



Living with the Fire in California – Past, Present and Future

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Scan me!

Introduction:

- Regular fires are important and normal for Californian ecosystems
- Fire return intervals (FRI) differ between fire regime types (e.g. based on vegetation types) → mean FRI ranged from 5 to 190 years
- Lowest FRIs: Productive drier forests, e.g. yellow pine, mixed conifer, oak woodland
- Highest FIRs: Less productive woodlands, e.g. pinyon-juniper, subalpine forest, desert mixed shrub, productive moist forests [1]
- Humans always had had an impact on fire ignitions

Wildfires before Euro-American settlement

Mediterranean climate:

- Long dry summers
- Mild wet winters
- Vegetation dry-out begins at late spring → peak in late summer/early fall [3]

Fire weather types:

- Climate internal and regional variability leading to higher fire risks due to hotter and drier conditions
- Santa Ana / Diablo winds
- Thermal low pressure systems
- Meridional ridge-southwest
- High pressure
- Convective / Atmospheric instability [5]

Frequent and relatively non-destructive fires leading to open forests [2]



Figure 1: Schematic drawing of wildfire conditions before 1850 (own presentation).

Offshore-wind-season:

- Starting in fall with second peak in spring
- Santa Ana / Diablo winds (Southern and Northern California)
- Hot, dry, down sloping winds with high speeds
- Rapid spreading of sparks and ashes [3]

Summer vs fall wildfires:

- More ignitions in summer
- Fewer, but larger wildfires in fall [4]

Indigenous burning practices:

- Burning to maintain meadows, raise water tables and initiate fresh plant growth [2]

Wildfires and climate change

Rising temperatures:

- Heat waves in summer [2]
- Higher spring and summer temperatures
- Increase drying of vegetation → inclined fuel aridity and flammability [6]

Larger vapor pressure deficit (VPD):

- Difference between water vapor pressure deficit at saturation and the actual water vapor pressure of near-surface air
- Globally increasing since the 1990s
- Increased evapotranspiration [2]

Miscellaneous:

- Changes in fire weather types, mostly towards increasing frequency [5]
- Increasing weather variability [2]

Fire regimes increased in area, severity and frequency



Figure 2: Schematic drawing of wildfire conditions today (own presentation).

Changes in precipitation patterns:

- General decline
- Shifting of precipitation seasonality + rising fraction of the annual precipitation [3]
- Alternation between particularly dry and wet winters [7]
- Low spring snowpack [6]

Human influence:

- Extreme fire exclusion practices between 1850 and 1980 → changes in species composition and plant age structure [2]
- 1/3 of California's homes are located in the WUI, constructed out of flammable materials [8]

Shifting of seasons: longer summers

Adaptation strategies for the future

Forest management:

- Thinning, mastication and prescribed burning
- Decrease surface load and fuel lowering fire intensity, heightening canopy base [9, 10]

Early warning systems:

- Prevention, protection, mitigation, response
- Red Flag Warnings → Fire Weather Watch, Evacuation Notices, Extreme Wildfire Behavior Alerts [11]
- ALERTCalifornia: Monitoring via >1000 cameras, live feed, remote sensing, wildfire and terrain modelling [12]
- AI to improve warning systems [13]

Conclusion:

Wildfires have always been a part of the Californian landscape. Especially with climate change, adaptation is necessary and feasible to make it possible to live with the fire.

Climate Change Mitigation needed

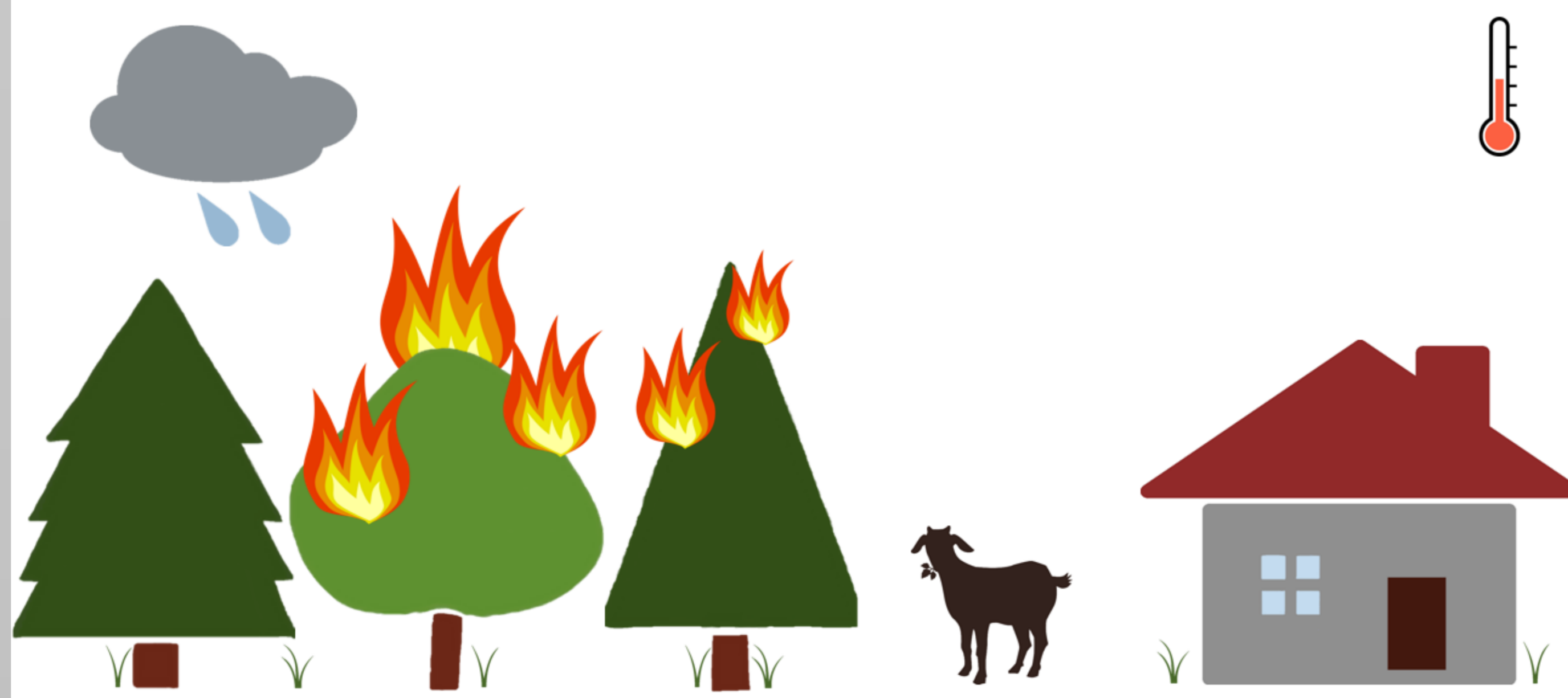


Figure 3: Schematic drawing of wildfire conditions in the future (own presentation).

Building adaptation:

- Handbook Wildland Urban Interface (WUI) products
- WUI Fire Safety Building Standards [14]
- Non-flammable or fire resistant materials like aluminum and coatings [15]
- Classification with building vulnerability index to support decision making

WUI management:

- Wildland urban interface
- Fuel breaks, grazing [16]
- Reduction of woody and herbaceous biomass, limit fire spread
- Increase distance between flammable vegetation and settlements

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