

Écouter le feu. The aftermath of wildfires and the question of rebuilding in high risk fire areas

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Mega-fires have become frequent in areas around the world. They are no longer limited to areas in the Mediterranean climate. Extreme fires are now burning in Canada and Siberia due to more frequent fire weather conditions. Such conditions are strongly linked to the warming of the earth's atmosphere. In the US the term mega-fires came into use after the 1988 fire at Yellowstone Park. Such fires can permanently transform a landscape into a non-forested habitat. Wildfires are uncontrolled fires that burn in the wildland urban interface. No longer are wildfires a topic of interest only to foresters. Those in the practice of urban design and planning need to take notice. Land-use changes made by local governments have permitted urban development within forested areas and they have further exacerbated fire risks.

Parole chiave: wildfires; climate change adaptation; urban development

Écouter le feu. Le conseguenze dei grandi incendi e la questione della ricostruzione nelle aree ad alto rischio

I mega-incendi sono diventati frequenti in tutto il mondo. Non sono più limitati alle regioni a clima mediterraneo. Incendi estremi bruciano ora anche in Canada e in Siberia a causa della maggiore frequenza di condizioni meteorologiche favorevoli fortemente legate al riscaldamento dell'atmosfera terrestre. Negli Stati Uniti il termine mega-incendi è entrato in uso dopo l'incendio del 1988 nel parco di Yellowstone. Tali incendi possono trasformare in maniera permanente il paesaggio. Gli incendi incontrollati che si verificano nell'interfaccia tra aree urbane e naturali non sono più un argomento di interesse solo per i forestali. Chi si occupa di progettazione e pianificazione urbana deve prenderne atto. Le variazioni di uso del suolo promosse dai governi locali hanno permesso lo sviluppo urbano all'interno di aree boschive, aggravando ulteriormente il rischio.

Keywords: grandi incendi; adattamento ai cambiamenti climatici; sviluppo urbano

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Background

California experienced the 15 largest wild-fires in the last two decades of its recorded history. The most devastating losses occurred during the Camp Fire of 2018, when most residents of Paradise, a town in the foothills of the Sierra Nevada, lost their homes and 85 of the 26.000 residents lost their lives. Two years later, during the night of August 17 to 18, 2020, lightning struck the coastal Redwood forests and inland grasslands in California's San Francisco Bay Area. The next morning television news showed images of a magenta colored skyline above San Francisco. The year 2020 resulted in 9,917 wildfires in California. Closed to two million hectares burned; fires caused thirty-three fatalities, thirty seven injuries, destroyed 10.000 homes and resulted in US\$12 billion in damage (fig. 1).¹

Case studies, three sites

In this paper, the authors report on the work by an international team. They selected three residential areas in high risk Fire Hazard Severity Zones, a classification made by the California state agency charged with fire prevention and extinction. The agency has jurisdiction over thirty percent of California's land area. Over 40% of land in California is under Federal jurisdiction. The remaining land area is under municipal control and subject to municipal firefighting responsibilities.

The team selected high fire risk areas in three different landscapes typical for Northern California. The first site is located at Boulder Creek in the redwood forests (*forêt de sequoias*) of the Santa Cruz coastal range. The forest burned when lightning struck during the night of August 17 to 18, 2020. As several fires were spreading, residents received evacuation orders the following morning. In various neighborhood pockets, the fire destroyed 911 homes. The team focused on a neighborhood of 19 homes located under a canopy of Redwood and Douglas Fir

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1. Fiery skies over San Francisco after August 18, 2020.

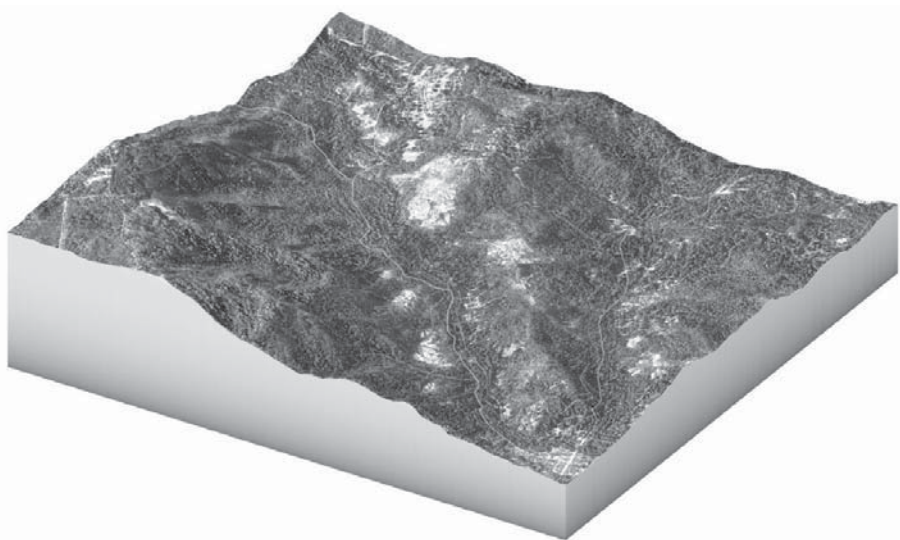
trees. Here, all but two homes burned to the ground (fig. 2). A second site was destroyed three years earlier by a wild-fire during the night of October 8 to 9 in 2017 and was caused by a fallen electric power line in Sonoma County. The fire came without warning and destroyed a total of 1.200 homes. The team focused on an ancient Native American quarry site where Sothern Pomo and Wappo nations once quarried volcanic glass to make weapons and tools. The site remained a quarry during the early colonial period. It became overgrown with stands of oak, laurel and madrone trees, a type of vegetative cover commonly described in California as chaparral (*forêt de arbustes*). In the late '60s the ridge was subdivided into 130 two-acre parcels for single family homes. In the night of the fire, ninety-two homes burned, one person died (fig. 3). The third site has not burned, but is equally at risk. Later during the night of the fire among the Redwood trees in August of 2020, lightning also struck grassland used to raise cattle further east in Alameda County, there the third site is located in a steep ravine along a seasonal creek adjacent to grassland over rolling hills (fig. 4). All three sites are located on single access roads with no second egress. The intent of the study was to learn from the aftermath of the first two fires, for the possible benefit of many locations equally at risk, like the third site. All three sites have

a similar topography. High winds propel flames and ambers across a hilly terrain, flames dip down into ravines, where large amount of dry fuel feeds the flames and increases temperatures to extremely high degrees, only to sweep up on the opposite side of the ravine and be carried from there over potentially large distances (fig. 5).

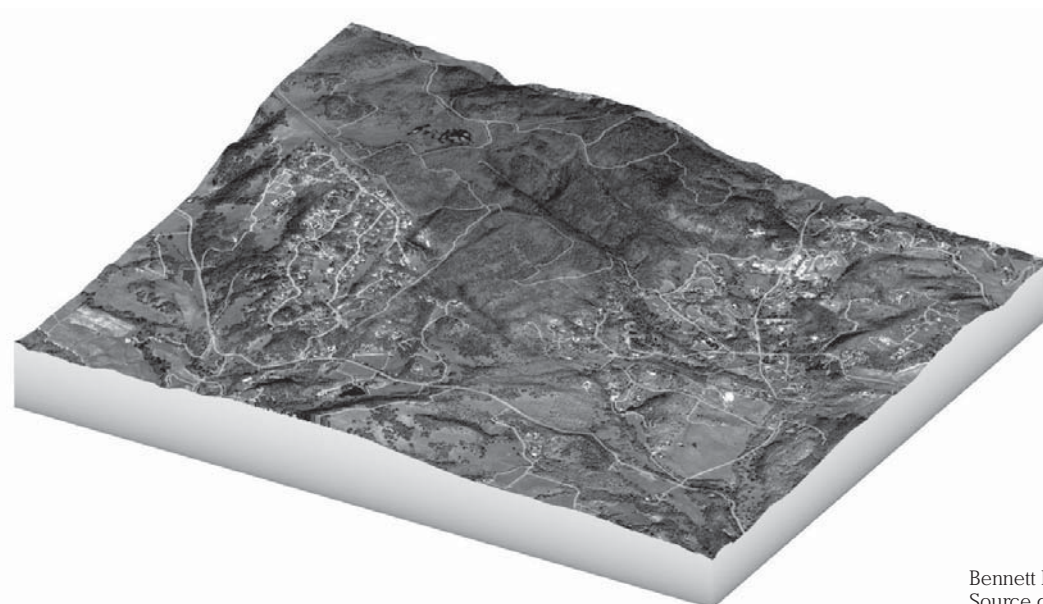
To rebuild, or not rebuild

Different from the governmental structure of various European countries, where rural areas are incorporated into the boundaries of a nearby town or city, and where a mayor together with an elected municipal board rules on land-use decisions, in California, decisions to permit new development in unincorporated administrative districts outside municipal boundaries are made by an elected County Board of Supervisors. The same board also grants rebuilding permits of structures destroyed by wildfires (fig. 6).

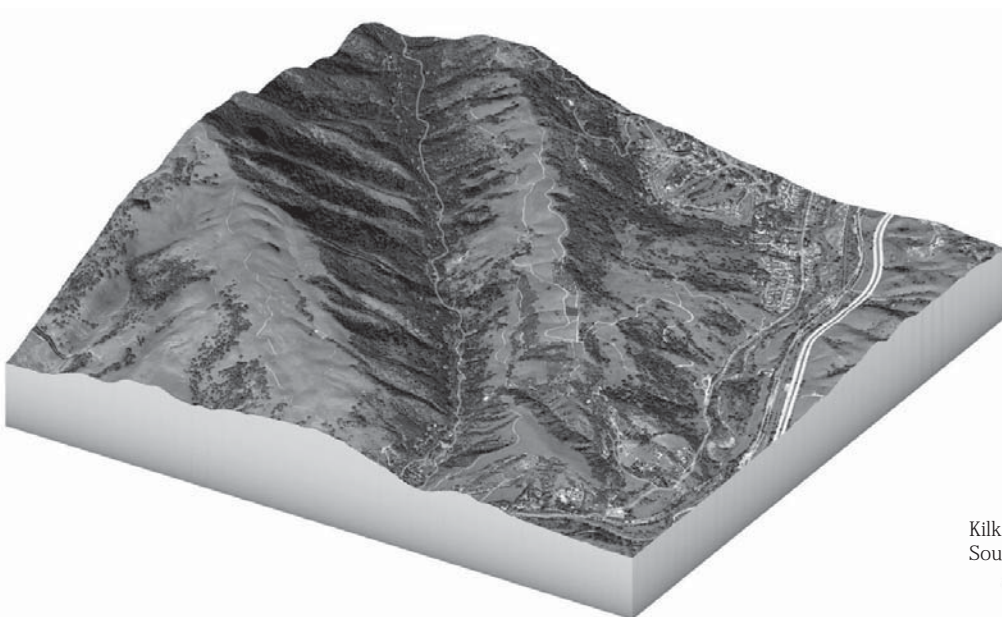
In addition, it is important to emphasize that the right to property is strongly imbedded in the American constitution. After well-specified conditions are met, an owner's use of land is 'as of right'. This right cannot be taken without just compensation and only when land is slated for a public purpose. Denying a property owner, the right to rebuild is politically



Boulder Creek, Santa Cruz County.
Source date: 2021.09.



Bennett Ridge, Sonoma County.
Source date: 2021.04.



Kilcare Rd, Alameda County.
Source date: 2021.12.



5. Morphological study of fire risk on Bennett Ridge: homes built up to 1980 (a); prior to the fire (b); Oct. 2017, after the fire (c).



6. Waiting for a permit to rebuild 18 months after the fire at Boulder Creek, Santa Cruz County.

untenable. At a board meeting one year after the 2020 fire in the Santa Cruz redwoods, the supervisor responsible for the district encouraged planning officials to expedite the rebuilding approval process: «To require fire survivors to evaluate and/or mitigate historic conditions will cause many property owners to unnecessarily expend limited resources and cause significant delays in their rebuilding permitting process. Financial consequences compound the longer residents must remain in rental housing. Or, even worse, the requirements may lead property owners to not rebuild at all, thus leading to the loss of valued community members and property tax revenue that funds important community services».²

The policy discussion at the state level is not much different. In 2021, legislation was introduced to prohibit all new buildings in very high-fire-hazard areas. While the proposed legislation was discussed in a committee of the California state senate, the building industry lobbied against such measures citing the state's housing shortage. The bill failed. Instead, the state enacted defensible space guidelines that establish a protective zone between structures in high risk fire severity zones. They became law in California on July 1, 2021, as part of mandatory disclosure at the time of home sales.

Defensible space

The so called 'defensible space guidelines' are the results of extensive experiments in the laboratory with embers and dispersers that simulate high velocity wind flows, observations confirmed that a protective zone of 1.5 meters of nonflammable materials effectively protects an exterior wall from catching fire. A second zone of 10 meters should be free of debris and flammable fence posts, decks, etc. A third zone of 30 meters should remain free of certain trees such as Douglas Fir or other conifers.

These guidelines were introduced in 2008 as part of building code revisions. They require nonflammable materials to harden roofs and outside walls. But those protections are not always a match for the high-speed fires that have raced

through Northern California in recent years. During the above mentioned Camp Fire, which burned down the small town of Paradise in 2018, both types of homes built before and after the 2008 code changes were destroyed at roughly the same rates (Braun, 2020). The us Forest Service conducted the study and concluded that the difference is not statistically significant.³ In the aftermath of wildfires an entire industrial complex stands to gain financially. It includes contractors that offer to rebuild, emergency aid and debris removal services, banks that provide loans, insurance companies who significantly raise policies or cancel protection from fires. But also affected are planning authorities and design professionals who issue and interpret permits for re-construction. For the last group frequent fires have risen questions similar to building on sites subject to sea level rise and flooding near rivers (Bosselmann, 2018). It might just become a hard truth: warming climate has practically eliminated new development options and forces retreat from sites subject to high risks of natural disasters (Cheng, 2021).

Living near parkland

All three areas studied are located adjacent to densely wooded parkland that is owned by the State of California. Forest management in these parks still follows an outdated model that favored fire suppression, but also the growing and marketing of commercial lumber. Douglas Fir is clearly favored over slower growing deciduous forests. In a deciduous forest, layers of fallen leaves retain moisture in the soil and lower the risk of combustion. Fallen limbs, dead trunks and small undergrowth are seen as providers of nutrients, which of course they are, but under extremely dry conditions they are also fuel for a fast moving fire. In the context of the two wild fires studied by the research team, differences stood out: a wild fire started by lightning like the one in 2020 was preceded by an evacuation order of all residents in the area. The earlier 2017 fire in Sonoma County came without warning. Also, the fire there in 2017 was started by a broken



7. Exhibition.

power line. Home owners and their insurance companies successfully sued the electricity company for damages. The electricity provider in turn distributed their losses by raising consumer rates throughout Northern California. In the case of a wildfire started by lightning in 2020, compensation could not readily be expected; state and federal emergency funds provided some relief. In both cases the financial burden was distributed and affected the larger community. Similarly, as the population of the entire San Francisco Bay Area noticed, wildfires considerably worsened air quality, thus endangered human health inside and outside the burned areas. Carbon released to the atmosphere by wildfires were significantly larger than the state's other carbon emissions combined in 2020 (Alberts, 2020, Sep.18).

Residents who lost their homes were forced to accept new conditions contrary to the emotional attachment they valued as part of their own identity, when they moved out of more densely built neighborhoods into forested areas at the urban edge. To represent the full range of public and private concerns, monetary and emotional, about the aftermath of wild-fires, the authors have created artwork for an exhibition (fig. 7) that can travel to high risk areas. Such artwork was done to clarify the concerns that remain despite mitigation measures (figs. 8 and 9).

Of major concern is the lack of alternative escape routes. In a related case, environmental groups have brought suit against Lake County to the north of San Francisco for permitting a large residential development in a high-risk fire area. The lawyer arguing the case for the environmental groups said when interviewed by the *New York Times*:⁴ «Without stricter prohibitions, new tract homes and cul-de-sacs will continue to push up into the brushy hills, and towns will be left to try to mitigate the danger. It is a strategy full of risk. Prevention is better than mitigation.

When you're mitigating impacts, then you're already one step behind». Lake County Superior Court Judge Markham agreed and instructed the county to revoke the permit: «the developers should have considered how many more people would be trying to escape during a wildfire. The additional people competing for the same limited routes can cause congestion and delay in evacuation, resulting in increased wild fire-related deaths».

Another concern is related to restrictions that non-elected county officials voiced prior to re-permitting new structures on properties destroyed by wildfires. When high winds drive fires to destroy structures and trees, fires also burn at extremely high temperatures, burning not only homes and trees but also tree roots close to the surface. As a result, soils become unstable especially on slopes near creek beds. Landslide are a frequent cause. To reduce liabilities, county officials proposed geological studies prior to issuing re-building permits. Elected county supervisors objected for reasons that delay rebuilding. As a compromise, planning officials mandated statements from homeowners that indemnify the county from future damages. Such indemnity would be recorded in the property title. Again, property owners and elected county supervisors objected because it would further traumatize fire survivors. Owners of destroyed homes argued, such a record would reduce the willingness by banks to offer re-construction loans (fig. 10).

The complexity of rebuilding in wildfire areas is daunting. Currently elected officials take a 'let's wait and see attitude'. Many politicians also anticipate upcoming re-election campaigns and select their public statement with great care when it comes to answering questions about rebuilding in high risk fire zones. Generally, politicians are hoping that defensible space guidelines will be followed and that the 2008 building code revision will prove effective. They also encourage communities at risk to form action



8. Bennett Ridge. On site drawing of a burned site: tracing the foundations (by Marc Dilet).

committees geared to fire prevention. Others, including unelected county officials advocate for greater caution. For them a purposeful and coordinated move of people and buildings away from risk would be worth considering if such a condemnation were not so strongly associated with the forceful removal of residents from inner city neighborhoods during urban renewal period of the '60s.

Managed retreat

Managed retreat is a term currently in use. Wildfires destroyed homes of people who own or rent, some are wealthy, others are not prosperous. Fires make no differences. However, a look at the demographics in fire damaged areas revealed that the average age of residents in all three areas we studied was twenty years or more above county averages. The residents we interviewed in our research were in their '60s, '70s and '80s. It took three to four years to rebuild and reoccupy homes after the Sonoma fire in 2017. In Santa Cruz County the rebuilding process after the 2020 fire had not started at the time of our research in early 2022. If a program were available that offers compensation for property rights on a voluntary basis soon after a wildfire event, the program would lower a future population from the exposure to risks. Fewer homes would be sold to new owners. But public expenditures would increase for county services and maintenance when accounted for and computed per remaining resident. For the future, one policy option would be to incorporate residential enclaves at high risk into the adjacent state parks. It would take time and park-land acquisition would need to go through a public planning process. Such a process would be best done through buyouts with life rights for present home owners but not their heirs.

None of these options would address all concern. Taking land into public trust is one of the more important function at the United States Department of the Interior. Incidentally a new, but very limited federal managed retreat program is available for native American tribes. Funding for retreat from areas at risk to climate change is offered to relocate native tribal groups. Once, in the 19th and early 20th century, native American were condemned to live on marginal and inhospitable lands. Five such tribal groups in Alaska and Washington State have received funding in 2022 to voluntarily relocate. Even if all areas with only the highest risk factor in the nation were considered for managed retreat, funding at a vastly different scale would be needed.

Epilog

Our research concluded in the spring of 2022. That year, wildfires started early in the season, and much damage resulted. By the time fall arrived, humidity rose in the San Francisco Bay Area and eliminated the risk of wildfires during the prime fire season which runs from August to October.

At the time of climate change, variables that contribute to risk appear unpredictable. Risks took on a different form: In early 2023, unusual and unrelenting rains have left the ground highly saturated in the Santa Cruz Redwoods. Coupled with high winds, major landslides have moved soil, trees and boulders down slopes. While the general public in the San Francisco Bay Area is greatly aware of natural disasters and knows for example that another earthquake could happen anytime. Californians have witnessed extreme natural conditions: coastal floods due to rising tides, people also had to live with wildfires, landslides and river flooding. Elected officials are not necessarily as



9. Bennett Ridge, Sonoma County. The owner received a rebuilding permit. Her application complied with the defensible space guidelines. The permit required non-flammable construction materials. The stand of Douglas fir trees in the rear remains as a fire risk.

10. Temporary protection from landslides across two properties where former homes stood.

true and honest as necessary about risks to their constituents who live in residential enclaves near parkland, seashores and rivers. Urban settlement patterns were approved during times associated with far lower climate risks. Extreme climate events underscore the need for land use changes. Managed retreat from areas with the highest risk of loss of life will become a hard choice in years to come.

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Notes

1. CAL FIRE, Fire Statistics, www.fire.ca.gov/incidents/2020/, retrieved January 2, 2021.
2. The quote is taken from the August 10, 2021 Santa Cruz Board of Supervisors public hearing during the passing of the czu Rebuild Directive.
3. Sophie Kasakove, 2022, «California acts to keep homes from sprouting fires' path», *New York Times*, January 28, page A12. www.nytimes.com/2022/01/26/us/wildfire-development-california-legal.html?searchResultPosition=1 (access: 2024.01.05).
4. *Ibid.*

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