

Topic 20: Wildfires – Part 2



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Topic 20: Wildfires – Part 2

<https://geowiki.ucsd.edu/sio15>

HW8 online
video/Gradescope submission portal also open

test #8
topics 19,20, HW6
(see geowiki under 'tests' tab)

Cali Wildfires and Climate Change

- earlier spring/late fall
- longer dry season
- more wildfires

Santa Ana season
Sep – Feb (peaks Dec)

Peak of SoCal Fire Season:
OCTOBER

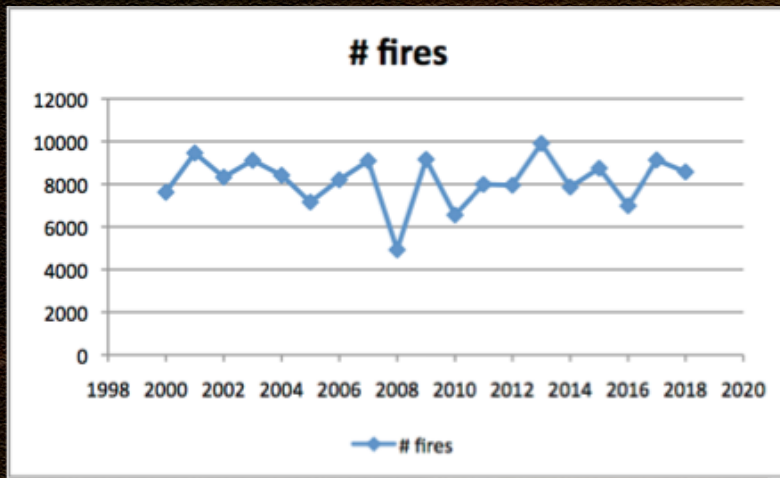


*as of today, we still wait
for that winter storm!*

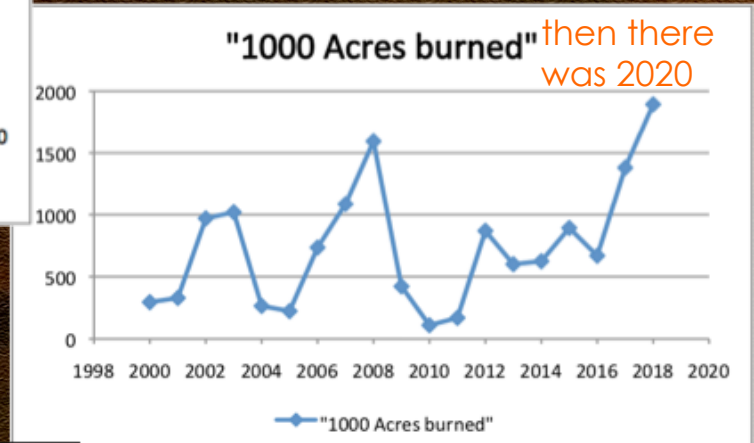
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source: Keller & Blodgett/World Watch Institute

Cali Fires since 2000



info difficult to get:
different fire agencies
CalFire/Feds have
different reporting



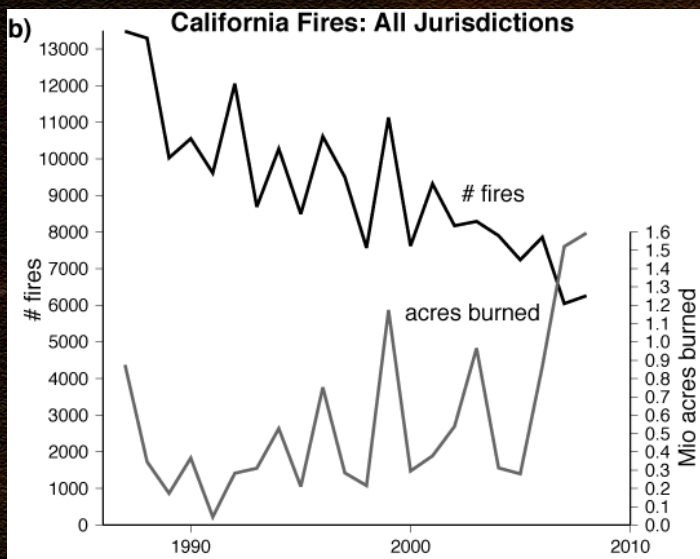
source: Wikipedia

single fires getting larger!!

- # fires steady
- but size of burned area increasing
- recent years exceptional in acreage?

2019 0.3 M
2020 4.4 M
2021 2.6 M
2022 0.4 M

Fire Suppression, Fire Fighting and the California Budget Crisis



- number of fires declining
- but size of burned area increasing

Cali (all jurisdictions):
less fires but larger!!

Fig 10.25b

- 2000, nearly 1/3 was prescribed
- prescribed fires can get out of control!!!!
- prescribed fires get more expensive!

2022 New Mexico
Apr-Aug (largest in
modern NM history)

does fire suppression increase
the risk of LARGE wildfires??

2024 Wildfires – U.S.

to date:

CA nearly 1M acres

AK 6.6M acres

(701 fires, 426 human = 61%)

> 50k acre Fires in U.S. in 2024

Name	State	Acres	Start Date	Cause
Betty's Way	NE	68,000	Feb 26	
Smokehouse Creek	TX/OK	1,055,000	Feb 26	downed powerlines
Windy Deuce	TX	143,500	Feb 26	
Catesby	OK	90,000	Feb 27	human
Falls	OR	151,500	Jul 10	human
Cow Valley	OR	133,500	Jul 11	human
Lone Rock	OR	137,000	Jul 13	undetermined
Battle Mountain Complex	OR	183,000	Jul 17	lightning
Durkee	OR	294,500	Jul 17	lightning
Swawilla	WA	53,500	Jul 17	lightning
Bighorn	WA	51,500	Jul 22	
Badlands Complex	OR	54,500	Jul 22	lightning
Crazy Creek	OR	87,000	Jul 22	lightning
Telephone	OR	54,000	Jul 22	
Hole in the Ground	OR	100,000	Jul 24	
Park	CA	430,000	Jul 24	arson
Borel	CA	59,500	Jul 24	fatal car accident
Wapiti	ID	125,500	Jul 24	lightning
Warner Peak	OR	66,000	Aug 5	
Nellie	ID	50,000	Aug 5	
Paddock	ID	187,000	Aug 5	
Flat Rock	WY	52,500	Aug 21	
House Draw	WY	174,500	Aug 21	
Remington	MT/WY	196,500	Aug 22	
Lava	ID	100,000	Sep 2	lightning
Rail Ridge	OR	163,500	Sep 2	
Bridge	CA	55,000	Sep 8	

as of 11/15/24

many some
98% contained

Source: wikipedia

still burning

as of 9/27/24

2024 Wildfires – SoCal

Source: wikipedia



from Lecture 1

quiet until September

(NorCal had burned 400k acres by then)

then 3+ at once:

9/5 Line Fire (San Bernardino), 40k acres

9/8 Bridge Fire (LA/San Bernardino), 55k acres

9/9 Airport Fire (Orange), 25k acres

--- numbers have not changed significantly

however Bridge, Line fire still "burning"

(98% contained)

NEW: 11/6 Mountain Fire some 20K acres;
during Red Flag warning ("Santa Ana winds")
as cold front passed
at the time: "*winds are so fierce that fixed-wing planes are grounded*"
now 91% contained

2024 Wildfires – SoCal

Source: wikipedia



cause:

9/5 Line Fire: arson

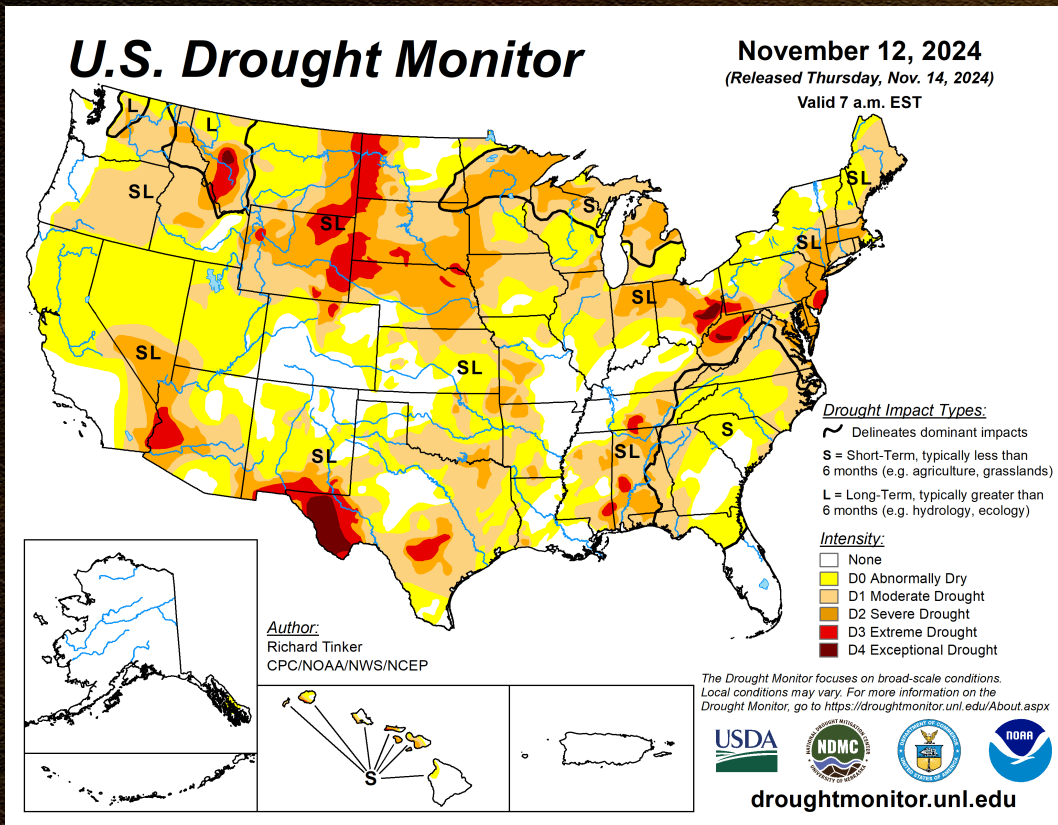
9/8 Bridge Fire: under investigation

9/9 Airport Fire: equipment sparks

11/6 Mountain: under investigation

➤ buildings destroyed
(1+81+160+243)

2024 Wildfires – U.S. - Northeast



news clip 11/1/24
NJ: 377 since 9/15
CT: 84 since 10/21
vs "normal"

NJ: 26
CT: 5

all caused by
people

"worry: cold front
moving in with
strong winds"

fire fighters learn
from western fire
fighters

The 2003 Cedar Fire – Santa Ana

I-15 could not stop this fire!



... largest wildfire in modern CA history

273,000 acres

2232 buildings

cost: > \$ 1.3 B

14 fatalities (1 firefighter)

cause: signal fire

... until Dec 2017

Largest in SD until then: 1970 Laguna Mt.

SIO15 2025: Topic 20 – Wildfires Part 2



4 Years Later: 21 Oct 2007 – Santa Ana

SoCal summary:

12 fires

1300 homes lost

7 fatalities

910,000 people evacuated (more than for 2005 Katrina!)

8,000 firefighters

400,000 acres burned (Witch Creek Fire 200,000)

cause: downed powerline

Navy initially not involved because no civil fire observer

UCSD closed
all week

May 2014

20 fires

26,000 acres 68 structures/1 fatality

cause: arson, equipment

Harris Fire



source: wikipedia

The 2003 Cedar Fire – Lessons Learned

things that needed work

- no-flight rule after dark
- different agencies communicate on different frequencies
- fire crews are 'on loan' were needed
- only 1-2 fire fighting helicopters (\$1.5 Mio or \$200k/month)
- fire fighting fee in rural areas?
- clear brush within 30 ft of buildings
- do not build into wildland/improve evacuation routes

The 2007 Witch Creek Fire – Lessons Learned

- modern roofs inadequate? (embers entering homes)
- add palm trees to 'bad' vegetation
- mass evacuation
- get military involved right away
- maintain powerlines/shut off power?



2017 Thomas Fire – Montecito/Santa Barbara

source: Wikipedia

... largest wildfire in modern CA history

282,000 acres

1063 buildings

cost: > \$ 2.2 B

2 (1 firefighter)

+ 21 fatalities*

Dec 4 – Jan 12

cause: downed powerlines

* from mudflow Jan 2018

... until Aug 2018

Peak of SoCal Fire Season:

OCTOBER

-> this fire unusually late!

2017 Tubbs Fire – Santa Rosa

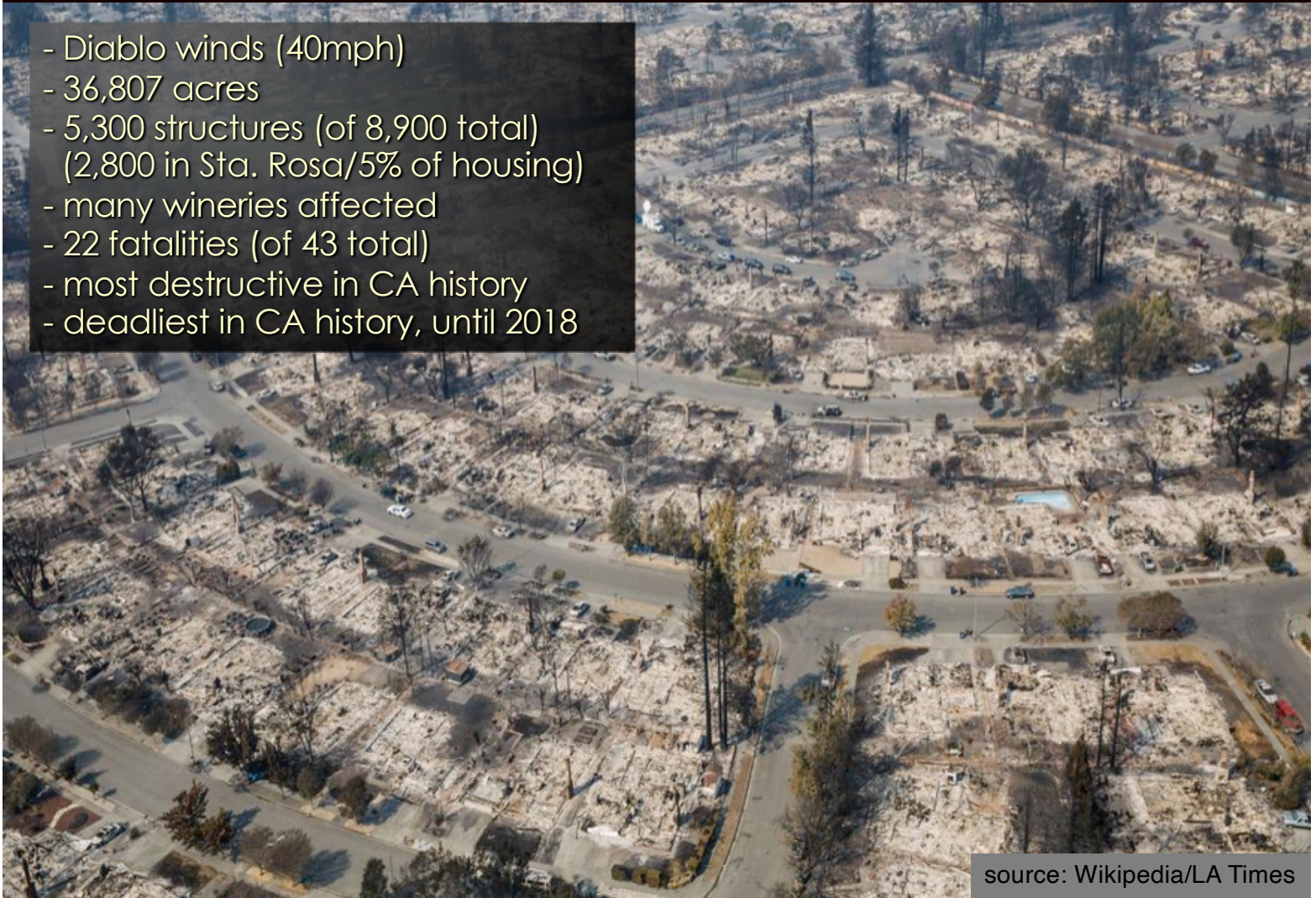
- 10/8-30; one of > 12 fires
- Napa/Sonoma/Lake County
(4th year in a row)



source: Wikipedia/LA Times

2017 Tubbs Fire – Santa Rosa

- Diablo winds (40mph)
- 36,807 acres
- 5,300 structures (of 8,900 total)
(2,800 in Sta. Rosa/5% of housing)
- many wineries affected
- 22 fatalities (of 43 total)
- most destructive in CA history
- deadliest in CA history, until 2018



source: Wikipedia/LA Times

2017 Tubbs Fire – Santa Rosa

-cause: downed powerlines/
exploding transformer

*“officials could have sent out
cell phone emergency call but
chose not to in order to not
interfere with first responders”*

*10/23/17 “power utilities delayed
mapping of powerlines
that could help prevent wildfires”*

source: Wikipedia/LA Times

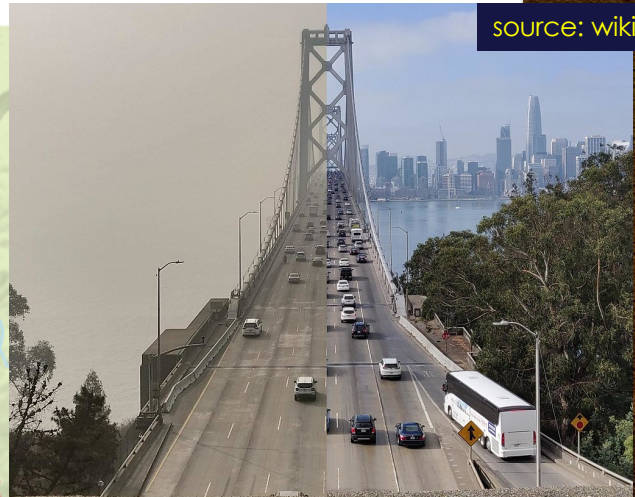
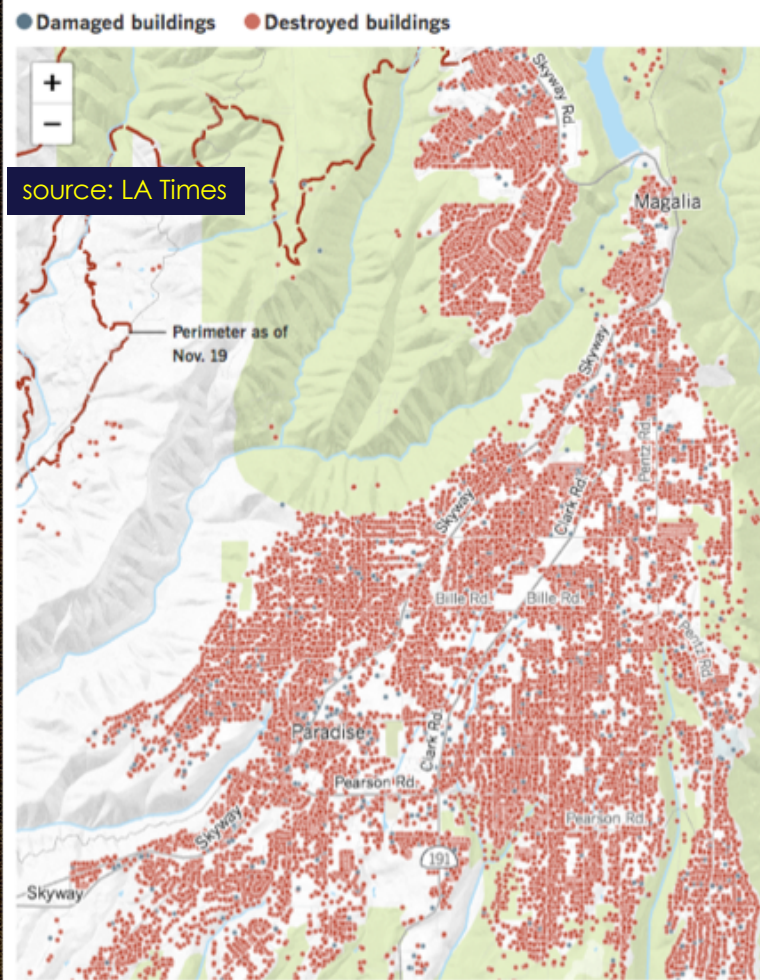
2017 Tubbs Fire – Humans and the Wildland

- ✧urban sprawl into the wildland
- ✧cookie-cutter, high-density housing
- ✧people unaware of hazard
- ✧people unprepared
- ✧no building code



source: NASA Earth Observatory

2018 NorCal Camp Fire



SF Bay Bridge 11/16

10/14

Camp Fire
11/8 – 11/25
153,336 acres
18,804 buildings
85 fatalities (Paradise)
deadliest in Cali history
cost: \$ 16.5 B
cause: power lines

Paradise – 5 Years later

11/8/23 S.D. Union Tribune

population 2018: 26,000
2023: 10,000

*some moved to Yuma, AZ
living in RV purchased with
insurance money
some on fixed income, can't rebuild*

destroyed 11,000 homes
(90% of town)
2,500 have been rebuilt

mayor:
by 2025 all powerlines underground
by 2026 all public roads repaved

*now power shut off during wind storms
home insurance dropped coverage in fire-prone areas
PG&E guilty in 84 manslaughter counts, filed for bankruptcy*

source: wikipedia

3/28/19 – first 2 building permits



2023 Maui

natural factors

drought

unusually strong trade winds

source: wikipedia

Hawaii fires (4)

Lahaina

8/8-11

17,000+ acres

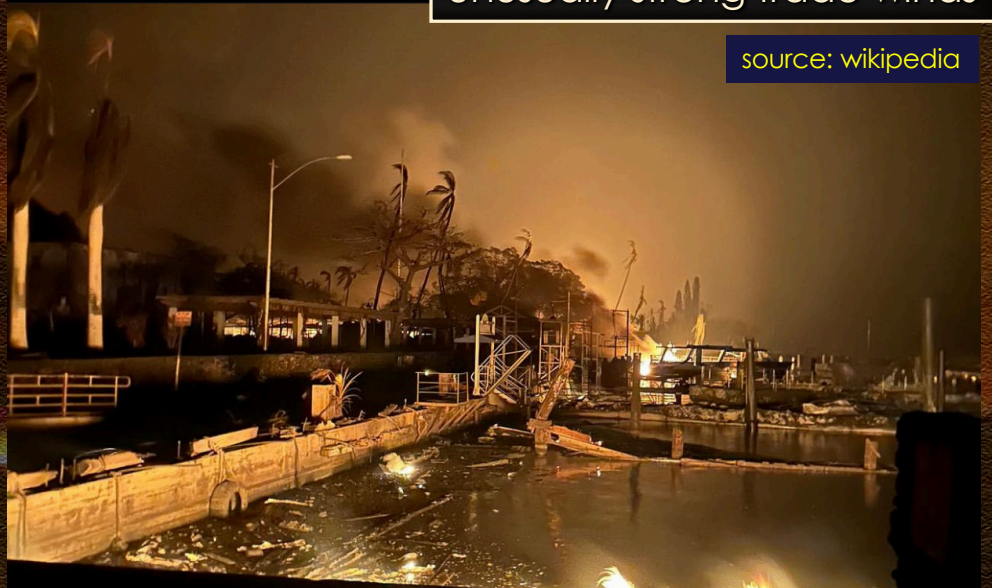
2,207 buildings

100+ fatalities

deadliest in U.S. history

cost: \$ 5.5 B

cause: power lines



source: Getty images

Lahaina timeline

started 8/8 6:37 am in hillside (downed powerlines)

9:00 am "fully contained" – reignited by 3:30 pm

pushed downhill by winds

4:46 pm crossed route 30

5:40 pm reached beach

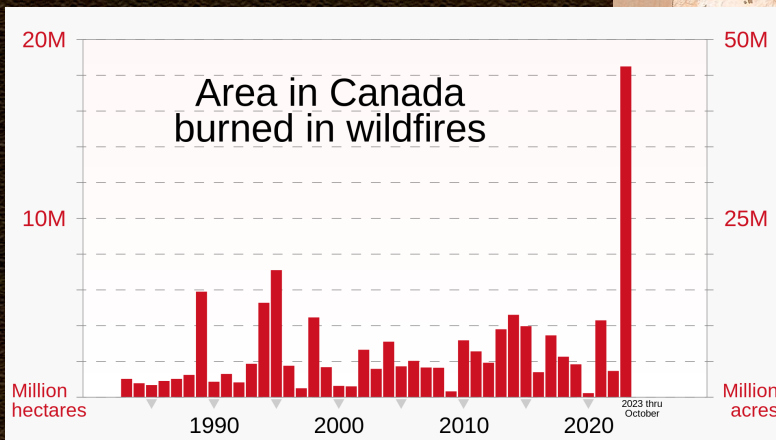
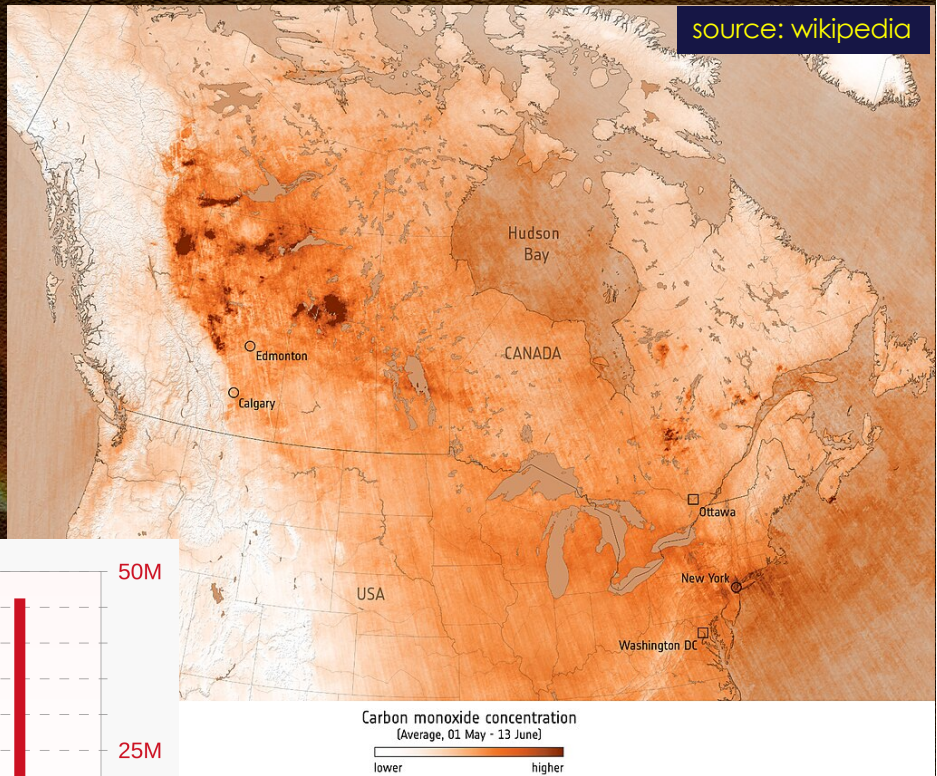
fire fighting hampered by lack of water/resources

evacuation hampered by lack of warning/coordination

traffic jams/no sirens

2023 Canada

March - ongoing
all 13 provinces/territories
record-breaking
(1989, 1995, 2014, 2020)
6 fatalities
~ 46M acres/6,551 fires
> 6 times long-term average
as of 10/6: 772 burning
346 out of control
cause: 50% lightning



June smoke:
eastern U.S.
Europe

2017/18 Wildfires: Northern Europe

8/3 Greenland

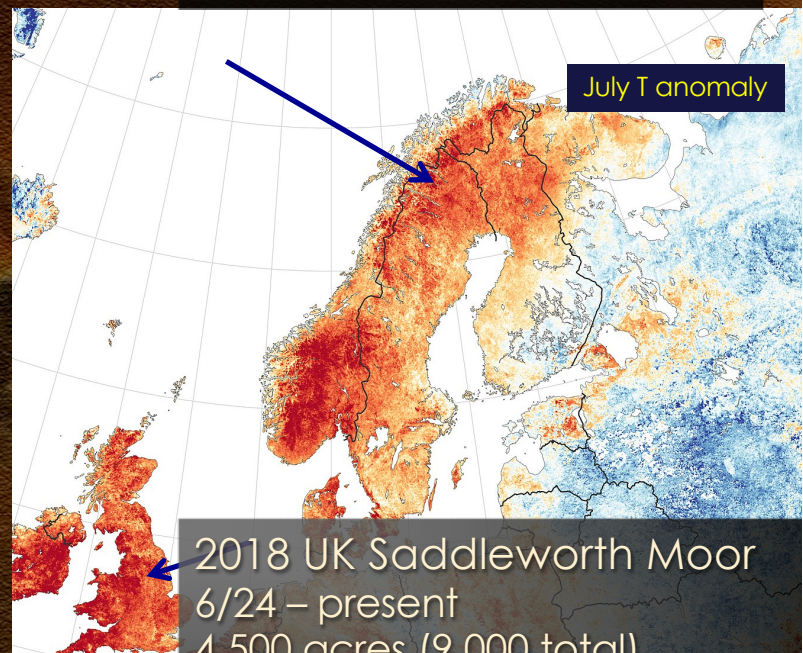
- unprecedented
- (underground) peat fire
- extremely hard to extinguish
- due to global warming?

source: Wikipedia



2018 Sweden

50 fires (May – Aug)
62,000 acres
cause: lightning/BBQ
factor: heat wave/drought



2018 UK Saddleworth Moor
6/24 – present
4,500 acres (9,000 total)
cause: arson
factor: heat wave/drought

2019 Wildfires: Amazon Rainforest

source: Wikipedia

Bolivia 1/8 area of Brazil
but same acreage
burns!

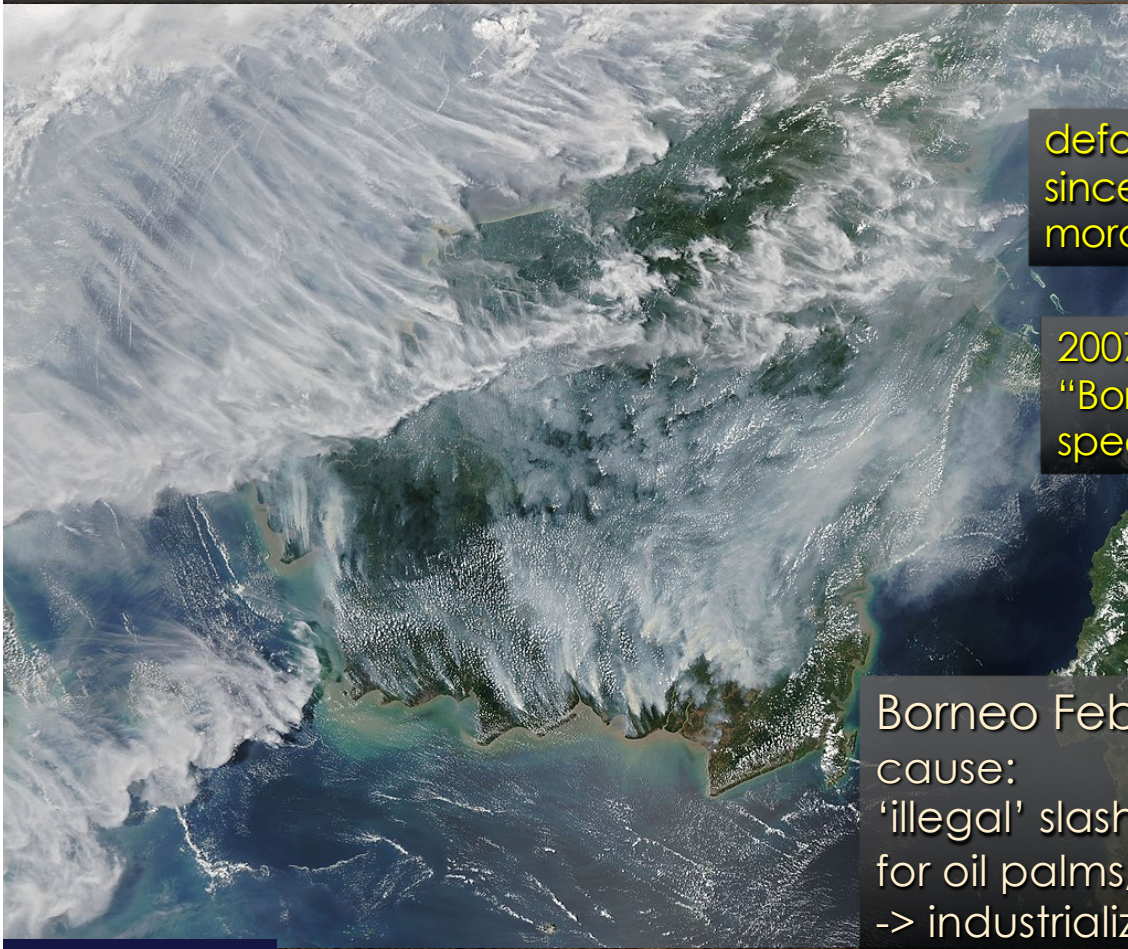
Jan – Nov ...

2,240,000 acres

- ✧ cause: slash-and-burn
in unusually dry season
- ✧ Brazil slow to accept
international help
- ✧ Bolivia

deforestation:
increases CO₂
reduces O₂
displaces indigenous people

2019 Wildfires: Indonesian Rainforest



deforestation increasing
since 2010 despite 2011
moratorium

2007 WWF:
"Borneo has unique
species"

Borneo Feb – Nov ...
cause:
'illegal' slash-and-burn
for oil palms/timber/paper pulp
-> industrialized nations

source: Wikipedia

2019 Wildfires: Indonesian Rainforest

[link to YaleE360](#)

Malaysia

Borneo (Kalimantan)

source: yaleE360
global forest watch



Indonesia
deforestation:
world's 3rd-worst
contributor to CO₂
after China, US

Sumatra lost 1/3 of its forest
between 1990 and 2010

Sumatra and Kalimantan
forests sit on peat
-> more CO₂ released

2019 Wildfires: Indonesian Rainforest

tropical rainforests have most biodiversity on Earth

source: Wikipedia

Burning rainforest

- ✧ extinction of unique species
- ✧ displacement of indigenous people -> conflicts

orangutans live only in Borneo and Sumatra



Oil Palm nursery - source: Greenpeace



Borneo orangutan critically endangered

2019 Wildfires: Indonesian Rainforest

tropical rainforests have most biodiversity on Earth

source: Wikipedia

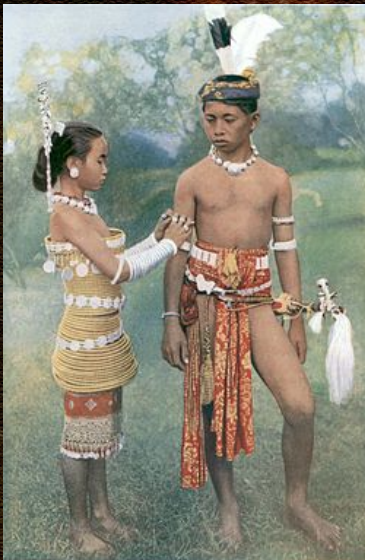
displacement of indigenous people -> conflicts

fight in 2001 claimed 1000s of lives

Dayak

vs

Madurese migrants



2019 Wildfires: Indonesian Rainforest

Kuala Lumpur, Malaysia



source: Wikipedia

Countries affected:
Malaysia
Singapore
Brunei
Philippines

Countries also burning:
Thailand (for rubber trees)
Vietnam
Malaysia

2019 Wildfires: Indonesian Rainforest – A way out

- ✧ reduce global demand for forest commodities
- ✧ produce bio diesel in a different way
- ✧ recycle more
- ✧ stronger global investment in conservation (Norway had pledged \$1 B in 2011)*
- ✧ more support from industrialized nations
- ✧ stronger, legally binding language in moratorium
- ✧ stronger enforcement ?
- ✧ better education; better job opportunities

but

* Indonesia's 2015 income:
\$1.8 B pulp export
\$15 B palm oil
\$12.9 B coal export