). Usually 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. Despite this the implementation of Martial Law by the Ukrainian Parliament in February 2022 changed the situation with a scale of involvement of these services for large wildfire suppression – firefighters from the State Emergency Service of Ukraine have priority for fast response on fires in cities, towns and villages and fires connected with critical and civil infrastructure that still remain the prime target for Russian missile and rocket attacks. Many foresters (every 7th) that were involved in fire prevention and suppression activity had joined the Ukrainian Military Forces and as a result a significant number of highly experienced personnel were temporarily excluded from fire protection system.

On territories that were occupied (Zhytomyr, Kyiv, Chernihiv, Sumy, Kharkiv, Luhansk, Donetsk, Kherson, and other oblasts), Russian militaries stole or destroyed equipment like trucks, tractors, excavators, fire engines and other vehicles, as well as special equipment: fire lookout towers with fire detection cameras etc.

During 2022, wildfires occurred mainly in the War zone (Kyiv, Kharkiv, Luhansk, Donetsk and Kherson directions). In the west of the country, the number of fires increased in the Lviv and Transcarpathian regions – the most safe regions, the increase in fires is associated with the movement of refugees – to safe regions, mainly western ones, and up to 7 million people fled the war, which increased fire risks in natural ecosystems due to the human factor (negligence, land-use change, arsons), in the west of the country this year, weather conditions were more arid than in the North-Eastern regions.

Fire danger in the 2022 season

In the 2022 fire season, regions with a heightened vulnerability due to ongoing combat operations, such as Chernihiv, Sumy, Kharkiv, Poltava, Dnipro, and Luhansk, experienced a reduction in fire danger due to cold and rainy weather. Government-operated weather stations in areas affected by conflict, including Zhytomyr, Kyiv, Sumy, Kharkiv, Luhansk, Donetsk, Zaporizhia, Kherson, and Mykolaiv, recorded considerable precipitation, particularly during the spring and autumn months. April and May received 21.2 and 16.3 mm more rainfall compare to long-term average, whereas June and July encountered a shortage of precipitation (10.9 and 0.2 mm,

respectively) along with relatively high temperatures (25°C). These conditions raised fire danger rates, especially in pine forests. However, the spread of wildfires in open landscapes remained limited due to the high moisture content in grasslands and certain agricultural areas. From August until the end of the fire season, there was a significant increase in rainfall, surpassing the long-term regional average by 100 mm.

Another crucial factor affecting fire behaviour during the 2022 fire season was strong winds, particularly at the onset of spring. In April, maximum wind speeds reached up to 37.2 km/h. This, coupled with the availability of dry grass as fuel in open areas and the collapse of the fire management system in regions with active combats, resulted in large wildfires. Midway through the fire season, maximum wind speeds rarely exceeded 21.2 km/h, only picking up again towards the end of the season, with wind speeds reaching a maximum of 26.7 km/h in October.

According to the updated national system of fire danger assessment, which was adopted in 2018, the level of fire danger was not high. The number of days with a high and very high danger class during the 2022 fire season did not exceed 31 days, while in 2021 it was 84 days (Figure 136).

The FWI, a commonly used index that indicates fire danger based on weather conditions, was chosen to compare fire weather during 2022 fire season with longer time period (1988-2021) (Figure 137).

In 2022, a relatively low level of fire danger was observed – one of the lowest in the past 18 years. Considering this, it becomes apparent that the severity of Ukraine's 2022 fire season was mainly caused by war impacts, not extreme weather conditions.

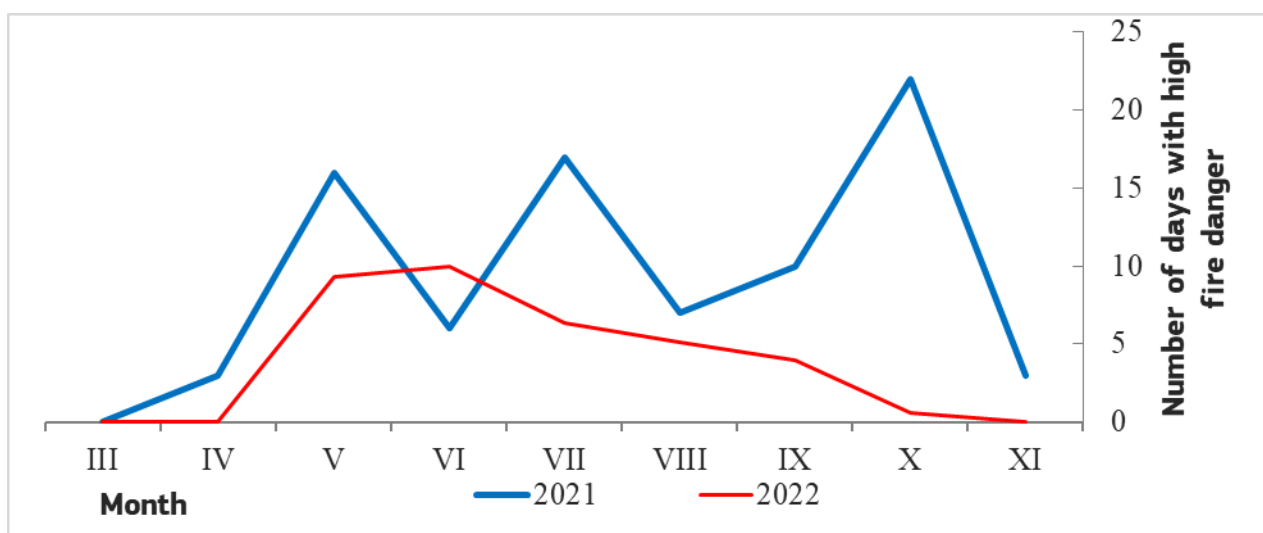


Figure 136. Fire danger indexes by national КПН index. 2021 vs 2022.

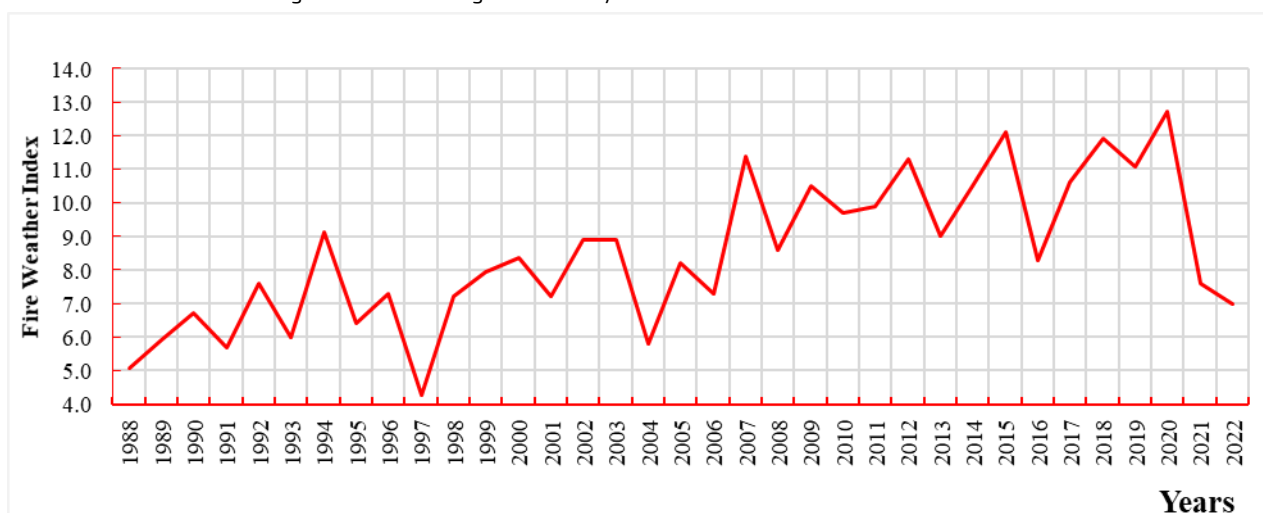


Figure 137. Fire Weather Index dynamics in Ukraine 1988-2022 based on average FWI values.

Fire occurrence and affected surfaces

The fire monitoring was carried out without taking into account a large part of the forests (in particular, Zaporizhzhya, Luhansk, Mykolaiv, Donetsk, Kherson and other regions), where military operations were conducted, and part of the territories of these regions are currently under the control of the occupiers. Due to this, total burnt area will be corrected only after the liberation and demining of temporarily occupied territories. The fire statistics comes only from enterprises that are under subordination of State Forest Resources Agency of Ukraine (73% of all forests).

In 2022, on controlled by Ukrainian government forests – 1 098 fires with the total burnt area of 18 100 hectares were recorded in the forests belonging to the State Forest Resources Agency of Ukraine (Figure 138), which is 1.5 times more than the number and 53 times more than the forest burnt area in the previous year. The average area of one fire increased 35 times and amounted to 16.5 hectares (Figure 139).

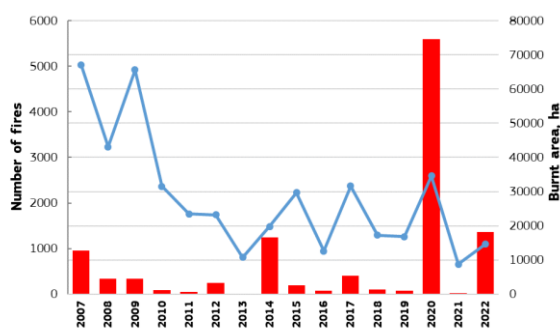


Figure 138. Burnt areas and number of in Ukraine from 2007 to 2022 (N.B. Official statistics are available only from liberated areas and only after verification by ground teams, so the real burnt area is much larger).

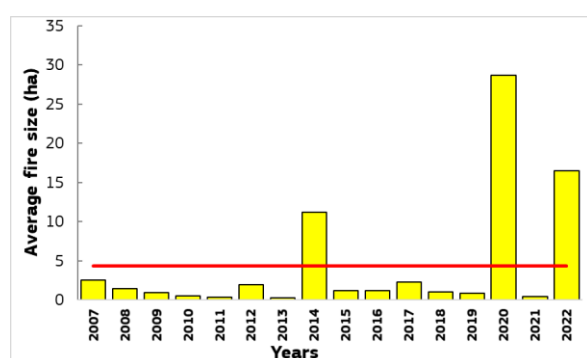


Figure 139. Average fire size in Ukraine from 2007 to 2022 (N.B. Official statistics are available only from liberated areas and only after verification by ground teams, so the real burnt area is much larger).

Most fires in 2022 occurred in the mid spring when active combats were combined with fuel availability (26% of all fires). The next peak of fire activity was in May (18.5% fires by number and 30% by burnt area) and August – during that month both armies intensively used forests for shelter and military operations (19% of fires by number) (Figure 140).

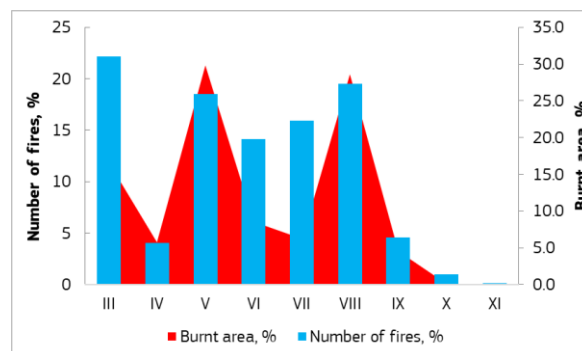


Figure 140. Number of fires and burnt area distribution by month in the 2022 fire season.

During the fire season, there were 202 large forest fires (burnt area size from 5 to 200 hectares). The total area of all large forest fires since the beginning of the year was 14.4 thousand hectares. The total area of large fires increased by 2 363 times compared to last year, that had similar weather conditions.

Only in the territories, controlled by Ukraine were registered crown fires on an area of 1 200 hectares. More than 50% of crown fires occur in August – especially in the East and South regions because of the impossibility of fire suppression actions. As a result, small surface fires grow into uncontrolled crown fires.

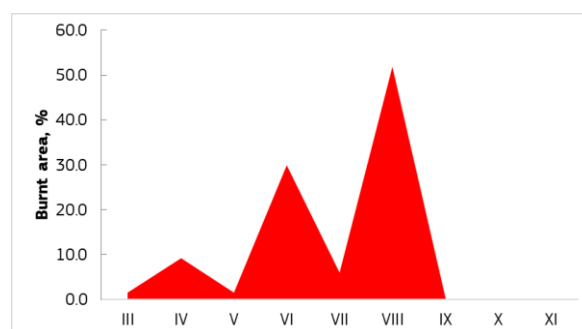


Figure 141. Crown fire distribution by month in 2022 fire season.

According to the remote sensing data, up to 144.7 thousand ha of forests (URIFFM study, which was based on data provided by EFFIS) were damaged by fires when including occupied territory.

Economic losses

The economic losses caused by forest fires are shown in Figure 142. In 2017 they were estimated to be around 43 800 000 Ukrainian hryvnia (UAH), in 2018 – 27 200 000 UAH, in 2019 – 6 700 000 UAH, in 2020 – 19 100 000 000 UAH, in 2021 – 2 100 000 UAH and in 2022 – 1 220 577 000 UAH.

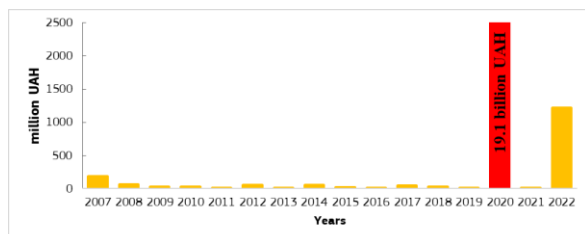


Figure 142. Economic losses caused by forest fires (data provided by the State Forest Resources Agency of Ukraine and State Service of Statistics)



Fire Causes

During the last decade, the majority of forest fires (more than 85%) were caused mainly by the negligence of local people. The main cause of forest fires was the violation of the fire safety requirements in forests during the fire season.

But this year the main cause of forest fires (62%) was the ignitions as a result of active hostilities, and shelling, as well as the presence of explosive objects in them (Figure 143).



Figure 143. Unexploded ordnances and their remains in the forests in the liberated territories. Source: State Environmental Inspectorate in Donetsk Oblast (Facebook).

Fire fighting means and fire prevention activities

The war had a serious impact on fire management, especially on fire prevention and fire suppression limitations. Despite this in order to prevent forest fires, enterprises installed almost 10.6 km of firebreaks and 35.2 thousand km of narrow fuelbreaks (up to 2.8 metres wide), and 153 thousand kilometres were maintained.

10 231 billboards, billboards, and posters on fire prevention are displayed in forest areas along public roads and in public recreation areas. 2 281 articles were published in mass media, 889 radio and 181 TV appearances were organized, 11 462 lectures and discussions were held on compliance with fire safety

requirements in forests. 12 485 unplanned roads were closed.

As mentioned before, Martial Law was declared and the restrictions of public access to forests and other natural landscapes were announced. In 17 regions, civilians are completely banned from visiting forests during the war, while in the remaining 7 regions, only cars are banned from entering during high rates of fire danger. These restrictions contributed to lowering the fire risks in territories not impacted by active combats.

Contamination of forest by mines and UXO leads for limitations especially in fuel management and fire suppression activity due to high risk for life of involved personnel (Figure 144).



Figure 144. Different types of Russian mines that were found in in the forests of the Izyum forestry (Kharkiv region). *Photo: Pavlo Domashkin.*

As of October 2022, the State Forest Resource Agency has documented the need to assess and demine approximately 0.5 million hectares of territory; in addition over an area over 0.8 million hectares, the situation remains unknown due to temporary occupation. The demining process is initially prioritizing urban areas, settlements, roads, and agricultural fields, with forests having the lowest priority. Demining activities have commenced in liberated regions, yet it has been observed that demining in forested areas presents greater challenges compared to other landscapes, with an estimated progress rate of around 12 square meters per day.

Under national legislation, specialized licensed authorities are responsible for conducting demining operations in Ukraine. The country receives international support for demining efforts, including assistance from organizations such as the United Nations Development Program (UNDP). To keep citizens informed, the State Service of Emergency Situation of Ukraine has launched a webpage (<https://dsns.gov.ua/map-demining>) which displays contamination areas and the extent of demining work accomplished throughout the territory of Ukraine (Status quo report, 2022).

Additionally, the government has taken steps to enhance awareness among forestry personnel regarding the risks associated with unexploded ordnance (UXO) contamination.

Training sessions have been organized to educate foresters on mine identification and safety protocols.

A Special State Mine Action Centre has been founded to facilitate the coordination among multiple organizations, including government agencies, non-governmental organizations (NGOs), and international donors.

During the 2022 fire season 23 administrative buildings and forest fire stations were destroyed or captured and 85 were damaged. 34 fire trucks and 21 fire modules were captured, destroyed or damaged. Fire monitoring equipment which provided fast fire detection was also partly lost: 20 fire watch towers with television surveillance systems were destroyed or damaged.

The State Forest Resource Agency (09/10/2022) reported that from the start of the war 2 659 foresters involved in fire prevention and fire suppression activity have been mobilized (every seventh one is involved in a war activity).

Due to the war 42 foresters were killed and 66 injured, 64 are missing.

Research activities

In 2022, several research projects and guidelines aimed at improving fire management were completed:

- 1) "To study features of pyrogenic damage in forests growing in different natural zones in Ukraine and develop the activities to reduce its negative consequences". S. Sydorenko, Ye. Melnyk, I. Koval, V. Voron, J. Kaczmarowski, V. Korsovetskyi. Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky (URIFFM)– Forest Ecology Sector. Steppe Branch of URIFFM.

The project was started in 2020, the project duration is 5 years. Project was started at the request of the State Forest Resources Agency of Ukraine (State Registration No 0120U101893). During 2022 the following working packages were completed:

- to improve the National scale of natural forest hazard. This scale is used for identification of the most flammable forest sites and used for fire prevention plans preparation on the national scale to justify providing additional fuel management treatments and other fire prevention activity.
 - methodology for open landscapes fire danger assessment was prepared based on GFDI (grass fire danger index) methodology and usage of remote sensing data.
- 2) "Forest protection. Terms and definitions" / Meshkova V., Davydenko K., Sydorenko S., Budzinskyi I., Gontaruk M., Korzun S., Vygovskyi I. / Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky (URIFFM). This national standard will establish main terms and definitions in the industry of forestry in relation to forest protection and fire management and intended to harmonize European and Ukrainian forest protection terminology.
 - 3) Forest management on territories contaminated with unexploded ordnance legislations for territories contaminated with unexploded ordnance. Zibtsev S., Soshenskyi O., Myroniuk V., Gumeniuk V., Meshkova V., Buksha I., Vasyliuk O. 10.13140/RG.2.2.22495.12966. The guidelines describe a systematic approach to forest management in the territories contaminated with unexploded ordnance, which will increase the safety of forestry staff, representatives of other services and the local population.

References:

Poliakova Liubov, Abruscato Silvia (2022). STATUS QUO REPORT – Supporting the recovery and sustainable management of Ukrainian forests and its forest sector. FOREST EUROPE – Liaison Unit Bonn Rapid Response Mechanism - Emerging Issues. Available at: https://foresteurope.org/publications_type/status-quo-report-supporting-the-recovery-and-sustainable-management-of-ukrainian-forests-and-its-forest-sector/

Public Report of Head of State Forest Resources Agency of Ukraine, 2022. Available at: https://forest.gov.ua/storage/app/sites/8/publich_zvit/publichnii-zvit-za-2022.pdf

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

1.2.30 United Kingdom

Introduction

Parts of the UK experienced a fifth 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. The peak was the 19th July 2022, when over 95 residential properties were destroyed in London, Norfolk and Yorkshire as well as 14 Fire and Rescue Services declaring Major Incidents on the same day.

Fire danger in the 2021 season

The Met Office reported that 2022 was the warmest year on record for the UK in a series from 1884 for maximum and mean temperatures, and it was the second warmest for minimum temperature (behind only 2014). All individual months except December were warmer than average. It was also the warmest year on record for the Central England Temperature (CET) series from 1659. Rainfall was mostly below average for the year, with the months from January to August, and December, all being generally drier than average. The autumn months were wetter than average, although this was not enough to fully offset the deficit from the previous eight months. It was a sunnier than average year for most areas, especially eastern England, with only some northern and western fringes recording less sunshine than average.

Extreme heatwaves in the summer months included temperatures in excess of 40°C being recorded in the UK for the first time. It was the driest January-August period since 1976 and drought conditions were declared across parts of England and Wales. The provisional UK rainfall total for 2022 was 1 051 mm, which is 90% of the 1991-2020 average. Parts of East Anglia saw only around 70% of their annual average rainfall.

UK wildfire conference

The UK Wildfire conference was held in 2022 after being delayed due to Covid in 2021. The conference was hosted by the Northern Ireland Environment Agency (NIEA), Northern Ireland Fire and Rescue Service and International Association of Wildland Fires (IAWF) and the theme was 'The Human Dimensions'. The conference attracted speakers and delegates across the United Kingdom and across the world. <https://www.ukwildfireconference2022.org/>

England and Wales

There were 983 wildfires recorded on the National Resilience Reporting Tool (NRT). This represents a 573% increase on 2021 reporting period.

UK Fire and Rescue services continue to apply the following criteria to differentiate between more severe and impactful wildfires and other vegetation fires.

- Involves a geographical area of at least one hectare (10 000 square metres);
- Has a sustained flame length of more than 1.5 metres;
- Requires a committed resource of at least four fire and rescue service appliances/resources;
- Requires resources to be committed for at least six hours;
- Presents a serious threat to life, environment, property and infrastructure.

This definition is taken from the UK Fire and Rescue Service National Operational Guidance (NOG) for Wildfires (2016).

Across this reporting period there has been a steady rise in the number of Wildfire events recorded on the National Reporting Tool (NRT) across the preceding years. This year on year trend has accelerated significantly across 2022, driven by exceptional weather conditions, which saw the UK's warmest year so far on record (January to August), the driest since 1976, and England's warmest summer on record.

In terms of context setting: There were 84 separate wildfires recorded over a 48-hour period on the 18th and 19th of July 2022.

On the 19th of July 2022, 14 Fire and Rescue Services declared Major Incidents, 9 of which were due to the capacity to maintain business as usual while responding to the greater operational demands posed by wildfires.

During 2022, there were also a very high number of spring fires in March and April (246) a figure that equalled the total number of wildfires from the previous year.

The exceptionally high numbers of wildfires across July and August (665) are also unprecedented on the previous reporting years.

It is a significant cause for concern that under similar conditions this may signal the start of a worrying pattern where early spring wildfires extend through to a second wildfire season, with high numbers of events lasting through until late summer.

The National Fire Chiefs Council (NFCC) continued to look for collaboration opportunities with partners and key stakeholders to highlight the risk of wildfire to share areas of learning and new opportunities across the UK. We continue to embed our Wildfire Tactical Adviser (WTA) capability during the 2022 season. The WTAs have been deployed to support and advise various Fire and Rescue Services (FRS) when dealing with wildfire incidents.

NFCC currently has 47 wildfire tactical advisors trained and available for deployment. Colleagues within UK National Resilience have taken on an integral role in coordinating the management and deployment of the WTAs, as set out within our current Wildfire Tac-Ad Concept of Operations.

NFCC continues to embed and enhance our communication strategy to provide support at a national and local level to support and coordinate FRS in the delivery of appropriate and timely wildfire prevention and safety messaging.

England and Wales Wildfire Forum

The England and Wales Wildfire Forum (EWWF) is a multi-agency stakeholder group of public, private and third-sector parties which works to address wildfire issues. Throughout 2022, the forum continued to share updates amongst members about relevant policy, guidance, research, opportunities and news about wildfires.

Wildfire Framework for England

The Home Office has produced a Wildfire Framework with support from the EWWF and government departments, principally Defra, the Cabinet Office and the Department for Levelling Up, Housing and Communities (DLUHC). This is a significant, and very welcome, document as it *“identifies responsibilities, clarifies relationships and facilitates coordination at government level and between key wildfire stakeholders, in England.”* Therefore, it is of fundamental importance to guiding how the EWWF and other partners liaise with government in a coordinated approach to wildfire mitigation.

<https://fireengland.uk/sites/default/files/2021-12/211220%20Wildfire%20Framework%20for%20England.pdf>

Scotland

In the past eleven years, from January 2010 to December 2021, 21% of large outdoor fires occurred in the month of March, 38% in April and 20% in May. In calendar year 2022, 45% of large outdoor fires occurred in the month of March and 21% in the month of April. 69% of large outdoor fires in 2022 occurred in Spring and 25% in Summer.

2022 was the warmest year on record for the UK. While many will remember the summer’s extreme heat, what has been noteworthy this year has been the relatively consistent heat through the year, with every month except December being warmer than average.

In January to December 2022, 34% occurred in Highland, 8% in Na h Eileanan Siar and 8% in Aberdeenshire.

60% of large outdoor fires over 1 hectare from 2010 to 2022 were extinguished within 6 hours, 31% within 6 to 24 hours, and 9% were protracted incidents lasting more than 24 hours.

Of the 61 fires lasting more than 24 hours, 54% were located in Highland, followed by 8% in Argyll and Bute, 8% in Na h Eileanan Siar, down to 1.6% in Scottish Borders, North Lanarkshire and Aberdeenshire.

77% of all large outdoor fires occurred between March and May. Of the 61 fires lasting more than 24 hours, over half (56%) occurred during this period.

In general, with climate change, we may be seeing hotter, drier summers and wetter, warmer winters. This could increase the chances for wildfires to occur, which is why preventative measures are more important than ever.

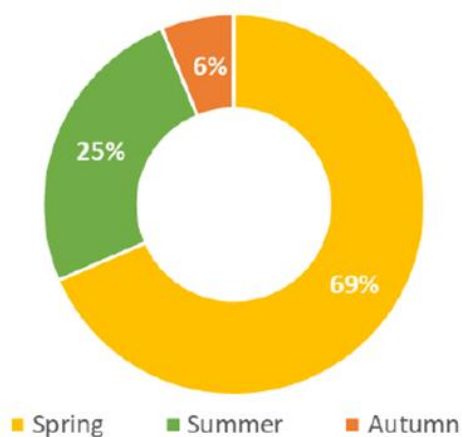
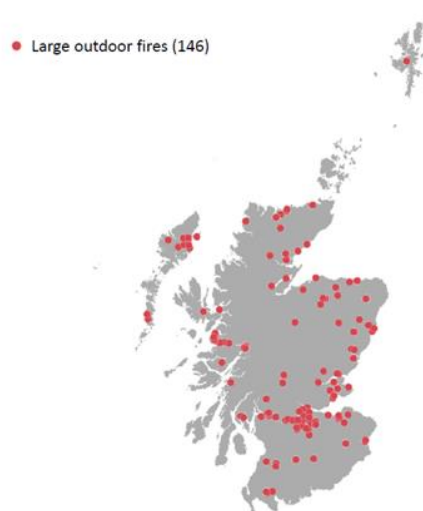


Figure 145. Seasonal distribution of large outdoor fires in 2022.

The location of large outdoor fires in Scotland is provided below.



These maps were created using ArcGIS Online

Figure 146. Location of large outdoor fires in Scotland in 2022.

Northern Ireland

The Forest Service Emergency Fire Plan was activated from mid-March 2022 to late June 2022. During this period, NI Fire and Rescue Service, supported by Forest Service staff, attended 5 fire incidents with a resulting burnt area of approximately 10.2 hectares of forested land and 4.8 hectares of open ground on Forest Service managed property. In response to wildfire warnings issued across the UK in August, the Forest Service collaborated with the Northern Ireland Fire & Rescue Service and adopted a high state of preparedness.

Fire prevention activities and information campaigns

The Department for Environment, Food and Rural Affairs (DEFRA), including Forestry Commission, National Parks and Natural England as well as Devolved Administrations supported Fire and Rescue Services using social media and other approaches to inform and warn the public of a period of high wildfire risk.

Lantra accredited Vegetation Fire Training was funded by the Department for Environment, Food and Rural Affairs (DEFRA) and developed and implemented by Forestry Commission for land managers and researchers. This includes training modules on wildfire response, prescribed fire operations and planning and Wildfire Management Planning.

Operations of mutual assistance

No requests were made to the United Kingdom for mutual assistance for wildfire incidents during 2022.

Climate change

Her Majesty Government published its response to the 3rd Climate Change Risk Assessment (CCRA) for the United Kingdom including links to wildfire across the priority risk areas.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1047003/climate-change-risk-assessment-2022.pdf

Wildfire was confirmed as a cross-sector risk linking to: infrastructure, heath, 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

[“Toward a UK fire danger rating system: Understanding fuels, fire behaviour and impacts”](#)

2022 brought a period of stability to the research activities of the UKFDRS project after the Covid-19 disruption in 2020 and 2021. We were able to

continue with our field monitoring and laboratory work, as well as progress work on earth observation and modelling activities. We also welcomed new research technicians to the project, two undergraduate student interns over the summer and a visiting researcher during autumn 2022.

The extreme heat in July 2022 proved to be a challenging period for the wildfire community across the UK. We were able to keep the field monitoring going to capture the fuel moisture and flammability dynamics under these extreme conditions. These data sets are being worked up and will be presented at upcoming conferences and prepared for publication in due course.

Team members attended and presented at a range of conferences across the UK and Europe, including the 2022 UK Wildfire Conference in Belfast, and continued to provide media contributions to print, TV and radio. You can find details on all of these via the project website.

For more information, please visit the project website (www.ukfdrs.com) or find us on Twitter (@ukfdrs).

2022 saw the continuation 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. UK partners in Pyrolife are Nick Kettridge at University of Birmingham and Guillermo Rein at Imperial College London.

UK Wildfire Research Group

After the successful 2022 UK Wildfire Conference, the UK Wildfire Research Group had a follow-on meeting to discuss the key messages from the conference around human dimensions of UK wildfire and how we can develop research projects to address key research gaps.

The group also contributed to a discussion around the development of wildfire related actions for the National Adaptation Programme. To connect with the group, visit <https://ukwildfireresearch.co.uk/>.

(Source: Forestry Commission; DEFRA, UK).

1.3 Comparison of Southern EU countries with longer time series (1980-2022)



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

Figure 147a 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.

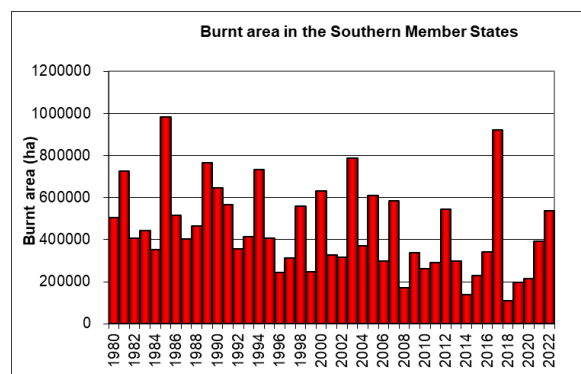
The total burnt area in 2022 was 538 846 ha (Figure 147a), the highest since 2017 and greater than the long term average for every previous decade except the 1980s. Of the five countries, Spain was the worst affected country with 267 947 ha recorded as burnt.

Figure 147b 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. However, in 2022 the total number of fires was 51 184, the highest recorded since 2012. The highest number of fires was, unusually, recorded in France with 22 796 fires; see Table 50 and Annex 1 for details.

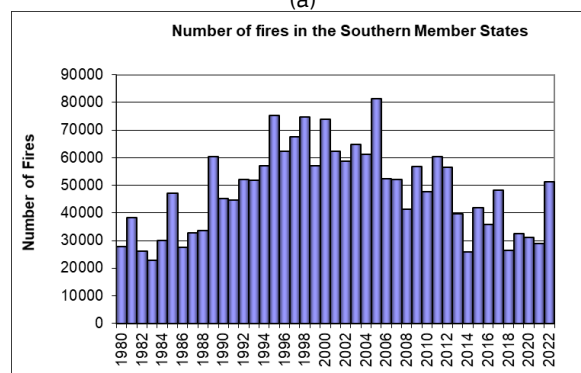
Figure 147c shows the yearly average fire size in the five countries since 1980. There is generally a difference in average fire size before and after 1990. This is a similar trend to that observed in the number of fires and is also partly due to the same reasons (the additional fires that are recorded thanks to the improvements in the statistical systems are the smallest ones). It is also largely due to the improvements of the fire protection services of the countries.

However, recent years have seen some large average fire sizes that compare with the figures of the 1980s.

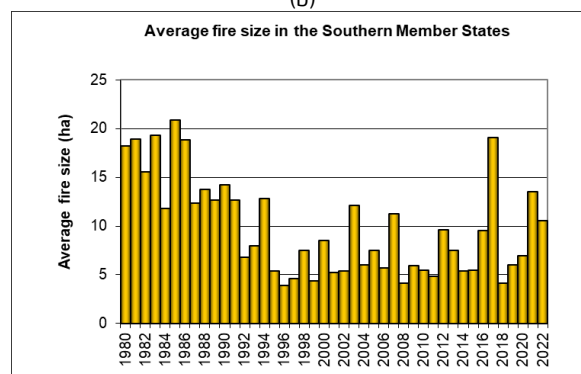
In 2022 the average fire size was 10.5 ha, the third highest (after 2017 and 2021) since 2007. France was particularly affected, with the highest recorded average fire size since 1990.



(a)



(b)



(c)

Figure 147. Burnt area (a) number of fires (b) and average fire size (c) in the five Southern Member States since 1980.

Figure 148 compares the yearly averages of burnt areas, number of fires and average fire size for the periods 1980-89; 1990-1999, 2000-2009, 2010-2019 and 2020-2022 with the figures for 2022. It shows each of the 5 countries separately and also their total.

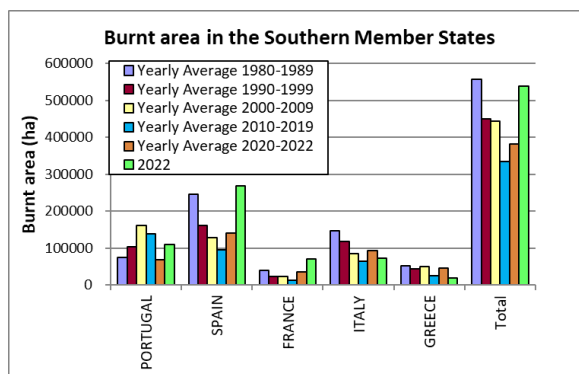
Table 50 gives a summary of the burnt areas and number of fires for the last 42 years, the average for the 1980s, the 1990s, the 2000s, the 2010s and the average for the last 3 years, together with the figures for 2022 alone.

The total number of fires and also the average fire size was higher than the average for the last four decades. Only the 1980s had a higher number on average. France in particular recorded the highest number of fires and average fire size for several decades (Figure 148).

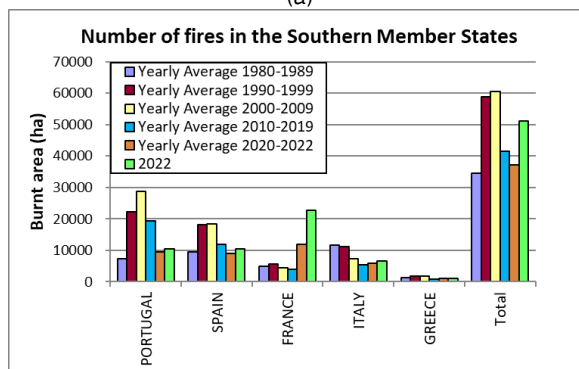
Figure 149 shows the contribution of each of the five Member States in terms of burnt areas and number of fires to the overall figures for all five countries in 2022.

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.

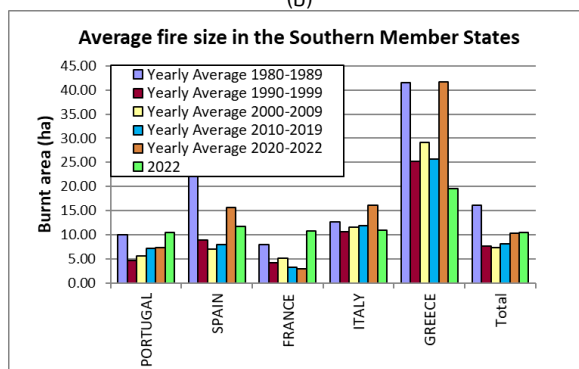
In 2022, France unusually recorded 45% of the total number of fires in the region (Figure 149b), but Spain experienced the highest proportion of burnt area (50% of the total, Figure 149a).



(a)

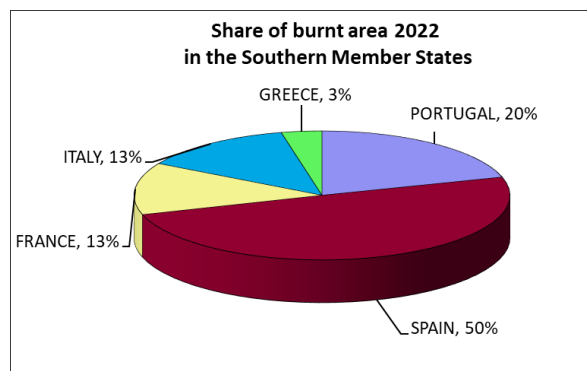


(b)

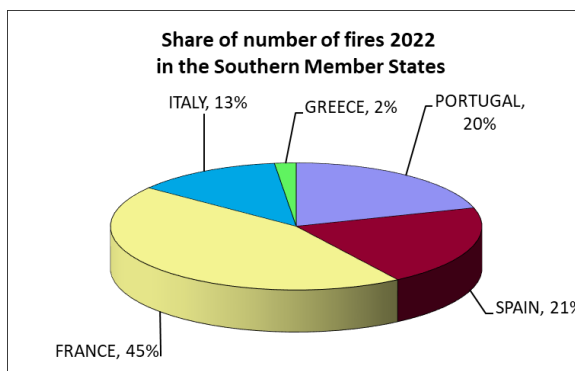


(c)

Figure 148. Burnt areas (a), number of fires (b) and average fire size (c) in the five Southern Member States in the year 2022 as compared with average values for previous decades.



(a)



(b)

Figure 149. Share of the total burnt area (a) and the total number of fires (b) in each of the Southern Member State for 2022.

Table 50. Number of fires and burnt area in the five Southern Member States in the last 43 years.

<i>Number of fires</i>	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE	TOTAL
2022	10 390	10 507	22 796	6 529	962	51 184
% of total in 2022	20%	21%	45%	13%	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	28 774	18 369	4 421	7 259	1 695	60 517
Average 2010-2019	19 362	11 860	3 913	5 420	946	41 501
Average 2020-2022	9 398	9 011	11 832	5 794	1 091	37 126
Average 1980-2022	18 741	14 093	5 193	8 641	1 390	48 058
TOTAL (1980-2022)	805 868	605 986	223 308	371 556	59 788	2 066 506

<i>Burnt areas (ha)</i>	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE	TOTAL
2022	110 097	267 947	70 301	71 694	18 807	538 846
% of total in 2021	20%	50%	13%	13%	3%	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	160 985	127 229	22 363	83 878	49 238	443 693
Average 2010-2019	138 084	94 514	12 582	63 907	24 220	333 307
Average 2020-2022	68 542	140 583	34 622	93 105	45 508	382 360
Average 1980-2022	115 191	155 820	24 936	102 660	42 706	441 312
TOTAL (1980-2022)	4 953 195	6 700 249	1 072 229	4 414 391	1 836 351	18 976 413

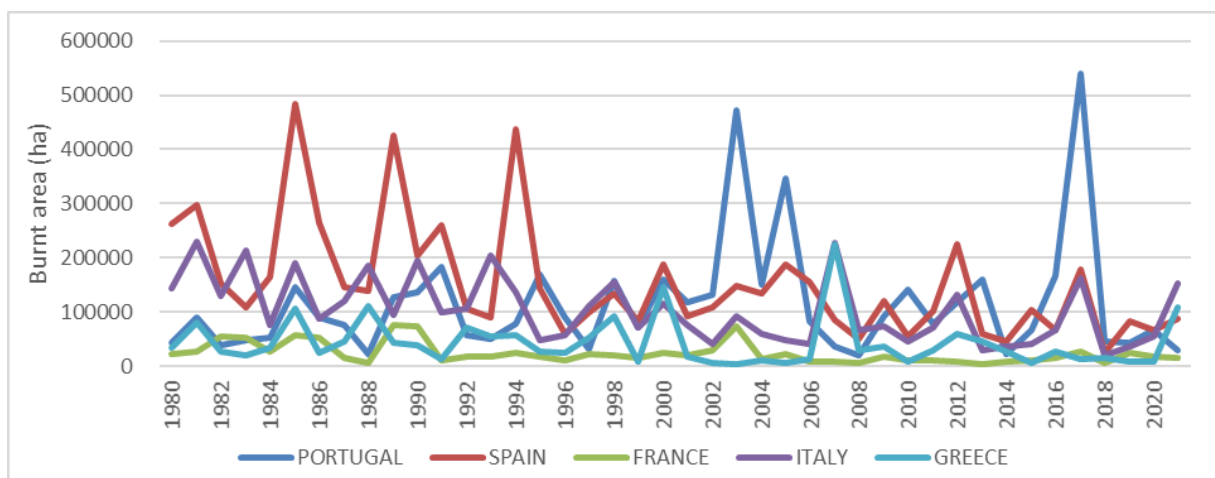
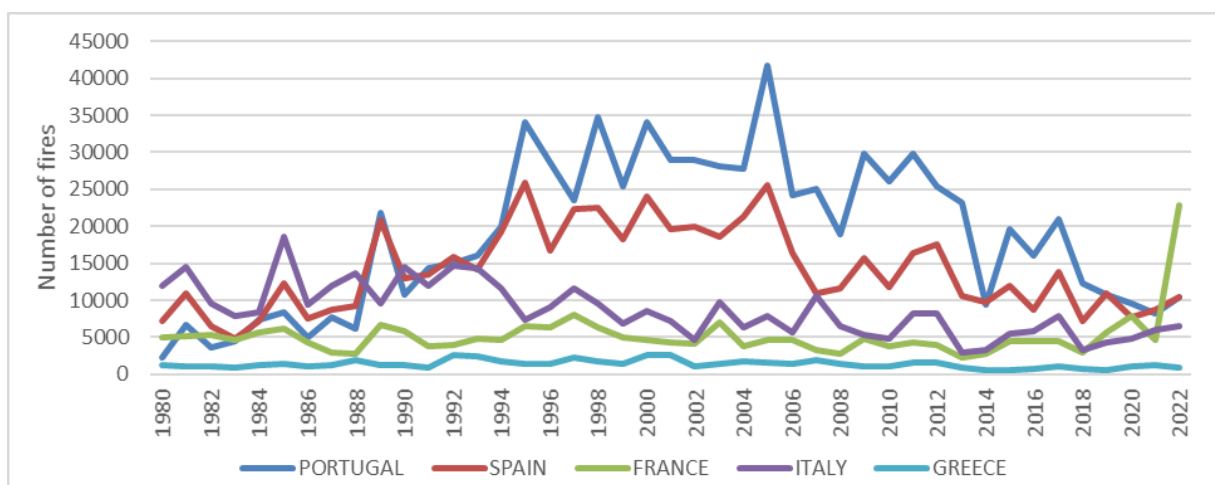


Figure 150. Time series showing the comparative burnt area and number of fires in the 5 large EU-Med countries.

1.4 Middle East and North Africa Countries



1.4.1 Algeria

Introduction

Protecting the country's forest and agricultural heritage is one of the major concerns of the Algerian government, which is constantly taking drastic measures to deal with the numerous fires that break out during the summer season, and which remain the main factor in the destruction and degradation of these national assets.

In this context, great efforts have been made by several sectors to protect the forest and agricultural heritage. In particular, they have strengthened and improved their capacities and actions to ensure better management of the fire-fighting campaign. To this end, operational and preventive measures comprising substantial human and material resources are regularly mobilized to deal with forest and crop fires.

However, it should be pointed out that the effects of climate change have made the task of preserving forests against fire even more difficult. This is particularly true in view of the very high temperatures generated by the recurrent heatwaves that characterize the summer season.

Fire danger in the 2022 fire season

The 2022 fire season saw a dozen very hot periods, linked to intense heatwaves coming from the south of the country and which were characterized by very high temperatures in the northern region. The forest fire risk reached very high levels during these periods, which encouraged the outbreak and rapid spread of forest fires.

The average burnt area per fire outbreak for forest-maquis and scrub during the 2022 season remains close to the usual average.

Below is a summary diagram (Figure 151) illustrating the average areas burned per fire over the past 11 years.

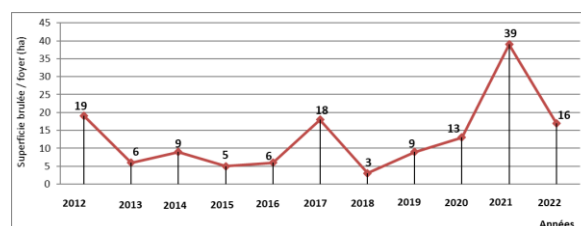


Figure 151. Average burnt area per fire for the last 11 years (Forest/maquis/scrub, ha/fire).

Fire occurrence and affected surfaces

The 2022 season saw a large number of fires which affected all plant species; namely forests, maquis, scrub, mountain trees and Alfa, some of which caused considerable human and material damage. The total area burnt by all species is estimated at 27 684.56 hectares, caused by a total of 1 607 fires.

The distribution of the area burned, by type of plant formation (forests, maquis, scrub, mountain trees and Alfa) illustrated in Figure 152, shows that during the 2022 season, the area of maquis burnt increased considerably, accounting for around 38% of the total area burnt, followed by bush and forests, which accounted for 31% and 25% of the total area burnt respectively.

However, mountain arboriculture and alfa account for a very small percentage, no more than about 6% of the total area burnt.

The monthly breakdown of the total area of forests, maquis and brush burnt (Figure 153), shows that August was the period of the season when most damage was caused in terms of burnt area, i.e. around 81.5% of the overall total. This is mainly due to the large number of heatwaves recorded during this month and which were the cause of several fires which caused significant damage. The month of October also saw unusual fires, which resulted in considerable losses. However, the other months saw smaller areas burnt. The number of fires was also considerably higher in August and October.

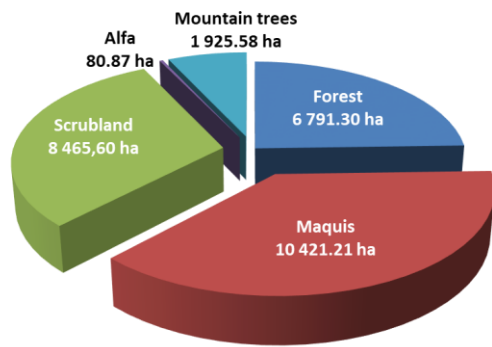


Figure 152. Burnt area in 2022 classified by vegetation type.

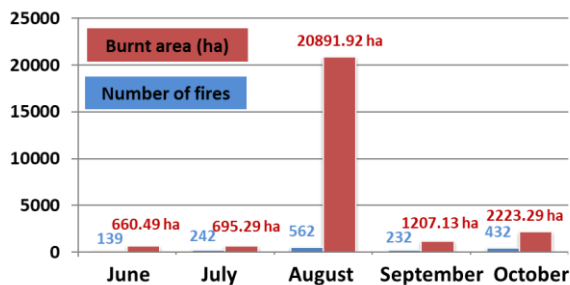


Figure 153. Monthly breakdown of the total area burnt (ha) (forest, scrub, undergrowth) and number of fires in 2022.

The distribution of the total area burnt in terms of forests, maquis and scrubland, by the three regions of the country, shows that the East region of the country was by far the most affected by fires, followed by the Centre region and then the West region which experienced insignificant damage during the fire season (Figure 154).

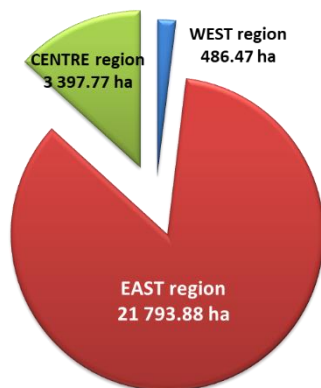


Figure 154. Total burnt area in 2022, by region.

Mutual assistance operations between states

Algeria did not request any international assistance as part of the fight against forest fires in the 2022 campaign. Also, the General Directorate of Civil Protection did not participate in any forest fire operations outside Algeria.

Forest fire prevention in 2022

Numerous actions have been carried out in preparation for the 2022 fire campaign, in particular preventive work, raising public awareness and setting up procedures and intervention plans to deal with forest fires. Below is a list of the main actions carried out:

Installation of operational committees:

- Installation of the National Forest Protection Commission.
- Installation of the forty wilaya operational committees, for the coordination of operations and the mobilisation of control resources on the territory of each wilaya.
- Installation of 468 daïra operational committees which coordinate control operations at the level of municipalities placed under the authority of each daïra.
- Installation of 1 333 municipal operational committees which have a role of coordinating control actions, at the municipal level, by mobilizing the necessary resources.
- Installation of 2 353 local residents' committees which play an important role in the prevention of forest fires, raising awareness, alerting people and providing the first response to incipient fires.

Prevention work:

- Opening and maintenance of firebreak trenches, forest trails and water points.
- Maintenance of roadside verges, railways and under high voltage lines.

Awareness-raising activities:

Organization of exhibitions and open days with the distribution of leaflets.

Hosting local and national television and radio broadcasts, as well as organising meetings with local residents.

Preaching and religious talks aimed at protecting forestry and agricultural heritage.

Organizational actions

- Update of the "Forest Fire" intervention plans for the forty wilayas affected by the forest fire risk.
- Implementation of numerous simulation exercises, relating to coordination between the sectors concerned in the event of a major forest fire.

Monitor, alert, intervention and response

The system put in place for surveillance, alert and first intervention was carried out by the forestry services. However, large-scale interventions on declared fires were carried out by civil protection units and mobile forest fire columns, set up to reinforce the intervention units.

Aerial forest fire-fighting during this campaign was also carried out by six civil protection helicopters, six water-bombing aircraft, each with a capacity of 3 000 litres, chartered by the Algerian government, as well as a water bomber plane with a capacity of 12 000L, belonging to the military services. These air resources were mobilized to support the intervention teams operating on the ground, in particular, during operations carried out in inaccessible places and in areas where the fire threatens homes.

In addition to these measures, civil protection intervention resources were regularly mobilized in sensitive areas, in particular in front of large plots of crops during the harvest-threshing season and inside forest areas frequented by citizens for leisure activities. Below is a representative diagram of the overall system deployed to support the 2022 forest fire fighting campaign (Figure 155).

Loss of human life

It should be noted that in addition to the loss of vegetation, some forest fires caused considerable human and material damage. The days of 17 and 18 August 2022 were particularly significant for the 2022 forest fire season. In fact, disastrous fires broke out in the eastern part of the country, particularly in the wilayas of El Tarf, Souk Ahras, Setif and Skikda. Some of these fires took on a disastrous aspect following the very unfavourable weather conditions, in particular the high temperatures and violent winds which characterized these days.

The fire-fighting effort was extremely difficult, and some fires reached urban areas, causing considerable human and material damage.

Local services recorded a total of 50 deaths across these wilayas, with several other people suffering from partial burns or smoke inhalation, who were rescued and evacuated by the civil protection services to hospital. In addition, dozens of dwellings and public and private buildings were affected to varying degrees by the flames. It should also be noted that in less than 48 hours, these fires covered a total area of around 7 864.63 ha of forest and scrubland.



Figure 155. Resources used in the 2022 season in Algeria.

(Source: Direction Générale de la Protection Civile; Direction Générale des Forêts, Algeria).

1.4.2 Israel

Meteorological conditions

According to the Israel Meteorological Service (IMS), in 2022 the temperature was close to the average (1991 to 2020), and compared to the past it ranks 19th in the series of measurements since 1950. This was relatively the coldest year since 2011. The year included several events and unusual weather episodes such as the “Elephus” system at the end of January which resulted in a lot of snow in the mountains, an unusually cold March followed by an unusually warm April, and the strong easterly winds in May that caused flooding and damage in Tiberias. However, the year 2022 was quite moderate, without very extreme events.

Temperatures

The year 2022 was close to the average of the reference period 1991 to 2020 and it should be noted that in the last 15 years only the year 2011 was cooler (Figure 156). In the series of measurements of the last 73 years, the year 2022 is ranked 19th, i.e. in the top third. This is because there is a clear trend of warming in the last three decades, so that despite the relative coolness of this year compared to the last period, it is still warmer than most years until the mid-90s and higher than the average of the previous reference period (1961 to 1990).

Six of the months of the year were close to average, four were warmer than average, of which April was considerably and unusually so, and two months were colder than average - January and March which was abnormally cold (Figure 156).

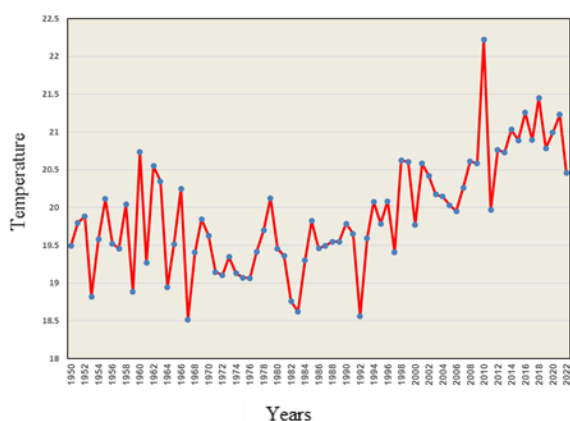


Figure 156. Average temperature in Israel 1950-2022.

Fire occurrence and affected surfaces

In 2022, the lowest number of forest fire incidents and amount of burned area was recorded in the last decade. The amount of forest fire events decreased by 46% compared to 2021 and by 19% compared to 2019, the year in which a small number of forest fires were recorded (Figure 158). The amount of burned area decreased by 56% compared to 2021 and 17% compared to 2017 (Figure 159).

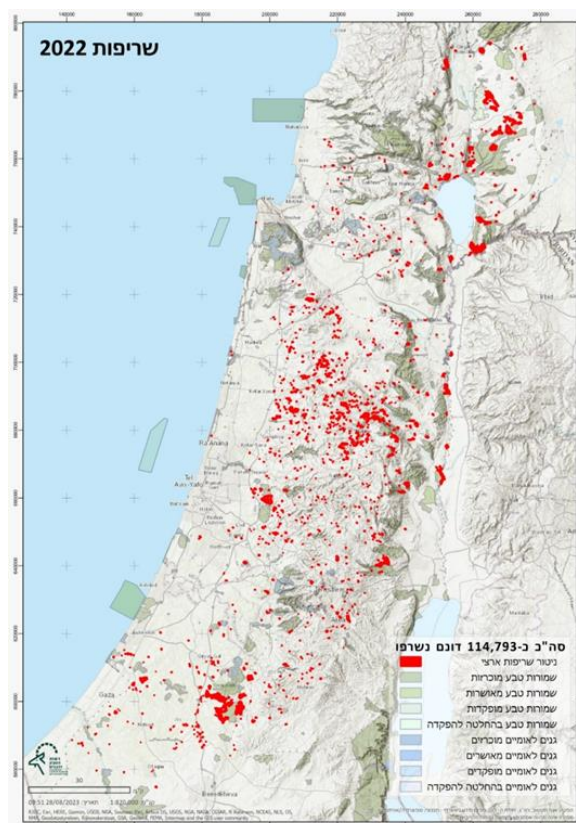


Figure 157. distribution of burnt area in Israel 2022.

The distribution of fires in Israel is mainly in the interior lowlands, the mountains of Judea and the Samaria. Another cluster of burned areas is located in the Golan Heights and the Galilee Mountains (Figure 157).

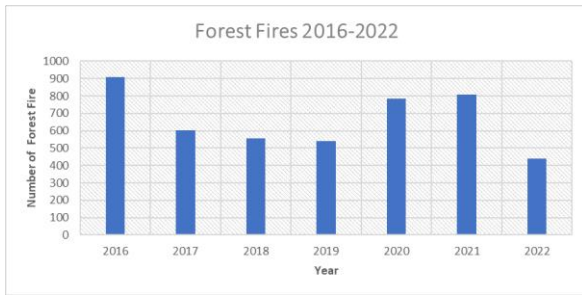


Figure 158. Number of fires in Israel 2016-2022.

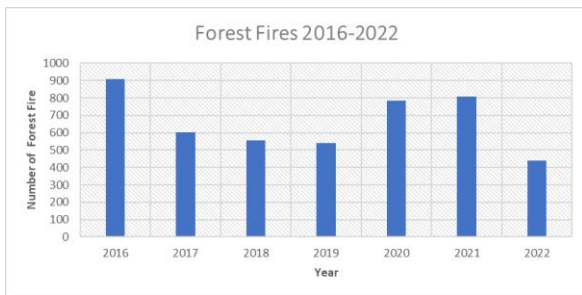


Figure 159. Burnt area in Israel 2016-2022.

Fire prevention in urban forest interfaces

In 2022, a wide-ranging project of creating buffer lines around settlements near a forest began. Israeli government budgeted designated funds for the project in recognition of the importance of buffer lines to prevent damage to human life and property.

Aerial firefighting capabilities

The Israeli firefighting squadron has 14 aircraft type AT 802F. The plane has a limit of working at night. In order to use firefighting capabilities from the air even at night, a system for dropping flame retardants using the Hercules planes was tested (Figure 160). The results of the experiment are evaluated by the Air Force and a decision will be made based on them.



Figure 160. An experiment of dropping flame retardants using the Hercules aircraft.

(Source: Fire and Rescue Commission, Ministry of Public Security, Israel).

1.4.3 Lebanon

Lebanon's annual forest fire reports are collaboratively prepared by the Ministry of Environment (MOE) and the Land and Natural Resources Program, Institute of the Environment, University of Balamand (LNR-IOE-UOB). The information presented primarily relies on the 2022 fire report (MOE/UOB, 2023), which is based solely on field inspections for reported fires. However, it's important to note that many other fires may not have been initially visited in the field and therefore remain unreported. Additionally, Mitri (2022) conducted a post-fire impact assessment of the 2022 fires in Lebanon using satellite images and field surveys. The main results of this assessment are presented accordingly.

Fire danger in 2022

During the 2022 fire season, Lebanon experienced a notable decrease in the number and extent of wildfires. This reduction was largely attributed to the launch and successful implementation of a nationwide emergency coordination plan for fire preparedness, risk reduction and awareness by the Ministry of Environment and its partners.

Fire season Overview

The calculated start date of the fire danger season for 2022 was April 15, and the calculated end date was October 11, 2022. The peak month (in number of fires) was August (a total of 5 fires) and the peak month (in burned area) was June (a total of 40.5 ha). In 2022, a total of 22 fires were reported, affecting a total area of 78.75 ha (Figure 161).

In reality, a significantly larger number of fires might have affected a much greater extent of burnt areas across the country. However, these incidents are not necessarily reflected in the MOE/UOB (2023) report, primarily due to the lack of comprehensive field surveys.

The following graphs (Figure 162, Figure 163) show the occurrence of fires in relationship to mean monthly temperature and monthly precipitation.

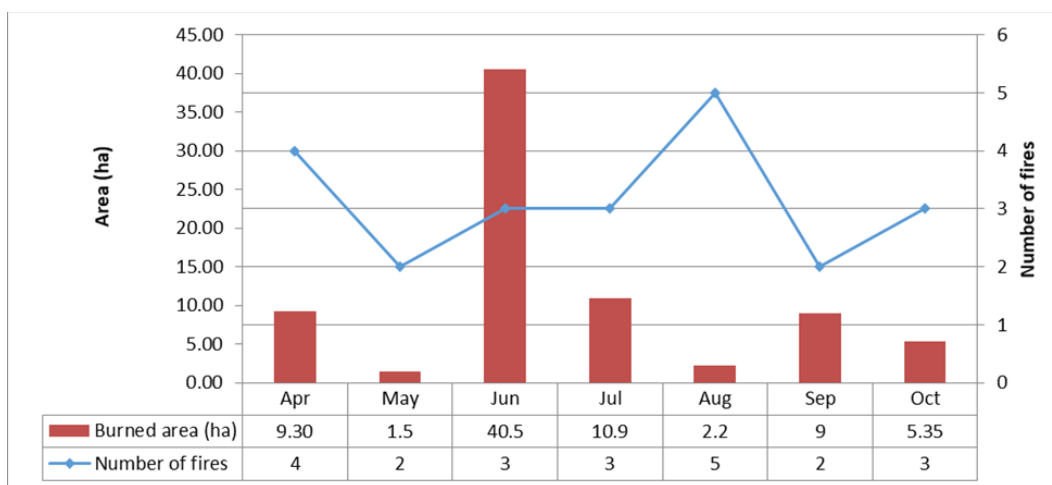


Figure 161. Monthly distribution of fire occurrence and fire affected areas in 2022 (source: MOE/UOB, 2023).

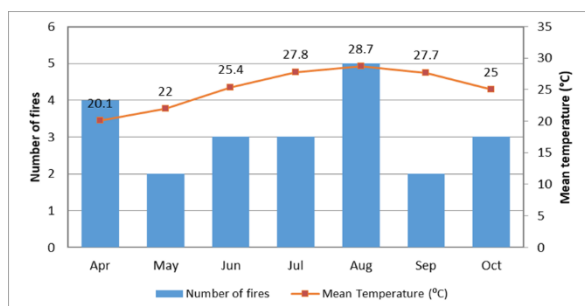


Figure 162. Number of fires in relation to mean temperature.

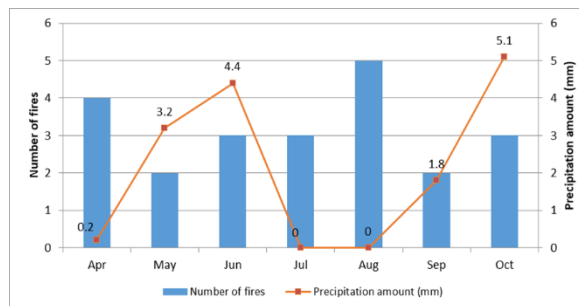


Figure 163. Number of fires in relation to precipitation.

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. Precipitation data were downloaded from <https://www.worldweatheronline.com/beirut-weather-averages/bevrouth/lb.aspx>

Land use type

The main land cover/land use of fire affected areas (Figure 164) included forest/woodlot (94.79%), grassland (4.70%) and agricultural land (0.51%).

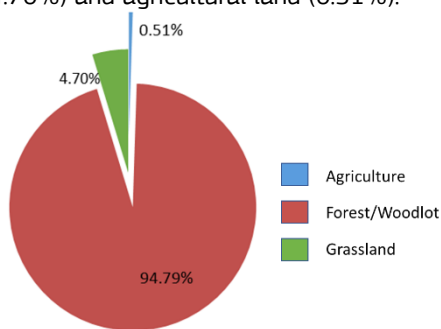


Figure 164. Land-use of fire affected areas (source: MOE/UOB, 2023).

Affected fuel type

A total of 70.79% of affected fuel types (Figure 165) was mixed forests, followed by needle forests (23.49%). A total of 3.30% of the affected fuel types was grassland.

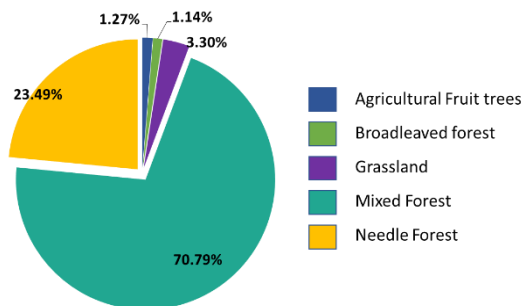


Figure 165. Distribution of fuel type affected by fires (source: MOE/UOB, 2023).

Causes of fire

A total of 73.59% of the fires had unknown causes. Neglect was accounted for 15.37% of all fire causes while 10.16% of fire causes was due to Arson (Figure 166).

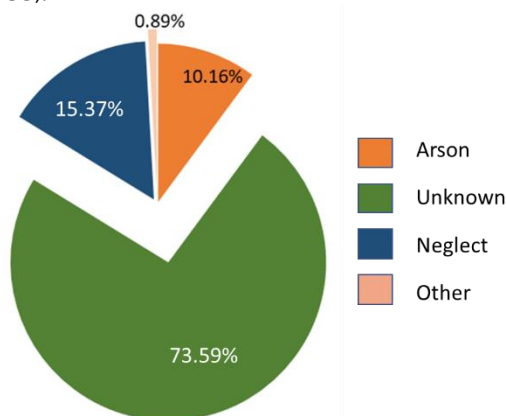


Figure 166. Distribution of main fire causes (source: MOE/UOB, 2023).

Intervention time

It was observed that 68% of first interventions in fire suppressions occurred after 20 minutes and before 1 hour from the reporting time, while 27% of interventions happened within the first 20 minutes after the reporting time. In addition, 5% of interventions took place after 1 hour of the reporting time (Figure 167).

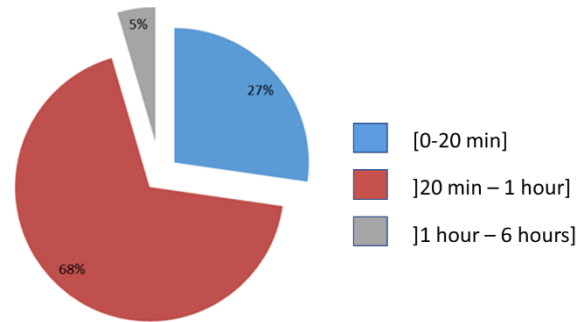


Figure 167. Times for intervention after reporting fires (source: MOE/UOB, 2023).

Fire duration

Fires lasting between 1 and 2 hours accounted for 29% of all fires. Also, fires lasting between 2 and 5 hours equally accounted for 29% of all incidents. A total of 14% of fires lasted between 5 and 12 hours, and 19% of fires lasted between 12 and 24 hours. It was also observed that 10% of fires lasted more than 24 hours. (Figure 168).

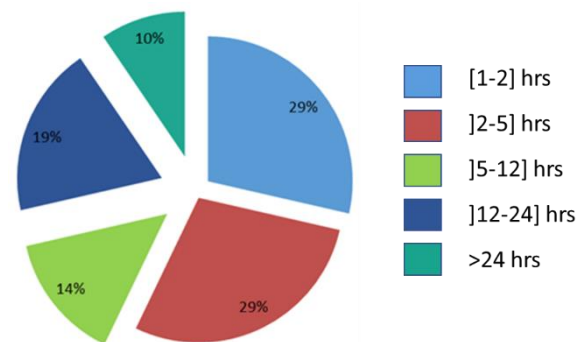


Figure 168. Fire duration (source: MOE/UOB, 2023).

Resources employed in fire suppression

The following human and technical resources were involved in fire suppression of reported fires (Table 51).

Table 51. Human and technical resources involved in fire control throughout 2022 (source: MOE/UOB, 2023).

	Number				Lebanese Army helicopters used	Lebanese Army helicopter flights
	Small Cars	Water Tanks	Other Cars	Human Resources		
Civil Defense	14	44	5	> 192		
Army	3	N/A	N/A	5	6	N/A
Internal Security	8	N/A	3	25		
Ministry of Agriculture	N/A	N/A	N/A	N/A		
NGO	N/A	N/A	N/A	N/A		
Local Resident	N/A	N/A	N/A	> 65		
Total	25	44	8	> 287	6	N/A

Research activities aimed at improving fire management

Mitri (2022) assessed the impact of 2022 fires at the landscape level using Sentinel 2-A images. As a result, a total area of 352 ha of burnt lands was mapped (Figure 9). This included an area of 231 ha of burnt forests (comprising shrubland with dispersed trees) of which 0.8 ha of burnt cedar, juniper and fir trees. An area of 39 ha of burnt lands was located in high mountainous lands (i.e., >1 500 m above sea level). Also, an area of 54 ha burned in agricultural land. The fires burned around 90 ha within Key Biodiversity Areas (KBAs).

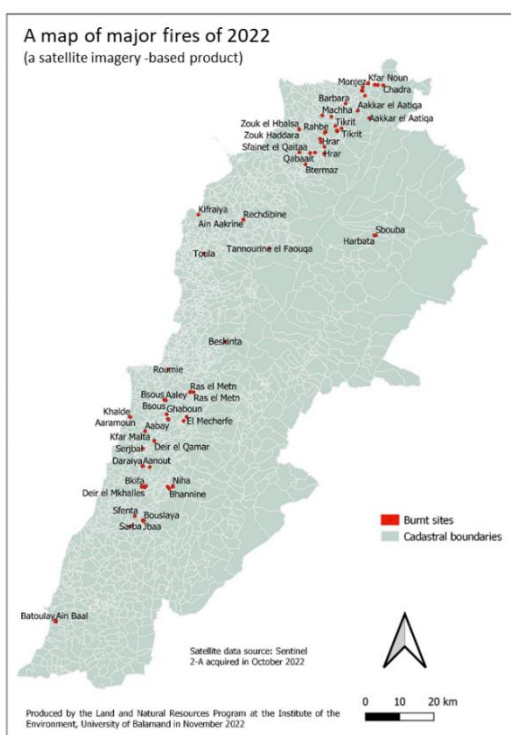


Figure 9. Map of burnt areas in 2022 (source: Mitri 2023).

On April 7, 2022, a kick-off meeting for introducing the need to have a national emergency plan for fire prevention, awareness and readiness was organized at the Ministry of the Environment with the presence of the Minister of Environment, representatives from the Ministry of Interior and Municipalities, the Disaster Risk Management unit, in addition to NGOs which are active in the wildfire sector, among others.

Consequently, the development of the emergency coordination plan for fire preparedness, risk reduction and awareness in Lebanon was initiated by the Ministry of Environment with the support of the World Bank Group, specifically the PROGREEN Trust Fund and in partnership with the various national stakeholders. As part of this plan, Lebanon updated its national wildfire risk map (Figure 169). Accordingly, priority areas for improved fire risk management were identified.

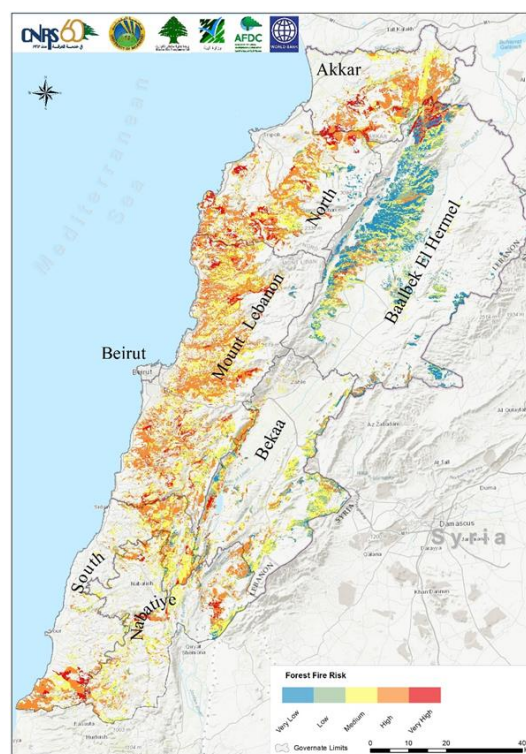


Figure 169. Updated 2022 wildfire risk map of Lebanon.

References:

Mitri, 2022. Mapping Lebanon's burnt areas of 2022: a brief note. Land and Natural Resources Program, Institute of the Environment, University of Balamand.

MOE/UOB, 2023. State of Lebanon's wildfires in 2022. 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*, and are distributed among the different bioclimatic zones, from semi-arid to humid.

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 2022, an average of 304 fires per year is calculated for an annual average area affected of 3 334 ha (ANEF, 2022).

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), National agency for waters and forests (ANEF), 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 National Agency of Land registry, Cadastral and Mapping (ANCFCC). 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 2022

The Data analysis of forest fires in Morocco during the period 1960 to 2022, shows a total of 19 161 outbreaks of fire and a total area damaged (but not lost) of 210 101 ha, giving an average of 304 fires per year for an annual average area of 3 334 ha affected, with maxima of 22 762 ha in 2022 and 11 000 ha in 1983. The absolute minimum was recorded in 2002 with 593 ha (Figure 170, Figure 171).

It should also be noted that, globally and since 1960, the trend of the number of fires and the area affected by forest fires has not ceased to increase; but the shapes of the augmentations are not similar. But comparing the last two decades, we see that the number of fires has decreased from an average of 498 between 2003-2012 to 447 forest fires in the last decade (2013-2022) (Figure 170).

We note that the area affected per fire, which reached a value of 9 ha during the period 2012-2022, has decreased compared to the national average recorded since 1960, which was about 11 ha per fire (Figure 172).

2022 fire season

High temperatures and drought contributed to an increase in forest fires in 2022. The Moroccan Forest Fire Information System (MFFIS) has shown that periods of rising temperatures and dry soils have compounded each other, increasing fire risk across all Moroccan regions.

These climatic conditions favoured the spread of large forest fires across the country, with extreme wildfires of more than 1 000 ha recorded in many provinces. In total, MFFIS estimates that more than 22 700 hectares were burnt across the country last year, making 2022 the year with the largest area burnt by wildfires on record over time.

During 2022, 499 fire events were recorded that affected an area of 22 762 ha, an average of 46 ha per fire.

In comparison with the last decade (2012-2021), the year 2022 was an exceptional year with a high risk of fire with an increase in terms of the number of fires of 12% and an increase in terms of burned area of around 683%. (Figure 173).

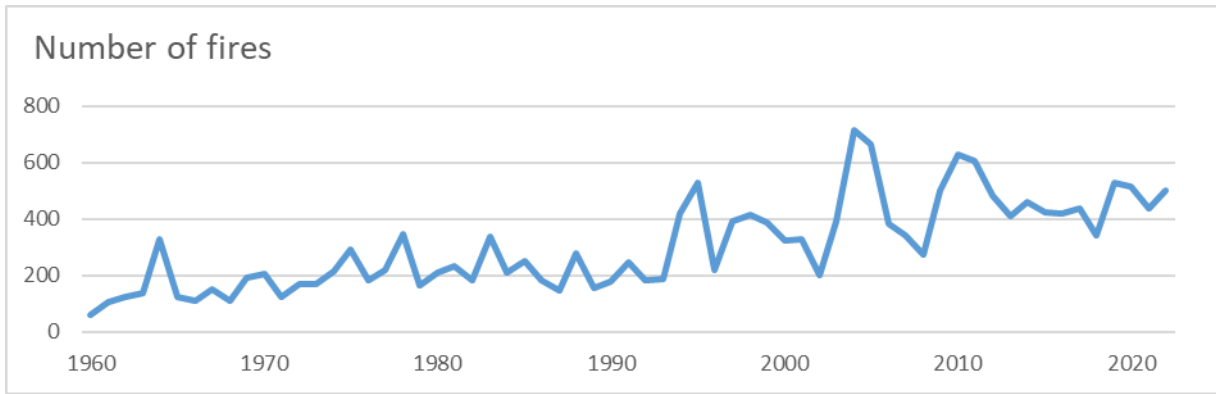


Figure 170. Evolution of forest fire numbers from 1960 to 2022 (ANEF, 2022).

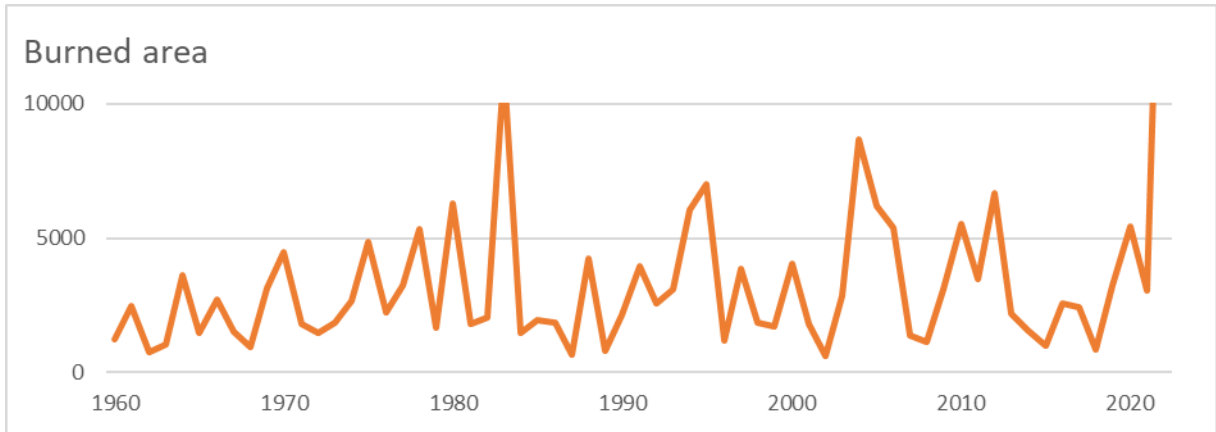


Figure 171. Evolution of forest fire area from 1960 to 2022 (ANEF, 2022).

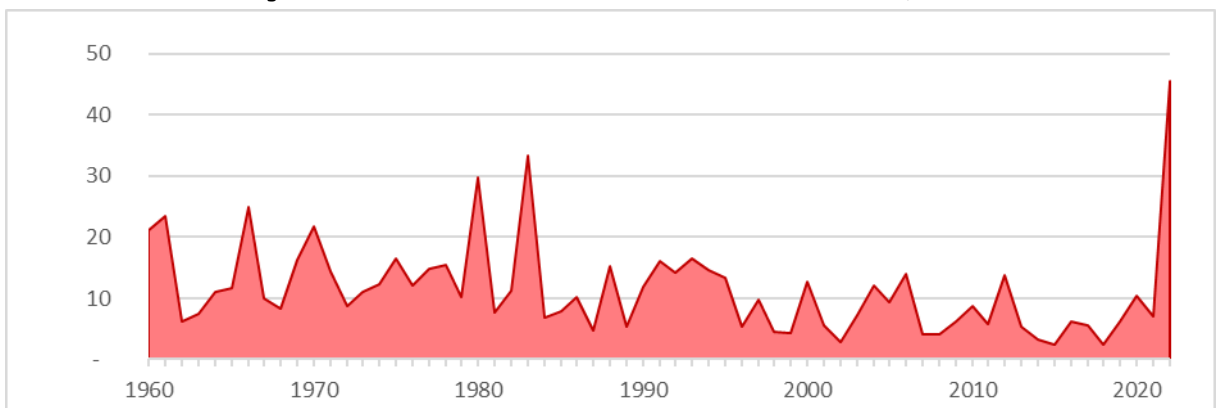


Figure 172. Evolution of area affected per fire from 1960-2022.

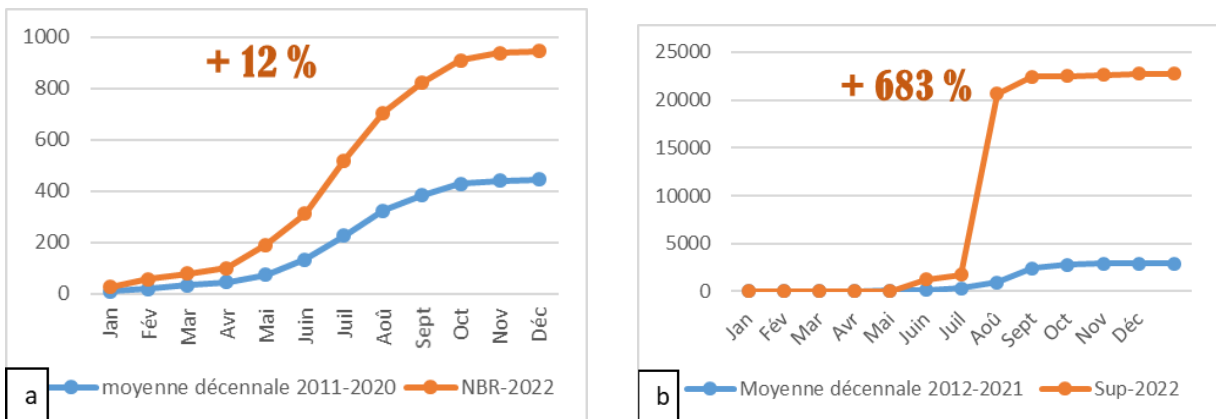


Figure 173. Evolution of number of fires (left) and burnt area (right) in 2022 compared to the last decade.

Distribution of fires

Based on the type of vegetation affected by fire, the distribution of forest fires recorded in 2022 (Table 52), is as follows:

- For wooded land, an area of 15 498 ha (68% of the total area burned) was affected by fires;
- The shrub and herbaceous covers were affected by fires that covered an area of 7 264 ha, equivalent to 32% of the total area burned;
- Cork oak trees are in first place with an area of 13 729 ha affected, equivalent to 60% of the total area burned in 2022, followed by *Eucalyptus gomphocephala* trees with an area of 705 ha affected (3% of the total area burned in 2022).

Table 52. Distribution of fires, based on the type of vegetation affected in 2022.

		Species	Burnt Area (Ha)	% Area
Wooded		Argan	0.058	0%
		Cork oak	13 729.3016	60%
		Tauzin oak	24.56	0%
		Holm oak	343,7837	2%
		Zeen oak	11	0%
		<i>Eucalyptus tereticornis</i>	0.4942	0%
		<i>Eucalyptus gomphocephala</i>	705.2406	3%
		<i>Eucalyptus globulus</i>	2	0%
		<i>Eucalyptus camaldulensis</i>	31.1	0%
		Acacia Cyanophilla	0.004	0%
		White poplar	4.74	0%
		Broadleaves Total	14 852.2821	65%
		Cedar	4.6052	0%
		<i>Juniperus phoenicea</i>	6.825	0%
		<i>Juniperus oxicedrus</i>	12.164	0%
		Pines aleppo	297.911	1%
		Pines maritime	319.191	1%
		Thuja	4.9045	0%
	Coniferous Total	645.6007	3%	
Wooded Total		15 497.8828	68%	
Non wooded		Alfa	609.648	3%
		Secondary species	4677.6444	21%
		Dwarf palm	0.006	0%
		Herbaceous cover	1976.8947	9%
Non wooded Total		7 264.1931	32%	
Grand Total		22 762.0759	100%	

The data relating to the distribution of fires according to size classes of affected areas are represented in Table 53. Notably, 88% of recorded fires were promptly controlled within the appropriate range, as the impacted area for each fire remained under 5 hectares. Additionally, it is observed that fires exceeding 50 hectares are affected only by 4.41% of the overall fire events (22 fires), but they accounted for 96% of the total burned area. This distribution underscores the critical importance of early intervention in the initial hours for effective fire control. Therefore, the focus should be directed towards vigilant monitoring and rapid response to incipient fires.

Table 53. Distribution of fires according to classes of affected areas.

Size Class (ha)	Number		Area (ha)	
	Count	%	Area	%
0-5 ha	438	87.78%	244.13	1.07%
5-20 ha	25	5.01%	223.15	0.98%
20-50 h	14	2.81%	416.78	1.83%
50-100 ha	6	1.20%	413.00	1.81%
100-500 ha	8	1.60%	1952.00	8.58%
>=500 ha	8	1.60%	19513.00	85.73%
Total	499	100%	22762.06	100%

The data illustrating the distribution of fires across various forest subdivisions are presented in Figure 174.

The Tanger-Tétouan-Al Hoceima region takes the lead in terms of affected area, encompassing 18 704 hectares, representing a substantial 82% of the national total. It also secures the top position for fire frequency, recording 188 incidents, a significant 38% of the overall number of fires. The fire situation in this region can be attributed to the challenging terrain that firefighting teams grapple with. Moreover, the region, being the most humid in Morocco, provides ideal climatic conditions for the growth of dense forests and formations, resulting in the rapid spread of fires.

In terms of area, the Province of Larache, Tetouan, Taza, Kenitra and Chefchaouen are the most affected by fire in 2022 with areas of 13 936ha, 3 119 ha, 1 476ha, 1 111 ha and 909 ha respectively. This situation is favoured by the terrain, the high sensitivity of forest stands types and the intense human pressure on land resulting from the use of fire as a practice of cleaning land for their cultivation.

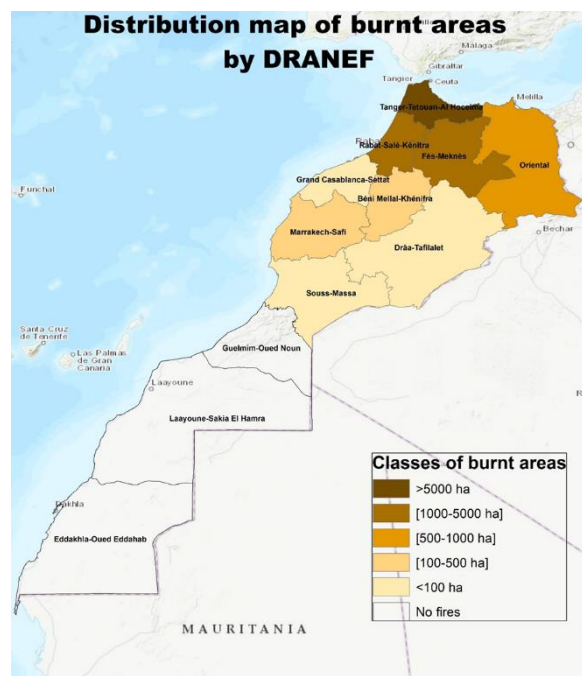


Figure 174. Location of the forest fires recorded in 2022 in Morocco.

Loss of human lives

7 lives were lost in the 2022 season. Around 400 houses were burned.

Firefighting means

The means mobilized by the different departments in 2022 in Morocco for the operations against forest fires, are as follows:

Table 54. Firefighting means in Morocco in 2022.

Activities	Department	Quantity
Monitoring and alerts	A N E F	1 297 watchers (4-5 months)
	Ministry of the Interior	1 139 watchers (2.5 months)
Ground intervention	A N E F	332 forests fighters with 95 vehicles for the first intervention
	Civil Protection	[Total Estimated to 500 persons with CCF, CCR, CCI and other engines]
	Auxiliary Forces	[Total Estimated to 600 persons]
	Royal Armed Forces	[Total Estimated to 1 000 persons]
Aerial control	Royal Gendarmery	12 Turbo Trush aircraft
	Royal Air Forces	5 Canadairs CL415

(Source: Service de la Protection des Forêts, Département des Eaux et Forêts, 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 the end of 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 of wildfire management. Currently, the EFFIS network is made up 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 services¹⁰ 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 8 times, daily), which can be interactively queried¹¹. 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 (RDA) module. Since 2000, cartography of the burnt areas is produced every year through the processing of satellite imagery. After 2003 the processing chain was further automated to process MODIS data in near-real time. Daily, two full image mosaics of the European territory are processed in EFFIS to derive burnt area maps, every day. Additionally, since 2018, Sentinel-2 imagery is used to map fires, which allows the mapping of fires smaller than 30 ha and refining the final perimeters of those fires initially mapped from MODIS 250 m imagery. The burnt area mapped by EFFIS corresponds, on average, to around 95% of the total area burnt in Europe each year. Further to the mapping of burnt areas, the analysis of which types of land cover classes are affected by fires is performed.

¹⁰ <http://effis.jrc.ec.europa.eu>

¹¹ see <http://effis.jrc.ec.europa.eu/current-situation>

3 Wildfires in 2022: Country reports from EFFIS

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 2022 fire season are presented, comparing them with long term trends. To make this analysis we use the Fire weather Index (FWI) calculated on the base of the ECMWF ERA5 reanalysis dataset. The link can be found here:

<https://cds.climate.copernicus.eu/cdsapp#!/dataset/cems-fire-historical?tab=overview>

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 throughout 2022 as determined by the average FWI values assessed in the individual countries.

In the following charts we present fire weather index data for the current year, showing how it compares against the long-term minimum and maximum, the 10-90 percentiles, and the long-term average (measured from 1980-2021). This makes it possible to see whether and when extreme conditions occur in the current year.

In these reports we have used two different methodologies to calculate the statistics. The first was used until 2021 and the second has been adopted since the year 2022. The first methodology started from the calculation of the FWI statistics (min, max, average, the 10th percentile and the 90th percentile) - based on the raster data and the full time series, then the values were calculated for each country.

The current methodology is based on the calculation of the FWI of each country day by day for the whole time series. Then for each country we calculate the statistics - min, max, average, the 10th percentile and the 90th percentile. Therefore, the calculated long term min and max levels are slightly different from those reported in previous reports.

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

How to read the charts

The red area encloses the most extreme values seen in the 41 year period from 1980-2021.

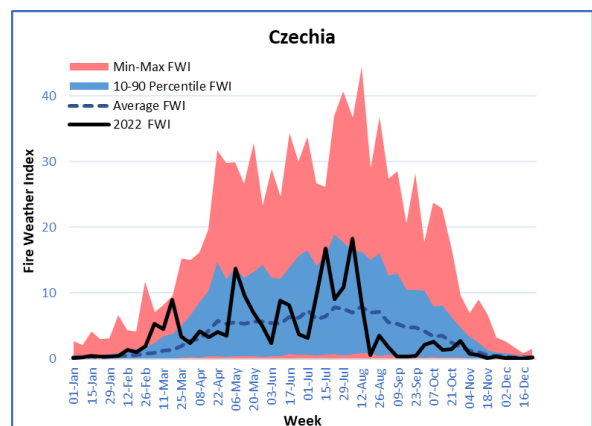
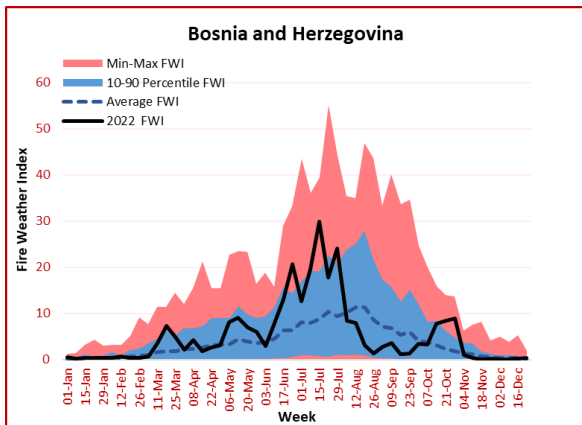
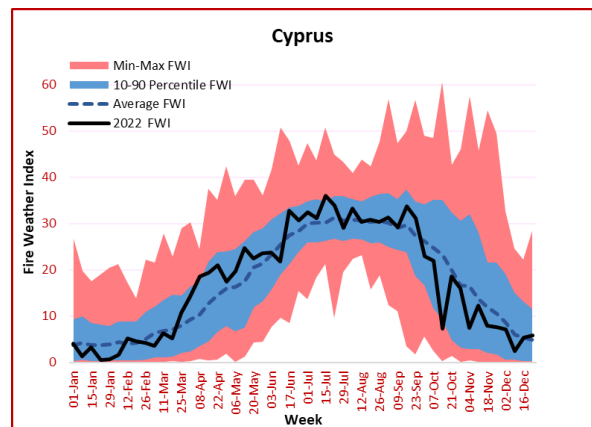
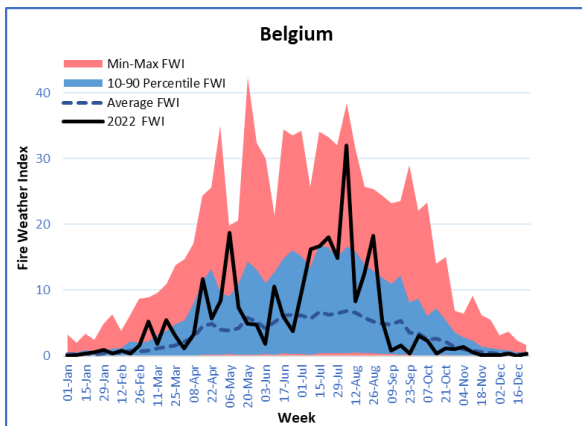
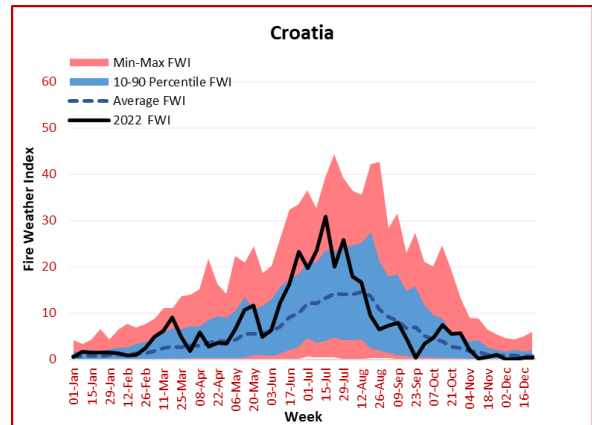
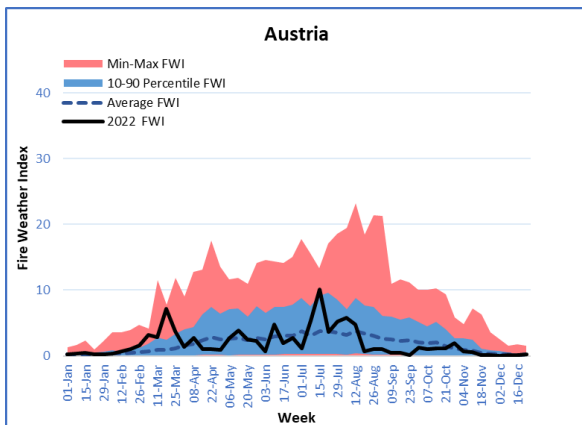
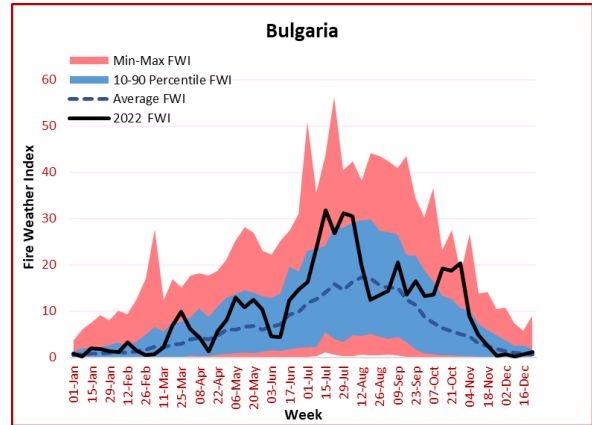
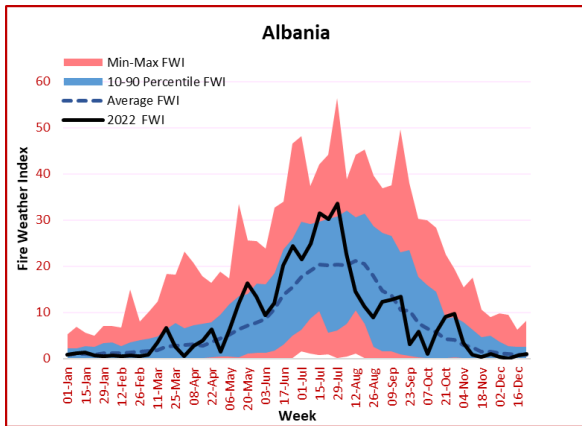
The blue area encloses the 10-90th percentiles: i.e. 80% of observations fall within this band.

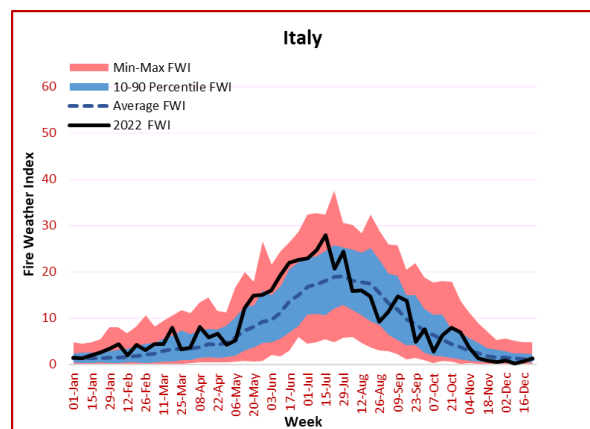
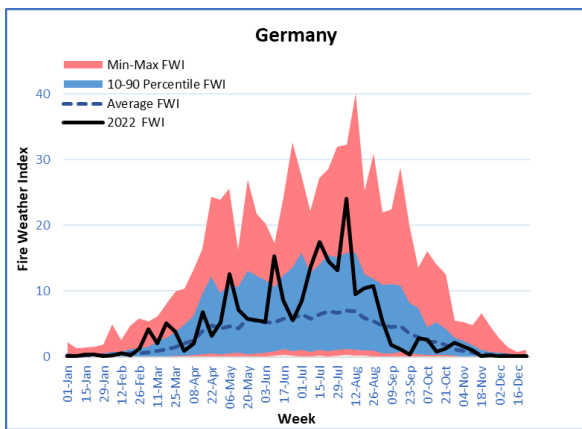
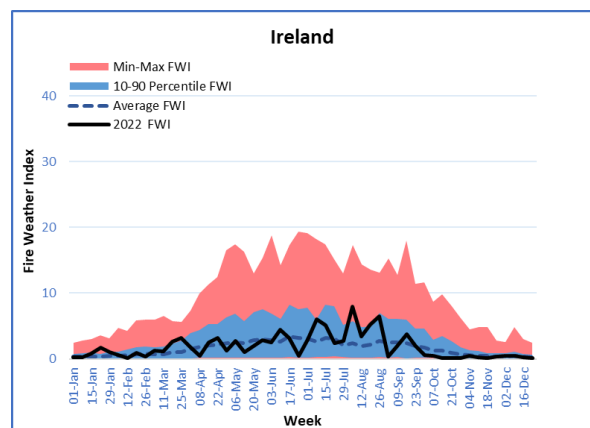
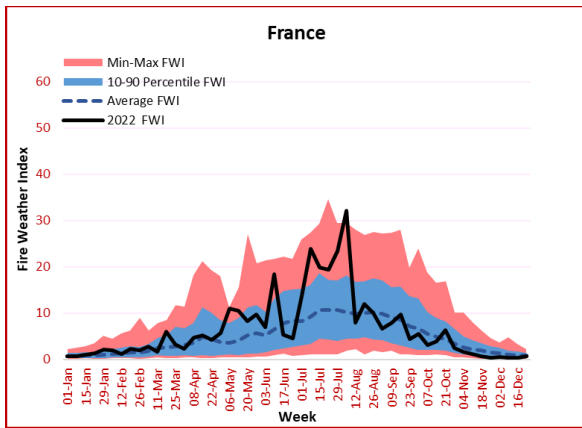
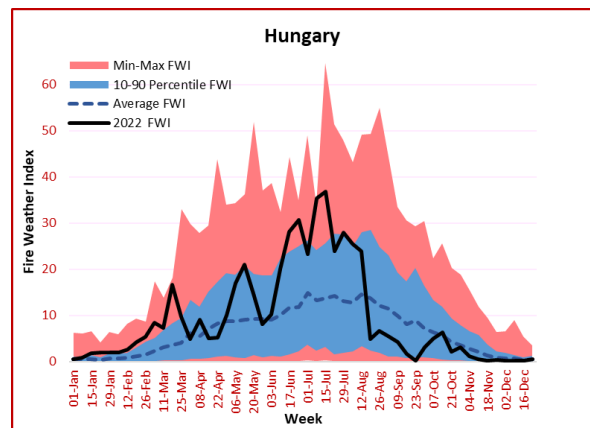
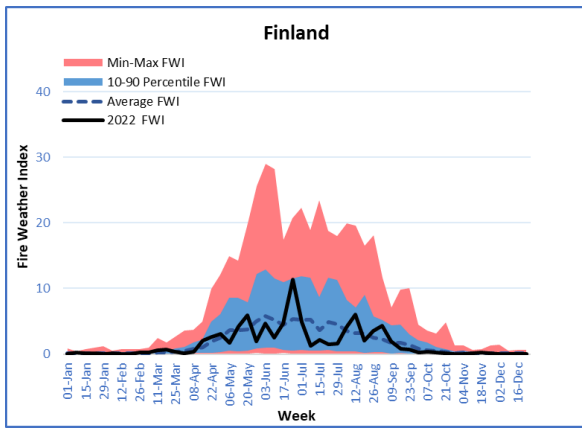
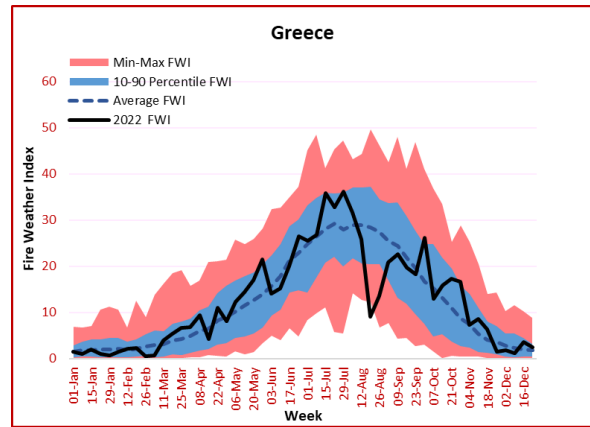
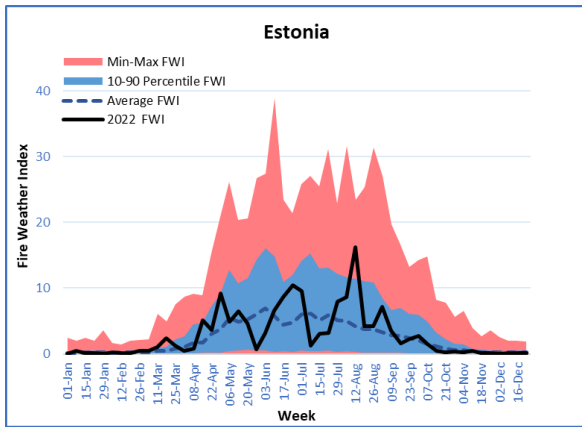
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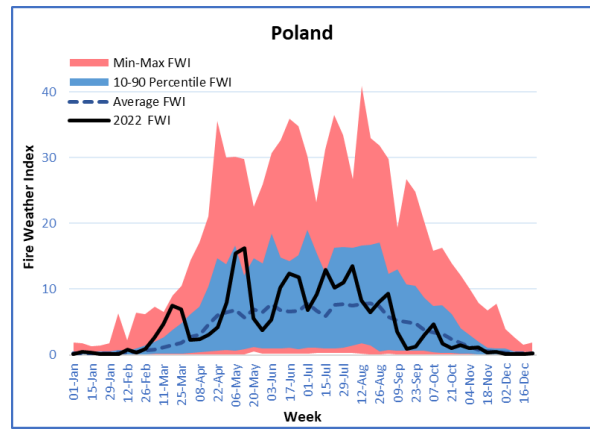
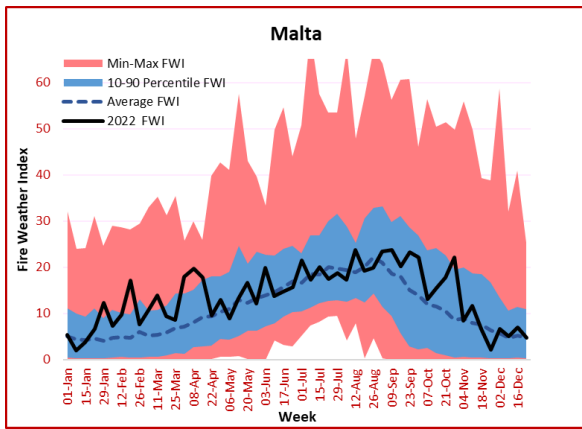
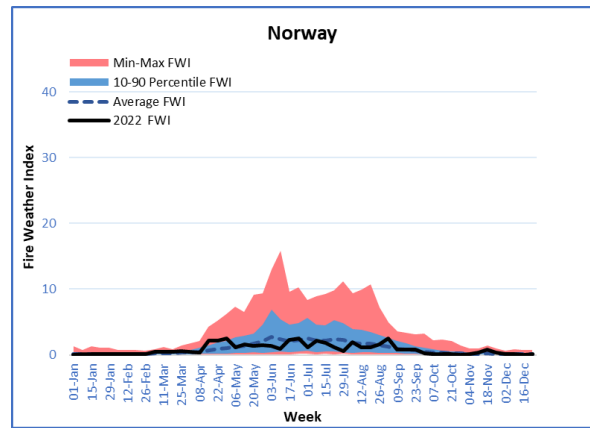
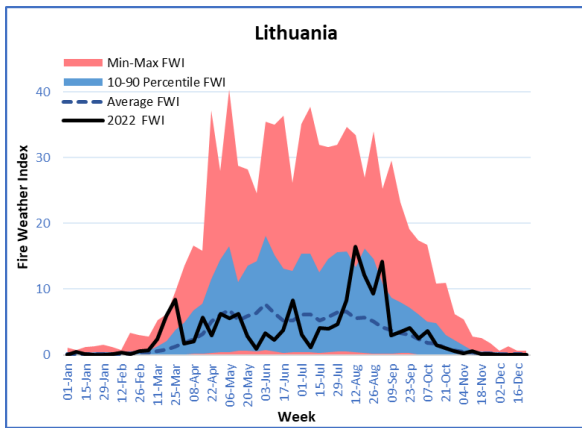
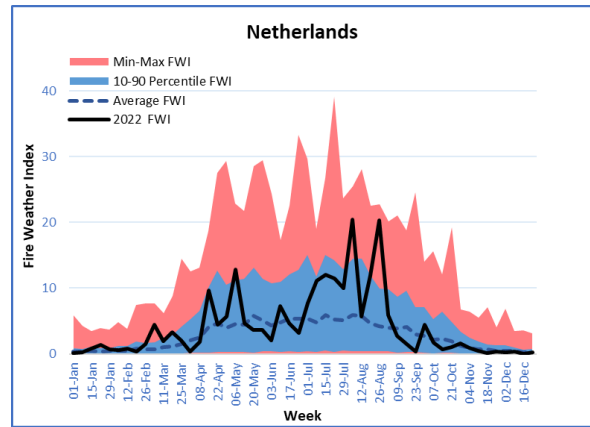
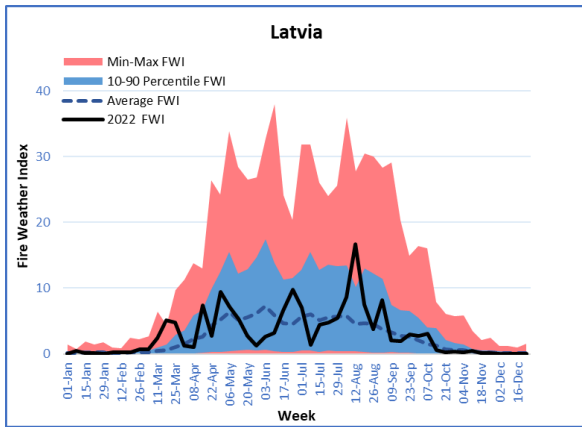
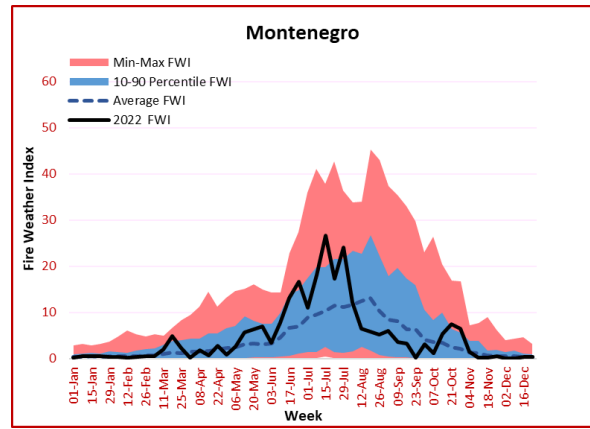
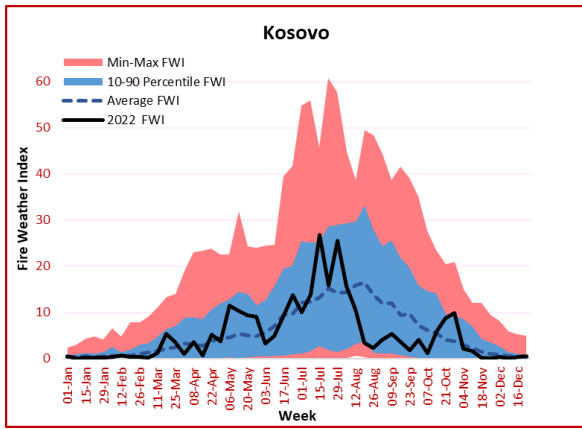
The solid black line shows the current year (2022).

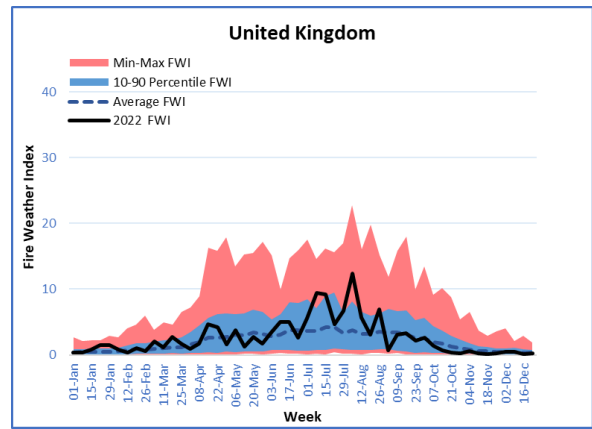
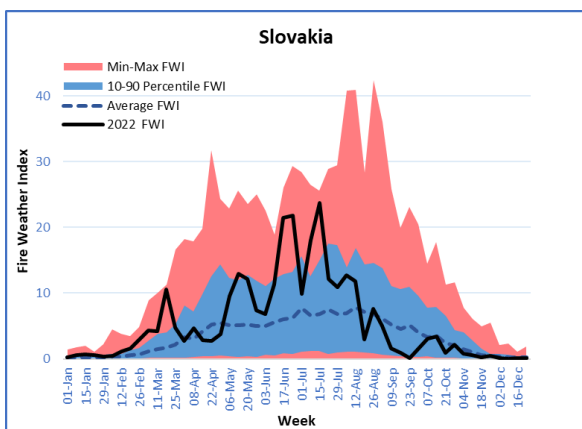
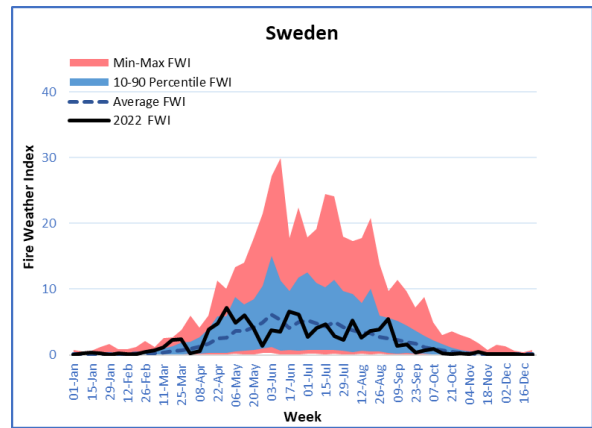
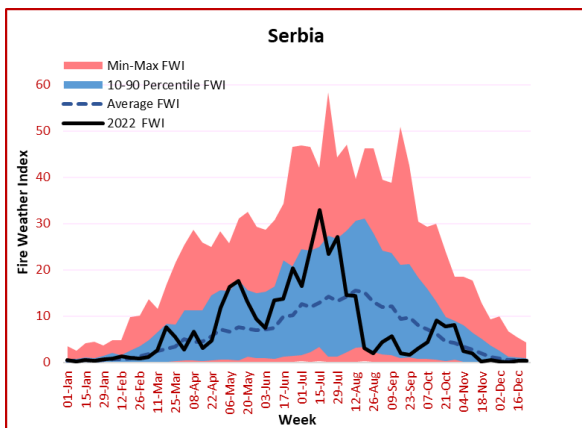
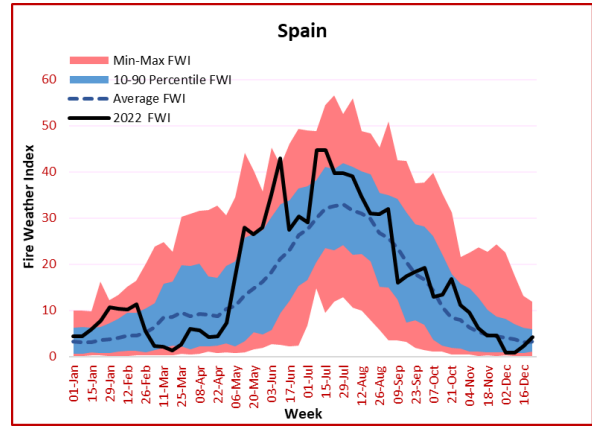
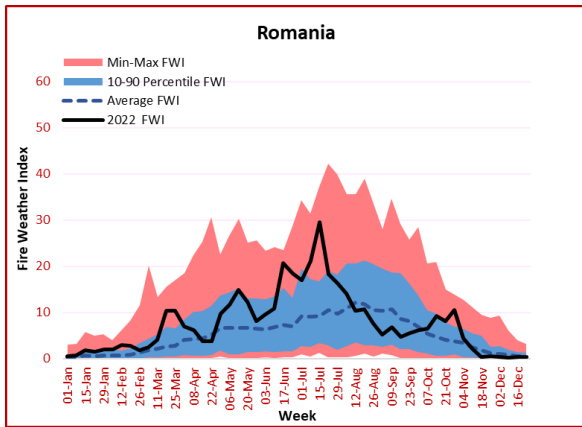
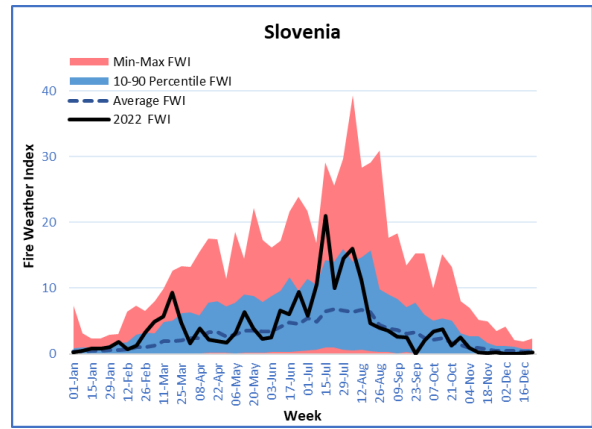
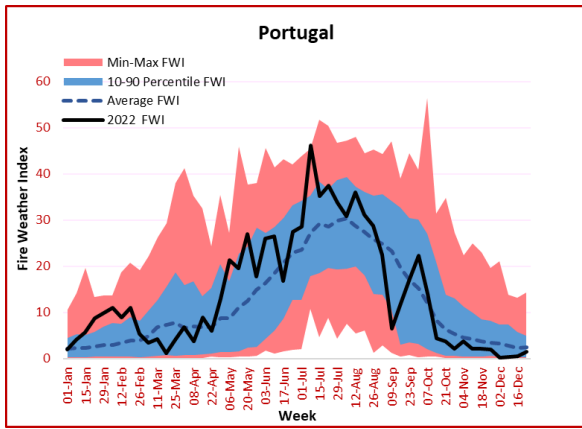
NOTE: Three colour-coded scales have been used to present the FWI: **0-45** for the most northern countries where fire danger rarely reaches high levels; **0-65** for central countries, Mediterranean and Türkiye, and **0-120** for the MENA countries.

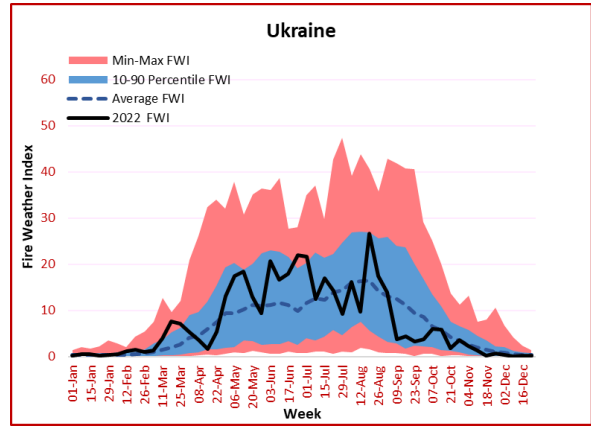
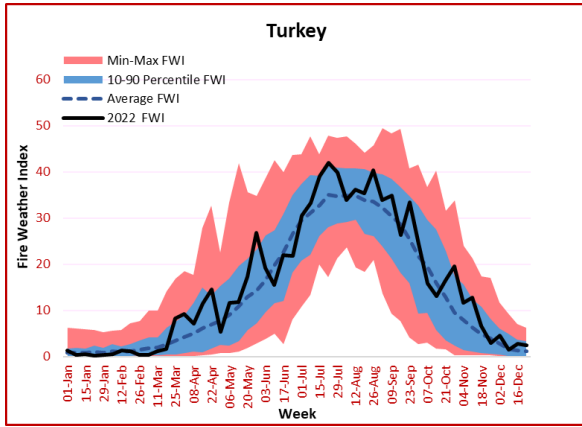
European countries



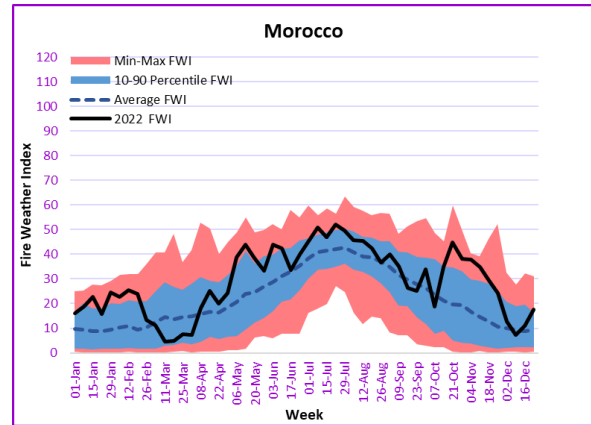
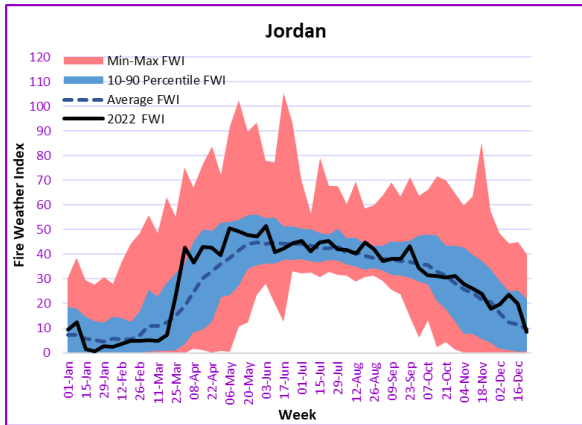
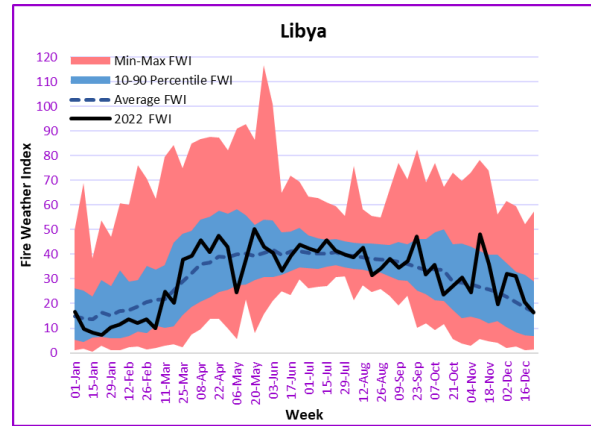
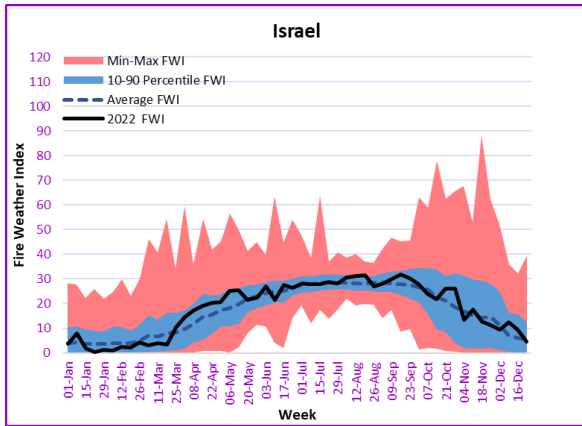
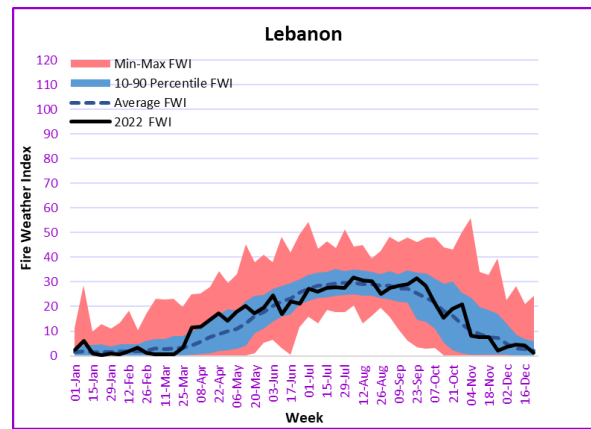
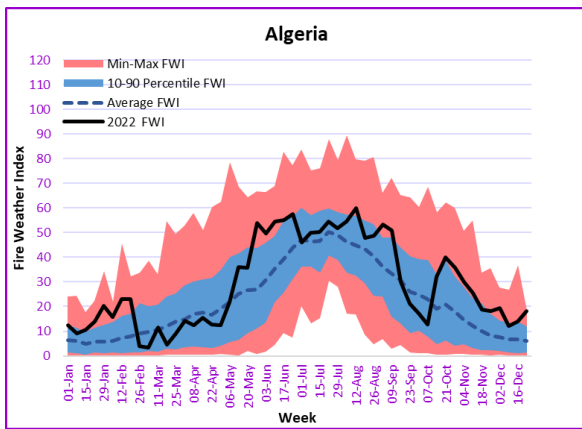


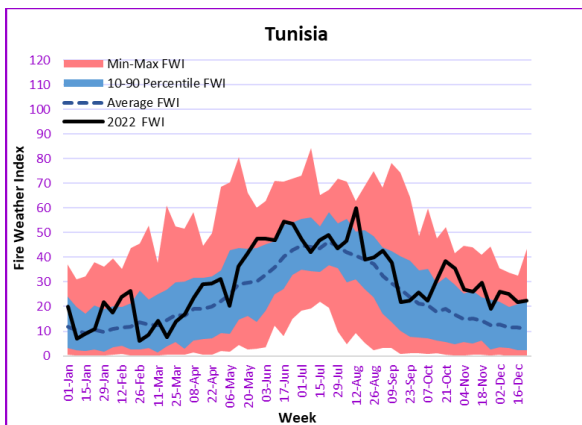
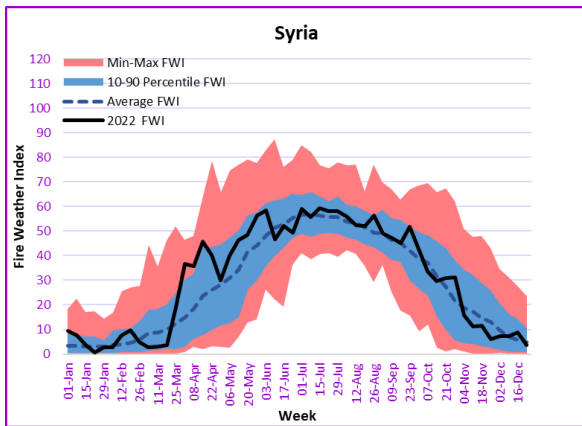
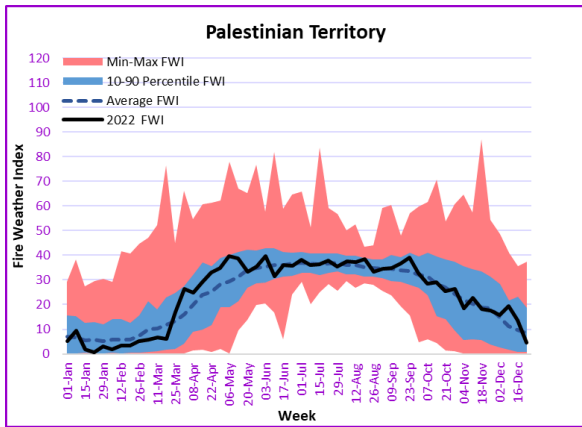






MENA countries





3.1 EFFIS Rapid Damage Assessment: 2022 results

The Rapid Damage Assessment module of EFFIS was set up to provide reliable and harmonized estimates of the areas affected by wildfires during the fire season. The methodology and the spatial resolution of the satellite sensor data used for this purpose, from the MODIS sensor, at 250 metre spatial resolution, allowed fires of about 30 ha or larger to be mapped. This methodology was enhanced in 2018 through the use of Sentinel 2 imagery, at 20 metre spatial resolution, which allowed the mapping of fires of about 5 ha or larger. In order to maintain the comparability of the area burnt nowadays with the area mapped prior to 2018, only the number and the area burnt by fires above 30 ha is used for the purpose of comparison of 2022 results with those of previous years.

Although the number of fires mapped in EFFIS is only a fraction of the total number of fires in the countries, the area burned by these fires represent approximately 95% of the total burnt area reported by the countries.

The fires mapped in EFFIS include all those fires that burned natural land. Only fires that burn agricultural land are excluded from the statistics published in the system. Accordingly, fires that burn grassland, shrub land and other wooded land are included in the EFFIS statistics. Agricultural or urban areas that may be affected by the fires are included in the total burnt areas. Information on each type of land cover that is affected by the fires mapped in EFFIS is provided for each fire event. However, total figures of burnt areas may not correspond with national statistics that consider only areas burned in forest areas.

In order to obtain the statistics of the burnt area by land cover type, the data from the European CORINE Land Cover database were used. Therefore, the mapped burnt areas were overlaid with the CLC data, making it possible to derive damage assessment results comparable for all the EU countries.

The results for each of the countries affected by forest fires are given in the following paragraphs in alphabetical order, followed by a section on the MENA countries.

The total area burned in 2022, as shown by the analysis of satellite imagery, is shown in Table 55.

Figure 175 below shows the scars caused by forest fires during the 2022 season. In 2022, fires were mapped in 45 countries and a total burnt area of 1 401 084 ha was mapped, around 20% more than in 2021.

Table 55. Areas mapped in 2022 estimated from satellite imagery.

Country	Area (Ha)	Number of Fires
Albania	19591	307
Algeria	53148	157
Austria	1034	8
Belgium	428	7
Bosnia	76473	578
Bulgaria	15461	150
Croatia	34818	290
Cyprus	2650	23
Czechia	1438	2
Denmark	510	30
Egypt	2163	13
Estonia	2	1
Finland	372	33
France	74654	1089
Germany	5117	115
Greece	23942	230
Hungary	7960	92
Ireland	3409	69
Israel	239	5
Italy	68510	1426
Kosovo under UNSCR 1244	4430	98
Latvia	238	14
Lebanon	249	22
Libya	207	9
Lithuania	34	7
Malta	23	2
Montenegro	26332	260
Morocco	32680	103
Netherlands	331	15
North Macedonia	4261	74
Norway	2867	84
Poland	675	39
Portugal	112063	1236
Romania	162518	1432
Serbia	13292	235
Slovakia	374	10
Slovenia	4431	7
Spain	315705	1490
Sweden	515	37
Switzerland	235	2
Syria	596	21
Tunisia	11745	155
Türkiye	17055	195
UK	22895	460
Ukraine ¹²	275414	2526
Total	1401084	13158

Summary	Total Area (Ha)
EU27	837212
Other European countries	462845
Middle East and North Africa	101027
Natura2000 sites	365308

¹² An additional 223 303 ha in agricultural and urban land was also mapped, at the country's request. See page 170.

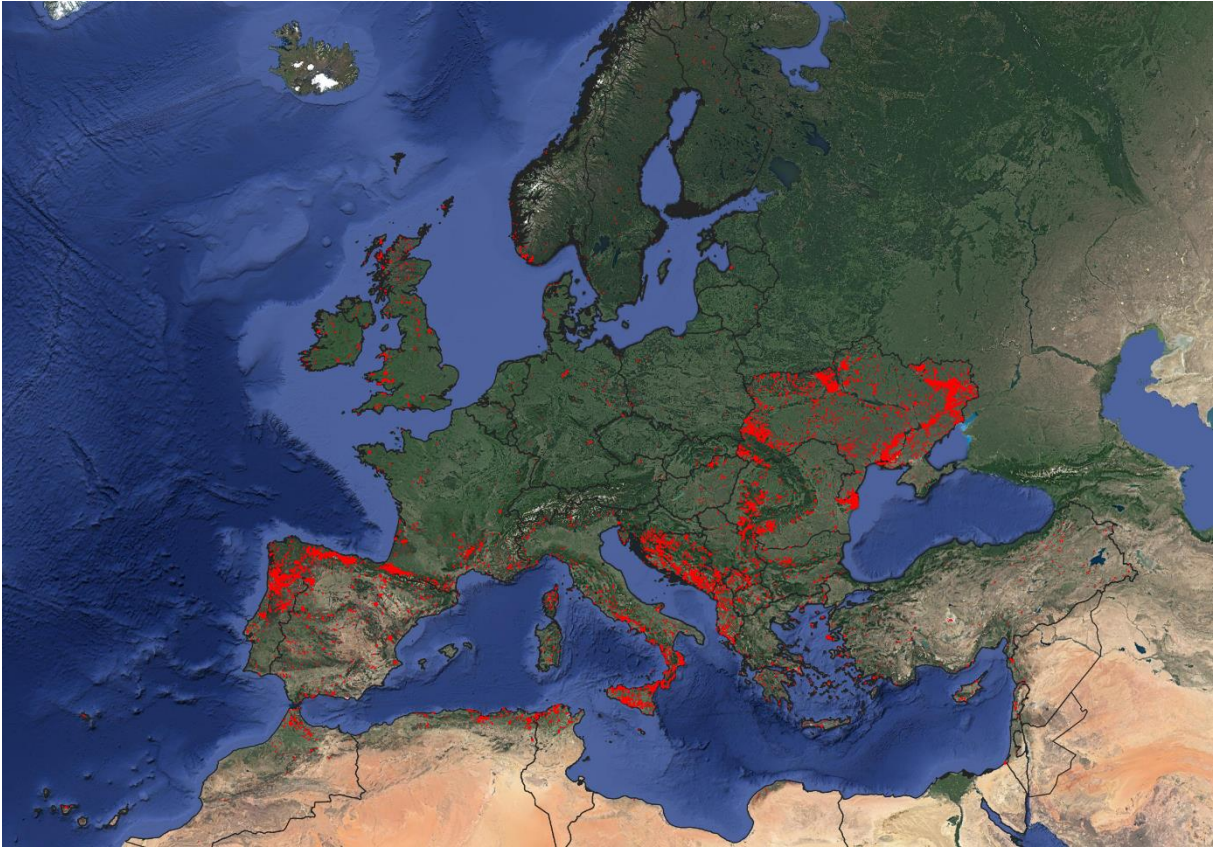


Figure 175. Burnt scars produced by forest fires during the 2022 fire season.

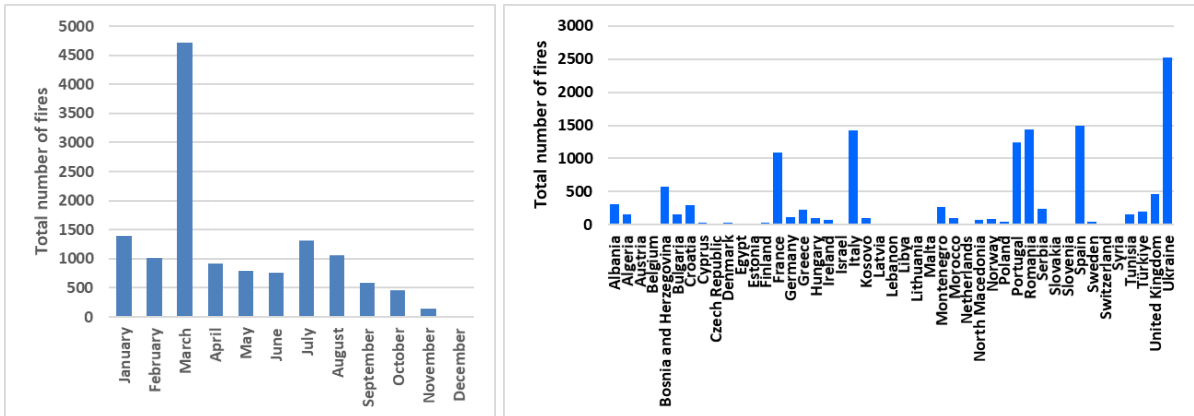


Figure 176. Total number of fires mapped by month and country in 2022

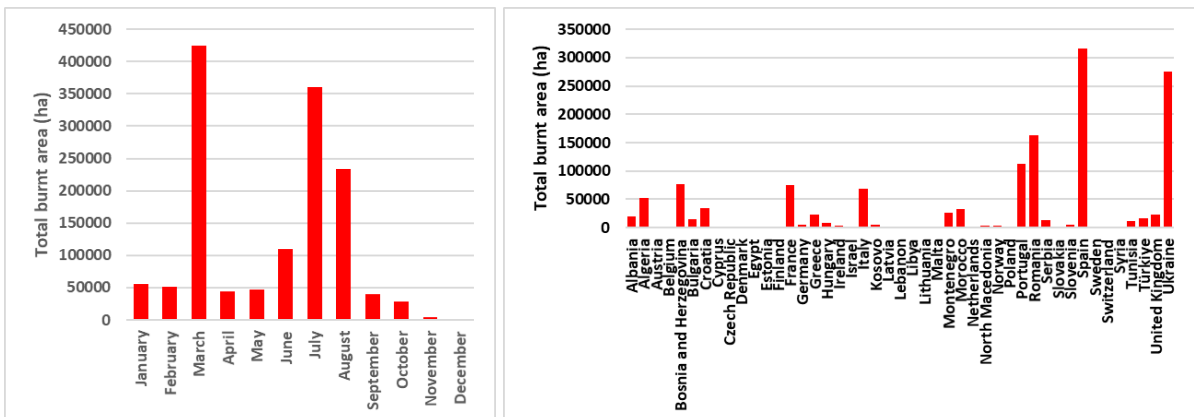


Figure 177. Total burnt area of fires mapped by month and country in 2022.

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, but some other countries also report equivalent protected areas. The area burnt within the Natura2000 sites and other protected areas for which there is information is presented below¹³.

Country	Area (Ha)	% of Natura2000 Area	Number of Fires
Austria	1032	0.07128	7
Belgium	428	0.06218	7
Bulgaria	6137	0.11375	80
Croatia	12014	0.57802	125
Cyprus	93	0.04087	6
Czechia	1436	0.09633	1
Denmark	474	0.01521	26
Finland	11	0.00020	3
France	23143	0.15171	567
Germany	4066	0.26767	103
Greece	9693	0.00154	3
Hungary	3715	0.13993	41
Ireland	1351	0.07335	34
Italy	17104	0.22299	456
Latvia	154	0.01964	11
Lithuania	2	0.00016	1
Netherlands	331	0.01315	15
Poland	541	0.00604	15
Portugal	41097	1.66518	451
Romania	102607	1.63685	689
Slovakia	136	0.00756	5
Slovenia	4396	0.39893	5
Spain	120340	0.64027	553
Sweden	135	0.00205	10
EU27 total	350437		3214
Algeria	9954	5.979709	10
Morocco	394	0.05166	6
UK	6177	0.092324	143
Non-EU total	16525		159
Total (all)	366962		3373

Fires were mapped in 24 of the 27 EU member states (all except Estonia, Luxembourg and Malta).

The total burnt area in Natura2000 sites in 2022 was 350 437 ha, the highest amount mapped in the last 10 years (Figure 178).

The damage was particularly concentrated in two countries, Spain and Romania, which between them accounted for two thirds of the total area burnt in protected areas in 2022 (Figure 179, Figure 180).

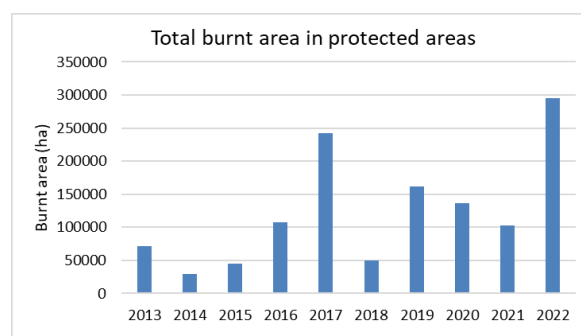


Figure 178. Total burnt area (from fires ≥ 30 ha) in protected areas since 2013¹⁴.

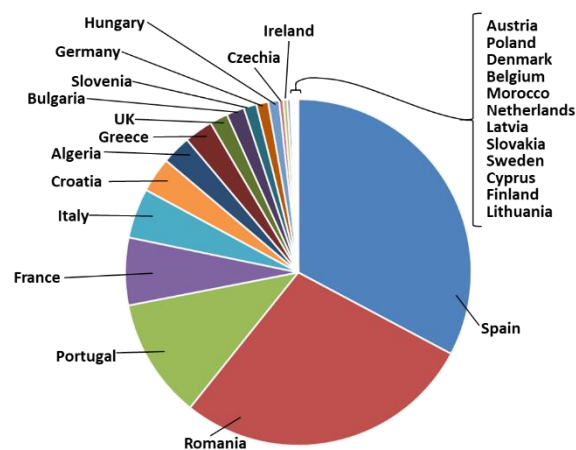


Figure 179. Total area burnt in Natura2000 sites and other protected areas in 2022.

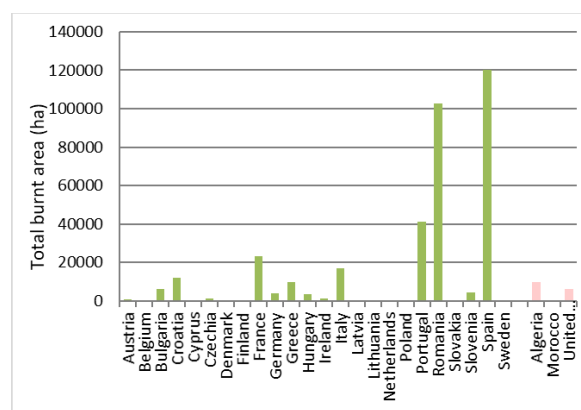


Figure 180. Total mapped burnt area in Natura2000 sites and other protected areas in 2022.

¹³ All fires mapped, including prescribed burns

¹⁴ For comparisons with previous years, a filter is applied to restrict data to fires ≥ 30 ha, to ensure consistency over time.

Affected land cover types

In 2022, around half of the total burnt area occurred either in Other Natural Land or Agricultural Land as identified by the 2018 CORINE Land Cover Type classification system and the 2019 Copernicus Globcover classification in regions where Corine was not available. The high proportion of Agricultural land affected was strongly driven by the figures from Ukraine (Figure 182). A further 26% was mapped in forest (Broadleaf, Conifer or Mixed). (Figure 181, Figure 182).

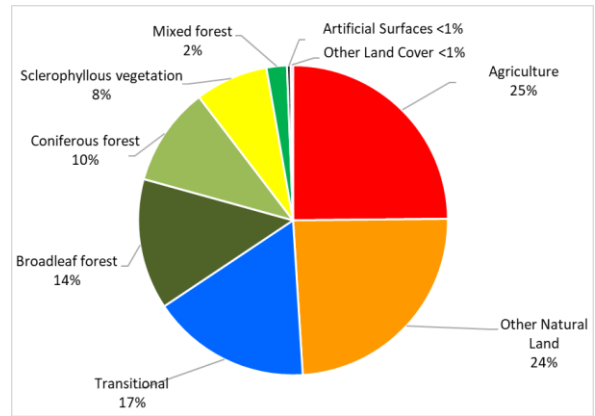


Figure 181. Proportions of land cover types affected in 2022 (all countries).

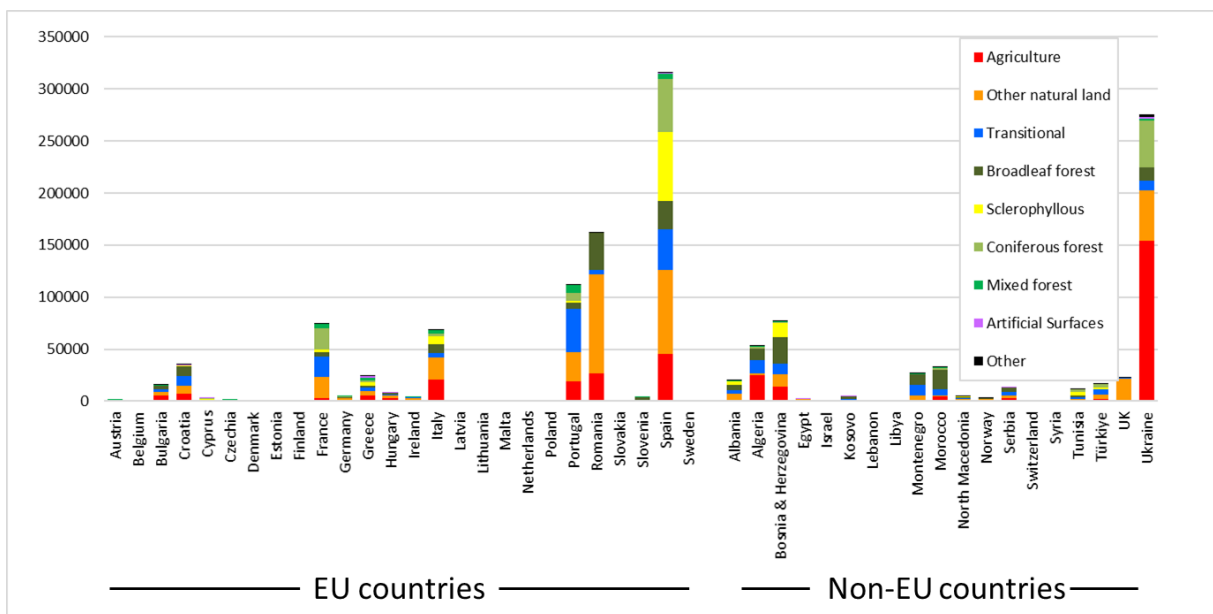


Figure 182. Burnt area in each country in 2022 by CORINE land class.

European countries

In 2022, fires were mapped in 26 of the EU27 countries (all except Luxembourg), burning 837 212 ha in total. This is well above the amount recorded in 2021 (449 342 ha).

There were two main peaks in the year: a first one in March when a very high number of fires occurred in almost every country, and a second larger peak in July from fewer but larger fires.

Of this total, 350 437 ha occurred on Natura2000 sites, three times the amount mapped in 2021. This is equivalent to around 44% of the total burnt area in these countries. Three quarters of the damage to protected areas came from three countries (Spain, Romania and Portugal).

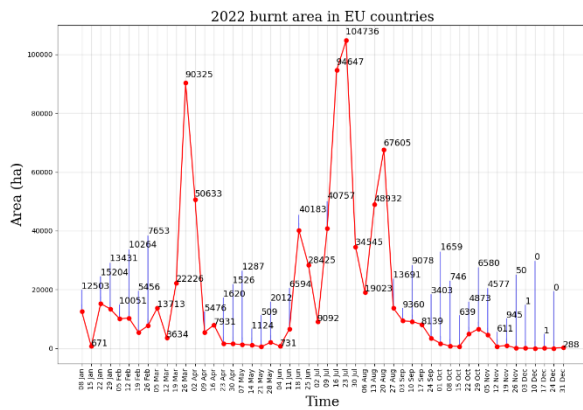


Figure 183. Burnt area weekly evolution in EU27 countries in 2022.

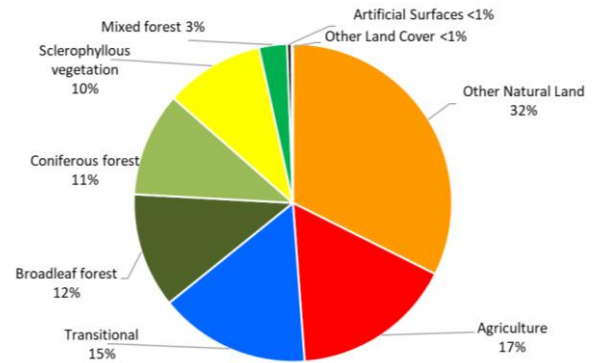


Figure 184. Proportions of land cover types affected in EU27 countries in 2022.

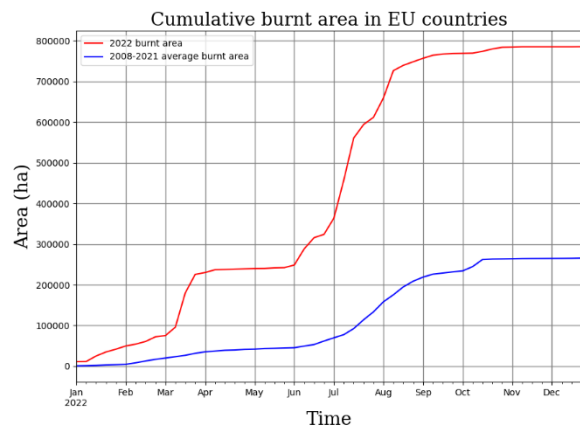
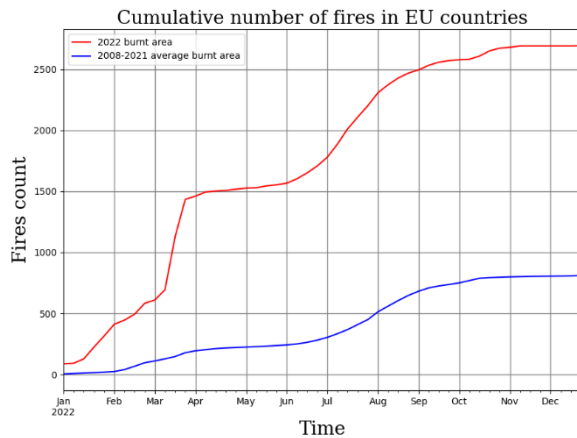


Figure 185. Cumulative number of fires and burnt area in 2022 in EU27 countries (red line) compared with 2008-2021 average (blue line). Fires are filtered to include only those ≥ 30 ha to allow the comparison with previous years.

Mapped burnt area by country

The following section details the burnt areas mapped in each country in 2022.

European countries (EU and non-EU) are listed alphabetically, followed by the MENA countries.

Burnt areas are split into different land cover types using the CLC 2018 database unless otherwise specified.

The figures may also include agricultural and urban areas that were burned during the wildfires, or prescribed fires, which may not strictly be considered forest fires in the countries concerned. The breakdown of totals into the different land cover types gives some ideas of the different areas affected.

NOTE

In 2022, fires smaller than 30 ha were also mapped. These figures are displayed in the tables of land cover types and the charts of monthly numbers of fires/burnt areas.

However, when comparing the latest data with the historic records of previous years, a filter has been applied excluding fires under 30 ha, in order to make consistent comparisons. This applies to the charts showing the annual time series of mapped numbers of fires/burnt areas.

It is also worth noting, however, that almost all damage comes from fires larger than 30 ha.

3.1.1 Albania

307 fires were mapped in Albania, resulting in a total burnt area of 19 591 ha. Around one half of the total was mapped in Broadleaf Forest or Other Natural Land (Table 56). There were two peaks in the season: one in March and the other over the summer months (Figure 187). The largest fire of the year occurred at the end of July in Dropull i Poshtëm province and affected 1 633 ha, and there were five other fires over 500 ha during the season. Mapped locations of the fires in 2022 can be seen in Figure 194 on page 149 below.

Table 56. Distribution of burnt area (ha) in Albania by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	5182	26.5
Coniferous forest	208	1.1
Mixed forest	268	1.4
Other Natural Land	5651	28.8
Sclerophyllous vegetation	3484	17.8
Transitional	3143	16.0
Agriculture	1622	8.3
Artificial Surfaces	24	0.1
Other Land Cover	9	0.1
TOTAL	19591	100

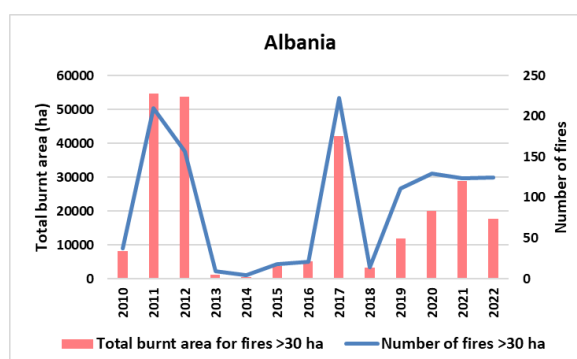


Figure 186. Annual mapped burnt area of fires >=30ha in Albania.

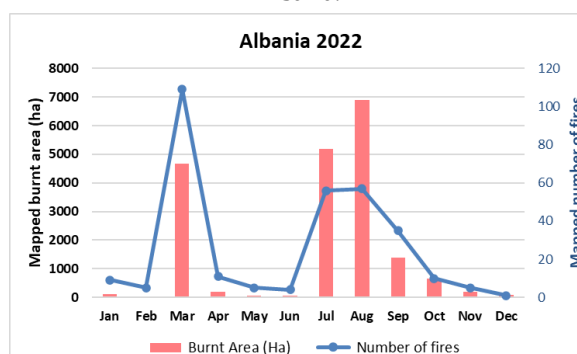


Figure 187. Monthly numbers of fires and burnt area in Albania in 2022.

3.1.2 Austria

It was the worst year in Austria for a decade. Eight large fires were mapped, the largest one (332 ha) in February. Practically all the total of 1 034 ha occurred on Natura2000 sites, with Coniferous Forest and Agricultural land the most affected (Table 57).

Table 57. Distribution of burnt area (ha) in Austria by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	420	40.6
Mixed forest	55	5.3
Other Natural Land	97	9.4
Transitional	29	2.8
Agriculture	433	41.9
TOTAL	1034	100

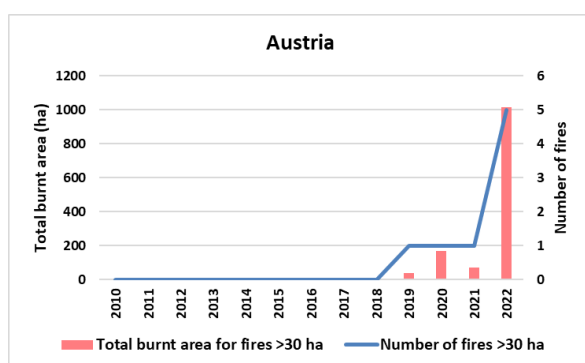


Figure 188. Annual mapped burnt area of fires >=30ha in Austria.

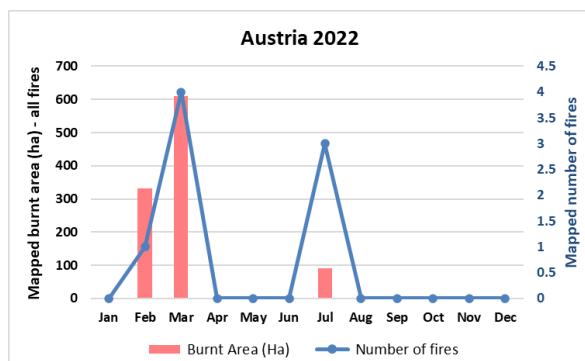


Figure 189. Monthly numbers of fires and burnt area in Austria in 2022.

3.1.3 Belgium

Seven fires were mapped in Belgium, all in March on Natura2000 sites, representing 0.062% of the protected area in the country. Almost all of the 428 ha total burnt area occurred on Other Natural Land (Table 58).

Table 58. Distribution of burnt area (ha) in Belgium by land cover types in 2022.

Land cover	Area burned	% of total
Other Natural Land	423	98.8
Transitional	4	0.9
Artificial Surfaces	1	0.2
TOTAL	428	100

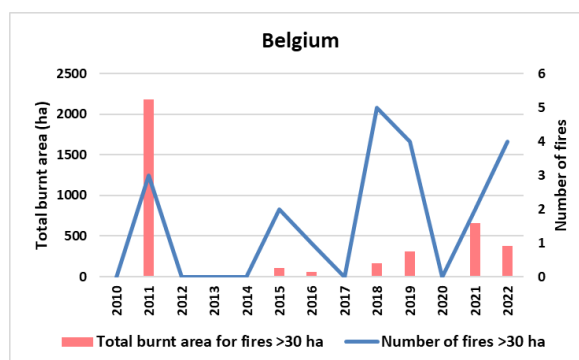


Figure 190. Annual mapped burnt area of fires >=30ha in Belgium.

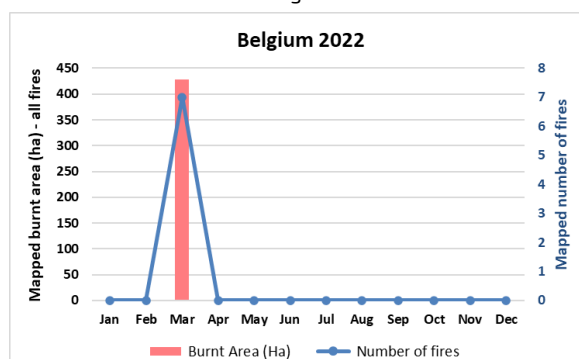


Figure 191. Monthly mapped burnt area and number of fires in Belgium in 2022.

3.1.4 Bosnia and Herzegovina

The fire season in Bosnia was similar to that of 2021, at least in terms of total burnt area. However, unlike 2021, when there were two peaks in the season (spring and summer), in 2022 almost all of the damage occurred in March (Figure 193). A total of 578 fires were mapped, covering 76 473 ha. The country's five largest fires were all over 2 000 ha with a further ten over 1 000 ha and 11 others over 500 ha. Fires affected several different land cover types, but the most affected type was Broadleaf Forest, which accounted for a third of the total. Figure 194 shows the locations of the large fires in 2022.

Table 59. Distribution of burnt area (ha) in Bosnia-Herzegovina by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	25224	33.0
Coniferous forest	594	0.8
Mixed forest	873	1.1
Other Natural Land	11620	15.2
Sclerophyllous vegetation	13456	17.6
Transitional	10312	13.5
Agriculture	14387	18.8
Artificial Surfaces	4	0.0
Other Land Cover	2	0.0
TOTAL	76473	100

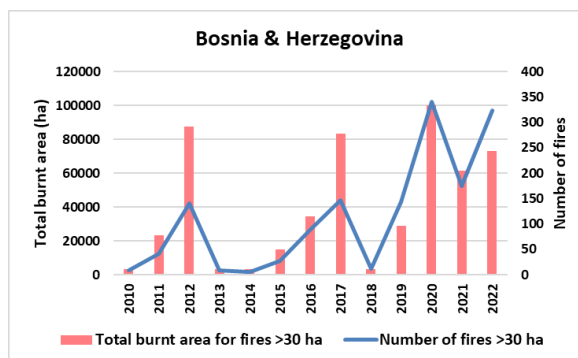


Figure 192. Annual mapped burnt area of fires ≥ 30 ha in Bosnia and Herzegovina.

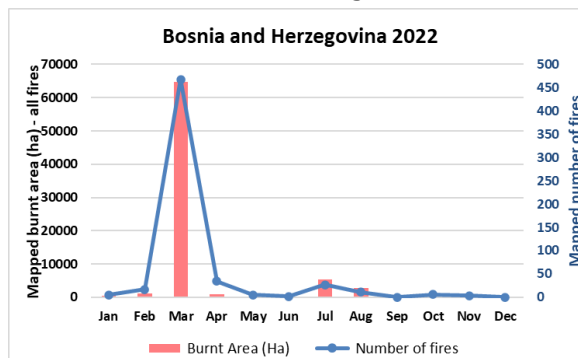


Figure 193. Monthly mapped burnt area and number of fires in Bosnia & Herzegovina in 2022.

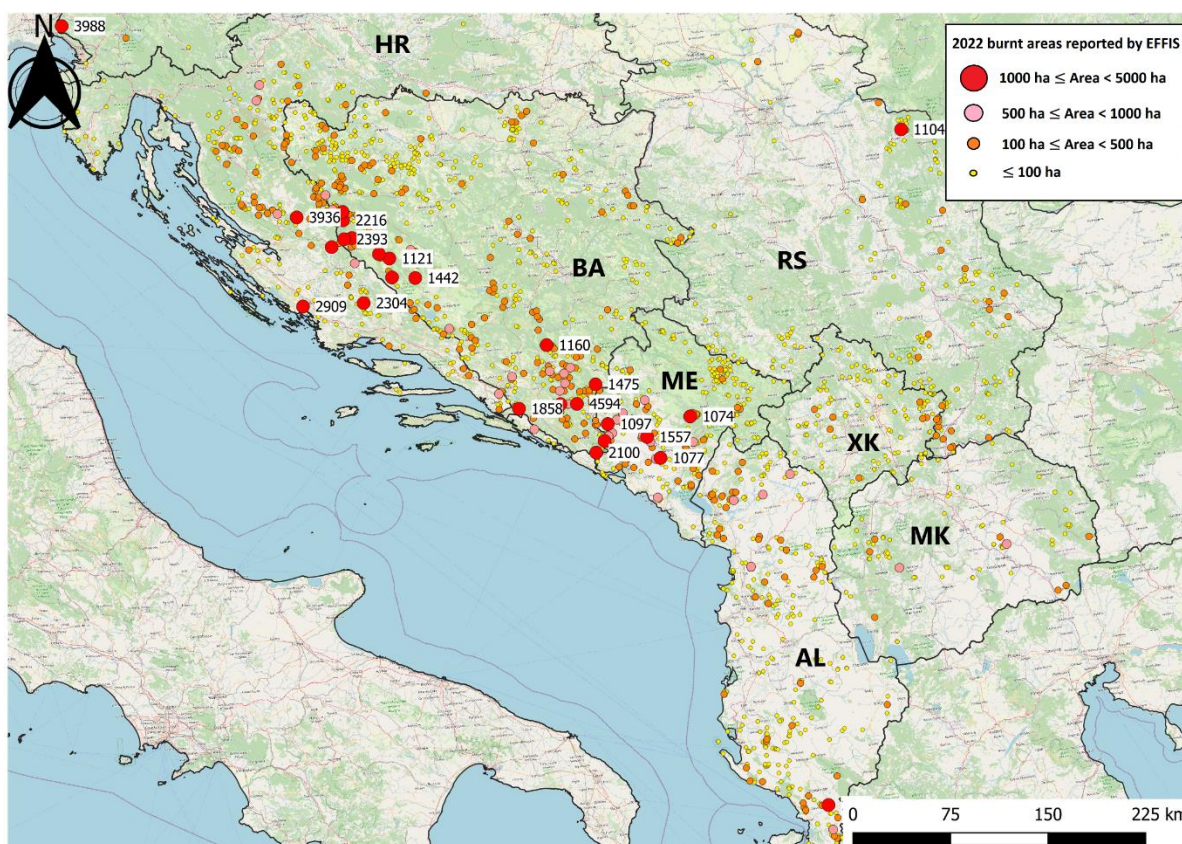


Figure 194. Locations of mapped fires in the Balkans in 2022. Largest fires are indicated in ha. AL=Albania; BA=Bosnia & Herzegovina; HR=Croatia; XK=Kosovo under UNSCR 1244; ME=Montenegro; MK=North Macedonia; RS=Serbia.

3.1.5 Bulgaria

The 2022 fire season in Bulgaria was among the worst of recent years. Similar to other countries, there was a major peak of activity in March, followed by a second peak in the summer (Figure 196). A total of 150 fires were mapped, burning 15 461 ha. The March peak was mainly caused by a fire of over 1 000 ha in Vidin province, while the August peak included three fires over 500 ha. Of the annual total, around 40% (6 137 ha) occurred on Natura2000 sites, which amounts to 0.114% of the total Natura2000 land in Bulgaria. The locations of the fires mapped in 2022 are shown in Figure 197.

Table 60. Distribution of burnt area (ha) in Bulgaria by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	3131	20.3
Coniferous forest	316	2.0
Mixed forest	411	2.7
Other Natural Land	2611	16.9
Transitional	2997	19.4
Agriculture	5916	38.3
Artificial Surfaces	71	0.5
Other Land Cover	7	0.1
TOTAL	15461	100

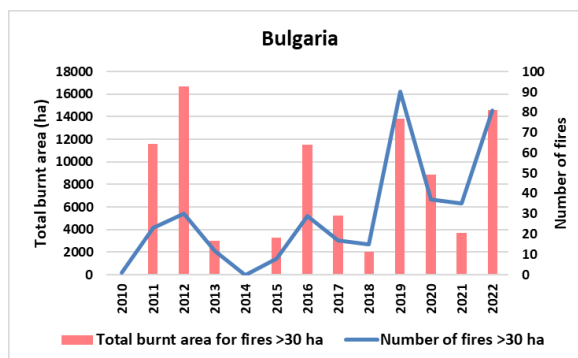


Figure 195. Annual mapped burnt area of fires ≥ 30 ha in Bulgaria.

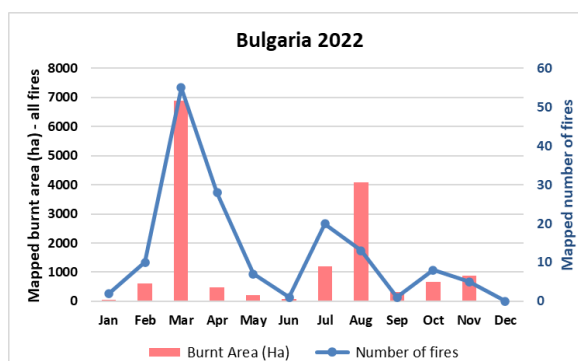


Figure 196. Monthly mapped burnt area and number of fires in Bulgaria in 2022.

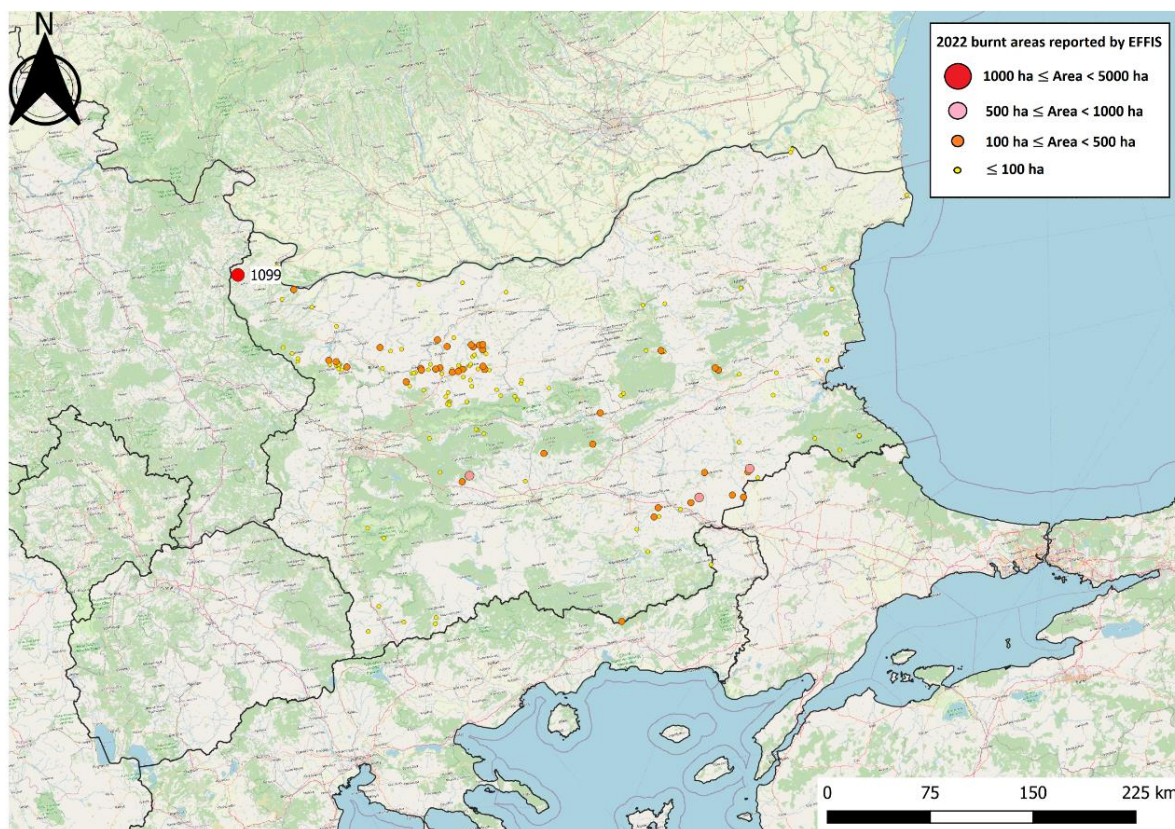


Figure 197. Locations of the mapped fires in Bulgaria in 2022.

3.1.6 Croatia

The total mapped burnt area in Croatia was 34 818 ha, around three times that recorded in 2021, although significantly lighter than the country's worst year in 2017. However, the number of fires mapped (even after applying a filter to exclude fires <30 ha) was the highest recorded in the last decade (Figure 198). Over three-quarters of the damage occurred in March, including Croatia's two largest fires of the year which were both in Gračac municipality and around 4 000 ha in size. Two other fires exceeded 2 000 ha and a further six were over 500 ha. Of the total, 12 014 ha (around a third) occurred on Natura2000 sites, amounting to 0.578% of the protected areas in the country. The locations of these mapped fires can be seen in Figure 194 above.

Table 61. Distribution of burnt area (ha) in Croatia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	9321	26.8
Coniferous forest	145	0.4
Mixed forest	218	0.6
Other Natural Land	8099	23.3
Sclerophyllous vegetation	803	2.3
Transitional	9065	26.0
Agriculture	7074	20.3
Artificial Surfaces	86	0.3
Other Land Cover	6	0.0
TOTAL	34818	100

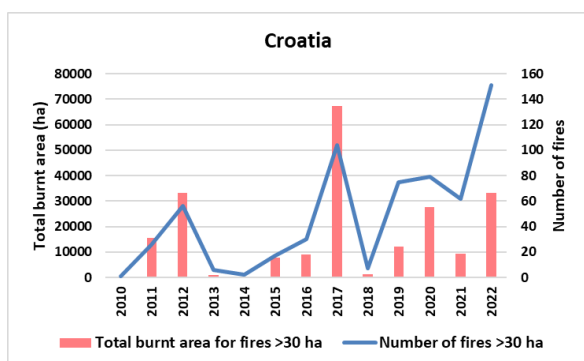


Figure 198. Annual mapped burnt area of fires >=30ha in Croatia.

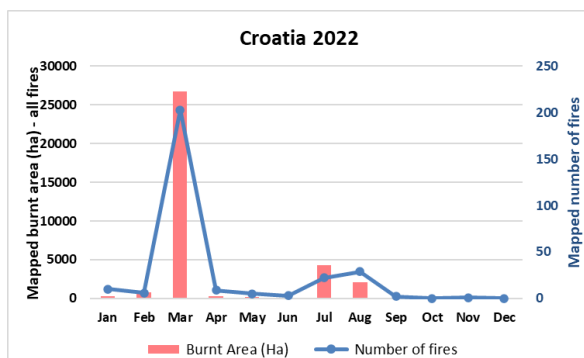


Figure 199. Monthly mapped burnt area and number of fires in Croatia in 2022.

3.1.7 Cyprus

The 2022 fire season in Cyprus was somewhat better than the previous two years. 23 fires were mapped, burning a total of 2 650 ha. Two thirds of this total came from a single large fire of 1 793 ha in the north of the country in June. Natura2000 land was relatively unaffected, accounting for only 93 ha (3.5% of the total) and 0.04% of the total protected land of the country.

Table 62. Distribution of burnt area (ha) in Cyprus by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	5	0.2
Coniferous forest	805	30.4
Other Natural Land	159	6.0
Sclerophyllous vegetation	938	35.4
Transitional	556	21.0
Agriculture	179	6.8
Artificial Surfaces	7	0.3
TOTAL	2650	100

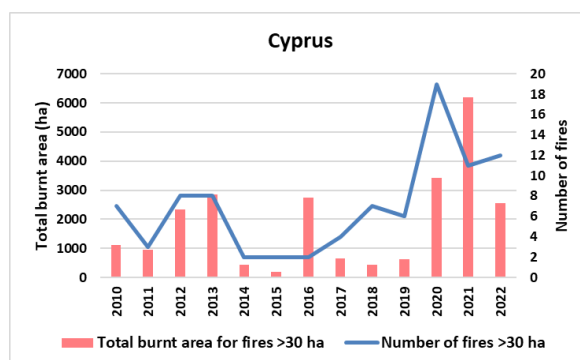


Figure 200. Annual mapped burnt area of fires >=30ha in Cyprus.

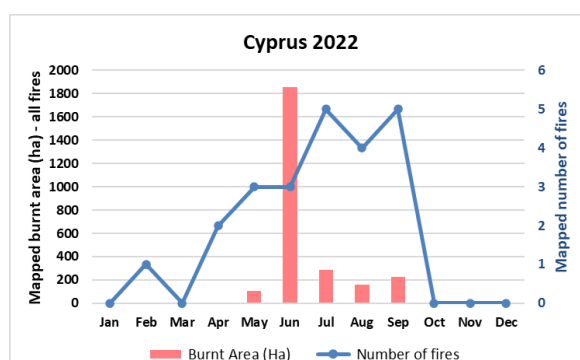


Figure 201. Monthly mapped burnt area and number of fires in Cyprus in 2022.



Figure 202. Locations of the mapped fires in Cyprus 2022.

3.1.8 Czechia

It was the worst season for fires in Czechia for at least a decade, because of a single very large fire that occurred in Hřensko province in July, burning 1 436 ha, all on Natura2000 land and amounting to 0.096% of the protected land in the country. The total burnt area mapped was 1 438 ha and was virtually all in forest lands (Broadleaf, Conifer or Mixed, Table 63). Figure 215 on page 155 below shows the location of this fire.

Table 63. Distribution of burnt area (ha) in Czechia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	22	1.5
Coniferous forest	1062	73.9
Mixed forest	353	24.5
Agriculture	1	0.1
TOTAL	1438	100

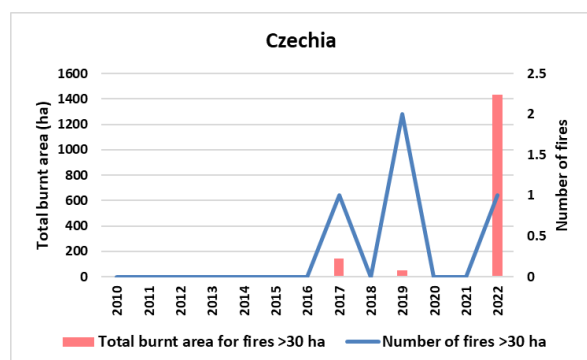


Figure 203. Annual mapped burnt area of fires >=30ha in Czechia.

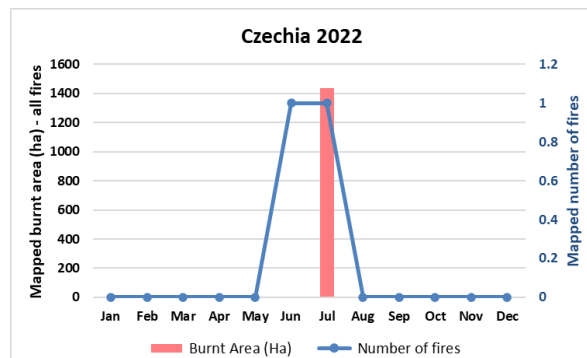


Figure 204. Monthly mapped burnt area and number of fires in Czechia in 2022.

3.1.9 Denmark

In 2022, 30 fires were mapped in Denmark, mostly early in the season in March. A total of 510 ha was mapped, the majority in Other Natural Land. Over 90% of the annual total (474 ha) was on Natura2000 sites, amounting to 0.015% of the total protected area in the country.

Table 64. Distribution of burnt area (ha) in Denmark by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	3	0.6
Other Natural Land	470	92.2
Transitional	37	7.3
TOTAL	510	100

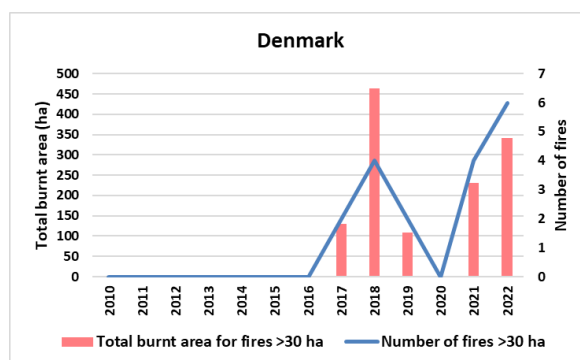


Figure 205. Annual mapped burnt area of fires >=30ha in Denmark.

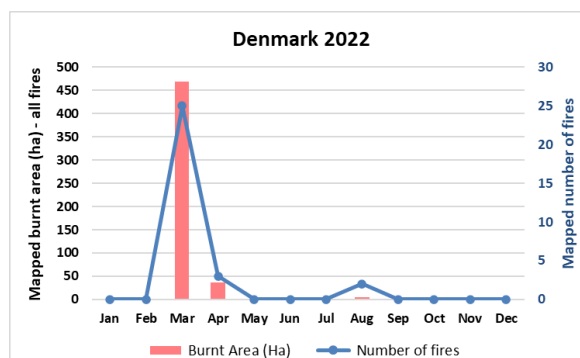


Figure 206. Monthly mapped burnt area and number of fires in Denmark in 2022.

3.1.10 Finland

After a bad year in 2021, the 2022 fire season in Finland was light. A total burnt area of 372 ha was mapped from 33 fires, of which only 11 ha was on Natura2000 land. The 2022 fire season ran from May to August (Figure 208).

Table 65. Distribution of burnt area (ha) in Finland by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	298	80.1
Mixed forest	23	6.2
Other Natural Land	32	8.6
Transitional	19	5.1
TOTAL	372	100

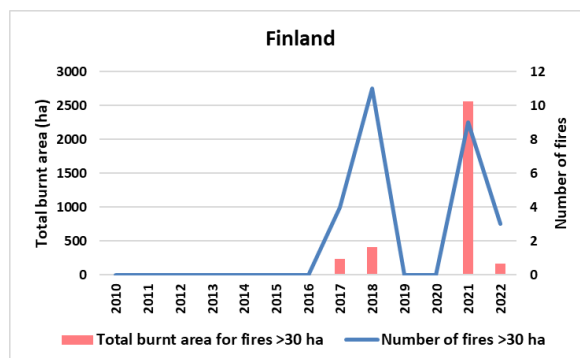


Figure 207. Annual mapped burnt area of fires >=30ha in Finland.



Figure 208. Monthly mapped burnt area and number of fires in Finland in 2022.

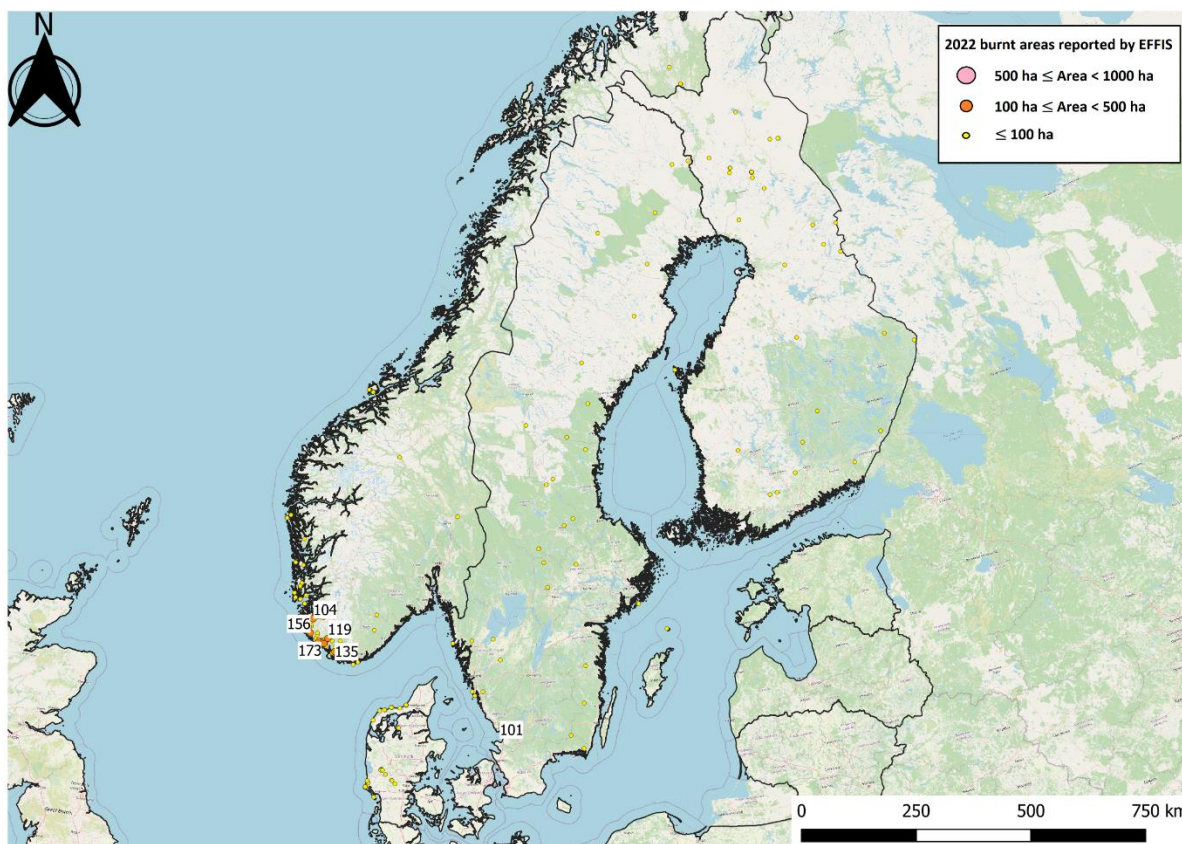


Figure 209. Locations of mapped fires in Scandinavia in 2022.

3.1.11 France

It was the worst fire season for France for over a decade (Figure 210). 1 089 fires were mapped, affecting a total of 74 654 ha, twice the amount recorded in 2021. Fires were mapped in every month except December, starting with a large number of relatively small fires in January. During the summer, the Gironde was affected by the country's four largest fires, including one in Louchats municipality which covered over 13 000 ha. Two of the others were over 5 000 ha and there were a further seven fires mapped at over 1 000 ha. (Figure 212). 23 143 ha of the annual total occurred on Natura2000 sites, which corresponds to 31% of the total area burned and 0.15% of the total Natura2000 areas in the country.

Table 66. Distribution of burnt area (ha) in France by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	4246	5.7
Coniferous forest	20435	27.4
Mixed forest	3672	4.9
Other Natural Land	20142	27.0
Sclerophyllous vegetation	3324	4.5
Transitional	19042	25.5
Agriculture	3293	4.4
Artificial Surfaces	452	0.6
Other Land Cover	46	0.1
TOTAL	74654	100

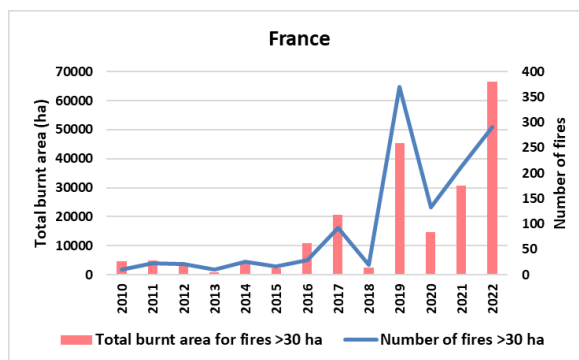


Figure 210. Annual mapped burnt area of fires ≥ 30 ha in France.

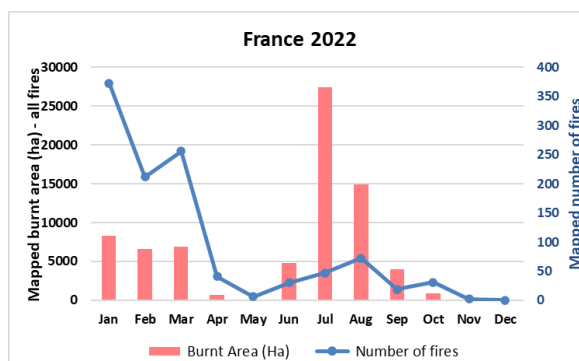


Figure 211. Monthly mapped burnt area and number of fires in France in 2022.

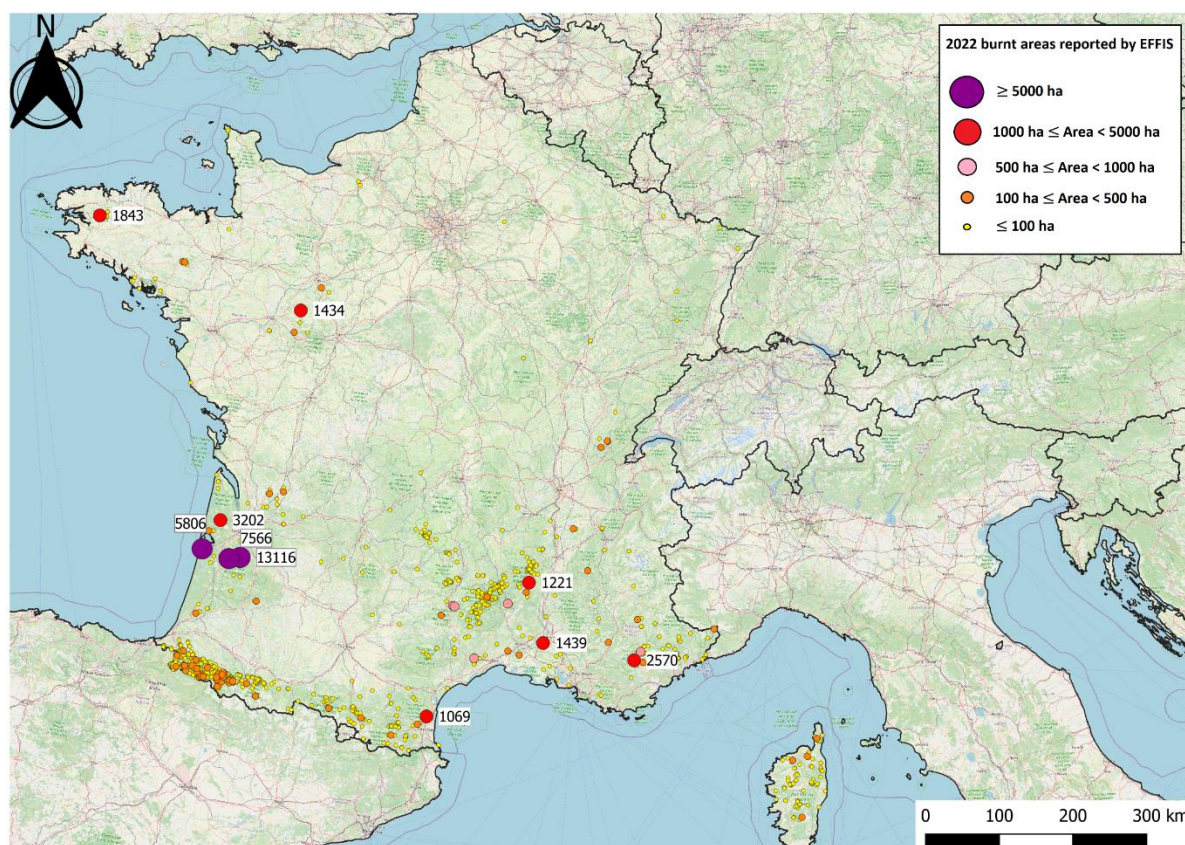


Figure 212. Location of mapped fires in France in 2022.

3.1.12 Germany

The 2022 fire season in Germany was the worst for more than a decade (Figure 213). Like many other countries, there was a first peak in activity in March, followed by a second one in the summer (Figure 214). A total of 5 117 ha was mapped from 115 fires, including two over 800 ha (one in Bavaria in March and the other in Elbe-Elster in June). Of the annual total, over three quarters (4 066 ha) occurred in Natura2000 sites, amounting to 0.036% of the Natura2000 area in the country.

Table 67. Distribution of burnt area (ha) in Germany by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	232	4.5
Coniferous forest	1423	27.8
Mixed forest	175	3.4
Other Natural Land	2715	53.0
Transitional	508	9.9
Agriculture	64	1.3
TOTAL	5117	100

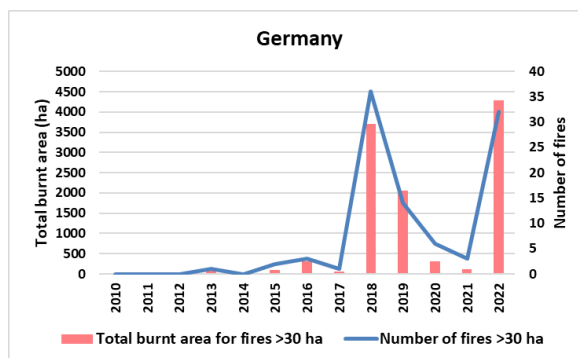


Figure 213. Annual mapped burnt area of fires >=30ha in Germany

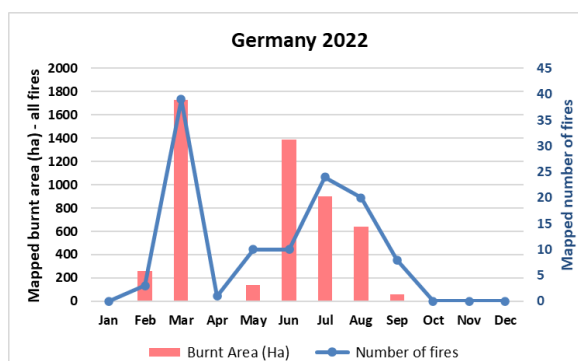


Figure 214. Monthly mapped burnt area and number of fires in Germany in 2022.

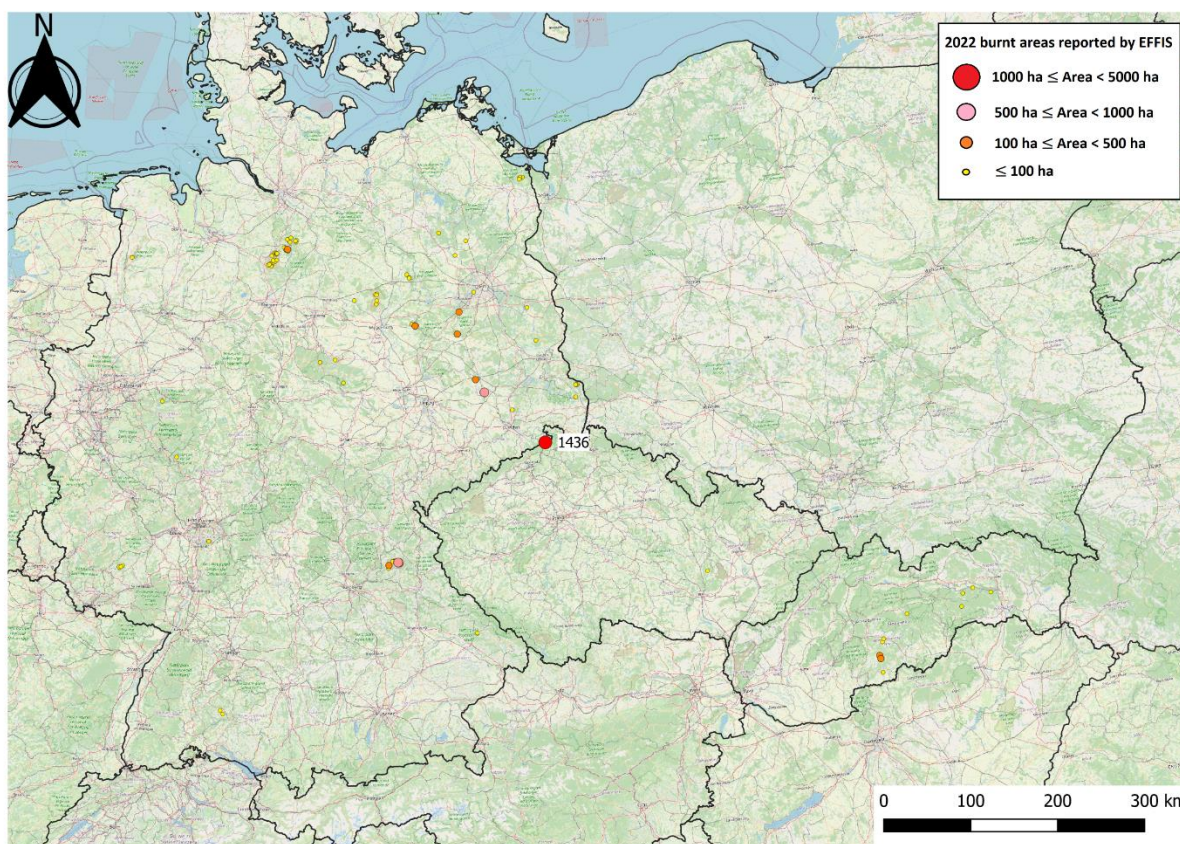


Figure 215. Location of fires in Germany, Czechia and Slovakia in 2022.

3.1.13 Greece

After an extreme year in 2021, the fire season in Greece reverted to an average level (Figure 216). A total of 23 942 ha was mapped from 230 fires. Most of these occurred in July, including the largest one of the season in Evros province at just over 4 000 ha. A further five fires were over 1 000 ha (Figure 218).

Of the total, 9 693 ha occurred on Natura2000 sites, amounting to 41% of the total and 0.002% of the total Natura2000 area of Greece. Table 68 presents the distribution of the mapped burnt area by land cover type.

Table 68. Distribution of burnt area (ha) in Greece by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1098	4.6
Coniferous forest	1421	5.9
Mixed forest	2812	11.7
Other Natural Land	4556	19.0
Sclerophyllous vegetation	3798	15.9
Transitional	3418	14.3
Agriculture	5447	22.8
Artificial Surfaces	1365	5.7
Other Land Cover	25	0.1
TOTAL	23942	100

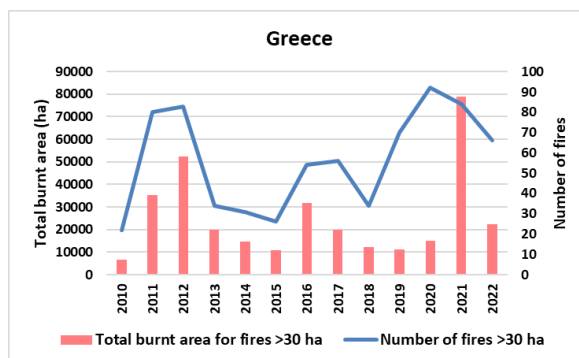


Figure 216. Annual mapped burnt area of fires ≥ 30 ha in Greece.



Figure 217. Monthly mapped burnt area and number of fires in Greece in 2022.

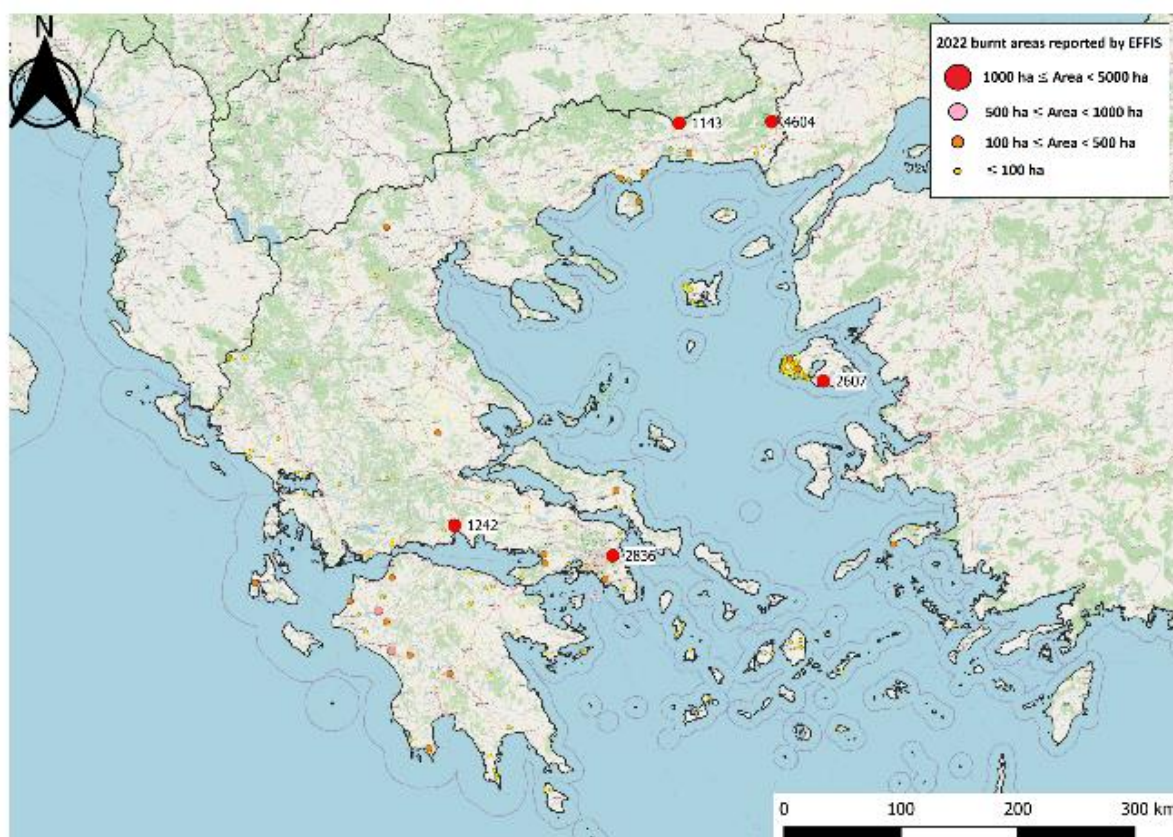


Figure 218. Locations of mapped fires in Greece in 2022.

3.1.14 Hungary

2022 was the worst fire season in Hungary by some margin (Figure 219). 92 fires burned 7 960 ha, more than ten times the average of the last decade. In common with several other countries, there was an early peak in March, followed by a second one in the summer months. In Hungary most of the damage occurred during the March peak, although the two largest fires (both over 700 ha) were mapped in July and August (Figure 223).

3 715 ha of the total was in Natura2000 sites, amounting to nearly half of the total and 0.14% of the Natura2000 area in the country.

Table 69. Distribution of burnt area (ha) in Hungary by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1432	18.0
Coniferous forest	25	0.3
Mixed forest	115	1.5
Other Natural Land	2607	32.8
Transitional	883	11.1
Agriculture	2880	36.2
Artificial Surfaces	17	0.2
TOTAL	7960	100

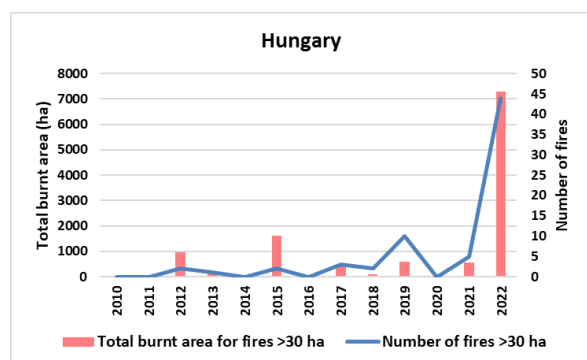


Figure 219. Annual mapped burnt area of fires >=30ha in Hungary.

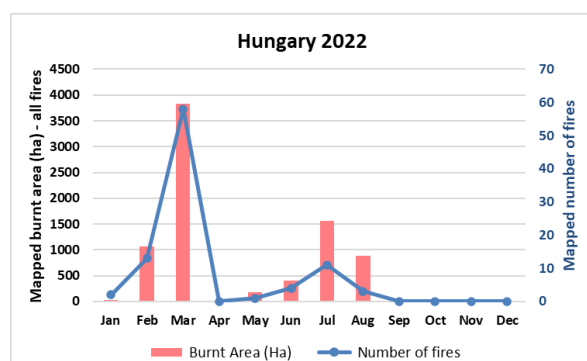


Figure 220. Monthly mapped burnt area and number of fires in Hungary in 2022.

3.1.15 Ireland

The total burnt area of 3 409 ha from 69 fires mapped in Ireland was close to the average of the last few years. As is usual in Ireland, the main peak of activity was in March and April. Around 40% of the burnt area (1 351 ha) was recorded in Natura2000 sites, which corresponds to 0.073% of the total Natura2000 land in the country. The most affected land type in 2022 was Other Natural Land, as shown in Table 70.

Table 70. Distribution of burnt area (ha) in Ireland by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	7	0.2
Mixed forest	20	0.6
Other Natural Land	3128	91.8
Transitional	216	6.3
Agriculture	38	1.1
TOTAL	3409	100

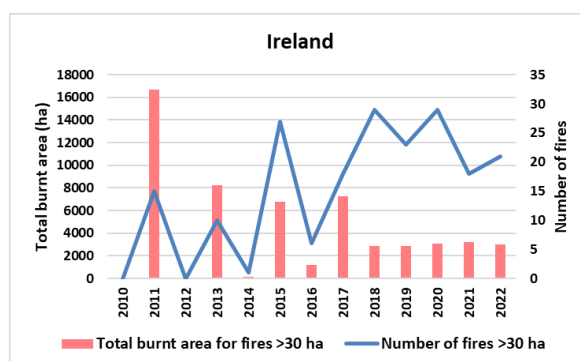


Figure 221. Annual mapped burnt area of fires >=30ha in Ireland.

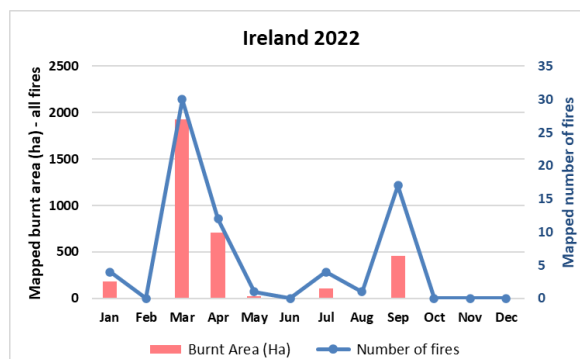


Figure 222. Monthly mapped burnt area and number of fires in Ireland in 2022.

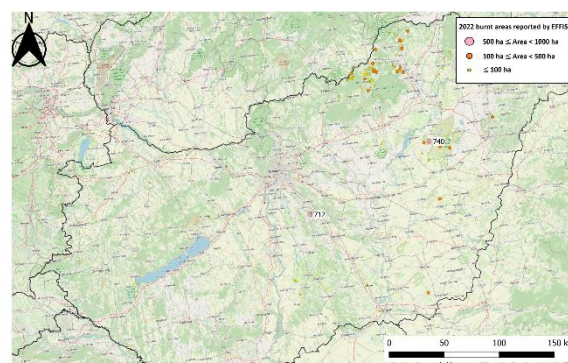


Figure 223. Locations of mapped fires in Hungary in 2022.

3.1.16 Italy

After a very hard season in 2021, the total mapped in Italy in 2022 settled at an average level. Most of the annual total of 68 510 ha from 1 426 fires occurred between June and September (Figure 225), with 10% of the total from two fires over 1 000 ha and a further 6 over 500 ha in Sicily (Figure 226). 17 104 ha of the total occurred on Natura2000 sites, corresponding to 25% of the total and 0.223% of the Natura2000 land in Italy.

Table 71. Distribution of burnt area (ha) in Italy by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	8010	11.7
Coniferous forest	3002	4.4
Mixed forest	2921	4.3
Other Natural Land	20868	30.5
Sclerophyllous vegetation	7740	11.3
Transitional	4801	7.0
Agriculture	20754	30.3
Artificial Surfaces	321	0.5
Other Land Cover	91	0.1
TOTAL	68510	100

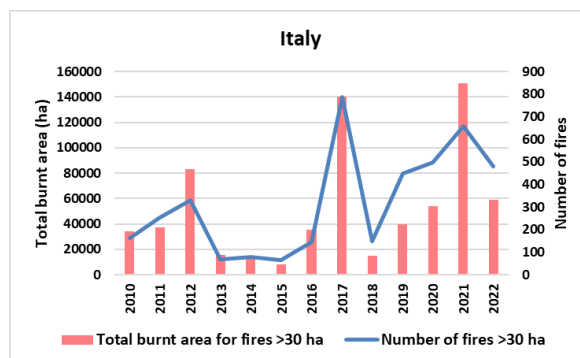


Figure 224. Annual mapped burnt area of fires ≥ 30 ha in Italy.

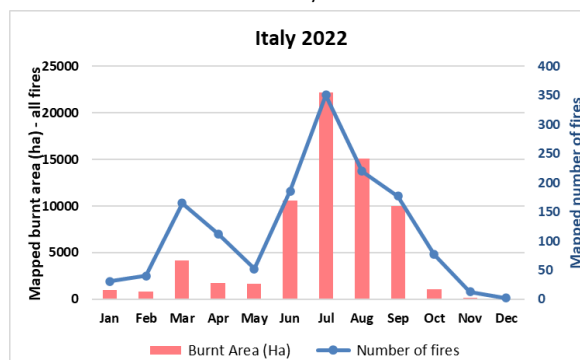


Figure 225. Monthly mapped burnt area and number of fires in Italy in 2022.

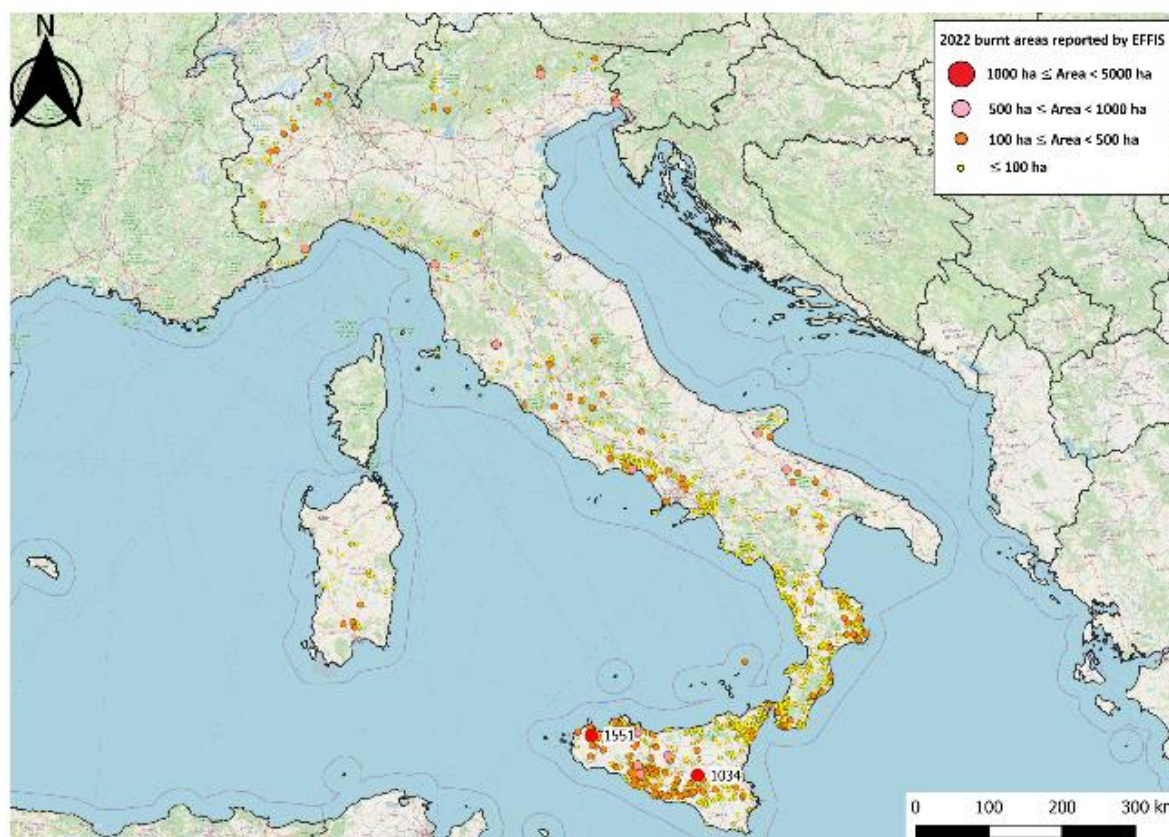


Figure 226. Locations of mapped fires in Italy in 2022.

3.1.17 Kosovo under UNSCR 1244

It was a relatively good year in Kosovo, with a total burnt area mapped of 4 430 ha from 98 fires, around half that of the previous two years. As in several other countries, the worst month was March, when around three-quarters of the damage occurred. Broadleaf Forest was the most affected land cover type, accounting for more than half of the total (Table 72).

Table 72. Distribution of burnt area (ha) in Kosovo by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	2521	56.9
Coniferous forest	91	2.1
Mixed forest	17	0.4
Other Natural Land	287	6.5
Sclerophyllous vegetation	8	0.2
Transitional	1044	23.6
Agriculture	461	10.4
Artificial Surfaces	1	0.0
TOTAL	4430	100

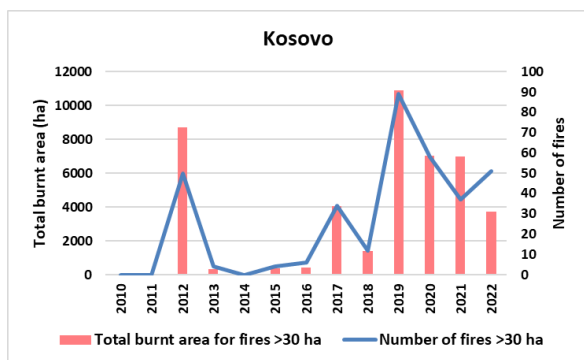


Figure 227. Annual mapped burnt area of fires >=30ha in Kosovo.

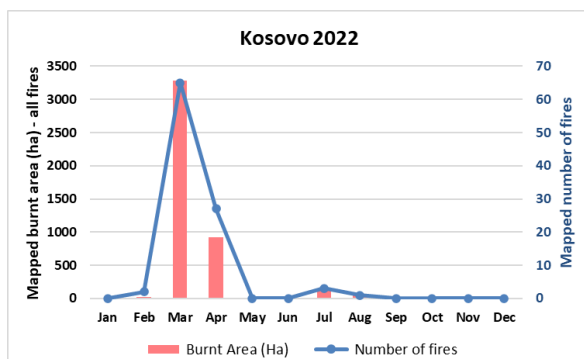


Figure 228. Monthly mapped burnt area and number of fires in Kosovo in 2022.

3.1.18 Latvia

238 ha were mapped in Latvia from 14 fires in 2022, around 30% less than in 2021. The damage occurred in April and May, including Latvia's largest fire of 113 ha.

154 ha of this total occurred in Natura2000 sites, corresponding to 65% of the total burnt area and 0.02% of the total protected area in the country.

Table 73. Distribution of burnt area (ha) in Latvia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	2	0.8
Coniferous forest	8	3.5
Other Natural Land	228	95.7
TOTAL	238	100

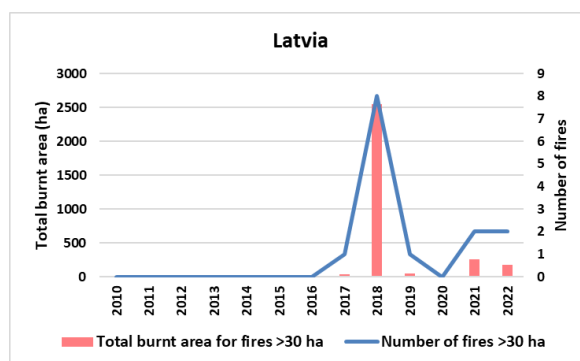


Figure 229. Annual mapped burnt area of fires >=30ha in Latvia.

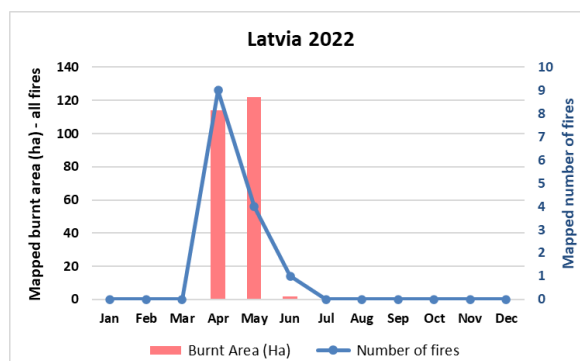


Figure 230. Monthly mapped burnt area and number of fires in Latvia in 2022.

3.1.19 Lithuania

The 2022 fire season in Lithuania was light. Seven fires were mapped burning a total of 34 ha, mostly in Other Natural Land. Very little Natura2000 land (2 ha) was affected.

Table 74. Distribution of burnt area (ha) in Lithuania by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	5	14.7
Other Natural Land	26	76.5
Transitional	2	5.9
Agriculture	1	2.9
TOTAL	34	100

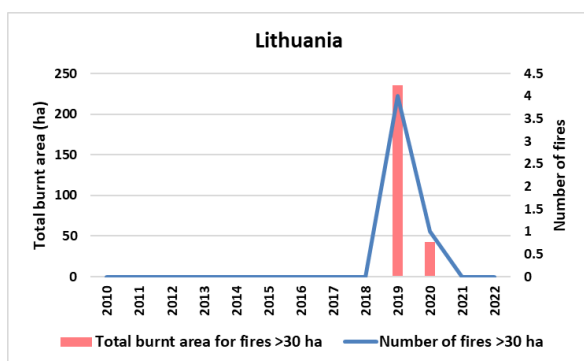


Figure 231. Annual mapped burnt area of fires >=30ha in Lithuania.

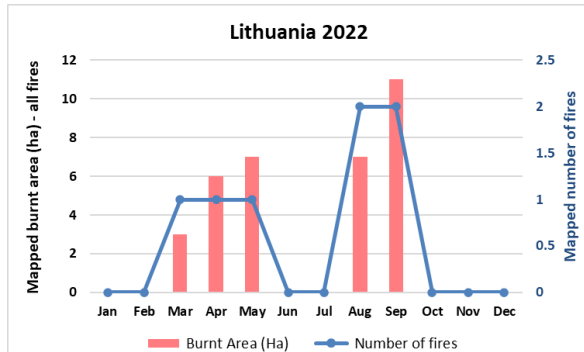


Figure 232. Monthly mapped burnt area and number of fires in Lithuania in 2022.

3.1.20 Montenegro

The fire season in Montenegro was relatively light compared to the previous two years. 26 332 ha were mapped from 260 fires. In common with other countries, March was the worst month, accounting for two thirds of the annual total (Figure 234). Four fires exceeded 1 000 ha, and a further 11 were over 500 ha. Figure 194 on page 149 above shows the locations of these fires.

Table 75. Distribution of burnt area (ha) in Montenegro by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	10417	39.6
Coniferous forest	4	0.0
Mixed forest	80	0.3
Other Natural Land	3912	14.9
Sclerophyllous vegetation	68	0.3
Transitional	10622	40.3
Agriculture	1213	4.6
Artificial Surfaces	10	0.0
Other Land Cover	6	0.0
TOTAL	26332	100

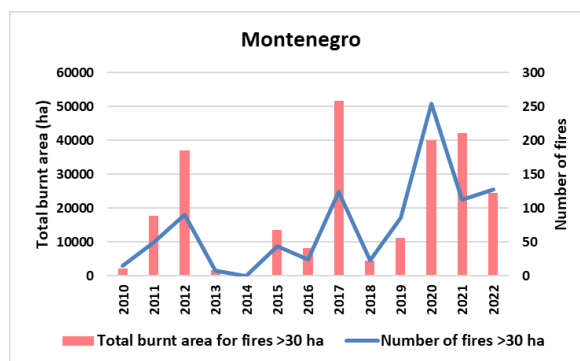


Figure 233. Annual mapped burnt area of fires >=30ha in Montenegro.

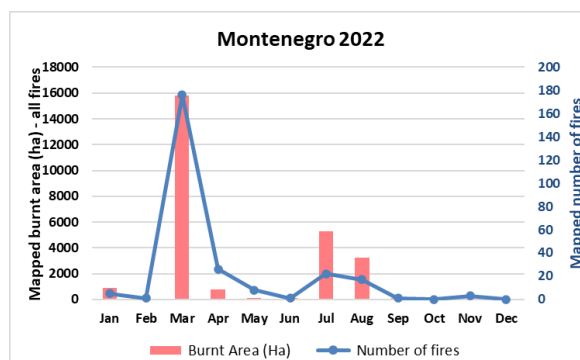


Figure 234. Monthly mapped burnt area and number of fires in Montenegro in 2022.

3.1.21 The Netherlands

A total of 15 fires were mapped in the Netherlands between February and August, resulting in a total burnt area of 331 ha, practically all of which occurred on Other Natural Land on Natura2000 sites, amounting to 0.013% of the total protected area of the country. Included in these numbers are five large management burns with a total of 203 ha in a Natura2000 site, whose uniqueness is for a large part due to the fact that fire is used in this site.

Table 76. Distribution of burnt area (ha) in the Netherlands by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1	0.3
Other Natural Land	330	99.7
TOTAL	331	100

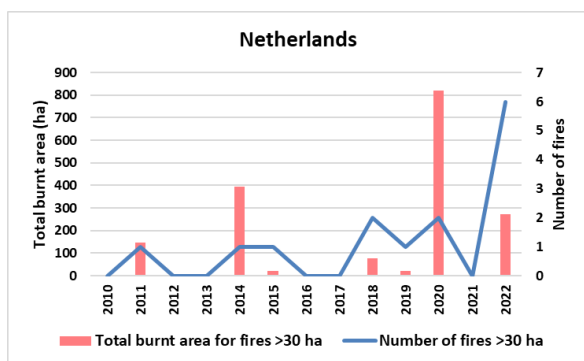


Figure 235. Annual mapped burnt area of fires >=30ha in the Netherlands.

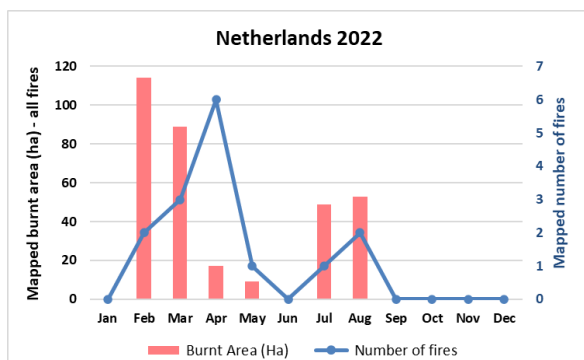


Figure 236. Monthly mapped burnt area and number of fires in the Netherlands in 2022.

3.1.22 North Macedonia

After a hard year in 2021, the 2022 season was relatively quiet in North Macedonia. 74 fires were mapped, burning a total of 4 261 ha, around one fifth of the amount mapped in 2021 (Figure 237). Fires were mapped in almost every month of the year, including two exceeding 500 ha in July and October. Figure 194 on page 149 above shows the locations of these fires.

Table 77. Distribution of burnt area (ha) in North Macedonia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1259	29.6
Coniferous forest	6	0.1
Mixed forest	4	0.1
Other Natural Land	982	23.0
Sclerophyllous vegetation	84	2.0
Transitional	1129	26.5
Agriculture	795	18.7
Other Land Cover	1	0.0
TOTAL	4261	100

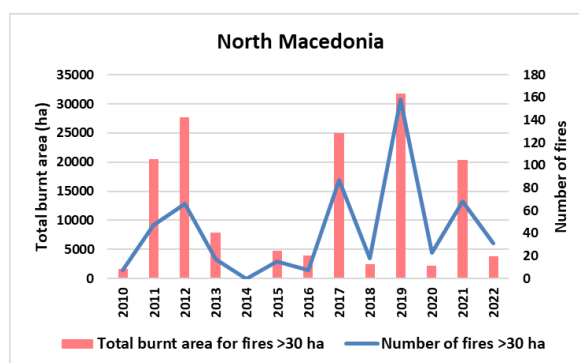


Figure 237. Annual mapped burnt area of fires >=30ha in North Macedonia.

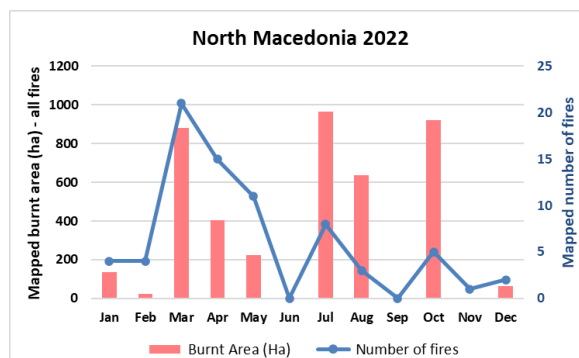


Figure 238. Monthly mapped burnt area and number of fires in North Macedonia in 2022.

3.1.23 Norway

The fire season in Norway resulted in 2 867 ha mapped from 84 fires. As was the case in several other countries, March was the worst month, when two-thirds of the fires and three-quarters of the damage was recorded. The summer, by contrast, was very quiet (Figure 240). Other Natural Land was the most affected land cover type. The locations of the mapped fires can be seen in Figure 209 on page 153 above.

Table 78. Distribution of burnt area (ha) in Norway by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	305	10.6
Coniferous forest	57	2.0
Mixed forest	34	1.2
Other Natural Land	2157	75.2
Agriculture	311	10.9
Other Land Cover	3	0.1
TOTAL	2867	100

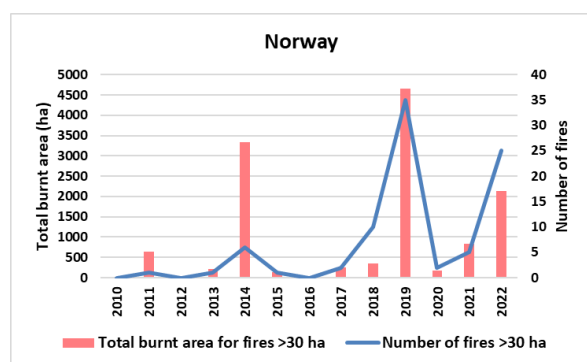


Figure 239. Annual mapped burnt area of fires >=30ha in Norway.

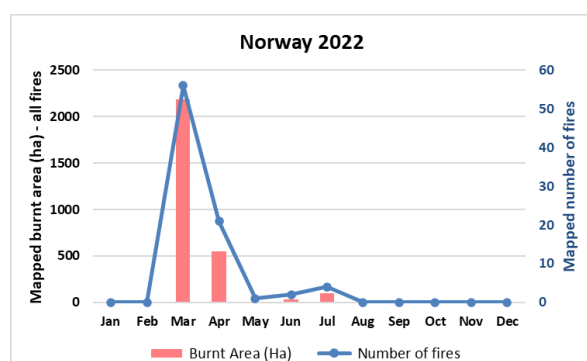


Figure 240. Monthly mapped burnt area and number of fires in Norway in 2022.

3.1.24 Poland

39 fires were mapped in Poland, resulting in 675 ha of burnt area, almost half of which was in Agricultural Land (Table 79). The worst affected month was March, although fires were mapped until the summer, with very little activity after July (Figure 242). 541 ha (80%) of this total was on Natura2000 land, amounting to 0.006% of the Natura2000 area of the country.

Table 79. Distribution of burnt area (ha) in Poland by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	13	1.9
Coniferous forest	113	16.7
Mixed forest	6	0.9
Other Natural Land	157	23.2
Transitional	78	11.6
Agriculture	304	45.0
Artificial Surfaces	1	0.2
Other Land Cover	3	0.4
TOTAL	675	100

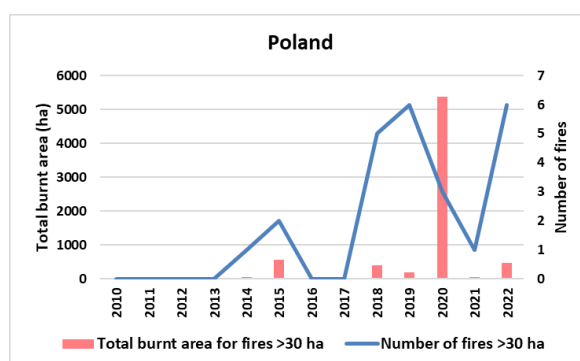


Figure 241. Annual mapped burnt area of fires >=30ha in Poland.

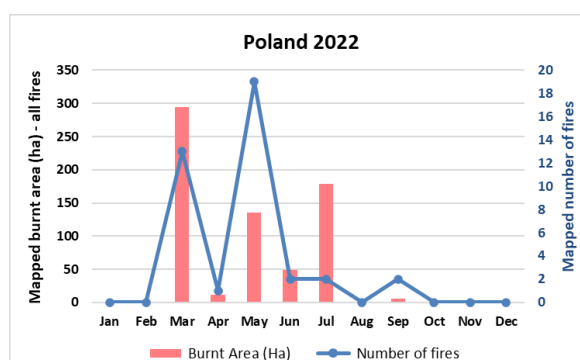


Figure 242. Monthly mapped burnt area and number of fires in Poland in 2022.

3.1.25 Portugal

It was the worst fire season in Portugal since 2017 and it was the third most affected EU country, although the total mapped burnt area of 112 063 ha from 1 236 fires was still only a fraction of the damage occurring in 2017 (Figure 243). Unlike many other countries, March was a quiet month, and almost all of the damage occurred in July and August (Figure 244). However, the highest number of fires was observed in January, although they were generally small, so the burnt area was low. During the summer there were several very large fires, including two in Beiras e Serra da Estrela province in August that covered over 15 000 and 10 000 ha respectively (Figure 245, considered as a single fire in the Portuguese national database). A further 13 fires over 1 000 ha were recorded, and 14 more exceeded 500 ha. 41 097 ha of the mapped total occurred on Natura2000 sites, corresponding to 37% of the total area burnt, and 1.665 % of the total Natura2000 areas in Portugal.

Table 80. Distribution of burnt area (ha) in Portugal by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	6381	5.7
Coniferous forest	7661	6.8
Mixed forest	7028	6.3
Other Natural Land	28198	25.2
Sclerophyllous vegetation	1734	1.5
Transitional	41442	37.0
Agriculture	18945	16.9
Artificial Surfaces	656	0.6
Other Land Cover	18	0.0
TOTAL	112063	100

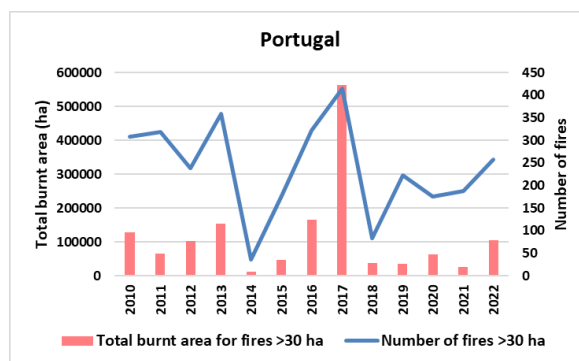


Figure 243. Annual mapped burnt area of fires ≥ 30 ha in Portugal.

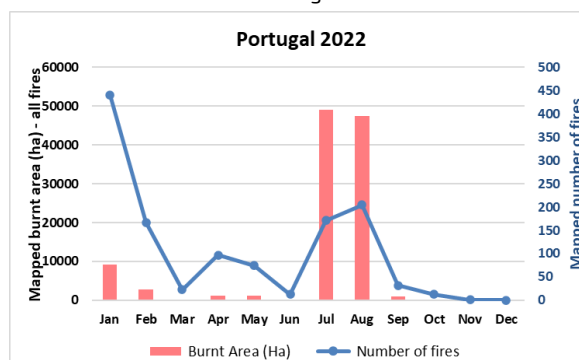


Figure 244. Monthly mapped burnt area and number of fires in Portugal in 2022.

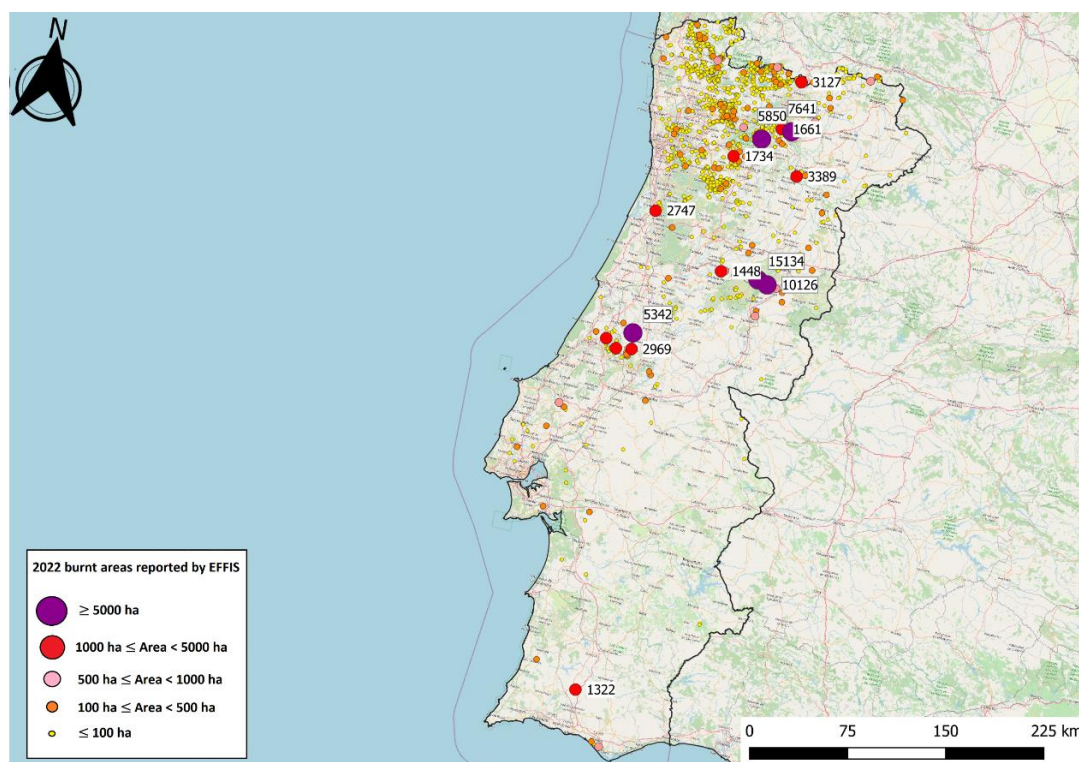


Figure 245. Location of mapped fires in Portugal in 2022.

3.1.26 Romania

The 2022 fire season in Romania was the worst in over a decade, with a total mapped burnt area of 162 518 ha from 1 432 fires, making it also the second most affected EU country after Spain. Over two-thirds of this damage occurred in a single month (March) and also included Romania's three largest fires, which were all in Tulcea province in the east of the country, and which were all more than 5 000 ha (Figure 248). 20 other fires were larger than 1 000 ha and a further 28 exceeded 500 ha. Over 50% of the burnt area occurred in Other Natural Land (Table 81).

In total, 102 607 ha (63%) of the mapped burnt area was on Natura2000 sites, representing 1.637% of the total Natura2000 area of Romania.

Table 81. Distribution of burnt area (ha) in Romania by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	34892	21.5
Coniferous forest	15	0.0
Mixed forest	238	0.1
Other Natural Land	95038	58.5
Transitional	4752	2.9
Agriculture	26729	16.4
Artificial Surfaces	83	0.1
Other Land Cover	771	0.5
TOTAL	162518	100

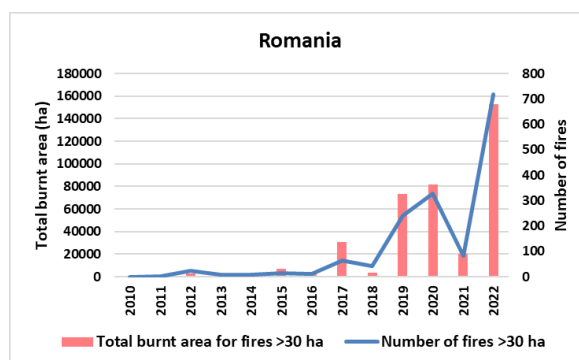


Figure 246. Annual mapped burnt area of fires ≥ 30 ha in Romania.

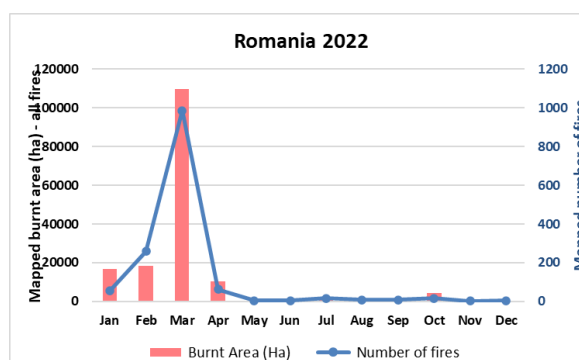


Figure 247. Monthly mapped burnt area and number of fires in Romania in 2022.

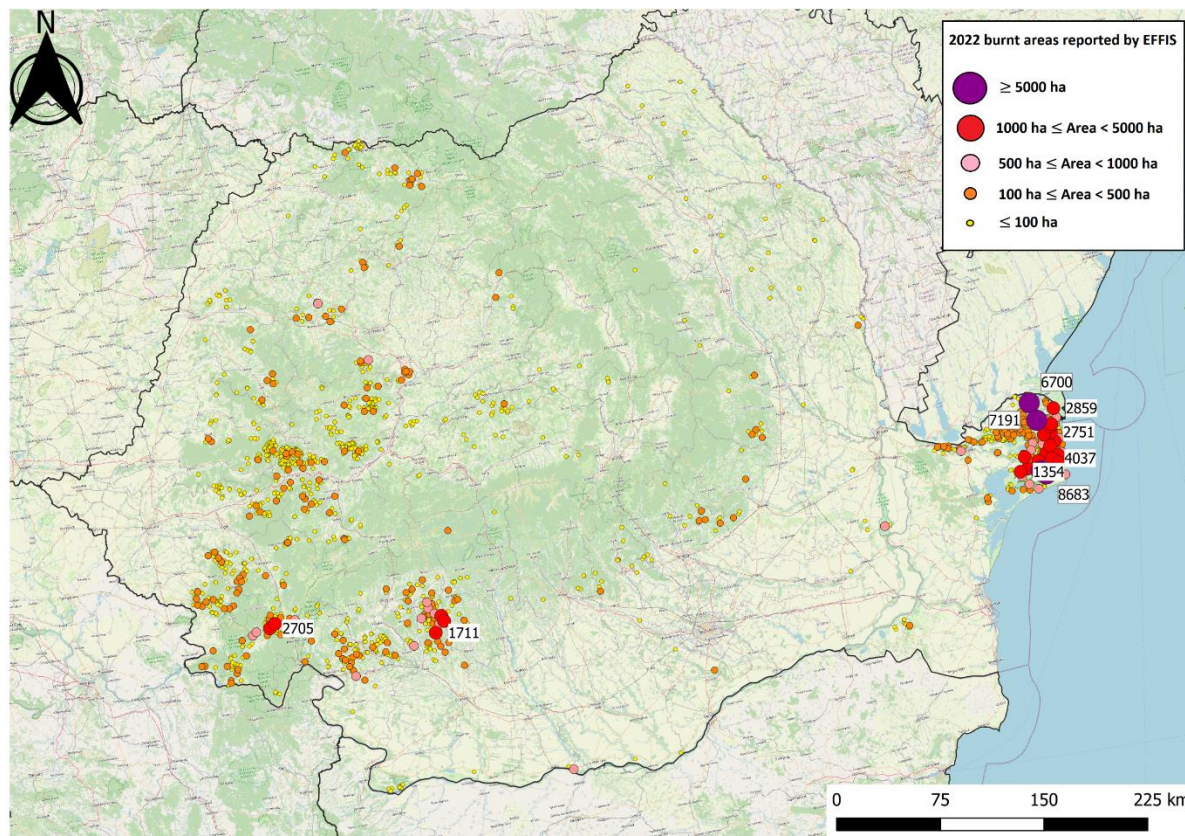


Figure 248. Locations of mapped fires in Romania in 2022.

3.1.27 Serbia

The fire season in Serbia was the second worst in recent years (after 2019, Figure 249). A total of 235 fires were mapped, burning 13 292 ha. Most of the damage occurred in March (Figure 249), including one fire of over 1 000 ha and another over 500 ha. Figure 194 on page 149 above shows the locations of these fires.

Table 82. Distribution of burnt area (ha) in Serbia by land cover type in 2022.

Land cover	Area burned	% of total
Broadleaf forest	4430	33.3
Coniferous forest	151	1.1
Mixed forest	27	0.2
Other Natural Land	2368	17.8
Transitional	2988	22.5
Agriculture	3311	24.9
Artificial Surfaces	18	0.1
TOTAL	13292	100

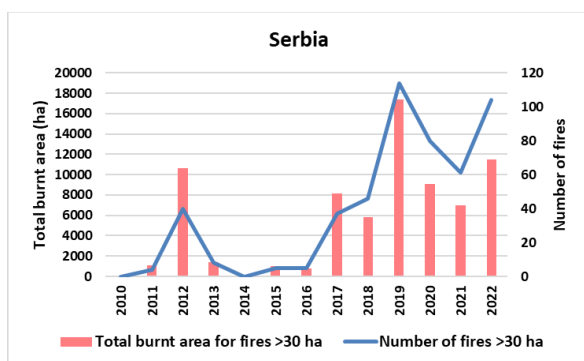


Figure 249. Annual mapped burnt area of fires >=30ha in Serbia.



Figure 250. Distribution of burnt area (ha) in Serbia by land cover types in 2022.

3.1.28 Slovakia

Ten fires burning a total of 374 ha were mapped in Slovakia, a heavier year than normal. Most of the damage occurred in March, similar to other countries. Of the total, 36% (136 ha) occurred on Natural2000 sites, amounting to 0.008% of the total protected area of the country.

Table 83. Distribution of burnt area (ha) in Slovakia by land cover type in 2022.

Land cover	Area burned	% of total
Broadleaf forest	51	13.7
Coniferous forest	16	4.3
Mixed forest	26	7.0
Other Natural Land	208	55.5
Transitional	21	5.6
Agriculture	45	12.1
Artificial Surfaces	7	1.9
TOTAL	374	100

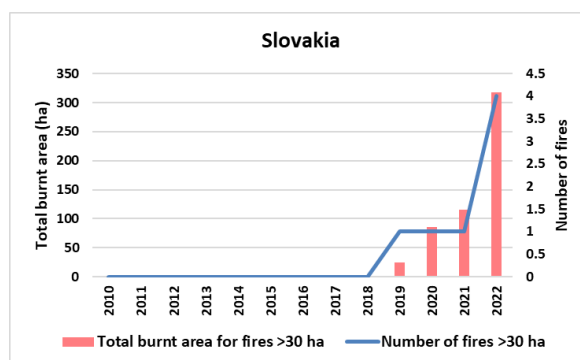


Figure 251. Annual mapped burnt area of fires >=30ha in Slovakia.

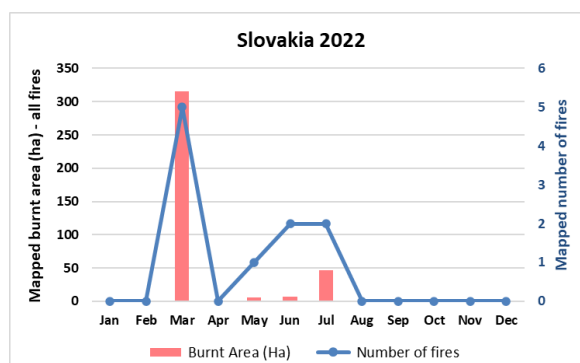


Figure 252. Monthly mapped burnt area and number of fires in Slovakia in 2022.

3.1.29 Slovenia

It was the worst fire season in Slovenia for over a decade, with 4 431 ha mapped from 7 fires. Almost all the damage came from a single very large fire of around 4 000 ha in Obalno-kraška province in the Karst Plateau in July (Figure 254, Figure 255).

Almost all of the total burnt area (4 396 ha) was on Natura2000 sites and amounted to 0.399% of the Natura2000 area of the country.

Table 84. Distribution of burnt area (ha) in Slovenia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1942	43.8
Coniferous forest	432	9.7
Mixed forest	583	13.2
Other Natural Land	295	6.7
Transitional	1005	22.7
Agriculture	174	3.9
TOTAL	4431	100

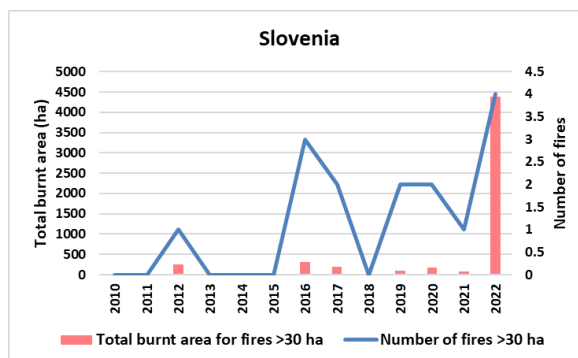


Figure 253. Annual mapped burnt area of fires >=30ha in Slovenia.

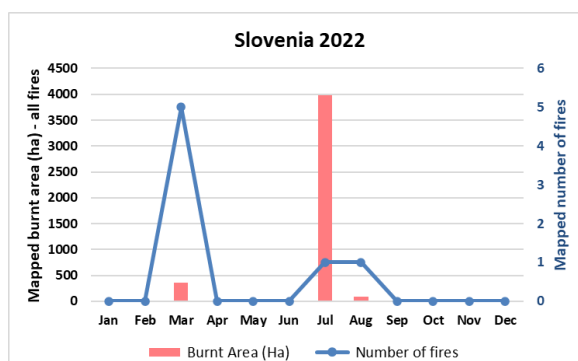


Figure 254. Monthly mapped burnt area and number of fires in Slovenia in 2022.

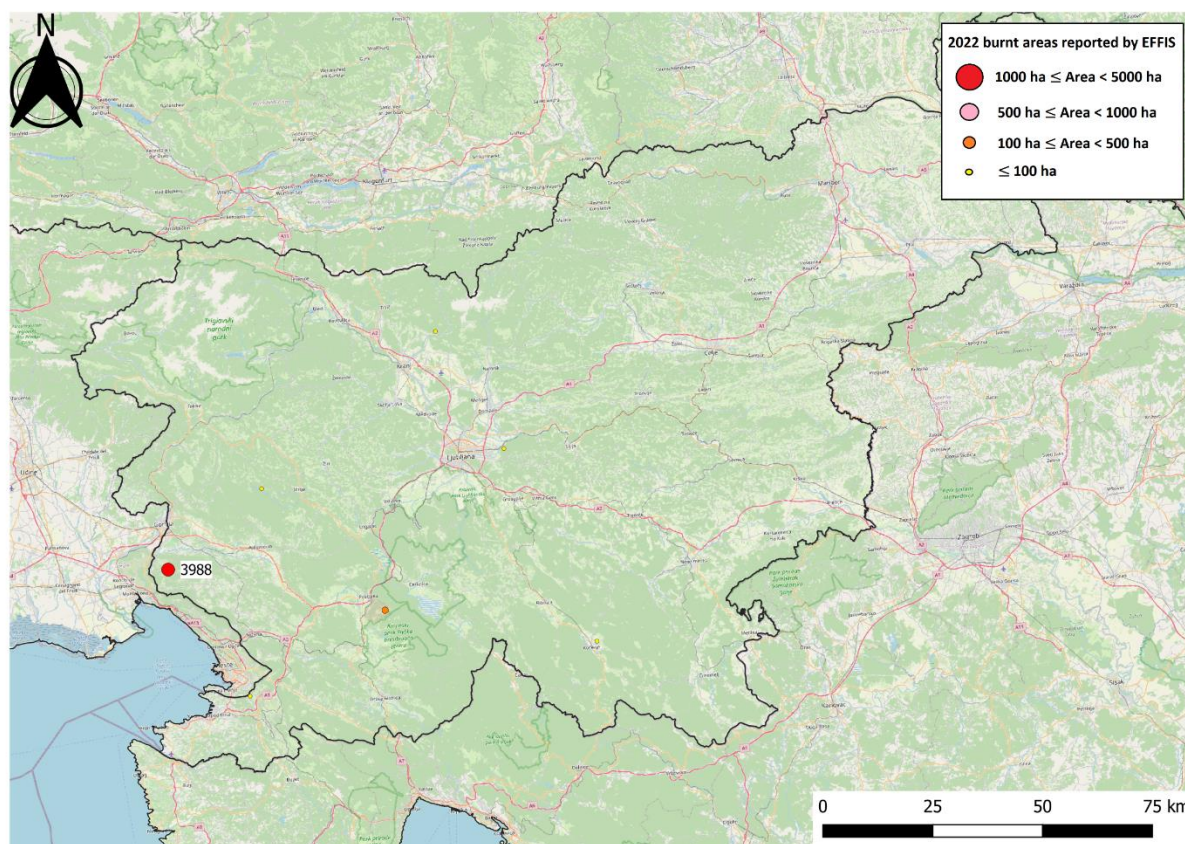


Figure 255. Locations of mapped fires in Slovenia in 2022.

3.1.30 Spain

The 2022 fire season in Spain was the worst in over a decade. Like Portugal, the season was notable for a large number of relatively small fires in January, but the main damage of the year occurred in the summer months. The three largest fires mapped in 2022 across the entire region covered by EFFIS were all in Spain. The largest was in Tábara municipality in Zamora province in July, and covered 32 528 ha. A second fire in Zamora in June was just over 28 000 ha, and the third, mapped in Castellón, was almost 20 000 ha (Figure 258). An additional five fires over 10 000 ha were mapped, 36 exceeded 1 000 ha and 20 others were greater than 500 ha (Table 85).

Table 85. Size distribution of fires mapped in Spain in 2022.

Size Class	Total burnt area (ha)	Number of fires
>=50 ha but <100	10454	151
>=100 and <500 ha	28303	137
>=500 and <1000 ha	14001	20
>=1000 ha	248515	44

Table 86. Distribution of burnt area (ha) in Spain by land cover type in 2022.

Land cover	Area burned	% of total
Broadleaf forest	26936	8.5
Coniferous forest	50947	16.1
Mixed forest	5318	1.7
Other Natural Land	80450	25.5
Sclerophyllous vegetation	66133	20.9
Transitional	39720	12.6
Agriculture	45387	14.4
Artificial Surfaces	644	0.2
Other Land Cover	170	0.1
TOTAL	315705	100

Of the total burnt area of 315 705 ha mapped in 2022, 120 340 ha occurred on Natura2000 sites, the highest amount recorded in any country in 2022, and a third of all the protected land burnt across Europe in 2022. This corresponds to 38% of the total area burned and 0.640% of the Natura2000 areas in Spain.

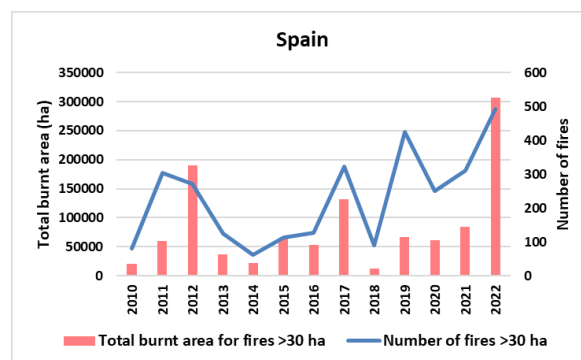


Figure 256. Annual mapped burnt area of fires >=30 ha in Spain.

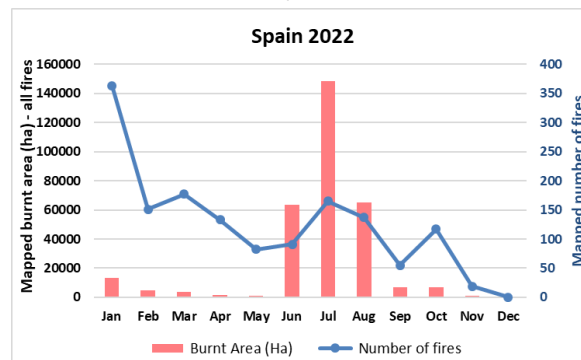


Figure 257. Monthly mapped burnt area and number of fires in Spain in 2022.

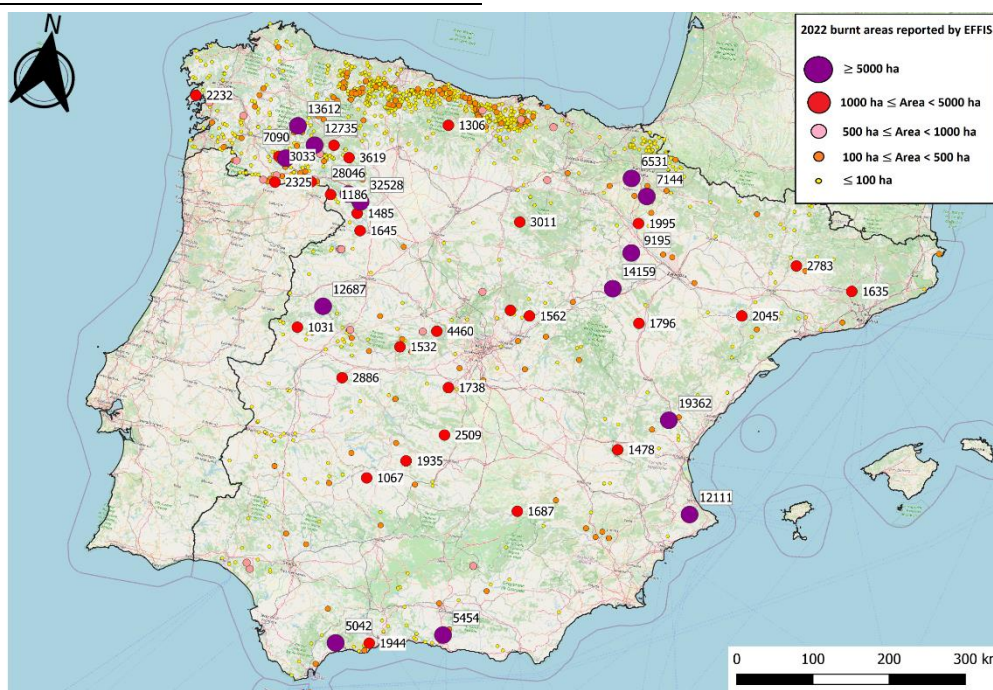


Figure 258. Location of mapped fires in Spain in 2022.

3.1.31 Sweden

Compared with the extreme years of 2014 and 2018 it was a light year for fires in Sweden. 37 fires were mapped in 2022, resulting in a total mapped burnt area of 515 ha, less than half that recorded in 2021. March/April and June were the most affected months, with the damage equally divided between Coniferous Forest and Other Natural Land (Table 87). Only one fire exceeded 100 ha. Locations of these fires can be seen in Figure 209 on page 153 above. 135 ha (26%) of the total was in Natura2000 sites, amounting to 0.002% of the Natura2000 area of the country.

However, for Sweden, a majority of the area mapped in 2022 was due to controlled burns that are not counted as wildfires in the national statistics (317 out of 515 ha). This is especially valid for Natura 2000-areas where this causes significant deviance between national statistics and EFFIS mapping. In Natura 2000-areas, 131 ha of the mapped total of 135 ha was from controlled burns, carried out by regional authorities with the purpose to restore and manage priority habitats in the Natura 2000 areas.

Table 87. Distribution of burnt area (ha) in Sweden by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	229	44.5
Other Natural Land	247	48.0
Transitional	29	5.7
Agriculture	9	1.8
TOTAL	515	100

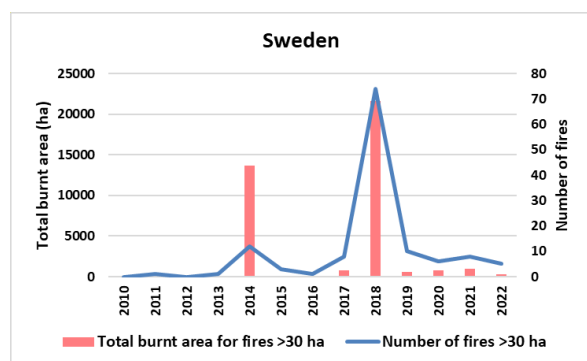


Figure 259. Annual mapped burnt area of fires ≥ 30 ha in Sweden.

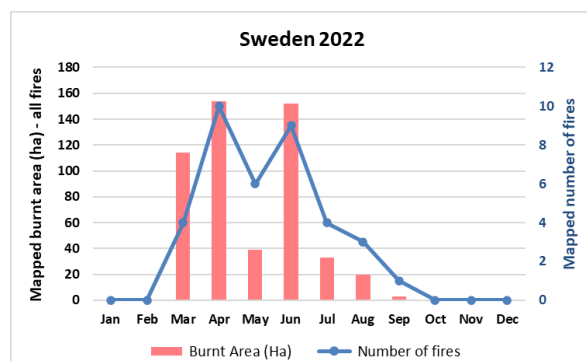


Figure 260. Monthly mapped burnt area and number of fires in Sweden in 2022.

3.1.32 Switzerland

Two fires were mapped in Switzerland in January and March, resulting in a total burnt area of 235 ha. Broadleaf Forest and Other Natural Land were the most affected land cover types.

Table 88. Distribution of burnt area (ha) in Switzerland by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	92	39.2
Coniferous forest	28	11.9
Mixed forest	1	0.4
Other Natural Land	108	46.0
Agriculture	6	2.6
TOTAL	235	100

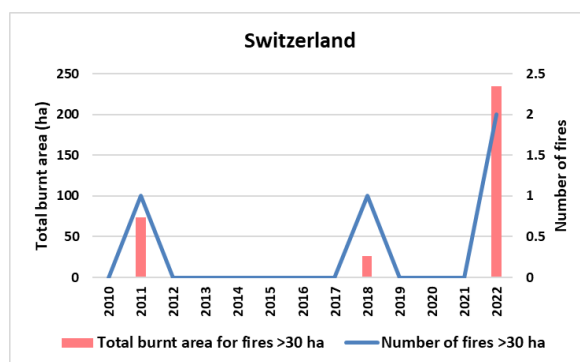


Figure 261. Annual mapped burnt area of fires ≥ 30 ha in Switzerland.

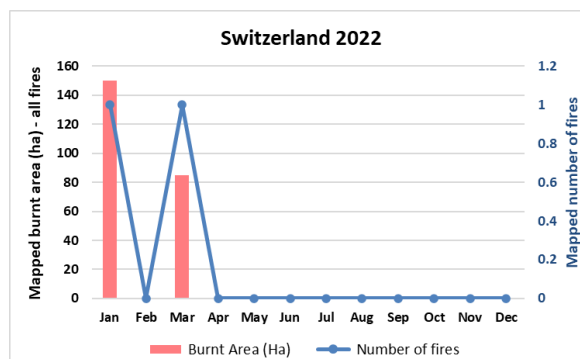


Figure 262. Monthly mapped burnt area and number of fires in Switzerland in 2022.

3.1.33 Türkiye

After an extreme year in 2021, Türkiye's 2022 fire season was very light. 17 055 ha was mapped from 195 fires, less than 10% of the previous year's total. Fires were mapped in every month of the year, but there was a peak in June, when the largest fire of the year occurred in the west of the country (4 548 ha), and another in September when several other large fires were mapped. Locations of these fires are shown in Figure 265.

Table 89. Distribution of burnt area (ha) in Türkiye by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	148	0.9
Coniferous forest	3871	22.7
Mixed forest	108	0.6
Other Natural Land	4770	28.0
Sclerophyllous vegetation	1633	9.6
Transitional	4628	27.1
Agriculture	1682	9.9
Artificial Surfaces	74	0.4
Other Land Cover	140	0.8
TOTAL	17055	100.0

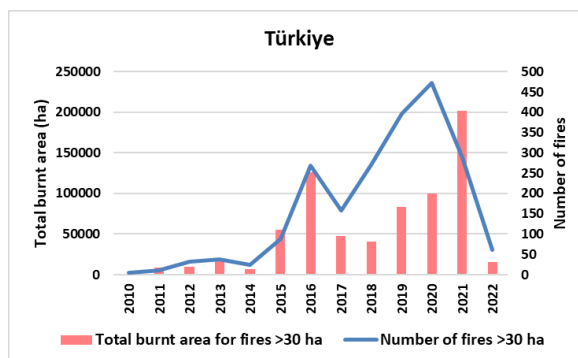


Figure 263. Annual mapped burnt area of fires ≥ 30 ha in Türkiye.

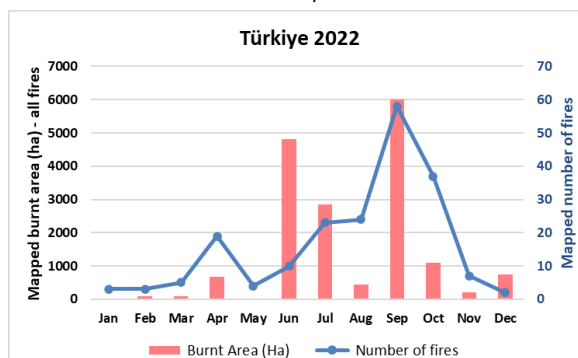


Figure 264. Monthly mapped burnt area and number of fires in Türkiye in 2022.



Figure 265. Location of mapped fires in Türkiye in 2022.

3.1.34 United Kingdom

The 2022 fire season in the United Kingdom was the worst since 2019. In common with several other countries, March was the most extreme month, when 80% of the annual damage occurred (Figure 267). 40 fires were mapped, with a total burnt area of 22 895 ha, mostly in Other Natural Land (Table 90). This included some large fires over 1 000 ha in Wales and Scotland, and, unusually, also one over 600 ha in the south of the country in Surrey Heath (Figure 268). 6 177 ha of this total occurred in protected areas, amounting to 27% of the total and 0.092% of the total protected area of the country.

Table 90. Distribution of burnt area (ha) in the UK by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	85	0.4
Coniferous forest	127	0.6
Mixed forest	8	0.0
Other Natural Land	21534	94.1
Transitional	946	4.1
Agriculture	155	0.7
Artificial Surfaces	36	0.2
Other Land Cover	4	0.0
TOTAL	22895	100

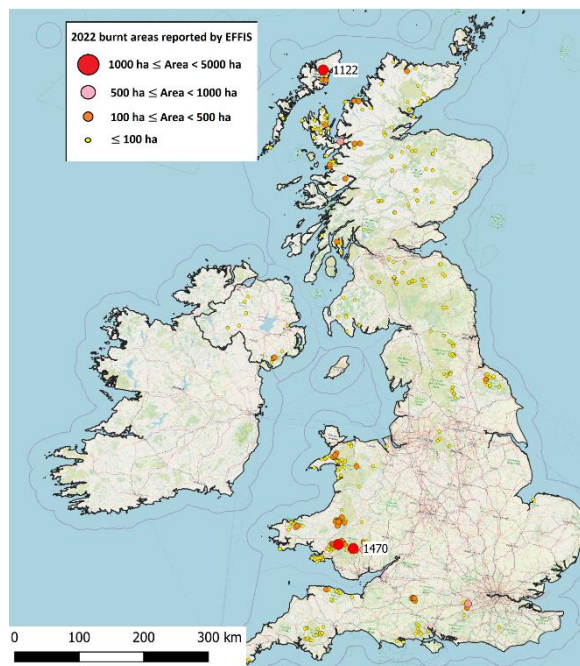


Figure 268. Location of mapped fires in the United Kingdom in 2022.

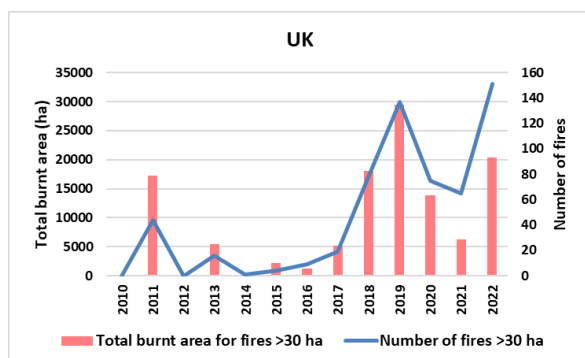


Figure 266. Annual mapped burnt area of fires ≥ 30 ha in the United Kingdom.

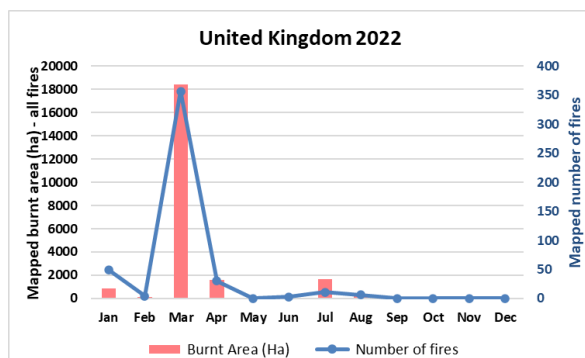


Figure 267. Monthly mapped burnt area and number of fires in the United Kingdom in 2022.

3.1.35 Ukraine

On request of the Ukrainian authorities, all fires were mapped in 2022, including purely agricultural and urban ones. This showed that in addition to the 275 414 ha mapped from 2 526 fires according to the usual protocols and shown in Table 91, an additional 220 584 ha of agricultural land was lost, as well as 2 140 ha of artificial surfaces and 579 ha of other land cover.

Even without including these extra fires, Ukraine recorded the highest number of fires of the countries covered by EFFIS, and the mapped burnt area was the second highest (after Spain).

When the extra mapped fires are taken into account, three-quarters of the total affected Agricultural Land (Figure 269, Figure 270). 133 fires over 500 ha were recorded, the largest two of which exceeded 6 000 ha. Locations of these mapped fires can be seen in Figure 271.

Table 91. Distribution of burnt area (ha) in Ukraine by land cover types in 2022.

Land cover	Area burned (ha)	Extra mapped	% of total burned
Broadleaf forest	12420		2.5
Coniferous forest	45195		9.1
Mixed forest	2569		0.5
Other Natural Land	48430		9.7
Transitional	9813		2.0
Agriculture	153771	220584	75.1
Artificial Surfaces	1252	2140	0.7
Other Land Cover	1958	579	0.5
TOTAL	275414		100

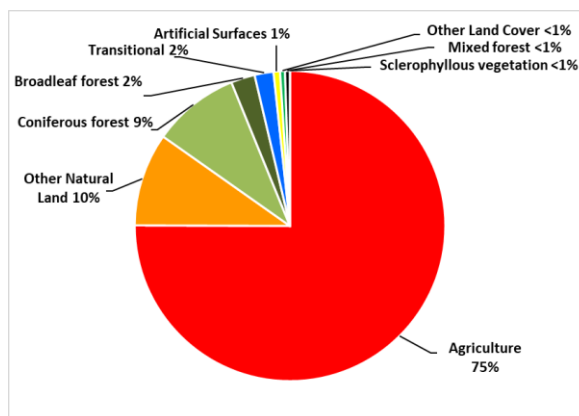


Figure 269. Distribution of burnt area (ha) in Ukraine by land cover types in 2022 (including extra mapped fires).

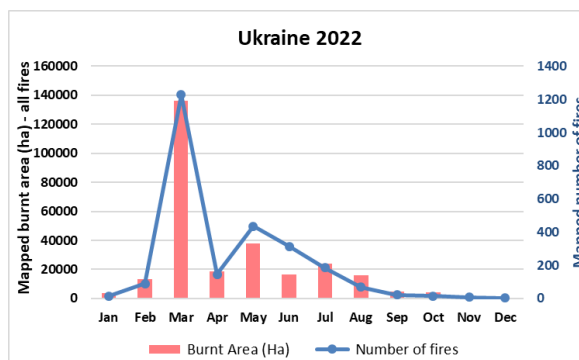


Figure 270. Monthly mapped burnt area and number of fires in Ukraine in 2022 (including extra mapped fires).

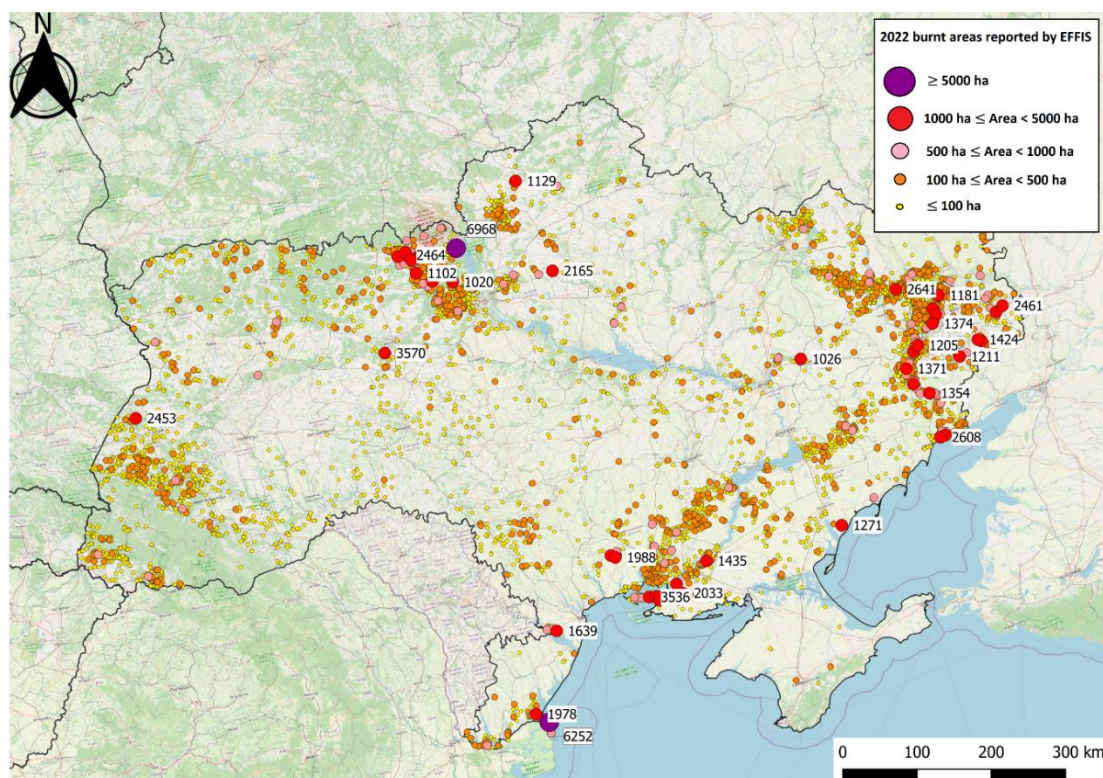


Figure 271. Locations of all mapped fires in Ukraine in 2022.

3.2 Middle East and North Africa

The total burnt area mapped across North Africa and the Middle East was less than the previous three years and slightly better than the long term average. Most of the individual countries across the region had a relatively good year, apart from Morocco whose total burnt area was significantly worse than in the previous decade.

3.2.1 Algeria

After two bad years in 2020 and 2021, Algeria had a relatively quiet year in 2022 (Figure 272). 157 fires were mapped, giving a total burnt area of 53 148 ha, 80% of which occurred in August. 9 954 ha of this total occurred in protected areas, amounting to 19% of the total and 5.98% of the total protected area in Algeria. The two largest fires of the season were both around 6 000 ha, and there were a further 13 fires over 1 000 ha (Figure 274). 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 92.

Table 92. Distribution of burnt area (ha) in Algeria by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	11283	21.2
Coniferous forest	1677	3.2
Mixed forest	460	0.9
Other Natural Land	1543	2.9
Transitional	13202	24.8
Agriculture	24793	46.6
Artificial Surfaces	123	0.2
Other Land Cover	66	0.1
TOTAL	53148	100

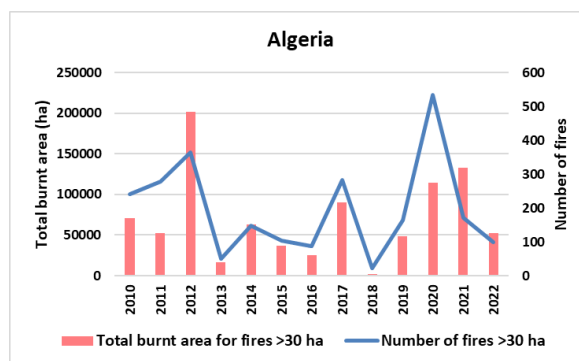


Figure 272. Annual mapped burnt area of fires ≥ 30 ha in Algeria.

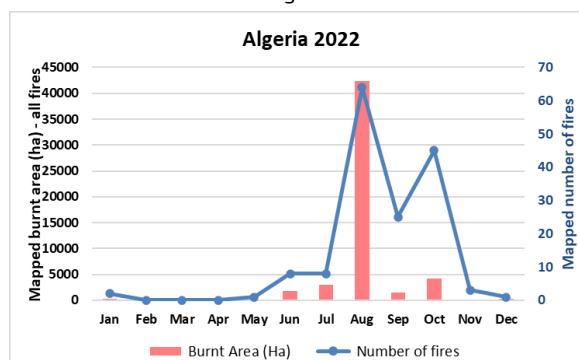


Figure 273. Monthly mapped burnt area and number of fires in Algeria in 2022.

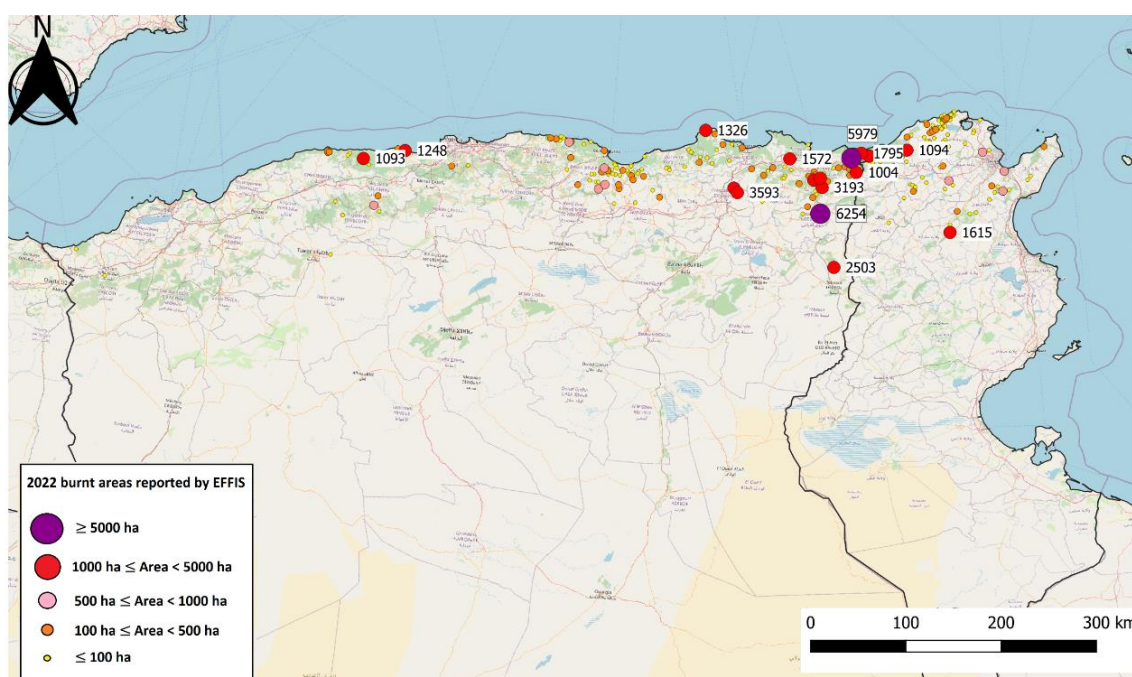


Figure 274. Locations of mapped fires in the north of Algeria and Tunisia in 2022.

3.2.2 Egypt

Thirteen fires were mapped in Egypt in May, June and October, resulting in a total burnt area of 2 163 ha. Over three-quarters of this total came from a single fire of 1 685 ha in May. The Globcover land cover map from ESA was used to split the burnt area into different land type categories, harmonised with CLC terminology. The main land cover types affected were divided between Other Natural Land and Agriculture.

Table 93. Distribution of burnt area (ha) in Egypt by land cover types in 2022.

Land cover	Area burned	% of total
Other Natural Land	1223	56.5
Transitional	2	0.1
Agriculture	920	42.6
Artificial Surfaces	18	0.8
TOTAL	2163	100

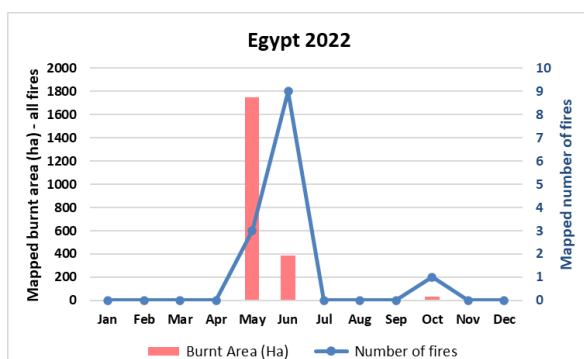


Figure 275. Monthly mapped burnt area and number of fires in Egypt in 2022.

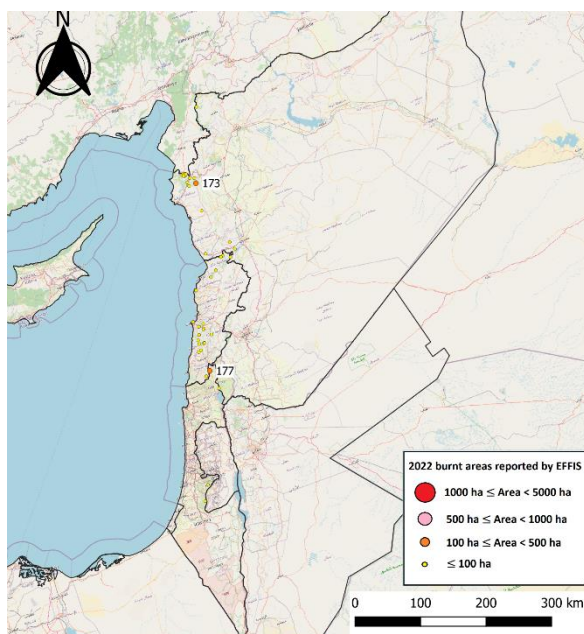


Figure 276. Mapped fires in the Middle East in 2022.

3.2.3 Israel

After three bad years for fires, the 2022 season in Israel was very quiet (Figure 277). Only five fires were mapped, covering a total of 239 ha. 59% of the total burnt area was in agricultural areas (Table 94).

Table 94. Distribution of burnt area (ha) in Israel by land cover types in 2022.

Land cover	Area burned	% of total
Other Natural Land	13	5.4
Transitional	86	35.8
Agriculture	140	58.8
TOTAL	239	100

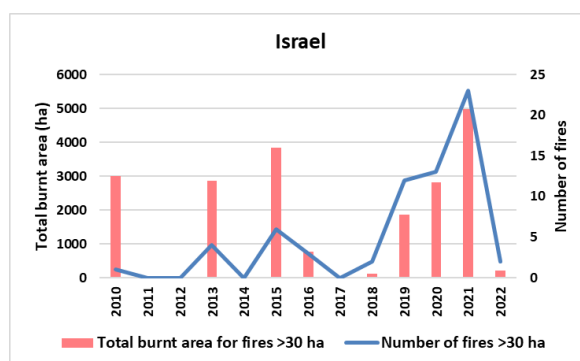


Figure 277. Annual mapped burnt area of fires ≥30ha in Israel.

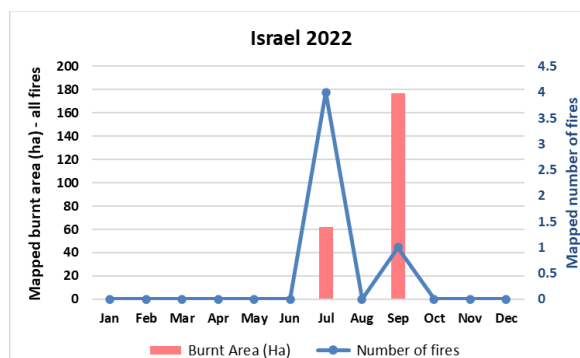


Figure 278. Monthly mapped burnt area and number of fires in Israel in 2022.

3.2.4 Lebanon

After three bad years, the 2022 season was very light for fires in Lebanon (Figure 279). The season lasted from July to October, when 22 fires were mapped for a total of 249 ha burnt. Table 95 presents the affected land cover types using the Globcover land cover map, harmonised with CLC.

Table 95. Distribution of burnt area (ha) in Lebanon by land cover types in 2022.

Land cover	Area burned	% of total
Coniferous forest	21	8.5
Other Natural Land	10	4.1
Transitional	132	52.8
Agriculture	86	34.6
TOTAL	249	100

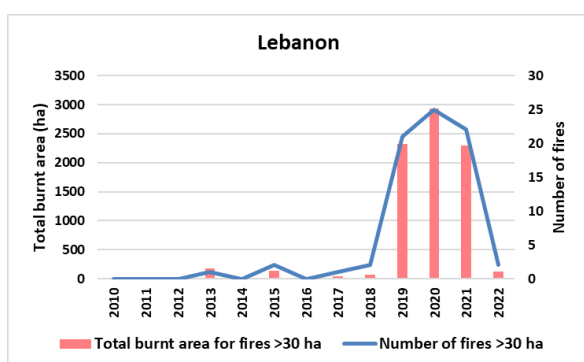


Figure 279. Annual mapped burnt area of fires ≥ 30 ha in Lebanon.

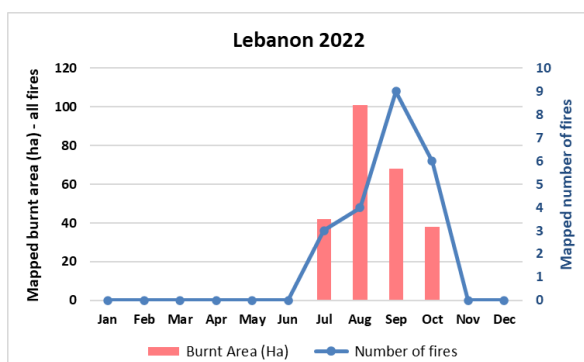


Figure 280. Monthly mapped burnt area and number of fires in Lebanon in 2022.

3.2.5 Libya

In common with much of the rest of the region, the 2022 fire season in Libya was relatively quiet. Nine fires were mapped, resulting in a total burnt area of 207 ha in May and September. Table 96 presents the distribution of the mapped burnt area by land cover type using the Globcover land cover map, harmonised with CLC.

Table 96. Distribution of burnt area (ha) in Libya by land cover types in 2022.

Land cover	Area burned	% of total
Other Natural Land	12	5.8
Transitional	98	47.3
Agriculture	97	46.9
TOTAL	207	100

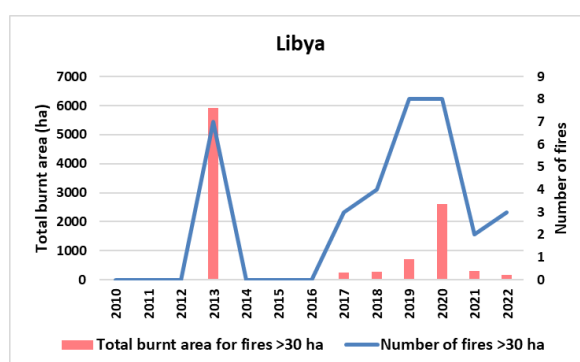


Figure 281. Annual mapped burnt area of fires ≥ 30 ha in Libya.

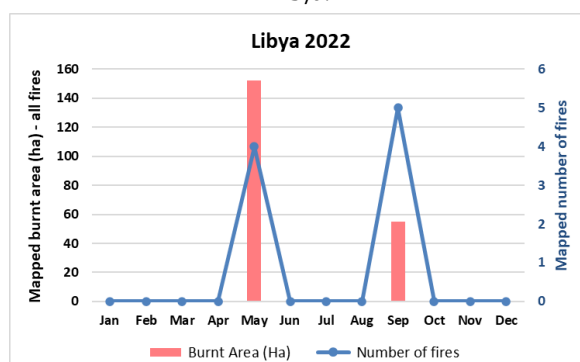


Figure 282. Monthly mapped burnt area and number of fires in Libya in 2022.

3.2.6 Morocco

Unlike most of the rest of the region, the fire season in Morocco was significantly worse than any measured in the previous decade (Figure 283). 103 fires were mapped, giving a total burnt area of 32 680 ha. Much of this total came from a single fire in Ksar El Keb province in July that was over 12 000 ha, almost one third of the annual total. A second fire in Larache province, also in July, covered over 8 000 ha, and three others exceeded 1 000 ha (Figure 285). 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 97. Of the total, a relatively small proportion (394 ha) was mapped in protected areas, amounting to 0.052% of the total protected areas of Morocco.

Table 97. Distribution of burnt area (ha) in Morocco by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	18660	57.1
Coniferous forest	1231	3.8
Mixed forest	1147	3.5
Other Natural Land	650	2.0
Transitional	6109	18.7
Agriculture	4867	14.9
Other Land Cover	15	0.0
TOTAL	32680	100

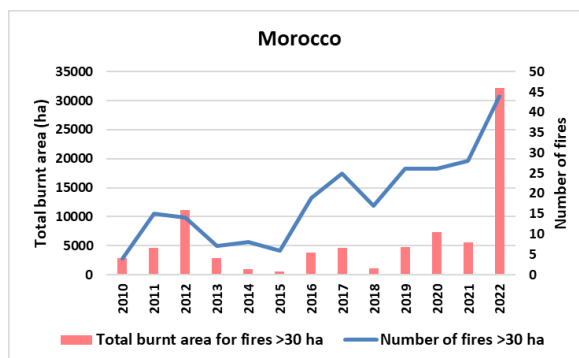


Figure 283. Annual mapped burnt area of fires ≥ 30 ha in Morocco.

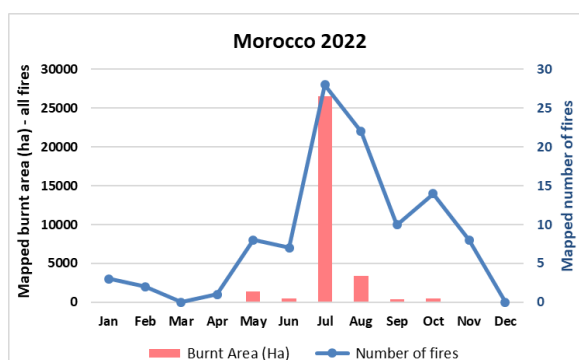


Figure 284. Monthly mapped burnt area and number of fires in Morocco in 2022.

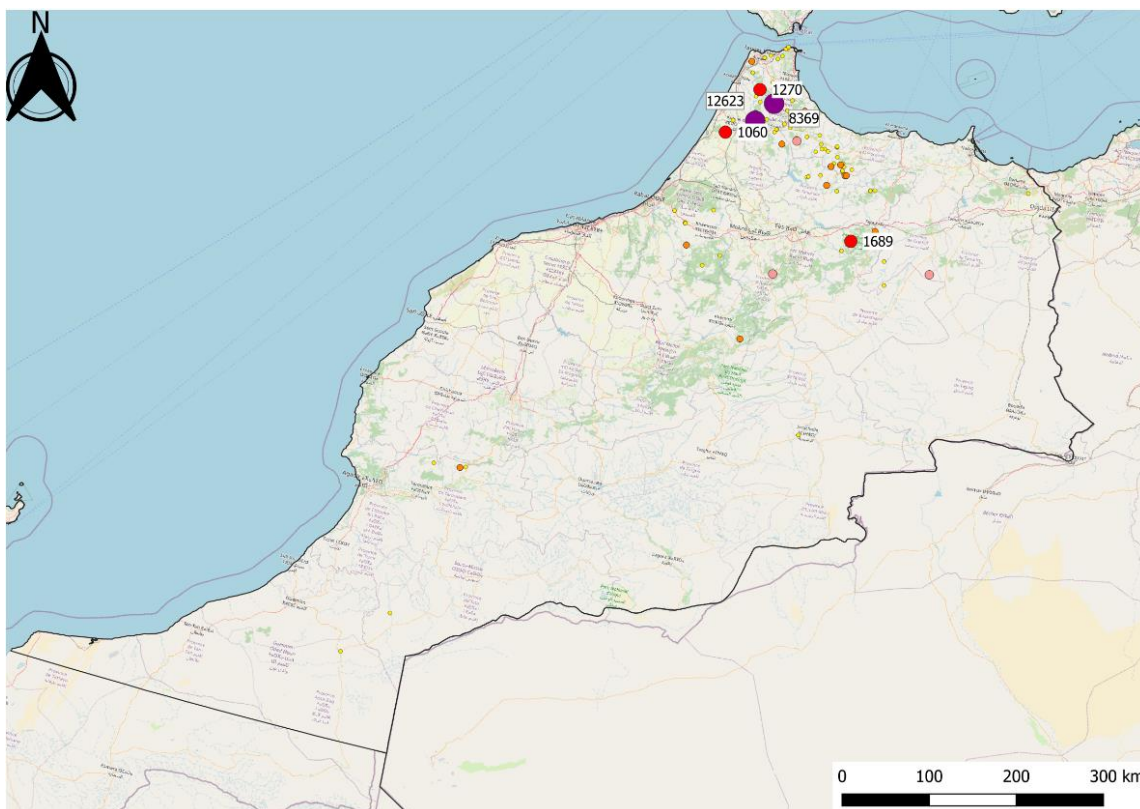


Figure 285. Locations of mapped fires in Morocco in 2022.

3.2.7 Syria

It was an extremely light year for fires in Syria, with the lowest total mapped hectares in the last decade. 21 fires were mapped, giving a total burnt area of 596 ha. There were no fires over 500 ha and only one that exceeded 100 ha.

The Globcover land cover map, harmonised with CLC, was used to split the burnt area into different land type categories (Table 98).

Table 98. Distribution of burnt area (ha) in Syria by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	32	5.4
Coniferous forest	220	36.9
Mixed forest	17	2.9
Other Natural Land	19	3.2
Transitional	80	13.4
Agriculture	228	38.3
TOTAL	596	100

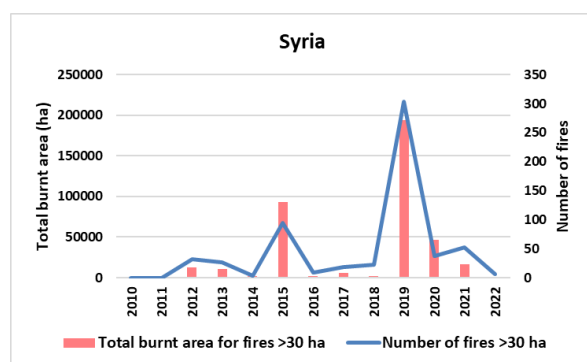


Figure 286. Annual mapped burnt area of fires >=30ha in Syria.

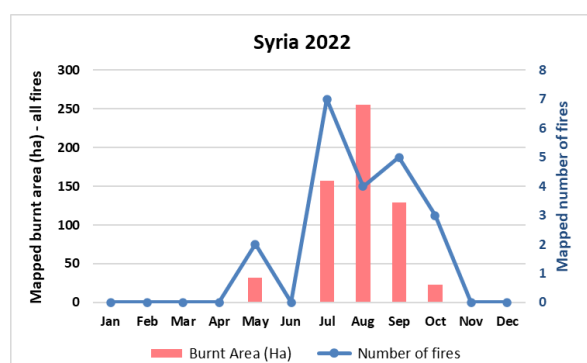


Figure 287. Monthly mapped burnt area and number of fires in Syria in 2022.

3.2.8 Tunisia

After the extreme 2021 fire season in Tunisia, 2022 was closer to an average year. A total of 11 745 ha of burnt area was mapped from 155 fires between June and November (Figure 289). There were two fires over 1 000 ha and a further 4 over 500 ha.

Figure 274 on page 172 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 99.

Table 99. Distribution of burnt area (ha) in Tunisia by land cover types in 2022.

Land cover	Area burned	% of total
Broadleaf forest	1481	12.6
Coniferous forest	2543	21.6
Mixed forest	344	2.9
Other Natural Land	621	5.3
Sclerophyllous vegetation	3533	30.1
Transitional	1522	13.0
Agriculture	1632	13.9
Artificial Surfaces	10	0.1
Other Land Cover	58	0.5
TOTAL	11745	100

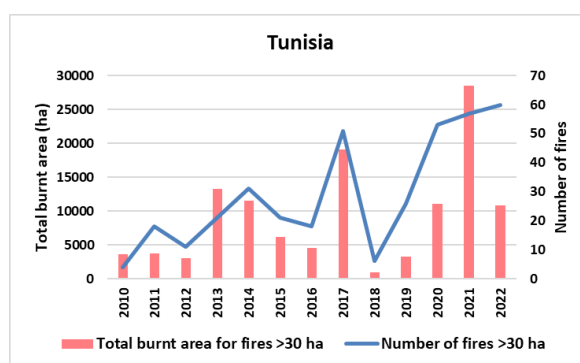


Figure 288. Annual mapped burnt area of fires >=30ha in Tunisia.

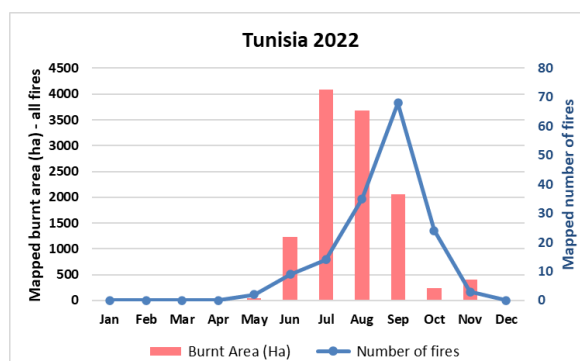


Figure 289. Monthly mapped burnt area and number of fires in Tunisia in 2022.

3.3 Conclusions

2022 was the second worst year in the European Union as regards area burned by wildfires. Nearly 900 000 ha of natural land were affected by the fires. About 43 % of the total burnt area (approx. 365 000 ha) burned within Natura2000 sites. The threat to these precious and, in some cases irreplaceable ecosystems, is enormous and cannot be only quantified in economic terms. It may take many years for them and the plant and animal species that live in them to recover. On the positive side of the 2022 wildfire campaign, we can report that, fortunately, the number of casualties caused by wildfires in 2022 was contained due to prevention measures put in place by the EU and its Member States and the enhanced preparedness and firefighting operations of the fire management services.

List of acronyms

CLC	CORINE Land Cover
ECHO	European Civil Protection and Humanitarian Aid Operations
ECMWF	European Centre for Medium Range Forecast
EFFIS	European Forest Fire Information System
EGFF	Expert Group on Forest Fires
ERCC	Emergency Response Centre
FWI	Fire Weather Index
GWIS	Global Wildfire Information System
MENA	Middle East and North Africa
MIC	Monitoring and Information Centre
MODIS	Moderate Resolution Imaging Spectroradiometer
RDA	Rapid Damage Assessment

4 EFFIS Applications

4.1.1 The Current Situation Application

The current situation enables the user to view and query map layers, with the most up to date information on the current fire season in Europe and in the Mediterranean area. This includes current date meteorological fire danger maps and forecast up to 9 days, daily updated maps of hot spots and fire perimeters. The application can also be used to view the situation in past years.

In the Fire Danger Forecast section ① two different sources and 8 different indices can be displayed, for the current day plus up to 8 days in the future.

The Rapid Damage Assessment ② allows the user to display active fire information and burnt area information for various time periods from two sources (Modis and VIIRS).

The Burnt area locator ③ shows the burnt area for the whole area or for a given country/region. A close-up view of the individual fire perimeter is shown if the user clicks on a specific fire ④.

A tool bar ⑤ has a number of controls for changing the view and displaying the legend.

This application can be accessed at

https://effis.jrc.ec.europa.eu/apps/effis_current_situation/

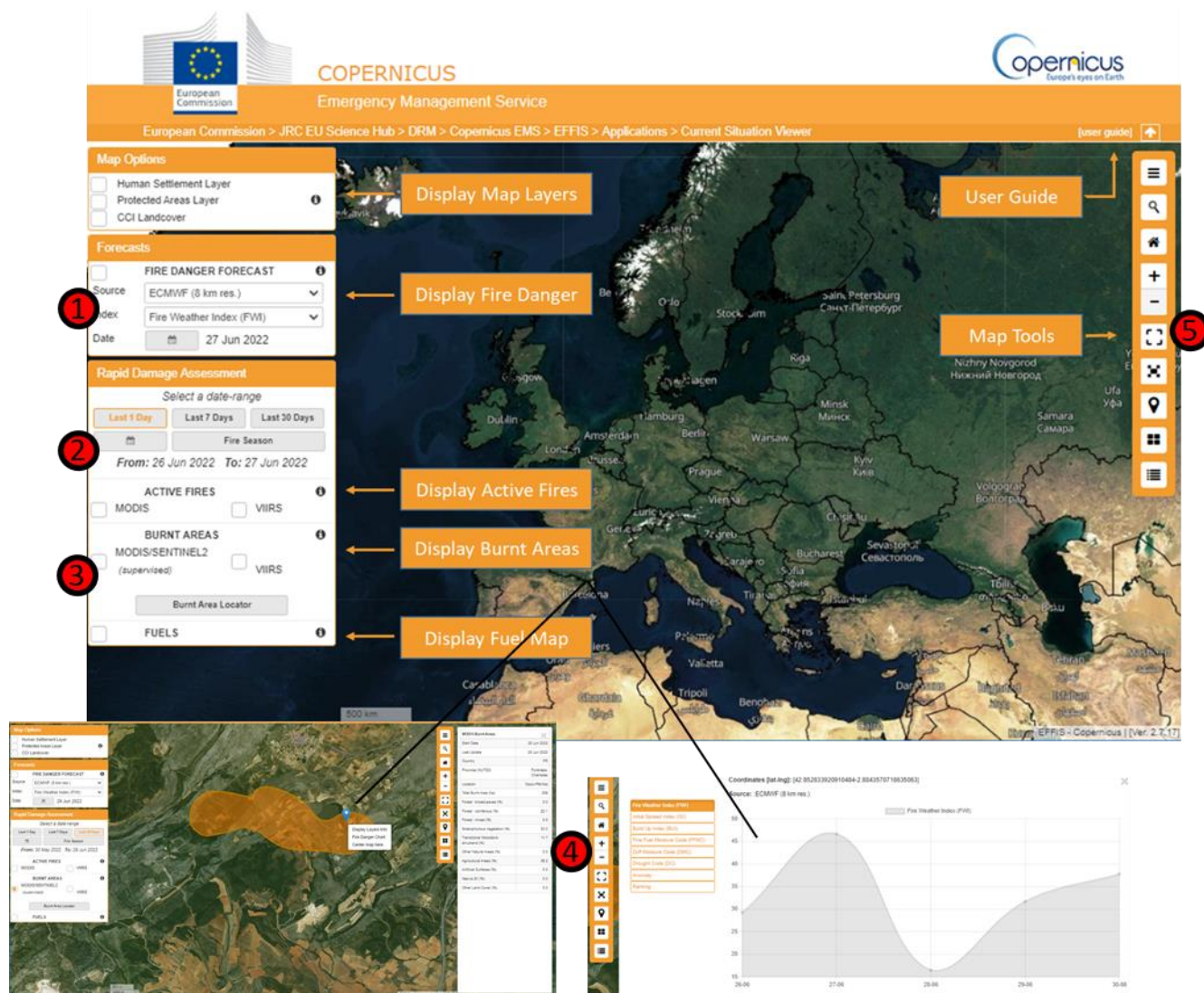


Figure 290. The Current Situation application.

4.1.2 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.

[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.*

This application can be accessed at <https://effis.jrc.ec.europa.eu/apps/firenews.viewer/>

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 times. The results can be filtered by country, and the Search box allows the user to narrow down the display to a specific location of interest.

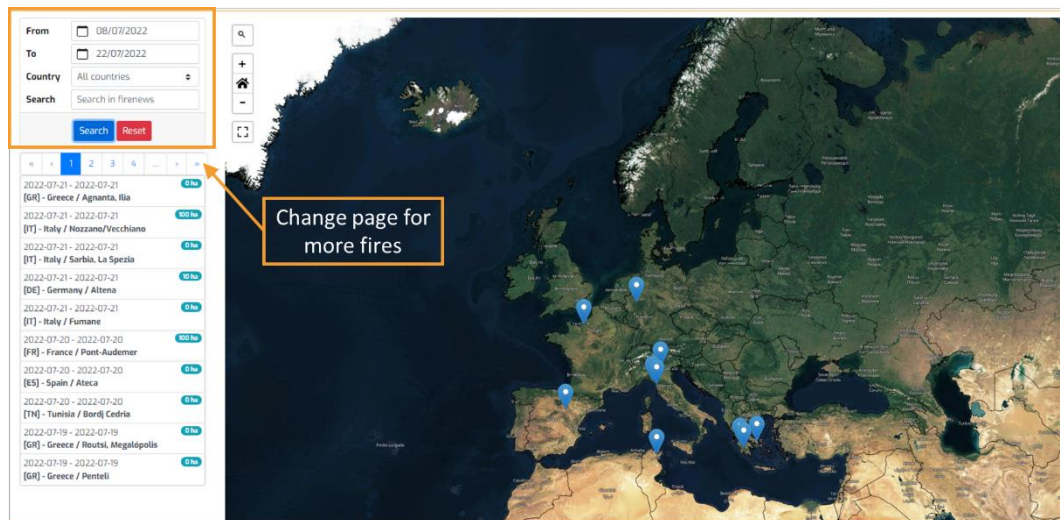


Figure 291. Clicking on a specific fire will zoom in to that spot. Clicking on the spot will bring up all the news items linked to the fire.

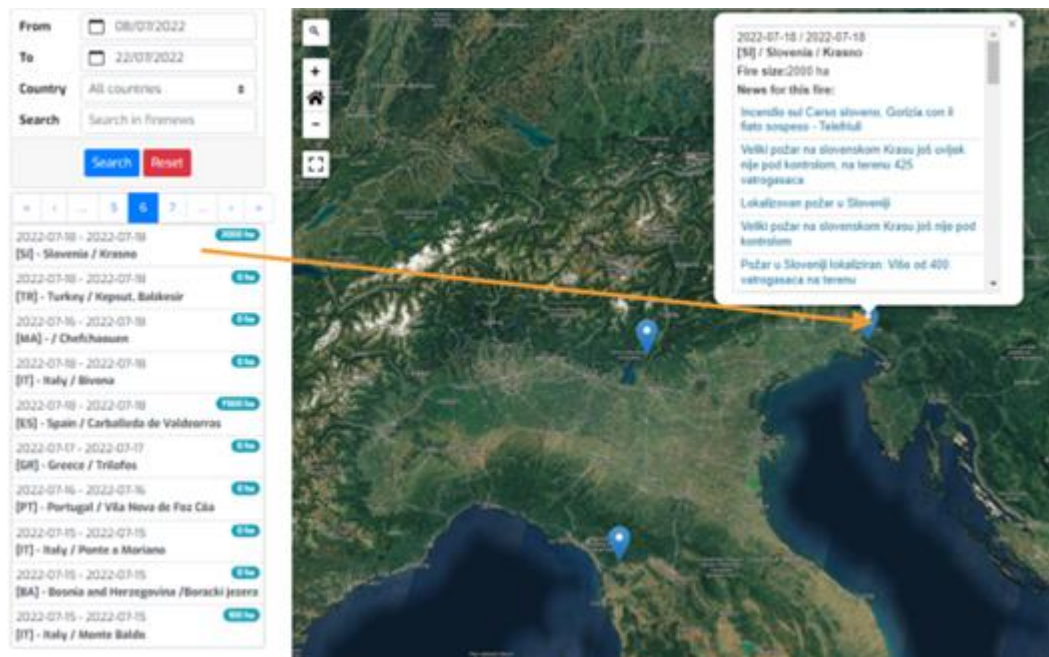


Figure 292. The Fire News application.

4.1.3 The EFFIS Statistics Portal

Statistics are provided at national level and for 3 groups: EU, European non-EU countries, and Middle East and North Africa countries. The portal provides information on the current fire season through the provision of the following information:

- Current statistics of burnt areas and number of fires, as compared to the average of the last 14 years. Statistics of the current year can be compared to a single year or a period in the past;

- Seasonal cumulative trend in burnt areas and number of fires as compared to the average of the last 14 years;
- Number of thermal anomalies detected by the VIIRS sensor as compared to the average of thermal anomalies for the last 10 years (2012-2021);
- Number of thermal anomalies detected by the MODIS sensor as compared to the average of the thermal anomalies for the last 10 years (2012-2021).

There are two parts to the Portal: [EFFIS estimates](#) and the [Seasonal trend](#).

EFFIS Estimates

In this section the user can display the burnt area or numbers of mapped fires for two periods. The first is a single year (default is the current fire season), and the second can be defined by the user to be any range between 2006 and the year before the current season. The countries are grouped by region and displayed in alphabetical order in the graph.

The values displayed on the graph are provided in table format below the graph. Extra information is also provided when the “overview” option is selected, including the country size and the percentage of the total country area that has been burned.

In each case the statistics can be displayed for the entire region of interest, or for any of the individual countries in the graph.

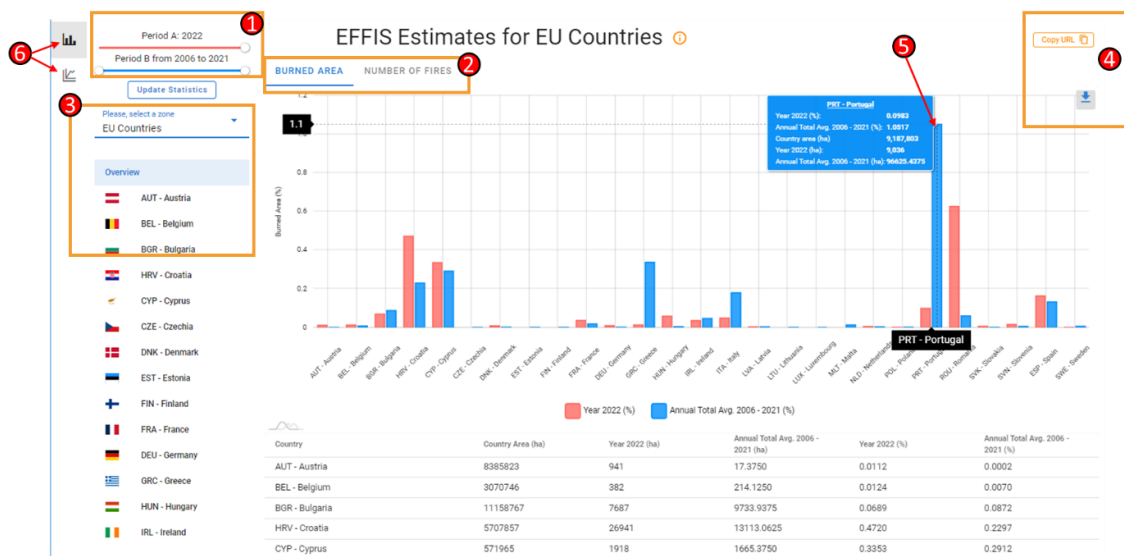


Figure 293. EFFIS estimates.

1. Use the sliders to select individual year of interest and period for comparison.
2. Choose Burned Area or Number of Fires.
3. Choose region of interest (EU countries, European Non-EU countries, Mena countries) and either the overview or an individual country.
4. Download the results or copy the url.
5. Hover the mouse over individual points to get their statistics.
6. Switch between the EFFIS Estimates and Seasonal Trends.

Seasonal Trends

In this section are 8 charts in 4 pairs. There are three main groups of countries (EU countries, European Non-EU countries, MENA countries) and the information can be displayed for the group as a whole or for individual countries in the same way as for the Estimates.

The first of each pair displays values comparing the current year's progress against the long term average (2006-2021) and the minimum/maximum values. The second displays the same information but displayed cumulatively through the year.

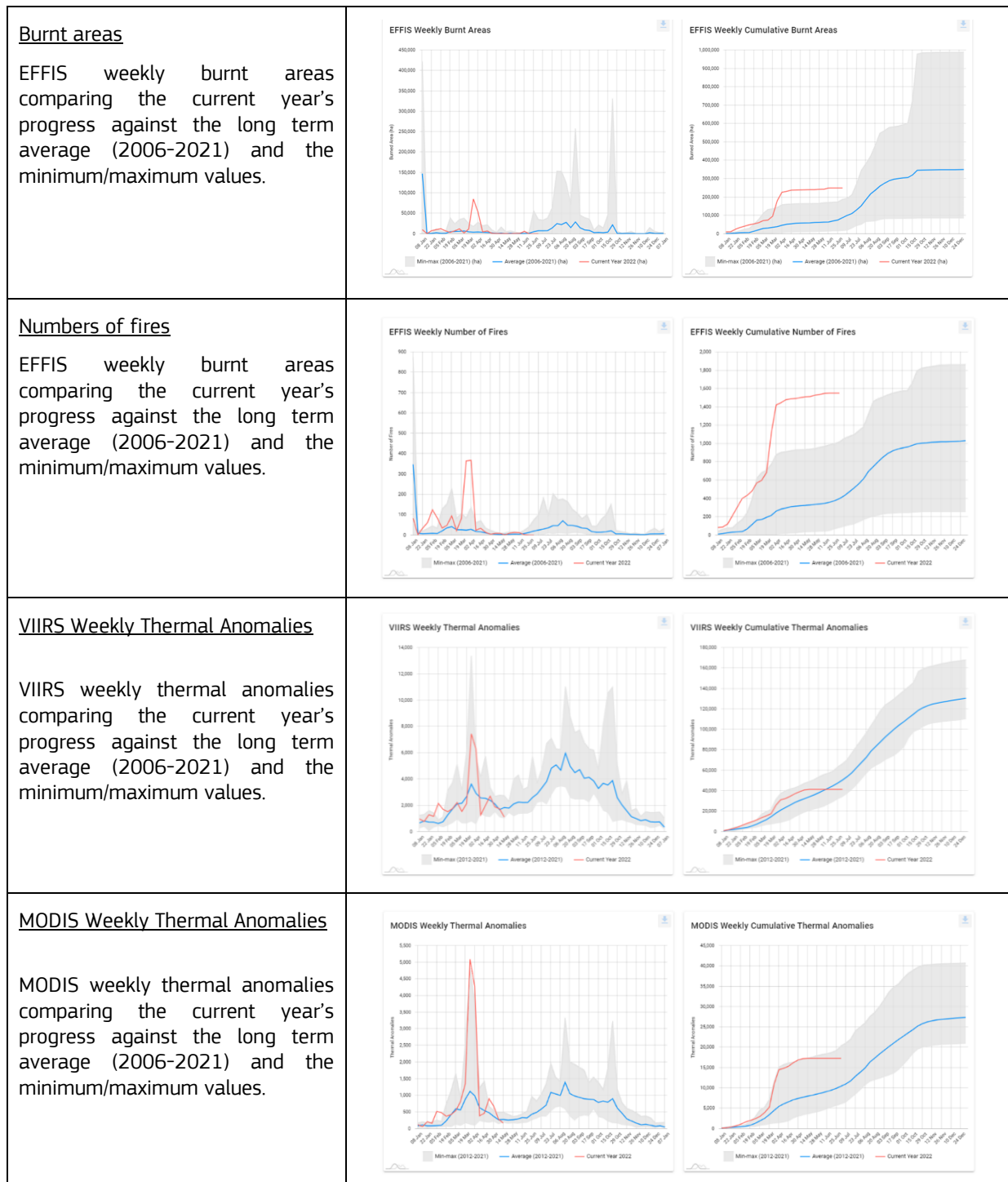


Figure 294. Seasonal trends.

4.1.4 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 have been 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 at least once to 27

(Algeria, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Lebanon, Morocco, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia and Türkiye). The database currently contains around 3 million individual fire event records (over 2 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:

<https://effis.jrc.ec.europa.eu/reports-and-publications/effis-related-publications>

Table 100. 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 101: 2022 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 101. 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	28915		4831	60						-	
2002		117	243		278		19929		4097	572	3428	429	4607				38154	28993		6490	64						-	
2003		304	427		1238		18616		7023	622	4904	373	9716				79013	28087		8282	227						-	
2004		94	221	957	300		21396		3767	739	1704	104	6341	430	647		36315	27829	34	4955	50	153					-	
2005	251	110	185	653	299	65	25492	2631	4698	718	2180	150	7918	267	365		46542	41689	64	4573	74	287	1530				-	
2006	393	110	172	697	717	248	16334	6314	4608	764	2210	97	5651	1444	1929		35630	24243	105	4618	106	238	2227			347	216	
2007	1479	120	111	809	435	64	10932	2813	3382	1226	3759	603	10736	245	426		31303	25133	478	3787	129	463	2706			304	292	
2008	582	63	114	470	560	71	11656	3161	2781	1071	228	502	6648	272	716		35786	18958	91	5420	68	182	2135			267	259	
2009	314	103	91	520	575	47	15642	2746	4808	354	181	608	5423	471	890		30912	29783	190	4180	122	347	-			487	199	
2010	222	88	133	731	525	30	11722	3100	3828	540	131	109	4884	106	319		24443	26113	70	3120	33	123	1861			597	264	
2011	635	114	85	1341	515	24	16417	2871	4283	953	279	2021	8181	137	373		39011	29782	340	3534	114	303	-			568	262	
2012	876	75	78	1555	451	5	15978	1050	3713	-	570	2657	10345	81	162		53907	25352	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	23129	118	4907	75	233	3755	-	-	411	-	
2014	151	60	68	870	251	91	9806	3637	1729	-	43	1042	1821	155	695		38115	9388	83	4374	35	153	-	-	-	460	-	
2015	439	166	87	1738	594	67	11810	1644	2891	-	176	1069	5424	247	704		60176	19643	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	92	988	176	61	-	2263	3201	-	328	1454	-	80	423	321	25193	21006	447	5276	108	162	-	-	-	437	-	
2018	222	153	131	2033	1216	230	-	4401	1616	-	57	530	-	211	972	949	35227	12273	158	8181	32	262	-	-	-	343	-	
2019	668	-	99	1964	845	143	-	3046	2886	-	123	2088	-	280	1107	547	41488	10832	425	5483	84	-	-	-	-	529	-	
2020	-	-	-	2079	684	24	-	2780	2658	-	-	1239	-	157	581	724	31061	9619	627	5305	120	-	-	-	-	514	-	
2021	-	-	-	1515	293	26	-	2370	2295	-	-	1154	-	46	448	212	15605	10380	278	1021	217	-	-	-	-	434	-	

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Annex – Summary Tables of Fire Statistics

Table 102. Number of forest fires in five Southern Member States (1980-2022)

Table 103. Burnt area (hectares) in five Southern Member States (1980 – 2022)

Table 104. Number of forest fires in other countries (1990-2022)

Table 105. Burnt area (hectares) in other countries (1990 – 2022).

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 102. Number of forest fires in five Southern Member States (1980-2022).

<i>Year</i>	<i>PORTUGAL</i>	<i>SPAIN</i>	<i>FRANCE</i>	<i>ITALY</i>	<i>GREECE</i>	<i>TOTAL</i>
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	28 915	19 547	4 309	7 134	2 535	62 440
2002	28 993	19 929	4 097	4 601	1 141	58 761
2003	28 087	18 616	7 023	9 697	1 452	64 875
2004	27 829	21 396	3 775	6 428	1 748	61 176
2005	41 689	25 492	4 698	7 951	1 544	81 374
2006	24 243	16 354	4 615	5 634	1 417	52 263
2007	25 133	10 936	3 383	10 639	1 983	52 074
2008	18 958	11 655	2 818	6 486	1 481	41 398
2009	29 783	15 643	4 888	5 422	1 063	56 799
2010	26 113	11 721	3 861	4 884	1 052	47 631
2011	29 782	16 414	4 290	8 181	1 613	60 280
2012	25 352	17 503	3 928	8 252	1 559	56 594
2013	23 129	10 626	2 223	2 936	862	39 776
2014	9 388	9 771	2 799	3 257	552	25 767
2015	19 643	11 928	4 439	5 442	510	41 962
2016	16 104	8 817	4 406	5 818	777	35 922
2017	21 006	13 793	4 429	7 855	1 083	48 166
2018	12 274	7 143	3 027	3 220	793	26 457
2019	10 832	10 883	5 728	4 351	657	32 451
2020	9 619	7 745	7 961	4 865	1 060	31 250
2021	8 186	8 780	4 739	5 989	1 250	28 944
2022	10 390	10 507	22 796	6 529	962	51 184
% of total in 2022	20%	21%	45%	13%	2%	100%
<i>Average 1980-1989</i>	7 381	9 515	4 910	11 575	1 264	34 645
<i>Average 1990-1999</i>	22 250	18 152	5 538	11 164	1 748	58 851
<i>Average 2000-2009</i>	28 774	18 369	4 421	7 259	1 695	60 517
<i>Average 2010-2019</i>	19 362	11 860	3 913	5 420	946	41 501
<i>Average 2020-2022</i>	9 398	9 011	11 832	5 794	1 091	37 126
<i>Average 1980-2022</i>	18 741	14 093	5 193	8 641	1 390	48 058
TOTAL (1980-2022)	805 868	605 986	223 308	371 556	59 788	2 066 506

Table 103. Burnt area (hectares) in five Southern Member States (1980 – 2022).

<i>Year</i>	<i>PORTUGAL</i>	<i>SPAIN</i>	<i>FRANCE</i>	<i>ITALY</i>	<i>GREECE</i>	<i>TOTAL</i>
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	117 420	93 297	20 642	76 427	18 221	326 007
2002	130 849	107 464	30 160	40 791	6 013	315 277
2003	471 750	148 172	73 278	91 805	3 517	788 522
2004	151 370	134 193	13 711	60 176	10 267	369 717
2005	346 718	188 697	22 135	47 575	6 437	611 562
2006	83 706	155 345	7 972	39 946	12 661	299 630
2007	36 413	86 122	8 574	227 729	225 734	584 571
2008	19 897	50 322	6 046	66 329	29 152	171 746
2009	92 126	120 094	17 033	73 355	35 342	337 950
2010	140 953	54 770	10 538	46 537	8 967	261 765
2011	77 104	102 161	11 751	72 004	29 144	292 164
2012	117 985	226 125	8 318	130 814	59 924	543 166
2013	160 388	58 985	3 608	29 076	46 676	298 733
2014	22 820	46 721	7 698	36 125	25 846	139 210
2015	67 200	103 200	11 546	41 511	7 096	230 553
2016	167 808	65 817	16 395	65 503	26 540	342 062
2017	539 921	178 234	26 641	161 987	13 393	920 176
2018	44 578	25 162	5 193	19 481	15 464	109 877
2019	42 085	83 963	24 133	36 034	9 153	195 367
2020	67 170	65 923	18 451	55 656	9 300	216 500
2021	28 360	87 880	15 114	151 964	108 418	391 736
2022	110 097	267 947	70 301	71 694	18 807	538 846
% of total in 2022	20%	50%	13%	13%	3%	100%
<i>Average 1980-1989</i>	73 484	244 788	39 157	147 150	52 417	556 995
<i>Average 1990-1999</i>	102 203	161 319	22 735	118 573	44 108	448 938
<i>Average 2000-2009</i>	160 985	127 229	22 363	83 878	49 238	443 693
<i>Average 2010-2019</i>	138 084	94 514	12 582	63 907	24 220	333 307
<i>Average 2020-2022</i>	68 542	140 583	34 622	93 105	45 508	382 360
<i>Average 1980-2022</i>	115 191	155 820	24 936	102 660	42 706	441 312
TOTAL (1980-2022)	4 953 195	6 700 249	1 072 229	4 414 391	1 836 351	18 976 413

Table 104. Number of forest fires in other countries (1990-2022).

Country	Algeria	Austria	Bulgaria	Croatia	Cyprus	Czechia	Estonia	Finland	Germany	Hungary	Latvia	Lebanon	Lithuania	Morocco	Netherlands	North Macedonia	Norway	Poland	Romania	Serbia	Slovakia	Slovenia	Sweden	Switzerland	Turkiye	Ukraine
Year																										
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	-	112	1196	372	-	-	-	-	1694	-	965	-	634	187	-	-	-	8821	159	-	-	-	-	83	2545	-
1994	-	105	667	181	-	-	-	-	1696	-	763	-	715	417	-	-	-	10705	121	-	366	-	-	86	3239	-
1995	-	54	114	109	-	1331	-	-	1237	-	582	-	472	528	-	-	-	7678	62	-	254	-	-	96	1770	-
1996	-	26	246	305	-	1421	-	1475	1748	-	1095	-	894	220	-	-	-	7923	72	-	662	-	-	130	1645	-
1997	-	42	200	305	-	1398	-	1585	1467	-	768	-	565	391	-	-	-	6817	37	-	535	-	-	179	1569	-
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	-	42	1710	706	285	1499	158	826	1210	811	915	-	654	321	-	-	-	12426	688	-	824	-	4708	70	2555	-
2001	-	54	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	-	238	452	532	427	1754	111	1734	2524	375	900	-	885	392	-	-	198	17087	203	-	872	224	8282	304	2177	-
2004	-	72	294	204	221	873	89	816	626	104	647	-	468	714	-	-	119	7006	34	-	153	51	4955	94	1762	-
2005	-	85	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	248	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	-	185	582	275	114	470	71	1456	818	502	700	-	301	273	-	573	171	9090	91	-	182	74	5420	63	2135	3231
2009	-	138	314	181	91	514	47	1242	763	608	823	-	471	501	-	80	109	9162	190	67	347	120	4180	103	1793	4922
2010	-	144	222	131	133	732	30	1412	780	109	316	-	104	629	-	99	62	4680	70	3	127	32	3120	88	1861	2368
2011	2487	267	635	280	85	1337	24	1215	888	2021	360	-	142	606	-	523	49	8172	340	211	303	114	3534	114	1954	1761
2012	5110	259	876	569	78	1549	5	417	701	2657	162	-	81	484	-	483	24	9265	911	318	513	168	2213	75	2450	1743
2013	2443	199	408	137	135	666	15	1452	515	761	422	-	123	411	-	186	42	4883	116	46	233	75	4878	58	3755	806
2014	4629	146	151	43	68	865	91	1660	429	1042	698	-	155	460	-	62	133	5245	83	23	153	35	4374	60	2149	1486
2015	2383	280	429	177	87	1748	67	745	1071	1069	704	107	247	425	-	106	29	12257	250	68	242	93	2700	166	2150	2225
2016	3150	141	584	151	119	892	84	933	608	452	641	260	98	422	-	60	345	5286	174	45	136	90	5454	82	3188	945
2017	2992	278	513	329	92	966	61	881	424	1454	423	92	80	433	321	301	264	3592	447	222	162	108	5276	110	2411	2371
2018	797	174	222	54	131	2033	230	2427	1708	530	972	41	211	343	949	19	887	8867	158	62	262	32	8181	153	2167	1297
2019	2278	244	668	123	99	1963	143	1458	1523	2088	1107	194	279	529	548	251	261	9635	425	189	210	84	5483	79	2688	1261
2020	3493	234	499	142	108	2081	24	1260	1360	1239	581	251	157	514	724	48	609	6627	627	81	221	120	5305	78	3399	2598
2021	1631	164	349	116	111	1517	32	1231	548	1154	448	131	46	435	212	113	653	3295	278	75	101	73	4087	85	2793	659
2022	1607	217	516		89	2473	26	1129	2397	2731	369	22	81	499	916	50	1275	6999	1021	66	297	217	5189	115	2160	1098

Table 105. Burnt area (hectares) in other countries (1990 – 2022).

Country	Algeria	Austria	Bulgaria	Croatia	Cyprus	Czechia	Estonia	Finland	Germany	Hungary	Latvia	Lebanon	Lithuania	Morocco	Netherlands	North Macedonia	Norway	Poland	Romania	Serbia	Slovakia	Slovenia	Sweden	Switzerland	Türkiye	Ukraine
Year																										
1990	-	-	-	-	-	-	-	-	-	-	258	-	-	2118	-	-	-	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	-	85	18164	20157	-	-	-	-	1493	-	570	-	274	3078	-	-	-	8290	518	-	-	-	-	37	15393	-
1994	-	80	18100	7936	-	-	-	-	1114	-	326	-	279	6072	-	-	-	9325	312	-	-	-	-	408	30828	-
1995	-	43	550	4651	-	403	-	-	592	-	535	-	321	7018	-	-	-	5403	208	-	-	-	-	446	7676	-
1996	-	8	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	6517	-
1998	-	101	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	-	32	57406	68171	8034	375	684	266	581	1595	1341	-	352	4064	-	-	-	7089	3607	-	904	-	1552	70	26653	-
2001	-	20	20152	16169	4830	87	62	187	122	-	311	-	113	1806	-	-	895	3466	1001	-	305	-	1254	21	7394	-
2002	-	112	6513	4853	2196	178	2082	590	122	1227	2222	-	746	593	-	-	221	5210	3536	-	595	161	2626	681	8514	-
2003	-	122	5000	27091	2349	1236	207	666	1315	845	559	-	436	2858	-	-	942	21551	762	-	1567	2100	4002	673	6644	-
2004	-	19	1137	3378	1218	335	379	358	274	247	486	-	253	8660	-	-	117	3782	124	-	157	138	1883	31	4876	-
2005	-	13	1456	3135	1838	227	85	495	183	3531	120	-	51	6198	-	-	346	5713	162	-	524	280	1562	67	2821	-
2006	-	54	3540	4575	1160	53	2638	1617	482	625	3387	-	1199	5360	-	-	3829	5657	946	-	280	1420	5710	127	7762	-
2007	-	54	42999	20209	4483	316	292	576	256	4636	272	-	38	1367	-	32665	128	2841	2529	-	679	128	1090	337	11664	12731
2008	-	20	5289	7343	2392	86	1279	830	539	2404	364	-	112	1127	-	5915	3174	3027	373	-	118	75	6113	68	29749	4521
2009	-	58	2271	2900	885	178	59	576	262	6463	646	-	287	3108	-	1307	1329	4400	974	712	510	177	1537	60	4679	4575
2010	-	36	6526	1121	2000	205	25	520	522	878	92	-	22	5511	-	737	769	2126	206	4	192	121	540	27	3517	1239
2011	13593	67	6883	15555	1599	337	19	580	214	8055	115	-	293	3460	-	17308	121	2678	2195	5003	403	288	945	225	3612	612
2012	99061	48	12730	24804	2531	634	3	86.5	269	14115	90	-	20	6695	-	10021	60	7235	6624	13226	1683	1006	483	30	10455	3311
2013	13396	102	3314	1999	2835	92	79	461.4	199	1955	217	-	25	2207	-	3027	47	1289	421	1132	270	66	1508	29	11456	220
2014	43125	92	916	188	669	536	77	881	120	4454	591	-	162	1540	-	846	770	2690	217	599	192	18	14666	46	3117	16677
2015	13010	114	4313	9416	652	344	83	143	526	4730	615	753	71	992	-	1798	143	5510	1671	1474	353	65	594	47	3219	2625
2016	18370	23	6340	7100	3205	141	123	310	283	974	467	1871	26	2585	-	450	1884	1451	675	843	175	526	1288	454	9156	1101
2017	53975	25	4569	48543	428	170	33	460	395	4933	265	264	53	2414	232	5619	525	1023	2459	4757	295	441	1433	118	11992	5474
2018	2312	19	1453	1506	1136	492	430	1228	2349	906	2864	643	110	841	639	95	3279	2696	1341	1502	248	20	24310	69	5644	1367
2019	21048	20	5620	2180	733	520	69	565	2711	6541	805	3155	200	3232	250	4834	3077	3572	2496	9872	462	154	1233	31	11332	1065
2020	43918	60	5258	23994	1305	484	191	719	368	2895	309	1851	64	5569	1072	68	363	8417	5152	1417	477	118	821	26	20971	74623
2021	100101	117	3143	6660	6612	411	33	785	148	2413	504	1508	11	3064	18	6796	653	894	2101	1630	159	124	731	35	139503	289
2022	27685	550	8126		685	1715	20	267	3085	20947	217	79	53	22762	220	199	2455	2853	13153	1053	1210	4059	912	322	12799	18100

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