4-2025

# Wildfire Smoke and U.S. Law

Michael B. Gerrard
*Columbia Law School*, michael.gerrard@law.columbia.edu

# Wildfire Smoke and U.S. Law

By Michael B. Gerrard*



* Michael B. Gerrard is Andrew Sabin Professor of Professional Practice and founder and Faculty Director of the Sabin Center for Climate Change Law at Columbia Law School, with a joint appointment to the faculty of the Columbia Climate School. He formerly chaired the faculty of the Columbia Earth Institute; the environmental sections of the American Bar Association and the New York State Bar Association; and the Executive Committee of the New York City Bar Association. He practiced environmental law full-time in New York City from 1979 through 2008, most recently as partner in charge of the New York office of Arnold & Porter. Lisa Dale and William Boyd provided very helpful comments on an earlier draft.

## I. INTRODUCTION

Many of the most wicked feedback effects of climate change relate to wildfire smoke. In some places the greenhouse gases poured into the atmosphere by wildfires exceed the reductions achieved by all efforts to fight climate change. At the same time, climate change is a major reason why wildfires are becoming more frequent and intense. Climate change and wildfires feed each other. However, environmental law and climate policy have paid relatively little attention to wildfires. The smoke from these fires—a major cause of illness and death, even thousands of miles from the blazes—is mostly unregulated. Efforts to impose liability on anyone for wildfires, except electric utilities, have gained little traction.

Part Two of this article discusses the global growth of wildfires; past trends and future projections; and the climate, health, and other impacts of wildfire smoke. Part Three traces the flip-flopping evolution of U.S. policy on extinguishing wildfires—a policy that in many ways made the problem worse. Part Four shows that the principal way to reduce wildfires is prescribed fires—the planned, small-scale setting of fires to reduce the fuel that causes much larger fires and more smoke. Part Five describes the impediments to prescribed fire, such as the implementation of certain environmental laws, relevant liability regimes, and the pattern of building housing in or near wildlands, which makes prescribed burns more difficult. Part Six discusses ways to defend against smoke. Part Seven concludes with recommendations for how the law can reduce wildfire smoke and its impacts.

## II. WILDFIRES: GROWTH, CAUSES, AND IMPACTS

### A. Growth and Causes of Wildfires

In July 2021, smoke from wildfires in western Canada and the western United States stretched across the continent and triggered health alerts from Toronto to Philadelphia.[1] In June and July 2023, wildfires

1. Nadja Popovich & Josh Katz, *See How Wildfire Smoke Spread Across America*, N.Y. TIMES (July 21, 2021), https://www.nytimes.com/interactive/2021/07/21/climate/wildfire-smoke-map.html [On File with the Columbia Journal of Environmental Law]. *See also* Wei-Ting Hung et al.,

in eastern Canada cast a pall over Chicago, New York, and as far south as Alabama,[2] and even crossed the Atlantic Ocean and darkened skies over Portugal and Spain.[3] New York briefly had the worst air quality of any major metropolitan area in the world—worse than even the famously polluted New Delhi.[4] A few months later, in October 2023, wildfires in the drought-ravaged Amazon caused the two million residents of Manaus, Brazil to experience the worst air quality in the world.[5]

These are not isolated incidents. In recent years wildfires have been increasing in number and intensity in many parts of the world, from Australia to the Arctic, and millions of people have been exposed to unhealthy levels of smoke.[6] Wildfires have hit places that had been completely unaccustomed to them, such as western Oregon in 2020; Russian Siberia and the suburbs of Boulder, Colorado in 2021; and the horrific fire in Maui, Hawaii in August 2023.[7]

*The impacts of transported wildfire smoke on surface air quality in New York State: A multi-year study using machine learning*, 259 ATMOSPHERIC ENV'T 118513 (2021) (scientific study confirming transport of wildfire smoke across long distances in North America).

2. Caitlin Kaiser, *Canadian wildfire smoke puts around 70 million US residents under air quality alerts*, CNN (July 17, 2023), https://www.cnn.com/2023/07/16/weather/canada-wildfires-us-air-quality-alerts-sunday/index.html [https://perma.cc/3NN3-SCSW]; Liam Stack & Ed Shanahan, *Wildfire Smoke: Smoke From Canada Fires Stretches From Midwest to East Coast*, N.Y. TIMES (June 30, 2023), https://www.nytimes.com/live/2023/06/29/nyregion/canada-wildfires-air-quality-smoke [On File with the Columbia Journal of Environmental Law].

3. Kathryn Hansen, *Canadian Smoke Reaches Europe*, NASA EARTH OBSERVATORY (June 26, 2023), https://earthobservatory.nasa.gov/images/151507/canadian-smoke-reaches-europe [https://perma.cc/7W5T-AK4P]. For more on long-distance transport of wildfire smoke, *see* Gary A. Morris et al., *Alaskan and Canadian forest fires exacerbate ozone pollution over Houston, Texas, on 19 and 20 July 2004*, 111 J. GEOPHYSICAL RSCH., no. D248S03 (2006); John Upton et al., *Breathing Fire: Health Is A Casualty Of Climate-Fueled Blazes*, KFF HEALTH NEWS (Nov. 9, 2017), https://kffhealthnews.org/news/breathing-fire-health-is-a-casualty-of-climate-fueled-blazes/ [https://perma.cc/VRU3-8SAC].

4. Derek Van Dam & Rachel Ramirez, *New York City's air pollution among the world's worst as Canada wildfire smoke shrouds Northeast*, CNN (June 7, 2023), https://www.cnn.com/2023/06/06/us/new-york-air-pollution-canada-wildfires-climate/index.html [https://perma.cc/8VEK-BWKY].

5. Crystal A. Kolden et al., *Wildfires in 2023*, 5 NATURE REVS. EARTH & ENV'T 238 (2024).

6. GABRIEL PETEK, LEGISLATIVE ANALYST'S OFF., LIVING UNDER SMOKY SKIES – UNDERSTANDING THE CHALLENGES POSED BY WILDFIRE SMOKE IN CALIFORNIA 4, 6–7 (2022).

7. Kristoffer Tigue, *Wildfires Are Exploding in Unexpected Places Due to Climate Change. Is Hawaii the Latest Example?*, INSIDE CLIMATE NEWS (Aug. 11, 2023), https://insideclimatenews.org/news/11082023/wildfires-are-exploding-in-unexpected-places-due-to-climate-change-is-hawaii-the-latest-example/ [https://perma.cc/FG2E-LTPN]; Christopher Flavelle & Henry Fountain, *In Oregon, a New Climate Menace: Fires Raging Where They Don't Usually Burn*, N.Y. TIMES (Sept. 12, 2020), https://www.nytimes.com/2020/09/12/climate/oregon-wildfires.html [On File with the Columbia Journal of Environmental Law].

Approximately 1.6 million wildfires occurred in the U.S. between 2000 and 2023. A small fraction of these become catastrophic, and a small percentage of fires accounts for the vast majority of acres burned (and, accordingly, smoke). About 1% of wildfires become raging, destructive fires, which experts call conflagrations.[8]

Wildfires are getting worse all over the world.[9] Three scientists wrote in 2018, "[t]he widespread fires this year have magnified concerns that we are locked in a worldwide pattern of conflagration that is both persistent and catastrophic."[10] The frequency and duration of large fires are increasing, and wildfire seasons are getting longer—as many as 20 days longer per decade over the last four decades in some parts of the U.S.[11] The area burned annually by large fires increased by more than 1,500% in the forests of the western U.S. from 1984 to 2017.[12] Fires are also intensifying in the southeast U.S.[13] and are becoming increasingly common in the northeast.[14] The fires strike not only forests; recent years have seen increasing fires in grasslands and shrublands, with resulting smoke and destruction.[15]

8. ANNE A. RIDDLE, CONG. RSCH. SERV., IF10244, WILDFIRE STATISTICS 1 (2023).

9. Calum X. Cunningham et al., *Increasing frequency and intensity of the most extreme wildfires on Earth*, NATURE ECOLOGY & EVOLUTION (June 4, 2024), https://www.wri.org/insights/global-trends-forest-fires [On File with the Columbia Journal of Environmental Law]; James MacCarthy et al., *The Latest Data Confirms: Forest Fires Are Getting Worse*, WORLD RES. INST. (Aug. 29, 2023), https://www.wri.org/insights/global-trends-forest-fires [https://perma.cc/HJ7B-KARM].

10. Don J. Melnick et al., *The Earth Ablaze*, N.Y. TIMES (Aug. 8, 2018), https://www.nytimes.com/2018/08/08/opinion/wildfires-california-climate-change.html [On File with the Columbia Journal of Environmental Law].

11. Crystal D. McClure & Daniel A. Jaffe, *US particulate matter air quality improves except in wildfire-prone areas*, 115 PROC. NAT'L ACAD. SCIS. 7901, 7902–05 (2018); U.S. DEP'T OF AGRIC., TOWARD SHARED STEWARDSHIP ACROSS LANDSCAPES: AN OUTCOME-BASED INVESTMENT STRATEGY 5 (2018); Philip E. Dennison et al., *Large wildfire trends in the western United States, 1984-2011*, 41 GEOPHYS. RSCH. LETTERS 2928 (2014).

12. Jennifer K. Balch et al., *Switching on the Big Burn of 2017*, 1 FIRE 17 (2018); ROSS GORTE, THE RISING COST OF WILDFIRE PROTECTION (2013).

13. Blake Hudson, *Fighting Fire with Fire? Adjusting Regulatory Regimes and Forest Product Markets to Mitigate Southern United States Wildfire Risk*, 33 J. ENV'T L. & LITIG. 33 (2018).

14. Hilary Howard, *Wildfire Risk Only Growing For Northeast*, N.Y. TIMES (Nov. 21, 2024), https://www.nytimes.com/2024/11/20/nyregion/new-york-wildfires-drought.html [On File with the Columbia Journal of Environmental law]; M.R. O'Connor, *The Northeast is Becoming Fire Country*, NEW YORKER (Nov. 20, 2024), https://www.newyorker.com/news/the-lede/the-northeast-is-becoming-fire-country [https://perma.cc/229A-DK9Z].

15. Volker C. Radeloff et al., *Rising wildfire risk to houses in the United States, especially in grasslands and shrublands*, 382 SCIENCE 702 (2023); Heath D. Starns et al., *Smoke in the Great Plains, USA: an increasing phenomenon with potential policy and health implications*, 16 FIRE ECOLOGY 12 (2020).

Several factors are at work. The largest is climate change.[16] The magnitude of future greenhouse gas emissions and, therefore, global warming has been determined to have a major impact on the likely extent of future fires.[17] We are seeing more "fire weather"—conditions conducive to the ignition and spread of wildfires. Warming can lead to "enhanced fuel aridity"—dryer trees and other vegetation. A 2022 review article found, "[o]verall, climate change is exerting a pervasive upwards pressure on fire globally by increasing the frequency and intensity of fire weather, and this upwards pressure will escalate with each increment of global warming."[18] Likewise, a 2022 report from the UN Environment Programme concluded that "[t]he heating of the planet is turning landscapes into tinderboxes, while more extreme weather means stronger, hotter, drier winds to fan the flames."[19] This UN report found that the risk of cataclysmic wildfires would increase as much as 57% by the end of the century, and that "[e]ven with the most ambitious efforts to curb greenhouse gas emissions, the planet will still experience a dramatic increase in the frequency of extreme fire conditions."[20] The U.S. National Climate Assessment found that "the area burned by wildfire across the western United States from 1984 to 2015 was twice what would have burned had climate change not occurred."[21] Climate change increased the likelihood and intensity of the fires in eastern Canada that caused unhealthy smoke conditions over New York and other U.S. cities in the

16. Tzeidle N. Wasserman & Stephanie E. Mueller, *Climate influences on future fire severity: a synthesis of climate-fire interactions and impacts on fire regimes, high-severity fire, and forests in the western United States*, 19 FIRE ECOLOGY 43 (2023); Matthew W. Jones et al., *State of Wildfires 2023-2024*, 16 EARTH SYS. SCI. DATA 3601, 3646 (2024); Matthew W. Jones et al., *Global rise in forest fire emissions linked to climate change in the extratropics*, 386 SCIENCE, no. 6719 (2024); Piyush Jain et al., *Drivers and Impacts of the Record-Breaking 2023 Wildfire Season in Canada*, 15 NATURE COMMC'NS 6764 (2024); Chantelle Burton et al., *Global burned area increasingly explained by climate change*, 14 NATURE CLIMATE CHANGE 1186 (2024); Chae Yeon Park et al., *Attributing human mortality from fire PM2.5 to climate change*, 14 NATURE CLIMATE CHANGE 1193 (2024).

17. Salvatore R. Curasi et al., *Global climate change below 2°C avoids large end century increases in burned area in Canada*, 7 CLIMATE AND ATMOSPHERIC SCI. 228 (2024).

18. Matthew W. Jones et al., *Global and Regional Trends and Drivers of Fire Under Climate Change*, 60 REVS. OF GEOPHYSICS, no. e2020RG000726 (2022). *See also* Colin S. Gannon & Nik C. Steinberg, *A global assessment of wildfire potential under climate change utilizing Keetch-Byram drought index and land cover classifications*, 2021 ENV'T RSCH. COMMC'NS, no. 3, 2021; Glen MacDonald et al., *Drivers of California's changing wildfires: a state-of-the-knowledge synthesis*, 32 INT'L J. WILDLAND FIRE 1039 (2023).

19. U.N. ENV'T PROGRAMME & GRID-ARENDAL, SPREADING LIKE WILDFIRE: THE RISING THREAT OF EXTRAORDINARY LANDSCAPE FIRES 6, 10, 41 (2022).

20. *Id. See also* Sally S.-C. Wang et al., *Projection of Future Fire Emissions Over the Contiguous US Using Explainable Artificial Intelligence and CMIP6 Models*, 128 J. GEOPHYSICAL RSCH.: ATMOSPHERES, no. e2023JD039154 (2023).

21. U.S. GLOBAL CHANGE RSCH. PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT 1104 (2018).

summer of 2023.[22] A 2021 study concluded that "the air pollution events caused by wildfire smoke could become much more serious in the western USA by the middle of this century."[23] In California's Sierra Nevada mountains, a 1°F increase in average summertime temperatures is associated with a 35% increase in acreage burned; in Montana, a 1°F increase doubles the cost of defending homes from wildfire and causes a 125% increase in acreage burned.[24] The temperate forests in the eastern U.S. are also seeing more wildfires.[25]

On top of the direct effect, warming leads to outbreaks of insects such as the mountain pine beetle and the southern pine beetle that devastate forests.[26] In 2015, California Governor Jerry Brown issued an executive order declaring an "epidemic of tree mortality" caused by drought and beetles, and exempting controlled burns and forest thinning from certain environmental reviews.[27] Another indirect effect of warming is that it has reduced cloud shading over coastal southern California, increasing evaporation and further drying vegetation.[28]

When there is a wet winter that leads to a lot of growth that dries out in a hot summer, and when the winds (such as southern California's Santa Ana wind) are especially strong, the fire season becomes

22. *Climate change more than doubled the likelihood of extreme fire weather conditions in Eastern Canada*, WORLD WEATHER ATTRIBUTION (Aug. 22, 2023), https://www.worldweatherattribution.org/climate-change-more-than-doubled-the-likelihood-of-extreme-fire-weather-conditions-in-eastern-canada/ [https://perma.cc/ZVH3-REW8]; Weiwei Wang et al., *Canadian forests are more conducive to high-severity fires in recent decades*, 387 SCIENCE 91 (2025); Megan C. Kirchmeier-Young et al., *Human driven climate change increased the likelihood of the 2023 record area burned in Canada*, 7 NPJ CLIMATE & ATMOSPHERIC SCI. 316 (2024).

23. Yongpiang Liu et al., *Projections of future wildfire emissions in western USA under climate change: contributions from changes in wildfire, fuel loading and fuel moisture*, 31 INT'L J. OF WILDLAND FIRE 1 (2021).

24. HEADWATERS ECON., DO INSURANCE POLICIES AND RATES INFLUENCE HOME DEVELOPMENT ON FIRE-PRONE LANDS? (2016); P.H. Gude et al., *Evidence for the Effect of Homes on Wildfire Suppression Costs*, 22 INT'L J. OF WILDLAND FIRE 537 (2013). *See also* Patrick T. Brown et al., *Climate warming increases extreme daily wildfire growth risk in California*, 621 NATURE 760 (2023).

25. Victoria M. Donovan et al., *Increasing Large Wildfire in the Eastern U.S.*, 50 GEOPHYSICAL RSCH. LETTERS, no. e2023GL107051 (2023); Michaella A. Ivey et al., *Woody Cover Fuels Large Wildfire Risk in the Eastern U.S.*, 51 GEOPHYSICAL RSCH. LETTERS, no. e2024GL110586 (2024).

26. W.A. Kurtz et al., *Mountain pine beetle and forest carbon feedback to climate change*, 452 NATURE 987 (2008); Corey Lesk et al., *Threats to North America forests from southern pine beetle with warming winters*, 7 NATURE CLIMATE CHANGE 713 (2017).

27. David Siders, *Jerry Brown declares emergency for dying trees*, SACRAMENTO BEE (Oct. 30, 2015), https://www.sacbee.com/news/politics-government/capitol-alert/article41962989.html [On File with the Columbia Journal of Environmental Law].

28. A. Park Williams et al., *Effect of Reduced Summer Cloud Shading on Evaporative Demand and Wildfire in Coastal Southern California*, 45 GEOPHYSICAL RSCH. LETTERS 5653 (2018).

even more treacherous.[29] Models predict more frequent wet winters, lower snowpack, and drier summers and autumns in the years to come, adding up to "an ideal recipe for wildfire in much of the western U.S."[30] Those predictions came true in January 2025 when the most destructive fires in California history (in terms of the value of the property destroyed, not deaths) hit the Los Angeles area. Though detailed attribution studies will no doubt be performed, it appears that these Los Angeles fires resulted from "hydroclimate whiplash"[31]—two extremely wet winters, which facilitated vegetation growth, followed by a period of record heat, which dried out the vegetation, and then an extreme windstorm that, once a spark occurred, pushed the fires a long distance. A 2023 study for the insurance industry was eerily prescient in discussing how a combination of wet periods, very hot and dry periods, high winds, and ignitable buildings close to each other could create "built environment conflagrations."[32] Early indications are that the forest management practices discussed later in this Article did not have much bearing on the Los Angeles fires. Most of the areas burned were not in or proximate to forests where prescribed burning might be appropriate; unusually high winds and the extreme dryness of the vegetation that had been made abundant by earlier wet seasons appear to be the principal factors.[33]

After large fires, hills newly denuded of vegetation sometimes wash away into deadly mudslides.[34] As if that weren't hellish enough, lightning—the principal cause of natural fires—has been increasing over the forests of Canada and Alaska,[35] and is expected to happen much

29. Nicholas J. Nauslar et al., *The 2017 North Bay and Southern California Fires: A Case Study*, 1 FIRE 18 (2018); Jennifer K. Balch et al., *Switching on the Big Burn of 2017*, 1 FIRE 17 (2018).

30. Balch et al., *supra* note 29, at 5.

31. Daniel L. Swain et al., *Hydroclimate volatility on a warming Earth*, 6 NATURE REVS. EARTH & ENV'T 35, 35 (2025).

32. IAN M. GIAMMANCO ET AL., INS. INST. FOR BUS. & HOME SAFETY, THE RETURN OF CONFLAGRATIONS IN OUR BUILT ENVIRONMENT (2023).

33. Gavin Madakumbura et al., *Climate Change a Factor in Unprecedented LA Fires*, UCLA (Jan. 13, 2025), https://sustainablela.ucla.edu/2025lawildfires [https://perma.cc/BBN3-8ZQL]; Cara Horowitz & Julia Stein, *Did California Policies Make the LA Policies Worse?*, LEGAL PLANET (Jan. 17, 2025), https://legal-planet.org/2025/01/17/did-california-policies-make-the-la-fires-worse/ [https://perma.cc/3DDT-C4QW].

34. *Who they were: The victims of the Montecito mudslides*, L.A. TIMES (Jan. 17, 2018), https://www.latimes.com/local/california/la-me-montecito-mudslide-victims-stories-20180112-story.html [https://perma.cc/9T2L-9MMX].

35. Sander Veraverbeke, *Lightning as a major driver of recent large fire years in North American boreal forests*, 7 NATURE CLIMATE CHANGE 529 (2017).

more frequently around the world as greenhouse gas emissions increase.[36]

In sum, drought, extreme heat that dries vegetation, and insect outbreaks—all worsened by climate change–are increasing the number and intensity of wildfires.

## B. Impacts of Wildfire Smoke

Obviously, wildfires can cause major loss of life and destruction of property. The two deadliest U.S. wildfires of the past century were the Maui fire of 2023, which killed about 100 people and destroyed the town of Lahaina;[37] and the Camp Fire of 2018, which killed 85 people and destroyed most of the town of Paradise, California.[38] However, the focus of this Article is wildfire smoke. As shown below, it causes far more fatalities than the fires themselves.

Wildfires release into the atmosphere large quantities of fine particulate matter ($PM_{2.5}$), an air pollutant that can penetrate deep into the lungs and is a major target of air pollution control regulations. While overall $PM_{2.5}$ levels in the U.S. had been declining for years, in some parts of the country this decline has halted or reversed, in large part due to wildfire smoke.[39] Wildfire has been estimated to account for up to 25% of $PM_{2.5}$ emissions in recent years across the U.S., and up to half in some Western regions.[40] Wildfires create what Jia Coco Liu and colleagues call "smoke waves"—two or more consecutive days with high levels of $PM_{2.5}$. They project that, with anticipated climate change, by mid-century more than 82 million people in the U.S. (especially in northern California, western Oregon, and the Great

36. Francisco J. Perez-Invernon et al., V*ariation of lightning-ignited wildfire patterns under climate change*, 14 NATURE COMMC'NS 739 (2023); Thomas A.J. Janssen et al*., Extratropical forests increasingly at risk due to lightning fires*, 16 NATURE GEOSCIENCE 1136 (2023).

37. Jacey Fortin & Adeel Hassan, *Death Toll of Maui Wildfire Now at 102*, N.Y. TIMES (Aug. 9, 2024), https://www.nytimes.com/article/maui-wildfire-victims.html [On File with the Columbia Journal of Environmental law].

38. *Remembering the Camp Fire*, CAL. FIRE, https://www.fire.ca.gov/our-impact/remembering-the-camp-fire [https://perma.cc/K9C3-NYY3] (last visited Feb. 9, 2025).

39. Marshall Burke et al., *The contribution of wildfire to PM2.5 trends in the USA*, 622 NATURE 761 (2023); Marissa L. Childs et al., *Daily Local-Level Estimates of Ambient Wildfire Smoke PM2.5 for the Contiguous US*, 56 ENV'T SCI. & TECH. 13607 (2022); JULIA LANGER & JEN BRADY, CLIMATE CENT., AIR POLLUTION PROGRESS STILL UNDERMINED BY WESTERN WILDFIRES (2018).

40. Marshall Burke et al*., The changing risk and burden of wildfire in the United States*, 118 PROC. NAT'L ACAD. SCIS., no. e2011048118, at 1 (2021).

Plains) will experience a 57% increase in the frequency of smoke waves, and a 31% increase in their intensity.[41]

Because wildfire smoke contains so many chemical constituents, its $PM_{2.5}$ seems to be even more unhealthy than $PM_{2.5}$ from other sources.[42] Wildfire smoke contains not only particulate matter and carbon dioxide but also carbon monoxide, nitrogen dioxide, ozone, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds.[43] It can carry even more nasty chemicals if the area burned includes, for example, former mines or chemical disposal sites,[44] industrial sites,[45] or metal-rich soils.[46] Even the plastics inside all homes generate an array of chemicals when burned.[47] When wildfire smoke enters buildings, the PAHs can accumulate in indoor materials.[48] Because large wildfires consume more than trees, their smoke

41. Jia Coco Liu, *Particulate Air Pollution from Wildfires in the Western US under Climate Change*, 138 CLIMATE CHANGE 655 (2016).

42. Rosana Aguilera et al., *Wildfire smoke impacts respiratory health more than fine particles from other sources: observational evidence from Southern California*, 12 NATURE COMMC'NS, no. 1493 (2021); Teresa C. Wegesser et al., *California Wildfires in 2008: Coarse and Fine Particulate Matter Toxicity*, 117 ENV'T HEALTH PERSPS. 893 (2009).

43. Xiaoxi Li et al., *Airborne measurements of western U.S. wildfire emissions: Comparison with prescribed burning and air quality implications*, 122 J. GEOPHYSICAL RSCH. ATMOSPHERES 6108 (2017); Katelyn O'Dell, *Hazardous Air Pollutants in Fresh and Aged Western U.S. Wildfire Smoke and Implications for Long-Term Exposure*, 54 ENV'T SCI. TECH. 11838 (2020); L.P. Naeher et al., *Woodsmoke health effects: a review*, 19 INHALATION TOXICOLOGY 67 (2007).

44. EDWARD STRUZIK, FIRESTORM: HOW WILDFIRE WILL SHAPE OUR FUTURE 141–62 (2017).

45. Eulalia Planas et al., *Fires at the wildland-industrial interface. Is there an emerging problem?*, 141 FIRE SAFETY J. 103906 (2023).

46. Alandra Marie Lopez et al*., Metal toxic threat in wildland fires determined by geology and fire severity*, 14 NATURE COMMC'NS, no. 8007 (2023).

47. Zoe Schlanger, *What happens when a plastic city burns*, ATLANTIC (Jan. 15. 2015), https://www.theatlantic.com/science/archive/2025/01/los-angeles-fire-smoke-plastic-toxic/681318/ [https://perma.cc/HAJ8-H6GB]; Audrey Gray & Andrew Robinson, *Smoke and Ash Made More Toxic by the Contents of Burning Homes Threaten Residents of LA and Beyond*, INSIDE CLIMATE NEWS (Jan. 17, 2025), https://insideclimatenews.org/news/17012025/toxic-smoke-threaten-los-angeles-residents/ [https://perma.cc/RLQ8-MEKY]; Ariel Wittenberg, *Cancer is the unseen danger in the Los Angeles fires*, E&E NEWS (Jan. 13, 2025), https://www.eenews.net/articles/cancer-is-the-unseen-danger-in-the-los-angeles-fires/ [https://perma.cc/P4GV-FUN8]; Brendan Borrell, *After Wildfires, L.A.'s Clear Skies Conceal 'Toxic Soup,'* N.Y. TIMES (Mar. 12, 2025), https://www.nytimes.com/2025/03/12/well/los-angeles-fires-health.html [On File with the Columbia Journal of Environmental Law].

48. Aurelie Laguerre & Elliott T. Gall, *Polycyclic Aromatic Hydrocarbons (PAHs) in Wildfire Smoke Accumulate on Indoor Materials and Create Postsmoke Exposure Pathways*, 58 ENV'T SCI. & TECH. 639 (2023). *See also* Colleen E. Reid et al., *Physical Health Symptoms and Perceptions of Air Quality among Residents of Smoke-Damaged Homes from a Wildland Urban Interface Fire*, 2 ACS ES&T AIR, no.1, 2024, at 13 (describing symptoms reported by residents returning to homes that had been exposed to wildfire smoke).

is considerably more toxic than the smoke from prescribed burns.[49] The Los Angeles fires of 2025 led to particular concerns about the toxicity of the resulting smoke and ash because the flames consumed thousands of buildings containing lead pipes, stores of chemicals, appliances, electric vehicles, and many other items whose combustion releases hazardous substances.[50]

Wildfire smoke is a killer. A 2024 study concluded that $PM_{2.5}$ exposure from California wildfires from 2008 to 2018 caused more than 52,000 premature deaths.[51] An earlier study found that wildfire smoke is responsible for about 33,000 excess deaths annually around the world, and about 3,200 in the U.S.[52] A different U.S. study calculated that, assuming business as usual for greenhouse gas emissions and the resultant warming, the annual U.S. mortality attributable to $PM_{2.5}$ from wildfire smoke would increase from around 17,000 deaths in 2000 to 44,000 in 2100.[53] Many of these deaths occur far from the

49. Xiaoxi Li et al., *Airborne measurements of western U.S. wildfire emissions: Comparison with prescribed burning and air quality implications*, 122 J. GEOPHYSICAL RSCH. ATMOSPHERES 6108 (2017). *See also* Yong Ho Kim et al., *Toxicity of fresh and aged anthropogenic smoke particles emitted from different burning conditions*, 892 SCI. TOTAL ENV'T 164778 (2023).

50. Hiroko Tabuchi & Mira Rojanasakul, *Airborne Lead and Chlorine Levels Soared as L.A. Wildfires Raged*, N.Y. TIMES (Jan. 20, 2025), https://www.nytimes.com/2025/01/20/climate/los-angeles-wildfires-lead-chlorine-air-quality.html [On File with the Columbia Journal of Environmental Law]; *LA wildfires' leftover ash might be toxic, experts warn*, GREENWIRE (Jan. 26, 2025), https://subscriber.politicopro.com/article/eenews/2025/01/22/la-wildfires-leftover-ash-might-be-toxic-experts-warn-00199886 [On File with the Columbia Journal of Environmental Law]; Eliyahu Kamisher et al., *Burning Teslas in LA Add to Toxic Mix Hindering Wildfire Cleanup,* BLOOMBERG (Jan. 17, 2025), https://www.bloomberg.com/news/articles/2025-01-17/burning-teslas-add-to-toxic-mix-of-cocktails-delaying-la-return [On File with the Columbia Journal of Environmental Law]; David Wallace-Wells, *After the L.A. Fires, a New Menace Lingers*, N.Y. TIMES (Jan. 29, 2025), https://www.nytimes.com/2025/01/29/opinion/los-angeles-fires-air.html [On File with the Columbia Journal of Environmental Law].

51. Rachel Connolly et al., *Mortality attributable to PM2.5 from wildland fires in California from 2008 to 2018*, 10 SCI. ADVANCES, no. 23 (2024).

52. Gongbo Chen et al., *Mortality risk attributable to wildfire-related PM2.5 pollution: a global time series study in 749 locations*, 5 LANCET PLANETARY HEALTH, no. e579 (2021). *See also* Rongbin Xu et al., *Global population exposure to landscape fire air pollution from 2000 to 2019*, 621 NATURE 521 (2023) (finding that during the period 2010–2019, 2.18 billion people were exposed to at least one day of substantial landscape fire-sourced air pollution per year, with each person in the world having, on average, 9.9 days of exposure per year); Kevin Cromar et al., *Adverse Health Impacts of Outdoor Air Pollution, Including from Wildland Fires, in the United States: "Health of the Air," 2018-2020,* 21 ANNALS AM. THORACIC SOC'Y, no.1, 2024, at 76 (presenting estimates of U.S. mortality impacts from wildland fires ranging from 4,080 to 28,000 deaths, depending on assumptions).

53. B. Ford et al*., Future Fire Impacts on Smoke Concentrations, Visibility, and Health in the Contiguous United States*, 2 GEOHEALTH 229 (2018). *See also* Yiqun Ma et al., *Long-term exposure to wildland fire smoke PM2.5 and mortality in the contiguous United States*, 121 PROC. NAT'L ACAD.

actual fires, as the smoke travels long distances.[54] High levels of $PM_{2.5}$ from wildfires have also increased the death rate from another disease that attacks the lungs, COVID-19, especially since the height of the pandemic in 2020 coincided with an extreme wildfire season.[55] In 2020, safety rules and staff shortages associated with COVID-19 also reduced the use of prescribed burns,[56] which, as shown below, are a major way to reduce wildfire impacts.

Many causes of death and illness have been linked to wildfire smoke. These health effects include heart attacks,[57] strokes,[58] asthma attacks and other respiratory problems,[59] cardiorespiratory

SCIS., no e2403960121 (2004); Minghao Qiu et al., *Mortality Burden From Wildfire Smoke Under Climate Change* (Nat'l Bureau of Econ. Rsch, Working Paper No. 32307, 2024); Colleen E. Reid et al., *Critical Review of Health Impacts of Wildfire Smoke Exposure*, 124 ENV'T HEALTH PERSPS. 1334 (2016); Neal Fann et al., *The health impacts and economic value of wildland fire episodes in the U.S.: 2008-2012*, 610 SCI. TOTAL ENV'T 802 (2018).

54. Katelyn O'Dell, *Estimated Mortality and Morbidity Attributable to Smoke Plumes in the United States: Not Just a Western US Problem*, 5 GEOHEALTH, no. e2021GH000457 (2021); Rodanthi-Elisavet Mamouri et al., *Wildfire smoke triggers cirrus formation: lidar observations over the eastern Mediterranean*, 23 ATMOSPHERIC CHEMISTRY & PHYSICS 14097 (2023) (finding smoke from California wildfires formed clouds over Cyprus).

55. Xiaodan Zhou et al., *Excess of COVID-19 cases and deaths due to fine particulate matter exposure during the 2020 wildfires in the United States*, 7 SCI. ADVANCES, no. eabi878 (2021); Sarah B. Henderson. *The COVID-19 Pandemic and Wildfire Smoke: Potentially Concomitant Disasters*, 110 AM. J. PUB. HEALTH 1140 (2020). *But see* Sheena E. Martenies et al., *The COVID-19-wildfire smoke paradox: Reduced risk of all-cause mortality due to wildfire smoke in Colorado during the first year of the COVID-19 pandemic*, 225 ENV'T RSCH. 115591 (2023).

56. FOREST SERV. & U.S. DEP'T OF AGRIC., FUTURE OF AMERICA'S FOREST AND RANGELANDS: FOREST SERVICE 2020 RESOURCES PLANNING ACT ASSESSMENT 5 (2023).

57. Caitlin G. Jones et al., *Out-of-Hospital Cardiac Arrests and Wildfire-Related Particulate Matter During 2015-2017 California Wildfires*, 9 J. AM. HEART ASS'N, no. e014125 (2020).

58. Zachary S. Wettstein et al., *Cardiovascular and Cerebrovascular Emergency Department Visits Associated With Wildfire Smoke Exposure in California in 2015*, 7 J. AM. HEART ASS'N, no. e007492 (2018).

59. Kai Chen et al., *Canadian Wildfire Smoke and Asthma Syndrome Emergency Department Visits in New York City,* 330 J. AM. MED. ASS'N 1385 (2023); Jeff Wen et al., *Quantifying fire-specific smoke exposure and health impacts*, 120 PROC. NAT'L ACAD. SCIS., no. e2309325120 (2023); RUBEN JUAREZ ET AL., UNIV. OF HAW. ECON. RSCH ORG., MAUI WILDFIRE EXPOSURE STUDY: COMMUNITY HEALTH, WELLBEING, AND RESILIENCE (2024); Cristin E. McArdle et al., *Asthma-Associated Emergency Department Visits During the Canadian Wildfire Smoke Episodes – United States April-August 2023,* 72 MORBIDITY & MORTALITY WKLY REP. 926 (2023); Jennifer D. Stowell et al., *Associations of wildfire smoke PM2.5 exposure with cardiorespiratory events in Colorado*, *2011-2014*, 133 ENV'T INT'L 105151 (2019); Stephanie DeFlorio-Barker, *Cardiopulmonary Effects of Fine Particulate Matter Exposure among Older Adults, during Wildfire and Non-Wildfire Periods, in the United States 2008-2010*, 127 ENV'T HEALTH PERSPS., no. 037006-1 (2019); Terry L. Noah et al., *The Effects of Wildfire Smoke on Asthma and Allergy*, 23 CURRENT ALLERGY & ASTHMA REPS. 375 (2023); MARC CARMICHAEL & BEN CERIO, KOMODO HEALTH, IMPACT OF WILDFIRE SMOKE WAVES ON ASTHMA EMERGENCIES IN CHILDREN: INSIGHTS INTO THE PEDIATRIC SUBPOPULATIONS MOST VULNERABLE TO THE THREAT OF CLIMATE CHANGE (2024), https://knowledge.komodohealth.com/hubfs/_2024/Komodo_Health_Asthma_and_Wildfires_Research_Brief_Aug_2024.pdf [https://perma.cc/FE42-5U7J].

hospitalizations,[60] emergency room visits,[61] some cancers,[62] neuroinflammation,[63] preterm births,[64] low birth weight,[65] adverse pregnancy outcomes,[66] pregnancy loss,[67] lowered fertility,[68] various skin conditions,[69] lower cognitive performance,[70] worsened student learning outcomes,[71] higher risk of dementia,[72] psychological effects that

60. Chen Chen et al., *Exploring spatial heterogeneity in synergistic effects of compound climate hazards: Extreme heat and wildfire smoke on cardiorespiratory hospitalizations in California*, 10 SCI. ADVANCES, no. eadj7264 (2024).

61. Jamie Ranse at al., *Impact of fine particulate matter (PM2.5) smoke during the 2019/2020 Australian bushfire disaster on emergency department patient presentations*, 6 J. CLIMATE CHANGE & HEALTH, no. 100113 (2022).

62. Jill Korsiak et al., *Long-term exposure to wildfires and cancer incidence in Canada: a population-based observational cohort study*, 6 LANCET PLANET HEALTH, no. e400-09 (2022).

63. David Scieszka et al., *Neuroinflammatory and Neurometabolomic Consequences From Inhaled Wildfire Smoke-Derived Particulate Matter in the Western United States*, 186 TOXICOLOGICAL SCIS. 149 (2021).

64. Sam Heft-Neal, *Association between wildfire smoke exposure during pregnancy and risk of preterm birth in California,* 203 ENV'T RSCH. 111872 (2022); Anjali Haikerwal et al., *Wildfire smoke exposure and respiratory health outcomes in young adults born extremely preterm or extremely low birthweight*, 197 ENV'T RSCH. 111159 (2021).

65. Weeberb J. Requia, *Birth weight following pregnancy wildfire smoke exposure in more than 1.5 million newborns in Brazil: A nationwide case-control study*, 11 LANCET REG'L HEALTH – AMS. 100229 (2022).

66. Mona Abdo et al., *Impact of Wildfire Smoke on Adverse Pregnancy Outcomes in Colorado, 2007-2015*, 16 INT'L J. ENV'T RSCH. & PUB. HEALTH, 3720 (2019).

67. Molly S. Kornfeld et al., *Wildfire smoke exposure and pregnancy loss*, 118 FERTILITY & STERILITY 626 (2022).

68. Sarah LaPointe et al., *Air pollution exposure in vitrified oocyte donors and male recipient partners in relation to fertilization and embryo quality*, 193 ENV'T INT'L 109147 (2024).

69. Kathyana P. Santiago Mangual et al., *The Burden of Air Pollution on Skin Health: a Brief Report and Call to Action*, 14 DERMATOLOLOGY & THERAPY 251 (2024); Raj P. Fadadu et al., *Association of Wildfire Air Pollution and Health Care Use for Atopic Dermatitis and Itch*, 157 J. AM. MED. ASS'N 658 (2021).

70. Stephanie E. Cleland et al., *Short-Term Exposure to Wildfire Smoke and PM2.5 and Cognitive Performance in a Brain-Training Game: A Longitudinal Study of U.S Adults*, 130 ENV'T HEALTH PERSPS. (2022); Ryan Israelson & Jing Kong, Hazy Outlook: Wildfire Smoke Exposure and Analysts (Jan. 21, 2024), https://dx.doi.org/10.2139/ssrn.4702170 [On File with the Columbia Journal of Environmental Law]

71. Jeff Wen & Marshall Burke*, Lower test scores from wildfire smoke exposure*, 5 NATURE SUSTAINABILITY 947 (2022).

72. Holly Elser et al, *Wildfire Smoke Exposure and Incident Dementia*, 82 J. AM. MED. ASS'N NEUROLOGY, no.1, 2024; Joan A. Casey & Holly Elser, *Exploring Wildfire Smoke Exposure and Risk of Dementia in an Older Patient Population*, NEUROLOGY LIVE (July 29, 2024), https://www.neurologylive.com/view/exploring-wildfire-smoke-exposure-risk-dementia-older-patient-population-joan-casey-holly-elser [https://perma.cc/LM9T-WGEG]; Boya Zhang et al., *Comparison of Particulate Air Pollution From Different Emission Sources and Incident Dementia in the US*, 157 J. AM. MED. ASS'N INTERNAL MED., no. 6, 2023.

harm the mental wellbeing of many in the population,[73] suicide,[74] the spread of infectious agents such as bioaerosols,[75] and perturbation of stratospheric ozone.[76] The health impacts are especially serious when high levels of $PM_{2.5}$ and ground-level ozone coincide, which is happening increasingly often, in part because extreme heat contributes to both wildfires and ozone levels.[77]

Climate change is an effect as well as a cause of wildfires. One study found that, globally, carbon emissions from forest fires increased by 60% between 2001 and 2023.[78] Already, wildfire smoke has wiped out many of the gains made by California in fighting greenhouse gas emissions and conventional air pollutants.[79] In just a few weeks, a major wildfire can emit more carbon dioxide than California's climate change programs can save in a year.[80] One analysis found that the

73. C. Howard et al., *SOS: Summer of Smoke – a mixed-methods, community-based study investigating the health effects of a prolonged, severe wildfire season on a subarctic population*, 19 CAN. J. EMERGENCY MED. 599 (2017); Maria C. Mirabelli et al., *Wildfire smoke and symptoms affecting mental health among adults in the U.S. State of Oregon*, 164 PREVENTIVE MED. 107333 (2022); Sharon J. Riley, *"The lost summer": the emotional and spiritual toll of the smoke apocalypse*, NARWHAL (Aug. 21, 2018), https://thenarwhal.ca/the-lost-summer-the-emotional-and-spiritual-toll-of-the-smoke-apocalypse/ [https://perma.cc/W4ZX-ZEEP]; David P. Eisenman & Lindsay P. Galway, *The mental health and well-being effects of wildfire smoke: a scoping review*, 22 BMC PUB. HEALTH, no. 2274 (2022).

74. David Molitor et al., *Air pollution and suicide in rural and urban America: Evidence from wildfire smoke*, 120 PROC. NAT'L ACAD. SCIS., no. e2221621120 (2023).

75. Leda N. Kobziar & George R. Thompson III, *Wildfire smoke a potential infectious agent*, 370 SCIENCE 1408 (2020).

76. V. Faye McNeill & Joel A. Thornton, *How Wildfires Deplete Ozone in the Stratosphere*, 615 NATURE 219 (2023); Peter Bernath et al., *Wildfire Smoke Destroys Stratospheric Ozone*, 375 SCIENCE 1292 (2022).

77. Dmitri A. Kalashnikov et al., *Increasing Co-Occurrence of Fine Particulate Matter and Ground-Level Ozone Extremes in the Western United States*, 8 SCI. ADVANCES, no. 1, 2022.

78. Matthew W. Jones et al., *Global Rise in Forest Fire Emissions Linked to Climate Change in the Extratropics*, 386 SCIENCE, no. 6719 (2024). *See also* Bo Zheng et al., *Record-High CO2 Emissions from Boreal Fires in 2021*, 379 SCIENCE 912 (2023).

79. Marc Carreras-Sospedra et al., *Air Quality and Health Impacts of the 2020 Wildfires in California*, 20 FIRE ECOLOGY 6 (2024); Michael Jerrett et al., *Up in Smoke: California's Greenhouse Gas Reductions Could be Wiped Out by 2020 Wildfires,* 310 ENV'T POLLUTION 119888 (2022); NEXT 10, 2019 CAL. GREEN INNOVATION INDEX 19 (2019), https://www.next10.org/sites/default/files/2019-10/2019-california-green-innovation-index-final.pdf [https://perma.cc/ZW57-KGSW]. These calculations do not account for the CO2 that will be absorbed if the burned areas are allowed to regrow, though that happens much more slowly than the release of carbon during a wildfire. *See* CHAD T. HANSON, SMOKESCREEN: DEBUNKING WILDFIRE MYTHS TO SAVE OUR FORESTS AND OUR CLIMATE (2021).

80. David R. Baker, *Huge Wildfires can Wipe Out California's Greenhouse Gas Gains*, S.F. CHRON. (Nov. 22, 2017), https://www.sfchronicle.com/bayarea/article/Huge-wildfires-can-wipe-out-California-s-12376324.php [On File with the Columbia Journal of Environmental Law]. *See also* Crystal D. McClure & Daniel A. Jaffe, *US Particulate Matter Air Quality Improves Except in Wildfire-*

2018 wildfire season in California emitted as much carbon dioxide as that generated by the production of all the electricity the state used in a year.[81] Another analysis concluded that four California wildfires emitted the carbon dioxide equivalent of one-half of California's cars for a year.[82] California's climate law, A.B. 32, has a program that allows GHG emitters to "offset" some of their emissions by paying to preserve forests, but a 2023 analysis found that wildfires almost entirely undo the benefits of this program.[83] Canada's severe wildfire season in 2023 produced nearly four times the $CO_2$ emissions of the global aviation sector, and 25% more than all tropical deforestation that year.[84] While forests have long been seen as net carbon sinks, absorbing large quantities of carbon dioxide from the atmosphere, one study found that beginning in 2001, logging, wildfire, and decay in Canadian forests have been emitting more $CO_2$ than the forests have

*Prone Areas*, 115 PROC. NAT'L ACAD. SCIS. 7901 (2018); Bob Berwyn, *How Wildfires Can Affect Climate Change (and Vice Versa)*, INSIDE CLIMATE NEWS (Aug. 23, 2018), https://insideclimatenews.org/news/23082018/extreme-wildfires-climate-change-global-warming-air-pollution-fire-management-black-carbon-co2/ [https://perma.cc/TXW5-8QEG]; JULIA LANGER & JEN BRADY, AIR POLLUTION PROGRESS STILL UNDERMINED BY WESTERN WILDFIRE (2018).

81. *New Analysis Shows 2018 California Wildfires Emitted as Much Carbon Dioxide as an Entire Year's Worth of Electricity*, U.S. DEP'T OF THE INTERIOR (Nov. 30, 3018), https://www.doi.gov/pressreleases/new-analysis-shows-2018-california-wildfires-emitted-much-carbon-dioxide-entire-years [https://perma.cc/9GPE-GB42].

82. THOMAS M. BONNICKSEN, FOREST FOUND., GREENHOUSE GAS EMISSIONS FROM FOUR CALIFORNIA WILDFIRES: OPPORTUNITIES TO PREVENT AND REVERSE ENVIRONMENTAL AND CLIMATE IMPACTS, FCEM REP. NO. 2 (2008). Some of these kinds of estimates are in dispute. Carl Smith, *Are Wildfires Offsetting Progress in Carbon Reduction?*, GOVERNING (Oct. 24, 2022), https://www.governing.com/next/are-wildfires-offsetting-progress-in-carbon-reduction [https://perma.cc/853H-UR9N].

83. Grayson Badgley, *Increasingly Active Wildfire Seasons Threaten the Sustainability of Forest-Backed Carbon Offset Programs*, 30 GLOB. CHANGE BIOLOGY, no. e17599 (2024); Grayson Badgley et al., *California's Forest Carbon Offsets Buffer Pool is Severely Undercapitalized*, 5 FRONTIERS FORESTS & GLOBAL CHANGE, no. 930426 (2022); Camilla Hodgson, *Wildfires Destroy Almost All Forest Carbon Offsets in 100-Year Reserve, Study Says*, FIN. TIMES (Aug. 5, 2022), https://www.ft.com/content/d54d5526-6f56-4c01-8207-7fa7e532fa09 [https://perma.cc/4UWP-ZHQE].

84. JAMES MACCARTHY ET AL., CANADA'S RECORD-BREAKING 2023 WILDFIRES RELEASED NEARLY 4 TIMES MORE CARBON THAN GLOBAL AVIATION (2024). *See also* Brendan Byrne et al., *Carbon Emissions From the 2023 Canadian Wildfires*, 633 NATURE 835 (2024).

been absorbing.[85] U.S. forests remain a net carbon sink, but that may change by mid-century.[86]

What is the magnitude of greenhouse gas emissions from wildfires?[87] The U.N. Framework Convention on Climate Change, which the U.S. Senate ratified in 1992, requires member states to report their greenhouse gas emissions.[88] The U.S. satisfies this requirement through a report periodically issued by the Environmental Protection Agency (EPA). The latest version of this report indicates that forest fires released 129.2 million metric tons (MMT) of $CO_2$ in the coterminous 48 states in 2022.[89] Roughly 15% of this was estimated to come from prescribed fires.[90] This is very small compared to U.S. emissions from fossil fuel consumption in 2022 (4,699 MMT).[91] (There is controversy, however, concerning the methodology for deriving the forest fire estimates.[92]) The 129.2 MMT of $CO_2$ emissions from wildfires

85. Barry Saxifrage, *Our Forests Have Reached a Tipping Point*, CAN.'S NAT'L OBSERVER (Aug. 21, 2023), https://www.nationalobserver.com/2023/08/21/analysis/our-forests-have-reached-tipping-point [https://perma.cc/K6MQ-3MUZ]. *Similarly,* Bailu Zhao et al., *North American Boreal Forests Are a Large Carbon Source Due to Wildfires From 1986 to 2016*, 11 SCI. REPS. 7723 (2021). *See also* David Wallace-Wells, *Forests Are No Longer Our Climate Friends*, N.Y. TIMES (Sept. 6, 2023), https://www.nytimes.com/2023/09/06/opinion/columnists/forest-fires-climate-change.html [On File with the Columbia Journal of Environmental Law]; Leyland Cecco, *Wildfires Turn Canada's Vast Forests from Carbon Sink into Super-Emitter*, GUARDIAN (Sept. 22, 2023), https://www.theguardian.com/world/2023/sep/22/canada-wildfires-forests-carbon-emissions [https://perma.cc/2L58-45XH].

86. U.S. FOREST SERV., FUTURE OF AMERICA'S FORESTS AND RANGELANDS: FOREST SERVICE 2020 RESOURCES PLANNING ACT ASSESSMENT 6-29 to 6-30 (2023), https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/2020-RPA-Assessment.pdf [On File with the Columbia Journal of Environmental Law]; Minho Kim, *Forests Are Losing Their Ability to Hold Carbon*, SCI. AM. (July 26, 2023), https://www.scientificamerican.com/article/forests-are-losing-their-ability-to-hold-carbon/ [https://perma.cc/JG9C-HAS7].

87. *See* N.L. Harris et al., *Attribution of Net Carbon Change by Disturbance Type Across Forest Lands of the Coterminous United States*, 11 CARBON BALANCE & MGMT., no. 24, 2016 (presenting calculations estimating carbon emissions from disturbances of U.S. forests, not limited to wildfires, and offsetting carbon absorption from regrowth).

88. United Nations Framework Convention on Climate Change art. 4 ¶ 1(a), May 9, 1992, S. Treaty Doc No. 102-38, 1771 U.N.T.S. 107.

89. ENV'T PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS, 1990-2022, at 6–32 (2024), https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf [https://perma.cc/77AZ-BEAA].

90. *Id.* at A-444.

91. *Id*. at ES-9. (figure ES-5).

92. The methodology for deriving the forest fire estimates is described in ENV'T PROT. AGENCY, *supra* note 89, at A-423 to A-424. It is based in part on IPCC guidelines. IPCC, 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES, VOL. 4, AGRICULTURE, FORESTRY AND OTHER LAND USE, at 4.21, https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html [https://perma.cc/5QD3-PDSW]. The controversy over the validity of these guidelines is discussed in Rosa Furneaux, *California's Battle Against Climate Change Is Going Up in Smoke*, MOTHER JONES (Dec. 11,

figure is not well known; it appears on page 444 of a 595-page volume of appendices, and it is not included in the nationwide GHG inventory totals. As Leehi Yona has written, "[b]ecause wildfire GHG emissions are unaccounted for, reducing them is not rewarded as climate mitigation, leading to adverse policy motivations."[93]

On a global basis, one study reports that wildfire carbon emissions were 9,248 million metric tons in 2023.[94] The same year, global carbon dioxide emissions from fossil fuel combustion were 36,800 million metric tons.[95]

It has been reported that an average wildfire season also contributes two-thirds of California's emissions of black carbon. This is a kind of particle—much larger than $PM_{2.5}$—that, while not a greenhouse gas, adds significantly to global warming when present in the lower atmosphere.[96] However, black carbon can have a cooling effect when it is in the stratosphere, and some wildfire smoke travels that far up. One study concluded that the combination of black carbon in the stratosphere and particles from volcanos had such a cooling effect "that the trend of the global mean surface temperature [between 2014

2018), https://www.motherjones.com/environment/2018/12/californias-battle-against-climate-change-is-going-up-in-smoke/ [On File with the Columbia Journal of Environmental Law]; *see also* Kevin R. Welch et al., *Predicting Conifer Establishment Post Wildfire in Mixed Conifer Forests of the North American Mediterranean-Climate Zone*, 7 ECOSPHERE, no. e01609 (2016). The National Academies of Science have launched a project to improve measurements of the GHG emissions from wildfires. NAT'L ACAD. OF SCIS., GREENHOUSE GAS EMISSIONS FROM WILDLAND FIRES: TOWARD IMPROVED MONITORING, MODELING, AND MANAGEMENT (2023), https://www.nationalacademies.org/our-work/greenhouse-gas-emissions-from-wildland-fires-toward-improved-monitoring-modeling-and-management-a-workshop [https://perma.cc/F5ZU-RFJ9]. Some countries, including Canada, exclude wildfires from their GHG reporting to the UN on the theory that burned forests will grow back and reabsorb the carbon lost in fires, though it takes many years for that to happen. James MacCarthy et al., *Extreme Wildfires in Canada and Their Contribution to Global Loss in Tree Cover and Carbon Emissions in 2023*, 30 GLOBAL CHANGE BIOLOGY, no. e17392 (2024); MATTHEW J. BRAMLEY, CANADA'S APPROACH TO FOREST CARBON QUANTIFICATION AND ACCOUNTING: KEY CONCERNS (2021).

93. Leehi Yona, *Emissions Omissions: Greenhouse Gas Accounting Gaps*, 49 HARV. ENV'T L. REV. (forthcoming 2025).

94. Crystal A. Kolden et al., *Wildfires in 2023*, 5 NATURE REVS. EARTH & ENV'T 238 (2024); e-mail from Matthew Jones, co-author of *Wildfires in 2023* (Aug. 28, 2014) (clarifying units of measurement) [On File with the Columbia Journal of Environmental Law].

95. GLOBAL CARBON PROJECT, FOSSIL CO2 EMISSIONS AT RECORD HIGH IN 2023 (2023), https://globalcarbonbudget.org/fossil-co2-emissions-at-record-high-in-2023/ [https://perma.cc/8EMP-EAK5].

96. FOREST CLIMATE ACTION TEAM, CALIFORNIA FOREST CARBON PLAN: MANAGING THE FOREST LANDSCAPES IN A CHANGING CLIMATE 23 (2018). *See also* Rajan K. Chakrabarty et al., *Shortwave Absorption by Wildfire Smoke Dominated by Dark Brown Carbon*, 16 NATURE GEOSCIENCE 683 (2023).

and 2022] would have been 24% larger without the stratospheric injections."[97]

Like so many environmental hazards, the dangers of wildfires and its smoke are not evenly distributed.[98] One study found that census tracts of communities that were majority Black, Hispanic, or Native American experience about 50% greater vulnerability to wildfire compared to other census tracts.[99] Another study, looking at data from 2004 to 2009 in the western U.S., found that the risk of hospital admission from respiratory problems from wildfire smoke was much higher for Black people than White people (21.7% vs. 6.9%) and for women than for men (10.4% vs. 3.7%).[100] Increases in the number of days of heavy smoke have been especially large "in communities characterized by racial or ethnic minority status, limited English proficiency, lower educational attainment, and crowded housing conditions."[101] People who must work outdoors, such as farmworkers, are

97. Pengfei Yu et al., *Radiative Forcing From the 2014-2022 Volcanic and Wildfire Injections*, 50 GEOPHYSICAL RSCH. LETTERS, no. e2023GL103791, at 1 (2023). It is unclear the extent to which the cooling effect of black carbon from wildfires offsets the warming effect of GHGs from wildfires. However, black carbon stays in the atmosphere for only a few days. Marianne T. Lund et al, *Short Black Carbon Lifetime Inferred from a Global Set of Aircraft Observations*, 1 NPJ CLIMATE & ATMOSPHERIC SCI., no. 31 (2018). Carbon dioxide in the atmosphere stays there for 300 to 1,000 years. ALAN BUIS, THE ATMOSPHERE: GETTING A HANDLE ON CARBON DIOXIDE (2019), https://science.nasa.gov/earth/climate-change/greenhouse-gases/the-atmosphere-getting-a-handle-on-carbon-dioxide/ [https://perma.cc/R83C-UEQ5].

98. Will Sharffenberger, *Environmental Justice Issues Surrounding California Wildfires*, 45 ENVIRONS ENV'T L. & POL'Y J. 261 (2022); *See*, U.S. GLOBAL CHANGE RSCH. PROGRAM, *supra* note 21, at 14-11 to 14-13.

99. Ian P. Davies et al., *The Unequal Vulnerability of Communities of Color to Wildfire*, 13 PLOS ONE, no. e0205825 (2018). *See also* Caitlyn Reilley et al., *Socially Vulnerable US Pacific Northwest Communities Are More Likely to Experience Wildfires*, 19 ENV'T RSCH. LETTERS, no. 094053 (2024); Ruwan Thilakaratne et al., *Wildfires and the Changing Landscape of Air Pollution-related Health Burden in California*, 207 AM. J. RESPIRATORY & CRITICAL CARE MED. 887 (2022); Shahir Masri et al., *Disproportionate Impacts of Wildfires among Elderly and Low-Income Communities in California from 2000-2020*, 18 INT'L J. ENV'T RSCH. & PUB. HEALTH 3921 (2021) (finding that census tracts in California that experienced wildfires from 2000 to 2020 had lower proportions of minority groups on average but higher Native American populations); Sharon A. Jones et al., *Wildfire Smoke, Environmental Justice, and Young Children in Urban Pacific Northwest Communities*, 50 URBAN CLIMATE 101581 (2023); Marissa L. Childs et al., *Daily Local-Level Estimates of Ambient Wildfire Smoke PM2.5 for the Contiguous US*, 56 ENV'T SCI. & TECH. 13607 (2022) (finding areas with predominantly Hispanic populations especially exposed to wildfire smoke); Sadia Afrin & Fernando Garcia-Menendez, *Potential Impacts of Prescribed Fire Smoke on Public Health and Socially Vulnerable Population in a Southeastern U.S. State*, 794 SCI. DIRECT 148712 (2021); Amber L. Kramer et al., *Environmental Justice Analysis of Wildfire-Related PM2.5 Exposure Using Low-Cost Sensors in California*, 856 SCI. TOTAL ENV'T 159218 (2023).

100. Jia Coco Liu, *Who Among the Elderly Is Most Vulnerable to Exposure to and Health Risks of Fine Particulate Matter From Wildfire Smoke?*, 186 AM. J. EPIDEMIOLOGY 730 (2017).

101. Jason Vargo et al., *Social Vulnerability in US Communities Affected by Wildfire Smoke, 2011 to 2021*, 113 AM. J. PUB. HEALTH 705 (2023).

also especially exposed to wildfire smoke,[102] which is often compounded by extreme heat;[103] these people are disproportionately Latino and tend to have low wages and poor housing and health care.[104] "Children under five are especially vulnerable to wildfire smoke inhalation as their organs are still developing and they breathe more air proportionally than adults," and children in low-income households are subject to greater smoke exposure because they are less likely than more affluent children to spend their time in homes and day care centers with air conditioning that filters out smoke.[105]

Wildfire smoke has many non-health impacts. It impairs visibility, which not only obscures scenic vistas but can also create hazardous driving conditions,[106] an especially serious matter when an area is being evacuated because of fire, and firefighting personnel are trying to enter.[107] Smoke disrupts many recreational activities, such as camping.[108] It also causes the cancellation of many airplane flights[109] and can create maintenance problems for aircraft that fly

102. Pranshu Verma et al., *Hazardous Air Quality from Wildfire Smoke Takes a Toll on Outdoor Workers*, WASH. POST (June 8, 2023), https://www.washingtonpost.com/climate-environment/2023/06/08/workers-outside-hazardous-air-quality-wildfire-smoke/ [On File with the Columbia Journal of Environmental Law].

103. KRISTINA DAHL & RACHEL LICKER, TOO HOT TO WORK: ASSESSING THE THREATS CLIMATE CHANGE POSES TO OUTDOOR WORKERS (2021), https://www.ucsusa.org/sites/default/files/2021-09/Too-Hot-to-Work_9-7.pdf [https://perma.cc/R54G-LL35].

104. Mary Prunicki, *Inequitable Health Impacts from Wildfire Smoke Increased by Danger Season*, EQUATION (Sept. 15, 2022), https://blog.ucs.org/science-blogger/inequitable-health-impacts-from-wildfire-smoke-increased-by-danger-season/ [https://perma.cc/SZ4L-WURU]; *Which Populations Experience Greater Risks of Adverse Health Effects Resulting from Wildfire Smoke Exposure?*, ENV'T PROT. AGENCY, https://www.epa.gov/wildfire-smoke-course/which-populations-experience-greater-risks-adverse-health-effects-resulting [https://perma.cc/M6JF-5364] (last updated Jan. 30, 2025).

105. Jones et al., *supra* note 99.

106. Stephen McCullers, *A Dangerous Servant and a Fearful Master: Why Florida's Prescribed Fire Statute should be Amended*, 65 FLA. L. REV. 587, 590–91 (2014) (describing traffic incident with multiple fatalities resulting from escaped prescribed fire and unusual weather conditions); Ferrara v. McCarter, 539 So. 2d 1247 (La. Ct. App. 1989) (finding that visibility impairment from wildfire contributed to traffic accident).

107. Paolo Intini et al., *Modelling the Impact of Wildfire Smoke on Driving Speed*, 80 INT'L J. DISASTER RISK REDUCTION 103211 (2022); GARY CURCIO ET AL., NAT'L WILDFIRE COORDINATING GRP., SMOKE AND ROADWAY SAFETY GUIDE (2020); Niklas Wetterberg et al., *Individual Driving Behavior in Wildfire Smoke*, 57 FIRE TECH. 1041 (2020). *See also* Jeva Lange, *Wildfire Traffic Jams Are Deadly. Can Anything Be done?*, HEATMAP DAILY (Aug. 31, 2023), https://mailchi.mp/heatmap/republicanferc1-6666271?e=6f4240b7b1 [https://perma.cc/UQS5-QB7C].

108. Jacob Gellman et al., *Wildfire, Smoke, and Outdoor Recreation in the Western United States* (Res. for the Future, Working Paper 21-22, 2021).

109. David Shepardson, *Wildfire Smoke from Canada Disrupts New York, Philadelphia Flights*, REUTERS (June 8, 2023), https://www.reuters.com/business/aerospace-defense/wildfire-smoke-canada-disrupts-new-york-flights-2023-06-07/ [On File with the Columbia Journal of Environmental Law].

through it.[110] Smoke also reduces the amount of power generated by solar panels.[111]

Wildfire smoke has economic impacts. It has been found to be associated with higher levels of household financial distress,[112] lower business for local establishments,[113] and lower rent prices.[114] One study found that wildfire smoke reduced U.S. workers' income by nearly 2% of U.S. annual labor income ($125 billion in 2018 dollars) per year on average.[115] One example of the negative economic impact of wildfire smoke is that in 2024 the Oregon wine industry sued the electric utility PacifiCorp for not turning off the power during a windstorm that, the suit alleges, contributed to fires whose smoke and soot damaged their grapes and reduced their harvests.[116]

110. Richard Scarbrough, *Aviation Maintenance in a Time of Wildfires*, FLYING (June 27, 2023), https://www.flyingmag.com/aviation-maintenance-in-a-time-of-wildfires/ [https://perma.cc/SWJ6-N3ZA].

111. Kimberley A. Corwin et al., *Solar Energy Resource Availability Under Extreme and Historical Wildfire Smoke Conditions*, 16 NATURE COMMC'NS, no. 245 (2025); Kelsey Misbrener, *Study Finds Wildfire Smoke Can Reduce Solar Panel Output by Nearly 50%*, SOLAR POWER WORLD (Aug. 22, 2023), https://www.solarpowerworldonline.com/2023/08/study-finds-wildfire-smoke-can-reduce-solar-panel-output-nearly-50-percent/ [https://perma.cc/2FH2-AVKZ]; Samuel D. Gilletly et al., *Evaluating the Impact of Wildfire Smoke on Solar Photovoltaic Production*, 348 APPLIED ENERGY 121303 (2023); A. J. Ali, *Development of a Quantification Method for the Impact of Wildfire Smoke on Photovoltaic Systems*, 2023 IEEE/IAS 59TH INDUS. AND COM. POWER SYS. TECH. CONF. (I&CPS), 1, 1–10 (2025); Gavin Maguire, *California Wildfires Dim Solar Generation During Power Demand Peak*, REUTERS (July 31, 2024), https://www.reuters.com/markets/commodities/california-wildfires-dim-solar-generation-during-power-demand-peak-2024-07-31/ [On File with the Columbia Journal of Environmental Law].

112. Xudong An et al., *Extreme Wildfires, Distant Air Pollution, and Household Financial Health* (Fed. Rsrv. Bank of Phila., Working Paper No. 24-1, 2024).

113. Jawad M. Addoum et al., Does Wildfire Smoke Choke Local Business? (Mar. 12, 2024) (unpublished manuscript) [On File with the Columbia Journal of Environmental Law].

114. Luis A. Lopez & Nitzan Tzur-Ilan, Air Pollution and Rent Prices: Evidence from Wildfire Smoke (Dec. 11, 2024) (unpublished manuscript) [On File with the Columbia Journal of Environmental Law].

115. MARK BORGSCHULTE ET AL., STANFORD INST. FOR ECON. POL'Y RSCH., WILDFIRES REVEAL THE LARGE TOLL OF AIR POLLUTION ON LABOR MARKET OUTCOMES 3 (2022), https://siepr.stanford.edu/publications/policy-brief/wildfires-reveal-large-toll-air-pollution-labor-market-outcomes [https://perma.cc/X5PC-H4Q3].

116. Claire Rush, *Oregon wineries, vineyards seek $100M from PacifiCorp for wildfire smoke damage to grapes*, BULLETIN (May 28, 2024), https://www.bendbulletin.com/localstate/state/oregon-wineries-vineyards-seek-100m-from-pacificorp-for-wildfire-smoke-damage-to-grapes/article_54cba2d8-93dc-552e-add5-8d7c70357f02.html [https://perma.cc/QC5A-8K8Q]. *See also* Sean P. Sullivan, *The Complex Science and Evolving Toll of Smoke Taint*, WINE ENTHUSIAST (May 8, 2023), https://www.wineenthusiast.com/culture/wine/wine-science-smoke-taint/ [On File with the Columbia Journal of Environmental Law]; London T. Weston, *Smoky Wine Variety: How Federal Crop Insurance Hinders Grape Growers Affected by Wildfire Smoke*, 9 TEX. A&M J. PROP. L. 391 (2023); Kelly Ball, *Smoky Grapes: Why the Risk of Smoke Exposure Should Modify Grape Contracts*, 11 KY. J. EQUINE AGRIC. & NAT. RES. L. 415 (2019).

Wildfire smoke is also known to have adverse effects on the health of whales,[117] birds, and other wildlife.[118]

## III. EVER-CHANGING FIRE SUPPRESSION POLICIES

While global warming results mostly from greenhouse gas emissions all around the world, distinct U.S. policies and laws have made wildfires and their smoke much worse in this country. This Part will discuss one set of them, the shifting policies and regulations on putting out or preventing fires. Subsequent parts will discuss other U.S. laws that have worsened wildfires or made it more difficult to fight them.

First, some prehistory. Wildfires (there wasn't any other kind) have been around for hundreds of millions of years, and they shaped the evolution of ecosystems and some species. For example, certain kinds of pine trees produce "serotinous" cones, meaning they are sealed shut by resin until fire melts the resin and releases the seed. Some beetles have heat-sensing organs to detect forest fires from miles away; then the beetles crawl toward the fires to lay their eggs in the just-burned trees.[119] Whereas today around five million acres burn annually in the U.S. in a typical year,[120] in the centuries before the Industrial Revolution the amount was more like 145 million acres (though there is a debate over how much was natural, mostly from

117. Kiah Lee et al., *Polycyclic aromatic hydrocarbon (PAH) source identification and a maternal transfer case study in threatened killer whales (Orcinus orca) of British Columbia, Canada*, 13 SCI. REPS. 22580 (2023).

118. O.V. Sanderfoot et al., *A review of the effects of wildlife smoke on the health and behavior of wildlife*, 16 ENV'T RSCH. LETTERS, no. 123003 (2021); Braelei Hardt, *How Does Wildlife Smoke Affect Wildlife?*, NWF BLOG (July 21, 2023), https://blog.nwf.org/2023/07/how-does-wildfire-smoke-affect-wildlife/ [https://perma.cc/7F3N-8RVL]; Starre Vartan, *How does wildfire smoke affect wildlife? Here's what we know*, NAT'L GEOGRAPHIC (Oct. 20, 2021), https://www.nationalgeographic.com/animals/article/how-does-wildfire-smoke-affect-wildlife? [https://perma.cc/65H8-QYQA]; Olivia V. Sanderfoot et al., *Hazardous wildfire smoke events can alter dawn soundscapes in dry forests of central and eastern Washington, United States*, 54 GLOBAL ECOLOGY & CONSERVATION, no. e03044 (2024) (finding fewer sounds from "acoustically active wildlife" detected during major smoke events).

119. Justin Gillis, *Let Forest Fires Burn? What the Black-Backed Woodpecker Knows*, N.Y. TIMES (Aug. 6, 2017), https://www.nytimes.com/2017/08/06/science/let-forest-fires-burn-what-the-black-backed-woodpecker-knows.html [On File with the Columbia Journal of Environmental Law].

120. *Total Wildland Fires and Acres (1983-2022)*, NAT'L INTERAGENCY FIRE CTR., https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html [https://perma.cc/8U27-YP7T] (last visited Feb. 3, 2025).

lightning, and how much was set by Native Americans for agriculture, hunting, warfare, and other purposes).[121]

The early European settlers (or, if you prefer, invaders) made much less use of fire than the peoples they displaced, but they did use fire to clear land for farming, make the soil more productive, and create buffers against wildfires.[122] Later, the threat of fires was worsened by the railroads, with their coal embers and sparking wheels. In the Organic Administration Act of 1897, Congress directed the Secretary of Agriculture to "make provisions for the protection against destruction by fire and depredations upon the public forests and national forests."[123] President Theodore Roosevelt created the U.S. Forest Service within the Department of Agriculture in 1905 and charged it with conserving timber resources and watersheds. Wildfires threaten both. As one study noted, "[b]eginning in the early 1900s, federal and state land management agencies prohibited the use of prescribed fire (known as 'light burning') and cultural burning."[124]

One of the worst wildfires in U.S. history hit in the dry summer of 1910. It burned three million acres in Idaho, Montana, and Washington, incinerated five towns, and blanketed the West in smoke. Legions of immigrants, convicts, African-American Buffalo soldiers, and others were hastily marshalled to fight the flames.[125] It was so horrific that after the fires died, the Forest Service declared a policy of trying to fight every fire in a national forest. It rejected the longstanding practice of occasional light burning, resisted calls for scientific studies to examine whether some fire might benefit forest health, and suppressed research that seemed to endorse the use of prescribed fire. "In 1926, the [Forest Service] developed its 10-acre policy—that all

121. STEPHEN J. PYNE, FIRE IN AMERICA: A CULTURAL HISTORY OF WILDLAND AND RURAL FIRE 71–83 (paperback ed. 1997); CHRISTINE A. KLEIN ET AL., NATURAL RESOURCES LAW: A PLACE-BASED BOOK OF PROBLEMS AND CASES 1068–69 (2d ed. 2009). *See also* Bill Leenhouts, *Assessment of Biomass Burning in the Coterminous United States*, 2 ECOLOGY & SOC'Y 1 (1998). For different numbers but still illustrating a disparity between modern and pre-industrial numbers, *see* Gillis, *supra* note 119.

122. Unless otherwise noted, the following six paragraphs are largely drawn from Robert B. Keiter, *The Law Of Fire: Reshaping Public Land Policy In An Era Of Ecology And Litigation*, 36 ENV'T L. 301 (2006); CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, CALIFORNIA'S STRATEGIC PLAN FOR EXPANDING THE USE OF BENEFICIAL FIRE (2022); Joshua C. Hyde et al., *Air quality policy and fire management responses addressing smoke from wildland fires in the United States and Australia*, 26 INT'L J. WILDLAND FIRE 347 (2017); and *U.S. Forest Service Fire Suppression*, FOREST HIST. SOC'Y, https://foresthistory.org/research-explore/us-forest-service-history/policy-and-law/fire-u-s-forest-service/u-s-forest-service-fire-suppression/ [https://perma.cc/3U4P-SNFE] (last visited Mar. 18, 2025).

123. 16 U.S.C. § 551(1897).

124. CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, *supra* note 122, at 7.

125. TIMOTHY EGAN, THE BIG BURN: TEDDY ROOSEVELT AND THE FIRE THAT SAVED AMERICA (2009).

wildfires should be controlled before they reached 10 acres in size."[126] Understaffing and inaccessibility made it impossible to do much with fires in remote areas until the mid-1930s, when the New Deal's Civilian Conservation Corps provided a large labor force to build roads into the backcountry and fight fires there. In 1935, after another set of large fires, the Forest Service announced its "10 a.m. policy," calling for the "fast, energetic and thorough suppression of all fires in all locations" by 10 a.m. the morning following detection.

Fighting fires took on military significance in World War II, when there was fear of fire attacks by Japan, first from submarines and then balloons. (The Japanese released into the jet stream nearly 9,000 balloons with thermite incendiary bombs; about 1,000 reached North America, but did little damage.) The U.S. adopted the theme "Careless Matches Aid the Axis" and issued posters showing the faces of Hitler and Hirohito in front of a forest fire with the caption, "Your Match, Their Secret Weapon: Prevent Forest Fires." Advertising agencies, working pro bono during the war, used the image of Bambi (who had survived a terrifying forest fire in the 1942 Disney film); but there were problems with the licensing of Bambi, so they created a new character—Smokey Bear. After the war, the Forest Service adopted Smokey's new slogan, "Remember, Only You Can Prevent Forest Fires."[127] (A search for Smokey Bear on YouTube reveals many iterations of this seemingly eternal character.)

To city dwellers, all fires must be extinguished. But in the 1960s a scientific consensus emerged that fighting all fires was actually bad for forests. Before humans, small natural fires had always cleared away the underbrush, deadwood, and other forest detritus. When people stopped fires as soon as they started, all this material—what foresters incisively call "fuel"—built up, and when it caught fire and couldn't be quenched right away, it got out of control and burned with much more intensity and destructiveness. In 1968, the National Park Service formally recognized fire as a critical ecological process and adopted a "let-burn" policy for some wildfires contained within parks, and a 1971 symposium organized by the Forest Service led to a policy shift that allowed some wildfires to burn within wilderness areas. The Forest Service dropped the 10 a.m. policy and made greater use of prescribed fires—blazes that were intentionally set, and hopefully

126. ROSS W. GORTE & KELSI BRACMORT, CONG. RSCH. SERV., RL30755, FOREST FIRE/WILDFIRE PROTECTION 2 (2012).

127. PYNE, *supra* note 121, at 175–77, 395–97.

confined—where natural fires had not done the job of clearing away the fuel.

The pendulum swung again toward fighting all fires in 1988, when a drought led to a conflagration in Yellowstone National Park that burned more than 1.5 million acres. Screaming headlines and politicians followed, and both the Forest Service and the Park Service suspended their prescribed fire policies. Fewer fires were set, more natural fires were put out, and, of course, forest fuel built up again.

During the presidency of Bill Clinton (1993-2001), prescribed fires came back. The Forest Service deemphasized Smokey Bear, and an organization of environmentally-minded Forest Service employees introduced Reddy Squirrel and her message, "Fire happens, be ready."[128] In an effort to protect untouched forest areas, just a few days before President Clinton left office, the Forest Service adopted the "Roadless Rule," which prohibited road building and logging in 58.5 million acres, preserving them for possible later designation as untouchable under the Wilderness Act of 1964. Legally, prescribed fires may be started and wildfires may be fought in roadless and wilderness areas, but they usually aren't; these areas are typically just left alone to let nature take its course.[129]

Another reason not to fight every fire is that it's dangerous work. In a typical year, roughly ten firefighters die fighting wildfires in the U.S.,[130] and they are at high risk of lung cancer and cardiovascular disease mortality as a result of prolonged smoke exposure.[131] One Wyoming fire marshal declared some developments "suicide subdivisions" and gave public notice that firefighter safety will not be risked to defend the homes in case of a wildfire.[132]

Some states were unhappy that the Forest Service was not cutting down more trees as a way to block fires. New Mexico argued that the U.S. had "forfeited jurisdictional supremacy" and that the state could

128. KLEIN, *supra* note 121, at 1120.

129. GREG APLIET & PAUL SPITLER, WILDERNESS SOC'Y, WILDFIRE AND WILDNESS: A BRIEF PRIMER (2014), https://nmwild.org/images/our-work/pecos/TWSWildernessFireFactSheet2014.pdf [https://perma.cc/S77A-3V38].

130. Kelsey G. Glover et al., *Wildland Firefighters Suffer Increasing Risk of Job-Related Death*, 45 J. BURN CARE & RSCH, no. irae036.103 (2024) (finding that 96 firefighters died fighting wildfires in the 10 year period 2013–2022).

131. Kathleen M. Navarro, *Wildland firefighter smoke exposure and risk of lung cancer and cardiovascular disease mortality*, 173 ENV'T RSCH. 462 (2019).

132. HEADWATERS ECON., REDUCING WILDFIRE RISKS TO COMMUNITIES (2014). Similarly, *see* Fernanda Santos, *A Fire-Scorched Arizona Pushes Prevention: Step 1, Clean Your Yard*, N.Y. TIMES (June 30, 2017), https://www.nytimes.com/2017/06/30/us/arizona-wildfire-prevention.html [On File with the Columbia Journal of Environmental Law].

go onto the national forest and cut trees itself. A federal court disagreed, finding that the Property Clause of the Constitution grants Congress, not the states, control over federal lands.[133]

On July 27, 1995, Congress passed a major spending bill that included what has come to be known as the Salvage Logging Rider. It made it more difficult, for a limited period of time, to use the environmental laws to restrain logging. President Clinton initially vetoed the bill, stating that "suspending all the environmental laws of the country for three years is not an appropriate way" to log the national forests. A few weeks later, however, President Clinton signed the bill.[134]

The forest industry found a new friend in President George W. Bush when he took office in 2001. In 2003, he signed the Healthy Forests Restoration Act, which made it harder to use the environmental laws and other administrative and judicial processes to fight mechanical thinning and salvage logging. The courts have held that this law sometimes authorizes clearcutting when needed, for example, to deal with a mountain pine beetle infestation.[135] The Bush administration tried to revoke the Roadless Rule and replace it with something weaker, but lost in court.[136]

The 2003 statute set up a process for counties to draft and adopt Community Wildfire Protection Plans with the help of federal planning money.[137] These plans identify and map areas at risk of fire, and then provide rules or incentives to deal with these risks. They can become integrated into hazard mitigation plans, which the Federal Emergency Management Agency (FEMA) requires before releasing certain financial assistance.

The way firefighting on federal lands was paid for created real difficulties. Congress set the budget for wildland fire suppression based on prior spending. That was fine when the costs were predictable and

133. United States v. Bd. of Cnty. Comm'rs of Otero, 184 F. Supp. 3d 1097 (D.N.M. 2015).

134. Trilby C.E. Dorn, *Logging Without Laws: The 1995 Salvage Logging Rider Radically Changes Policy and the Rule of Law in the Forests*, 9 TUL. ENV'T L. REV. 447, 463 (1996). *See also* HANSON, *supra* note 79, at 5–6.

135. Decker v. U.S. Forest Serv., 780 F. Supp. 2d 1170 (D. Colo. 2011).

136. Wyoming v. U.S. Dep't of Agric., 661 F.3d 1209 (10th Cir. 2011), *cert. denied*, 568 U.S. 928 (2012). The prior and subsequent history of the Roadless Rule is discussed in Natalie Bishop, *On the 'Road' Again: The 'Roadless Rule' Saga, the Tongass National Forest Exemption, and the Future of State-Specific Roadless Rules*, 73 ADMIN. L. REV. 421 (2021).

137. Stephen R. Miller, *Planning for Wildfire in the Wildland-Urban Interface: A Guide for Western Communities*, 49 URB. L. 207 (2017); Myles Conway, *Expanding wildfire planning efforts to address rising temperature*s, MARTEN LAW LLP (Aug. 21, 2018), https://www.lexology.com/library/detail.aspx?g=87f6e6fc-22c3-49b8-90d3-c4c807f7801b [https://perma.cc/QEB4-ADR2].

stable. However, in a warmer world with the continuing build-up of fuels and more people living in or near forests, the costs of fighting fires increased, and the Forest Service had to take money from its other programs in order to fight fires. Some years, around 80% of the Forest Service's budget has gone to firefighting, some of it at the expense of programs such as forest thinning to reduce the risk of unwanted wildfires; there is no dedicated budget line for managed fires.[138] Most of this firefighting money is spent on private contractors in what some have called the "fire industrial complex," whose members have a great incentive to fight fires rather than prevent them.[139] As a further step toward privatization, some insurance companies hire private firefighting companies to go save their clients' houses but let the others burn.[140]

In October 2009, President Barack Obama signed the Federal Land Assistance, Management and Enhancement Act (FLAME) to create a more sustainable funding mechanism.[141] The funding process was further modified by budget and appropriations legislation signed by President Donald Trump in 2018 that created a disaster fund to help pay for the most expensive fire seasons without taking away money from other programs. It also created new exemptions from the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA); in the view of one commentator, these "could provide a backdoor to large-scale logging projects across millions of acres without addressing the issues of fire risk or forest health."[142]

On August 6, 2018, President Trump tweeted, "California wildfires are being magnified & made so much worse by the bad environmental laws which aren't allowing massive amount of readily available water to be properly utilized. It is being diverted into the Pacific Ocean. Must also tree clear to stop fire spreading!"[143] A few days later Ryan

138. LISA DALE & KIMIKO BARRETT, HEADWATERS ECON. & COLUMBIA CLIMATE SCH., MISSING THE MARK: EFFECTIVENESS AND FUNDING IN COMMUNITY WILDFIRE RISK REDUCTION 10, 12 (2023), https://headwaterseconomics.org/wp-content/uploads/HE_2023_Missing-the-Mark-Wildfire.pdf [https://perma.cc/4XFG-LSTX]; Stephanie M. Regenold & Matthew L. Rojas, *Money to Burn: Investing in Proactive Fire Management*, 33 NAT. RES. & ENV'T, Winter 2019, at 12.

139. TIMOTHY INGALSBEE, FIREFIGHTERS UNITED FOR SAFETY, ETHICS & ECOLOGY, GETTING BURNED: A TAXPAYER'S GUIDE TO WILDFIRE SUPPRESSION COSTS 15 (2010).

140. MCKENZIE FUNK, WINDFALL: THE BOOMING BUSINESS OF GLOBAL WARMING 102–07 (2014).

141. W. Wallace Covington & Diane Vosick, *Restoring The Sustainability Of Frequent-Fire Forests Of The Rocky Mountain West*, 48 ARIZ. ST. L.J. 11 (2016).

142. RYAN RICHARDS, CTR. FOR AM. PROGRESS, DEFINING SUCCESS FOR THE WILDFIRE FUNDING FIX (2018).

143. John D. Sutter, *Trump's 'ridiculous' tweet about California wildfires*, CNN (Aug. 8, 2018), https://www.cnn.com/2018/08/07/health/trump-tweet-california-wildfire-water-invs/index.html [https://perma.cc/UP2M-C44E].

Zinke, the Secretary of the Interior, told Breitbart News that "environmental terrorist groups" are preventing the government from managing forests. In a different interview, he said, "This has nothing to do with climate change. This has to do with active forest management."[144] As many experts quickly pointed out, the part about water being diverted is false; the water diversion is not affecting firefighting.[145] And the disavowal of climate change is also false.

President Trump followed up by issuing an executive order with the stated purpose of reducing wildfire risk, but that served to make it easier to engage in logging.[146] Environmental experts quickly criticized the order as being ineffective—if not counterproductive—in combatting wildfires, and as favoring Republican donors in the forestry industry.[147] Consistent with the order, the Forest Service issued a rule allowing the logging of old-growth forests in the Pacific Northwest and making it easier to mine and build roads on Forest Service lands.[148] This order was challenged in the U.S. District Court in Oregon. The court found that the Forest Service had violated NEPA, the ESA, and the National Forest Management Act (NFMA) in taking this

144. Erin B. Logan, *Ryan Zinke blames 'environmental terrorist groups' for severity of California wildfires,* WASH. POST (Aug. 15, 2018), https://www.washingtonpost.com/nation/2018/08/15/ryan-zinke-blames-california-wildfires-environmental-terrorist-groups/ [On File with the Columbia Journal of Environmental Law].

145. Lisa Friedman, *Trump Inaccurately Claims California Is Wasting Water as Fires Burn*, N.Y. TIMES (Aug. 6, 2018), https://www.nytimes.com/2018/08/06/climate/trump-california-fire-tweets.html [On File with the Columbia Journal of Environmental Law]. For discussion of his false statements about forest management, *see* Kendra Pierre-Louis, *Trump's Misleading Claims About California's Fire 'Mismanagement*,' N.Y. TIMES (Oct. 13, 2018), https://www.nytimes.com/2018/11/12/us/politics/fact-check-trump-california-fire-tweet.html [On File with the Columbia Journal of Environmental Law].

146. Exec. Order No. 13855, 84 Fed. Reg. 45 (Dec. 21, 2018).

147. Mark Hand, *Trump ignores climate change, offers handouts to timber industry in wildfire executive order*, THINK PROGRESS (Dec. 24, 2018), https://archive.thinkprogress.org/trump-ignores-climate-change-offers-handouts-to-timber-industry-in-wildfire-executive-order-65a4dbc382fe/ [https://perma.cc/ENM2-WGKE]; Darryl Fears & Juliet Eilperin, *Trump's executive order will aggressively cut more forest trees*, WASH. POST (Jan. 14, 2019), https://www.washingtonpost.com/energy-environment/2019/01/14/trumps-executive-order-will-cut-more-forest-trees-some-publics-tools-stop-it/ [On File with the Columbia Journal of Environmental Law]; Alex Kotch, *America's Biggest Wildfire Profiteer Is Major Donor to Republicans Whose Policies Benefit His Business*, SLUDGE (Dec. 6, 2018), https://readsludge.com/2018/12/06/americas-biggest-wildfire-profiteer-is-major-donor-to-republicans-whose-policies-benefit-his-business/ [https://perma.cc/2ABC-YNR5].

148. Dino Grandoni, *The Energy 202: Trump administration seeks to ease way for logging, fire prevention in national forests*, WASH. POST (June 13, 2019), https://www.washingtonpost.com/news/powerpost/paloma/the-energy-202/2019/06/13/the-energy-202-trump-administration-seeks-to-ease-way-for-logging-fire-prevention-in-national-forests/5d012e461ad2e55f2de7c0a7/ [On File with the Columbia Journal of Environmental Law].

action without, among other things, preparation of an environmental impact statement.[149]

Under President Joseph Biden, EPA, the Departments of Interior and Agriculture, and the Centers for Disease Control and Prevention (CDC) agreed to work together to improve land management practices to reduce wildfire risk.[150] The Bipartisan Infrastructure Law of 2021 included $3.5 billion to the Forest Service and $1.5 billion to the National Park Service over five years for wildfire preparedness, fuels management, post-fire restoration, and fire science.[151]

Project 2025, a Heritage Foundation report that many look to as roadmap for likely actions in the second Trump administration, expresses skepticism about prescribed burning and advocates mechanical thinning and increased timber sales as the preferred methods to control wildfires, as well as reducing the obstacles posed by NEPA and the ESA.[152] Thus, as this is written in early 2025, significant changes in federal wildfire policy are anticipated.[153]

## IV. PRESCRIBED FIRE: THE PRINCIPAL SOLUTION

Most people's immediate reaction to wildfires is that we should put them out. That is what we try to do when a building catches fire. However, it has become clear that suppressing fires as the major strategy no longer works for wildfires, if it ever did. As one study noted,

149. Greater Hells Canyon v. Wilkes, No. 22-cv-00859-HL (D. Or. Mar. 29, 2024) (order adopting findings & recommendation).

150. *Biden-Harris Administration Agencies Sign Interagency Agreement to Address Wildfire Risk and Protect Communities From Smoke,* U.S. DEP'T OF AGRIC. (Nov. 9, 2023), https://www.usda.gov/about-usda/news/press-releases/2023/11/09/biden-harris-administration-agencies-sign-interagency-agreement-address-wildfire-risk-and-protect [https://perma.cc/FG8N-LR2C].

151. *How the Bipartisan Infrastructure Law Impacts Wildland Fire,* NAT'L PARK SERV., https://www.nps.gov/subjects/fire/bipartisan-infrastructure-law.htm [https://perma.cc/76H9-LKM4] (last visited Feb. 9, 2025); Alyssa Lukpat, *Biden Administration Announces Plan to Spend Billions to Prevent Wildfires*, N.Y. TIMES (Jan. 19, 2022), https://www.nytimes.com/2022/01/19/climate/biden-administration-wildfire-plan.html [On File with the Columbia Journal of Environmental Law]; *Fact Sheet: The Biden-Harris Administration Continues Efforts to Address Growing Wildfire Threat*, WHITE HOUSE (July 28, 2022), https://bidenwhitehouse.archives.gov/briefing-room/statements-releases/2022/07/28/fact-sheet-the-biden-harris-administration-continues-efforts-to-address-growing-wildfire-threat/ [https://perma.cc/4SHP-2BHW].

152. HERITAGE FOUND., 2025 MANDATE FOR LEADERSHIP: THE CONSERVATIVE PROMISE 308 (2023), https://static.project2025.org/2025_MandateForLeadership_FULL.pdf [https://perma.cc/4KF5-PHT2].

153. Peter Slevin, *The Felling of the U.S. Forest System*, NEW YORKER (Mar. 13, 2025), https://www.newyorker.com/news/the-lede/the-felling-of-the-us-forest-service [https://perma.cc/3XEX-V9UR].

"This is the wildfire paradox: Wildfire suppression, effective 95% to 98% of the time, inevitably leads to ecologically significant wildfires with higher intensities and rapid growth that are unable to be suppressed."[154] One 2021 study from the Stanford Woods Institute for the Environment concluded, "there is no way for CalFire [the California Department of Forestry and Fire Protection] in combination with local and federal firefighting agencies to firefight the state out of this crisis." The state spent more than $3.6 billion fighting fires in 2020, "[b]ut it's not at all clear that doubling or tripling the fire suppression outlay would lead to better outcomes for California communities." Moreover, that study found, "the most destructive fires in terms of loss of life, property destruction, and smoke impacts, often occur during weather conditions where fire suppression is largely or even totally ineffective."[155]

Trying to suppress all wildfires is not natural. As discussed above, forests developed over the centuries with frequent, mostly small fires ignited by lightning. The dominant tree species and other vegetation naturally adapted to these fires, and some actually require fire in order to thrive. When fires are suppressed and these natural processes do not occur, the mix of tree species changes; for example, healthy oak woodlands need fire every three to fifteen years to thrive. Without fire, trees like Douglas fir, bay laurel, and madrone can quickly overtake the oak.[156]

Mechanical fuels treatment—sending in workers to physically remove dead trees and other fuel—is very expensive, requiring large amounts of personnel and equipment, and in some cases can actually increase fire frequency or intensity.[157] There is some use of "fire

154. David E. Calkin et al., *How risk management can prevent future wildfire disasters in the wildland-urban interface*, 111 PROC. NAT'L ACAD. SCI. 746 (2013) (citations omitted).

155. MICHAEL WARA, STANFORD WOODS INST. FOR THE ENV'T, A NEW STRATEGY FOR ADDRESSING THE WILDFIRE EPIDEMIC IN CALIFORNIA 1 (2021), https://woodsinstitute.stanford.edu/system/files/publications/New_Strategy_Wildfire_Epidemic_Whitepaper_1.pdf [https://perma.cc/G3UX-ATEL].

156. Mukta Patil, *Living with Fire*, BAY NATURE (June 23, 2021), https://baynature.org/article/living-with-fire-in-california/ [https://perma.cc/39L2-EJDZ].

157. William Boyd, *Climate Liability for Wildfire Emissions from Federal Forests*, 48 ECOLOGY L.Q. 981, 1003–04 (2021); Dana Mitchell & Mathew Smidt, *Costs of Mechanical Fuel Reduction Treatments*, *in* ENCYCLOPEDIA OF WILDFIRES AND WILDLAND-URBAN INTERFACE (WUI) FIRES (S.L. Manzello ed., 2019), https://www.srs.fs.usda.gov/pubs/ja/2019/ja_2019_mitchell_003.pdf [On File with the Columbia Journal of Environmental Law]; Sara Elizabeth Jensen, *Policy Tools for Wildland Fire Management: Principles, Incentives and Conflicts*, 46 NAT. RES. J. 959, 974–75 (2006).

flocks"—flocks of goats and sheep that are released into forest and eat some of the fuel—but this may not be practical at scale.[158]

An expert consensus has emerged that one major way to address wildfires is through prescribed burning—the frequent planned setting of small fires that will clear away the fuel: underbrush, dead trees, and other highly flammable vegetation. Numerous reports have reached this conclusion,[159] though there are arguments about the details of some programs,[160] and a few commentators disagree.[161] Prescribed fires are much cheaper than mechanical fuels treatment, allow for treatment in remote locations or in rough terrain where other treatment methods are not practical, and can ecologically benefit species that have adapted to fire-prone conditions.[162] As one ecologist wrote:

> Forest thinning should not be conflated with prescribed burning, which can temporarily reduce the intensity of a potential fire and will slow down its approach. Prescribed fire usually kills less than 5 percent of the mature trees in a forest canopy. The important thing is that the trees stay in the forest, even if they burn. Charred wood is a valuable habitat for woodpeckers and other cavity-nesting birds

158. Sergi Nuss-Girona et al., *Fire Flocks: Participating Farmers' Perceptions after Five Years of Development*, 11 LAND 1718 (2022).

159. *E.g.*, Xiao Wu et al., *Low-intensity fires mitigate the risk of high-intensity wildfires in California's forests,* 9 SCI. ADVANCES, no. eadi4123 (2023); Crystal A. Kolden, *We're Not Doing Enough Prescribed Fire in the Western United States to Mitigate Wildfire Risk*, 2 FIRE 30 (2019); U.N. ENV'T PROGRAMME, *supra* note 19, at 12; CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, CALIFORNIA'S STRATEGIC PLAN FOR EXPANDING THE USE OF BENEFICIAL FIRE 3, 6 (2022), https://wildfiretaskforce.org/wp-content/uploads/2022/05/californias-strategic-plan-for-expanding-the-use-of-beneficial-fire.pdf [On File with the Columbia Journal of Environmental Law]; NAT'L WILDFIRE COORDINATING GRP., NWCG SMOKE MANAGEMENT GUIDE FOR PRESCRIBED FIRE 12 (2020), https://fs-prod-nwcg.s3.us-gov-west-1.amazonaws.com/s3fs-public/publication/pms420-3.pdf [On File with the Columbia Journal of Environmental Law]; Winston Choi-Schagrin, *Wildfires Are Intensifying. Here's Why, and What Can Be Done.*, N.Y. TIMES (July 16, 2021), https://www.nytimes.com/2021/07/16/climate/wildfires-smoke-safety-questions.html [On File with the Columbia Journal of Environmental Law]; Felicity Barringer, *Gaining in Public Acceptance, Can Prescribed Fires Head Off Devastating Wildfires?*, BILL LANE CTR. FOR THE AM. WEST (July 18, 2019), https://andthewest.stanford.edu/2019/gaining-in-public-acceptance-can-prescribed-fires-head-off-devastating-wildfires/ [https://perma.cc/ZVF8-YTGY]; Kate Selig, *In California, Controlled Fires Can Save Homes. Why Aren't More Happening?*, N.Y. TIMES (Sept. 7, 2024), https://www.nytimes.com/2024/09/07/us/california-controlled-fire.html [On File with the Columbia Journal of Environmental Law].

160. Joshua Emerson Smith, *Newsom's $1-billion wildfire plan favors logging over homeowners, critics say*, L.A. TIMES (May 2, 2021), https://www.latimes.com/environment/story/2021-04-30/newsom-california-wildfire-plan [https://perma.cc/EM3N-TPEN].

161. *E.g.*, CHAD T. HANSON, SMOKESCREEN: DEBUNKING WILDFIRE MYTHS TO SAVE OUR FORESTS AND OUR CLIMATE 52–59 (2021).

162. Brendan Barbara, *The Need for Reform in Forest Service Wildfire Discretion*, 34 COLO. NAT. RES. ENERGY & ENV'T L. REV. 327, 337 (2023).

> and mammals as well as the plants and insects that sustain them. Fire unlocks nutrients from leaves and pine needles and enhances a forest's carbon sequestration and storage. In a fire, just 1 to 2 percent of the tree's carbon is consumed and emitted. Logging is the real carbon bomb, because most of the carbon ends up in the atmosphere.[163]

Prescribed fires also improve the food supply and other habitat characteristics for several species of mammals (such as deer and bighorn sheep) and birds (such as bobwhite quail and wild turkey),[164] and have numerous other ecological benefits.[165] On the other hand, prescribed burns can only be performed during certain weather and heat conditions, making it harder to find safe windows for the burning than mechanical treatment, which faces fewer constraints.

California's plan for prescribed burns found, "[f]ire suppression will continue to be critical to protect communities and infrastructure in the wildland urban interface and more urbanized landscapes. The active use of fire, however, is also among the most important tools for safety of our communities. Restoring fire as a keystone natural process . . . will re-establish ecological resilience and better protect communities and public health."[166] The U.S. Forest Service has adopted a similar policy.[167] In 2022, the Forest Service announced a ten-year strategy to treat up to an additional 20 million acres on National Forest System Lands, and up to an additional 30 million acres of other Federal, State, Tribal and private lands.[168] In recent years the Forest Service has been treating around 800,000 acres a year.[169]

The states retain control over non-federal lands, and some state agencies are taking steps to make it easier to conduct prescribed

163. Chad Hanson, *Logging in disguise: How forest thinning is making wildfires worse*, GRIST (Aug. 24, 2021), https://grist.org/fix/opinion/forest-thinning-logging-makes-wildfires-worse/ [https://perma.cc/Z2PL-N662].

164. NAT'L WILDFIRE COORDINATING GRP., *supra* note 159, at 13.

165. Ben Richmond, *Beyond the Exceptional Events Rule: How the Local Implementation of Air Quality Regulations Affects Wildfire Air Policy*, 46 ECOLOGY L.Q. 343, 347–48 (2019); Scott L. Stephens et al., *Forest restoration and fuels reduction work: Different pathways for achieving success in the Sierra Nevada*, 34 ECOLOGICAL APPLICATIONS, no. e2932 (2023).

166. CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, *supra* note 159, at 6.

167. U.S. FOREST SERV., NATIONAL PRESCRIBED FIRE RESOURCE MOBILIZATION STRATEGY (2023), https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/Rx-Fire-Strategy.pdf [On File with the Columbia Journal of Environmental Law].

168. U.S. FOREST SERV., WILDFIRE CRISIS STRATEGY 5 (2022), https://www.fs.usda.gov/sites/default/files/Confronting-Wildfire-Crisis.pdf [On File with the Columbia Journal of Environmental Law].

169. U.S. FOREST SERV., CONFRONTING THE WILDFIRE CRISIS: MAKING A DIFFERENCE 3 (2025), https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/WCS-making-difference.pdf [On File with the Columbia Journal of Environmental Law].

burns in their territories.[170] California has adopted a goal of reducing fuels on one million acres per year. One study, using conservative assumptions, found that meeting this goal would annually cost $3 billion but would confer a benefit of $10.9 billion.[171] An online dashboard maintained by the state shows that acres treated in 2023 were almost exactly at the goal; acres in 2021 and 2022 were somewhat below.[172]

While there seems to be too little prescribed fire in most of the United States, one exception is the southeastern states, which have engaged in large-scale prescribed burning since at least the mid-twentieth century, and which between 1998 and 2018 had over twice the amount of prescribed fire as the rest of the country combined.[173] This has been identified as one of the reasons why these states have experienced far fewer wildfire disasters than the western U.S.[174] Residents in the southeastern states "are more accustomed to using controlled fire to enhance timber production, control the rapidly growing vegetation, and enhance game species habitat."[175] Another reason for fewer wildfire disasters is that the southeastern states are wetter and more humid than the rest of the continental United States.[176]

Prescribed fires do generate smoke, but it has substantially fewer negative impacts than wildfire smoke. Prescribed fires typically create far lower concentrations of $PM_{2.5}$ and other air pollutants than wildfires.[177] They are planned and managed to take place when

170. *See* Seyed Sadredin, *Devastating Health Impacts Associated With Air Pollution From Wildfires and Potential Actions by the District Aimed at Reducing the Number and Intensity of Wildfires in the Future*, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DIST. (Nov. 19, 2015), http://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2015/November/final/09.pdf [https://perma.cc/2N2M-T8D3].

171. PATRICK T. BROWN, BREAKTHROUGH INST., COST-EFFECTIVENESS OF LARGE-SCALE FUEL REDUCTION FOR WILDFIRE MITIGATION IN CALIFORNIA 2 (2024), https://thebreakthrough.imgix.net/Cost-Effectiveness-of-Large-Scale-Fuel-Reduction-for-Wildfire-Mitigation-in-California_v3-1.pdf [https://perma.cc/622B-5UU7].

172. *Interagency Treatment Dashboard,* CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, https://interagencytrackingsystem.org/ [https://perma.cc/2CF2-G9YG] (last visited Dec. 15, 2024). The figures displayed were 818,525 acres in 2021 (the first year displayed); 854,591 acres in 2022; and 1,058,306 acres in 2023.

173. WILLIAM BOYD, THE SLAIN WOOD: PAPERMAKING AND ITS ENVIRONMENTAL CONSEQUENCES IN THE AMERICAN SOUTH 29 (2015).

174. Kolden, *supra* note 159, at 6.

175. *Id*. at 7.

176. U.S. GLOBAL CHANGE RSCH. PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES 2009 REPORT, SOUTHEAST (2009), https://nca2009.globalchange.gov/southeast/index.html [https://perma.cc/VAP4-LHYW].

177. Kathleen M. Navarro et al., *A Review of Community Smoke Exposure from Wildfire Compared to Prescribed Fire in the United States*, 9 ATMOSPHERE 185 (2018); S.J. Kramer et al.,

weather conditions are favorable, such as when winds would blow smoke away from population centers. Nearby communities can be notified in advance, making it easier for residents to minimize the impacts. These fires do not burn buildings and other structures that may have toxic chemicals. Fire professionals have identified several other techniques to minimize the smoke.[178]

The true masters of planned burning are the Native American tribes. They have been doing it for thousands of years to recycle nutrients, manage plant and wildlife habitat, provide community protection, control insects and disease, and engage in cultural and spiritual practices.[179] They understand how fire interacts with their environment, for example, how wind would spread fire down a particular hillside.[180] European settlers halted these practices in many places, sometimes violently; stopped the regular burning; and began altering the landscape in ways that increased fire risks, such as overgrazing and removing fire-resistant old growth forests for the logs and then using that land for grazing and planting.[181] Some of these traditional tribal efforts have continued, however.[182] One bit of evidence of their

*Projected smoke impacts from increased prescribed fire activity in California's high wildfire risk landscape*, 311 ATMOSPHERIC ENV'T 119993 (2023); Mary Prunicki et al., *The impact of prescribed fire versus wildfire on the immune and cardiovascular systems of children*, 74 ALLERGY 1989 (2019); Jonathan W. Long et al., *Aligning Smoke Management with Ecological and Public Health Goals*, 116 J. FORESTRY 76, 80 (2017); NAT'L WILDFIRE COORDINATING GRP., *supra* note 159, at 8. *But see* Nicolas Borchers-Arriagada et al., *Smoke health costs and the calculus for wildfires fuel management: a modelling study*, 5 LANCET-PLANETARY HEALTH 608 (2021) (finding prescribed burns produce more $PM_{2.5}$ per hectare than wildfire smoke). *See also* Benjamin A. Jones et al., *More smoke today for less smoke tomorrow? We need to better understand the public health benefits and costs of prescribed fire*, 31 INT'L J. WILDLAND FIRE 918 (2022).

178. NAT'L WILDFIRE COORDINATING GRP., *supra* note 159, at 146–63. Some of these techniques include burning fewer acres, burning when fuels have a higher fuel moisture content, removing fuels before ignition, and shifting combustion from the smoldering phase to the flaming phase.

179. CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, *supra* note 159, at 7, 27–30. Indigenous peoples in South America and Africa have also long often used their own fire management techniques. Imogen Saunders, *International Disaster Relief Law and Article 38(1)(c) of the Statute of the International Court of Justice: The Forgotten Source of International Law*, *in* THE INTERNATIONAL LAW OF DISASTER RELIEF 29, 42 (David D. Caron ed., 2014).

180. Jill Cowan, *Alarmed by Wildfires, Officials Turn to Tribes for Help*, N.Y. TIMES (Oct. 8, 2020), https://www.nytimes.com/2020/10/07/us/native-american-burning-practices-california.html [On File with the Columbia Journal of Environmental Law]; Robyn Schelenz, *How the Indigenous practice of 'good fire' can help our forests thrive*, UNIV. OF CAL. (Apr. 6, 2022), https://www.universityofcalifornia.edu/news/how-indigenous-practice-good-fire-can-help-our-forests-thrive [https://perma.cc/YU4W-W8HL].

181. William P. Edwards, *The New Normal: Living with Wildland Fire,* NAT. RES. & ENV'T, Winter 2019, at 30, 33.

182. It is not only Native Americans who developed these practices; so did the aboriginal people of Australia. Alexis Wright, *Want to Stop Australia's Fires? Listen to Aboriginal People*, N.Y.

effectiveness occurred in 2011, when the Wallow Fire became the worst in Arizona history. The fire would have been even worse but for the longstanding efforts of the White Mountain Apache Tribe in managing their forest, including burning underbrush, clearing younger trees and logging larger trees, all of which slowed the spread of the fire.[183] The tribal manager said that a key to success is that the tribe is "unhindered by environmental litigation and drawn-out federal government processes."[184] Similarly, traditional forestry techniques used by the Westbank First Nation in British Columbia helped save a town from an incoming wildfire in 2023.[185] One study found that fire suppression on tribal lands (though not necessarily using indigenous techniques) had a benefit-cost ratio of greater than 4.5.[186]

Today some forest managers are beginning to mimic the tribal practices. California's wildfire plans say that the "state and its partners will support expansion of cultural burning, and seek to better integrate tribal organizations and cultural fire practitioners into public agency prescribed fire projects and programs."[187] Nonetheless, several legal and bureaucratic obstacles inhibit cultural burning.[188] This is very partially addressed by the Tribal Forest Protection Act of 2024, which allows the U.S. Forest Service and the Bureau of Land

TIMES (Jan. 15, 2020), https://www.nytimes.com/2020/01/15/opinion/australia-fires-aboriginal-people.html [On File with the Columbia Journal of Environmental Law]; Thomas Buller & Matthew Abbott, *Reducing Fire, and Cutting Emissions, the Aboriginal Way*, N.Y. TIMES (Jan. 16, 2020), https://www.nytimes.com/2020/01/16/world/australia/aboriginal-fire-management.html [On File with the Columbia Journal of Environmental Law].

183. Brandon Quester, *Experts: Managing tribal forest helped stop Wallow Fire at reservation*, CRONKITE NEWS (Dec. 8, 2011), https://cronkitenewsonline.com/2011/12/experts-decades-of-logging-treatments-helped-stop-wallow-fire-at-reservation/index.html [https://perma.cc/XT6Y-ETZD].

184. Katie Tubb & Sophia Bagley, *How Federalism is Making a Difference on Western Lands*, HERITAGE FOUND. (Aug. 21, 2019), https://www.heritage.org/environment/commentary/how-federalism-making-difference-western-lands [https://perma.cc/RCZ8-ZZNQ].

185. Ian Austen, *How Indigenous Techniques Saved a Community From Wildfire*, N.Y. TIMES (Aug. 28, 2023), https://www.nytimes.com/2023/08/27/world/canada/canada-wildfires-kelowna-british-columbia.html [On File with the Columbia Journal of Environmental Law].

186. Karen L. Abt et al., *Effect of fire prevention programs on accidental and incendiary wildfires on tribal lands in the United States*, 24 INT'L J. WILDLAND FIRE 749 (2015).

187. CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, *supra* note 159, at 5.

188. SARA A. CLARK ET AL., KARUK TRIBE, GOOD FIRE: CURRENT BARRIERS TO THE EXPANSION OF CULTURAL BURNING AND PRESCRIBED FIRE IN CALIFORNIA AND RECOMMENDED SOLUTIONS (2022), https://karuktribeclimatechangeprojects.files.wordpress.com/2022/06/karuk-prescribed-fire-rpt_2022_v2-1.pdf [https://perma.cc/2TQF-XLCK].

Management to enter into agreements with tribes to allow them to carry out their own forest management practices.[189]

Funding prescribed burns continues to be a major issue. That, together with the associated lack of capacity (e.g. resources, knowledge and people to conduct work), was found to be the greatest barrier to prescribed burns.[190] However, some places have created ways to pay. For example, in 2012 the City of Flagstaff, Arizona, which had suffered a devastating fire in 2010, approved a municipal bond issue to undertake forest restoration (including selective thinning and prescribed burns) and watershed management to reduce the fire risk.[191]

One way to help pay for forest thinning could be to collect the wood and send it to large factories that process it into wood pellets, which are then burned in power plants to produce electricity. However, this can create serious smoke conditions around the power plants; the victims of the smoke become the neighbors of the power plants rather than those who live downstream of the forests.[192] The wood pellet companies sometimes claim that they are carbon neutral because the trees that are cut down then regrow and absorb $CO_2$, but there are serious issues with this claim. New tree growth does not always occur, and even if it does, the $CO_2$ is absorbed by the trees over a period of years or decades, while the $CO_2$ is released instantly when the wood pellets are burned.[193]

A particular challenge is conducting prescribed burns on privately-owned lands. Many farmers conduct their own burns on their own land, but except in emergencies, the government cannot go onto

189. 25 U.S.C. § 3115(a). *See* Crystal Owens, *Bill Would Give Tribes Stronger Say In Forest Protection*, LAW360 (June 4, 2024), https://www.law360.com/articles/1843934/bill-would-give-tribes-stronger-say-in-forest-protection [On File with the Columbia Journal of Environmental Law].

190. COURTNEY A. SCHULTZ ET. AL., ECOSYSTEM WORKFORCE PROGRAM, PRESCRIBED FIRE POLICY BARRIERS AND OPPORTUNITIES: A DIVERSITY OF CHALLENGES AND STRATEGIES ACROSS THE WEST 2 (2018).

191. Regenold & Rojas, *supra* note 138, at 14.

192. Rita Vaughan Frost, *Why Wood Pellets Won't Solve California's Wildfire Problem*, NAT. RES. DEF. COUNCIL (Feb. 1, 2024), https://www.nrdc.org/bio/rita-frost/why-wood-pellets-wont-solve-californias-wildfire-problem [https://perma.cc/T54Z-UESW].

193. Rebecca Speare-cole, *Biomass is promoted as a carbon neutral fuel. But is burning wood a step in the wrong direction?*, GUARDIAN (Oct. 5, 2021), https://www.theguardian.com/environment/2021/oct/04/biomass-plants-us-south-carbon-neutral [https://perma.cc/WU8Q-8LYS]; Noah Haggerty, *Biofuel plans alarm a community; A project to reduce wildfire risk could worsen air pollution in South Stockton*, L.A. TIMES (Dec. 18, 2024), https://www.latimes.com/environment/story/2024-12-01/wood-biofuel-project-could-worsen-air-quality-critics-say [https://perma.cc/X5CQ-D3PH]; Emma Shumway, *Wood Pellet Production in the U.S. South and Exportation for 'Renewable' Energy in Europe: The New Green Sacrifice Zone*, 48 COLUM. J. ENV'T L. 478, 168–69 (2023).

private land and set fires, and even then, in some states it may have to compensate the owner for the damage.[194] Voluntary cooperation by the landowners is required if forests are to be managed in a way that reduces wildfires.[195] The issue of cooperation is especially challenging where the forest landscape features a mosaic of federal, state, and private ownership, with each owner having different goals and interests.[196] One approach to overcoming this challenge is "prescribed burn associations"—voluntary groups of landowners who pool their knowledge, equipment and other resources to help members conduct these prescribed burns. There are more than 132 of these associations in 22 states.[197] As one participant wrote, "Prescribed-burn associations—neighbors helping neighbors burn—[pool] community members' resources, experience and time. Think of it as a barn raising with smoke and flame."[198] However, these associations are mostly located in the southeastern and midwestern states; many parts of the western states have few or none.[199]

## V. LEGAL IMPEDIMENTS TO PRESCRIBED FIRE

The National Association of State Foresters and the Coalition of Prescribed Fire Councils have listed these nine categories of impediments to prescribed burns:[200]

194. *See generally* Robert H. Thomas, *Evaluating Emergency Takings: Flattening the Economic Curve*, 4 WM. & MARY BILL RTS. J. 1145 (2021); Brian Angelo Lee, *Emergency Takings*, 114 MICH. L. REV. 391 (2015).

195. Karen Bradshaw & Monika U. Ehrman, *Cloud Seeding, Wildfire Smoke Emissions and Solar Geoengineering: Why Is Climate Modification Unregulated?*, 35 GEO. ENV'T L. REV. 459, 475 (2023).

196. Casey J. Fleming et al., *Conflict and Collaboration in Wildfire Management: The Role of Mission Alignment*, 75 PUB. ADMIN. REV. 445, 448 (2015).

197. Rhonda Wise, *Prescribed burn associations ignite the future*, U.S. FOREST SERV. (Mar. 27, 2024), https://www.fs.usda.gov/about-agency/features/prescribed-burn-associations-ignite-future [On File with the Columbia Journal of Environmental Law].

198. M.R. O'Connor, *There's a Simple Way to Stop Dangerous Wildfires*, N.Y. TIMES (Nov. 26, 2024), https://www.nytimes.com/2024/11/24/opinion/wildfires-new-york-new-jersey-prescribed-burn.html [On File with the Columbia Journal of Environmental Law].

199. *Prescribed Burn Associations Interactive Map*, GREAT PLAINS FIRE SCI. EXCH., https://gpfirescience.org/prescribed-burn-associations/ [https://perma.cc/93F7-JUE8] (last visited Jan. 19, 2025).

200. MARK A. MELVIN, NAT'L ASS'N OF STATE FORESTERS & COAL. OF PRESCRIBED FIRE COUNCILS, 2021 NATIONAL PRESCRIBED FIRE USE SURVEY REPORT 5 (2023).

Table 1 - The nine impediment categories are as follows:

| | |
|---|---|
| **Capacity Concerns** | Limited personnel, training, private contractor availability, partnerships, equipment |
| **Weather Concerns** | Narrow burn windows, drought, available burn days |
| **Air Quality/Smoke Management Concerns** | Visibility, nuisance, emission impacts |
| **Resource Concerns** | Limited funding, high implementation costs |
| **Public Perception Concerns** | Lack of public understanding/acceptance |
| **Liability/Insurance Concerns** | Landowner liability, insurance availability and/or cost |
| **Permitting/Legal Concerns** | State law, burn bans, local restrictions, NEPA process, ESA |
| **WUI/Population Growth Concerns** | Urbanization, influx of new residents |
| **Low Priority** | Agency or landowner priority, too difficult |

Several of these categories involve the design and application of laws.

## A. Regulation of Prescribed Fire

### 1. Clean Air Act

Burning wood creates air pollution; smoke is its most visible manifestation. Unfortunately, the way EPA is implementing the federal Clean Air Act (CAA) gets in the way of the optimal amount of burning.

As just shown, a major reason that wildfires have become so serious is the accumulation of fuel, and small prescribed fires are a major way to prevent this accumulation. Prescribed fires reduce the number and severity of wildfires and also minimize the quantity of smoke produced per acre.[201] Prescribed fires can be planned for days with favorable weather conditions; in contrast to wildfires which often happen on hot, dry days when the fuels will more completely combust and the air is stagnated, trapping it close to the ground.

Natural fires require no permits and are generally disregarded in the air pollution regulation scheme. Prescribed fires are treated much differently. Under the CAA, anyone wishing to carry out a prescribed burn must get approval either from EPA or from a state agency to which EPA has delegated this CAA program.

201. Unless otherwise noted, this section is derived from Kirsten H. Engel, *Perverse Incentives: The Case of Wildfire Smoke Regulation*, 40 ECOLOGY L. Q. 101, 628 (2013).

The real benefits of prescribed fires in reducing large wildfires are disregarded in the CAA permitting scheme as implemented by EPA. The favorable treatment of natural over prescribed fires induces air pollution regulators to disfavor prescribed fires, as they may annoy residents with their smoke. Applications to conduct prescribed burns may languish, while the fuel accumulates awaiting the next spark.

Congress and EPA have moved to reduce one of the CAA impediments to prescribed fires through the "exceptional events" rule. This requires some explanation.

Wildfire smoke might push the area, in a regulatory sense, into or toward "nonattainment status," meaning the air is so persistently dirty that it is in violation of the health-based National Ambient Air Quality Standards (NAAQS).[202] The CAA restricts industrial development in nonattainment areas.[203] If wildfire smoke is considered in designating nonattainment areas, new industries that will emit some pollution might not be able to locate there.[204] Moreover, when an area is given nonattainment status, the state must develop a "state implementation plan" (SIP).[205] These SIPs impose additional requirements that, once approved by EPA, can be enforced, including by citizen suits.[206] As a result, states and industry very much dislike nonattainment status.

The CAA requires extensive air quality monitoring and modeling to determine whether a region is in nonattainment status and what the SIP must include to clean up its air.[207] Going back to the early days of the CAA and of EPA in the 1970s, EPA issued various guidance documents concerning how to treat "exceptional events." In 1998 EPA adopted guidance that encouraged states to adopt smoke management plans; a state with such a plan might be able to claim exceptional event status for wildfires and prescribed burns, meaning the smoke from these fires would not count in finding nonattainment.[208] According to one account, the principal advocate of giving CAA relief to exceptional events was Senator James Inhofe (R-OK), who also gained

202. 42 U.S.C. § 7407(d).

203. 42 U.S.C. §§ 7501–06.

204. D. W. Schweizer1 & R. Cisneros, *Forest fire policy: change conventional thinking of smoke management to prioritize long-term air quality and public health*, AIR QUALITY, ATMOSPHERE & HEALTH, Apr. 2016, at 33–36.

205. 42 U.S.C. § 7410(a)(1).

206. 42 U.S.C. § 7604(a).

207. 42 U.S.C. §§ 7403(c), 7410(a)(2)(B).

208. Emily Williams, *Reimagining Exceptional Events: Regulating Wildfires Through the Clean Air Act*, 96 WASH. L. REV. 765, 782–84 (2021).

notoriety as the leading climate denier in Congress.[209] In 2005, as part of a transportation bill that went through a committee that Senator Inhofe chaired,[210] Congress amended the CAA to explicitly allow EPA to exclude the monitoring results from "exceptional events" in its attainment determinations.[211] The amendment defines an exceptional event as one that "affects air quality," is "not reasonably controllable or preventable," and is "caused by . . . activity that is unlikely to recur at a particular location."[212] But, under this provision, even a recurring event such as a wildfire can be "exceptional" if it is a "natural event."[213] Areas may still be considered to be in attainment even if their pollutant levels, as measured by monitoring devices, exceed the NAAQS if that is due to exceptional events. Pursuant to the 2005 amendment, EPA adopted regulations in 2007 that treat both wildfires and prescribed burns as exceptional events such that their emissions do not need to be considered in making nonattainment determinations or in writing SIPs if the states establish that certain conditions have been met.[214] Environmental groups challenged this in court, but the D.C. Circuit upheld EPA rule.[215] In doing so the court deferred to EPA's interpretation of the CAA using the "Chevron doctrine."[216] (In 2024 the Supreme Court famously overruled the Chevron doctrine.[217] It is unknown whether this will lead to a reopening of the interpretation of the CAA's exceptional events provision.)

EPA amended these regulations in 2016, making them lengthier and more involved, but still allowing both wildfires and prescribed burns to be treated as exceptional events, provided many conditions are met.[218] One of these conditions is that the state must either certify that it has adopted and is implementing a smoke management program, or show that certain listed smoke management practices were

209. Molly Peterson, Dillon Bergin & Emily Zentner, *What you need to know about the loophole hiding the extent of US wildfire pollution*, GUARDIAN (Oct. 16, 2023), https://amp.theguardian.com/us-news/2023/oct/16/epa-rule-responsible-for-wildfire-smoke-not-reported-americans-health [https://perma.cc/NSJ2-7T83]. *See* JAMES INHOFE, THE GREATEST HOAX: HOW THE GLOBAL WARMING CONSPIRACY THREATENS YOUR FUTURE (2012).

210. Safe Accountable Flexible Efficient Transportation Equity Act of 2005, Pub. L. No. 109-59, § 6013.

211. 42 U.S.C. § 7619(b).

212. 42 U.S.C. § 7619(b)(1)(A).

213. 42 U.S.C. § 7619(b)(1)(A)(iii).

214. 40 C.F.R. § 50.14; Treatment of Data Influenced by Exceptional Events, 72 Fed. Reg. 13560 (Mar. 22, 2007).

215. Nat. Res. Def. Council v. Env't Prot. Agency, 896 F.3d 459, 461 (D.C. Cir. 2018).

216. Chevron U.S.A. Inc. v. Nat. Res. Def. Council, 467 U.S. 837 (1984).

217. Loper Bright Enters. v. Raimondo, 144 S. Ct. 2244 (2024).

218. Treatment of Data Influenced By Exceptional Events, 81 Fed. Reg. 68216 (Oct. 3, 2016).

employed.[219] It is so "technically complicated and resource intensive" to demonstrate that all the conditions have been met that between December 2012 and August 2022, not a single state, local or tribal agency submitted an exceptional event demonstration for a prescribed burn.[220] The final report of the Congressionally-mandated Wildland Fire Mitigation and Management Commission recommended that this process be eased, but its only specific suggestion for achieving that was providing more resources to agencies.[221]

In practice, in the words of one commentator, "the exceptional event regulations broadly exempt wildfire smoke and narrowly exempt prescribed burn smoke."[222] In summary, she found:

> Under the EPA's regulations, pollution from wildfire smoke meets the requirements for an exceptional event simply because it comes from a wildfire. If the event recurs and a mitigation plan is required, these plans do not require states to consider the underlying cause of wildfires and are generally not federally enforceable; therefore, they do not meaningfully mitigate the risk of harm to human health caused by wildfire smoke. On the other hand, the regulations require complicated procedures to receive an exceptional event designation for prescribed burns. Further, mitigation plan regulations do not recognize that prescribed burns can reduce the frequency and intensity of wildfires.[223]

This last point is key. We should encourage prescribed fires; while they cause smoke in the short term, they greatly reduce smoke in the long term by reducing the size and frequency of wildfires. Instead, current EPA rules discourage prescribed fires by, among other things, making it difficult to obtain "exceptional events" status, while wildfires have a free ride.

This policy also gives a free ride to some industrial polluters. As shown above, air pollution sources in nonattainment areas are subject to stricter controls than those in attainment areas. Some places often have unhealthy levels of air quality due to a combination of industrial and motor vehicle pollution and wildfire smoke, but the wildfire

219. 40 C.F.R. § 50.14(b)(3)(ii)(A), 40 C.F.R. § 51.930.

220. U.S. GOV'T ACCOUNTABILITY OFF., WILDFIRE SMOKE: OPPORTUNITIES TO STRENGTHEN FEDERAL EFFORTS TO MANAGE GROWING RISKS 40, 74 n.6 (2023); *similarly,* CTR. FOR L., ENERGY, & THE ENV'T, UNIV. OF CAL., BERKELEY L. SCH., SCOPING THE PUBLIC HEALTH IMPACTS OF WILDFIRE 34–35 (2024); Engel, *supra* note 201, at 652.

221. ON FIRE: THE REPORT OF THE WILDLAND FIRE MITIGATION AND MANAGEMENT COMMISSION, 97–99 (2023).

222. Williams, *supra* note 208, at 785.

223. Williams, *supra* note 208, at 791. *See also*, Gregory Pelletier, *Fighting Fire With Fire: Expanding the Exceptional Events Rule to Make a Workable Solution for Prescribed Fires*, 18 J.L. ECON. & POL'Y 384 (2023).

smoke is taken out of the calculations, as if it was not there. Thus, the area preserves its attainment status, industries escape stricter regulation, and cars and trucks may not need to be inspected as often.

While exceptional event demonstrations are rarely filed for prescribed burns, they have become common for wildfires. Expensive consultants are hired to argue that it was wildfires that tipped an area's poor air over the NAAQS level, and therefore nonattainment status should be preserved. For example, in 2017 the Louisiana Mid-Continent Oil and Gas Association, representing ExxonMobil and other major industry players, paid for an exceptional events filing. This allowed the five-parish Baton Rouge area, with 800,000 people, to be deemed to be in compliance with the NAAQS. The state government was happy with the result. One state official was quoted as saying, "We are going full bore on this one. . . . Use whatever or whoever you need to get the information we need to prove" that wildfires were to blame for the poor air quality.[224]

Similarly, in 2023, EPA determined that the Detroit, Michigan area was in attainment for the ozone NAAQS. Some of the air monitors had shown violations of the NAAQS, but EPA found that was caused by smoke from Canadian wildfires, and therefore qualified as an exceptional event.[225] A nonattainment finding could have triggered, among other things, a mandatory vehicle inspection program for the region's 4.8 million people.[226] The Sierra Club sued EPA challenging this decision.[227] The American Petroleum Institute and other industry groups filed an amicus brief supporting EPA's position. As of this writing, the case is pending before the U.S. Court of Appeals for the Sixth Circuit.[228]

224. Molly Peterson & Dillon Bergin, *In Detroit, a 'magic wand' makes dirty air look clean – and lets polluters off the hook*, KQED (Oct. 17, 2023), https://www.kqed.org/news/11964517/in-detroit-a-magic-wand-makes-dirty-air-look-clean-and-lets-polluters-off-the-hook [https://perma.cc/KK9M-GMR9].

225. Air Plan Approval; Michigan; Clean Data Determination for the Detroit Area for the 2015 Ozone Standard, 88 Fed. Reg. 32584 (May 19, 2023).

226. John Lippert & Dillon Bergin, *Midwest pollution spiked dramatically this summer because of Canadian Wildfires. Now officials may erase those days from the books*, CHI. TRIB. (Nov. 13, 2023), https://www.chicagotribune.com/2023/11/12/midwest-pollution-spiked-dramatically-this-summer-because-of-canadian-wildfires-now-officials-may-erase-those-days-from-the-books/ [On File with the Columbia Journal of Environmental Law].

227. Petition for Review at 1, Sierra Club v. Env't Prot. Agency, No. 23-3583 (6th Cir. July 17, 2023).

228. The Sixth Circuit heard argument in the case on December 12, 2024. Carolyn Muyskens, *Sierra Club-EPA Row Has 6th Cir. Debating Smog Data*, LAW360 (Dec. 12, 2024), https://www.law360.com/articles/2273085/sierra-club-epa-row-has-6th-circ-debating-smog-data [https://perma.cc/FD59-FCCU].

A journalistic investigation found that between October 2016 and October 2023, EPA agreed to 139 exceptional event determinations in 20 states, and that in more than half of these states, "industry lobbyists and business interests pressed to make that happen."[229]

This issue is likely to take on greater significance in view of the action taken by EPA on February 7, 2024 to lower the NAAQS for $PM_{2.5}$ from twelve to nine micrograms per cubic meter, in light of mounting medical evidence of the adverse health effects of these lower levels.[230] This will require new determinations of whether many areas of the country are still in attainment with the $PM_{2.5}$ NAAQS. This may in turn lead to some new areas seeking to avoid nonattainment status claiming that their high levels of this pollutant are partly due to wildfire smoke.[231] This possibility will not be lost on the states; the EPA rule advising states how to revise their state implementation plans in view of an earlier tightening of the $PM_{2.5}$ standards mentioned the phrase "exceptional events" forty times.[232] Similarly, EPA's *Federal Register* explanation of its 2014 decision to lower the $PM_{2.5}$ NAAQS mentioned that phrase thirty-eight times.[233]

An underlying irony, or perhaps one should call it a tragedy, is that the wildfires that lead to "exceptional events" determinations are no longer exceptional. Indeed, they have become routine. EPA's Clean Air Scientific Advisory Committee has made exactly that point in urging the agency to reconsider its exceptional events rule.[234] As one study concluded, "[t]he allowance of exceptional events removes the threat of non-attainment for the NAAQS but does not void the nation's responsibility to protect public health."[235]

229. Molly Peterson et al., *Smoke, Screened: How a Little-Known pollution rule keeps the air dirty for millions of Americans*, GUARDIAN (Oct. 16, 2023), https://www.theguardian.com/us-news/2023/oct/16/epa-local-governments-dont-report-air-pollution-wildfire-smoke-data-across-us [https://perma.cc/JZR2-ECBA].

230. Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, 89 Fed. Reg. 16202 (Mar. 6, 2024).

231. OMAR M. HAMMAD, CONG. RSCH. SERV., R47652, AIR QUALITY: EPA'S 2023 PROPOSED CHANGES TO THE PARTICULATE MATTER (PM) STANDARD 1 (2023); Brian Allnutt, *What the EPA's new soot rules could mean for Detroit*, PLANET DET. (Feb. 18, 2024), https://planetdetroit.org/2024/02/what-do-the-epas-new-soot-rules-mean-for-detroit/ [https://perma.cc/3YXR-DFEK].

232. Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements, 81 Fed. Reg. 58010 (Aug. 24, 2016).

233. Reconsideration of the National Ambient Air Quality Standards for Particulate Matter, 89 Fed. Reg. 16202 (Mar. 6, 2024).

234. Letter from Elizabeth A. (Lianne) Sheppard, Chair, Clean Air Scientific Advisory Committee, to Michael S. Regan, Administrator, EPA, (Mar. 18, 2022) [On File with Columbia Journal of Environmental Law].

235. Liji M. David, *Could the exception become the rule? 'Uncontrollable' air pollution events in the US due to wildland fires*, 16 ENV'T RSCH. LETTERS, no. 034029 (2021).

A different program under the CAA that also ignores wildfire smoke is the Regional Haze Rule, which is designed to inhibit emissions that reduce visibility.[236] Natural fires are not subject to this program; prescribed fires may escape regulation under certain specified conditions.[237]

The CAA regulates the intentional burning of wood in another common context: the New Source Performance Standards for wood stoves.[238] Smoke from these stoves accounts for about 8% of $PM_{2.5}$ emissions in the U.S., but a much larger share in some places, such as about 59% of $PM_{2.5}$ emissions in Vermont and 27% in New York.[239] EPA agreed to review and potentially revise these standards in a September 2024 settlement agreement in a suit brought by New York and several other states.[240] The Inflation Reduction Act of 2022 created a 30% federal tax credit for efficient wood stoves and boilers as well as other energy efficient home improvements.[241] Many states and cities have their own requirements or incentives for lower-emitting wood stoves.[242]

236. 42 U.S.C. §§ 7491–92.

237. 40 C.F.R. § 51.308(f)(1)(vi)(B); Madeleine Weisz, *Smoke Regulation and Liability Laws: How the Current Legal Scheme Discourages the Optimal use of Prescribed Fire* (N. Cal. Prescribed Fire Council 2014), https://static1.squarespace.com/static/5e013c51bf487105fe2e858f/t/61e0c14c1b442104e0d9ee8e/1642119500687/NCPFC+Smoke+%26+Liability+White+Paper.pdf [https://perma.cc/HP5D-983U].

238. New Residential Wood Heaters, 40 C.F.R. §§ 60.530–39b; New Residential Hydronic Heaters and Forced-Air Furnaces, 40 C.F.R. §§ 60.5472–83.

239. Ali Sullivan, *EPA Will Review Wood Stove Emissions Rules to Settle Lawsuit*, LAW360 (Sept. 27, 2024), https://www.law360.com/articles/1883354/epa-will-review-wood-stove-emissions-rules-to-settle-lawsuit [https://perma.cc/UAV5-5QEZ].

240. Proposed Consent Decree, N.Y. v. Regan, No. 1:23-cv-02767 (D.D.C. Sept. 26, 2024). This agreement was approved by the court on October 2, 2024.

241. 26 U.S.C. § 25C(d)(2)(B); *Biomass Stoves/Boiler Tax Credit*, ENERGY STAR, https://www.energystar.gov/about/federal-tax-credits/biomass-stovesboilers [https://perma.cc/872U-48TV] (last visited Mar. 17, 2025); *Frequently asked questions about energy efficient home improvements and residential clean energy property credits*, INTERNAL REVENUE SERV. (Apr. 17, 2024), https://www.irs.gov/credits-deductions/frequently-asked-questions-about-energy-efficient-home-improvements-and-residential-clean-energy-property-credits [https://perma.cc/JP3K-SNTY].

242. *Ordinances and Regulations for Wood-Burning Appliances*, ENV'T PROT. AGENCY (Dec. 5, 2024), https://www.epa.gov/burnwise/ordinances-and-regulations-wood-burning-appliances [https://perma.cc/FH8M-MQ8V]; *State Policies and Change-out Programs,* ALL. FOR GREEN HEAT, https://www.forgreenheat.org/states-policy [https://perma.cc/6X52-CXYH] (last visited Mar. 17, 2025).

2. NEPA

Another law that yields many benefits but has also impeded prescribed burning is NEPA.[243] Signed into law by President Richard Nixon on January 1, 1970, it is the first of the great modern environmental laws. It is purely procedural; it requires the preparation of environmental impact statements (EISs) for federal actions that could have a significant environmental impact, but it does not impose substantive standards. It applies only to discretionary federal actions, such as federal funding, permits, and use of federal land. Its use is far more common in the western states, where much of the land is federally owned. The Forest Service is the agency that is most pertinent in the wildfire context.

The Healthy Forests Restoration Act of 2003 explicitly provides that "authorized fuel reduction projects" are subject to NEPA.[244] That includes prescribed burns.[245] However, such projects were subject to NEPA well before the 2003 law. On the other hand, fire suppression—the largest undertaking of the Forest Service—has never undergone NEPA analysis.[246]

Under NEPA, actions can receive either a "categorical exclusion," meaning that actions of this sort have been determined never to require an EIS; an environmental assessment, which is a document that helps the agency determine whether the project is of such environmental significance as to require an EIS or an EA. Many of the efforts to hasten the approval process for prescribed burns have involved attempts to provide more categorical exclusions.

In 2000, the Forest Service tried to create a categorical exclusion for fuel reduction projects, but that was struck down in court.[247] In 2003,

243. 42 U.S.C. §§ 4321 et seq.

244. 16 U.S.C. § 6514(a)(1).

245. The term "authorized hazardous fuel reduction project" is defined as "the measures and methods described in the definition of 'appropriate tools' contained in the glossary of the implementation Plan." 16 U.S.C. § 6511(2)(A). The "implementation plan," as defined in §6511(11), is A COLLABORATIVE APPROACH FOR REDUCING WILDLAND FIRE RISKS TO COMMUNITIES AND THE ENVIRONMENT: 10-YEAR STRATEGY IMPLEMENTATION PLAN (Dec. 2006), https://www.forestsandrangelands.gov/documents/resources/plan/10-yearstrategyfinal_dec2006.pdf [https://perma.cc/3ZDV-2NL5]. The glossary in this plan defines "appropriate tools" as "[m]ethods for reducing hazardous fuels including prescribed fire, wildland fire use, and various mechanical methods such as crushing, tractor and hand piling, tree removal (to produce commercial or pre-commercial products), and pruning." *Id.* at 23.

246. SARAH A. CLARK, ANDREW MILLER & DON L. HANKINS, GOOD FIRE: CURRENT BARRIERS TO THE EXPANSION OF CULTURAL BURNING AND PRESCRIBED FIRE IN CALIFORNIA AND RECOMMENDED SOLUTIONS 2 (2021).

247. Sierra Club v. Bosworth, 510 F.3d 1016 (9th Cir. 2007).

in the Healthy Forest Restoration Act, Congress limited the number of alternatives that the Forest Service must consider under NEPA.[248] The Infrastructure Investment and Jobs Act of 2021 created a categorical exclusion for certain forest management activities.[249] Current Forest Service regulations do include categorical exclusions for prescribed burning under certain circumstances.[250] Many in the environmental community oppose categorical exclusions, as they limit environmental analysis and public participation.[251] Others have proposed expansion of the categorical exclusions for prescribed burning, especially "cultural burning" by tribes, since many tribes have hundreds of years of successful experience with this practice.[252] Several bills have been introduced in Congress to expand the availability of categorical exclusions for prescribed fires and otherwise ease their approval.[253] A provision of the Healthy Forests Restoration Act related to protection of forests from insect infestation[254] was held to provide a categorical exclusion for two particular prescribed burn projects.[255] The Consolidated Appropriations Act of 2018 created a statutory categorical exclusion for "Wildfire Resilience Projects" for hazardous fuel reduction projects.[256] In 2021, just prior to President Trump leaving office, the Forest Service promulgated several new categorical exclusions for forest activities, including prescribed burning, "with a primary purpose of meeting restoration objectives or increasing resilience, up to 2,800 acres."[257] In short, categorical exclusions from the NEPA process are often available.

248. 16 U.S.C. § 6514(c), (d).

249. Infrastructure Investment and Jobs Act § 40806, Pub. L. No. 117-58, 135 Stat. 1110.

250. 36 C.F.R. § 220.6(e)(6). *See also* DALE & BARRETT, *supra* note 138, at 19.

251. Stephanie Young, *Categorical Exclusions: Are Agencies Silencing the Public's Voice*?, 23 NAT. RES. & ENV'T, no. 4, 2009, at 39.

252. Nina Fontana & Chris Adlam, *Create a categorical exclusion in the National Environmental Policy Act (NEPA) for Cultural Burning, in Wildland Fire Policy Recommendations*, FED'N OF AM. SCIENTISTS (Apr. 24, 2023), https://fas.org/publication/wildland-fire-policy-recommendations/ [On File with the Columbia Journal of Environmental Law]. *See also* Jane Jacoby, *Fighting Fire With Fire: How NEPA's Emphasis on Risk Prevents Prescribed Burns and Intensifies Wildfire*, 52 URB. LAW. 146 (2023).

253. *See, e.g.,* National Prescribed Fire Act of 2020, S.4625, 116th Cong.; *See also* Eric Biber, *The Urgent Need to Address Fire Risk: We need legislative action to accelerate fire risk reduction in general*, LEGAL PLANET (Jan. 10, 2025), https://legal-planet.org/2025/01/10/the-urgent-need-to-address-fire-risk/ [https://perma.cc/G967-SHYM].

254. 16 U.S.C. § 6591b.

255. Wild Watershed v. Hurlocker, 961 F.3d 1119 (10th Cir. 2020).

256. Stephen Sepp Wildfire Suppression Funding and Forest Management Activities Act, Pub. L. No. 115-141, div. O, tit. II, § 202, 132 Stat. 1062 (2018) (current version at 16 U.S.C. § 6591(d)).

257. 36 C.F.R. § 220.6(e)(25). *See also* Barbara, *supra* note 162, at 349.

Even if a categorical exclusion may be available, utilizing it involves much more than checking a box on a form. The NEPA regulations of the Council on Environmental Quality (CEQ) provide, "[i]f an agency determines that a categorical exclusion identified in its agency NEPA procedures covers a proposed action, the agency shall evaluate the action for extraordinary circumstances in which a normally excluded action may have a significant effect."[258] The Forest Service's list of possible "extraordinary circumstances" includes threatened or endangered species or their critical habit, wetlands, "American Indian or Alaska Native religious or cultural sites," and others.[259] It can take months to determine if any of these circumstances are present.

The NEPA process is lengthy. A study of Forest Service fuel treatment projects for the period 2006 to 2017 found that more than 81% received categorical exclusions, but the paperwork for even those took an average of 208 days. The average NEPA duration for projects receiving environmental assessments was 572 days; for those receiving EISs, it was 1,194 days.[260] Further time is consumed between the completion of the NEPA process and the actual fuel treatment. For prescribed burn projects with an EIS, the time between initiation of the NEPA process and the start of actual burning was 7.2 years.[261] To be fair, many of these projects involved not only prescribed burns but also large-scale timber harvests.[262]

Several attempts have been made to shorten the process. The Fiscal Responsibility Act of 2023, which resolved that year's debt ceiling crisis, amended NEPA to require EISs to be completed within two years after a determination that one is necessary, with limited opportunities for extensions and with page limits.[263] Time will tell how well this works.

There can also be greater use of programmatic EISs or other techniques that allow proposed burns or other fire management techniques that take place in similar kinds of ecosystems to be considered together, without requiring a new EIS for each project.[264]

258. 40 C.F.R. § 1501.4(b). In November 2024 a court ruled, in a 2-1 vote, that CEQ did not have the authority to issue binding regulations under NEPA. Marin Audubon Soc'y v. Fed. Aviation Admin., No. 23-1067 (D.C. Cir. 2024). The defendants have petitioned for *en banc* review of this decision.

259. 36 C.F.R. § 220.6(b)(1).

260. ERIC EDWARDS & SARA SUTHERLAND, PROP. & ENV'T RSCH. CENTER, DOES ENVIRONMENTAL REVIEW WORSEN THE WILDFIRE CRISIS? 6 (2022).

261. *Id.* at 3.

262. *See also* Jacoby, *supra* note 252.

263. 42 U.S.C. § 4336a(g).

264. DALE & BARRETT, *supra* note 138, at 19.

In 2008, California adopted legislation exempting much prescribed burning from the California Environmental Quality Act (CEQA), that state's equivalent of NEPA, and made several other changes to forestry regulation and funding.[265] Disputes continue in the California legislature about whether to relax the review requirements further.[266]

The environmental review process is also litigious, and the NEPA issues are often tied in with other disputes. Fuel management involves several processes, not just prescribed burning. Mechanical thinning is often carried out, and during that process, often big trees of great commercial value are also chopped down. "Salvage logging"—going into a forest after a fire, flood, insect outbreak or other natural disturbance, and removing the damaged but still-valuable trees—is also performed. Many environmentalists argued that all this was becoming a subterfuge for clearcutting and other destructive practices, and they turned to litigation to try to stop it, using NEPA, the ESA, the NFMA, and other laws, often with success.[267]

Nearly 18% of fuel treatment projects are taken to court.[268] Forest Service wins 54% of its NEPA cases.[269] For the period 2013–2022, the federal courts of appeals decided 66 NEPA cases involving forest management; of these, 26 concerned fuel management.[270] Of these 26 cases, Forest Service won 92%.[271] For these fuel management cases, the median time between issuance of the challenged NEPA document and the appellate court decision was 1,053 days (about three and a half years); the range was 312 days to 2,057 days.[272]

Aside from the time that the NEPA and CEQA litigation takes, one study concluded that "[i]f the agency anticipates litigation, it may

265. S.B. 901, 2023–2024 Leg., Reg. Sess. (Cal. 2024). *See also* Dylan Sollfrank, *The Effects of California SB 901 on Forest Conservation*, A.B.A. (May 31, 2022), https://www.americanbar.org/groups/environment_energy_resources/publications/fr/20220531-the-effects-of-california-sb901-on-forest-conservation [On File with the Columbia Journal of Environmental Law].

266. Camille Von Kaenel, *California Democrat pushes CEQA exemption for wildfire treatment*, GREENWIRE (Feb. 26, 2024), https://www.eenews.net/articles/california-democrat-pushes-ceqa-exemption-for-wildfire-treatment/, [https://perma.cc/5ENV-QZLQ].

267. Amanda M.A. Miner et al., *Twenty Years of Forest Service Land Management Litigation*, 112 J. FORESTRY 32 (2014); Changyou Sun & Xianchun Lia, *Effects of litigation under the Endangered Species Act on forest firm values*, 17 J. FOREST ECON. 388 (2011).

268. EDWARDS & SUTHERLAND, *supra* note 260, at 9.

269. *Id.* at 5.

270. NIKKI CHIAPPA ET AL., BREAKTHROUGH INST., UNDERSTANDING NEPA LITIGATION: A SYSTEMATIC REVIEW OF RECENT NEPA-RELATED APPELLATE COURT CASES 10–11 (2024).

271. E-mail from Nikki Chiappa, co-author of *Understanding NEPA Litigation* (Aug. 21, 2024) [On File with the Columbia Journal of Environmental Law].

272. Chiappa, *supra* note 270.

engage in a more thorough regulatory analysis to reduce the chances of a challenge or the odds the proposed action will be overturned, in essence trying to construct a 'bullet-proof NEPA.'"[273] (This corresponds to the author's personal experience with many non-forest projects undergoing review under NEPA and its state equivalents.)

Some of the environmental battles over fuel treatment can go on for many years. For example, in 2005, the Forest Service concluded that fuel buildup in the Gallatin National Forest in Montana endangered private homes and campgrounds near a lake. It decided to engage in thinning and prescribed burning of about 1,750 acres. The Native Ecosystems Council sued, alleging that the studies under NEPA were inadequate. Then, grizzly bears were listed as a threatened species under the ESA; the Forest Service conducted new studies and was sued again. The federal district court enjoined the project in 2014 because the Fish & Wildlife Service had not adequately studied the project's effects on the grizzly bear and the Canadian lynx (which itself had been listed as a threatened species after eight years of litigation). Lynx habitat enjoys special legal protection, *except* that some fuel treatment projects would be allowed to proceed.[274] The Native Ecosystems Council said this exception did not apply and pursued further litigation, pointing to the masters thesis of a wildlife biology student at the University of Montana which concluded that the proposal would impair lynx reproduction. There were also disputes over the presence of the moose, the northern goshawk (a raptor), and the pine marten (a small furry mammal) in the area. More studies followed. In 2018 the U.S. Court of Appeals for the Ninth Circuit concluded that, while the Forest Service's species studies were still flawed, they were good enough and the project could proceed.[275] In September 2023, the Native Ecosystems Council sued again, alleging that the Fish & Wildlife Service violated NEPA, the ESA and other laws by authorizing a tree-cutting and burning project that would eliminate thousands of acres of lynx habitat.[276] The parties settled the case in April 2024, nineteen years after Forest Service had concluded that the forest thinning was needed.[277]

In 2020, the California Chaparral Institute and several other environmental groups sued the California Board of Forestry and Fire

273. *Id.* at 9.
274. Cottonwood Env't Law Ctr. v. U.S. Forest Serv., 789 F.3d 1075 (9th Cir. 2015).
275. Native Ecosystems Council v. Marten, 883 F.3d 783 (9th Cir. 2018).
276. Native Ecosystems Council v. Platt, No. CV 23-112-M-DLC (D. Mont. Apr. 29, 2024).
277. *Id.*

Protection challenging its vegetation management plan, which included prescribed burning. The plaintiffs said that the plan's effect on greenhouse gas emissions and other items should have been analyzed under CEQA. The court dismissed the lawsuit, finding, "[t]he Board was not required to evaluate, as a CEQA issue, the [plan's] efficacy in addressing the wildfire crisis in California because that is not a potential environmental impact, and wildfires are part of the baseline/existing environmental conditions."[278] The plaintiffs have filed an appeal, which is pending.

Delays from litigation can have serious consequences. For example, in May 2021, Forest Service issued an environmental impact statement for a prescribed burn in a portion of the Helena National Forest in Montana. Some of the landowners sued. The U.S. District Court set a hearing for October 2023, but in July 2023 approximately 45% of the project area burned.[279]

As a report from the Karuk Tribe found, "all prescribed fire and cultural burning activities must be consistent with the underlying land use or land use management plans established by the federal agencies. This advanced planning requirement is often where prescribed fire and cultural burning can face significant NEPA review. For instance, National Forests in California have been updating their Forest Plans to better allow prescribed and managed fire use; even for relatively small amendments, the NEPA process has taken multiple years."[280]

Another point about the relationship between NEPA and wildfires should be mentioned. The EISs and other NEPA review documents for forestry projects that involve prescribed fires often include extensive discussion of smoke impacts and the ways that they will be monitored.[281] Public comments often object to the smoke impacts. Some

278. Cal. Chaparral Inst. v. Bd. of Forestry and Fire Prot., No. 37-2020-00005203-CU-TT-CTL, at 2 (Cal. Super. Ct. San Diego Cnty. Nov. 9, 2023).

279. *The Role of NEPA in the States of Washington, Oregon, Idaho, Montana and Alaska: Hearing Before the H. Comm. on Resources*, 109th Cong. 3–4 (2005) (statement of Abigail R. Kimbell, Regional Forester, U.S. Forest Service), https://www.fs.usda.gov/sites/default/files/legacy_files/media/types/testimony/042305.pdf [On File with the Columbia Journal of Environmental Law].

280. CLARK, *supra* note 246, at 2.

281. *See, e.g.*, U.S. FOREST SERV., SUPPLEMENTAL INFORMATION REPORT: BOUNDARY WATERS CANOE AREA WILDERNESS FUEL TREATMENT FINAL ENVIRONMENTAL IMPACT STATEMENT (Apr. 2016) (multiple pages), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd518251.pdf [On File with the Columbia Journal of Environmental Law]; BUREAU OF LAND MGMT., PROGRAMMATIC ENVIRONMENTAL ASSESSMENT: STATEWIDE WILDLAND URBAN INTERFACE FUELS TREATMENTS 33–42 (2023), https://eplanning.blm.gov/public_projects/2016583/200502688/20083595/250089777/Final%20Programmatic%20EA%20SWFT_07AUG2023.pdf [https://perma.cc/DQX9-KC

of the agency responses to these comments address the tradeoffs. For example, the review document for a forestry project in Arizona stated:

> From a quality of life perspective, smoke emissions would be inevitable under all alternatives – whether from prescribed burns or wildfire. The degree (intensity and duration) of emissions, however, are variable. With prescribed burns, burn plans are developed, which helps to minimize adverse effects to quality of life in nearby communities. The Forest Service is required to work with the Arizona Department of Environmental Quality (ADEQ) to ensure that smoke impacts to human health are avoided or minimized. In contrast, wildfires are by definition unplanned. The community smoke effects from wildfire can range from negligible to severe. The advance notice associated with prescribed burns allows individuals with acute sensitivity to smoke (e.g., asthmatics) to engage in averting behavior, which reduce the negative quality of life impacts.[282]

This response is a reasonable way to deal with adverse comments. However, it does not necessarily assuage public concerns.

3. State Approvals

At least 37 states have their own permitting systems for prescribed fires.[283] They vary considerably in what kinds of burns require permits vs. simply notice, how far in advance a permit must be sought or notice provided, what agency grants the permit, what conditions apply, who else must be notified, and other factors.[284] In California, this involves registering the burn with the air district (the local office that runs the air pollution programs); obtaining a burn permit; submitting a smoke management plan; and obtaining air district approval for the

FP]; U.S. FOREST SERV., ENVIRONMENTAL ASSESSMENT: WHITE ROCK PRESCRIBED BURNING PROJECT (2013), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5416990.pdf [On File with the Columbia Journal of Environmental Law]; U.S. FOREST SERV., FINAL ENVIRONMENTAL IMPACT STATEMENT, FOREST HEALTH AND RESTORATION PROJECT, NATIONAL FORESTS IN ALABAMA, BANKHEAD NATIONAL FOREST, FRANKLIN, LAWRENCE, AND WINSTON COUNTIES, ALABAMA (2003), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5157290.pdf [On File with the Columbia Journal of Environmental Law].

282. U.S. FOREST SERV., FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE FOUR-FOREST RESTORATION INITIATIVE WITH ERRATA AND OBJECTION RESOLUTION MODIFICATIONS, VOLUME 1, COCONINO AND KAIBAB NATIONAL FORESTS, COCONINO COUNTY, ARIZONA 136 (2015), https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3836625.pdf [On File with the Columbia Journal of Environmental Law].

283. MARK A. MELVIN, COALITION OF PRESCRIBED FIRE COUNCILS, 2018 NATIONAL PRESCRIBED FIRE USE SURVEY REPORT 9 (2018).

284. SCHULTZ, *supra* note 190, at 14 tbl. 1 ("State-by-State Overview of Air Quality Regulatory Process and Interagency Relationships to Support Burning").

plan.[285] The air district may delay issuing the approvals if the air quality that week is already bad, if the neighbors of the proposed burn object, if the air district is short staffed, or for any number of other reasons.[286] However, California has adopted a new automated system for parts of the state that integrates smoke and air permitting; it has cut permitting time dramatically.[287] California has also issued detailed regulations for each of fifteen air basins specifying the meteorological conditions during which permits for agricultural or prescribed burns may take place.[288]

California is one of the states where the permit program is partly a matter of state law and partly to administer EPA's program. In some other states, there is no delegation agreement with EPA and the state is purely operating its own program.

Florida is an example of a state that operates its program on its own. The procedure there is simpler than California's (burns in the national forests in Florida are subject to U.S. Forest Service rules). Landowners must register with the Florida Forest Service (FFS) and get a customer number; then on the day they want to burn, they contact the FFS and request a burn authorization. The FFS will then "plot your burn on a map and generate a smoke plume for your burn to make sure there are no potential problems with the smoke."[289] The FFS issues approximately 88,000 authorizations each year.[290] FFS has detailed regulations on how and when burning is to be carried out.[291] Some local jurisdictions in Florida have their own requirements.[292]

State agencies are more subject than EPA to local political pressures. Many years of fire suppression policies meant fires were put

285. CAL. AIR RES. BD., FACT SHEET: PRESCRIBED BURNING AND SMOKE MANAGEMENT (2003), https://www.sierraforestlegacy.org/CF_ManagingFire/CARBFactSheet.pdf [https://perma.cc/9X3D-6V53].

286. Elizabeth Shogren, *A Century of Fire Suppression is Why California is in Flames*, MOTHER JONES (Dec. 12, 2017), https://www.motherjones.com/environment/2017/12/a-century-of-fire-suppression-is-why-california-is-in-flames/ [On File with the Columbia Journal of Environmental Law].

287. DALE & BARRETT, *supra* note 138, at 20.

288. CAL. CODE REGS. tit. 17, §§ 80179 et seq. (2025).

289. *Steps to get a prescribed burning authorization in Florida*, FLA. FOREST SERV., https://ccmedia.fdacs.gov/content/download/39865/file/prescribed_burning_authorization_steps.pdf [https://perma.cc/7UZU-3WY9] (last visited Mar. 19, 2025).

290. *Prescribed Fire in Florida*, FLA. FOREST SERV., https://www.fdacs.gov/Forest-Wildfire/Wildland-Fire/Prescribed-Fire [https://perma.cc/3F5J-GV2B] (last visited Mar. 19, 2025).

291. FLA. ADMIN. CODE ANN. r. 5I ch. 2.

292. *Prescribed Burning Regulations/Local Ordinances and Contacts*, UNIV. OF FLA. IFAS EXTENSION, https://programs.ifas.ufl.edu/florida-land-steward/planning-and-assistance/environmental-regulations/prescribed-burning-regulations/ [https://perma.cc/ND88-B6HM] (last visited Mar. 17, 2025).

out quickly and prescribed fires were banned; this created a public expectation of no smoke, and so anything that will create smoke is objectionable. All this leads to pressures to deny or sit on permits for prescribed burns. But California and Florida have shown that it is possible to design a program that approves prescribed burns fairly quickly.

### B. Liability

The actual or perceived liability of companies, governments and individuals can inhibit the use of prescribed burns.

#### 1. Emissions

There is very little caselaw on the liability of the sources of wildfire smoke *per se* (as opposed to the liability of those who started or otherwise caused the fires).

There are numerous attempts to hold greenhouse gas emitters financially liable for the impacts of climate change. So far none of them has succeeded in leading to an award of money damages.[293] However, this is because of various legal issues such as choice of venue, preemption, and separation of powers, and not because of lack of evidence that climate change is causing damage. A few of these cases explicitly connect to wildfires; all of them are still in their early stages.

The Union of Concerned Scientists issued a report in 2023 that drew on scientific studies that found that wildfire conditions were worsened by climate change, and "attribute[d] portions of the observed increased in fire-danger conditions and burned forest area across the western United States and southwestern Canada . . . to the world's 88 largest fossil fuel companies . . . and cement manufacturers."[294] The report found that "37 percent of the cumulative burned forest area in western North American since 1986 can be traced to carbon emissions from these companies' products,"[295] and it listed the top ten fossil fuel producers in terms of the carbon emissions from each. Saudi Aramco was Number 1, at 3.40%; Chevron was Number 2, at 3.06%.[296]

293. JOANA SETZER & CATHERINE HIGHAM, GRANTHAM RSCH. INST. ON CLIMATE CHANGE & THE ENV'T & SABIN CTR FOR CLIMATE CHANGE LAW, GLOBAL TRENDS IN CLIMATE CHANGE LITIGATION: 2024 SNAPSHOT 31–32 (2024).

294. UNION OF CONCERNED SCIENTISTS, THE FOSSIL FUELS BEHIND FOREST FIRES: QUANTIFYING THE CONTRIBUTION OF MAJOR CARBON PRODUCERS TO INCREASING WILDFIRE RISK IN WESTERN NORTH AMERICA 1 (2023).

295. *Id.* at 1.

296. *Id.* at 2.

In 2023, Multnomah County, Oregon sued thirteen oil, gas and coal companies, two industry associations, and a consulting firm in Oregon state court for $51.55 billion in damages from wildfires and extreme heat.[297] The complaint cited the just-described work of the Union of Concerned Scientists.[298] The suit is still in its early stages.

In 2020, the County of Maui, Hawaii sued twenty oil companies, alleging that the GHG emissions from the use of their products was causing damages. The complaint mentioned the word "wildfires" seventeen times (but not wildfire smoke), and alleged that GHG emissions were increasing the frequency and intensity of wildfires.[299] This case is now being considered together with a similar lawsuit filed by the City and County of Honolulu.[300] Honolulu's original complaint (also filed in 2020) mentioned wildfires only once.[301] In October 2023, the Hawaii Supreme Court denied defendants' motion to dismiss these cases without mentioning wildfires.[302] In January 2025, the U.S. Supreme Court denied the defendants' petition for certiorari in this case. So far it appears that the wildfire that devastated Maui in August 2023 has not played a role in this litigation, though there was press speculation at the time that it would.[303]

In 2020, six Portuguese youth filed a complaint with the European Court of Human Rights against thirty-three European countries claiming that their GHG emissions had contributed to forest fires in Portugal.[304] In 2024, the court dismissed the case, largely on the grounds that it should have been brought in the courts of Portugal, and that those courts might not have jurisdiction outside their country.[305]

297. Complaint at 173–74, Cnty of Multnomah v. Exxon Mobil Corp., No. 23CV25164 (Or. Cir. Ct. Oct. 7, 2024).

298. *Id.* at 111 n.245, 135 n.279, 144 n.300, 151 n.314.

299. Complaint, Cnty of Maui v. Sunoco LP, No. 2CCV-20-0000283 (Haw. 2d Cir. Ct. Oct. 12, 2020).

300. The Sabin Center's Climate Change Litigation Database posts relevant orders as they become available. *See City & County of Honolulu v. Sunoco LP,* CLIMATE CASE CHART, https://climatecasechart.com/case/city-county-of-honolulu-v-sunoco-lp/ [https://perma.cc/U4N6-Y4L4] (last visited Mar. 18, 2025).

301. Complaint at 89, City and Cnty of Honolulu v. Sunoco LP, No. 1CCV-20-0000380 (Haw. 1st Cir. Ct. Mar. 9, 2020).

302. City and Cnty of Honolulu v. Sunoco LP, No. 1CCV-20-0000380 (Haw. S. Ct. Oct. 31, 2023).

303. Hiroko Tabuchi, *In 2020, Maui Sued Big Oil Over Fire Risks. Now, the Suit Has New Weight*, N.Y. TIMES (Aug. 19, 2023), https://www.nytimes.com/2023/08/18/climate/maui-fires-lawsuit.html [On File with the Columbia Journal of Environmental Law].

304. Duarte Agostinho and Others v. Portugal, Application No. 39371/20 (Eur. Ct. H.R. Apr. 9, 2024).

305. *Id.* at 73.

Professor William Boyd has proposed a novel liability scheme for wildfire smoke. He "would impose strict liability for $CO_2$ emissions from all *unplanned* wildfires on federal lands."[306] Emissions from prescribed burning would not be subject to liability. The government would pay the social cost of carbon for the emissions of wildfires. At the time of his article, the figure used by the government was $51 per metric ton of $CO_2$.[307] At that figure, Boyd estimated that on the order of $6 billion per year would be generated,[308] which he proposes to come from the general federal treasury, not agency budgets.[309] This system would help pay for long-term investments in forest restoration and resilience.

A related issue in assigning liability is that wildfires may cause the release of hazardous substances into the environment, contaminating other locations. The Government Accountability Office has identified at least 234 nonfederal National Priorities List sites (also known as Superfund sites) located in areas in the contiguous United States that have high or very high wildfire hazard potential.[310] Fires have swept across some of these sites, though it is not clear whether the smoke carried away toxic substances.[311] Wildfires have also come very close to several sites that have a great deal of nuclear material, including the Los Alamos National Laboratory in New Mexico, the Santa Susana Field Laboratory in southern California, and the Pantex Plant (where

306. William Boyd, *Climate Liability for Wildfire Emissions from Federal Forests*, 48 ECOLOGY L.Q. 981, 1009 (2021) (emphasis in original).

307. *Id*. at 1011. The value of the social cost of carbon is highly contested, based on such factors as the discount rate used; the array of damages that are considered; and whether global damages or only damages within the U.S. are considered. At the end of the first Trump administration, it was $1. Paul Voosen, *Trump downplayed the costs of carbon pollution. That's about to change*, SCIENCE (Jan. 22, 2021), https://www.science.org/content/article/trump-downplayed-costs-carbon-pollution-s-about-change [On File with the Columbia Journal of Environmental Law]. The Biden administration raised it to $190. Coral Davenport, *Biden Administration Unleashes Powerful Regulatory Tool Aimed at Climate*, N.Y. TIMES (Dec. 2, 2023), https://www.nytimes.com/2023/12/02/climate/biden-social-cost-carbon-climate-change.html [On File with the Columbia Journal of Environmental Law]. In late 2024 several economists argued it should be $283. Frances C. Moore et al., *Synthesis of evidence yields high social cost of carbon due to structural model variation and uncertainties*, 121 PROC. NAT'L ACAD. SCIS., no. e2401733121, at 1 (2024). The second Trump administration is expected to lower it again.

308. Boyd, *supra* note 306, at 1011.

309. *Id*. at 1008.

310. U.S. GOV'T ACCOUNTABILITY OFF., SUPERFUND: EPA SHOULD TAKE ADDITIONAL ACTIONS TO MANAGE RISKS FROM CLIMATE CHANGE 26 (2019), https://www.gao.gov/assets/710/702306.pdf [https://perma.cc/F3WW-ETZ3].

311. Michael Kodas & David Hasemeyer, *Wildfires fueled by climate change threaten toxic Superfund sites*, NBC NEWS (Dec. 23, 2020), https://www.nbcnews.com/news/us-news/wildfires-fueled-climate-change-threaten-toxic-superfund-sites-n1252156 [https://perma.cc/2GX4-PR69].

nuclear weapons are disassembled) in Texas, though the fires did not actually reach the sites.[312] If toxic contamination was spread by a wildfire, the caselaw would not seem to support liability under the Comprehensive Environmental, Response, Compensation, and Liability Act,[313] as smoke from burning has not been deemed to be disposal.[314] However, if severe enough, it could lead to cleanup obligations for the owners of the land where the contamination comes to rest.

2. Starting Intentional Fires

Fear of potential liability is one of the major factors that inhibits government employees as well as private landowners from undertaking prescribed fires.[315] One examination concluded that "the probability of escape of a prescribed fire is below 1%, with most escaped fires being minimal in size, presenting almost zero risk of fatality and minimal risk of insurance claims or lawsuits."[316] The Forest Service says that 99.84% of its prescribed fires go according to plan.[317] There are some notable exceptions, however. One fire escaped from a wildlife management area in Florida in 2008 combined with unusual weather conditions to impair visibility on a nearby interstate highway so severely that seventy cars and trucks piled up, with five deaths and thirty-eight injuries.[318] In April 2022, the Forest Service started a prescribed fire in the Santa Fe National Forest; it exploded into the largest fire in New Mexico's history. In releasing a report analyzing the agency's failures concerning this event, the chief of the Forest Service wrote, "[c]limate change is leading to conditions on the ground we have never encountered. We know these conditions are leading to

312. Tammy Webber, *Sites with radioactive material more vulnerable as climate change increase wildfire, flood risks*, L.A. TIMES (May 22, 2024), https://www.latimes.com/world-nation/story/2024-05-25/sites-with-radioactive-material-more-vulnerable-as-climate-change-increases-wildfire-flood-risks [https://perma.cc/EEA8-VTHP].

313. 42 U.S.C. § 9607.

314. Pakootas v. Teck Cominco Metals, Ltd., 830 F.3d 975 (9th Cir. 2016).

315. Rebecca K. Miller, Christopher B. Field & Katharine J. Mach, *Barriers and enablers for prescribed burns for wildfire management in California*, 3 NATURE SUSTAINABILITY 101 (2020); John R. Weir et al., *Liability and Prescribed Fire: Perception and Reality*, 72 RANGELAND ECOLOGY & MGMT. 533 (2019); SCHULTZ, *supra* note 190, at 20–21.

316. Weir, *supra* note 315, at 536; Tania Schoennagel, et al., *Adapt to more wildfire in western North American forests as climate changes*, 114 PROC. NAT'L ACAD. SCIS. 4582 (2017).

317. Randy Moore, *From the Chief's Desk: Reviewing our prescribed fire program*, U.S. FOREST SERV. (May 20, 2022), https://www.fs.usda.gov/inside-fs/leadership/chiefs-desk-reviewing-our-prescribed-fire-program [On File with the Columbia Journal of Environmental Law].

318. McCullers, *supra* note 106, at 591.

more frequent and intense wildfires. Drought, extreme weather, wind conditions and unpredictable weather changes are challenging our ability to use prescribed fire as a tool to combat destructive fires."[319]

Ranchers frequently set fires on their own property to clear land and for other purposes.[320] Liability standards vary state by state for injuries caused by prescribed burns. In many states landowners may be liable in simple negligence if the fire they set causes damage outside their property. Eleven states have instead adopted a gross negligence standard, making it more difficult for an injured party to recover.[321] Notably, a South Carolina law, adopted in 2012, applies the gross negligence standard only to liability caused by the smoke resulting from a prescribed fire.[322] A Florida law applies this standard only if the burn was carried out by a "certified prescribed burn manager."[323] (At least seven other states provide heightened liability protection for certified burners.[324]) A California law establishes a Prescribed Fire Claims Fund, which will provide coverage for losses where prescribed or cultural burns escape.[325] On the other hand, four

319. U.S. FOREST SERV., *Statement from Chief Randy Moore on Hermit's Peak Fire Review* (June 21, 2022), https://www.legistorm.com/stormfeed/view_rss/3328855/organization/33661/title/statement-from-chief-randy-moore-on-hermits-peak-fire-review.html [https://perma.cc/T4QX-UWXB]. *See also* Colleen Hagerty, *The Government Set a Fire in New Mexico. It burned 341,735 Acres*, ROLLING STONE (Mar. 10, 2024), https://www.rollingstone.com/politics/politics-features/calf-canyon-hermits-peak-fire-new-mexico-prescribed-burn-1234982093/ [On File with the Columbia Journal of Environmental Law].

320. *Prescribed burning is a tradition for Floridians*, ST. JOHNS RIVER WATER MGMT. DIST. (Feb. 9, 2023), https://www.sjrwmd.com/streamlines/prescribed-burning-is-a-tradition-for-floridians/ [On File with the Columbia Journal of Environmental Law].

321. The states are Alabama, California, Florida, Georgia, Louisiana, Michigan, Mississippi, Nevada, North Dakota, South Carolina, and Tennessee. CLARK, *supra* note 188, at 23; Jim Brenner & Dale Wade, *Florida's Revised Prescribed Fire Law: Protection For Responsible Burners, in* PROCEEDINGS OF FIRE CONFERENCE 2000: THE FIRST NATIONAL CONGRESS ON FIRE ECOLOGY, PREVENTION AND MANAGEMENT 133 (K.E.M. Galley et al. eds., 2003).

322. S.C. CODE ANN. § 48-34-50 (2025).

323. Brenner & Wade, *supra* note 321.

324. Stephen R. Miller, The Legal Framework of Prescribed Fire: Catalogue of Findings 7–8 (Apr. 15, 2024), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4769687 [On File with the Columbia Journal of Environmental Law].

325. *Prescribed Fire Liability Claims Fund Pilot*, CAL. WILDFIRE & FOREST RESILIENCE TASK FORCE, https://wildfiretaskforce.org/prescribed-fire-liability-claims-fund-pilot/ [https://perma.cc/29MY-BMHE] (last visited Mar. 12, 2025). *See also* Chris Adlam, *Landscapes and Communities: Create Federal Indemnity Fund to cover accidental damages from cultural and prescribed fire*, *in* WILDLAND FIRE POLICY RECOMMENDATIONS, FED'N OF AM. SCIENTISTS (2023), https://fas.org/publication/wildland-fire-policy-recommendations/ (recommending establishment of a similar fund at the federal level).

states have a strict liability standard for prescribed fire users, meaning they are liable regardless of the amount of care they take.[326]

The revised liability standard may have an impact on landowners' willingness to conduct prescribed burns; one study found that "private landowners in counties with gross negligence liability standards burn significantly more hectares than those in counties with simple negligence standards."[327]

If a prescribed fire escapes to another property, the owner of the property may seek damages using nuisance or trespass theories. Some states treat prescribed fires as nuisances; others specifically provide that prescribed fires are not a nuisance.[328]

The federal government is often sued when a prescribed burn escapes. The government has sovereign immunity, but Congress has partially waived that immunity in the Federal Tort Claims Act of 1948. An exception to the waiver is when the injury is due to a federal employee's exercise of a "discretionary function or duty."[329] Most, but not all, of the cases have found that this "discretionary function" exception applied to prescribed burns, and therefore the government was not liable under sovereign immunity. But there can be liability if the government's plan was improper, or its agents did not follow the plan.[330] As Professor Robert Keiter has written:

> As a legal matter, the threat of fiscal liability for fire-related damages has not proven a major impediment to federal prescribed fire policies. The modern courts have not imposed tort or takings liability on the public land agencies for their fire management decisions, save for one instance when agency officials negligently allowed a controlled burn to

326. The states are Connecticut, North Dakota, New Hampshire, and Oklahoma. Jonathan Yoder, *Liability, Regulation and Endogenous Risk: The Incidence and Severity of Escaped Prescribed Fires in the United States*, 51 J.L. & ECON. 297, 307 (2008).

327. Carissa L. Wonkka, William E. Rogers & Urs P. Kreuter, *Legal barriers to effective ecosystem management: exploring linkages between liability, regulations, and prescribed fire*, 25 ECOLOGICAL APPLICATIONS, no. 2382 (2015).

328. Miller, *supra* note 324, at 8.

329. 28 U.S.C. § 2680(a).

330. Robert H. Palmer III, *A New Era of Federal Prescribed Fire: Defining Terminology and Properly Applying the Discretionary Function Exception*, 2 SEATTLE J. ENV'TL L. 279 (2012); Charles H. Oldham, *Wildfire Liability and the Federal Government: A Double-Edged Sword*, 48 ARIZONA STATE L.J. 205 (2016); Keiter, *supra* note 122; Elias Kohn, *Wildfire Litigation: Effects on Forest Management and Wildfire Emergency Response*, 48 ENV'T L. 585 (2018); Fla. Dep't Agric. & Consumer Servs. v. United States, No. 4:09-CV-386, 2010 WL 3469553 (N.D. Fla. Aug. 30, 2010); Anderson v. United States, 55 F.3d 1379 (9th Cir. 1995); Foster Logging, Inc. v. United States, 973 F.3d 1152, 1166 (11th Cir. 2020).

escape and destroy a residential neighborhood. But as a political matter, liability concerns are quite real.[331]

At least twice, Congress has passed special laws granting compensation when fires on federal land went out of control.[332]

Forest Service efforts to suppress accidental fires or its decisions to let these fires burn are, like prescribed fires, generally immune from liability under the Federal Tort Claims Act's discretionary function exception.[333] However, when the Forest Service fails to carry out its own firefighting policies, such as its incident-command structure or its duty to warn those in the path of a fire, it may be held liable.[334] The Court of Appeals for the Federal Circuit has held that the government might be liable for a takings claim where it started a fire on privately-owned land to block the spread of an accidental fire in a national forest; in denying a motion to dismiss and reversing the trial-level decision, the court found that "there are legitimate questions as to imminence, necessity, and emergency" in determining whether "the Government is allowed to take a private citizen's property without compensation if it could just as easily solve the problem by taking its own."[335]

Logging companies[336] and railroads[337] have been found liable for sparking wildfires. Plaintiffs have had particular success going after electric utility companies whose transmission lines pass through forests. About 5% of wildfire ignitions in California are from power lines, and they account for about 11% of the acres burned.[338] The courts have held that under the California Constitution, if electric utility equipment causes a fire, the utility is strictly liable for the damages,

331. Keiter, *supra* note 122, at 358. For a subsequent finding of government liability for the escape of a prescribed burn, *see Jury holds Nevada liable for 2017 wildfire that burned homes*, 3NEWS (Aug. 18, 2018), https://news3lv.com/news/local/jury-holds-nevadas-forestry-division-liable-for-17-fire-that-burned-23-homes [https://perma.cc/MZ2U-HWQZ].

332. Keiter, *supra* note 122, at 355–56.

333. Strawberry Water Users Ass'n v. United States, 109 F.4th 1287 (10th Cir. 2024); Miller v. United States, 163 F.3d 591, 594 (9th Cir. 1998); McDougal v. U.S. Forest Serv., 195 F. Supp.2d 1229 (D. Or. 2002); Woodward Stuckart, LLC v. United States, 973 F. Supp. 2d 1210, 1213, 1221–22 (D. Or. 2013), *aff'd*, 650 F. App'x 380 (9th Cir. 2016).

334. Am. Reliable Ins. Co. v. United States, 106 F.4th 498 (6th Cir. 2024); Reed v. United States, 426 F. Supp. 3d 498, 508-511 (E.D. Tenn. 2019).

335. Trinco Investment Co. v. United States, 722 F.3d 1375 (Fed. Cir. 2013).

336. United States v. Sierra Pac. Indus., 100 F. Supp. 3d 948, 953 (E.D. Cal. 2015).

337. United States v. Union Pac. R.R. Co., 565 F. Supp. 2d 1136 (E.D. Cal. 2008).

338. CAROLYN KOUSKY ET AL., WHARTON RISK MGMT. AND DECISION PROCESSES CTR., WILDFIRE COSTS IN CALIFORNIA: THE ROLE OF ELECTRIC UTILITIES 3 (2018), https://esg.wharton.upenn.edu/wp-content/uploads/2023/07/Wildfire-Cost-in-CA-Role-of-Utilities-1.pdf [https://perma.cc/7FXR-Y367].

regardless of whether it is at fault, under a theory of inverse condemnation.[339] California, and perhaps Alabama, are the only states with this doctrine.[340] The costs can be extremely high; San Diego Gas & Electric Co. (SDGE) paid out $379 million for the damages from a 2007 fire, and in 2017 the California Public Utilities Commission refused to allow the utility to pass along these costs to its ratepayers, meaning the shareholders would have to pay.[341] Pacific Gas & Electric (PG&E) faced even higher costs from the 2017 and 2018 wildfires; it declared bankruptcy in 2019 (again) and emerged in 2020, pled guilty to eighty-four counts of involuntary manslaughter, and reached a $13.5 billion settlement with victims.[342] In 2019, California enacted a law called A.B. 1054 that established a $21 billion liability fund to help utilities cover the cost of wildfires caused by their equipment; half of the fund is paid by the state's largest utilities (PG&E, SDGE, and Southern California Edison) and half by ratepayers.[343] California utilities must create Wildfire Mitigation Plans that require the utilities to shut off power at times of very high fire risk,[344] something they have done from time to time, to the great annoyance of their customers.[345] The Hawaiian Electric Industries and other companies have tentatively agreed to pay more than $4 billion to resolve lawsuits involving the 2023 fire in Maui that killed 100 people—the deadliest U.S. wildfire in

339. Pac. Bell Tel. Co. v. S. Cal. Edison Co., 208 Cal. App. 4th 1400 (2012); Barham v. S. Cal. Edison Co., 74 Cal. App. 4th 744 (1999).

340. KOUSKY ET AL., *supra* note 338, at 6. For a discussion of the pertinent cases in Alabama, where an inverse condemnation case involving electric power companies and wildfire has apparently not arisen, *see* William Burkett, *Southern Takings: Alabama Eminent Domain, Inverse Condemnation, and Regulatory Takings*, 50 CUMB. L. REV. 211 (2019).

341. Jason Fordney, *Wildfire Costs Ignite Worry at CPUC, Legislature*, RTO INSIDER (Feb. 27, 2018), https://www.rtoinsider.com/20563-wildfire-costs-ignite-worry-at-cpuc-legislature/ [On File with the Columbia Journal of Environmental law].

342. Ivan Penn, *PG&E, Troubled California Utility, Emerges From Bankruptcy*, N.Y. TIMES (July 1, 2020), https://www.nytimes.com/2020/07/01/business/energy-environment/pge-bankruptcy-ends.html [On File with the Columbia Journal of Environmental Law]; Ivan Penn et al., *PG&E Reaches $13.5 Billion Deal with Wildfire Victims*, N.Y. TIMES (Dec. 6, 2019), https://www.nytimes.com/2019/12/06/business/energy-environment/pge-wildfire-victims-deal.html [On File with the Columbia Journal of Environmental Law]. *See generally* KATHERINE BLUNT, CALIFORNIA BURNING: THE FALL OF PACIFIC GAS AND ELECTRIC–AND WHAT IT MEANS FOR AMERICA'S POWER GRID (2022).

343. Myanna Dellinger, *Electric Utility Wildfire Liability Reform in California*, 49 ENV'T L. REP. 11003 (2019).

344. MICHAEL WARA ET AL., HAMILTON PROJECT, CLIMATE CHANGE AND UTILITY WILDFIRE RISK: A PROPOSAL FOR A FEDERAL BACKSTOP 4 (2024).

345. Matt Simon, *Power Shutoffs Can't Save California From Wildfire Hell*, WIRED (Oct. 8, 2019), https://www.wired.com/story/pge-california-power-outage/ [https://perma.cc/CX9H-SE49].

the past century.[346] Wildfires sparked by electric utilities are a growing problem in many parts of the country. Stanford's Michael Wara, a leading authority on these issues, and colleagues have proposed enactment of a federal law, somewhat modeled after California's A.B. 1054, that would subject utilities to a regulatory process for their fire safety measures, coupled with a risk-pooling insurance mechanism to help cover catastrophic losses.[347]

3. Employers

The federal Occupational Safety and Health Administration (OSHA) has issued multiple regulations requiring employers to protect the safety and health of their workers, but it has no regulations on outdoor smoke. In June 2023, when Canadian wildfires were causing hazardous air pollution in wide swaths of the U.S., both OSHA[348] and the CDC[349] circulated suggestions to employers to protect outdoor workers from the smoke, such as monitoring the AirNow.gov website to see local air quality conditions; moving work indoors if possible; reducing levels of physical activity; allowing breaks in smoke-free places; and providing the National Institute for Occupational Safety and Health (NIOSH) approved respirators and the N95 mask, which became very familiar during the height of the COVID-19 pandemic. However, these were not binding. OSHA does have a widely applicable regulation that provides that "[a] respirator shall be provided to each employee when such equipment is necessary to protect the health of such employee."[350]

The Occupational Safety and Health Act of 1970 (OSHA's organic statute) has a "general duty clause," which states that "each employer…shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his

346. Jef Feeley & Mark Chediak, *Hawaiian Electric Among Firms in $4 Billion Maui Fire Deal*, BLOOMBERG LAW (July 19, 2024), https://news.bloomberglaw.com/insurance/hawaiian-electric-among-firms-eyeing-4-billion-maui-fire-deal [On File with the Columbia Journal of Environmental Law].

347. WARA ET AL., *supra* note 344, at 10.

348. *OSHA National News Release, US Department of Labor urges employers to have a plan to protect outdoor workers from hazards associated with poor air quality*, OCCUPATIONAL SAFETY & HEALTH ADMIN. (June 9, 2023), https://www.osha.gov/news/newsreleases/national/06092023 [On File with the Columbia Journal of Environmental Law].

349. Maryann M. D'Alessandro et al., *Protecting Workers and the Public from Wildfire Smoke*, CTRS. FOR DISEASE CONTROL & PREVENTION: NIOSH SCI. BLOG (June 29, 2023), https://blogs.cdc.gov/niosh-science-blog/2023/06/29/wildfire-smoke/ [https://perma.cc/9N6U-GUUQ].

350. 29 C.F.R. § 1910.134(a)(2) (2025).

employees."[351] This arguably requires employers to provide the sort of protections that OSHA and the CDC recommended, but it is so vague that it is difficult to enforce. One law firm has argued, "[i]n light of wildfire smoke, the General Duty Clause implies that employers must proactively engage in risk assessment, establish and implement protective measures, and ensure employees are not subjected to conditions that could detrimentally affect their health. Employers must consider factors like air quality and visibility, especially when heavy wildfire smoke infiltrates indoor and outdoor workplaces."[352] There does not appear to be any caselaw on this issue.

In August 2024, OSHA proposed its first standard for protecting outdoor and indoor workers from heat, but the proposal makes no mention of smoke.[353] This heat standard has not yet been adopted in final form.

Three states have issued their own regulations requiring employers to protect workers from smoke—California, Oregon, and Washington.[354] The California regulations require employers to inform employees of the air quality levels, to use engineering controls "whenever feasible" such as in enclosed buildings where the air is filtered, to provide respirators if $PM_{2.5}$ levels exceed a certain level, and to mandate use of respirators if levels are even higher.[355] They exempt enclosed buildings and vehicles where there is adequate air filtration.[356] Oregon's rules provide that during high smoke conditions appropriate actions include "temporarily relocating outdoor workers to available indoor areas or vehicles where the air is adequately filtered, or using portable air purifiers," and changing employee work locations and schedules "when work permits."[357] Several business groups challenged the Oregon rule in federal court on the grounds that it was unconstitutionally vague and also exceeded the issuing agency's

351. Occupational Safety & Health Act § 5(a)(1), 29 U.S.C. § 654(a)(1).

352. *Workers' Right During Heavy Wildfire Smoke in New Jersey: A Comprehensive Guide*, KOTLAR, HERNANDEZ & COHEN (Sept. 13, 2023), https://peoplefirstlawyers.com/workers-rights-during-heavy-wildfire-smoke/ [https://perma.cc/JRL8-F33M].

353. Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings, 89 Fed. Reg. 70698 (proposed Aug. 30, 2024).

354. Kathryn P. Fletcher & Theodore G. Lee, *Washington State Adopts New, Permanent Wildfire Smoke Regulations*, NAT'L L. REV. (Dec. 21, 2023), https://natlawreview.com/article/washington-state-adopts-new-permanent-wildfire-smoke-regulations [https://perma.cc/2MGF-5WVX]; ENV'T L. INST., WILDFIRE SMOKE: STATE POLICIES FOR REDUCING INDOOR EXPOSURE 72–76 (2024).

355. CAL. CODE REGS. tit. 8, § 5141.1 (2025).

356. CAL. CODE REGS. tit. 8 §5141.1(2) (2025).

357. OR. ADMIN. R. 437-002-1081 (2022).

statutory authority. The court dismissed the suit with prejudice.[358] Washington has similar rules though they are somewhat less detailed than those of California and Oregon.[359] Washington also requires temporary worker housing (such as for farmworkers) to have adequate ventilation.[360] Montana has issued guidance, but not regulations, on protecting workers from wildfire smoke.[361]

When wildfire smoke from Canada shrouded the northeastern states in 2023, several law firms sent out notices warning that workers' compensation claims might be filed by employees who were sickened by wildfire smoke while on the job.[362] It is not clear if any such claims have actually been filed. Construction contractors have also been warned that they could face a choice between being liable for endangering workers who they require to work during high smoke conditions, or being liable to project owners for not performing the work, though the Associated Builders and Contractors emphasized "contractors need to do what is necessary to put their workers' health first."[363]

Xavier Becerra, former Secretary of Health and Human Services, announced in March 2024 that he was asking health experts to meet regularly in an effort to better protect farmworkers from extreme heat

358. Or. Mfrs. & Com. v. Or. Occupational Safety & Health Div., 2022 WL 17820312 (D. Or. 2022).

359. WASH. ADMIN. CODE §§ 296-820-805–60.

360. WASH. ADMIN. CODE §§ 296-307-16145(11), 246-358-075(11), 296-307-16146, 246-358-076.

361. MONT. DEP'T OF PUBLIC HEALTH AND HUM. SERVS., WILDFIRE SMOKE & EMPLOYEE HEALTH, https://dphhs.mt.gov/assets/publichealth/Asthma/Wildfire%20Smoke/WildfireSmokeEmployeeProtection.pdf [https://perma.cc/X2BX-DYHG].

362. *E.g.*, Noah L. Dennison et al., *Canadian Wildfire Smoke and Potential Workers' Compensation Claims*, GOLDBERG SEGALLA (June 8, 2023), https://www.goldbergsegalla.com/news-and-knowledge/knowledge/canadian-wildfire-smoke-and-potential-workers-compensation-claims/ [https://perma.cc/932Z-J7Q9]; *Worker's Compensation and Smoke Inhalation on the Job*, ROBINSON LAW LLC, https://robinsonlwyr.com/workers-compensation-and-smoke-inhalation-on-the-job/ [https://perma.cc/BY8P-BVM2] (last visited Feb. 13, 2025); *Wildfire Smoke Exposure & Workers' Compensation*, LEVINSON AXELROD (June 12, 2023), https://www.njlawyers.com/blog/2023/june/wildfire-smoke-exposure-workers-compensation/ [https://perma.cc/XS9S-XNQJ].

363. Joe Bousquin, *Contractors Could be Liable for Wildfire Smoke Impacts on Workers' Health*, CONSTR. DIVE (Sept. 25, 2020), https://www.constructiondive.com/news/contractors-could-be-liable-for-wildfire-smoke-impacts-on-workers-health/585861/ [https://perma.cc/B77W-YUT5].

and wildfire smoke. He said he was inspired to do this because his own father picked crops in California farm fields.[364]

Early in the COVID-19 pandemic, many people became familiar with the NIOSH-approved N95 or P100 disposable respirators. Use of these kinds of masks has been recommended for those who must work outside in smoky conditions.[365] However, these recommendations were not binding. OSHA does have a widely applicable regulation that provides that "[a] respirator shall be provided to each employee when such equipment is necessary to protect the health of such employee."[366] One potential complication for employers and others is that various criminal enterprises have manufactured counterfeit N95 masks. In February 2021, federal agents seized approximately 11 million such masks.[367] Several people have been prosecuted for such actions.[368]

4. Insurance

Insurance plays a role, but a limited one, in reducing wildfire risk. For a long time, higher insurance costs did not significantly discourage development in or near forested areas; people wanted to live

364. Ariel Wittenberg, *HHS to Target Heat, Smoke Effects on Farmworkers*, CLIMATE WIRE (Mar. 28, 2024), https://www.eenews.net/articles/hhs-to-target-heat-smoke-effects-on-farmworkers/ [On File with the Columbia Journal of Environmental Law]. *Cf.* Danielle Paquette, *During California Wildfires, Farmworkers Say They Felt Pressure to Keep Working or Lose Their Jobs*, WASH. POST (Nov. 20, 2018), https://www.washingtonpost.com/business/economy/during-california-wildfires-farm-workers-felt-pressured-to-keep-working-or-lose-their-jobs/2018/11/20/757f92a0-ec06-11e8-baac-2a674e91502b_story.html [On File with the Columbia Journal of Environmental Law].

365. ENV'T PROT. AGENCY, WILDFIRE SMOKE: A GUIDE FOR PUBLIC HEALTH OFFICIALS 27–29 (2019), https://www.airnow.gov/sites/default/files/2021-09/wildfire-smoke-guide_0.pdf [https://perma.cc/9FW9-DKF7].

366. 29 C.F.R. § 1910.134(a)(2).

367. *DHS Prevents Millions of Counterfeit N95 Masks from Reaching Hospital Workers, First Responders*, U.S. IMMIGR. AND CUSTOMS ENF'T (Feb. 17, 2021), https://www.ice.gov/news/releases/dhs-prevents-millions-counterfeit-n95-masks-reaching-hospital-workers-first [https://perma.cc/82MH-27W6].

368. *Phoenix Man Sentenced for Importing Counterfeit N95 Masks from Asia*, U.S. ATT'Y'S OFF., DIST. OF ARIZ. (Dec. 30, 2022), https://www.justice.gov/usao-az/pr/phoenix-man-sentenced-importing-counterfeit-n95-masks-asia [https://perma.cc/7VEE-KP6R]; Kyle Iboshi, *Feds Seek Lamborghini, Mercedes and Cash from Oregon Man Who Allegedly Sold Fake N95 Masks*, KGW8 (Oct. 4, 2023), https://www.kgw.com/article/news/investigations/oregon-man-selling-fake-counterfeit-n95-masks-covid-charged-federal/283-b6f99c61-ee64-4e62-a25b-d21cc898b85d? [https://perma.cc/U7SL-ETGY]; *Feds Charge Michigan Man With N95 Mask Scam Which Burned Bay Area Victims*, CBS NEWS (Apr. 28, 2020), https://www.cbsnews.com/sanfrancisco/news/feds-charge-michigan-man-with-n95-mask-scam-which-burned-bay-area-victims/ [https://perma.cc/P5G6-9974].

there and were willing to pay the higher premiums.[369] Some carriers are now refusing to sell policies in wildfire-prone areas,[370] but this may not be having much impact on home values or sales,[371] though it is possible that the Los Angeles fires of 2025 will change that, at least in parts of California. Moreover, some states do not allow insurance companies to raise premiums to fully reflect wildfire risks.[372] A California law prohibits insurance companies from canceling a policy while a primary residence is being rebuilt after a disaster and requires them to renew the policy at least once following a total loss.[373] However, these policies are typically written for only twelve months. Thus, many homeowners are now rebuilding their homes in areas recently (and sometimes repeatedly) destroyed by fire, and they still have their insurance; a year after their first renewal, their policy may be canceled, and they may be relegated to a state-sponsored "last resort" insurance program with high premiums and limited coverage.[374]

369. Ray Rasker, *Do Insurance Policies and Rates Influence Home Development on Fire-Prone Lands?*, HEADWATERS ECON. (June 28, 2016), https://headwaterseconomics.org/wildfire/solutions/insurance-wildfire-home-development/ [https://perma.cc/H3X2-YCHR].

370. Gloria Oladipo, *Insurance Giant Halts Sale of New Home Policies in California due to Wildfires*, GUARDIAN (May 27, 2023), https://www.theguardian.com/us-news/2023/may/27/state-farm-home-insurance-california-wildfires [https://perma.cc/FG4E-E326]; Christopher Flavelle, Jill Cowan & Ivan Penn, *Climate Shocks Are Making Parts of America Uninsurable. It Just Got Worse*, N.Y. TIMES (May 31, 2023), https://www.nytimes.com/2023/05/31/climate/climate-change-insurance-wildfires-california.html [On File with the Columbia Journal of Environmental Law]; Nadja Popovich & Brad Plumer, *As Wildfires Grow, Millions of Homes Are Being Built in Harm's Way*, N.Y. TIMES (Sept. 9, 2022), https://www.nytimes.com/interactive/2022/09/09/climate/growing-wildfire-risk-homes.html [On File with the Columbia Journal of Environmental Law].

371. Hongwei Dong, *Climate Change and Real Estate Markets: An Empirical Study of the Impacts of Wildfires on Home Values in California*, 247 LANDSCAPE & URB. PLAN. 105062 (2024); Miriam Greenberg et al., *Relational Geographies of Urban Unsustainability: The Entanglement of California's Housing Crisis with WUI Growth and Climate Change*, 121 PROC. NAT'L ACAD. SCIS., no. e2310080121 (2024).

372. Christopher Flavelle, *Why Two Years of Historic Wildfires Haven't Made Southern California Safer*, BLOOMBERG NEWS (Aug. 15, 2018), https://www.bloomberg.com/news/articles/2018-08-15/why-two-years-of-historic-wildfires-haven-t-made-southern-california-safer [On File with the Columbia Journal of Environmental Law]; *but see* Brianna Sacks, *As Wildfire Risks Intensify, California Insurance Rates Keep Rising*, WASH. POST (Aug. 29, 2024), https://www.washingtonpost.com/climate-environment/2024/08/29/california-insurance-wildfires-allstate/ [On File with the Columbia Journal of Environmental Law].

373. CAL. INS. CODE § 675.1 (West 2019).

374. Jessica Wentz, *Wildfire Risk In A Warming Climate: Homes Built In The Aftermath Of Wildfires May Become Uninsurable*, CLIMATE L. BLOG (June 25, 2018), https://blogs.law.columbia.edu/climatechange/2018/06/25/wildfire-risk-in-a-warming-climate-homes-built-in-the-aftermath-of-wildfires-may-become-uninsurable/ [https://perma.cc/9GNA-SYHQ]. *See also* CAL. DEP'T OF INS., THE AVAILABILITY AND AFFORDABILITY OF COVERAGE FOR WILDFIRE LOSS IN

A major question as this is written is how this program, and the real estate market for much of California, will cope in the wake of the Los Angeles fires.[375]

Where the law does not restrain insurance companies from charging market-based rates, insurance is starting to be effective in inducing some building owners in high-hazard areas to build to fire-resistant standards; otherwise, they may lose their coverage or have to pay more for it.[376]

Occasionally, insurance claims are made for economic damage caused by wildfire smoke. In *Oregon Shakespeare Festival Ass'n v. Great American Insurance Co.*, several theater events were cancelled due to wildfire smoke. The court found that this loss was covered because "the infiltration of smoke into the interior of the theater is a covered 'physical loss of or damage to property' . . . ."[377]

United Policyholders, a nonprofit that advances the interests of insurance policyholders, has advised, "Damage to your home and possessions by smoke and ash is covered in your home policy. Payment for smoke damage to the structure of your home (walls, studs, wall-to-wall carpeting etc.) comes out of your dwelling coverage. Payment for smoke damage to area rugs, clothing, curtains, furniture, etc.) comes out of your contents coverage."[378] However, some homeowners have experienced difficulties getting insurance companies to pay for damage caused by wildfire smoke.[379]

RESIDENTIAL PROPERTY INSURANCE IN THE WILDLAND-URBAN INTERFACE AND OTHER HIGH-RISK AREAS OF CALIFORNIA: CDI SUMMARY AND PROPOSED SOLUTIONS (2017), https://uphelp.org/wp-content/uploads/2020/08/docs_legal-1053561-v1-cdi_white_paper_availability_affordability_120817.pdf [https://perma.cc/KRR9-NV5X]; Christopher Flavelle, *Wildfires Threaten to Make Home Insurance Unaffordable*, BLOOMBERG NEWS (Jan. 4, 2018), https://www.bloomberg.com/news/articles/2018-01-04/california-says-wildfires-are-making-home-insurance-unaffordable [On File with the Columbia Journal of Environmental Law].

375. *See* Lawrence Darmiento, *Insurer of last resort may need a bailout*, L.A. TIMES (Jan. 19, 2025), https://www.latimes.com/business/story/2025-01-18/california-fair-plan-the-home-insurer-of-last-resort-may-need-bailout-after-fire-losses [https://perma.cc/7CCD-NJ2C].

376. Jonathan Yoder, *Fuel for the Fire: Liability and the Economics of Wildfire Risk, in* WILDFIRE POLICY: LAW AND ECONOMICS PERSPECTIVES 51 (Karen M. Bradshaw & Dean Lueck eds., 2012); Rasker, *supra* note 369.

377. Or. Shakespeare Festival Ass'n v. Great Am. Ins. Co., No. 1:15-cv-01932-CL, 2016 WL 3267247, at *7 (D. Or. June 7, 2016).

378. *Smoke and Ash Damage from a Wildfire*, UNITED POLICYHOLDERS, https://uphelp.org/claim-guidance-publications/smoke-and-ash-damage-from-a-wildfire/ [https://perma.cc/ET49-3MC7] (last visited Feb. 7, 2025).

379. Kiley Price, *Wildfires Leave Toxins in Homes. Insurance Companies Can Do More About It*, TIME (Jan. 25, 2024), https://time.com/6588094/wildfires-hidden-toxins-insurance/ [https://perma.cc/49TX-FZPM].

Senator Alex Padilla (D-CA) has introduced the Smoke Exposure Crop Insurance Act of 2023, which would require creation of a crop insurance policy to better insure against wine grape losses due to wildfire smoke.[380] However, that bill has made little progress in Congress.[381]

5. Smoke Across Borders

Wildfires in Canada have caused serious smoke conditions in the United States. Canada is the second largest country in the world (behind Russia), and more than 43% of its land area is forest.[382] Like the United States, Canada had a long history of fire suppression, leading to a buildup of fuel.[383] But stifling smoke crossing national borders is a global phenomenon. Fires in Indonesia have repeatedly blanketed Singapore, Malaysia, and beyond.[384] In May 1998, the entire state of Texas was under an air quality alert, and visibility was impaired as far north as Wisconsin, because of smoke from fires thousands of miles away in Mexico.[385] Smoke from China has long sickened people in South Korea, though that situation is improving.[386]

A country does not bear legal responsibility if it experiences a natural disaster such as a volcanic eruption or an earthquake that leads to damage in other countries. But if the disaster was caused or worsened by human actions, legal questions arise. The Indonesian smoke plumes largely came from farmers and landowners starting fires to

380. Smoke Exposure Crop Insurance Act of 2023, S. 2134, 118th Cong. (2023). *See also* Smoke Exposure Crop Insurance Act of 2023, H.R. 4308, 118th Cong. (2023).

381. *See All Information (Except Text) for S.2134 - Smoke Exposure Crop Insurance Act of 2023*, CONGRESS.GOV, https://www.congress.gov/bill/118th-congress/senate-bill/2134/all-info [On File with the Columbia Journal of Environmental Law] (last visited Feb. 7, 2025).

382. *Canada*, GLOB. FOREST WATCH, https://www.globalforestwatch.org/dashboards/country/CAN/?category=land-cover&location=WyJjb3VudHJ5IiwiQ0FOIl0%3D [On File with the Columbia Journal of Environmental Law] (last visited Feb. 7, 2025).

383. Marc-André Parisien et al., *Fire Deficit Increases Wildfire Risk for Many Communities in the Canadian Boreal Forest*, 11 NAT. COMMC'NS, no. 2121, at 1, 4–5 (2020).

384. *See, e.g.,* Michael Brauer & Jamal Hisham-Hashim, *Fires in Indonesia: Crisis and Reaction*, 32 ENV'T SCI. & TECH. 404A, 404A (2011).

385. John H. Cushman Jr., *Texans Coping with Smoke Cloud and Fires in Mexic*o, N.Y. TIMES (May 18, 1998), https://www.nytimes.com/1998/05/18/us/texans-coping-with-smoke-cloud-from-fires-in-mexico.html [On File with the Columbia Journal of Environmental Law]; R.A. Peppler et al., *ARM Southern Great Plains Site Observations of the Smoke Pall Associated with the 1998 Central American Fires*, 81 BULL. AM. METEOROLOGICAL SOC'Y 2563, 2563 (2000).

386. *China's Pollution Spills Over to South Korea, as Does the Benefits of its Policies*, ENERGY POL'Y INST. AT THE UNIV. OF CHI. (Mar. 27, 2023), https://epic.uchicago.edu/insights/chinas-pollution-spills-over-to-south-korea-as-does-the-benefits-of-its-policies/ [https://perma.cc/QW9E-EEX2].

clear land for crops or development. These actions were tolerated by the Indonesian government. If government action or inaction leads to smoke that darkens the skies across borders, can the law assist the downwind countries?

Several principles of international law would seem to apply. Most importantly, the "no-harm rule" provides that states have a sovereign right to exploit their resources, but they must ensure that their exercise of this right does not damage the environment of other states or areas outside their jurisdiction. This rule has been recognized in several arbitral and judicial decisions[387] and United Nations declarations.[388] One commentator has suggested that Brazil's forest management policies during the presidency of Jair Bolsonaro, which led to massive wildfires, violated these principles as well as the no-harm rule under the Convention on Biological Diversity.[389] The existence of these principles does not mean there is always a legal remedy for their breach. A remedy would have to be imposed by a court or other tribunal, and a fundamental principle of international law is that states are not subject to the jurisdiction of a tribunal unless they have consented. In December 2024, the International Court of Justice (ICJ) heard arguments in a case originally brought by the island nation of Vanuatu claiming that its survival is threatened by GHG emissions from other countries.[390] However, the most the ICJ can do here is issue an advisory opinion; the largest emitters, China and the U.S., are not among the countries that have consented to give the ICJ the power to issue a binding ruling in such a case.[391] Moreover, getting to the ICJ

387. *See, e.g.,* Trail Smelter (U.S./Can.), 3 R.I.A.A. 1905, 1965 (Ottawa Convention 1941); Corfu Channel (U.K. v. Alb.), Judgment, 1949 I.C.J. 4, 22 (Apr. 9); Pulp Mills on River Uruguay (Arg. v. Uru.), Judgment, 2010 I.C.J. 14, ¶ 101 (Apr. 20).

388. *See, e.g.,* U.N. Conference on the Human Environment, *Declaration of the U.N. Conference on the Human Environment*, prin. 21, U.N. Doc. A/CONF.48/14/Rev. 1 (June 16, 1972); U.N. Conference on Environment and Development, *Rio Declaration on Environment and Development*, prin. 14, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I), annex I (Aug. 12, 1992).

389. Ruslan Klafehn, *Burning Down the House: Do Brazil's Forest Management Policies Violate the No-Harm Rule Under the CBS and Customary International Law?*, 35 AM. U. INT'L L. REV. 941, 945 (2020).

390. Stephanie van den Berg, *Vanuatu urges World Court to recognize climate change harms*, REUTERS (Dec. 2, 2024), https://www.reuters.com/business/environment/world-court-open-climate-change-hearings-2024-12-02/ [On File with the Columbia Journal of Environmental Law].

391. ZACHARY VERMEER & DAPO AKANDE, PRIOR CONSENT BY STATES TO THE JURISDICTION OF INTERNATIONAL COURTS AND TRIBUNALS IN INTER-STATE DISPUTES 3, 25–26, (2019), https://www.elac.ox.ac.uk/wp-content/uploads/2023/10/PriorConsent_Final_Report.pdf [https://perma.cc/5NJU-Y7QM].

for an advisory opinion requires a majority vote of the United Nations General Assembly.[392]

Vanuatu launched a successful campaign for that because so many countries are concerned about climate change,[393] but a similar campaign to protect the U.S. from Canadian wildfires is difficult to imagine.

In 2024, the International Tribunal on the Law of the Sea ruled that GHGs that acidify and otherwise damage the oceans violate a provision of the U.N. Convention on the Law of the Sea that requires states to prevent, reduce, and control marine pollution from anthropogenic GHG emissions; but here too, the tribunal could only issue a non-binding advisory opinion.[394]

Most importantly, it is not clear how an advisory ruling on Canadian wildfires, for example, would actually reduce the fires or the smoke. It might increase political pressure on the Canadian government to act, but that government presumably is already facing pressure from its own citizens, who are more directly affected by the smoke than U.S. citizens. As Professor Nicholas Robinson has written, forest fires invoke various principles of international environmental law but,

"[i]t is hard to see how the concepts of liability in international responsibility may be a useful concept to either deter future [forest fires] or insist on measures to prevent the fires. It is evident that traditional international public law has little to offer to solve the problems of transnational forest fire air pollution."[395]

Instead, he argues that international cooperation is more productive. For example, Congress has approved several regional compacts among states to provide mutual aid in fighting wildland fires; two of

392. U.N. Charter art. 96.

393. Michael Birnbaum, *How a Small Island Got the World's Highest Court to Take on Climate Justice*, WASH. POST (Mar. 29, 2023), https://www.washingtonpost.com/climate-solutions/2023/03/29/vanuatu-international-court-un/ [On File with the Columbia Journal of Environmental Law].

394. Margaretha Wewerinke-Singh & Jorge E. Viñuales, *More than a Sink: The ITLOS Advisory Opinion on Climate Change and State Responsibility*, CLIMATE LAW: A SABIN CTR. BLOG (June 7, 2024), https://blogs.law.columbia.edu/climatechange/2024/06/07/more-than-a-sink-the-itlos-advisory-opinion-on-climate-change-and-state-responsibility/ [https://perma.cc/SV3E-AR94].

395. Nicholas A. Robinson, *Forest Fires as a Common International Concern: Precedents for the Progressive Development of International Environmental Law*, 18 PACE ENV'T L. REV. 459, 467 (2001).

these (the Great Lakes Forest Fire Compact and the Northeastern Forest Fire Protection Compact) also include Canadian provinces.[396]

There are examples of international agreements that have effectively addressed transboundary air pollution. The Canada-United States Air Quality Agreement of 1991 was originally designed to address acid rain and was amended in 2000 to concern ground-level ozone.[397] A 2023 review by the countries' environmental agencies concluded that the agreement has been successful in dealing with these two issues, but that fine particulate matter from wildfires is a problem that is increasingly causing transboundary air pollution problems.[398] The two countries could build upon the Air Quality Agreement to foster stronger cooperation in fighting wildfires.[399] They did so in June 2023 using a different mechanism—a memorandum of understanding between the U.S. Departments of Agriculture and Interior and Natural Resources Canada, pledging mutual aid during wildfire emergencies and other extreme events.[400]

Another framework for international cooperation is the Convention on Long-Range Transboundary Air Pollution, which was signed in 1979 and entered into force in 1983.[401] It has fifty-one parties (including the United States and Canada[402]) and eight protocols, most of which address specific pollutants (e.g., persistent organic pollutants,

396. *EACG Representation*, E. AREA COORDINATION CTR., https://gacc.nifc.gov/eacc/eacg/agency_representation/agency_representation.htm [https://perma.cc/9KUG-8UCB] (last visited Feb. 7, 2025).

397. Canada-United States Air Quality Agreement, U.S.-Can., Mar. 13, 1991, T.I.A.S. No. 11,730; *Canada-United States Air Quality Agreement: overview*, GOV'T OF CAN., https://www.canada.ca/en/environment-climate-change/services/air-pollution/issues/transboundary/canada-united-states-air-quality-agreement-overview.html [https://perma.cc/WV6P-HZ49] (last modified Nov. 26, 2024).

398. ENV'T & CLIMATE CHANGE CAN. & U.S. ENV'T PROT. AGENCY, REVIEW AND ASSESSMENT OF THE CANADA-U.S. AIR QUALITY AGREEMENT (AQA), at ii–iv (2023), https://www.epa.gov/system/files/documents/2024-03/review-and-assessment-of-the-canada-us-aqa-508-compliance.pdf [https://perma.cc/J5FM-7E58].

399. Madison Gaffney, *Only Bilateral Agreements Can Stop Wildfires: Why Diplomacy Through the U.S.-Canada Air Quality Agreement (AQA) Is a Solution for Wildfire Related Transboundary Pollution*, VT. J. ENV'T L., Summer 2022, at 1, 28.

400. *Canada and the United States Commit to Enhanced Wildland Fire Cooperation*, U.S. DEP'T OF THE INTERIOR (June 28, 2023), https://www.doi.gov/wildlandfire/canada-and-united-states-commit-enhanced-wildland-fire-cooperation [https://perma.cc/HEZ7-CGYK].

401. Convention on Long-Range Transboundary Air Pollution, Nov. 13, 1979, 1302 U.N.T.S. 217.

402. *Id.*

heavy metals, sulfur, and nitrogen oxides).[403] A new protocol could be adopted for wildfire smoke or $PM_{2.5}$.

Particular efforts have been undertaken in southeast Asia to address smoke that crosses borders. In 2014, the Singapore Parliament enacted the Transboundary Haze Pollution Act imposing criminal and civil liability on agri-business companies involved in fires outside of Singapore that cause haze in the country.[404] Aside from difficult issues of proof and causation, the law could only be enforced against companies with assets or other presence in Singapore.[405] It is not clear if any cases have actually been brought under this law. As a tiny but prosperous island state located between two much larger states, Malaysia and Indonesia, Singapore has led regional efforts to control the haze coming from its neighbors.[406] The Association of Southeast Asian Nations (ASEAN) has adopted various agreements on controlling haze including the ASEAN Agreement on Transboundary Air Pollution (AATHP).[407]

In 2024, the Human Rights Commission of Malaysia ("SUHAKAM") issued a detailed report to address the problem of haze pollution. The report found that the haze was coming from fires in Malaysia, Indonesia, and other countries in southeast Asia. It acknowledged that existing laws were too weak to address the problem and recommended several changes in domestic law and negotiations to try to develop "a protocol to the AATHP to establish a legally binding commitment by each Member State to enact domestic legislation to hold to account its

403. *See, e.g.*, Protocols to the Convention on Long-Range Transboundary Air Pollution, including the Protocol on the Reduction of Sulphur Emissions, July 8, 1985, 1480 U.N.T.S. 215, and the Protocol on Persistent Organic Pollutants, June 24, 1998, U.N. Doc. ECE/EB.AIR/104; U.N. Economic Commission for Europe, Protocols, https://unece.org/protocols [On File with the Columbia Journal of Environmental Law] (last visited Feb. 7, 2025).

404. Transboundary Haze Pollution Act 2014, No. 24 of 2014 (Sing.).

405. Alan Khee-Jin Tan, *The 'Haze' Crisis in Southeast Asia: Assessing Singapore's Transboundary Pollution Act 2014*, at 21, 41–42 (Nat'l Univ. of Sing., Working Paper No. 2015/002, 2015).

406. Helena Varkkey, *Emergent Geographies of Chronic Air Pollution Governance in Southeast Asia: Transboundary Publics in Singapore*, 32 ENV'T POL'Y & GOVERNANCE 348, 351 (2022).

407. ASEAN SECRETARIAT, EXECUTIVE SUMMARY OF THE FINAL REVIEW OF THE ROADMAP ON ASEAN COOPERATION TOWARDS TRANSBOUNDARY HAZE POLLUTION CONTROL WITH MEANS OF IMPLEMENTATION 1 (2022), https://asean.org/wp-content/uploads/2022/06/Executive-Summary-Haze-Roadmap-Review-E-PUB-21Jun22.pdf [https://perma.cc/9WMT-TVL6]; Varkkey, *supra* note 406; Lauren Mai, *Extinguishing a Point of Contention: Examining Transboundary Haze in Southeast Asia*, DIPLOMAT (Nov. 28, 2023), https://thediplomat.com/2023/11/extinguishing-a-point-of-contention-examining-transboundary-haze-in-southeast-asia/ [On File with the Columbia Journal of Environmental Law]; Samantha Ho, *Asean Still Lacks Legal Redress Against Transboundary Haze, in Focus Ahead of Leaders' Meeting*, ECO-BUSINESS (June 5, 2023), https://www.eco-business.com/news/asean-still-lacks-legal-redress-against-transboundary-haze-in-focus-ahead-of-leaders-meeting/ [On File with the Columbia Journal of Environmental Law].

citizens and corporations domiciled in its own jurisdiction for their contribution to land and/or forest fires in other Member States."[408]

In sum, there do not currently appear to be any options to secure redress (either through money damages or injunctive relief) from the courts for cross-boundary smoke. Diplomacy remains a potential tool, and it would be supported by principles of international law.

### C. Building near the Woods

As climate change makes wildfires more frequent and intense, people who live near or in forested areas are in peril, leading to a policy of aggressive fire suppression. If people live nearby, it is much more challenging to let fires burn or to set prescribed fires. Dealing with this peril, and with the suppression of natural wildfires, poses legal issues that are key to coping with wildfire smoke.

There is a legal term for these areas: the Wildland-Urban Interface, or WUI (pronounced "WOO-EE").[409] Several federal and state statutes and regulations define the WUI in different ways, but the basic concept is areas where buildings are near or within undeveloped wildland.[410] As urban areas grow, the borderline pushes outward into the trees.[411] The WUI is the fastest-growing land use type in the coterminous United States. The number of houses in the WUI has been rapidly growing and was forty-four million in 2020.[412] Today, about one in three houses and one tenth of the land area in the coterminous United States is in the WUI.[413] Sixty percent of new homes built in the United States since 1990 have been constructed in the WUI, converting wildlands to WUI at a rate of approximately four thousand acres

408. SUHAKAM, SILENT ENEMY: REPORT ON HAZE POLLUTION & THE RIGHT TO CLEAN AIR 43 (2024), https://suhakam.org.my/wp-content/uploads/2024/09/SUHAKAM-Report-on-Haze-Pollution-Right-to-Clean-Air.pdf [https://perma.cc/5LQK-ZQZE].

409. This is not only a U.S. phenomenon. Franz Schug et al., *The Global Wildland-Urban Interface*, 621 NATURE 94, 94 (2023).

410. Stephen R. Miller, *Planning for Wildfire in the Wildland-Urban Interface: A Guide for Western Communities*, 49 URB. LAW. 207, 213 (2017).

411. Prashant Gopal & Noah Buhayar, *California's Housing Crunch is Pushing Developers Deeper into Dangerous Fire Zones*, CLAIMS J. (Nov. 25, 2019), https://www.claimsjournal.com/news/west/2019/11/25/294252.htm [https://perma.cc/42A7-3SJD].

412. Volker C. Radeloff et al., *Rising Wildfire Risk to Houses in the United States, Especially in Grasslands and Shrublands*, 382 SCIENCE 702, 706 (2023). *See also* Nadja Popovich & Brad Plumer, *Homes Built in Harm's Way, Even as Wildfires Grow Larger*, N.Y. TIMES (Sept. 9, 2022), https://www.nytimes.com/interactive/2022/09/09/climate/growing-wildfire-risk-homes.html [On File with the Columbia Journal of Environmental Law].

413. Volker C. Radeloff et al., *Rapid Growth of the US Wildland-Urban Interface Raises Wildfire Risk*, 115 PROC. NAT'L ACAD. SCIS. 3314, 3314 (2018).

per day and two million acres per year.[414] These homes are especially vulnerable to wildfires; 69% of buildings destroyed by wildfire in the U.S. are located in the WUI, and in California, that number rises to 75%.[415]

Of the privately-owned wildlands in the western states, only about 16% of the acreage is now developed; the remaining 84% is available for development if state and local governments allow it.[416] Thus, state and local governments will play central roles in determining how many buildings and people are endangered by the fires that climate change is worsening. Governments have three major regulatory targets to reduce the risk: the development of land, the construction of buildings, and the land around buildings.

No federal or state statute specifically prohibits or discourages development in the WUI.[417] Restricting development in the WUI would prevent fire damage there and make it easier to carry out prescribed fires, but it is rarely politically acceptable. (The same issues arise with respect to development in areas threatened by coastal or inland flooding.) Barring any use of private property can make a town liable to a claim for compensation for a regulatory taking.[418] Developers of residential subdivisions are sometimes told to keep the houses away from the portions of their property that are especially vulnerable to fire (as also routinely happens with wetlands and the like[419]); that is usually not a taking.[420]

Monrovia, a suburb of Los Angeles, spent $24 million (mostly from a bond issue) to buy 1,416 acres of WUI land from willing sellers, so there was no takings issue.[421] But few places are willing to spend

414. BOOZ ALLEN HAMILTON, 2014 QUADRENNIAL FIRE REVIEW: FINAL REPORT 28 (2015), https://www.forestsandrangelands.gov/documents/qfr/2014QFRFinalReport.pdf [https://perma.cc/8XFY-YWD4].

415. Heather Anu Kramer et al., *High Wildfire Damage in Interface Communities in California*, 28 INT'L J. WILDLAND FIRE 641, 641 (2019).

416. ROSS GORTE, HEADWATERS ECON., THE RISING COST OF WILDFIRE PROTECTION 1 (2013), http://i2.cdn.turner.com/cnn/2014/images/06/25/fire-costs-background-report.pdf [https://perma.cc/N5VW-ETCA].

417. Lauren Ashley Week, *Climate Change in Unincorporated California: The Consequences of Limited Regulation for Land Use, Lodging, and Livelihoods in the Wildland Urban Interface*, 52 URB. LAW. 539, 549–54 (2024).

418. Lucas v. S.C. Coastal Council, 505 U.S. 1003, 1027–31 (1992).

419. Blake Hudson, *Fighting Fire with Fire? Adjusting Regulatory Regimes and Forest Product Markets to Mitigate Southern United States Wildfire Risk*, 33 J. ENV'T L. & LITIG. 33, 44 (2018).

420. Murr v. Wisconsin, 582 U.S. 383, 406 (2017); Palazzolo v. Rhode Island, 533 U.S. 606 (2001).

421. Char Miller, *A Way to Break the Terrifying Pattern of Fire and Flood*, L.A. TIMES (Jan. 11, 2018), https://www.latimes.com/opinion/op-ed/la-oe-miller-post-fire-strategies-20180111-story.html [https://perma.cc/J9QV-GGDD].

taxpayer money to buy land so it cannot be built on, and regulations to restrict development are often rejected as an infringement on private property rights, as a threat to the local tax base, and even "creeping socialism."[422] The federal government also pays much of the cost of fighting fires in the WUI, reducing the incentive for state and local governments to restrict risky development.[423] Even modest efforts to require local residents to take some of the burden of protecting themselves are fragile. In 2011, the California legislature levied a fee of up to $150 on people who live in areas where the state, rather than the municipality, has to deal with wildfires; but it was so unpopular that Governor Jerry Brown scrapped it.[424] Where wildfire has destroyed houses in the WUI, new or rebuilt houses usually pop up again within a few years.[425]

Where development is allowed in the WUI (which it usually is), the buildings can at least be made more fire resistant. This really matters. One of the greatest dangers in a wildfire is burning embers—also called firebrands—that can be blown long distances by the wind, fall on a roof, burn through, and ignite the whole building. Wood shingle and wood shake roofs are especially vulnerable; clay, composite and metal roofs, much less so. There are guidelines for materials and designs for roofs, siding, windows, gutters, vents, and other building elements to make them fire resistant; these guidelines are incorporated into the building codes of some towns, and some insurance policies, for structures in wildfire danger zones.[426] In 2016, President Obama

422. Richard Manning, *Combustion Engines*, HARPER'S (Aug. 2018), https://harpers.org/archive/2018/08/lolo-peak-rice-ridge-mega-fires/ [https://perma.cc/9X24-W3UF].

423. Tania Schoennagel, et al., *Adapt to More Wildfire in Western North American Forests as Climate Changes*, 114 PROC. NAT'L ACAD. SCIS. 4582, 4582–90; HEADWATERS ECON., REDUCING WILDFIRE RISKS TO COMMUNITIES (2014), https://headwaterseconomics.org/wp-content/uploads/Paper-Reducing-Wildfire-Risk.pdf [https://perma.cc/93ST-Z8DT].

424. Christopher Flavelle, *Why Is California Rebuilding in Fire Country? Because You're Paying for It*, BLOOMBERG BUS. WK. (Mar. 1, 2018), https://www.bloomberg.com/news/features/2018-03-01/why-is-california-rebuilding-in-fire-country-because-you-re-paying-for-it [On File with the Columbia Journal of Environmental Law].

425. Patricia M. Alexandre et al., *Rebuilding and New Housing Development After Wildfire*, 25 INT'L J. WILDLAND FIRE 138 (2015).

426. INT'L CODE COUNCIL, INT'L WILDLAND-URBAN INTERFACE CODE (2018 ed.); INS. INST. FOR BUS. & HOME SAFETY, BEST PRACTICES GUIDE FOR WILDFIRE – COMMERCIAL PROPERTIES (2015), https://adventistrisk.org/Adventist_Risk/media/ARMSiteContent/Safety%20Resources/English/IFS-IBHS-Best-Practices-Guide-Wildfire-NAD-CAN-EN.pdf [https://perma.cc/8H7H-GFDS]; UNIV. OF NEV. COOP. EXTENSION, FIRE ADAPTED COMMUNITIES: THE NEXT STEP IN WILDFIRE PREPAREDNESS (2011), https://extension.unr.edu/publication.aspx?PubID=2980 [https://perma.cc/L2LP-ZXE9]; Jack D. Cohen, *Preventing Disaster: Home Ignitability in the Wildland-Urban Interface,* 98 J. FORESTRY, no. 3, at 15–21 (2000); Stephen L. Quarles et al., *Home Survival in Wildfire-Prone*

issued an executive order requiring federal buildings in the WUI to comply with such guidelines.[427] As is almost always the case, these rules apply only to new and modified buildings; old ones need not be retrofit, so they remain a danger to themselves and neighboring structures.

Some buildings with precious contents are built with especially strong fire protections. For example, the Getty Center museum, in a fire-prone area of Los Angeles, was built with 1.2 million square feet of travertine stone covering the outside walls, crushed rock on the roofs, outdoor sprinklers to cool the glass windows, fire-resistant acacia shrubs close to the buildings, and a pressurized air filtration system to keep out the smoke.[428]

Another important legal tool in protecting against wildfire is requiring "defensible space"—keeping vegetation some distance (typically 100–200 feet) away from buildings. Short of that, some places have "weed ordinances" that say properties must be kept free of weeds. Here, too, guidelines are sometimes incorporated into law.[429] Los Angeles has an especially strong ordinance, and its fire department also posts a list of "goat vendors" from which property owners can rent a

*Areas: Building Materials and Design Considerations*, UNIV. OF CAL. AGRIC. & NAT. RES., no. 8393 (May 2010).

427. Exec. Order No. 13,728, Wildland-Urban Interface Federal Risk Mitigation, 81 Fed. Reg. 32223 (May 18, 2016); *see also* FED. EMERGENCY MGMT. AGENCY, IMPLEMENTATION GUIDELINES FOR EXECUTIVE ORDER 13728 WILDLAND-URBAN INTERFACE FEDERAL RISK MANAGEMENT (2016), https://www.usfa.fema.gov/downloads/pdf/eo13728_guidelines.pdf [https://perma.cc/CAX9-TU6X].

428. John Schwartz, *Why the Getty Center's Art Stayed Put as Fires Raged Nearby*, N.Y. TIMES (Dec. 12, 2017), https://www.nytimes.com/interactive/2017/12/12/arts/design/getty-center-fire-evacuation.html [On File with the Columbia Journal of Environmental Law]; John Gittelsohn, *How Museums Fight Fires, Floods and Climate Change*, BLOOMBERG NEWS (Dec. 15, 2017), https://www.bloomberg.com/news/articles/2017-12-15/how-art-museums-fight-wildfires-floods-and-climate-change [On File with the Columbia Journal of Environmental Law]; Katherine Gammon, *How LA's Getty Center Built a Fire-Proof Fortress for Priceless Art*, GUARDIAN (Oct. 28, 2019), https://www.theguardian.com/us-news/2019/oct/28/california-wildfires-getty-fire-museum-art [https://perma.cc/3VJG-SPC5]. The Getty Center survived the 2025 Los Angeles fires, but it was a close call. Christopher Knight, *Fire could have destroyed the Getty's irreplaceable art. Should the museum move?*, L.A. TIMES (Mar. 13, 2025), https://www.latimes.com/entertainment-arts/story/2025-03-13/should-getty-center-villa-museum-move-out-of-wildfire-zone [https://perma.cc/N5ST-UNBA].

429. NAT'L FIRE PROT. ASS'N, COMMUNITY WILDFIRE SAFETY THROUGH REGULATION: A BEST PRACTICES GUIDE FOR PLANNERS AND REGULATORS (2013), https://unifiedfire.org/wp-content/uploads/Firewise-Wildfire-Best-Practices-Guide-for-Planners-and-Regulators.pdf [https://perma.cc/C8F9-TP8K]; Stephen R. Miller, *Planning for Wildfire in the Wildland-Urban Interface: A Guide for Western Communities*, 49 URB. LAW. 207 (2017).

herd of these non-mechanized brush clearers.[430] The biggest problems with weed ordinances are maintenance and enforcement—many property owners do not keep the weeds trimmed, and few towns have the resources and political will to issue violation notices.[431] Much of that task falls to homeowners associations; roughly 24% of the national housing stock and more than 60% of all new construction are in developments run by these associations.[432] Homeowners can be required to sign covenants that specify allowable vegetation, adding legal teeth but not ensuring enforcement.

Other non-regulatory efforts have also had limited success. The National Fire Protection Association has a program called Firewise Communities that encourages control of vegetation, fire-resistant building materials, public education, and the like.[433] However, only 2% of some 70,000 high-risk communities are certified as "Firewise." Insurance companies have inspected less than 3% of the 46 million homes in at-risk communities for wildfire survivability. Only 10% of these communities have adopted a WUI code.[434]

California has adopted binding regulations for both building materials (such as roofs and siding) and defensible space in the WUI,[435] though the state is behind in implementing this law.[436] After a severe fire in Oakland in 1991, the state legislature required mapping of high fire risk areas, and obliged home sellers to disclose to prospective

430. *Fire Hazard Reduction Programs*, L.A. COUNTY FIRE DEP'T, https://fire.lacounty.gov/fire-hazard-reduction-programs [https://perma.cc/8A2C-8EXQ] (last visited Feb. 6, 2025).

431. CHRIS DUERKSEN ET AL., FIRE PROT. RSCH. FOUND., ADDRESSING COMMUNITY WILDFIRE RISK: A REVIEW AND ASSESSMENT OF REGULATORY AND PLANNING TOOLS (2011).

432. Miller, *supra* note 429.

433. *Public Education: Firewise USA*, NAT'L FIRE PROT. ASS'N, https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA/Become-a-Firewise-USA-site [https://perma.cc/JL7U-6GDX] (last visited Mar. 12, 2025).

434. BOOZ ALLEN HAMILTON, *supra* note 414, at 29. This figure may be out of date, but no more recent one has been found.

435. *Wildland Hazard & Building Codes*, CALFIRE, http://calfire.ca.gov/fire_prevention/fire_prevention_wildland_codes [https://perma.cc/5MMT-XF9Q] (last visited Mar. 13, 2025).

436. Tran Nguyen, *California Is Years Behind Fire-Proofing Homes Under Law*, ASSOCIATED PRESS (Jan. 17, 2025), https://apnews.com/article/california-defensible-space-zone-zero-ember-resistant-73739a63eafc6239753152f19e7cc81f [On File with the Columbia Journal of Environmental Law]; Emily Pontecorvo, *The Five Feet That Could Prevent the Next Palisades Fire: California Passed a New Fire Safety Law More Than Four Years Ago. It Still Isn't in Force*, HEATMAP (Jan. 14, 2025), https://heatmap.news/climate/los-angeles-fires-zone-zero [https://perma.cc/C22M-N8X5].

buyers if the property is in such an area.[437] California and Oregon are the only states that require such disclosures.[438] It is not surprising that more states do not require this, as it lowers a house's sales price if it is disclosed to be at high risk of wildfire.[439]

Oregon's mapping has not gone smoothly. In 2021 the state legislature enacted a law that required the State Forestry Department to work with Oregon State University to develop a statewide map of wildfire risk, and to release it within one year.[440] When the map was released, it led to controversy and loud protests from homeowners who were distressed to see their houses within the areas designated as high risk.[441] The state rescinded the map and announced it would prepare a new one after more extensive community outreach. The new map was released in July 2024, not much different than the prior one.[442] Time will tell how well it is received, but some early reports were not positive.[443]

California's fire hazard mapping system is perhaps the strongest in the country (one survey rated California the top-ranked state in forest

437. Jeffrey G. Wagner, *Natural Hazard Disclosure: Failure to Comply with 1998 Law May Render Seller of Property or Agent Liable for Actual Damages*, CAL. BAR J. (Aug. 1999), https://archive.calbar.ca.gov/archive/calbar/2cbj/99aug/mclestdy.htm [https://perma.cc/LP6N-9NAG]; Carolyn Kousky et al., *In Harm's Way: Homeowner Behavior and Wildland Fire Policy, in* WILDFIRE POLICY: LAW AND ECONOMICS PERSPECTIVES 178 (Karen M. Bradshaw & Dean Lueck eds., 2012).

438. Lauren Sommer, *Millions of Homes Are at Risk of Wildfires, but It's Rarely Disclosed*, NPR (Oct. 21, 2020), https://www.npr.org/2020/10/21/924507691/millions-of-homes-are-at-risk-of-wildfires-but-its-rarely-disclosed [https://perma.cc/9P7H-NJW4]. *See also* Rebecca K. Miller et al., *Factors Influencing Adoption and Rejection of Fire Hazard Severity Zone Maps in California*, 50 INT'L J. DISASTER RISK REDUCTION, no. 101686 (2020) (discussing California's move from voluntary to mandatory disclosure).

439. Emily Joiner et al., *Disclosing Wildfire Risks in Home Sales*, RES. MAG. (Jan. 2024), https://www.resources.org/common-resources/disclosing-wildfire-risks-in-home-sales/ [https://perma.cc/F9L3-CL7R].

440. Or. S.B. 762, § 7 (2021).

441. Kylie Mohr, *Fire Risk Map Ignites Controversy*, HIGH COUNTRY NEWS (Jan. 1, 2023), https://www.hcn.org/issues/55-1/north-wildfire-fire-risk-map-ignites-controversy/ [https://perma.cc/5CAZ-WPG6].

442. April Ehrlich, *Oregon Releases New Draft Wildfire Hazard Map*, OR. PUB. RADIO (July 18, 2024), https://www.opb.org/article/2024/07/18/oregon-releases-new-draft-wildfire-hazard-map/ [https://perma.cc/5CAZ-WPG6]. The final version of the map was released in January 2025. Bobby Corser, *Oregon's New Wildfire Maps Address Criticism, Clarify Hazard Zones*, NBC16 (Jan. 7, 2025), https://nbc16.com/news/local/oregons-new-wildfire-maps-address-criticism-clarify-hazard-zones-salem-oregon-department-of-forestry-firefighters-fire [https://perma.cc/G7TW-SK9K].

443. Justin Higginbottom, *County Commissioners Raise Concerns over Draft Wildfire Hazard Map*, JEFFERSON PUB. RADIO (Aug. 27, 2024), https://www.ijpr.org/environment-energy-and-transportation/2024-08-27/county-commissioners-raise-concerns-over-draft-wildfire-hazard-map [https://perma.cc/X7UD-C6NZ].

management[444]), but it is imperfect. For example, certain rules apply only to areas mapped as "very high severity." The state provides the maps but local jurisdictions can change them.[445] In 2017, the Coffey Park suburb of Santa Rosa burned to the ground during the Tubbs Fire (which until 2018 was the most destructive fire in the state's history); the flames had been some distance away, but they threw off firebrands that ignited the houses. The city (to its later regret) had omitted Coffey Park from its own "very high severity" map, exempting it from some fire protection requirements.[446] About 30% of the houses that burned in the Tubbs Fire were outside the WUI altogether, but their destruction resulted from the fires inside the WUI.[447] Moreover, back in 1964 another fire had burned some 53,000 acres along a nearly identical path as the Tubbs Fire of 2017, though it did little damage because few buildings were there; in the intervening half a century this fire-vulnerable area had become heavily populated.[448] Notwithstanding its history of fires, the Coffey Park area has been rebuilt to even greater density than before the 2017 fire, with the encouragement of the city.[449]

444. CONSTANCE L. MCDERMOTT ET AL., EARTHSCAN, GLOBAL ENVIRONMENTAL FOREST POLICIES: AN INTERNATIONAL COMPARISON (2010).

445. CAROLYN KOUSKY & RAY RASKER, HEADWATERS ECON., LESSONS FOR WILDFIRE FROM FEDERAL FLOOD RISK MANAGEMENT PROGRAMS 20–21 (2014), https://headwaterseconomics.org/wp-content/uploads/Paper-Lessons-For-Fire-From-Floodrisk.pdf [https://perma.cc/R54K-CA4K].

446. Doug Smith & Nina Agrawal, *Despite Clear Risks, Santa Rosa Neighborhood that Burned Down Was Exempt from State Fire Regulations*, L.A. TIMES (Oct. 15, 2017), https://www.latimes.com/local/lanow/la-me-ln-coffey-park-explainer-20171011-story.html [https://perma.cc/ST2G-ESTB]; Irvin Dawid, *Wildfire Destroys Santa Rosa Neighborhood Outside of Fire Hazard Zone*, PLANETIZEN (Oct. 20, 2017), https://www.planetizen.com/news/2017/10/95385-wildfire-destroys-santa-rosa-neighborhood-outside-fire-hazard-zone [https://perma.cc/NYV3-7U5N].

447. Manning, *supra* note 422.

448. Jason G. Goldman, *Living on the Edge: Wildfires Pose a Growing Risk to Homes Built Near Wilderness Areas*, SCI. AM. (June 1, 2018), https://www.scientificamerican.com/article/living-on-the-edge-wildfires-pose-a-growing-risk-to-homes-built-near-wilderness-areas/ [https://perma.cc/AUA4-AXKD].

449. J.K. Dineen, *The Tubbs Fire Leveled Parts of This Bay Area City; It's Been Rebuilt with More Housing Density*, S.F. CHRON. (Nov. 13, 2023), https://www.sfchronicle.com/bayarea/article/tubbs-fire-santa-rosa-housing-18435848.php [On File with the Columbia Journal of Environmental Law]; Dale Kasler & Ryan Sabalow, *Burned-Out California Town Ignores Stricter Building Codes, Even with Wildfire Threat*, SACRAMENTO BEE (Nov. 15, 2019), https://www.sacbee.com/news/california/fires/article236909028.html [On File with the Columbia Journal of Environmental law]; *Resilient City Zoning*, CITY OF SANTA ROSA, https://www.srcity.org/2674/Resilient-City-Zoning [https://perma.cc/RW9C-ZL6A] (last visited Mar. 13, 2025). The City of Santa Rosa maintains a website, "Resilient City Recovery Maps," showing the rebuilding of the areas that were destroyed in the Tubbs fire. *Resilient City Recovery Maps*, CITY OF SANTA ROSA, https://santarosa.maps.arcgis.com/apps/MapSeries/index.html [https://perma.cc/ZU6F-6QYJ] (last visited Mar. 13, 2025).

Though few states require fire disclosures when selling a home, the nonprofit First Street Foundation has produced a model that predicts wildfire hazards for all U.S. homes.[450]

Fire suppression (putting out wildfires) creates a fire deficit—the difference between the rate of burning before humans arrived, and the current rate (whether wildfire or prescribed fire) plus thinning.[451] This fire deficit increases the risk of wildfires to communities in the WUI because when the fires do come, they are more severe.[452]

When there is a fire, burning embers can travel so fast that notifying WUI residents of impending danger is a challenge. A heat wave develops over days, giving time for door-to-door visits; a wildfire can leap miles in a few hours or even minutes.[453] During the Tubbs Fire, many people went to bed oblivious to then-distant fires, only to wake up with the fire on top of them. Some were unable to escape; the fire killed at least forty-three people and destroyed at least 8,900 homes and structures.[454] Most of those who died were senior citizens who were not able to move fast enough to flee.[455] Officials have begun using emergency alert systems to send alarms to smartphones, but there is sometimes uncertainty over just how broadly to send out the alerts.[456] If you didn't charge your phone, left it at the other end of the house, have the ringer turned off, have poor hearing and are not wearing hearing aids, or are in an area with poor cell phone reception or

450. Judson Boomhower, *Adapting to Growth Wildfire Property Risk*, 382 SCIENCE 638, 639 (2023).

451. U.S. DEP'T OF AGRIC., TOWARD SHARED STEWARDSHIP ACROSS LANDSCAPES: AN OUTCOME-BASED INVESTMENT STRATEGY 10 (2018), https://www.fs.usda.gov/sites/default/files/toward-shared-stewardship.pdf [https://perma.cc/WX22-8M7B].

452. Marc-Andre Parisien et al., *Fire Deficit Increases Wildfire Risk for Many Communities in the Canadian Boreal Forest*, 11 NATURE COMMC'NS 2121 (2020).

453. Joseph Serna, *Without Warning: Redding Fire Moved Faster Than Evacuation Orders, Leaving a Deadly Toll,* L.A. TIMES (Aug. 18, 2018), https://www.latimes.com/local/lanow/la-me-redding-fire-reconstruct-20180818-htmlstory.html [https://perma.cc/5CDF-6EPC].

454. Derek Watkins, *How California's Most Destructive Wildfire Spread, Hour by Hour*, N.Y. TIMES (Oct. 21, 2017), https://www.nytimes.com/interactive/2017/10/21/us/california-fire-damage-map.html [On File with the Columbia Journal of Environmental Law]; Alex Dobuzinskis, *Death Toll from California Blazes Rises to 43, After Teen Dies*, REUTERS (Oct. 30, 2017), https://www.reuters.com/article/world/death-toll-from-california-blazes-rises-to-43-after-teen-dies-idUSKBN1D005H/ [On File with the Columbia Journal of Environmental Law].

455. *Majority of North California Fire Victims Were Senior Citizens*, NBC BAY AREA (Oct. 19, 2017), https://www.nbcbayarea.com/news/local/north-bay-fires-victims/35581/ [https://perma.cc/R2YQ-7GBE].

456. Brianna Sacks, *This Is How California Officials Alerted Millions of People as Wildfires Approached Homes*, BUZZFEED NEWS (Dec. 6, 2017), https://www.buzzfeednews.com/article/briannasacks/as-wildfires-rip-through-southern-california-heres-how [https://perma.cc/4BK7-27UE].

the fire has already burned down the cell tower, you may not receive the alarm.

Opponents of proposed developments in the WUI have sometimes litigated under CEQA. In two cases brought by the Center for Biological Diversity and then joined by the California Attorney General, courts halted WUI projects because the environmental impact reviews had not adequately examined the public safety risks.[457] The Governor's Office of Planning and Research issued guidelines on considering climate change under CEQA, and the Attorney General took the unusual step of issuing guidance on how wildfire risks should be considered under CEQA.[458] Several other attempts to challenge WUI projects based on inadequate CEQA review of wildfire risks have been unsuccessful.[459] Under the state's CEQA guidelines, one of the factors to be considered in whether a full environmental impact report is required under CEQA is whether "[d]ue to slope, prevailing winds, and other factors, [the project would] exacerbate wildfire risks, and thereby expose occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire."[460]

It may seem that the WUI is inhabited mainly by wealthy people who enjoy living in scenic areas, but that is untrue. One study found that around one-third of the residents of the WUI in the western states

457. Ctr. for Biological Diversity v. Cnty of Lake, No. CV421152 (Cal. Super. Ct. Jan. 4, 2022); People's Notice of Motion and Motion for Leave to Intervene, No. 37-2019-00038820-CU-TT-CTL (Cal. Super. Ct. July 23, 2021). In later proceedings in the former matter, the Court of Appeal found that the final environmental report failed to provide "meaningful information" regarding the project's "potential impact of exacerbating wildfire ignitions." People *ex rel*. Bonta v. County of Lake, No. A165677, at 2 (Cal. Ct. App. Oct. 23, 2024); *Judge Finds Environmental Review of Huge Otay Ranch Project Failed to Account for Wildfire Risks*, TIMES OF SAN DIEGO (Oct. 7, 2021), https://timesofsandiego.com/politics/2021/10/07/judge-finds-environmental-review-of-huge-otay-ranch-projects-failed-to-account-for-wildfire-risks/#google_vignette [https://perma.cc/VN4H-SADX] (discussing the context for the latter decision).

458. ROB BONTA, OFF. OF THE ATT'Y GEN. OF CAL., BEST PRACTICES FOR ANALYZING AND MITIGATING WILDFIRE IMPACTS OF DEVELOPMENT PROJECTS UNDER THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (2022), https://oag.ca.gov/system/files/attachments/press-docs/2022.10.10%20-%20Wildfire%20Guidance.pdf [https://perma.cc/W9HM-X4E9].

459. *See* William W. Abbott et al., *Emerging Issues in Evaluating Wildfire Impacts Under CEQA*, LAND USE LAW BLOG (May 24, 2023), https://blog.aklandlaw.com/2023/05/uncategorized/emerging-issues-in-evaluating-wildfire-impacts-under-ceqa-a-resource-guide-2/ [https://perma.cc/XM88-2R4Y]; Arthur F. Coon & Mathew C. Henderson, *Attorney General's Guidance on 'Best Practices' for CEQA Analysis Of and Mitigation For Wildfire-Related Impacts is Long on Litigation and Policy Advocacy, Short on Neutral Legal Analysis*, CEQA DEVELOPMENTS (Nov. 23, 2022), https://www.ceqadevelopments.com/2022/11/23/attorney-generals-guidance-on-best-practices-for-ceqa-analysis-of-and-mitigation-for-wildfire-related-impacts-is-long-on-litigation-and-policy-advocacy-short-on-neutral-leg/ [https://perma.cc/MA4Y-LYYZ].

460. ASS'N OF ENV'T PROFESSIONALS, 2024 CEQA STATUTES & GUDELINES 357 app. G no. XX/b (2024).

lack incomes sufficient to meet basic economic needs.[461] Poor areas will be especially hit hard by wildfires because they lack the financial resources to rebuild or to protect themselves; many of the residents have highly insecure livelihoods, and those who live in mobile homes or rural cabins are especially at risk.[462]

Banning new development in the WUI would allow more prescribed burning and protect people and property from the flames; but this is not workable in most places as it would worsen already severe housing shortages, though infill development in existing cities could address some of the problems.[463] Building codes and defensible space requirements effectively reduce risks, but they do little to address the smoke issue (except that they reduce the number of structures that burn and generate their smoke). Moreover, it appears, at least in California, that most houses that are destroyed by wildfires are rebuilt in ways that are similarly vulnerable to the originals.[464]

Overall, building in the WUI is a significant inhibitor of the prescribed fires critical to minimizing wildfires and wildfire smoke. Legal tools exist to stop this building in the WUI and mitigate the damage to the houses there, but there is seldom the political will to use them, and the challenges in building a massive number of new homes in "safe" areas are daunting. Some scholars call for a lessened focus on "managed retreat" from wildfire-prone regions and more attention to building homes and neighborhoods that are more resilient to the fires that will come.[465]

461. KATHY LYNN, NATURAL HAZARDS OBSERVER, WILDFIRE AND RURAL POVERTY: DISASTROUS CONNECTIONS 10 (2003), https://scholarsbank.uoregon.edu/server/api/core/bitstreams/d4ec6337-85ee-4cd7-9df1-282c5ac2297f/content [On File with the Columbia Journal of Environmental Law].

462. Kellen Browning & Michael Finch II, *Wildfire Areas Have High Poverty and Small Tax Bases. Will That Affect Future Construction?*, SACRAMENTO BEE (Aug. 16, 2018), https://www.govtech.com/em/preparedness/wildfire-areas-have-high-poverty-and-small-tax-bases-will-that-affect-future-construction.html [https://perma.cc/P464-KY8E]; Timothy W. Collins, *The political ecology of hazard vulnerability: marginalization, facilitation and the production of differential risk to urban wildfires in Arizona's White Mountains*, 15 J. POL. ECOLOGY 21 (2008).

463. Eric Biber & Moira O'Neill, *Building to Burn? Permitting Exurban Housing Development in High Fire Hazard Zones*, 48 ECOLOGY L.Q. 943 (2021); F. NOEL PERRY ET AL., NEXT 10 & UC BERKELEY CTR. FOR CMTY. INNOVATION, REBUILDING FOR A RESILIENT RECOVERY: PLANNING IN CALIFORNIA'S WILDLAND URBAN INTERFACE (2021).

464. H. Anu Kramer et al., *Post-wildfire rebuilding and new development in California indicates minimal adaptation to fire risk*, 107 LAND USE POL'Y, no. 105502 (2021).

465. Liz Koslov & Kathryn McConnell, *There Is No Way to Retreat From the Risk of Wildfires*, N.Y. TIMES (Jan. 19, 2025), https://www.nytimes.com/2025/01/19/opinion/los-angeles-wildfires-burn.html [On File with the Columbia Journal of Environmental Law]; Kathryn McConnell & Liz Koslov, *Critically assessing the idea of wildfire managed retreat*, 19 ENV'T RSCH. LETTERS, no. 041005 (2024).

## VI. DEFENDING AGAINST SMOKE

So far, this Article has focused on how to reduce the amount of smoke that is generated, primarily by starting more prescribed fires and allowing more natural fires to burn, all to reduce the size of wildfires, the damage they do, and the smoke they generate. Now, we turn to what can be done when the smoke comes.

To begin with, other sources of air pollution should be minimized on high-smoking days. Some cities restrict truck entries, halt construction and the operations of polluting industrial facilities, and discourage outdoor grilling.[466] This reduces the cumulative impacts of wildfire smoke and other sources of pollution. But much else can be done to help people who might be exposed to smoke.

### A. Warnings

People with asthma or other respiratory conditions, the elderly, and others who are medically vulnerable should stay home during smoky conditions. If they do not have air conditioning at home and it is hot and smoky, they should go to cooling centers if available. Outdoor work should be restricted. Schools may be closed and outdoor events canceled if the smoke is bad enough. If the decision to do any of these cannot be made until the smoke has already arrived and is visible or can be smelled, chaos or disorder can result, and many people will be exposed to unhealthy smoke. Thus, much advance notice of a smoke condition is critical.

This advance notice requires three things: monitoring what is happening with the fire and smoke, modeling to predict where the smoke will go, and communicating with the people needing the information.

The CAA calls for a nationwide air quality monitoring system,[467] and requires states to establish systems to "monitor, compile, and analyze data on ambient air quality."[468] Despite some efforts at improvement, large swaths of rural America still have no air quality monitors.[469] The

466. *Smoke in the City: Recommendations for NYC Government to Protect New Yorkers from Poor Air Quality Events,* 5BORO (June 15, 2023), https://fiveboro.nyc/smoke-in-the-city-recommendations-for-nyc-government-to-protect-new-yorkers-from-poor-air-quality-events/ [https://perma.cc/UHS9-UYCJ].

467. 42 U.S.C. § 7619(a).

468. 42 U.S.C. § 7410(a)(2)(b)(i).

469. Matthew Brown & Padmananda Rama, *Gaps in US wildfire smoke warning network leave many exposed*, ASSOCIATED PRESS (Aug. 26, 2021), https://apnews.com/article/health-fires-environment-and-nature-wildfires-science--9da6e376edb5648bed06f326e30c97d1 [On File with

government website AirNow.gov has real-time information about air quality around the country, and the government has several related programs to provide such information.[470] Likewise, the state of Washington posts a map called the Washington Smoke Blog, a partnership among state, county, and federal agencies, and tribes.[471] However, the information on these sites is only as good as the monitors they rely on. In 2022, Google acquired a company called BreezoMeter, which provides similar information.[472] PurpleAir, which was started in 2015 by a "self-proclaimed tech and electronics geek" in Utah named Adrian Dybwad, sells air quality monitors of his design[473] ranging in cost between $209 and $289[474] so that people can determine their own exposure, and these monitors generate data that is fed into a freely available website.[475] Some cities, including Washington, D.C., loan PurpleAir sensors to residents.[476] Another company, IQAir,[477] offers a somewhat similar service.

In June 2023, after Canadian wildfires led to extremely high levels of smoke in New York City, the mayor was criticized for waiting

the Columbia Journal of Environmental Law]; Sam Metz, *Parts of now smoky rural Nevada lack government air monitors*, ASSOCIATED PRESS (Sept. 18, 2020), https://apnews.com/general-news-b79ce80d22f17897413e940649731825 [On File with the Columbia Journal of Environmental Law]; ON FIRE: THE REPORT OF THE WILDLAND FIRE MITIGATION AND MANAGEMENT COMMISSION 101 (2023), https://www.usda.gov/sites/default/files/documents/wfmmc-final-report-09-2023.pdf [On File with the Columbia Journal of Environmental Law]; Yuzhou Wang, Julian D. Marshall & Joshua S. Apte, *U.S. Ambient Air Monitoring Network Has Inadequate Coverage under New PM2.5 Standard*, 11 ENV'T SCI. & TECH. LETTERS 1220 (2024). *See also* Brenna C. Kelly et al., *Racial and Ethnic Disparities in Regulatory Air Quality Monitor Locations in the US*, 7 J. AM. MED. ASS'N NETWORK, no. e4499005 (2024).

470. ENV'T PROT. AGENCY, WILDFIRE SMOKE: A GUIDE FOR PUBLIC HEALTH OFFICIALS 33–37 (2019), https://document.airnow.gov/wildfire-smoke-guide.pdf [https://perma.cc/9FW9-DKF7].

471. WASH. SMOKE BLOG, https://wasmoke.blogspot.com/ [https://perma.cc/RUW5-U9LE] (last visited Mar. 17, 2025).

472. Elihay Vidal, *Google acquires Israeli climatetech startup BreezoMeter for over $200 million*, CTECH (Sept. 20, 2022), https://www.calcalistech.com/ctechnews/article/sycbrdpbi [https://perma.cc/7WAN-EKDZ].

473. Michelle Robertson, *The story behind PurpleAir, which has become a necessity for Bay Area summers*, SFGATE (Sept. 9, 2022), https://www.sfgate.com/news/article/The-story-behind-website-Bay-Area-PurpleAir-16393480.php [On File with the Columbia Journal of Environmental Law].

474. PURPLEAIR, https://www2.purpleair.com/products/list [https://perma.cc/M9NE-9K2V] (last visited Dec. 13, 2024).

475. PURPLEAIR, https://map.purpleair.com/air-quality-standards-us-epa-aqi?opt=%2F1%2Flp%2Fa10%2Fp604800%2FcC0#1/25/-30 [https://perma.cc/K5SF-6C9D] (last visited Dec. 13, 2024).

476. *The PurpleAir Monitoring Project*, D.C. DEP'T OF ENERGY & ENV'T, https://doee.dc.gov/service/purpleair-monitoring-project [https://perma.cc/XUM7-MJRJ] (last visited Dec. 13, 2024).

477. *AirVisual Pro Indoor Monitor*, IQAIR, https://www.iqair.com/us/air-quality-monitors/ [https://perma.cc/WQ5S-3F74] (last visited Mar. 17, 2025).

several hours to issue an alert.[478] A civic organization recommended that the City push an emergency alert message to all mobile devices in the area, similar to AMBER alerts for missing children, but this has not been done.[479]

Smoke that has traveled a long distance may lose its smell but not its dangers, so people may be exposed to high levels of $PM_{2.5}$ and other pollutants in smoke and not realize it.[480] This wildfire smoke increases the need for monitoring.

In 2019, Congress passed, and President Trump signed a lengthy bill known as the John D. Dingell, Jr. Conservation, Management, and Recreation Act.[481] One short provision requires the Secretaries of Agriculture and Interior to establish the Interagency Wildland Fire Air Quality Response Program, which involves assigning "air resource advisors" to manage wildland fires.[482] These advisors set up carbon monoxide and $PM_{2.5}$ monitors, model wildfire smoke dispersion, and engage in outreach "to help the public and firefighters understand existing and predicted air quality, potential smoke health effects, how to reduce exposure, and how to recognize and mitigate safety hazards."[483] The program also uses meteorological models to help establish "the prescribed fire planning horizon."[484]

The Infrastructure Investment and Jobs Act of 2021 and the Consolidated Appropriations Act of 2023 contain substantial funds for air quality monitoring, modeling, and related activities.[485] The National Defense Authorization Act for Fiscal Year 2024 authorizes the "FireGuard Program," in which members of the National Guard may "aggregate, analyze, and assess multi-source remote sensing information for interagency partnerships in the detection and monitoring of

478. Ivan Pereira, *New York City's 'smoke wave' response time for warnings criticized*, ABC NEWS (June 7, 2023), https://abcnews.go.com/US/new-york-citys-smoke-wave-response-time-warnings/story?id=99914653/ [https://perma.cc/V4KP-T4FP].

479. 5BORO, *supra* note 466.

480. Sandra E. Hemmingway, *Even when you don't smell the smoke, it can affect your health*, AIR QUALITY RSCH. CTR. (Sept. 21, 2023), https://aqrc.ucdavis.edu/news/even-when-you-dont-smell-smoke-it-can-affect-your-health. [https://perma.cc/LXT8-S3TJ]; Jayme DeLoss, *Smoke in the air? Beware, and don't trust your nose*, CO. STATE UNIV. (June 9, 2023), https://source.colostate.edu/smoke-in-the-air-beware-and-dont-trust-your-nose/ [https://perma.cc/2DK8-VSAX].

481. John D. Dingell, Jr., Conservation, Management, and Recreation Act of 2019, Pub. L. No. 116-9, 133 Stat. 580 (2019).

482. 133 Stat. 617, 43 U.S.C. § 1748b-1(f).

483. INTERAGENCY WILDLAND FIRE AIR QUALITY RESPONSE PROGRAM, 2021 ANNUAL REPORT: A NATION IN WILDFIRE SMOKE 1 (2021).

484. *Id.* at 10.

485. Liz Johnson, *Congressional Efforts to Minimize the Impacts of Wildfires*, NAT. RES. & ENV'T, Spring 2024, at 54.

wildfires, and to support any emergency response to such wildfires."[486] In November 2023, twenty members of Congress wrote to EPA, NOAA, and the CDC asking that smokewave alerts be issued via the nationwide Wireless Emergency Alerts system.[487] At the state level, in 2018, the California Legislature enacted a law requiring the state "to enhance air quality and smoke monitoring, and to provide a public awareness campaign regarding prescribed burns."[488] Efforts to expand monitoring and public alerts are growing in several other states.[489]

Obtaining the monitoring data is the first step. Turning that into predictions is very challenging, as there are an extraordinary number of variables—the nature, extent, moisture content, etc., of the vegetation being burned; efforts to put the fires out; current and expected weather conditions at all points between the fire(s) and those who will be exposed; and the topography along the way, just to mention a few. While the techniques are improving rapidly, it has been said that "smoke forecasts today are about as reliable as weather forecasts were forty-five years ago."[490]

Several government agencies have issued guidance on what to do in case of heavy wildfire smoke conditions.[491] Many state and local agencies have smoke response plans. A California statute requires each county to develop a strategy for use in the case of a "significant

486. National Defense Authorization Act for Fiscal Year 2024, Pub. L. No. 118-31, § 515, 137 Stat. 136 (2023).

487. Kellie Lunney, *Democrats Want Wildfire Smoke Added to Severe Weather Alerts*, BLOOMBERG GOV'T (Nov. 3, 2023), https://news.bgov.com/bloomberg-government-news/democrats-want-wildfire-smoke-added-to-severe-weather-alerts [On File with the Columbia Journal of Environmental Law].

488. CAL. PUB. RES. CODE § 4495 (2025).

489. Blaine Friedlander, *Cornell expands wildfire smoke sensor network in New York*, CORNELL CHRON. (Oct. 25, 2023), https://news.cornell.edu/stories/2023/10/cornell-expands-wildfire-smoke-sensor-network-new-york [https://perma.cc/4JWY-SDJF]; Kristoffer Tigue, *The Midwest Could Be in for Another Smoke-Filled Summer. Here's How States Are Preparing*, INSIDE CLIMATE NEWS (May 20, 2024), https://insideclimatenews.org/news/20052024/midwest-smoky-summer-prep/ [https://perma.cc/JE5C-Z5UR].

490. Carolyn Kormann, *Why It's So Hard to Forecast Wildfire Smoke*, NEW YORKER (Aug. 8, 2023), https://www.newyorker.com/science/elements/why-its-so-hard-to-forecast-wildfire-smoke [https://perma.cc/TN52-TC9K]; e-mail from Jeff Masters, Metereologist for Yale Climate Connections, (Sept. 5, 2024) [On File with the Columbia Journal of Environmental Law].

491. *E.g.*, ENV'T PROT. AGENCY, *supra* note 470; *Are YOU Smoke Ready?,* INTERAGENCY WILDLAND FIRE AIR QUALITY RESPONSE PROGRAM (2024), https://www.wildlandfiresmoke.net/smoke-ready [https://perma.cc/MDM7-FUL4]; WASH. DEP'T OF HEALTH, *Severe Smoke Episodes, in* WASHINGTON STATE COMPREHENSIVE EMERGENCY MANAGEMENT PLAN, WILDFIRE RESPONSE, app. 5, attachment 1 (2018), https://doh.wa.gov/sites/default/files/legacy/Documents/4300/ESF8-Appendix5-Att1-SevereSmokeEpisodes.pdf?uid=64b72ee109ab1 [https://perma.cc/SG4N-R7WC].

air quality event caused by wildfires or other sources."[492] A Washington state statute directs state agencies to "conduct community engagement and outreach related to wildfire smoke risks and impacts, particularly in regions of the state that experience disproportionately high levels of air contaminants and pollutants."[493]

B. Reducing Residential Exposure

During high smoke conditions, the most common advisory issued is to stay indoors. As EPA has indicated, "[t]he effectiveness of this strategy depends on how well the building limits smoke from coming indoors and on efforts to minimize indoor pollution sources. Staying indoors will provide some protection from smoke, especially in a tightly closed, air-conditioned home where the air conditioner recirculates indoor air."[494] In one California study, the concentration of $PM_{2.5}$ in buildings without air conditioning and some older buildings nearly tripled during wildfire days.[495] In 2008, California enacted a requirement that new homes have mechanical ventilation,[496] and in 2023, in the wake of the COVID-19 pandemic, the CDC set a target of five air changes per hour in buildings.[497] These requirements can be met using fans that bring in air from the outside; without filtration, such as that provided by air conditioners, this ventilation can bring wildfire smoke inside a building. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has issued a guideline, "Protecting Building Occupants from Smoke During Wildfire and Prescribed Burn Events," that calls for (among other things) filters on air intakes and on internal air circulation systems.[498] ASHRAE and the Association of Home Appliance Manufacturers have developed

492. Cal. A.B. 619 § 3; CAL. HEALTH & SAFETY CODE § 107250(f).

493. Wash. H.B. 1578 § 2.

494. ENV'T PROT. AGENCY, *supra* note 470, at 18.

495. Yutong Liang et al., *Wildfire Smoke Impacts On Indoor Air Quality Assessed Using Crowdsourced Data In California*, 118 PROC. NAT'L ACAD. SCIS., no. e2106478118, at 1 (2021).

496. WANYU R. CHAN ET AL., LAWRENCE BERKELEY NAT'L LABORATORY, VENTILATION AND INDOOR AIR QUALITY IN NEW CALIFORNIA HOMES WITH GAS APPLIANCES AND MECHANICAL VENTILATION 13 (2020).

497. Brenda Goodman, *CDC Sets First Target For Indoor Air Ventilation To Prevent Spread Of Covid-19*, CNN (May 12, 2023), https://www.cnn.com/2023/05/12/health/cdc-new-ventilation-target/index.html [https://perma.cc/8CL4-V98E].

498. Tom Javins et al., *Protecting Building Occupants From Smoke During Wildfire and Prescribed Burn Events,* AM. SOC'Y HEATING, REFRIGERATING AND AIR-CONDITIONING ENG'RS J., March 2021, at 38. *See also* Patrick Sisson, *The Quest for the Smoke-Proof Building,* BLOOMBERG (June 12, 2023), https://www.bloomberg.com/news/articles/2023-06-12/wildfire-smoke-draws-attention-to-indoor-air-quality-technology [On File with the Columbia Journal of Environmental Law].

standards for ventilation and air cleaning equipment for various applications in order to maintain adequate indoor air quality in the face of wildfire smoke.[499] The filters should have a high MERV rating (Minimum Efficiency Reporting Value), but it is important that the house's air handler be strong enough to suck the air through the thickness of a high-efficiency filter.[500]

There is no general law in the U.S. requiring air conditioning. Few, if any, state or local laws expressly require building owners to protect their occupants against wildfire smoke. The usual housing codes and landlord-tenant codes have language concerning safe and healthful conditions and habitability that arguably could be applied to unhealthful smoke levels, but they are not specific enough to actually induce owners to install air conditioning.[501] A bill requiring air conditioning in residential buildings was introduced into the New York City Council in July 2024, in the midst of a heat wave;[502] it was not enacted, and it would have been in tension with the city's law requiring decarbonization of buildings.

In some states, certain people, especially those with low incomes or certain medical conditions, are able to secure financial assistance to purchase air filters and air conditioners, and to pay for the power to run air conditioners, through various government programs. These include Medicaid, the Children's Health Insurance Program, the Low-Income Home Energy Assistance Program, asthma programs funded by the CDC, home weatherization programs funded by the Department of Energy, or home repair programs funded by the Department of Housing and Urban Development.[503]

499. ENV'T PROT. AGENCY, *supra* note 470, at 19–24; ENV'T L. INST., *supra* note 354, at 9–14. *See also Wildfire Smoke Factsheet: Indoor Air Filtration*, ENV'T PROT. AGENCY, https://www.epa.gov/sites/default/files/2018-11/documents/indoor_air_filtration_factsheet-508.pdf [On File with the Columbia Journal of Environmental Law] (last visited Mar. 31, 2025).

500. DAVID POGUE, HOW TO PREPARE FOR CLIMATE CHANGE: A PRACTICAL GUIDE TO SURVIVING THE CHAOS 429 (Simon & Schuster 1st ed., 2021)

501. ENV'T L. INST., *supra* note 354, at 77–80; Michael B. Gerrard, *Heat Waves: Legal Adaptation to the Most Lethal Climate Disaster (So Far)*, 40 U. ARK. LITTLE ROCK L. REV. 515, 537–38 (2018).

502. Ali Bauman, *NYC Landlords Would Be Required To Provide Air Conditioning For Tenants Under Newly Introduced Bill*, CBS NEWS (July 19, 2024), https://www.cbsnews.com/newyork/news/nyc-air-conditioning-bill/ [https://perma.cc/8S45-7NV5].

503. ENV'T L. INST., *supra* note 354, at 60–67; ANDREA NISHI, DIANA HERNANDEZ & MICHAEL B. GERRARD, COLUMBIA CTR. ON GLOBAL ENERGY POL'Y, ENERGY INSECURITY MITIGATION: THE LOW INCOME HOME ENERGY ASSISTANCE PROGRAM AND OTHER LOW-INCOME RELIEF PROGRAMS IN THE US 5, 23–26 (2023), https://scholarship.law.columbia.edu/faculty_scholarship/4196 [https://perma.cc/NCC3-DBEQ].

C. Cleaner Air Centers

Some cities have established "cleaner air centers" for people who cannot safely stay home during high smoke conditions because, for example, they lack air conditioning or filtration. During normal conditions, these places are often community centers, armories, libraries, theaters, church recreation halls, or other uses. Many of them are also used as cooling centers during high heat days, or shelters for people displaced by floods, wildfires, or other conditions.

FEMA may provide support for these centers during a presidentially declared emergency or a major disaster. State and local emergency management agencies implement emergency shelter programs.[504] California and Oregon (two states where wildfires have been especially severe) have enacted legislation specifically for cleaner air centers.[505] Seattle and San Francisco are among the cities that have established such centers.[506]

D. Schools

Children are especially at risk from wildfire smoke.[507] Children benefit from regular physical activity, but breathing smoky air while engaging in such activity is bad for them, and EPA has issued guidance on what levels of air quality should lead to restrictions on outdoor activity.[508] However, even indoors the air can be harmful on smoky days.

An Environmental Law Institute (ELI) study published in 2023 found that most states have ample authority to address ventilation in schools, but most current state policies lack clear ventilation and

504. ENV'T L. INST., *supra* note 354, at 45–47.

505. *Id*. at 47–53.

506. Todd Woody & Linda Poon, *NYC, DC Lag Western States in Wildfire Smoke Preparations*, BLOOMBERG LAW (June 9, 2023), https://news.bloomberglaw.com/environment-and-energy/nyc-dc-follow-example-of-western-states-to-set-wildfire-policy [On File with the Columbia Journal of Environmental Law]; Claire Elise Thompson, *Threatened By Wildfire Smoke, West Coast Cities Are Piloting Clean-Air Centers*, GRIST (Aug. 2, 2023), https://grist.org/looking-forward/threatened-by-wildfire-smoke-west-coast-cities-are-piloting-clean-air-centers/ [On File with the Columbia Journal of Environmental Law].

507. Stephanie M. Holm, Mark D. Miller & John R. Balmes, *Health Effects of Wildfire Smoke in Children and Public Health Tools: A Narrative Review*, 31 J. EXPOSURE. SCI. & ENV'T EPIDEMIOLOGY 1 (2021).

508. ENV'T PROT. AGENCY, AIR QUALITY AND OUTDOOR ACTIVITY GUIDANCE FOR SCHOOLS (2014), https://document.airnow.gov/air-quality-and-outdoor-guidance-for-schools.pdf [On File with the Columbia Journal of Environmental Law].

filtration requirements.[509] Another ELI study found that "[f]ew states have established minimum air filtration standards for existing codes other than the building code requirement in effect at the time of construction or system installation, and those building codes typically include minimal if any filtration efficiency standards."[510]

The importance of ventilation and filtration became more of a pressing issue at the height of the COVID-19 pandemic, and findings emerged that schools with good ventilation and filtration had fewer COVID-19 cases than the much larger number of schools without them.[511] California adopted legislation in 2022 that sets minimum filtration efficiency and ventilation standards for existing schools. Montana's health agency adopted regulations relating to infiltration of outdoor air and filtration efficiency for public schools. A Connecticut law requires schools to undertake comprehensive ventilation evaluations every five years, though the law does not set minimum filtration efficiency requirements.[512]

High smoke often leads to the cancellation of outdoor events, whether or not they are associated with schools. The state of Washington has issued formal guidance on when this should be done.[513]

## E. Federal Assistance

The Stafford Act is the principal federal statute for disaster preparation, response and recovery. It is administered by FEMA. The statute authorizes the President to declare a major disaster upon request from a governor or Tribal chief executive.[514]

The Stafford Act defines a "major disaster" as:

> any natural catastrophe (including any hurricane, tornado, storm, high water, winddriven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act

509. ENV'T LAW INST., VENTILATION IN SCHOOLS: A REVIEW OF STATE POLICY STRATEGIES i-ii (2023).

510. ENV'T L. INST., *supra* note 354, at 82.

511. Apoorva Mandavilli, *Bad Ventilation Remains Threat to U.S. Students*, N.Y. TIMES (Aug. 27, 2023), https://www.nytimes.com/2023/08/27/health/schools-indoor-air-covid.html [https://perma.cc/K3SR-F53Q].

512. ENV'T L. INST., *supra* note 354, at 82–85.

513. WASH. DEP'T OF ECOLOGY & WASH. DEP'T OF HEALTH, GUIDANCE FOR CANCELING OUTDOOR EVENTS OR ACTIVITIES AND CLOSING SCHOOLS (2024), https://doh.wa.gov/sites/default/files/legacy/Documents/4300/334-428-WildfireSmokeClosureGuidance_final3.pdf?uid=625f19d9dfcc0 [On File with the Columbia Journal of Environmental Law].

514. 42 U.S.C. § 5170.

> to supplement the efforts and available resources of States, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.[515]

FEMA has received several state requests to declare a major disaster based on extreme heat events, but it has never granted such a request;[516] while wildfires have often led to disaster declarations in the burned areas, there have been no disaster declarations for the areas affected by the smoke but not the flames.[517] On June 17, 2024, the Center for Biological Diversity (CBD), on behalf of itself and thirty other NGOs and labor unions, petitioned FEMA to institute a rulemaking to include extreme heat and wildfire smoke as major disasters under the Stafford Act.[518] The petition argues that the "any natural catastrophe including" language in the statute means that the list of specific types of disasters that follows is not exclusive, and that the number of people who die from extreme heat and smoke events warrants treating such events as disasters that warrant federal assistance. The petition asks FEMA to amend its regulations to add extreme heat and smoke events to the list of disasters that qualify for various forms of disaster assistance.

The petition states that "emergency funding for smoke events would allow governments to erect clean air community centers; provide crucial supplies, like air filtration technology and masks; and supply medical services and related supplies for those harmed by the health effects of smoke."[519]

FEMA's director has publicly reacted positively to the CBD petition,[520] but as of this writing, FEMA has not acted on the petition.[521]

515. 42 U.S.C. § 5122(2) (emphasis added).

516. Michael B. Gerrard, *Killer Heat Waves Warrant FEMA Action Under New Authority*, BLOOMBERG LAW (July 23, 2024), https://www.bloomberglaw.com/bloomberglawnews/environment-and-energy/XBFDOSTC000000?bna_news_filter=environment-and-energy [On File with the Columbia Journal of Environmental Law].

517. *Petition for Rulemaking, Pursuant to the Administrative Procedure Act, to Include Extreme Heat and Wildfire Smoke as Major Disasters Under the Stafford Act*, CTR. FOR BIOLOGICAL DIVERSITY (June 17, 2024), https://www.biologicaldiversity.org/programs/energy-justice/pdfs/EMBARGOED_FEMA-Petition-on-Heat-and-Wildfire-Smoke.pdf [https://perma.cc/65JC-AWSL].

518. *Id.*

519. *Id.* at 49.

520. Gabe Castro-Root, *Heat and Smoke Could Qualify as Disasters, FEMA Chief Says*, BLOOMBERG LAW (July 25, 2024), https://news.bloomberglaw.com/environment-and-energy/heat-and-smoke-could-qualify-as-disasters-fema-chief-says [On File with the Columbia Journal of Environmental Law].

521. E-mail from Jean Su, Dir. of Energy Justice Program, Center for Biological Diversity (Dec. 15, 2024) [On File with the Columbia Journal of Environmental Law].

## VII. WHAT THE LAW CAN DO

The law can do much to reduce greenhouse gas emissions.[522] However, so much heat is baked into the system (especially the oceans), and so many emissions will continue around the world regardless of any imaginable regulations and technologies, that the earth will continue to warm for at least several more decades.[523] But in the meantime, there is much the law can do to help people and communities reduce wildfire smoke and its impacts.

As a general matter, federal and state policies should be modified to generally leave wildfires alone if they do not threaten buildings or infrastructure. This will continue the natural process of clearing away the forest fuel that otherwise leads to much more intense and dangerous fires. In areas where fires must be suppressed, prescribed burns and (where necessary) mechanical thinning should be conducted vigorously, without unnecessary clearcutting and other destructive actions. The environmental review of these actions should be expedited through the use of more categorical exclusions from NEPA, narrower scopes for EISs, more programmatic EISs (allowing many projects to be considered together), and other means. State permitting processes should be streamlined to reduce the "bureaucratic friction" that inhibits prescribed burns.[524] An automated system could be developed to integrate smoke and air permitting, as is done in parts of California.

Financing prescribed burning and mechanical thinning is a major challenge.[525] A great deal of money goes to suppressing wildfires; much less goes to starting prescribed fires. For example, California fire agencies in 2020 spent $2.2 billion on fire suppression and $300 million on everything else, including fuels management.[526] During the period 2019 through 2023, the federal government spent an average of just under $3 billion per year on fire suppression.[527] The amount

522. *See* MICHAEL B. GERRARD & JOHN C. DERNBACH, LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES (2019).

523. Press Release, World Meteorological Organization, Greenhouse Gas Concentrations Surge Again To New Record In 2023 (Oct. 28, 2024), https://wmo.int/news/media-centre/greenhouse-gas-concentrations-surge-again-new-record-2023 [https://perma.cc/73DX-Q83F].

524. CTR FOR L., ENERGY, & THE ENV'T, UNIV. OF CAL., BERKELEY L. SCHOOL, *supra* note 220, at 43.

525. SCHULTZ, *supra* note 190, at 17.

526. MICHAEL WARA, STANFORD WOODS INST. FOR THE ENV'T, A NEW STRATEGY FOR ADDRESSING THE WILDFIRE EPIDEMIC IN CALIFORNIA 14 (2021).

527. NATIONAL INTERAGENCY FIRE CENTER, *Suppression Costs*, https://www.nifc.gov/fire-information/statistics/suppression-costs [On File with the Columbia Journal of Environmental Law] (last visited Mar. 17, 2025).

of federal money spent on prescribed burning is on the order of $500 million per year.[528] In contrast, anticipated expenditures on clean energy under the Inflation Reduction Act and the Infrastructure Investment and Jobs Act have been estimated at more than $430 billion from 2022 through 2031,[529]or $43 billion/year. A major purpose of these expenditures is to transition from fossil fuels to clean energy in an effort to reduce GHG emissions. Thus, the annual amount the federal government spends (without regard to state, city and private expenditures) on clean energy is about ninety times the amount spent on prescribed fires, even though wildfires—some of which could have been reduced by prescribed fires—are going a long way to wiping out the GHG reductions caused by clean energy.

Two of the leading academic experts on wildfires, William Boyd and Michael Wara, have different proposals for financing prescribed burns. As noted above, Boyd would impose liability on the federal government for the $CO_2$ emissions from its burning forests. Wara, focused on California, would set up a new state agency with a starting budget of around $500 million to conduct prescribed burns and other fuel management on state and private lands.[530] The federal government, which owns about 57% of the forested lands in California,[531] would presumably take care of its own.

Natural fires and prescribed burning should be treated the same as each other under the CAA. The current regulations that ignore smoke from wildfires but strongly regulate smoke from prescribed fires go in the wrong direction. Air quality regulators should approve prescribed burns unless there are strong reasons for denial; and, as one commentator suggested, "exclude uncontrolled wildfires from the exceptional events rule in order to incentivize the use of prescribed fires and managed wildfires for air quality management."[532] A new category of "landscape emissions" could be created, subject to different penalties and incentives. Prescribed fire could be defined as a

528. Lea Schram von Haupt, *Fighting Fire with Fire: Proposed Legislation Would Address the Fire Deficit*, UNIV. OF ARIZ., NATURAL RES. USE & MGMT. CLINIC (Oct. 11, 2021), https://westernlandsblog.arizona.edu/fighting-fire-fire-proposed-legislation-would-address-fire-deficit [On File with the Columbia Journal of Environmental Law].

529. DANIEL C. STEINBERG ET AL., NAT'L RENEWABLE ENERGY LABORATORY, EVALUATING IMPACTS OF THE INFLATION REDUCTION ACT AND BIPARTISAN INFRASTRUCTURE LAW ON THE U.S. POWER SYSTEM 1 (2023).

530. *Id*. at 15.

531. *Id*. at 12.

532. Ben Richmond, *Beyond the Exceptional Events Rule: How the Local Implementation of Air Quality Regulations Affect Wildfire Policy*, 46 ECOLOGY L.Q. 343, 369–70 (2019).

"reasonably available control technology" and could be included in state implementation plans.[533]

More states should follow the examples of the six states that shield those who undertake prescribed burns, or allow it on their land, from liability up to a gross negligence standard.

Development in the WUI should be disfavored. While complete bans on use of privately-owned land could be deemed a taking, there is no legal obligation to extend public infrastructure such as roads and sewers into undeveloped areas, to provide tax or other incentives to build there, or to lease public land. Transfer of development rights programs can allow landowners to derive value from their land while building elsewhere.[534] However, it must be acknowledged that restricting development in the WUI is in tension with the need in some areas for much more housing.

In WUI areas that are being developed, building codes should require fire-resistant construction and materials and adequate defensible space for new buildings. Reconstruction of areas damaged by wildfire should be discouraged, and where it is allowed, building should be to new, heightened standards. Incentives such as tax credits and rebates should be provided to encourage retrofit of existing buildings in the WUI to make them fire resistant, and application and processing fees should be waived. Cities should provide free fire vulnerability audits (similar to energy efficiency audits). Retrofitting should be mandatory (after an adequate warning period) for the most dangerous conditions, such as wooden roofs, in high hazard areas. Where permissible, federal and state financial assistance to facilities in the WUI should be conditioned on adherence to fire resistance standards.

New subdivisions, campuses, and other large developments in the WUI should be designed with buffers against wildfires such as wetlands, open meadows, and ballfields.

Inspections and enforcement should ensure compliance with defensible space and weed-clearing requirements. Homeowner associations should be required to carry this out in the areas they control. In such areas, property purchasers should be required to sign covenants obligating them to comply with these requirements.

533. Several of these techniques were proposed in Alistair Hayden & Susan Prichard, *Consider modifying the Clean Air Act to incentivize increased use of beneficial fire*, *in* WILDLAND FIRE POLICY RECOMMENDATIONS, FED'N OF AM. SCIENTISTS, *supra* note 325.

534. Sarah J. Stevenson, *Banking on TDRs: The Government's Role as Banker of Transferable Development Rights*, 73 N.Y.U. L. REV. 1329 (1998).

FEMA (or states applying FEMA guidelines) should prepare and frequently update maps of fire hazard zones. These maps should be available online and be provided to all prospective purchasers, tenants and builders so that they are aware of the risks in the places they are contemplating buying, leasing or building. Insurance companies could use these maps in setting rates. Public education campaigns should be conducted to help residents and businesses be aware of fire risks and precautions. Public education is also needed to increase tolerance for the smoke from prescribed fires.

The governments in the WUI with zoning and building code authority—typically counties or municipalities—should be required to share in firefighting costs, to give them added incentives to consider fire risks.

States should not restrict the ability of insurance companies to raise rates to reflect true wildfire risks, or to refuse to renew policies based on these risks.

States, perhaps through their public utility commissions, should provide clear guidance to electric utilities about vegetation removal and other actions necessary to reduce fire risk, and should assure rate recovery for these expenditures. Utilities that follow this guidance should not be subject to strict liability should fires ensue, but only liability based on negligence.

More measures should be undertaken to defend people against smoke: better warning systems, enabled by more air quality monitors; more air conditioners and air filters

If all of this is done, people and communities will be much better able to cope with the extreme temperatures and increased fires that are in our future.