

How will the impact of wildland fires on environment ?

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Examples of direct and indirect impacts



Increase of temperature

↓
↓
Reduction of snow and ice cover
Accelerated atmosphere

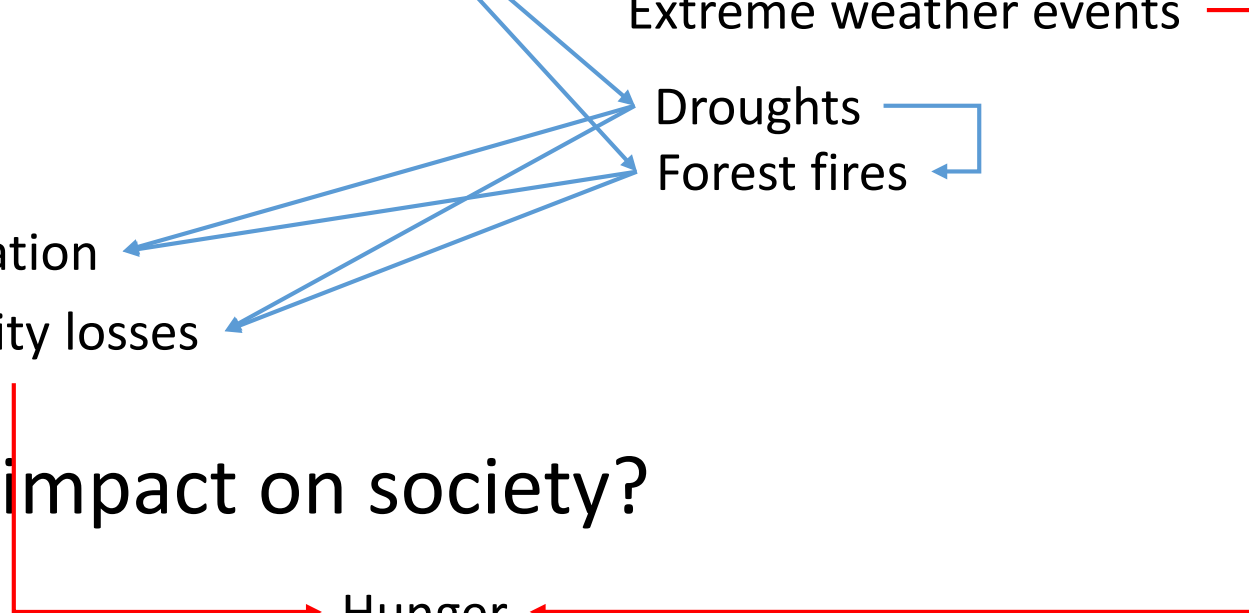
Extreme weather events

Droughts
Forest fires

Desertification
Biodiversity losses

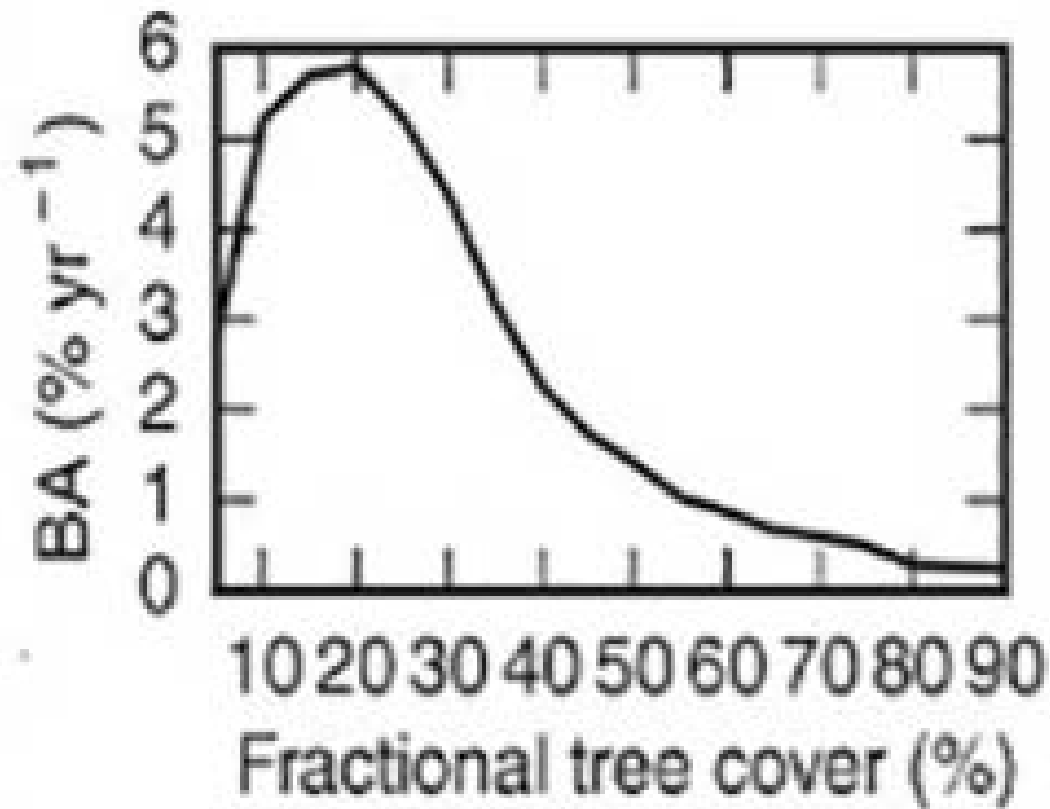
How do they impact on society?

Hunger



Wildfires - facts

- almost ALL ecosystems are affected
- 3 main types of forest fires
- \searrow tree cover \nearrow burnt area



Wildland Fire Types



Ground

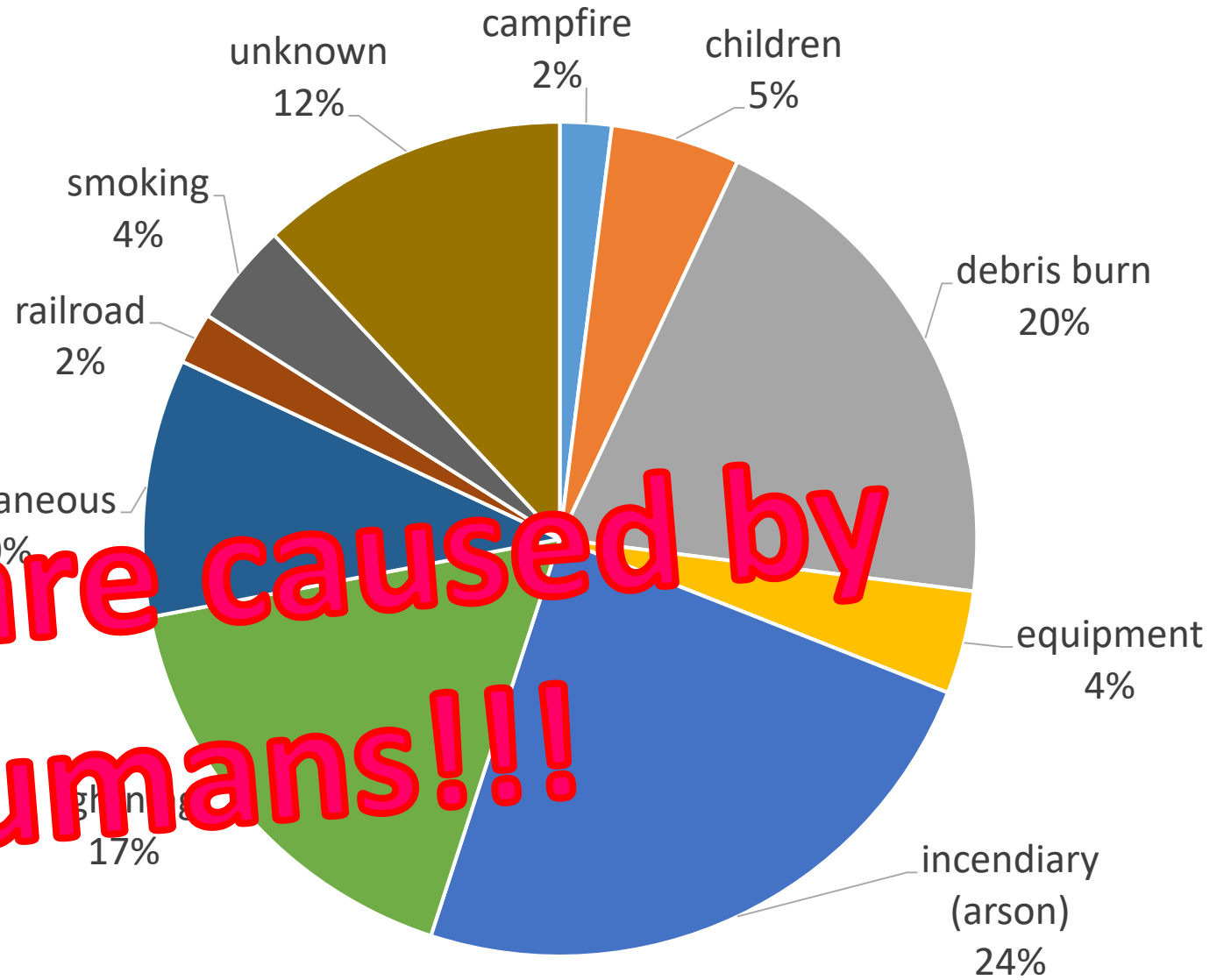


Surface



Crown

Wildfires - causes



~70% are caused by humans!!!

Wildfires - facts

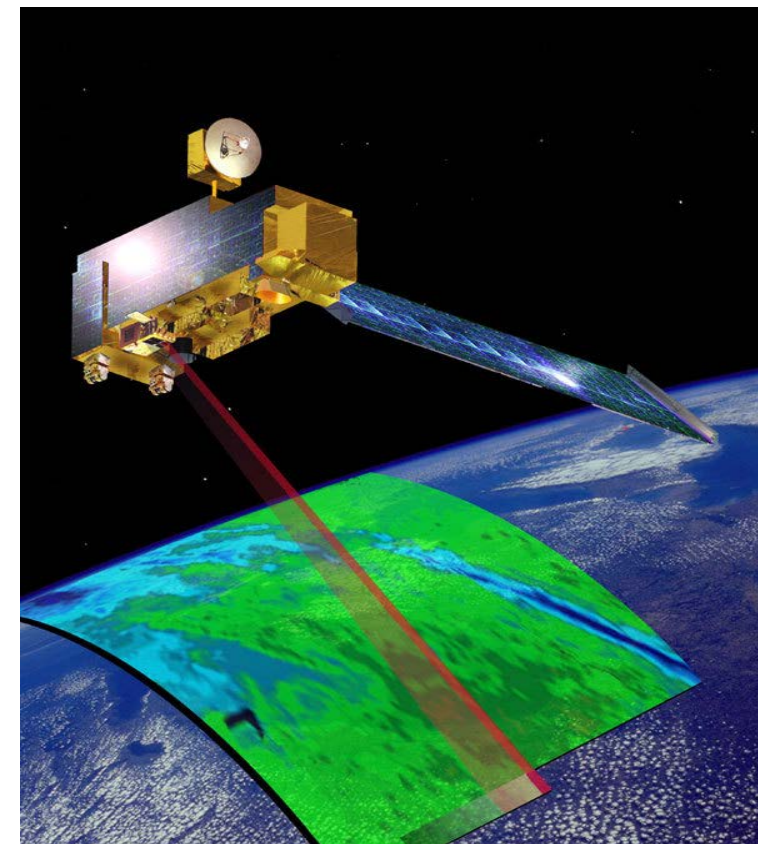
- number of forest fires increases all over the world
- at the same time burnt areas decreases (e.g. in the United States the area burned has declined by more than 90% since 1930, in Sweden the area burned annually fell from about 12,000 hectares in 1876 to about 400 hectares in 1989)
 - Faster detection
 - Better extinction

**Let's check regional trends
and spatial distribution!!!**

MODIS

Moderate Resolution Imaging Spectroradiometer

- MODIS satellites are viewing the entire Earth's surface every 1 to 2 days
- acquiring data in 36 spectral bands ranging in wavelength from 0.4 μm to 14.4 μm
- varying spatial resolutions (2 bands at 250 m, 5 bands at 500 m and 29 bands at 1 km)
- operating from 1999 (global products available from spring 2000)

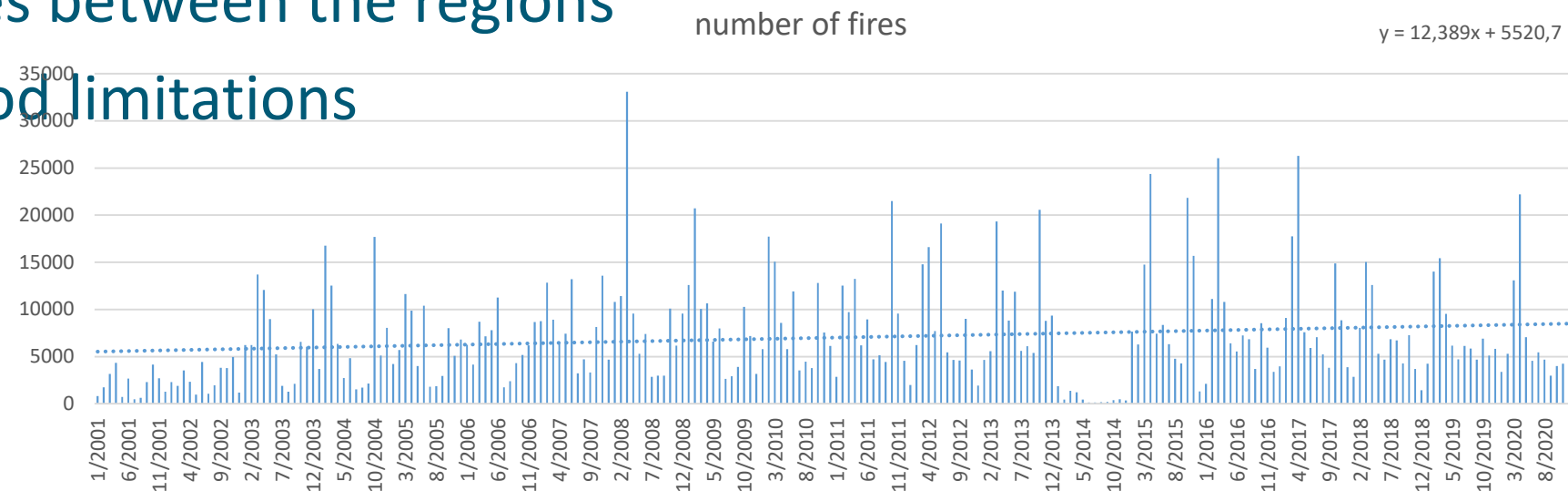


We will use:

- MODIS Thermal Anomalies/Fire (MOD14)

Analysis of the wildfire regime trends

1. Open .xlxs file in excel for your region
2. Draw a graph of number of fires per month and add trend line
3. Analyse regime of fires:
 1. The month of maximum and minimum number of fires
 2. Monthly mean of number of fires
 3. The length of fire season with number of fire higher than the mean
 4. Find the trend
4. Discuss differences between the regions
5. Discuss the method limitations



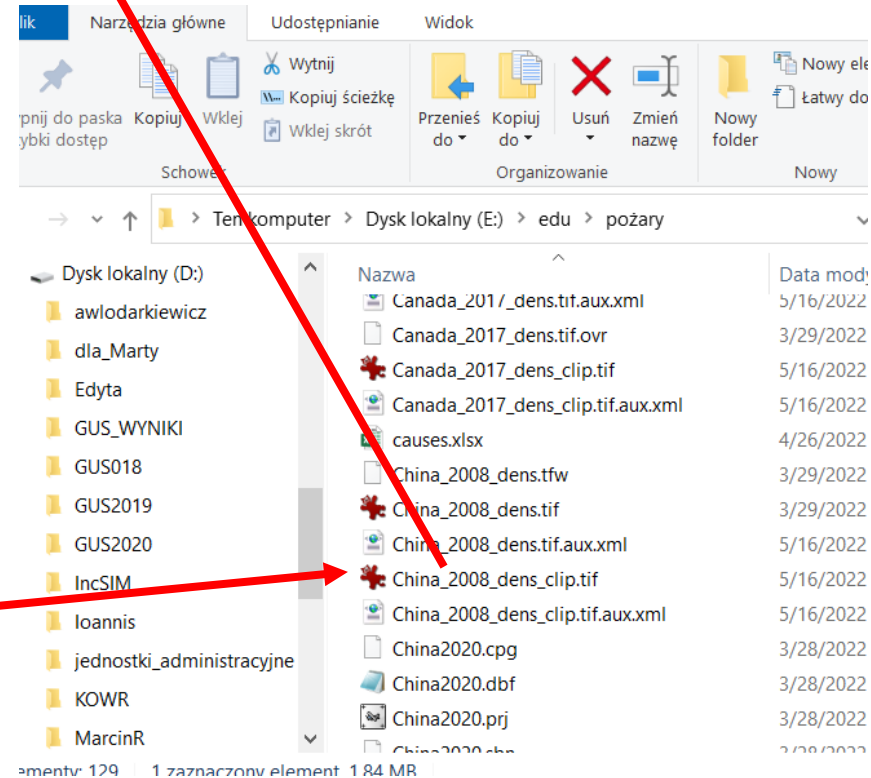
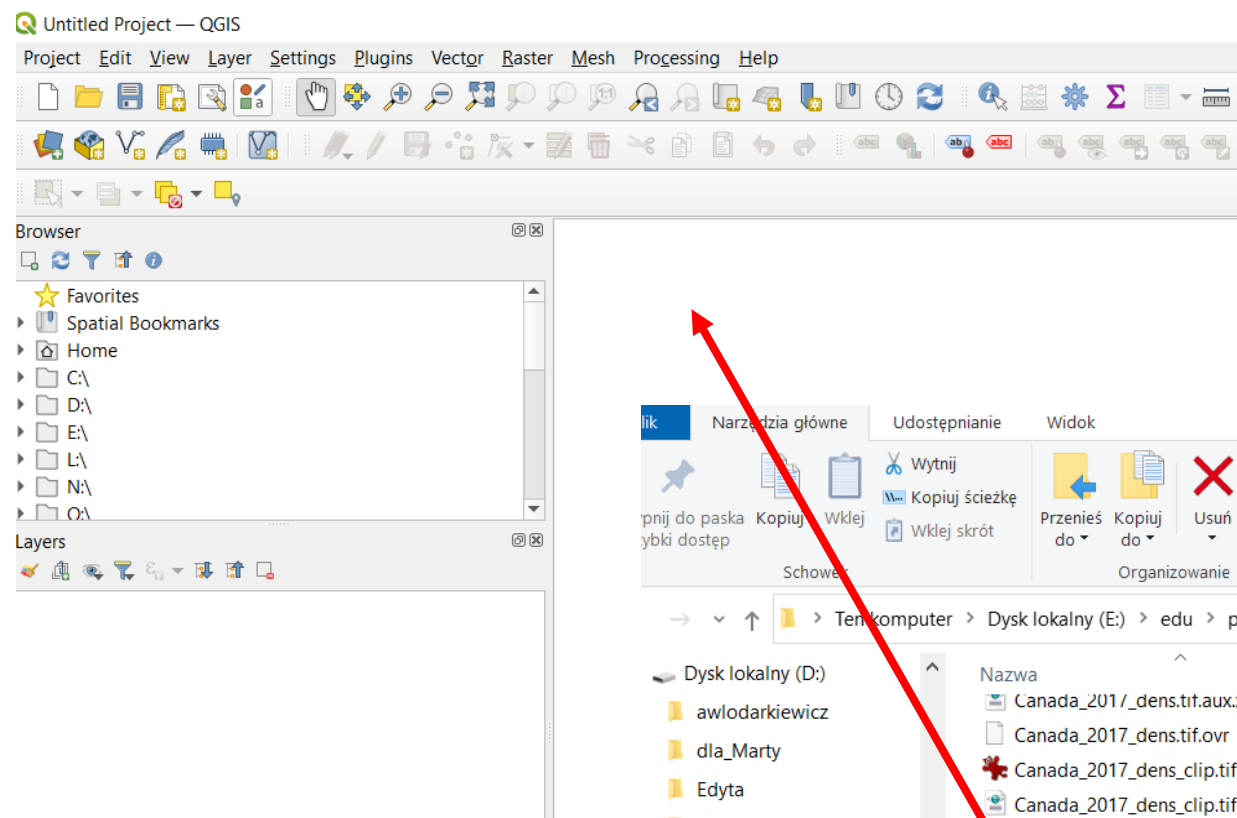
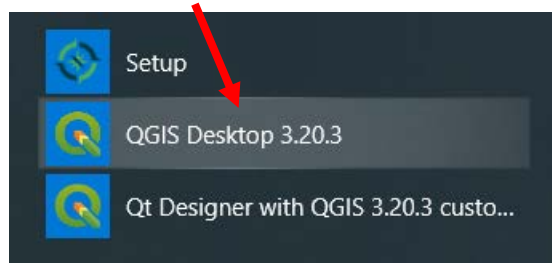
Discussion and conclusions

- Individual groups present their conclusions regarding the changes in wildland fires in the region in the period 2001 – 2021.
- If there are regional trends of changes? If yes, if they are similar for all regions?

Spatial distribution of the wildfire in regions

Opening software and data

1. Open QGIS



2. Drag an image „region_year_dens_clip.tif”



Layers

China 2008 dens clip

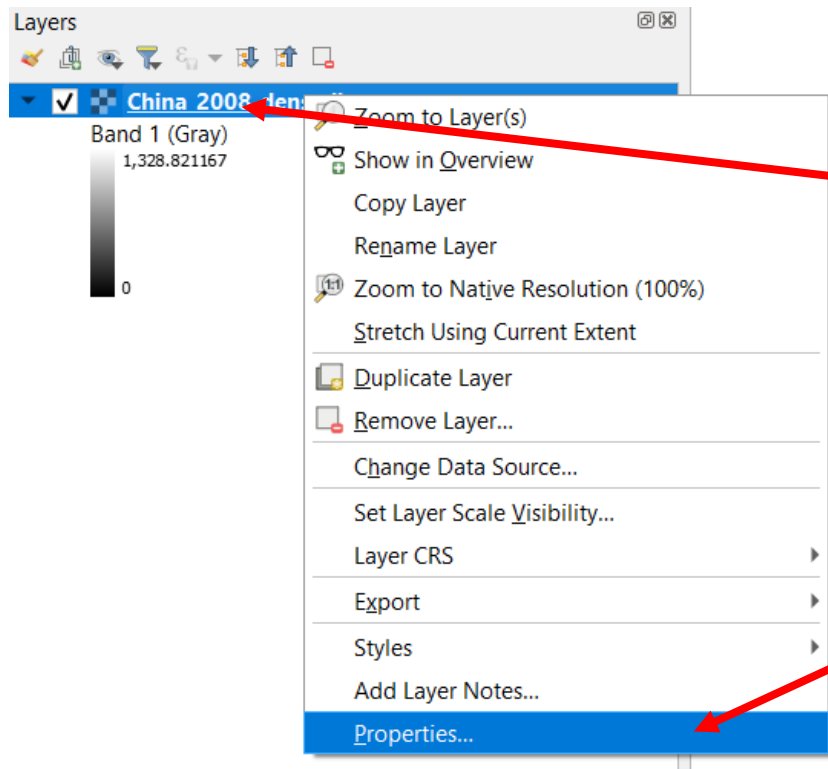
Band 1 (Gray)

1,328.821167

0

3. read maximum density



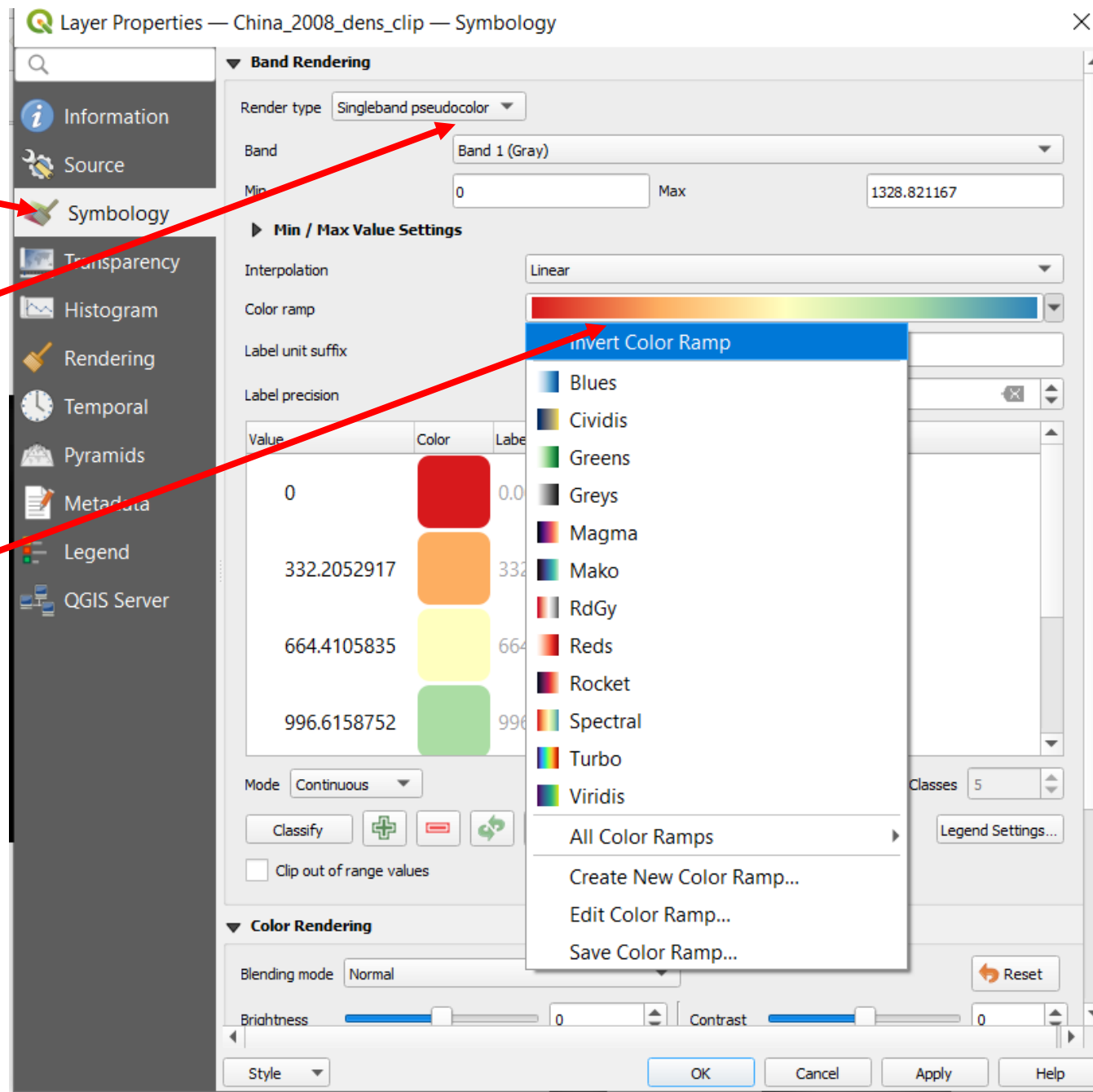


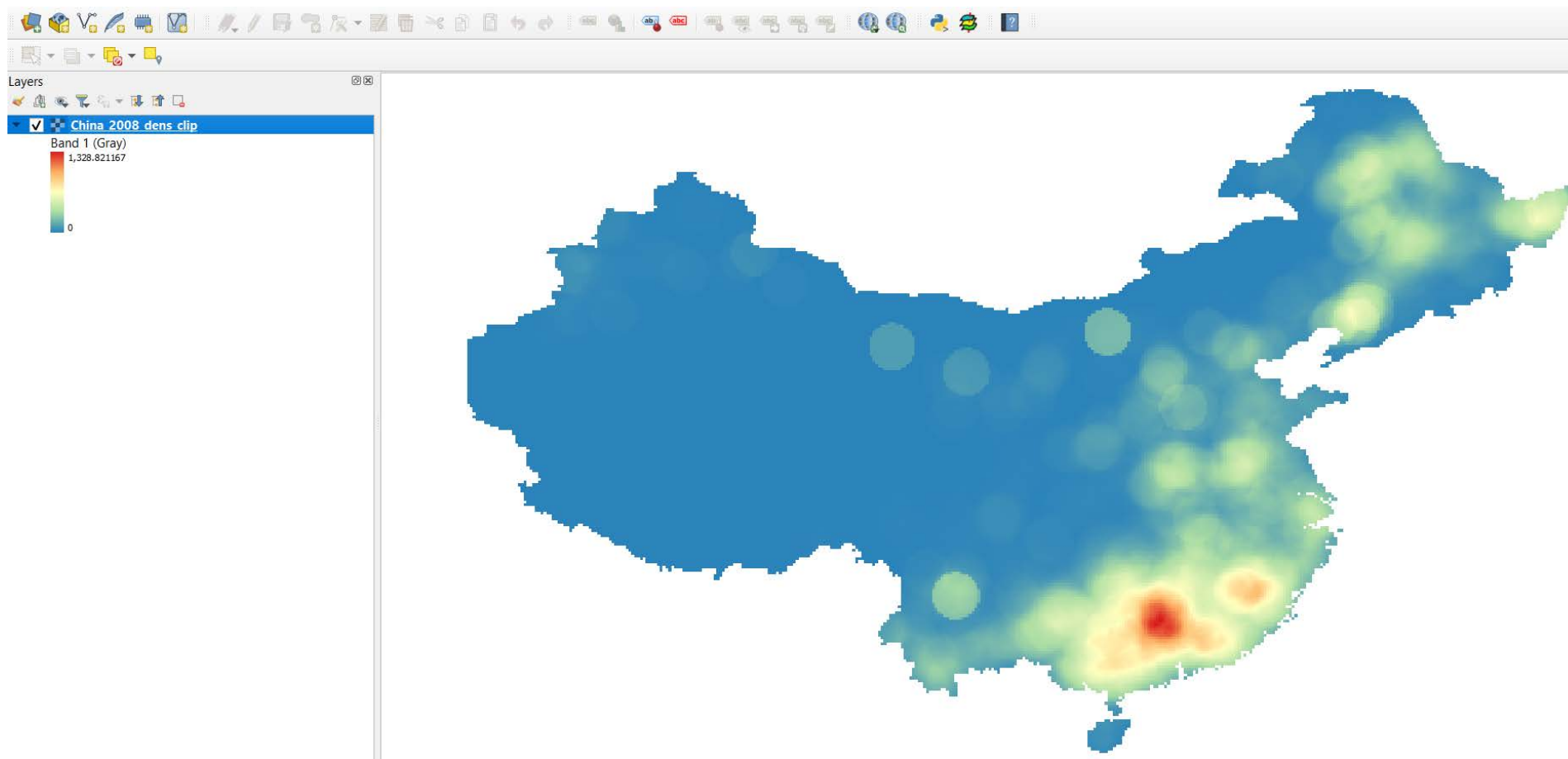
4. Click right button of mouse and open properties

5. Select symbology

6. Select Singleband pseudocolor

7. Click right button and Select Invert Color Ramp

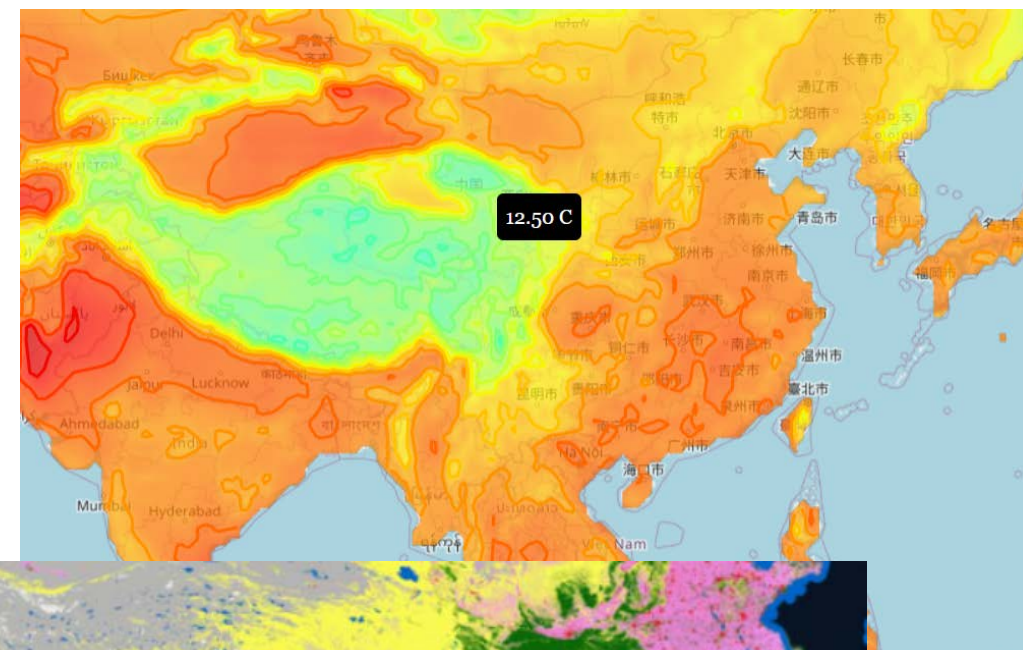




Let's check what climatic factors influence on fire density in the region

Open website where you can find climate maps <https://climatemaps.romgens.com/>

Check if there is direct relations between climate and fires



What is burned?

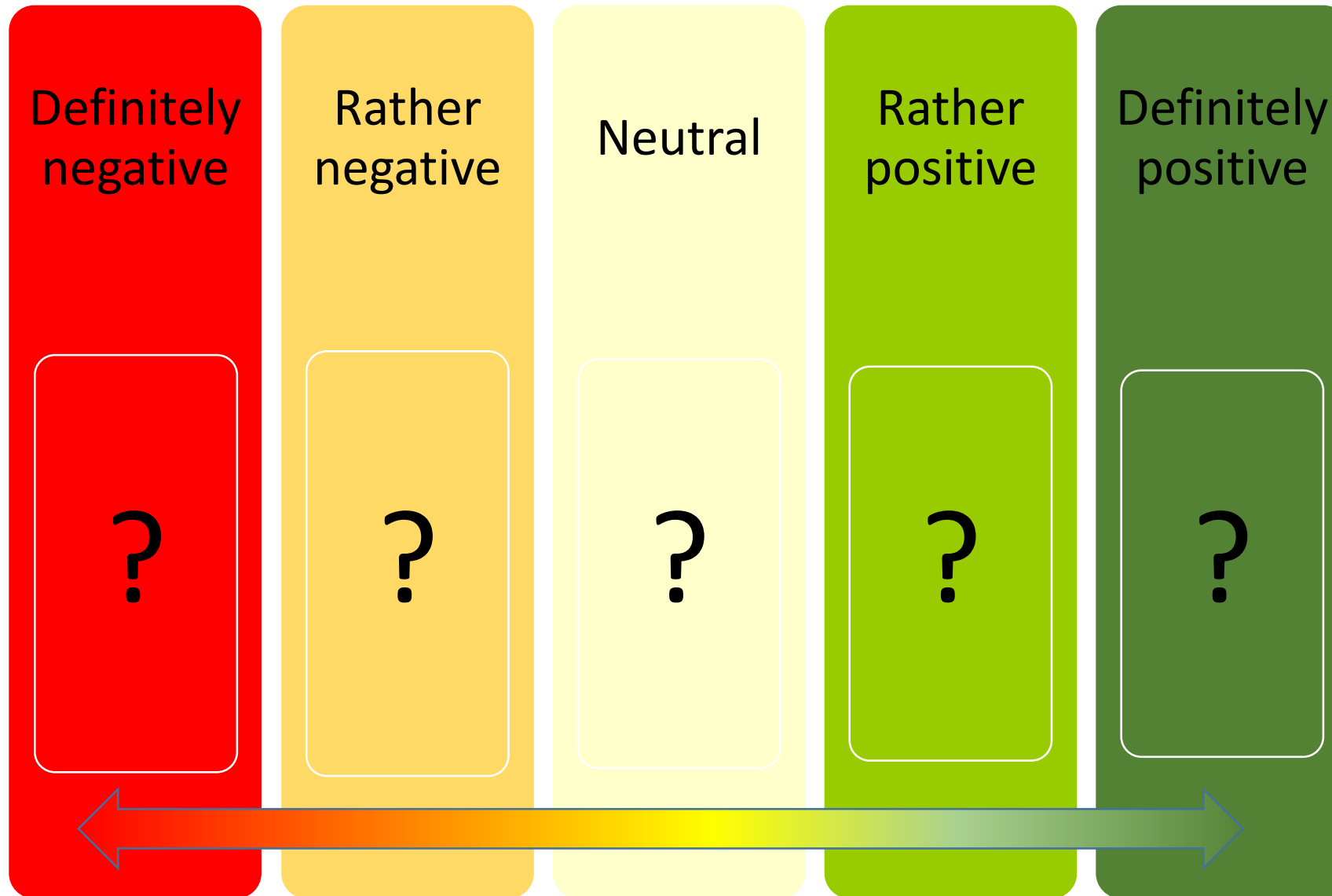
<https://esa-worldcover.org/en>



Discussion and conclusions

- What is a spatial distribution of wildland fires in their regions?
- They will discuss if there were relation between climate and wildland fires within areas
- How the climate change will influence on wildland fires distribution?

What is an impact of wildfires?



Wildfires – environmental impact

Wildfire is a part of nature!!!

The problem is the increased frequency and severity of fires!!!

- Fire plays an essential role in ecosystems both positive and negative
- Diverse ecosystems are fire-dependent or fire-adapted.
 - fire-dependent ecosystems need wildfire to maintain appropriate function and health
 - fire-adapted ecosystems have evolved to survive wildfire.

Wildfires – environmental impact

- **Low-severity fires can:**

- promote biological diversity
- remove alien/invasive species from sites and heal ecosystems
- reduce build-up of organic debris
- release nutrients into the soil
- trigger changes in vegetation community composition
- maintain savannahs, heathlands
- create mosaic habitats in temperate and boreal systems

Fire dependent species



Vine maple



Black-backed woodpecker

Wildfires – environmental impact

- **High-severity fires can:**

- damage to flora and fauna, which could be of high ecological value
- increase soil erosion due to loss of vegetation and destruction of soil structure
- pollute water of lakes, wetlands, reservoirs, rivers with ashes, which may have significant effects on the chemistry: higher nitrate and organic carbon content
- release carbon dioxide—a key greenhouse gas—into the atmosphere, about 23% of global fossil fuel CO₂ emissions



Wildfires – economic impact

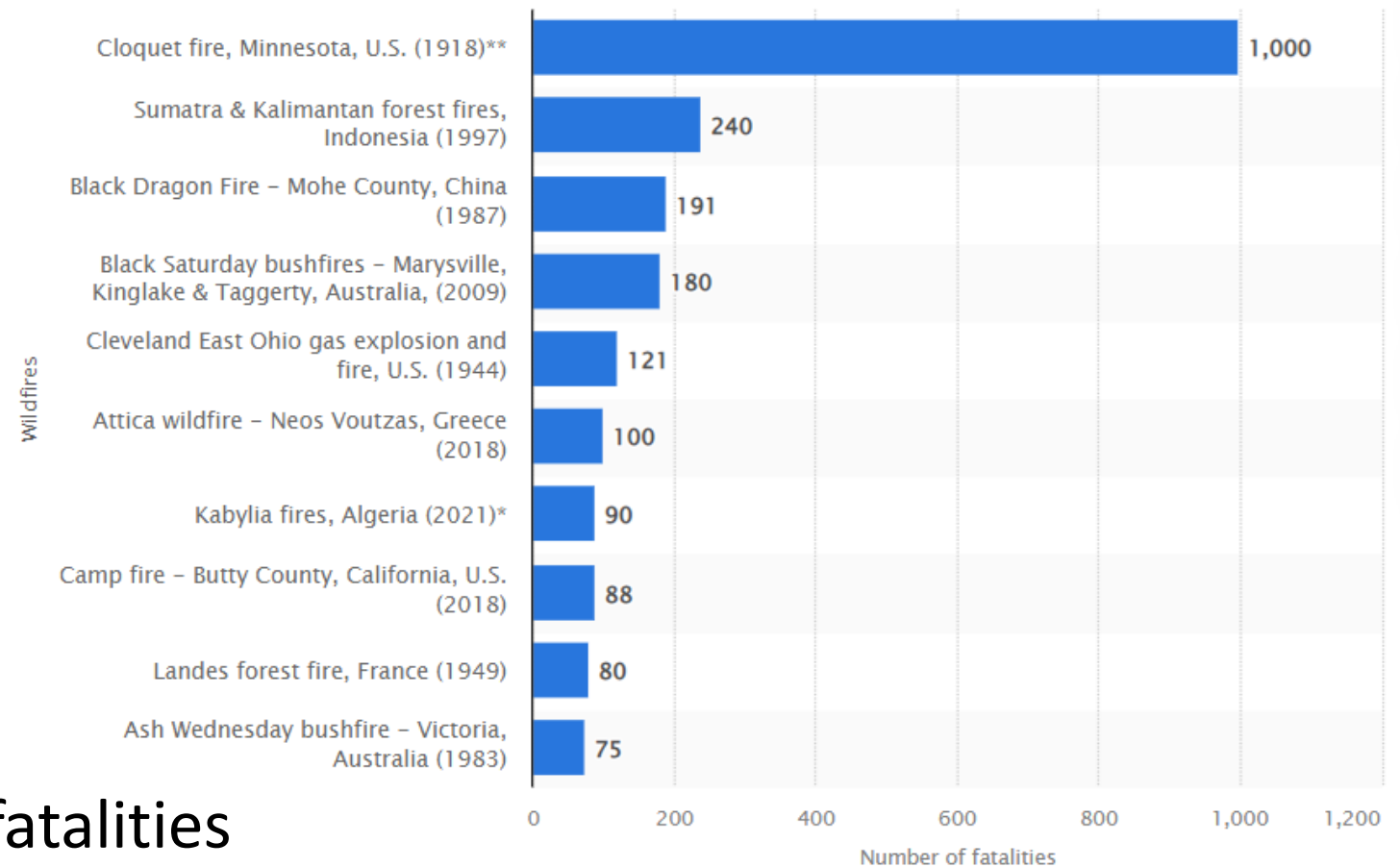
- Fires come at a huge financial cost, for example:
 - the total annual cost of 2005 bushfires in Australia was estimated at \$12 billion, an amount equivalent to 1.3% of Australia’s Gross Domestic Production
 - in California, another region struggling with worsening forest fires estimates the 2017 and 2018 wildfire seasons together cost over \$40 billion
- Damage of infrastructure, land, timber, crops, etc.
 - in Sweden damages caused by wildfires have doubled since the latest survey in 2014. In total, 165 000 tones of grain were destroyed by wildfires in 2020, compared with 88 000 tones in 2014.
 - cost of the worst wildfire season in Florida (1998) (tab. 1)

Table 1: Wildfire Cost Estimates from Florida Study (in millions)¹

Cost Type	Total Estimated Cost	Cost Per Acre	Percent Total
Timber	\$605	\$1,212	69%
Fire Suppression	\$100	\$200	11%
Disaster Relief	\$25	\$50	3%
Property Losses	\$12	\$24	1%
Tourism	\$138	\$276	16%
TOTAL	\$880		

Wildfires - social impacts

- Direct and indirect threats to human health and life
 - globally fire emissions are responsible for 5-8% of the 3.3 million premature deaths each year from poor air quality and the contamination of drinking water in affected watershed from ash runoff.



Discussion and conclusions

- What fire-dependent species/ecosystems are present in which regions?
- In what consists this dependency?