

Fires in the Forest - Good or Bad?

Peter Thomas





Cannich wildfire could be largest recorded in UK

🕒 31 May 2023

8,000 ha



Corrimony Nature Reserve (RSPB)
Birch woodland and moorland

“...ground-nesting birds had been badly affected and some species, including frogs, had died in the fire”

“Trees planted, some by local schoolchildren, in an effort to regenerate native woodland have also been destroyed”



California fires Nov 2018

“At least 42 die in state's deadliest wildfire”



Antarctica is the only continent without **natural** fire
Burning for more than 400 million years





Scottish native woods:
very rare

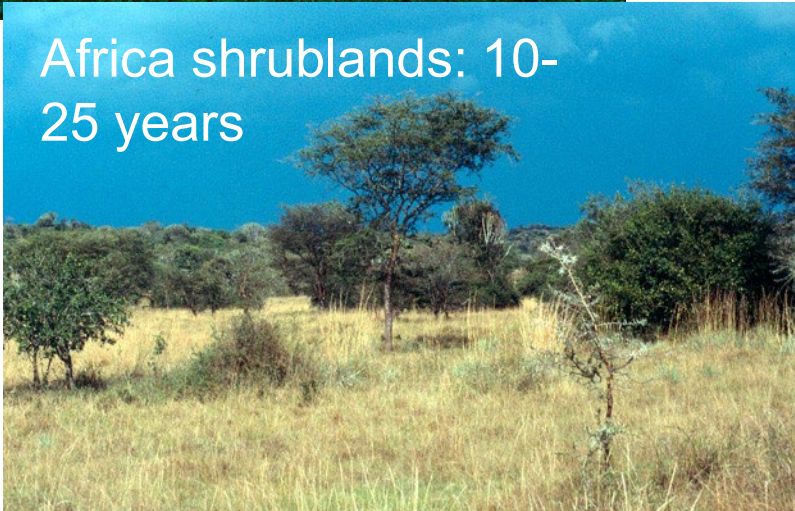


Boreal: 130-150 years

Fire frequencies




Eucalypts: 100 years



Africa shrublands: 10-25 years

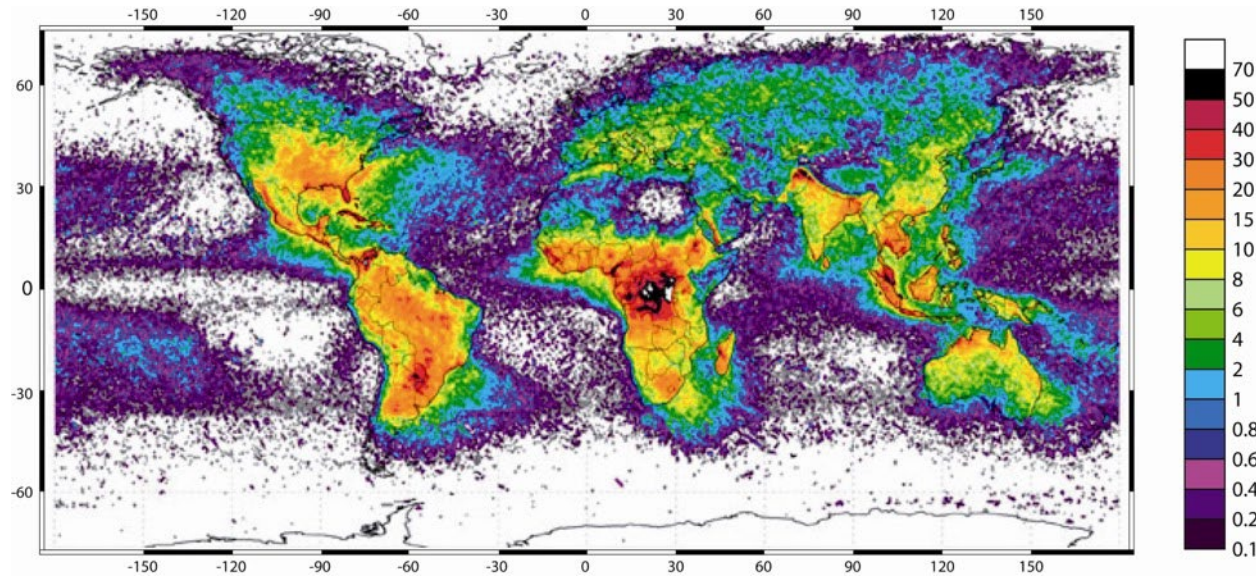


Chaparral: 5-10 years

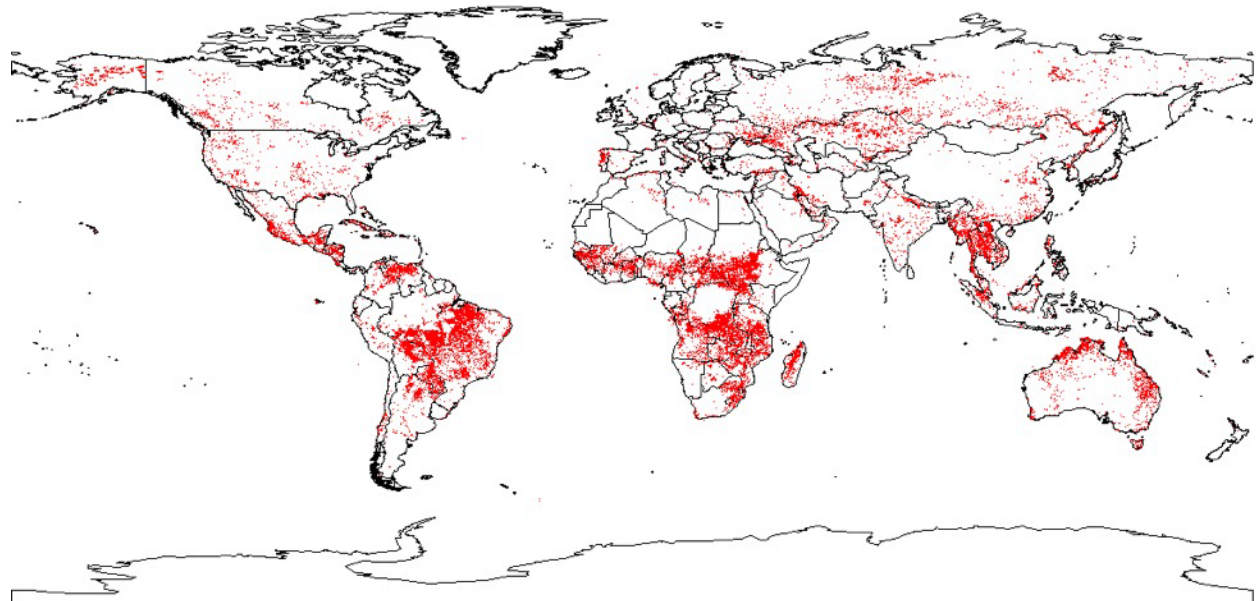


8 million strikes
per day globally

Lightning strikes



Fires





Positive strike
5-20 miles
'Bolt from the blue'



Negative strike



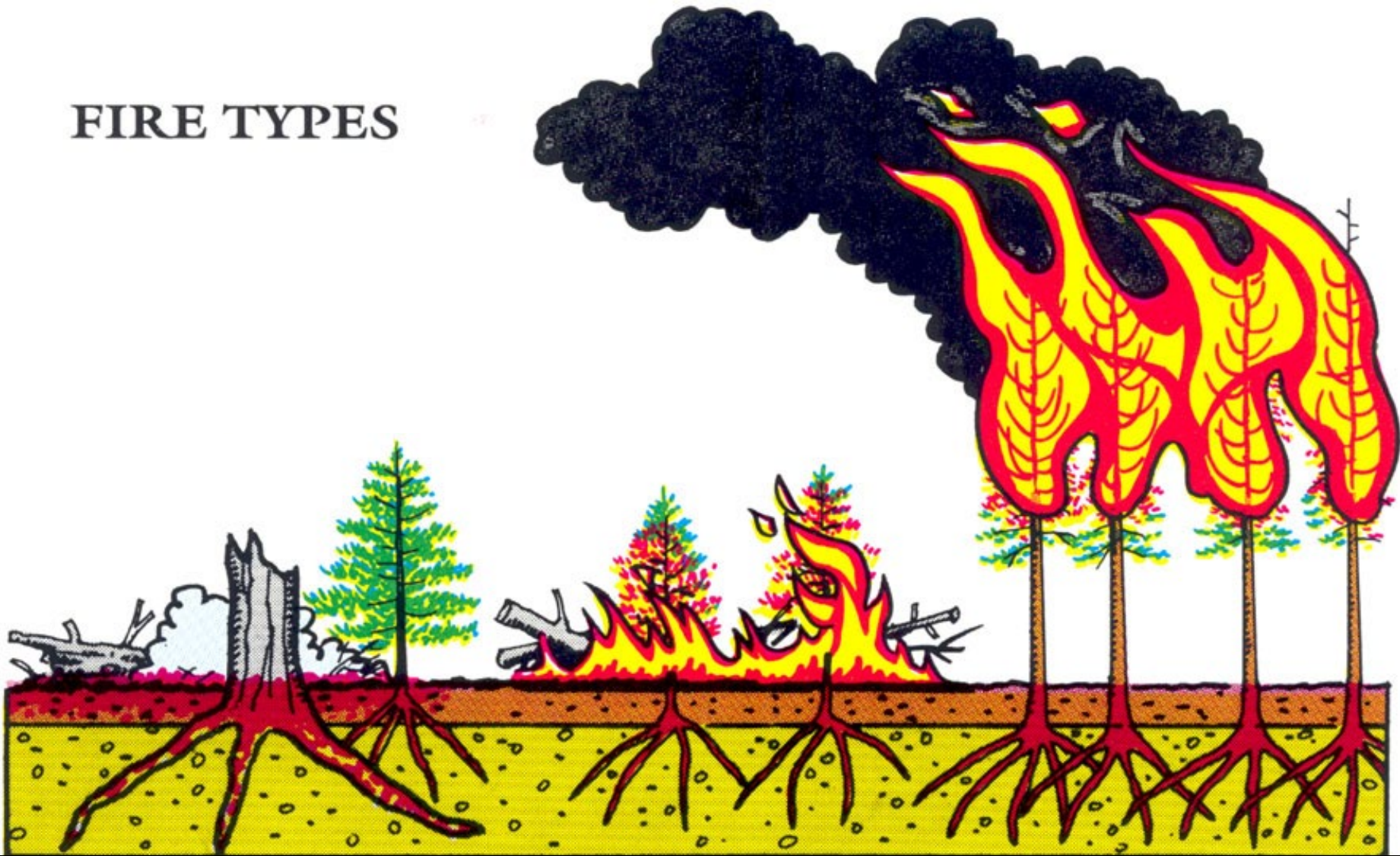
How do plants survive fire?

Living tissue dies at 55-60 °C

Flame temperature 800-1,200 °C



FIRE TYPES



Ground fire

Surface fire

Crown fire

Fire Intensity (kW m^{-1})

10-500

up to 100,000

Ground fire



Surface fire



Crown fire



Surviving a surface fire



Thick bark

Sprouting

Giant Sequoia - *Sequoiadendron giganteum*



Douglas fir - *Pseudotsuga menziesii*

Cork oak - *Quercus suber*

Eucalypts - *Eucalyptus* spp.





Surviving a surface fire



Thick bark

Sprouting

Aspen - *Populus tremuloides*



Mesquite - *Prosopis* spp.

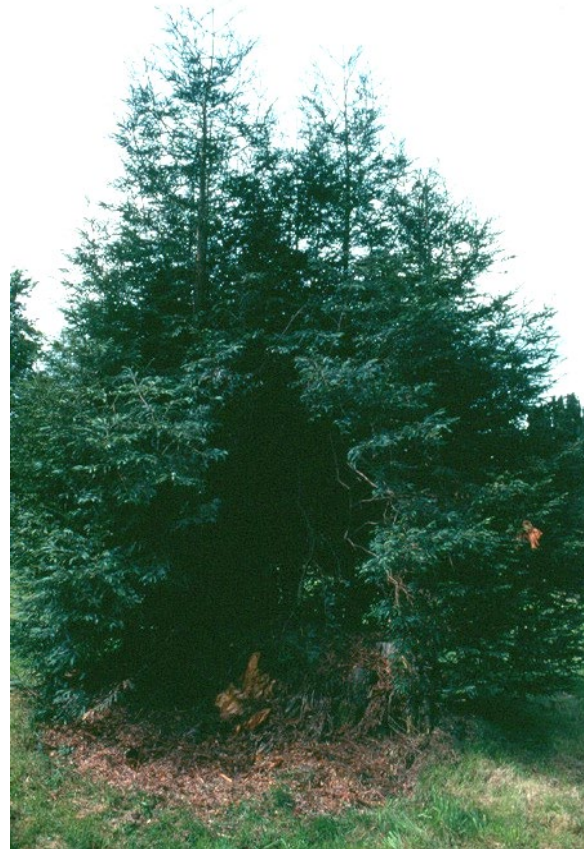






Grass tree
Xanthorrhoea sp.





Coastal redwood - *Sequoia sempervirens*



Surviving a crown fire



Sprouting

Seeds stored in

- soil

- canopy

Surviving a crown fire

soil seed bank

Fabaceae, Cistaceae

e.g. Gorse – *Ulex* spp

What triggers germination?

Physical cues

- Heat shock
- Fluctuating post-fire temperature

Chemical cues

- Smoke
- Karrikins

(Aboriginal word *karrick* for smoke)



King protea

Protea cynaroides



Surviving a crown fire



Sprouting

Seeds stored in

- soil

- **canopy**

Seeds stored in the canopy – Serotiny



Bottlebrush tree *Banksia* sp.

Seeds stored in the canopy – Serotiny

e.g. Jack Pine *Pinus banksiana*



To open cones: 50-60 °C for
1-2 minutes





**7 years post-fire
2.4 Million seeds per ha
“Dog’s hair regeneration”**

Ladder fuels carry a surface fire into the canopy







Animals

<5% mortality per
fire



Fire is tolerated, is it necessary?



Fire is tolerated, is it necessary?

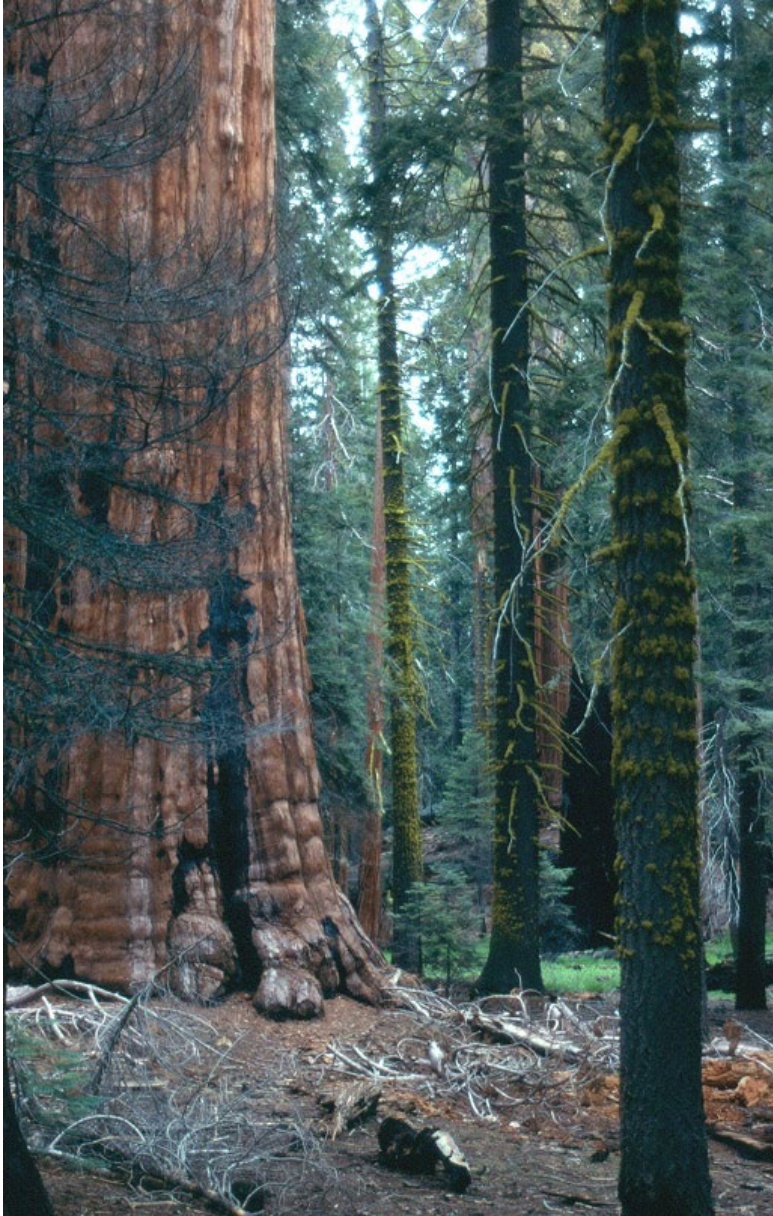


Giant Sequoia
S. giganteum

Thick bark
Seeds in canopy

Natural Fire Frequency
c. 25 years

Fire is tolerated, is it necessary?



Giant Sequoia
S. giganteum

White fir
Abies concolor

3 fires: 2020-21
killed 8-19% of mature trees

In fire-prone environments fire is:

- Natural
- Survivable
- Necessary
- Socially?

Early humans

Used fire 1.5 M years ago
in the African Rift Valley

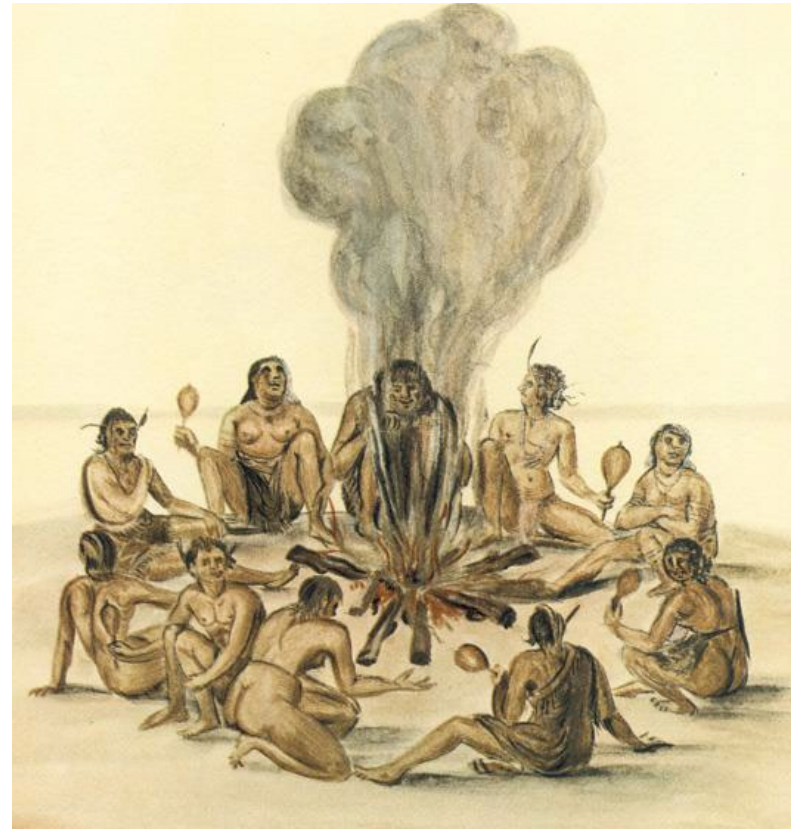


Australian aboriginals

40,000+ years

N American First People

12,000+ years





World War II

1944 Smokey Bear

1944 Walt Disney's Bambi





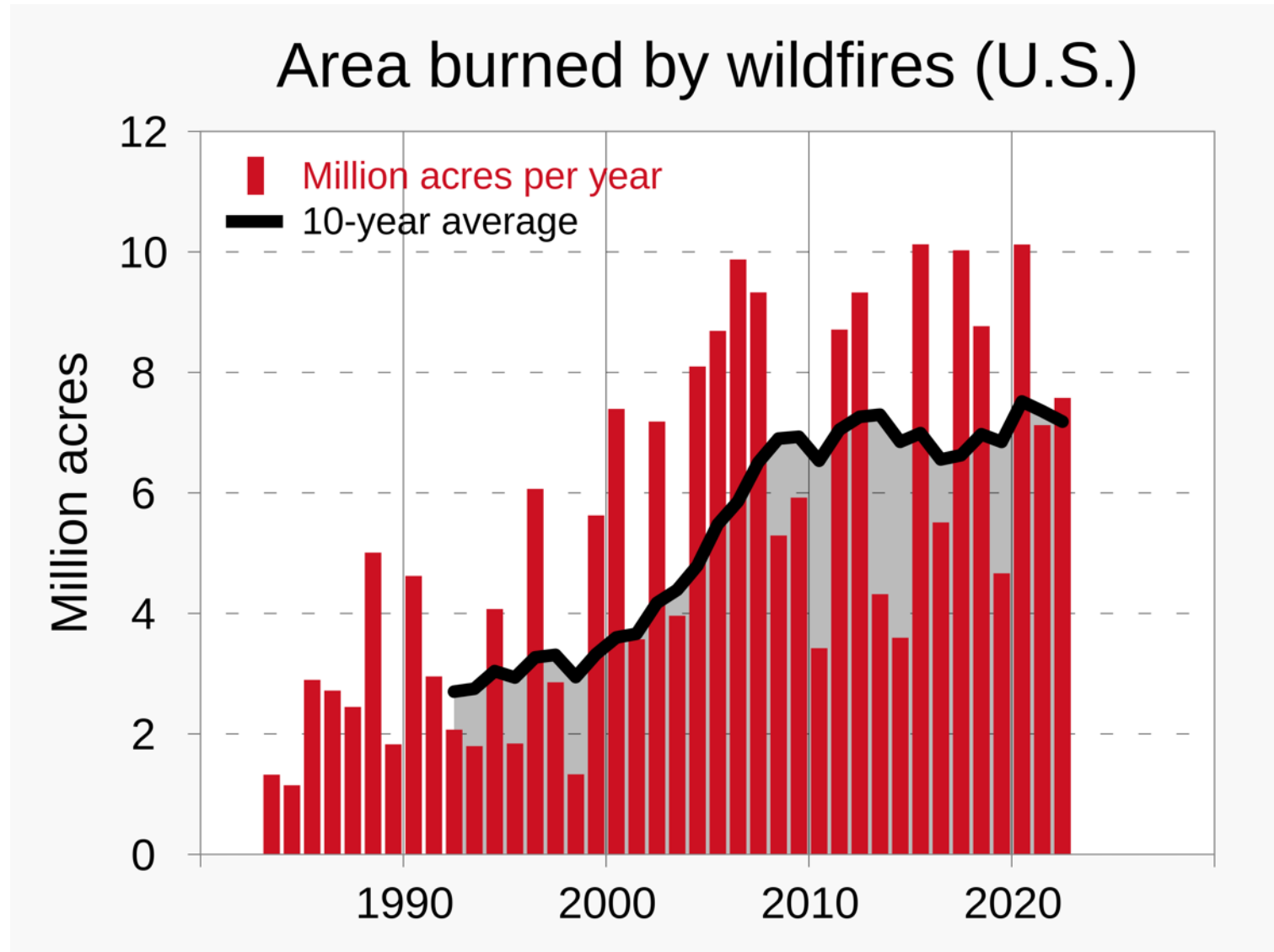


De Havilland
Canada
CL-415 water
bomber





Why are big fires becoming more common?



Why are big fires becoming more common?

- Previous fire suppression, more fuel
 - 3-10 times as many trees in the Sierra Nevada Mountains as in the 1900s
- Climate change
 - More droughts
 - Warmer
 - Higher winds
- Flammable non-native, invasive plants

e.g. grasses

Bromus tectorum

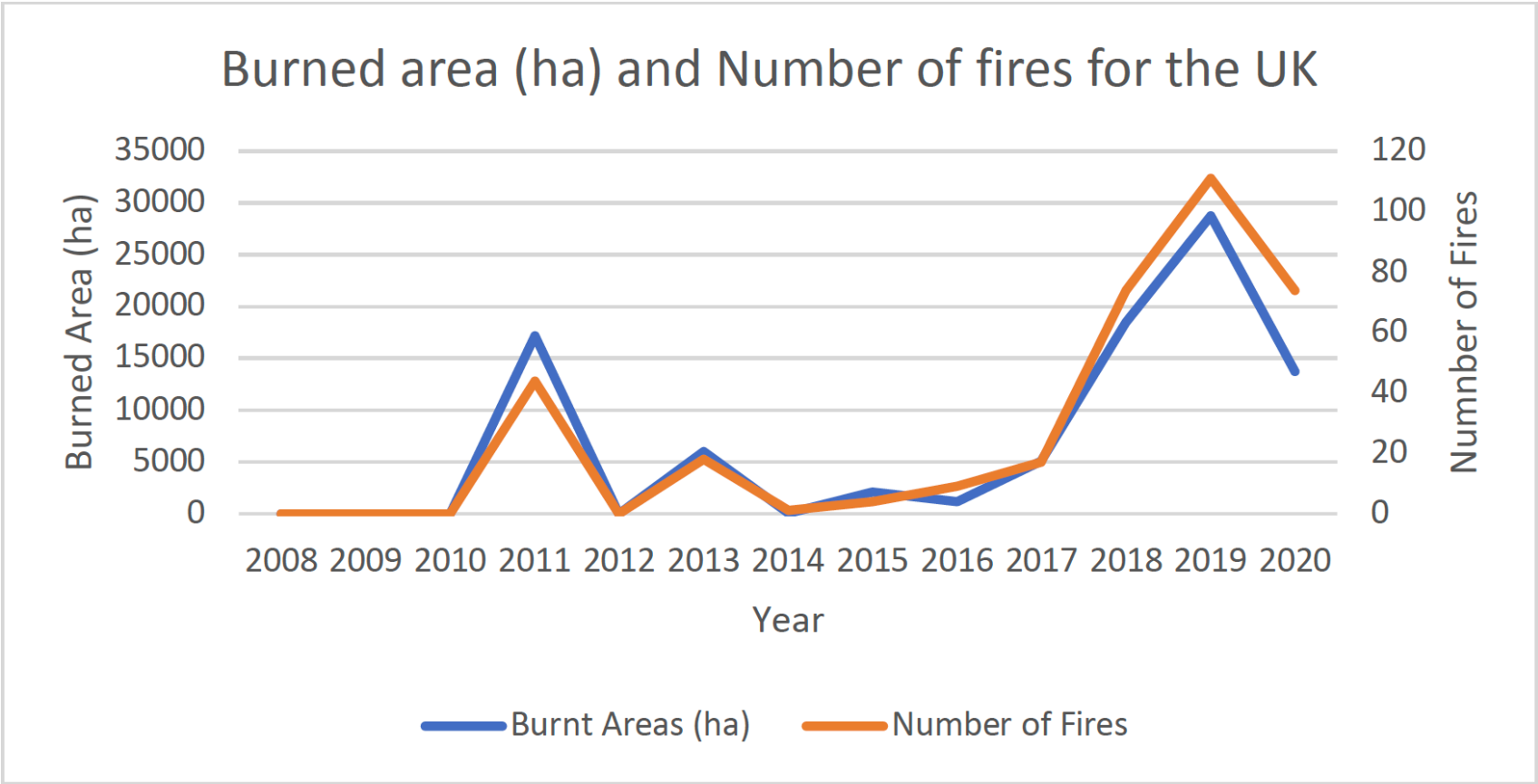
Imperata cylindrica

Andropogon gayanus

Melinis minutiflora

Cenchrus ciliaris





The European Forest
Fire Information System



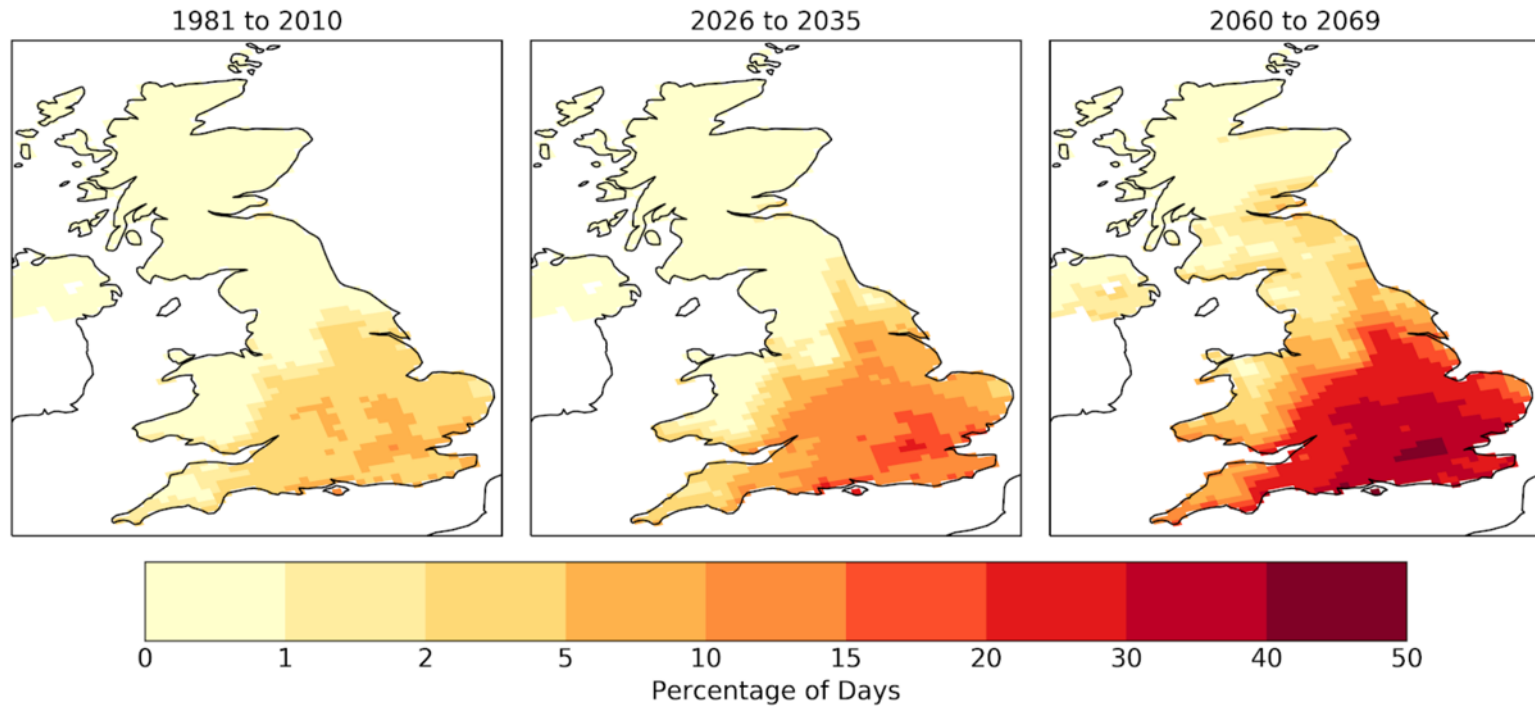
More fire is predicted

- 20% rise in global burnt area by 2050s
- 50% by 2100



2 °C warming

4 °C warming



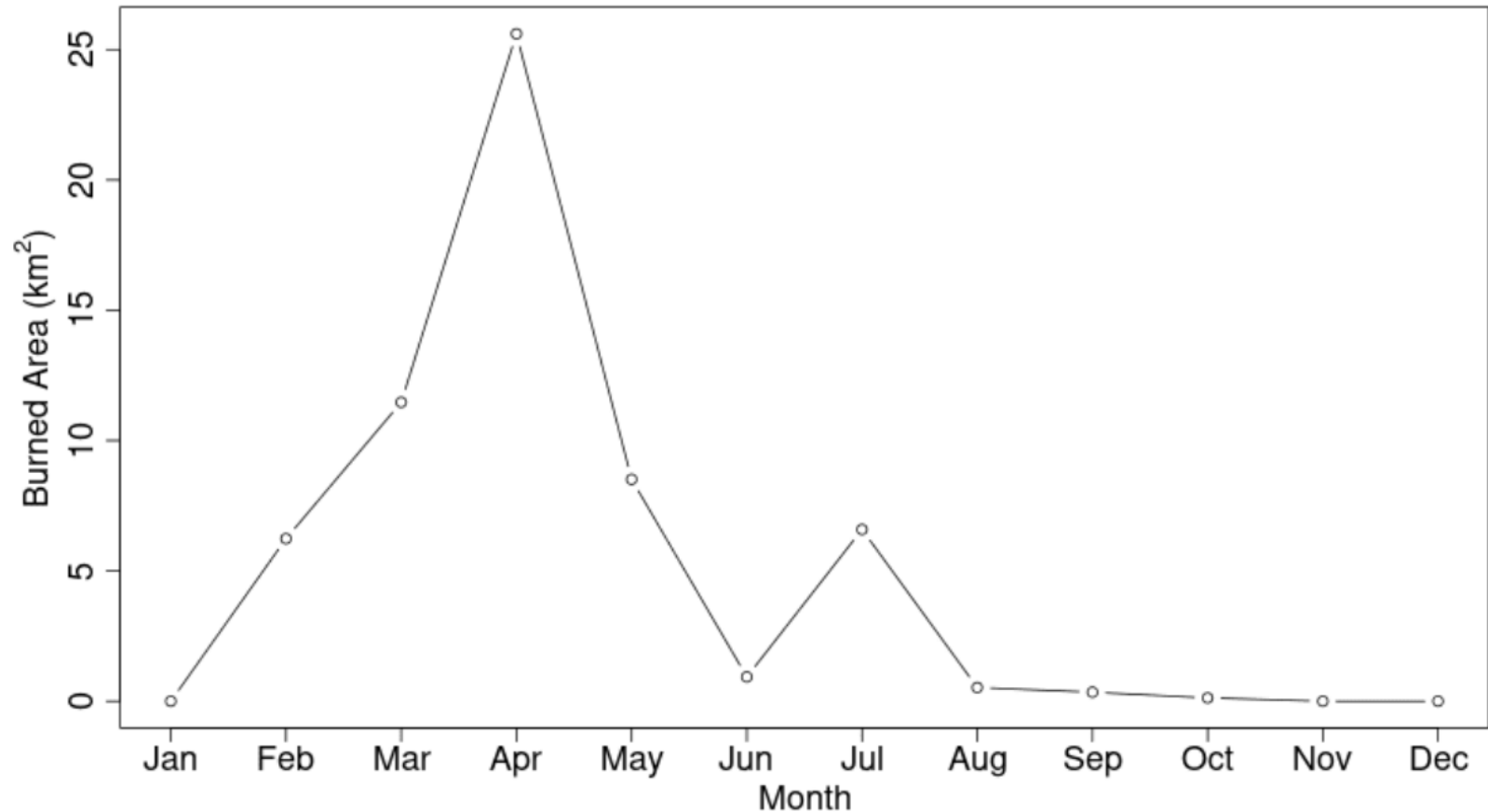
Extreme fires weather in summer (FWI >21 / Fire Danger class 4/5)

Southern England:

- 20 days per year 1981-2010
- 111 by the 2080s

Arnell et al (2021) The effect of climate change on indicators of fire danger in the UK. *Environmental Research Letters*, 16, 044027

Area burnt by month (2003-2019)



Belcher et al (2021) *UK wildfires and their climate challenges*. Expert Led Report, Third Climate Change Risk Assessment



Need more small,
prescribed fires