The Power and Peril of Wildfires

SorS Conference 2025

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A Brief Introduction to Wildfires

Introduction
Understanding Wildfires

> **"**
>
> A wildfire is an unplanned, unwanted wild land fire (including unauthorized human-caused fires)
>
> **United Nations**

Causes of ignition

- Human Activity
  - 80 - 95% of wildfires are caused by humans.
  - E.g. Arson, Negligence, Machinery, Infrastructure
- Natural Causes
  - E.g. Lightning, Volcanoes

Contributing factors include:

- Temperature
- Wind speed and direction
- Humidity
- (Lack of) Precipitation
- Slope and Aspect
- Elevation
- Land use / Vegetation type
- Human activity

Components of major loss causing wildfire events

- Exposure Aggregation
- Extreme Fire Weather
- Urban Conflagration

Wildfire Occurrence in Europe

- European countries most at risk include:
  - Portugal, Spain, Italy, Greece and Turkey
  - Ukraine is facing an increased number of wildfires since the War began

Wildland - Urban interface

- An estimated 85% of wildfire property loss occurs in the WUI

- "The **Wildland –Urban interface** (WUI) is the zone of transition between unoccupied land and human development. It is the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels." (U.S. Fire Administration)

- 15-20% of the European Land area is classified as WUI

2024
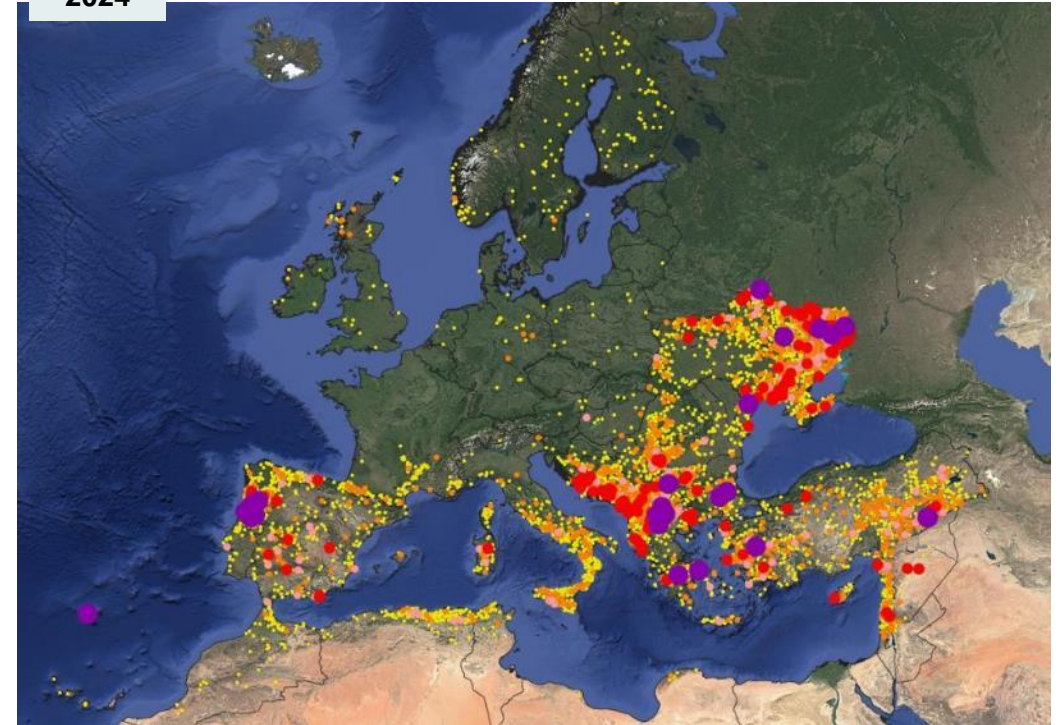
Extent of burnt areas in 2024 as reported by EFFIS. Yellow dots refer to areas up to 100 ha, orange up to 500 ha, pink up to 1000 ha, red up to 5000 ha, purple beyond 5000 ha.
© EU, 2025 − GWIS

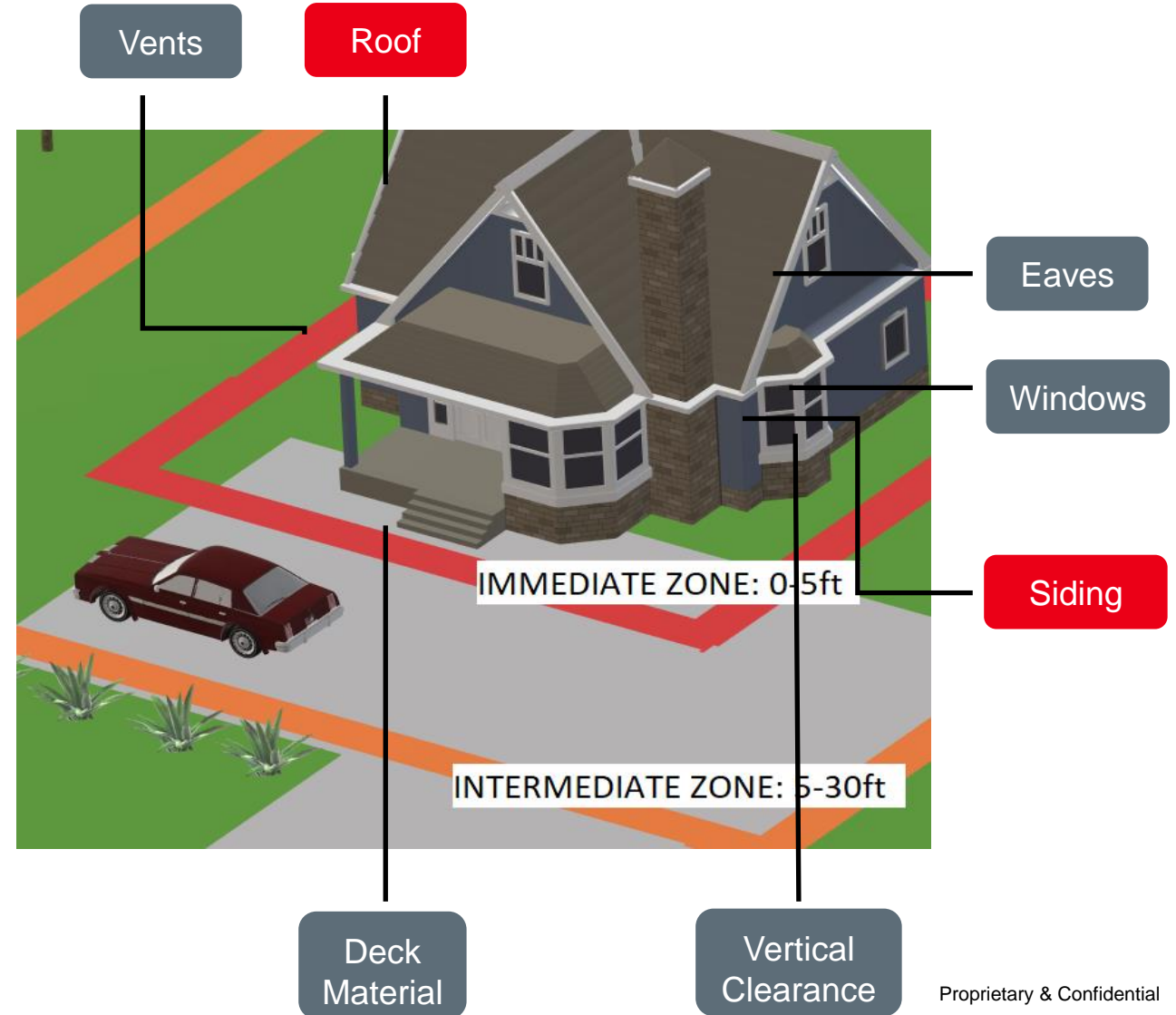# Structures Are Vulnerable To Wildfire Based On Their Weakest Link

Failure of a single component leads to a 100% loss for the structure

Ignition Sources of Buildings

- Direct Contact by Flame or Hot Gases
- Flying Embers & Firebrands
- Radiated Heat

Building vulnerability factors include

- Vegetation clearance
- Openings like vents
- Roof material
- Wall material
- Windows and Doors

Vents

Roof

Eaves

Windows

IMMEDIATE ZONE: 0-5ft

Siding

INTERMEDIATE ZONE: 5-30ft

Deck Material

Vertical Clearance

Wildfire Situation

1

Current Situation

- Worldwide wildfire activity has more than doubled between 2003 and 2023
- The last 8 years include the 6 most extreme years on record
- Fire seasons are getting longer
- Wildfires are getting larger
- More people and structures are getting exposed and threatened by wildfires
- Wildfires interact with other perils, increasing the potential for the likes of floods and landslides

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Human Activity

- Main cause of Fire weather becoming more common
- Climate change
- Increasing population growth in the Wildland-Urban Interface (WUI)
  - Increases ignition risk
  - Increases exposure in wildfire prone areas
- Wildfire suppression
  - Increases severity of wildfires

3

Mitigation

- Minimise the number of ignitions
- Landscape management
- Prevent the accumulation of high-risk fuel types
  - Promote tree species that are less fire-prone
  - Enable animal grazing or conduct prescribed burning
- Combat Climate Change

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## A Closer Look At the Ex-Yugoslavia Region

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Regional View
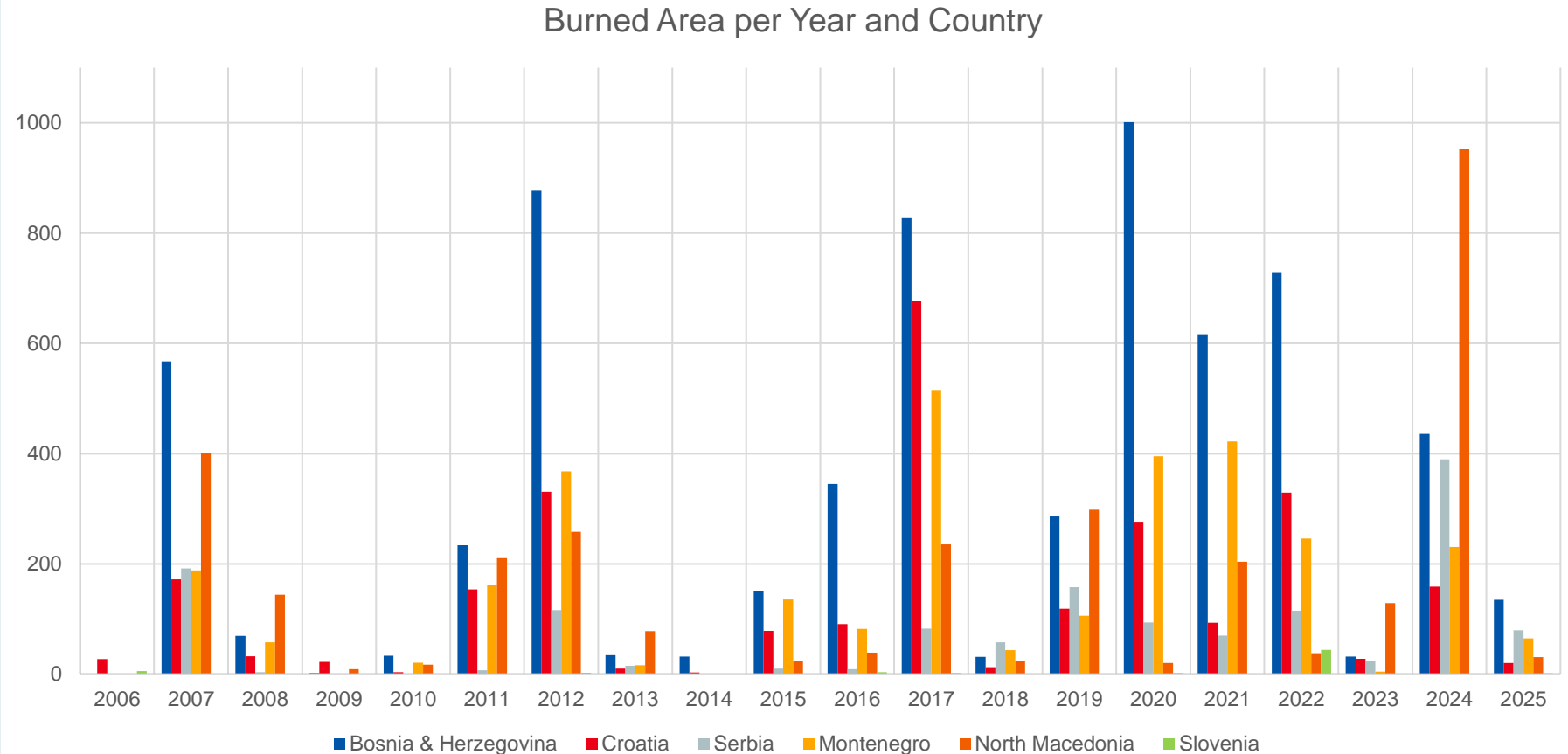## Number of fires per year and country

- Wildfire risk is already present in the region.

- Bosnia and Herzegovina has seen the most wildfires over the last 20 years.

- Slovenia sees the least number of wildfires.

- Over the past 20 years:
  - Serbia has seen roughly 90% of the number of wildfires in the last 10 years

- Across all countries:
  - The last 10 years are accountable for more than 80% of the number of fires that occurred in the last 20 years.

Number of Fires per Year and Country

Legend: Bosnia & Herzegovina, Croatia, Serbia, Montenegro, North Macedonia, Slovenia
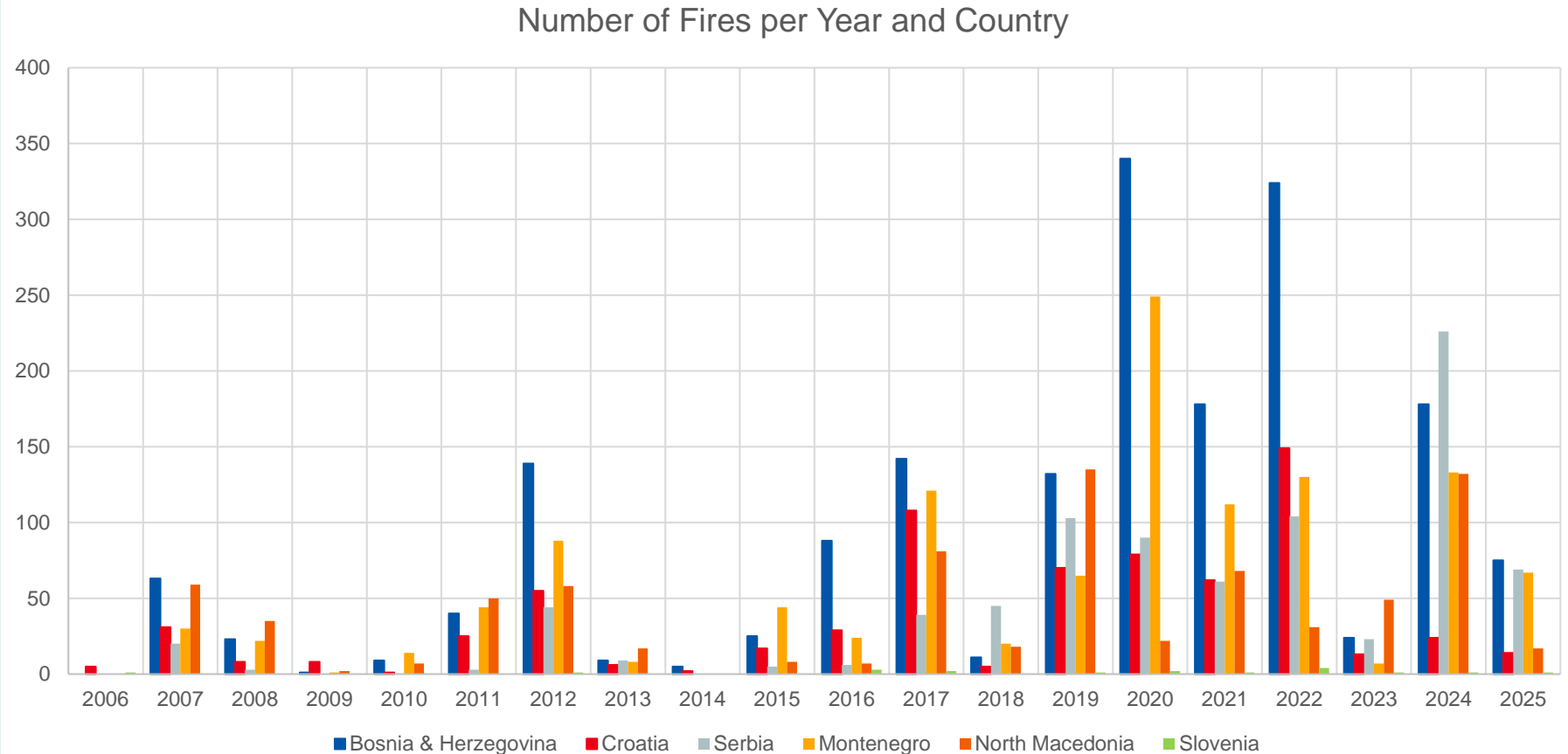
Regional View

Burned area per country and year in km^2

- Wildfire risk exists across all countries with the possible exception of Slovenia

- Bosnia and Herzegovina has seen the most burned area over the last 20 years

- The last 10 years have seen an increase in bad wildfire years compared to the 10 years before

- North Macedonia has faced an extraordinary wildfire year in 2024

Burned Area per Year and Country

Legend: Bosnia & Herzegovina, Croatia, Serbia, Montenegro, North Macedonia, Slovenia

The Year 2024

Summer of 2024 was the hottest in the western Balkans on record

Bosnia & Herzegovina

More activity than in 2023 but less than the preceding three years

The two largest fires of the season (Nevesinje & Glamoč) occurred in January and March

Second peak around August

19 fires of over 5km^2

Croatia

More activity than in 2023 but close to the long-term average

Largest fire occurred in January (Hrvace)

Half of the damage occurred in August

7 out of 8 fires over 10km^2 in July or August

Montenegro

More activity than in 2023 and close to the long-term average

Two peaks of activity, January/February and July/August

5 fires over 5km^2

North Macedonia

Worst wildfire season in over a decade

Burned area exceeded the total of the previous 6 years

Fire Season between July and September

4 fires over 100km^2 and 10 exceeding 10km^2

Serbia

Worst wildfire season since the beginning of EFFIS monitoring (2000)

430km^2 burned area across 584 events

Pitroski wildfire was the second largest in history (52km^2)

Majority of events between February and April as well as in August

Slovenia

Normal wildfire year with very little activity

2022 was an exception with the largest wildfire recorded in the history of Slovenia (Karst fire)

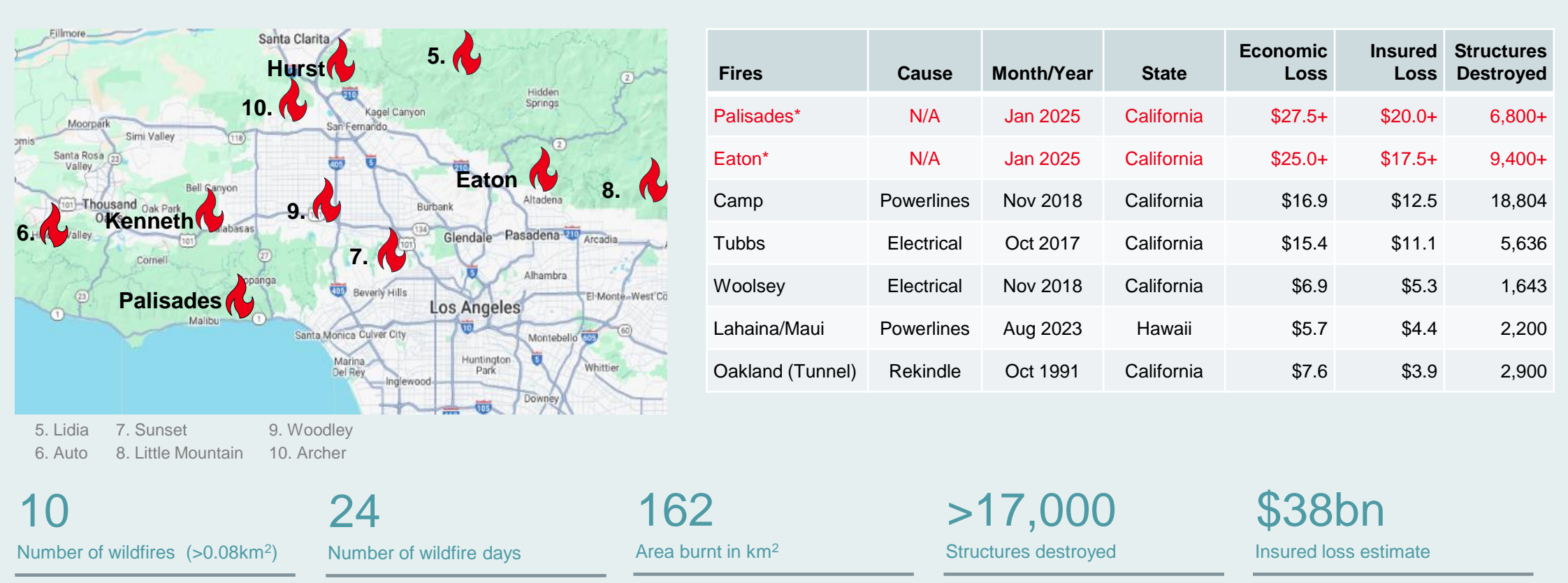Two wildfire peaks per year, the first in January/February, the second in July/August

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Southern California
Wildfires - January 2025

Southern California Wildfires
Event Overview

Fires	Cause	Month/Year	State	Economic Loss	Insured Loss	Structures Destroyed
Palisades*	N/A	Jan 2025	California	$27.5+	$20.0+	6,800+
Eaton*	N/A	Jan 2025	California	$25.0+	$17.5+	9,400+
Camp	Powerlines	Nov 2018	California	$16.9	$12.5	18,804
Tubbs	Electrical	Oct 2017	California	$15.4	$11.1	5,636
Woolsey	Electrical	Nov 2018	California	$6.9	$5.3	1,643
Lahaina/Maui	Powerlines	Aug 2023	Hawaii	$5.7	$4.4	2,200
Oakland (Tunnel)	Rekindle	Oct 1991	California	$7.6	$3.9	2,900

5. Lidia   7. Sunset   9. Woodley
6. Auto   8. Little Mountain   10. Archer

10
Number of wildfires (>0.08km²)

24
Number of wildfire days

162
Area burnt in km²

>17,000
Structures destroyed

$38bn
Insured loss estimate

Two very large wildfires threatened the area around Los Angeles at the same time

Evolution of Jan 2025 Southern California Wildfires

Satellite-based Evolution of Hot Spots for Jan 2025 Fires
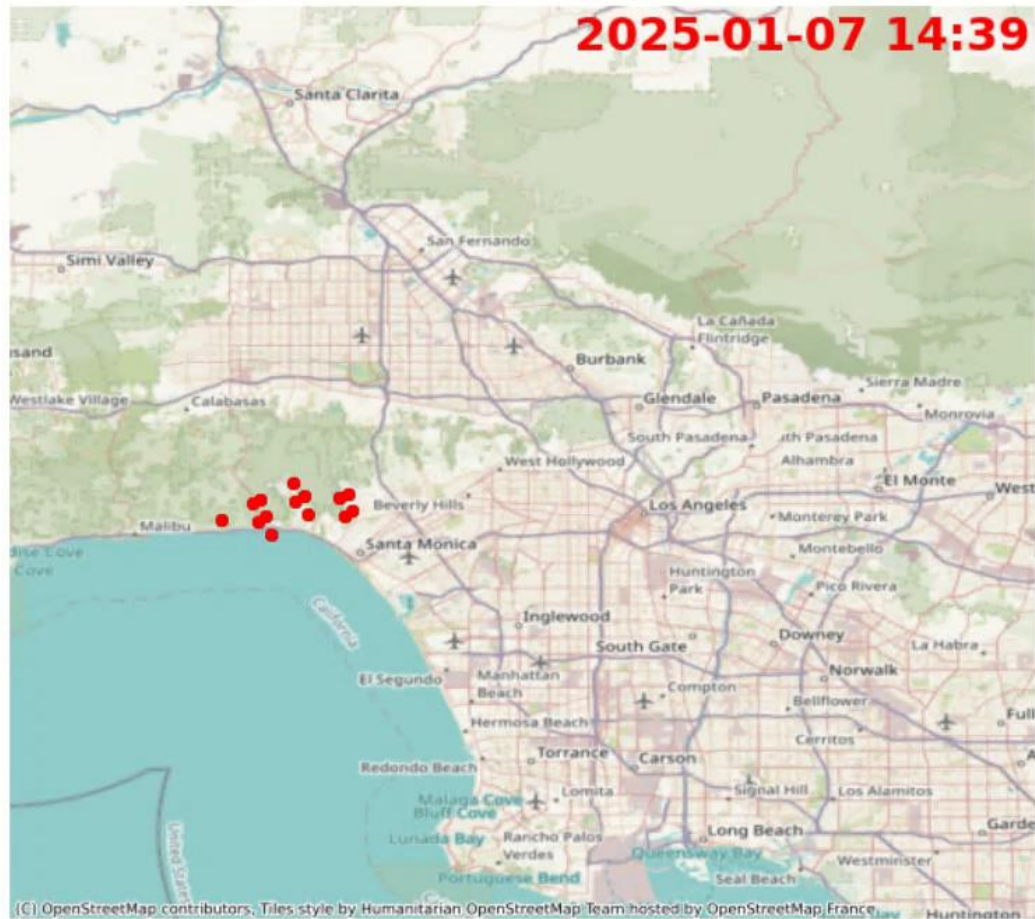
● Current 1km Hot Spot Detection
● Previous 1km Hot Spot Detection

Source: NASA MODIS fire detection dataset; Animation by Aon's Catastrophe Insight

- Red flag warning means warm temperature, low humidity and strong winds are expected which in combination produce an increased risk of fire danger.

- The peaks in wind speed on Jan 7th and Jan 8th cause an extreme increase in the wildfire extent

- With a short lag we see the effect in the area burned

Q1 Effect of the Southern California Wildfires
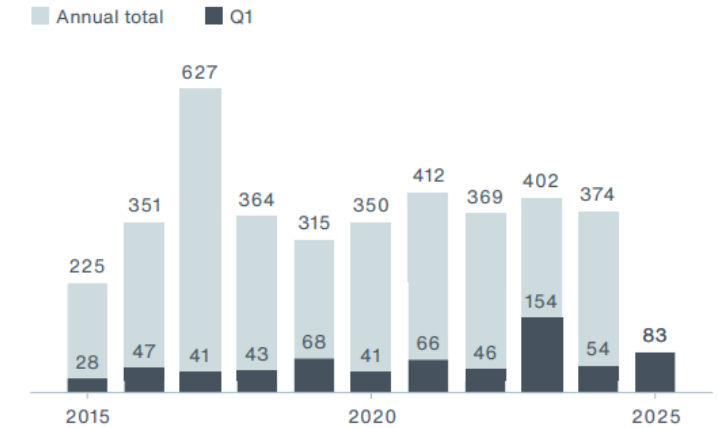
Highest Q1 insured losses since Q1 2011 ($81 bn)

- $37.5bn of $53bn insured loss due to Palisades and Eaton wildfires

USA drives these losses

- 95% of the global insured losses in Q1 are accounted by natural catastrophes in the USA
  - Six times higher than the long-term average since 2000
- Q1 losses in all other regions were significantly lower compared to their long-term averages.
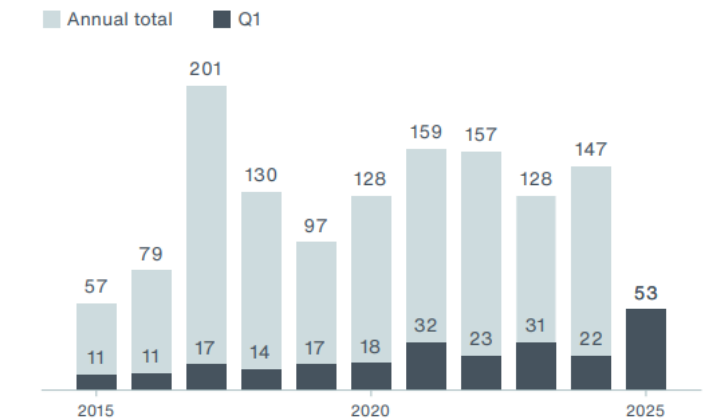
Date(s)	Event	Location	Fatalities	Insured Loss ($B)
01/07-01/28	Palisades Fire	United States	12	20.0
01/07-01/28	Eaton Fire	United States	18	17.5
03/14-03/16	Severe Convective Storm	United States	30	5.0
03/03-03/06	Severe Convective Storm	United States	6	1.3
03/28-03/31	Storms & Winter Weather	United States, Canada	9	1.2

Economic Losses (2025 $B)

Annual total / Q1

2015: 225 / 28
2016: 351 / 47
2017: 627 / 41
2018: 364 / 43
2019: 315 / 68
2020: 350 / 41
2021: 412 / 66
2022: 369 / 46
2023: 402 / 154
2024: 374 / 54
2025: 83

Data: Aon Catastrophe Insight

Insured Losses (2025 $B)

Annual total / Q1

2015: 57 / 11
2016: 79 / 11
2017: 201 / 17
2018: 130 / 14
2019: 97 / 17
2020: 128 / 18
2021: 159 / 32
2022: 157 / 23
2023: 128 / 31
2024: 147 / 22
2025: 53

Data: Aon Catastrophe Insight

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How Aon Can Help

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How Does Automatic Event Response Help Re/Insurers?
Automated Daily Reports

To give insurers an idea of the number of claims

To identify maximal financial exposure per portfolio

To help insurers focus on specific high-risk areas

To visualize fire activity and assess proximity for insured properties

To allow clients to track annual losses in real time

To identify how quickly the damage increases over the course of the event

Affected Locations

Affected Locations Exposed Limit

Postal Code Damage

Automated Event Response

Wildfire Map

Cumulative Damage

Historical Damage Data

Wildfire Hazard Score for Europe

- **Aim:**
  - To establish a wildfire hazard index tailored towards property insurance that can be used to estimate the wildfire hazard across an insurance portfolio.
- **Classification**
  - Wildfire hazard is classified into six categories: minimal, low, medium, high, very high, and extreme.
  - Hazard is determined per exact location and for aggregated data, postalcode averages can be used
- **Requirements from the client**
  - Portfolio on address level
- **Deliverables for the client**
  - Wildfire hazard classification across all locations in the portfolio
  - Identification of potential loss drivers
  - Identification of potential loss driving areas
- **Benefits for the Client**
  - Assisting underwriting
  - Expand the view of risk by including a further peril with wildfire
  - Optimize the portfolio by identifying hazard-prone areas and accounts
  - Be one step ahead by understanding the risk resulting from a peril that will be highly affected by climate change in the future.

> *Greece recorded the largest area burned by forest fires in the European Union in 2023…with about 175,000 hectares…July fires became another economic billion-dollar event for Greece.*

Aon Climate and Catastrophe Insight report (2024)

> *Europeans Lack Insurance Protection as Wildfires and Drought Batter the Region*

Bloomberg (08/2023)

> *Wildfires: 2023 among the worst in the EU in this century*

European Commission report (04/2024)

Conclusions

1 **Exposure Aggregations**

Significant Exposure Growth Has Occurred In Areas With Known Fire History

3 **Urban Conflagration**

Understand Interdependence of Structural Characteristics That Impact Wildfire Vulnerability

2 **Extreme Fire Weather**

Climate Change Is Increasing Potential For Extreme Fire Weather On a Local Scale

4 **Automated Event Response**

Automated Reports Detailing Impact Of Events On Client Portfolios

Thank You For Your Attention!

Maximilian Huber

Catastrophe Modeller
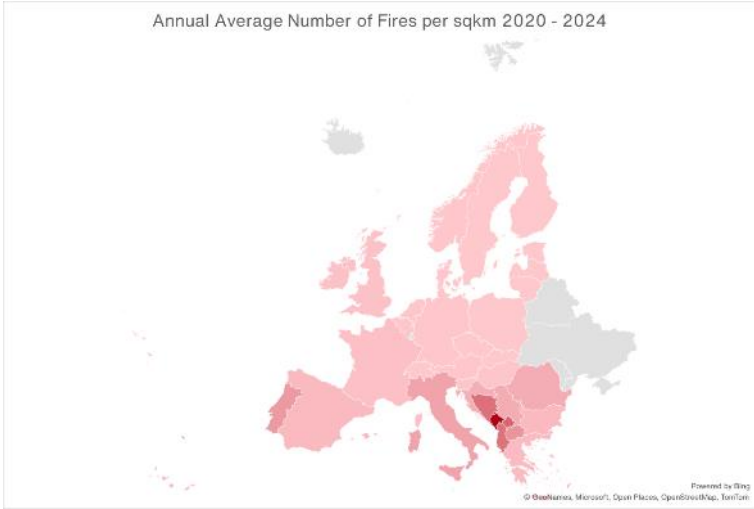
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Appendix

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Number of Fires and Burned Area in Europe
2020 - 2024

Number of Fires

Annual Average Number of Fires 2020 - 2024

Number of Fires 2020-2024
511
0.2

Annual Average Number of Fires per sqkm 2020 - 2024

Burned Area

Annual Average burned area 2020 - 2024

Annual Avg. (km2) 2020 -2024
1200
0

Annual Average burned area per sqkm 2020 - 2024
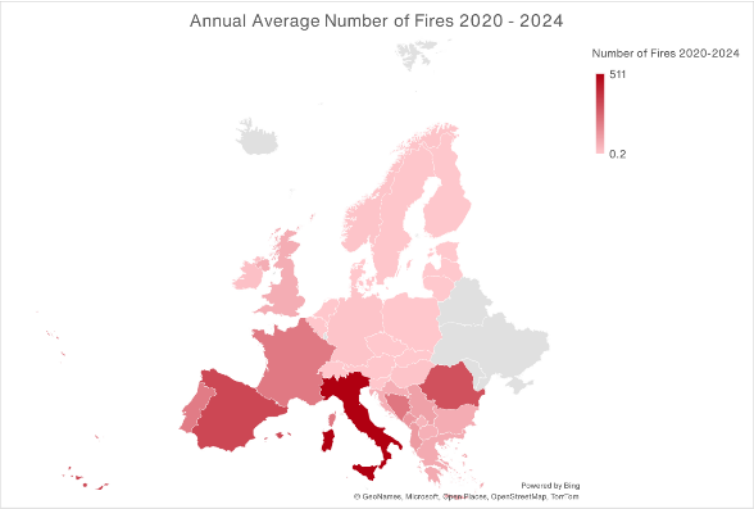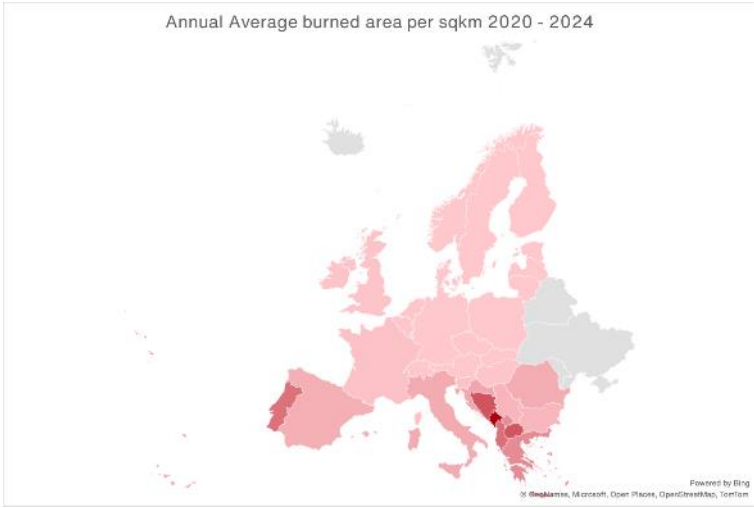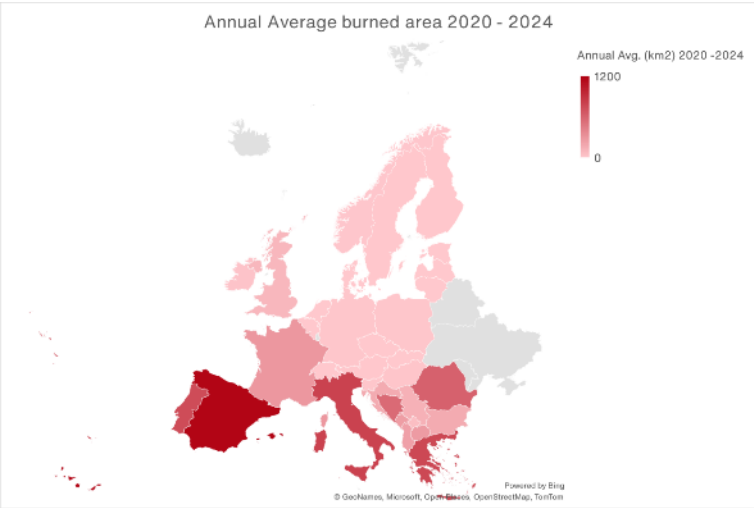
# Santa Ana Wind Conditions Exacerbate Fire Spread
Environmental Setup for January 2025 Southern California Wildfires

What are Santa Ana Winds?

- Commonly occur during the fall and winter months; peak in Dec and Jan

- Topography-enhanced surface winds that originate from a strong high-pressure system over the Great Basin region of the Intermountain West.

- At the surface, clockwise winds around the system accelerate downslope over the mountain ranges across the region toward the coast.

- Winds warm, dry, and increase in speed as they flow downslope, resulting in high winds with very low relative humidity ideal for wildfire spread.

- Unique topography of the Los Angeles basin supports ideal conditions during Santa Ana events in which wind gusts can exceed 100mph.
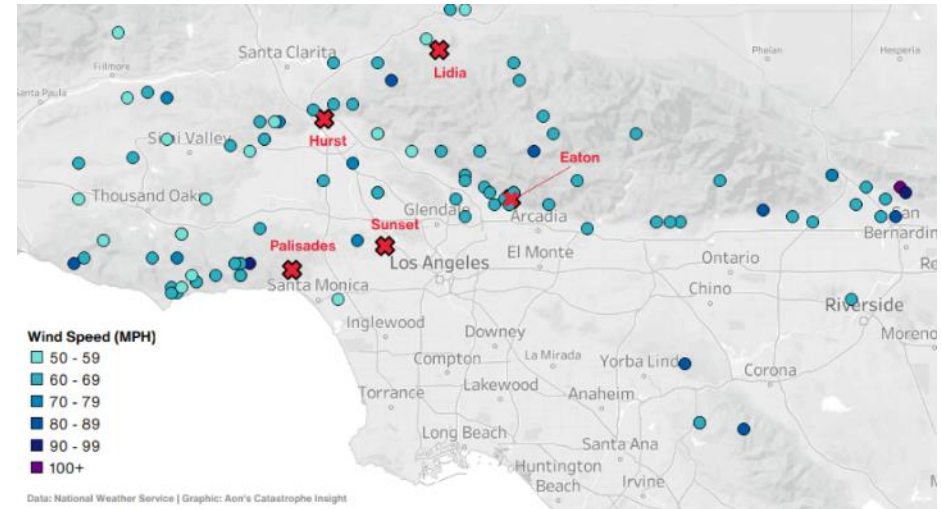

Source: Spectrum News Weather
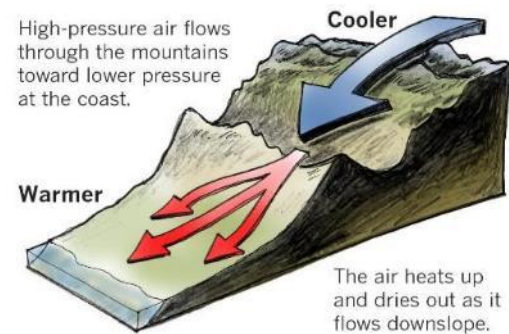
Source: Los Angeles Times

Southern California Wind Measurements (January 7-8, 2025)

Wind Speed (MPH)
- 50 - 59
- 60 - 69
- 70 - 79
- 80 - 89
- 90 - 99
- 100+

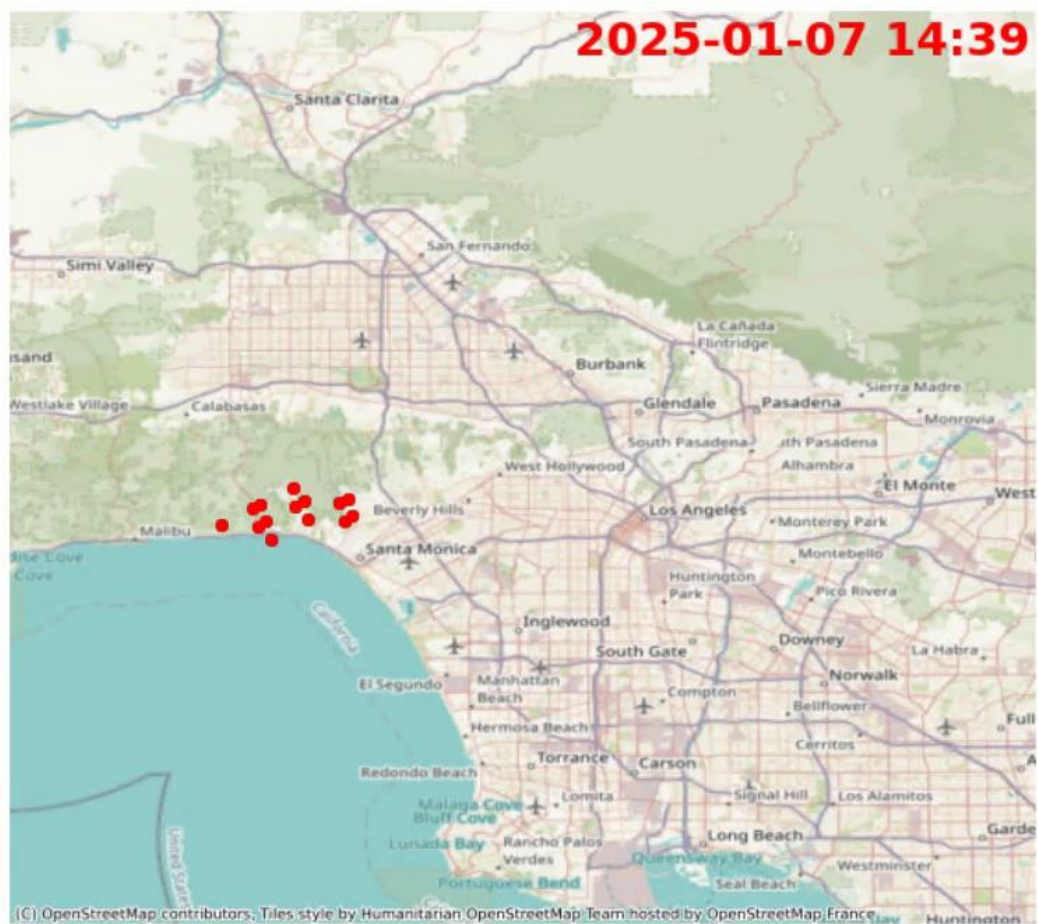Data: National Weather Service | Graphic: Aon's Catastrophe Insight

Unique Considerations:

- Observed wind gusts of 60-100 mph mark one of the strongest Santa Ana events in history rivaling the 2011 event which produced 55-97 mph gusts.

- LA County is currently under drought conditions due to lack of precipitation in recent weeks, resulting in dry vegetation and favorable fuel conditions.

- Extreme wind speeds increase fire risk in otherwise 'low to moderate' wildfire risk areas due to spotting and longer ember travel.

- Extreme fire spread observed for the Palisades Fire may also reduces the effectiveness of fire suppression services as they are unable to access larger that they could otherwise reach in lower wind speed conditions.

Evolution of Jan 2025 Southern California Wildfires

Satellite-based Evolution of Hot Spots for Jan 2025 Fires

2025-01-07 14:39

- Current 1km Hot Spot Detection
- Previous 1km Hot Spot Detection

Source: NASA MODIS fire detection dataset; Animation by Aon's Catastrophe Insight

Progression of the Palisades Fire

Jan 8	**11.74**	**Unknown**
Impacted Areas: Palisades	sqkm Burned	Structures Destroyed
Jan 9	**63.94**	**+1,000**
Impacted Areas: Palisades and East Malibu	sqkm Burned	Structures Destroyed
Jan 10	**79.32**	**+5,300**
Impacted Areas: Topanga	sqkm Burned	Structures Destroyed
Jan 12	**95.10**	**+6,800**
Threatened Areas: Brentwood, West LA (Bel Air), Santa Monica	sqkm Burned	Structures Destroyed