Redefining the Urban Wildfire Problem in the West

Spring 2024

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HEADWATERS ECONOMICS

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Published Online:

https://headwaterseconomics.org/natural-hazards/redefining-the-urban-wildfire-problem-in-the-west/

About Headwaters Economics

Headwaters Economics is an independent, nonprofit research group whose mission is to improve community development and land management decisions. https://headwaterseconomics.org

Acknowledgments

We would like to thank the external reviewers who provided valuable feedback on this white paper including Paul Hessburg, Michele Steinberg, Matt Thompson, Sara Brown, and Jeff Marsolais.

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Executive Summary

Society is facing a wildfire crisis of ever-increasing risks to homes and communities in wildfire-prone areas. Current approaches to controlling wildfire are ineffective, costly, and inconsistent with the well-anchored notion that fire is a sustaining ecological factor in fire-adapted ecosystems.

Community wildfire losses continue to rise due to several related factors: 1) communities have been and continue to be developed with vulnerable construction within and adjacent to fire-prone wildlands and with little preparation; 2) attempts at fire exclusion as a part of land management have caused fuel accumulation that threatens ecosystem sustainability in many areas; and 3) climate change is exacerbating wildfire activity.

The U.S. government's 2014 National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) is currently the dominant framework for addressing wildfire on the nation's 640 million acres of federal land. The Strategy is an effort to work with public agencies and landowners to reduce wildfire risk on comingled lands. The broad approach of the Strategy outlines a vision of *living with wildland fire* by means of three primary goals: 1) engaging in safe and effective wildfire responses; 2) creating and maintaining resilient landscapes; and 3) creating and maintaining fire-adapted communities. In 2022 the U.S. Forest Service released its 10-year Wildfire Crisis Strategy. This Crisis Strategy outlines an ambitious goal of dramatically increasing the pace and scale of forest treatments "*to address wildfire risks to critical infrastructure, protect communities, and make forests more resilient*."

In 2023, an addendum to the Cohesive Strategy was approved that clearly recognized the inevitability that wildfire and communities will interact. Specifically, it restated the goal for fire-adapted communities as: "*Human populations and infrastructure are as prepared as possible to receive, respond to, and recover from wildland fire*." While the Cohesive Strategy has greatly improved collaboration across the landscape and the more recent Wildfire Crisis Strategy outlines aggressive fuel treatment goals, government agencies responsible for carrying out wildfire and fuels management remain committed to the assumption that community protection should be a primary focus of federal wildfire mitigation and response efforts. Emphasizing fuel reduction on federal land proximate to communities as the cornerstone of both strategies fails to account for emerging research demonstrating that fires with high structure loss are increasingly ignited by human activity on nonfederal lands.[1] Moreover, wildland-urban interface (WUI) research demonstrates that structure ignition conditions within communities principally determine destructive fire impacts on society.

In this white paper, we assert that the current wildfire management approach has partially inverted the wildfire problem as one in which wildland fires encroach on communities when, in actuality, it is communities that have increasingly impinged on wildlands where fires might appropriately play an important ecological role. As a result, predominant strategies continue to apply shortsighted, risk-averse reactions emphasizing community protection at the expense of creating resilient landscapes and promoting safe and effective wildfire responses.[2] In doing so, managers are inadvertently limiting agency ability to build fire-adapted communities and generate landscape vegetation and fire conditions that support more meaningful and useful change.

This paper highlights the uncompromising realities of nature and climate change and suggests practical opportunities for living within the conditions that can support ongoing wildland fire as an essential reality and vital ecological process. Wildfire is coming to our landscape. Is it fire that we can live with or fire that will repeatedly destroy us? Forward-looking ecological and practical thinking would transition conditions away from continually degrading fire-adapted ecosystems and underinvesting in community resilience and toward a sustainable approach that consistently promotes ecological and human ecosystem benefits.

Introduction

Let's highlight three fires. The Chimney Tops Two fire began November 23, 2016, as a human-caused wildfire in Great Smoky Mountains National Park. On November 28, driven by strong winds, it combined with ignitions from downed powerlines into a swarming conflagration that burned across 11,410 acres into Gatlinburg, Tennessee, and nearby communities. Some 2,400 structures were destroyed or damaged and 14 people were unnecessarily killed.

In a second instance, the Tubbs fire kindled from downed powerlines on the evening of October 8, 2017, became another roaring conflagration. The landscape was parched by prolonged drought, and when the ignition met with powerful east winds, the fire burned 37,000 acres of Sonoma County and into Santa Rosa, California. Some 5,600 structures were destroyed and 22 people died.

In the third instance, the Marshall Fire beginning December 30, 2021 (Figure 1), was carried by strong winds through dry grass and across 6,000 acres in Boulder County, Colorado, initiating fires in the towns of Superior and Louisville that destroyed 1,056 structures.

Figure 1: Homes and apartments burning during the December 2021 Marshall Fire.

Together the three fires, and most recently repeated with the devastating Lahaina Fire in Maui in August 2023, highlight an escalating and seemingly runaway fire crisis in America. These fires burned in wildly different environments – amid the forested foothills of the Appalachian Mountains, across a rumpled valley in Northern California, and along the grassy Front Range of the Rocky Mountains. They burned trailer parks, modern subdivisions, and mature cities. They all started from human causes, near but outside the city proper, then initiated structure fires that spread as urban conflagrations. Against them modern firefighting was ineffective and unprepared.

What was once dismissed as a California quirk, an episodic concern of rural life, and a nuisance that would wither away with better firefighting, is becoming a national issue, a systemic problem, and like a drugresistant bacterium that cannot be treated by increased dosage, a threat that will not succumb to increased firefighting capabilities. A long-festering concern has become a national crisis that will only worsen without aggressive, appropriate, re-imagined intervention. This intervention will likely be much different than the current approach.

Factor in climate change, a wildfire accelerant in space and time, and you have dry spells getting drier, more abundant heat waves, wet spells getting wetter, winds and storms strengthening, and the old rhythms that once defined fire seasons and fire regimes are beating more vigorously, severely, and frequently than before. The boundaries that had defined where, when, and for how long fires would burn are blurring. These climatic changes will challenge ideas, institutions, and policies no less than our sequoias, woodpeckers, and landscapes that are affected by them.

No one disputes that the United States has a fire problem. But solutions depend in large part on how an issue is observed and then defined. How we observe a thing affects how we define a thing.

Currently, society largely defines the wildfire problem as the destruction of human communities for which "protection" requires the unremitting suppression of all ignitions in the countryside, a doctrine that many observers liken to a "war on fire." The fire-industrial complex has misapprehended the problem of fires that span town and country – focusing on the "wildland-urban interface" (WUI) rather than on wildland fire environments that became occupied by humans, houses, and communities. The outcome is that we treat the urban half of that problem as though it were primarily a wildland concern, best handled by eliminating and controlling all fires in the surrounding countryside. Meanwhile, and regardless of the inevitability and ecological realities of wildfire, we treat the wildland portion as if it were an urban fire, best handled by abolishing fire with methods like those used historically to purge fires from cities. *The consequence is cities burning as though they were wildlands, and wildlands not burning enough.*

The modern wildfire problem. The problem was initially defined by the wildland fire community as a *fire control problem complicated by encroaching houses*. It would be more effective to define the situation as *fire-prone and fire-requiring landscapes complicated by an ever-expanding urban scene*.

The current wildfire crisis is particularly troubling to federal land management agencies. It has, along with other stresses, rapidly expanded the fire program of the U.S. Forest Service at the expense of proactive programs that could change the conditions caused by current wildfires. An agency originally chartered to protect woods and waters has increasingly been distracted by an urgent need to protect urban enclaves. From its origins, the agency considered fire control a foundational charge. But increasingly the demands of the wildland-urban scene have unmoored the agency's overall land management program as active fire suppression has consumed more than half of the entire agency budget.[3] The fire community understands that the current approach is insupportable, ineffective, and disruptive of the agency's overall mission, and that the problem cannot be mitigated by more of the same.[4]

How Did We Get Here?

Town and country have been linked to fire since before the Euro-American colonization era of the 18th, 19th, and 20th centuries. Early villages and cities were made of woody combustibles, and many burned up along with the surrounding countryside. Indeed, all major U.S. cities have historically burned at least once.[5]

The most recognized illustration is the 1871 fire that burned Chicago at the same time an estimated one million acres of harvested, denuded, and slash-covered landscape around Lake Michigan, including Peshtigo, Wisconsin, where an estimated 400-1,200 people died (Figure 2). That enormous conflagration heralded a half-century of megafires bounded by the 1918 Cloquet fire, where 435 souls perished. Borders between town and country were porous and wildfire readily crossed them.[6]

For reformers of the Progressive Era, fire was emblematic of waste, mistakes, and tragedy – exactly the kind of problem that applied science and know-how could fix. The National Fire Protection Association (NFPA) was organized in 1896, and the U.S. system of forest reserves was chartered in 1897. Thanks to political determination, cities enacted effective codes, zoning, and infrastructure informed by findings from fire protection engineering. These actions temporarily broke the baleful cycle of urban conflagrations that would no longer extend beyond large urban areas. The last great urban fire leveled most of San Francisco in 1906.

Landscape fire was everywhere but it did not belong institutionally or intellectually anywhere. No science claimed it, no university department housed its study, no institutions outside cities engaged with it. Instead, wildfire management on landscapes fell to state-sponsored forestry, which saw fire as a threat and appreciated the power of bad burns to rally public enthusiasm for conservation. However ill-equipped, foresters became, by default, the engineers and oracles for landscape fire in all its manifestations.

Figure 2: The Chicago Fire of 1871 consisted of two fires that simultaneously burned the same day (Image: Chicago History Museum)

Figure 3: Timeline of Major Wildfire Policy and Events

1871	Chicago burns. Starts roughly 50 years of "megafires" that burn cities and towns and kill thousands. The border between town and country is blurred and wildfire crosses it easily. For the first time, both wildlands and a major metropolis burned at the same time.
1891	A system of forest reserves begins, though no system of management is authorized.
1897	National Forest Reserves (precursors to national forests) are chartered by the federal government across the country; administration remains within the lands office of the Department of Interior. No institutions oversee dealing with landscape fire. By default, foresters become the engineers and oracles for landscape fire.
1905	U.S. Forest Service is assigned responsibility for management of Forest Reserves.
1906	San Francisco burns. Cities start enacting fire codes and zoning; the number of urban conflagrations starts to decline.
Up to 1910	Native people, homesteaders, lumber producers, academics, and others widely acknowledge that burning forests lightly plays a useful and necessary role in many forest types.
1910	The 3-million-acre Great Fire of 1910 in the Northwest is described in terms of death and destruction battled by courageous firefighters; a "war on fire" is waged. Light-burning controversy goes public and the U.S. Forest Service adopts a policy of fire exclusion.
1911, 1924	Federal-state alliances for fire protection are created and expanded. Cooperative agreements commit the U.S. Forest Service to aiding states.
1935	Forest Service enacts the "10 am policy" dictating that all fires be suppressed by 10 am the day following ignition.
1940s - 1950s	WWII inspires the first fire prevention campaigns; fire protection is framed as part of the U.S. national defense.
	America enters "a cold war on fire"; the fire-industrial complex grows as the U.S. Forest Service is enlisted into national defense programs. War-surplus hardware (planes, trucks, halftracks, etc.) is converted into firefighting equipment. Federal Highway Act is passed further promoting migration to the suburbs and exurban areas.
1960s	U.S. Forest Service assigned to conduct a National Fire Coordination Study to develop plans for major fire emergencies, including thermonuclear war. "10 am policy" is modified then rescinded. A few national forests and national parks begin experimenting with allowing wildfires to burn in remote areas.
1970s	Urban outmigration leads to more development in rural landscapes. The Riverside Lab developed the basis of the incident command system and incident management system to assist cooperation among various jurisdictions and agencies, including urban and wildland fire services. U.S. Forest Service strengthens partnerships with state forestry bureaus.
	Wildland-urban fires start commanding more attention, including the Laguna Fire (1970) and major fires in both northern and southern California (1977).
1978	U.S. Forest Service recants the "10 am policy" in favor of more pluralistic approach. The Cooperative Forestry Assistance Act authorizes the U.S. Department of Agriculture (including the U.S. Forest Service) to assist in preventing and controlling rural fires.
1986	Wildfire Strikes Home workshop launches the National Wildland-Urban Interface Initiative.
1990s	National Fire Plan is authorized; prioritizes locations around urban areas for fuel treatments. Fuels reduction is prioritized over forest ecology. Federal Wildland Fire Management Policy & Program Review (1995).
2003	Healthy Forests Restoration Act (HFRA) becomes law, expediting fuel reduction projects on federal lands and requiring communities to develop Community Wildfire Protection Plans (CWPPs) to be eligible for many types of federal funding, especially grants focused on hazardous fuels reduction, among other wildfire risk-reduction tactics outlined in the law. The Act required that the U.S. Forest Service and Department of Interior agencies allocate no less than 50 percent of all funding to treatments within the WUI.
2009	Guidance for Implementation of Federal Wildland Fire Management Policy expands fire management decisions for federal land management agencies and state partners, particularly regarding the management of wildland fires to meet multiple resource objectives.
2014	National Cohesive Wildland Fire Management Strategy pairs fire-resilient landscapes with fire-adapted communities as co-equal principles.

The U.S. Forest Service was given responsibility for the national system of forest reserves in 1905, and its manual (*The Uses of the National Forests*) identified fire protection as one of its three primary duties. In 1910 it confronted two challenges to that ambition. The Big Blowup in the Northern Rockies burned 3.25 million acres, killed 78 firefighters (and 7 civilians), destroyed several towns, and questioned the agency's ability to control fires. At the same time, the "light-burning controversy," which argued that fire lighting rather than fire fighting should be the basis of forest management went public in California, which questioned its capacity to determine suitable policy. The young agency doubled down on fire suppression and eventually quashed light burning. The Weeks Act of 1911 created a federal-state alliance for fire protection, later bolstered in 1924 by the Clarke-McNary Act. State forestry bureaus became the primary agency for fire protection outside municipalities. Meanwhile, the U.S. Forest Service sought to strengthen fire programs on its own estate through cooperative agreements that provided for mutual assistance. The concern was that the private lands surrounding the reserves were a source of unregulated burning that often burst onto these public lands. Those cooperative agreements now bind the agency to this assistance.[7]

The nationalizing of fire protection accelerated through the Civilian Conservation Corps. Later, World War II made fire protection a national security duty. The war inspired the first national fire prevention campaigns and enshrined fire protection as an expression of national defense. California doubled the budget for its forestry agency and fashioned a master fire plan that could mobilize resources throughout the state to meet emergencies. In effect, it went to war and never stood down.

America entered a cold war on fire, complete with a fire-industrial complex (Figure 4). More and more, the U.S. Forest Service was enlisted into a national defense apparatus, even assigned vague oversight for rural fire protection. Its researchers participated in nuclear weapons tests, joined the National Research Council Committee on Fire Research, and accepted contracts from Department of Defense and the Office of Civil Defense for research that helped underwrite dedicated fire labs.[8] The U.S. Forest Service had priority access to war-surplus hardware, which led it to create equipment development centers that could help convert planes, trucks, jeeps, and even halftracks for firefighting, and then funnel much of this to its state cooperators.[9] After the Cuban Missile Crisis, funding boomed. The agency was assigned to conduct a National Fire Coordination Study to develop plans for coping with major fire emergencies (even a thermonuclear war) that would affect town and country alike.[10] The 1972 Rural Development Act further extended the reach of federal-state agreements to areas in need of fire protection. Similarly, a National Commission on Fire Prevention and Control assisted and reorganized urban fire services, which led to a U.S. Fire Administration.[11]

Meanwhile, outmigration from urban centers, first and most visibly evident in Southern California, initiated recolonization of rural landscapes. A new kind of fire landscape appeared: one with people and their homes tucked away in it. The 1970 fire season in California led to the development of the national incident management system (FIRESCOPE). At its core, the incident command system was explicitly designed to allow wildland and urban fire departments to work together. But what started in California did not stay in California as the boundary between town and country became increasingly porous and the need for intergovernmental coordination expanded.[12]

At the same time, some federal land management and protection agencies, beginning with the National Park Service, were reorienting their fire policies away from simple suppression and toward mixed programs aimed at restoring fire to the landscape. This emphasis on

Figure 4: The fire-industrial complex (Image: NY Times, via Getty Images).

interagency cooperation replaced the U.S. Forest Service hegemony; fire protection was, in principle, reformed from a stand-alone program and reintegrated with land management. The U.S. Forest Service completed its own reformation in 1978, accompanied by a reorganization of fire research and a transfer of fire and aviation management to the Division of State and Private Forestry. The Cooperative Forestry Assistance Act of that year further authorized the U.S. Department of Agriculture to assist in "the prevention and control of rural fires."[13]

The U.S. Forest Service never intended to become a rural or urban fire service. Yet with wildland-urban fires dominating headlines and California as a strong lead, it has been pushed and pulled into that role. Often it was the largest fire-competent agency outside of municipalities and the most powerful ally of state forestry bureaus. This, coupled with mission creep to fill a vacuum and a residual Cold War ethos, drew it to duties it would be not fully equipped to perform.

Whether competing or cooperating, urban fire nonetheless trumped and absorbed wildland fire. FEMA assumed oversight for the National Incident Management System. The National Fire Protection Association (NFPA) absorbed the wildland-urban interface initiative into "Firewise." The National Institute of Standards and Technology (NIST) claimed research on structures burning from adjacent wildland fires. The National Fire Plan identified peri-urban sites for preferential fuel treatments and made fuels, not ecosystems, the metric of accomplishment. The National Cohesive Wildland Fire Management Strategy paired fire-resilient landscapes with fire-adapted communities as co-equal principles. In coupling these two tenets to reduce community wildfire risks, the U.S. Forest Service now must assume responsibilities for addressing risk to the entire built environment—all of which is beyond their purview and expertise given their ecosystem and natural resource-based assignment. As a result, the agency defaulted to wildfire exclusion as their solution to community risk reduction via the only two levers they had at their disposal: fuel reduction and suppression. Yet the answer to community protection resides with communities themselves. Until the wildfire problem is redefined as one involving people and communities alongside wildlands, risk-reduction strategies will continue to be ineffective and insufficient.

Much of the recent legislation and agency initiatives require that a significant portion of all fuels investments be focused on the wildland-urban interface or to directly reducing wildfire transmission into communities.[14] These investments assume that forest fuels management will have significant influence on reducing community loss despite strong evidence that the conditions directly adjacent to the structures within the community are largely responsible for loss.[15] They shift the fire task from towns to countryside, paradoxically leaving the towns vulnerable and the countryside destabilized.[16]

The current fire crisis is not simply a question of money. The National Fire Plan and now the Bipartisan Infrastructure Bill (BIL) and Inflation Reduction Act (IRA) have appropriated significant funds to the wildfire "crisis." But these one-time investments will not address long-term and systemic challenges in wildfire management. To be effective, spending is most sensibly guided by suitable policies, housed in appropriate agencies, and inspired by an understanding and definitions of the actual problem.

The Cohesive Strategy and the Crisis Strategy

After four years of interagency work, the Obama Administration released the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) in 2014, with an addendum during the Biden Administration in 2023, to encourage collaborative work among state and federal agencies and other stakeholders across all landscapes.[17] Its purpose was to provide a national framework to guide and support decision-makers.[18] In 2022 the U.S. Forest Service released the Wildfire Crisis Strategy. The Crisis Strategy outlines an ambitious goal of treating an additional 20 million acres of U.S. Forest Service land and 30 million acres of other federal, tribal, state, and privately owned land "to address wildfire risks to critical infrastructure, protect communities, and make forests more resilient."[19] These two strategic efforts represent both a recognition of the severity of the wildfire problem and a unique opportunity to make meaningful change to the nation's relationship with wildfire. However, to achieve the necessary pace and scale of change required, implementation of the strategies must overtake the pace and scale of modern wildfires so that the landscape might tip to more benign wildfire dynamics. To do so requires that we recognize some of the unintended contradictions within these efforts:

- **Short-term outlook:** Schultz et al. (2019) identified ambiguity and conflict within the U.S. Forest Service's definition of the wildfire problem: short-term protection objectives are inconsistent with more meaningful, longer-term risk reduction. Reducing wildfire risk and restoring an ecological role for fire is a transgenerational goal and responsibility.
- **Lack of workforce:** The Crisis Strategy outlines a massive increase in fuel-reduction work with a focus on going to highest-risk areas first, but does not confront the workforce capacity and capability required to conduct these efforts. Most of that workforce is continually over-committed to wildfire suppression activities. The 2023 Cohesive Strategy Addendum recognizes that the existing wildfire management system has not kept up with demands and therefore includes a new critical emphasis challenge area in workforce capacity, health, and well-being. Thousands of former employees who worked on proactive forest mitigations have been lost to retirement, non-replacement, and the ever-enlarging fire-industrial complex.
- **Over-reliance on fuel treatments:** Most importantly, wildland fuel treatments are seen as the primary tool to reduce structure loss despite decades of research demonstrating that the conditions of the structures and their immediate surroundings are largely responsible for loss. This is a community responsibility. Given the scale of current wildfires and the area burned relative to treated area, wildfires will continue to have increasingly more influence modifying future wildfire potential than hazardous fuels management.
- **Under-reliance on wildfire:** Perhaps the largest opportunity of all is to increase the positive work of

wildfires. In the average year, more than 7 million acres burn in the United States largely under the most extreme hot, dry, and windy conditions, while up to 98 percent of wildfires are suppressed at relatively small size. Risk aversion and uncertainty around the potential of fires to cause damage incentivizes immediate suppression yet reduces the opportunity to utilize ignitions that could improve ecological condition and reduce future risk. On average, about one-half of the 7 million acres burned annually burns at very low, low, or moderate severity. One may think of these lower-severity burned areas as first-entry fires, with a relatively short-lived window of opportunity to extend the effectiveness of this first "treatment" in a fire-excluded landscape. Rarely are these acres re-treated in time with fire or post-fire fuel reduction, and after a decade or more the next fire will often be worse than the first. Further, application of fire under quiescent weather conditions during large wildfire incidents can support strategic wildfire response while reducing responder exposure to the hazards of the wildfires.

While the Cohesive Strategy has improved collaboration across the landscape and the Wildfire Crisis Strategy proposes dramatic increases in fuel treatments, there remains an assumption that community protection should be a primary focus of federal wildfire management efforts. Both strategies emphasize the need for coordinated fuels reduction efforts across a mosaic of public-private landownership to reduce fire transmission between wildlands and the urban interface. This emphasis reinforces the current approach of wildfire control in lieu of reintroducing ecologically beneficial fire and reducing exposure within the built environment.[20] A continued emphasis on fuel reduction proximate to communities does not consider the role of beneficial fire or underscore the importance of community efforts in the home ignition zone. Moreover, it fails to account for research showing that high structure losses are generally associated with ignitions on nonfederal lands,[21] and that disastrous outcomes are principally determined by structure ignition conditions within communities.[22] Continued reliance on fire exclusion, suppression, and avoidance of beneficial burning while underinvesting in communities will perpetuate the sequence of events leading to wildfire disasters.

Following, we discuss how each of the Cohesive Strategy's three goals – fire-adapted communities, wildfire response, and resilient landscapes – is being served with current approaches (Figure 5).

Figure 5: Ends-Means Diagram of Three Cohesive Strategy Goals

Cohesive Strategy Approach	VISION	GOAL	MEANS	OUTCOME
Fire-Adapted Communities	Communities are not substantially impacted by wildfires and social expectations are aligned with biophysical realities.	Homes and community infrastructure survive wildfire with minimal damage and any needed recovery occurs with minimal social and economic disruption.	• **HIZ Management:** Vegetation management and ignition-resistant measures are applied to homes and properties; homes are considered a source of fuel and therefore mitigated appropriately. • **Resident Accountability:** Social acceptance of risk and accountability for home and property maintenance that's supported by technical and financial assistance from federal and state agencies. • **Community Planning:** Anticipation of wildfire through proactive planning of neighborhoods and across ownerships, evacuation protocols, and post-fire recovery.	• Social behavior, accountability, and participation in achieving wildfire resilience. • A designated lead agency to coordinate community wildfire risk reduction. • Sufficient and dedicated funding, investment, and technical expertise. • Proactive, consistent, science-based approaches for tracking data, regulations, compliance, and outcome-based performance metrics.

Cohesive Strategy Approach	VISION	GOAL	MEANS	OUTCOME
Wildfire Response	Wildfire response is mostly local, more effective, and limited in scope and scale.	Wildfire management decisions are risk informed, resulting in more effective and efficient strategies that promote fire-adapted communities and resilient landscapes while minimizing hazardous conditions for firefighters.	• **Prioritize Effectiveness:** Identification of locations on the landscape where suppression actions have the highest likelihood of reducing losses. • **Strategic Opportunities:** Fuels management and wildfire response are used strategically to enhance fire management opportunities; successful suppression where necessary, expanded fire where available, and targeted, effective response. • **Responders Health:** Fire management capacity is enhanced to reduce mental and physical strain on responders. • **Knowledge Generation:** Education and training are promoted to achieve broader fire management and ecological resilience.	• Social and political support for this proactive paradigm through an active and ongoing communication campaign. • Response strategies that emphasize long-term risk reduction and maintenance of ecologically appropriate fire. • Workforce capacity such that responders are capable of supporting this transition while reducing current, long-term negative mental and physical impacts.
Resilient Landscapes	Wildfire plays an appropriate ecological role and contributes to climate adaption while enhancing natural resource values.	Prescribed fire (including cultural Indigenous burning) is prevalent and inexpensive, most ignitions are allowed to burn to enhance ecological resilience, and there is broad social acceptance of smoke from prescribed and natural fire.	• **Fuels Management:** The scale of prescribed burning, Indigenous cultural burning, and forest treatments is significantly expanded and are proactively done to restore climate and wildfire resilience. • **Fire Response:** Fire is suppressed when needed and promoted wherever possible.	• Wildfire response and land management are coordinated, risk-informed, and leverage each other with appropriate emphasis on long-term resilience. • Sufficient and sustained operational and strategic expertise within appropriate agencies. • Effective science-management partnerships. • Metrics beyond "acres treated" to measure investment outcomes, not easily measured outputs. • Standardized data on wildfires and responses for ongoing learning.

1. Safe and Effective Wildfire Response – Less is More

The vision of the Cohesive Strategy is "To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, to live with wildland fire." Our ability to extinguish fire safely and effectively "when needed" requires that we greatly expand our use of fire "where allowable." Despite recognition by researchers, managers, and policymakers that fire provides key ecological benefits and long-term risk reduction,[23] a short-term focus on removing fire from the landscape is reinforced and incentivized in current fire management. Aggressive fire suppression, as a strategy, is unsustainable in the long term[24] and does not constitute a safe and effective wildfire response.[25] To improve the safety and effectiveness of our wildfire response, more proactive burning and ultimately less fire suppression is needed. Yet fear that a fire may eventually cause damage to communities, societal intolerance of smoke, and a now ingrained emergency response culture constrain our ability to utilize fire as a proactive tool to reverse the mounting crisis. Essentially, the lack of community wildfire adaptation perpetuates a response system that will accelerate future damage.

Over the middle half of the 20th-century (1935-1985), huge investments in fire suppression coupled with a relatively mild climate after the close of the Little Ice Age created an illusion that long-term fire control was possible, even desirable.[26] Further, public investments in fuel reduction and wildfire suppression in and around wildfire-prone areas reduced our ability to discern the true future cost of housing location decisions, thus incentivizing development in high-fire-danger areas and fueling a growing social and moral hazard.[27]

Inertia represented in existing social systems, communities, and local governance systems habituated to the current situation is buttressed by rigid societal expectations and an entrenched fire management culture.[28] Social pressure to suppress wildfires constrains alternative management approaches that would promote more wildfire on the landscape under appropriate conditions.[29] High-profile events where initial suppression is limited and fires escape to surrounding lands support a false narrative that less-aggressive suppression often results in negative outcomes, despite the rarity of such events and outcomes.[30] These pressures further promote risk-averse management and human community cultures that emphasize aggressive suppression as the *de facto* response. And, paradoxically, wildfire suppression ensures the future occurrence of large and damaging wildfires.[31]

After more than a century of successful fire suppression, the destabilizing feedbacks from surface fuel accumulation, species composition change, increased canopy density, and increased forest continuity to landscape scale are driving even more expensive and, unfortunately, increasingly futile efforts to rein in inevitable wildfires.[32] Wildfires are inevitable because vegetation continually grows, reproduces, seeds in, and releases in the context of limited ignition occurrence. While largely successful with suppression, it is the fires that escape under the hottest, driest, and windiest conditions that predominantly burn the landscape.[33] Fires that can be successfully suppressed are suppressed, and they often occur under more moderate fuel moisture and weather conditions. That is often why they are suppressible. Given the myriad ways for a fire to escape, reliance on suppression as a means of wildfire control is predictably ineffective during extreme and escalating hot, dry, and windy wildfire conditions.

In recent decades, wildfire suppression expenditures have increased far in excess of inflation and have had a major impact on states' budgets and federal land managers' ability to address their core missions.[34] For example, for the U.S. Forest Service, the largest wildfire organization in the country, the proportion of annual expenditures associated with wildfire management has increased from less than 20% in the early 1990s to well over 50% each of the last five years. In fact, wildfire-preparedness and suppression expenditures by the U.S. Forest Service and Department of Interior agencies (BLM, NPS, USFWS) from 2011 to 2020 alone have nearly doubled.[35] The growing workload associated with wildfire response coincides with emerging recognition of serious and increasing physical and mental health issues within the firefighter community.[36]

The increasing cost of aggressive fire suppression also grossly overshadows investments in prevention, mitigation, and recovery, and reinforces an ongoing posture of reaction versus the needed proaction.[37] Central to the wildfire paradox is the aggressive suppression paradigm. The more we double down on suppression investments, the more difficult it will be to suppress future wildfires due to fuels growth and fire avoidance. Ironically, one key limiter of modern-day wildfire growth is fuel reduction deriving from past failed suppression activities.[38]

> ***"Valuing and prioritizing home protection via heavy investment in suppression and nearby forest treatments is ineffective and comes at a great cost to the federal government and taxpayers."***

The need to reduce forest fuels and their connectivity is unparalleled. One primary challenge related to this need is building organizational capacity on all fronts to burn at the scale needed to reduce risk and tip ecosystems to more ecologically sustainable conditions.[39] A dramatic increase in the fire workforce is needed to conduct proactive fuel treatments at a scale that meaningfully and rapidly transitions work dominated by fire suppression operations to that dominated by proactive burning. Treatment strategies are readily designed that can promote conditions that will accept the active return of naturally ignited fires and their associated ecological and risk-reduction benefits.[40] Under this new paradigm, losses and the need for suppression will greatly decline over time.

This is a Manhattan-style project (large, well-organized, fast-acting, and well-funded), where a much larger fire management community of practice establishes the requisite skills, creates burn plans, and establishes forest and nonforest conditions that can more readily accept the return of appropriate fire – that is, fire that is well-matched to each land type, native fire ecology, and evolving climatic and fire regime conditions. Policy, funding, organizational structures, and governance to work at these scales are poorly developed or absent but are nonetheless needed. There is value in beginning work in high-risk areas, as is outlined in the Wildfire Crisis Strategy, but societal and self-imposed agency constraints are most present in these same areas.

Societal expectations and institutional designs still assume that traditional fire management approaches form appropriate foundations of future strategies and are appropriate for home and community protection. They are not. Valuing and prioritizing home protection via heavy investment in suppression and nearby forest treatments is ineffective and comes at a great cost to the federal government and taxpayers.[41] Fundamentally, the Cohesive Strategy's vision of living with fire and the goal of fire-adapted communities is inconsistent with the current emphasis on controlling wildfire. Restoring and maintaining climate- and wildfire-resilient landscapes will allow us to live with wildfire – in other words, restoring ecologically appropriate fire that replaces destructive fire.

There are growing efforts and investments[1] to address the reactive suppression mindset and reduce the time pressure of suppression decision-making. New efforts are focusing attention on pre-planning fire suppression responses using what is known as the Potential Operational Delineations (PODs) planning process.[2] PODs combine local fire and topography knowledge with advanced spatial analytics to help managers develop a common understanding of risks, management opportunities, and desired outcomes. A key aspect of PODs is recognition of the need to bring multiple partners, cooperators, and stakeholders together to develop a shared understanding of values, opportunities, and challenges. This shared understanding can foster collaborative, cross-boundary planning and prioritization. PODs not only identify locations of high risk and where fire can most likely be successfully contained but also those areas where less aggressive strategies can be implemented to reduce fuel loading and improve landscape condition.[3] To move PODs from aspirational to operational, pre-identified anchoring and control locations are treated and established prior to any outbreak of fire. Where a natural ignition occurs, these improvements provide fire managers with many needed tools for suppressing a wildfire when needed or promoting a wildfire as a fire and fuels management tool where and when appropriate.

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2. Resilient Landscapes – Sustaining Ecosystems

The second pillar of the Cohesive Strategy is creating "resilient landscapes." In fire-dependent vegetation types of the western United States, this basically means applying and reapplying fire to sustain those ecosystems. In fire-excluded landscapes, it means re-introducing and maintaining the role of ecologically appropriate fire. Fire-dependent ecosystems require regular burning as a physical process to reduce competition for resources, consume organic debris, kill competing vegetation, modify the structure, age, density, and layering of vegetation to maintain its resilience, and address the complex habitat needs of associated flora and fauna. For landscapes to be resilient, fires would maintain ecosystem structure and function by burning within the necessary ranges of intensity, frequency, seasonality, distribution, and patch sizes. One-half century of research shows that managed fuel conditions of resilient forested landscapes also benefit the other two pillars of the Cohesive Strategy – reducing the probability of large fires near communities and municipal watersheds, and making emergency response safer and more effective. However, fire resilient landscapes will not be sufficient to protect communities and developed assets from fire if they remain vulnerable to ignition. Ironically, restoring fire at landscape scales will require ignition resistant, fire adapted communities.

Methods for creating resilient landscapes can involve using fire in three ways:

- Proactively using prescribed and Indigenous cultural burns to:
  - reduce surface woody fuel and duff and litter deposits that continually accumulate,
  - achieve forest thinning by regularly eliminating lower-level crown classes,
  - increase the average diameter of residual trees and thereby their fire tolerance,
  - favor fire-tolerant species that are adapted to regular burning,
  - increase canopy base heights of residual trees to help keep them out of flames' reach,
  - reduce canopy bulk density to reduce crown fire initiation and spread potential,
  - and reduce smoke emissions and impacts on communities compared to wildfires.

- Expanding fire intentionally during wildfire suppression operations:
  - to concurrently benefit ecological and containment objectives while reducing risk,
  - by applying night burning when relative humidity and fine fuel moistures often recover,
  - by applying fire in intentional patterns to limit intensity and fuel consumption,
  - by burning adjacent to anchoring and control locations of prepared PODs.

- Taking advantage of unplanned ignitions with limited suppression actions:
  - under the appropriate fuel, wind, and weather conditions,
  - to increase the network of burned areas on the landscape,
  - by carefully monitoring natural spread and suppressing only when necessary to protect values at risk.

Although increased investments in fuels management will support landscape resilience in and adjacent to treated areas, hyperfocus of treatment investments to achieve community protection primarily restricts the collective ability to make substantive progress in this area. In some years, 80 to 90 percent of suppression activity is in the wildland-urban interface. However, wildfire resilience that is integral to fire-adapted landscapes requires periodic burning to maintain this resilience.[42] Thus, current emergency response fire operations that match and reinforce societal expectations are inconsistent with the needs of landscapes. But they match societal expectations and current fire response functions within government land management agencies. The inevitable return of fire is unalterable. Will we be acting to return it sensibly?

This logical mismatch derives from currently held cultural assumptions – that free-roaming fires are unusual and a constant threat. This train of reasoning leads to the currently unchallenged expectation that suppression is always the most appropriate and effective response.

Although the science of fire ecology has developed over a century of research and is embedded in official fire management policy of the federal government since 1977, the public remains largely alarmed by the presence of wildfire. Historical suppression policies fostered the belief that organized fire suppression is effective at stopping fires, and thus, is beneficially protecting communities and natural resources from ongoing wildfire threats. This arises from an easily established perception from the mid-20th century – when the climate was moderate and fires were readily contained.

In fact, a century of data seems to support this idea. Most fires *were kept small* by suppression, and fire records since the 1910s show that 96 to 98 percent of all wildfires *were kept smaller* than 300 acres. However, the remaining 2 to 4 percent of fires that escape suppression attempts each year are responsible for 90 to 95 percent of annually burned area. This means that fire suppression predictably fails one time in fifty. This failure leads to the 2 to 4 percent of fires each year that are most damaging and difficult to control. Moreover, we have learned that it is the smaller fires that we successfully douse that provide the capacity to constrain the growth, size, and frequency of the largest fires.[43]

Creating resilient landscapes is but one factor that contributes to reducing wildfire risk. Risk is determined by combining the landscape fire hazard with the susceptibility of the values at risk.[44] Fuel reduction treatments (as above) applied to improving landscape resilience can also reduce probabilities of severe fires and the extent of their impacts. Mechanical thinning and prescribed and unplanned fire are the most effective techniques for reducing hazard in seasonally cured forests and are consistent with their fire ecology.[45]

While hazardous fuels reduction treatments can reduce burn severity and extent when implemented at the appropriate scale and spatial distribution, evidence that treatments are sufficient to reduce risk to communities is not supported by wildland-urban fire research.[46] Too often wildland fuel treatments are promised as the exclusive means of preventing community destruction.[47] Establishing landscapes that are truly more resilient to wildfires requires a fundamental recognition that wildfires play an ecologically appropriate role in ecosystem functionality and sustainability over extremely large areas. What's more, ecologically appropriate fire does not sufficiently prevent ignition-vulnerable communities from burning.

Transitioning to fire-resilient landscapes will require more individual fires (thousands) to burn across large spatial scales over extended durations and weather conditions. The potential fire conditions for any specific fire will remain uncertain and, unavoidably, some fires will experience extreme conditions. Further, climate change through a potent and unwavering combination of warming air temperatures, earlier snow melt, longer fire seasons, earlier fuel curing, drier summers with more windy days, and below-average winter precipitation shifting from snow to rain will be an intense driver of larger and more intense fires.[48] Coupled with fire exclusion and 100 to 170 years of accumulated fuels, fire regimes are departed from historical conditions.[49] What traditionally worked in the past to contain and extinguish wildfires from impacting homes, communities, and critical values will not work in the future. For fire and fuels management to succeed in the near term, large-scale transitions are needed – away from the short-term protection mentality that concentrates attention in the wildland-urban interface and to those that support long-term and large-scale landscape and wildfire resilience. Protection of the community is a great need as well, but it involves communities taking responsibility for their vulnerabilities and that requires alternative methods, means, investments, and governance.

On many landscapes, climate change will make historical ecological conditions unattainable because ecological resilience is now known to be a nonstationary condition, ever-evolving with the climate. However, developing and maintaining landscape resilience to newly emerging conditions resulting from climate change and shifting wildfire dynamics is achievable. Resilient landscape configurations will play upon major themes of historical landscapes, but there will be more nonforest and open-canopy forest conditions.[50]

Predictably, some fire suppression will fail during extreme conditions, and failures will increase by more than 1 in 50 occurrences. This will not change for the foreseeable future and it presents a profound challenge for managing wildland fire:

Fortunately, wildland-urban fire research reveals significant opportunities to create ignition-resistant homes, structures, and communities sufficient to prevent disastrous community destruction without controlling all extreme wildfires and the transition to fire resilient landscapes:

> *How do we provide more fire to sustain fire-adapted ecosystems without inviting disastrous community destruction during extreme wildfires?*

3. Fire-Adapted Communities - Ignition Resistance

The third pillar of the Cohesive Strategy is creating and maintaining fire-adapted communities through engagement and action with homeowners and communities. Through the lens of the Cohesive Strategy, the intent of creating fire-adapted communities is to better prepare human populations and infrastructure to withstand a wildfire without loss of life and property.

Residential and commercial structures built in wildfire-prone areas must be able to resist wildfire. All structures must be robust to wind-blown embers. The potential for radiant heat and limited flame exposures from nearby vegetative and nonvegetative combustible materials must be considered in the selection of construction materials. Period. Reducing the vulnerability of a structure to radiant heat and flame contact exposures must consider a coupled approach where construction materials and the selection, location, and maintenance of combustibles around the home are included in the overall mitigation strategy.

Research shows specific and time-tested opportunities to reduce community destruction of homes and other structures when threatened by wildfire.[51] Modifying construction designs and materials, updating building codes and regulations, adapting fire-safe landscaping ordinances, and limiting development in high-fire-danger environments can all improve community resilience. For example, vulnerable construction factors are:

- Wood shake and shingle roofing material, especially for complex roof designs,
- poor attic venting that allows entry of burning embers,
- combustible siding adjacent to combustible vegetation,
- gutters full of conifer needles and leaves,
- firewood piles next to homes,
- wooden steps, fences, and decks exposed to direct heating and flames,
- flammable vegetation closely surrounding nearby outbuildings,
- houses sited on steep slopes and ravines that quickly carry flames to them,
- housing tightly packed in neighborhoods that enable easy home-to-home fire spread.

By creating structure ignition resistance and, collectively, ignition-resistant communities, towns and villages can effectively reduce the chance of wildland-urban fire disasters. Until community ignition resistance is recognized as the most effective means of preventing disastrous community fire impacts, communities, homes, and neighborhoods will continue to burn.

Patterns of Home Destruction During Wildfires

We can better build fire-adapted communities when we understand how homes and neighborhoods burn in the first place. Common social and media perceptions of wildfire disasters erroneously assume home loss and community destruction result from a massive wildfire front or wave of fire sweeping through a neighborhood. However, decades of wildfire research and post-fire analysis indicate the primary culprits of home loss during a wildfire are the much less conspicuous firebrands (embers) and low-intensity surface fires.[52] Embers are important because of their ability to ignite combustible materials directly (e.g., ignition of a wooden deck or fence) and indirectly (e.g., ignition of a wood pile located close to a structure, with subsequent structural ignition via radiant heat or flame contact). Once individual homes start to burn, fire continues to spread from burning structures and other flammable materials within the community. Embers from burning structures and structure-to-structure fire spread in high density development become the main causes of home loss. Unburned vegetation after a fire is the typical pattern associated with extreme wildfire conditions.[53] Post-fire analysis of destroyed homes and outbuildings adjacent to unconsumed vegetation routinely shows:

Home destruction with adjacent unconsumed shrub and tree vegetation, Paradise (Image: LiPo Ching/Bay Area News Group)

- High-intensity wildfire did not spread through the area as a sweeping wave of flame.
- Unburned shrubs and trees adjacent to homes did not ignite the homes.
- Homes that have been ignited from embers landing directly on or near the home, low-intensity surface fire spreading to the home, and in high-density developments, structure-to-structure fire spread.
- During a severe fire within a community, wildfires ignite structures, vegetation, and other burnable materials concurrently across a broad area. These materials continue to burn and spread fire, by ember cast, within a community long after the main front of the wildfire has passed.[54]

How Disastrous Community Fire Destruction Occurs

Recognizing the essential premises of structural ignition helps us better understand and identify opportunities to mitigate vulnerabilities. Local conditions in, on, and around the home primarily determine whether structures will ignite and spread destructive structural fire within a community.[55] The home and its surrounding fuel conditions, an area within 100 feet of the home is called the "home ignition zone" (HIZ). This zone exists regardless of property boundaries and in high-density developments will include neighboring homes on one or more sides of a house in question. The principal cause of wildland-urban fire disasters is home ignition vulnerability to embers from any source, and burnable materials within 100 feet of a home.[56] Thus, *wildland-urban fires are a structure-ignition problem largely undetermined by wildfire intensity and geographic location*.

Wildland-urban fire research clearly shows that urban conflagrations involving 100 or more destroyed homes and other structures only occur during extreme wildfire conditions where wildfire suppression has failed and communities' fuels were exposed to a shower of burning embers.[57] Although the wildfire did not spread through these communities, the uncontrolled, extreme wildfires initiated numerous, simultaneous ignitions across a broad community area. The flaming front of the wildfire did not destroy homes, but embers lofted from the wildfire plume caused home ignitions either directly or indirectly. As such, *a community's vulnerability to ignitions and the potential for fire to spread within community fuels determines the amount of fire destruction*.[58] Thus, creating and maintaining ignition-resistant structures within communities can prevent wildfire disasters without necessarily controlling wildfires.[59]

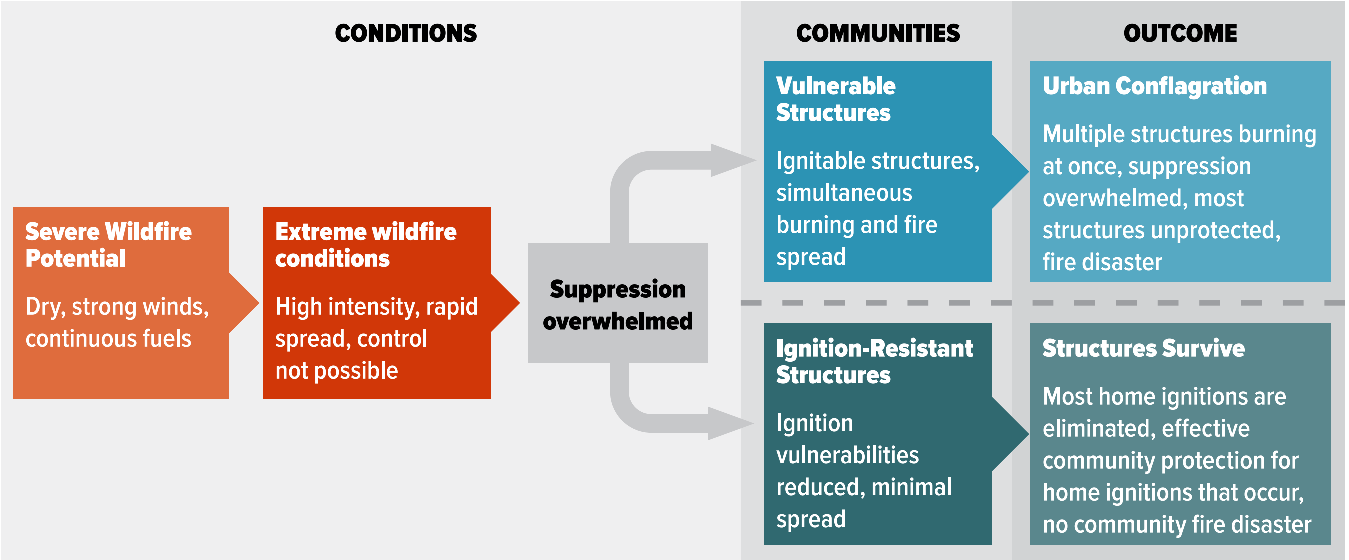

Figure 6: Wildfire Disaster Sequence

Reducing Community Wildfire Risk

Community wildfire risk reduction must address key risk factors that determine structure ignitions including exposure to a wildfire hazard (*wildfire exposure*), probability of structure ignitions (*structure ignitions*), and likelihood of structure protection (*structure protection*).[60]

- *Wildfire exposure*: Wildfire exposure is represented by the likelihood of coupling a nearby wildfire with community vulnerability to damage.[61] Where the likelihood of extreme burning conditions is high and likelihood of suppression failure under extreme conditions is high, reducing community wildfire exposure should focus on reducing ignitions. Once a fire is ignited under these conditions, the ability to suppress it is very limited. Thus, identifying relative wildfire exposure across a broad set of communities can aid in prioritizing communities for wildfire risk reduction.[62]

- *Structure ignitions*: As discussed above, mitigating the critical ignition factors within the HIZ and reducing likelihood for spread structure-to-structure are the most effective and practical approaches for reducing community wildfire risk. While structure ignition resistance can eliminate most ignitions, it does not "fire-proof" structures. The numerous simultaneous structure ignitions in vulnerable communities and structure-to-structure fire spread in high density development readily overwhelm fire protection leading to disastrous community destruction. Community ignition and fire spread resistance can sufficiently reduce the number of simultaneous burning structures to enable effective community structure fire protection.[63]

- *Structure protection*: Community wildfire risk reduction does not reduce the need for structure fire protection, it enables effective fire protection. Hence, community fire protection effectiveness is a primary risk factor for reducing community wildfire risk dependent on community ignition and fire spread resistance. Attaining a high level of community resistance will require technical facilitation from agencies, adoption and enforcement of relevant codes and standards for low- and high-density communities, residents engaged in maintaining ignition-resistant HIZs, and cooperation among residents and agencies.

Wildland-urban fire is a structure-ignition and community-fire-spread problem.

While the U.S. Forest Service and Department of Interior agencies are tasked with wildfire risk reduction, most ignitions occur on private lands. Thus, in the West, consideration of the 300 million acres of private land is central to achieving fire-adapted communities. The Crisis Strategy has outlined the goal of treating 30 million acres of nonfederal land under programs like the Community Wildfire Defense Grant (CWDG). While ambitious, more is needed to ensure these objectives don't fall short of addressing the scale and primary location of the risks. Moreover, budgets are insufficient relative to the scale of the problem. Similarly, burning in multi-jurisdiction landscapes is new territory in terms of liability, agreements, and shared expense, and all levels of government lack workforce capacity under this approach.

Community wildfire risk reduction must begin within the community. Effective mitigation occurs in the HIZ and, collectively, throughout an entire community.[64] Yet many communities and local governments are often woefully understaffed and lack the resources, budget, and expertise to implement and maintain critical parcel- and neighborhood-level risk-reduction measures. While the discourse of creating fire-adapted communities is common policy rhetoric, the practice of mitigating and adapting the built environment to increasing wildfire risk is an applied skillset requiring a multidisciplinary understanding of wildfire behavior, structural ignition vulnerabilities, and urban resilience.

Wildland fire management is predominantly housed within federal land management agencies, primarily within agencies of the U.S. departments of Interior and Agriculture, and whose staffs have natural resource backgrounds and training. Risk-reduction strategies for private structures, neighborhoods, and infrastructure are not intrinsic institutional knowledge or chartered tasks for these agencies. While mitigation of private structures and the community should largely fall within the purview of local government, effective implementation will require significant upfront and ongoing investment and technical assistance at the federal level. Few agencies are equipped to address this gap in community wildfire resilience. One agency—the U.S. Fire Administration (USFA) within Homeland Security—has the organizational culture to potentially apply wildfire science and structural mitigation principles to the built environment. The Department of Housing and Urban Development (HUD) also has experience providing technical assistance to communities for disasters and could broaden its role within wildfire resilience and proactive community planning.

Establishing the administrative mechanisms needed at the federal level to direct funding and technical assistance to communities will require enhanced coordination among federal agencies and state-level departments, who can then direct resources to local jurisdictions. Recent efforts in California, Colorado, and Oregon are structuring home mitigation programs on this model with the underlying objective of delivering funding, support, and expertise to communities and individual residents to improve their ongoing wildfire resilience.[65]

A New Paradigm is Needed

Society largely defines the wildfire problem in terms of the destruction of communities. Yet emphasizing community protection as the prime objective of wildfire management overlooks the unavoidable and beneficial need for more fire on the landscape, inadvertently impeding our ability to create both resilient landscapes and fire-adapted communities.

We must separate what historical circumstances have poorly joined. It is time to let each side of the wildland-urban frontier do what it does best: *Define communities as city firescapes and apply proven methods to halt urban conflagrations*, and *define the countryside as appropriate fire habitats and ensure that the right mix of fire is applied and withheld.*

The current preoccupation with home protection during wildfires is incommensurate with current federal and state investment in fire preparation and planning. In contrast, living with wildland fire will require us to take a holistic view of communities, landscapes, and the entire fire management system. Separating fire-adapted communities from resilient landscapes and safe and effective wildfire response goals may be the key to initiating that new paradigm.

We can adapt to increasing wildfires by building and retrofitting structures that can withstand new climate regimes. We can build up rather than out into high-fire-danger environments. By appropriately designing neighborhoods and enhancing the ignition resistance of structures and communities, we have an opportunity to effectively reduce the chance of wildland-urban fire disasters.

To do so will require equipping a federal agency with workforce, appropriations, and expertise to address the built environment.[66] With robust knowledge of structural fire, the U.S. Fire Administration – along with interagency coordination with other agencies experienced in urban planning, disaster, and infrastructure such as the Department of Housing and Urban Development (HUD), Federal Emergency Management Agency (FEMA), and Department of Health and Human Services (HHS) – may provide a logical home for a wildfire mitigation program that works directly with residents to protect their properties. This interagency coordinating body would need to be empowered with dedicated and consistent funding, staffing, and resources to effectively liaise with state agencies, local fire districts, and community partners.

In decoupling land management priorities from community protection and structure loss priorities, federal land management agencies can commit to their mission of stewarding natural resources and natural processes – setting up landscapes for more "desirable" fire in the future. Land management agencies can continue to suppress wildfires to protect specific values and critical assets when necessary, making suppression efforts more targeted, effective, and pragmatic. They will use fuel treatments and beneficial burning to proactively restore fire as an appropriate ecological factor in all fire regimes across landscape scales.

To achieve a future where wildfire is recognized and managed as an appropriate ecological factor, land management agencies will need to consider: 1) improved and sufficient risk sharing among affected partners; 2) modification of managerial incentive structures and enhanced training; 3) land management treatments that directly address local risk factors and align with long-term risk reduction; 4) reduction of the uncertainty around outcomes from less aggressive suppression response through improved decision support and advanced POD preparation; and 5) enhanced consideration of long-term impacts of current decisions.[67]

Overall, one of the key missing linkages is between the known risks and the appropriate responsible parties. Collaboration with fire councils, land management agencies, and fire response organizations who, at the local level, have acute understanding of wildfire risks can inform the collective identification of risks and responsibilities and the associated mitigation strategies that are timely, practical, and site-specific to the conditions and the expected fire behavior.

Recent legislation such as the 2018 Omnibus Bill, which provides emergency funding to cover costly wildfires, the 2021 Bipartisan Infrastructure Law, and the 2022 Inflation Reduction Act have provided significant funding to address the investment gap between suppression and mitigation and recovery, but this is a temporary funding bump and it will take time for the administrative culture and workforce capacity to be redirected to a more balanced investment portfolio. Such a dramatic shift will require societal acceptance and associated political support acknowledging that the solution to the wildfire problem requires much more fire and increased short-term risk to obtain a long-term vision of living with wildfire.

A profound societal shift is needed to accept living with wildfire,[68] and in some cases, learning to *relive* with wildfire. At its core, transformational acceptance of *living with fire implies and recognizes that wildland fire is ecologically appropriate and inevitable.* Alternatives to living without wildfire are not realistic expectations. Thus, we must step away from what amounts to magical thinking and develop expertise in the use of fire, allow fire to play a constructive and proactive role in land management as it has for millennia,[69] and adapt our modern communities to this natural reality as our forebearers have done since ancient times. Society must come to understand that forest treatments are most effective for forest restoration and climate change adaptation, not for community risk reduction.

To succeed in a new paradigm, wildfire risk reduction to homes and neighborhoods becomes the ongoing and intergenerational social contract within human communities. One resident can do all that is necessary to reduce home ignition potential, but if their neighbor does nothing, the wildfire threat continues. Adoption of building codes, regulations, and land use planning measures can help compel compliance at the scales needed to broadly reduce wildfire risk at the community level. Local partnerships and community champions can help leverage and support increased wildfire awareness. However, given disparate abilities of residents to implement, maintain, and pay for risk reduction measures, state and federal governments will need to provide funding, resources, and technical assistance including the need to retrofit the existing housing stock. Homeowners in high-hazard locations will come to understand that they cannot be protected from wildfire by federal land management agencies.

We have the tools and knowledge to reduce community wildfire risks. Yet there is a profound and deeply rooted misalignment of policy and societal expectations of what it means to live safely with wildfire. The time is now to invest in long-term, economically efficient, and effective solutions rather than short-term, risk-averse tactics. The Cohesive Strategy Addendum provides a starting vision – articulating that communities and wildfire will no doubt interact, and they must be prepared for that day. Yet federal agencies alone cannot solve the wildfire crisis. We all have a role to play in adapting to the new wildfire reality.

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