Is there a bad/good fire?

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Fire in European ecosystems

Lightning-ignited fires

Human-ignited fires

Boreal Europe

Temperate Europe

Mediterranean Europe
More forest and shrubland, decrease in use and management

Increase in connectivity, decrease in pyrodiversity

Fuel accumulation

More frequent and more severe extreme fire weather events
Fire regime shift: 1960s-1970s

Biomass (fuel) trends

Fuel hazard trends
Fire regime shift: 1990s

~66% decrease in burned area due to fire exclusion policies

Turco et al. (2016), PlosOne
Fire regime shift: 1990s

Increased burned area in Autumn to Spring

Turco et al. (2016), PlosOne
Wildfires in Europe

Mean annual burned area: 324,500 hectares

2017 burned area (so far): 801,700 hectares
Fire use in a changing landscape, under a changing climate
Increasingly larger and severe fires

Extreme weather conditions overwhelm fire suppression resources

- 2016 large wildfires
- Past wildfires >2500 ha
Increasingly larger and severe fires

Mega-fires (> 5000 ha)
Extreme and potentially catastrophic fire behaviour

- Plume-driven fire
- Vorticity
- Profuse spotting
- Fire-induced lightning
- Downburst and very fast rate of spread
2071-2100 fire danger forecasts

Moriondo et al. (2006), Climate Research 31: 85-95

- Increased mean fire danger
- Longer fire season
- Increased maximum daily fire danger
- More days with extreme fire danger
- More episodes of persistent (>7 days) extreme fire danger
Values threatened by ‘bad fires’

Wildland-urban interfaces

Rural communities safety and livelihoods

Commercial forestry
Mediterranean ecosystems: adapted and resilient to fire

Strategies: individual (resistance - thick bark, self-thinning; vegetative response – sprouting) versus population (seeding)
Mediterranean ecosystems: Adapted and resilient to fire, but not necessarily to all fire regimes.

E.g. mountain pines, adapted to low severity, frequent fires.
“Good fire” in hazard reduction: large fires are impacted by previous fires

• Wildfire spread constrained by pastoral burning
• Highly variable burn severity
• Unburnt islands and low/moderate severity associated to recent fires
Prescribed burning ("good fire") in hazard reduction


Experimental evidence, *Pinus pinaster* stand in NE Portugal

<table>
<thead>
<tr>
<th>Untreated</th>
<th>13 yrs. after treatment</th>
<th>3 yrs. after treatment</th>
<th>2 yrs. after treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown fire</td>
<td>Fireline intensity = 2000 –11000 kW m(^{-1})</td>
<td>Surface fire</td>
<td>Fireline intensity = 200–1000 kW m(^{-1})</td>
</tr>
<tr>
<td>Tree mortality = 100%</td>
<td>Tree mortality = 41-55%</td>
<td>Tree mortality = 41-55%</td>
<td>Tree mortality = 41-55%</td>
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</tbody>
</table>
Prescribed burning (“good fire”) in hazard reduction

Riserva Tirone Alto Vesuvio, Italy, 18 July 2017
Prescribed burnt vs. untreated *Pinus pinaster* stand

Battipaglia et al. (2017), Forest@
Prescribed burning ("good fire") in habitat management and nature conservation

Scotland

Sweden

- Leave >15% of original volume before burning. Count as area x 1.5
- Leave >30% of original volume before burning. Count as area x 2
- Leave >50% and set aside from production after burning. Count area as x 3.
Prescribed burning ("good fire") in habitat management and nature conservation
Thank you!