A Modern Overview of Wildfire Law

Karen M. Bradshaw∗

∗Fordham University School of Law
ARTICLES

A MODERN OVERVIEW OF WILDFIRE LAW

Karen M. Bradshaw*

I. INTRODUCTION

Wildfire presents an unprecedented and growing threat to America's forests. A variety of factors have combined to create some of the worst and largest wildfires in modern history. The negative effects from wildfires stretch beyond environmental concerns; wildfire suppression costs are also an enormous drain on increasingly-tight public funds. In 2008, state and federal governments spent over $1.7 billion on fighting wildfire in California alone, the same amount needed in education funding to help all K-12 students in the state reach academic achievement standards. Yet, the

* Clerk to the Honorable E. Grady Jolly, Fifth Circuit Court of Appeals; J.D. 2010, The University of Chicago; M.B.A. 2006, California State University, Chico, B.S. 2004, The University of California Berkeley. Support provided by the Casper Platt Award, and Olin Fellowship. The author acknowledges the invaluable guidance of Saul Levmore; helpful comments provided by Dean Lueck, Lisa Bernstein, Jianlin Chen; and invaluable information provided by numerous wildfire experts, especially Lloyd Bradshaw and Ron Berryman.

1. See Kate Robertson, A Forest Fire's Price Tag, INVESTOPEDIA (June 8, 2010, 9:46 AM), http://financialedge.investopedia.com/financial-edge/0610/A-Forest-Fires-Price-Tag.aspx (noting that the size of wildfires has increased dramatically in the past twenty years).


3. Jennifer Imazeki, Assessing the Costs of K-12 Education in California Public Schools, STANFORD UNIV. INST. FOR RESEARCH ON EDUC. POLICY & PRACTICE (March 2007), http://irepp.stanford.edu/documents/GDF/SUMMARIES/Imazeki.pdf (stating that "[t]he cost-function model estimates that California school districts need up to $1.7 billion more overall to achieve state API goals.").

445
destructiveness of wildfire, unlike other natural disasters, can be substantially lessened and contained through suppression or firefighting, activity. Public policies, enacted by legislatures and carried out by government agencies and private actors, have the potential to dramatically reduce wildfire’s incredible ecological costs and drain on public resources.

Despite the potential for policy changes to produce profound benefits, little legislative effort has been made to understand or stem the causes of wildfire spread and funding increases. Similarly, legal literature has historically ignored the topic of wildfire. Wildfire has only gained note in academia recently, and still only in limited areas concentrated around clusters of administrative and environmental law. The current level of minimal attention is shocking given the helpful policy suggestions legal academics could contribute.

4. Wildfire is relatively unstudied in legal literature. See Lauren Wishnie, Note, Fire and Federalism: A Forest Fire is Always an Emergency, 17 N.Y.U. ENVTL. L.J. 1006, 1007 (2008) (commenting that “[d]espite its significant economic, environmental, and social impacts, the law has surprisingly little to say about wildfire.”) (internal citation omitted).

5. Perhaps because of renewed public attention to wildfire as a result of the recent dramatic growth in the number and severity of burns annually, this area of law is experiencing renewed attention. Recent literature addresses wildfire policies, inter-agency dynamics, and state-federal interplay. See Jamison Colburn, The Fire Next Time: Land Use Planning in the Wildland/Urban Interface, 28 J. LAND RES. & ENVTL. L. 223 (2008); Robert B. Keiter, The Law of Fire: Reshaping Public Land Policy in an Era of Ecology and Litigation, 36 ENVTL. L. 301 (2006) (exploring wildfire policies); Rebecca K. Smith, War on Wildfire: The U.S. Forest Service’s Wildland Fire Suppression Policy and Its Legal, Scientific, and Political Context, 15 U. BALTIMORE L. ENVTL. L. 25 (2007) (summarizing the interplay among federal agencies in wildfire suppression). The majority of material that addresses the intersection of private interests and wildfire focuses on the roles and incentives of private homeowners or small landowners in traditionally forested areas. Randal O’Toole, The Perfect Firestorm: Bringing Forest Service Wildfire Costs Under Control, 591 POL’Y ANALYSIS 11, 16 (2007) (providing a discussion of wildland urban interface owners). Little mention is made of the role of institutional private landowners, although they hold the majority of timberland. See ROSS W. GORTE, CONG. RESEARCH SERV., RL30755, FOREST FIRE/WILDFIRE PROTECTION 1 n.3 (2008) (noting that “[d]espite the substantial attention given to the [Forest Service] and [Department of the Interior] agencies, the majority of wildlands are privately owned.”). For a notable exception to the general lack of focus on the incentives of institutional landowners in reducing the risk of wildfire, see Jonathan Yoder, Liability, Regulation, and Endogenous Risk: The Incidence and Severity of Escaped...
This Article seeks to overcome the reticence of legal thinkers to engage in this unfamiliar but important area by providing a brief background of the aspects of wildfire most pertinent to legal analysis. In particular, this Article assesses the incentive structures that guide the actions of government firefighting suppression agencies, wildland urban interface owners, and private institutional landowners, who often have conflicting views on the appropriate treatment of wildfire suppression efforts.

Section II sets forth a basic overview of the conditions that give rise to wildfire and the different types of wildfire. Next, Section III discusses the public and private actors who are most impacted by wildfire; specifically government land management agencies, wildfire-urban interface owners, and public institutional landowners. Section IV examines the damage caused by wildfires and evaluates the ecological and fiscal costs associated with this damage. Finally, Section V discusses current issues in wildfire law that demand thoughtful contributions from legal academics and others in order to develop sound policy.

Prescribed Fires in the United States, 51 J.L. & ECON. 297 (2008). Yoder's Article is the first modern piece of legal scholarship to address a form of wildfire using a law and economics analysis. For an older study on the topic, see also A.A. Dyer et al., The Role of Private Individuals and Firms, States, and the Federal Government in Protection of State and Private Lands from Hazards of Wildfire, in SPECIAL SERIES 1983 (Dep't. of Forest & Wood Sci. Colo. St. U., Ser. 26, 1983). Legal analysis of specific fire management practices has been limited to clearing land through the use of mechanical cutting or prescription burning prior to a fire's occurrence. See, e.g., Robert B. Keiter, Breaking Faith with Nature: The Bush Administration and Public Land Policy, 27 J. LAND RES. & ENVTL. L. 195 (2007); Evan N. Turgeon, Federal Forests, Biomass, and Ethanol: Energy Security Sabotaged, 39 ENVTL. L. REP. NEWS & ANALYSIS 10140 (2009). Because of the controversies surrounding timber thinning, this subject represents the most robust area of legal literature regarding wildfire; the debate was revived by the Healthy Forests Restoration Act of 2003, Pub. L. No. 108-48, 117 Stat. 1887 (codified at 16 U.S.C. §§ 6501-6591). I could not find a prolonged discussion of the specific fire management practices that occur after a wildfire begins. This paper explores the topic of backfire, which comprises a subpart of the broad subject of ex post fire management.
II. THE FUNDAMENTAL CONCEPTS OF WILDFIRE

A. An Overview of Wildfire

Wildfire is best understood as fire occurring on sparsely or unpopulated land that is not burning at the intention of a responsible land manager. To start a fire, the elements of fuel, heat, and oxygen must combine. In wildlands, fuel is everywhere: trees, underbrush,

6. Ron Wakimono, Wilderness Fire Policy—“Let It What?”, in WILDERNESS & WILDFIRE 1, 4 (Tom Walsh ed., 1989) (explaining that a wildfire is a wildland fire that is not designated or managed as a prescribed fire, because it exceeds specified conditions and/or does not meet stated land management objectives).

In contrast to wildfire, controlled burns, sometimes called prescription fires, are intentionally set fires that are designed to meet land management objectives. See id. at 50 (describing a prescribed fire as “any fire [that is] burning under specific, pre-planned conditions and is meeting pre-determined land management objectives.”). For example, controlled burns may be used to remove slash or control underbrush. Controlled burns are generally accepted as a tool for sound forest management, and are widely used by public and private land managers. See BOB GRAY, FORESTS, FIRES AND WILD THINGS 230 (1985) (providing an example of the Shasta-Trinity Forest, where more acreage has burned by controlled burns than by wildfire). Controlled burns, however, can present problems, including damaging clean air and water supplies, killing animals, and potentially slipping out of control. See Mariel Garza, Fast Burn—Controlled Burn Policy of the US Forest Service, REASON MAG., Nov. 1999, available at http://findarticles.com/p/articles/mi_m1568/is_6_31/ai_56750023/ (noting that “[t]here are the myriad environmental hurdles to consider [with controlled burns], including rules about clean air and water. There’s also the potential for torching endangered animals. And contrary to their name, controlled burns aren’t all that controllable.”). Bob Gray, an experienced fire expert, described a controlled burn that became uncontrollable and burned 300 acres, including private land and a Forest Service plantation of trees. GRAY, supra at 232. To monitor and protect against irresponsible use of controlled burns, government agencies typically require the use of burn permits, and impose heightened liability for escaped controlled burns. See generally Yoder, supra note 5 (providing an excellent overview of the liability rules surrounding prescription burns and their efficacy).

7. ELEMENTS OF FIRE, http://www.smokeybear.com/elements-of-fire.asp (last visited Sept. 23, 2010) (conveying that “[t]he fire triangle is a simple way of understanding the factors of fire. Each side of the triangle represents one of the three ingredients needed to have a fire – oxygen, heat, and fuel – demonstrating the interdependence of these ingredients in creating and sustaining fire. When there is not enough heat generated to sustain the process, when the fuel is exhausted, removed, or isolated, or when oxygen supply is limited, then a side of the triangle is broken and the fire will die.”).
and slash—or vegetative debris—provide excellent fodder for fire. Heat can be produced naturally, as with lighting, or by human activity. Once a fire starts, its continuation depends upon a number of natural factors. For example, weather plays a crucial role in determining whether a fire will spread or extinguish. Wildfires can be started by natural conditions or, more frequently, human action. In recent decades, wildfires have grown significantly in size. Additionally, fire suppression costs are at a record high. Federal expenditures on fire fighting rose from $1 billion spent annually prior to 1997 to more than $3 billion annually after 2003. The graph below shows this dramatic spike in wildfire spending between 1970

10. Enoch Bell et al., Fire Economics Assessment Report 30 (Sept. 1, 1995) (unpublished report) (claiming that “[i]increased human access generally increases the frequency of wildfire ignitions—88% of the fires from 1988-1997 were caused by humans, with only 12% caused by lightning. While human-caused fires can be catastrophic, they are typically in accessible areas, and thus can often be controlled more quickly; for example, only 48% of the acres burned from 1988-1997 were in human-caused fires.”). Estimates suggest that humans start between 68% to 97% of all wildfires. See, e.g., Living With Wildfire: A Homeowner’s Guide, ROGUE VALLEY FIRE PREVENTION CO-OP 4 (2008), available at http://www.co.josephine.or.us/files/wildfire2.pdf (noting that approximately 68% of all wildfires are human-caused, with lightning and other natural causes being responsible for the rest).
11. See Robertson, supra note 1 (noting that the size of wildfires has increased dramatically over the past twenty years).
and 2008, which occurred even though the size of wildfires (depicted in red) grew at a much slower pace.\textsuperscript{13}

Moreover, the nature of wildfire has changed over time, with fires becoming larger and more intense;\textsuperscript{14} some attribute increases in intensity and severity to global warming.\textsuperscript{15} Further, changing firescape patterns leave some regions, such as California, at particular risk.\textsuperscript{16} Coupled with these changes, the government sometimes has had insufficient resources to fight all fires burning simultaneously.\textsuperscript{17}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{wildfire图表}
\caption{Total US Wildfire Acres 1961-2008, and USFS Fire Expenditures 1970-2008.}
\end{figure}

\begin{itemize}
\item \textsuperscript{13} Pyne, supra note 12, at 8.
\item \textsuperscript{14} Randal O’Toole, Reforming the Fire Service: An Analysis of Federal Fire Budgets and Incentives, \textit{The Thoreau Inst.} 13 (2002), available at http://www.ti.org/firesvc.pdf (stating that “there is no doubt that forests are different today than they were a hundred years ago”).
\item \textsuperscript{15} Kevin C. Ryan, \textit{Climate Change, Fire & Natural Vegetation: Implications for Wilderness Areas}, in \textit{Wilderness & Wildfire} 1, 18-21 (Tom Walsh ed., 1989) (noting that the climate change associated with global warming will change fires).
\item \textsuperscript{16} Matthew F. Pawa, \textit{Global Warming: The Ultimate Public Nuisance}, 39 \textit{Envtl. L. Rep. News & Analysis} 10230, 10233 (2009) (stating that “[m]ore than one-half of the most damaging fires in the United States over the past 170 years have occurred in California, and the state leads the nation in wildfire-related economic losses,” and that “[g]lobal warming will substantially increase the wildlife damage in California by increasing the number of escaped wildfires, increasing the area burned by wildfires, and shortening the return period between wildfires.”).
\item \textsuperscript{17} Brandon Honig, \textit{California Guard Adds Water Trucks to Firefighting Inventory}, \textit{The Nat’l Guard} (Jan. 31, 2009), http://www.ng.mil/news/archives/
requiring agencies to prioritize their allocation of resources including manpower, equipment, and money.18

III. STAKEHOLDERS IN WILDFIRE SUPPRESSION

Although fire itself seems simple—a mere mix of fuel, heat, and oxygen—its effect on people, property interests, laws, and the government agencies involved is stunningly complex.19 This Section outlines the stakeholders who drive and bear the costs of wildfire decision-making.

Wildfire profoundly affects a diffuse group of people.20 Wildfire impacts are particularly concentrated among groups with wildland property interests whose well-being is directly diminished by the occurrence of wildfire. More specifically, three groups have property interests that are directly impacted by wildfire: (1) government land management agencies,21 (2) small private landowners,22 and (3) institutional landowners.23 These groups often have wildly divergent land use goals, which also leads to similarly variant interests in

---

2009/02/020509-firefighter.aspx (noting that there were 1,800 fires burning simultaneously in California in 2008, burning 1.3 million acres of land).
18. Id. (describing the allocation of manpower and resources for firefighting).
19. See Keiter, supra note 5, at 303-04 (noting "an uncoordinated and fragmented welter of organic statutory provisions, environmental protection mandates, annual budget riders, site-specific legislation, judicial decisions, policy documents, management plans, and diverse state statutory provisions"); Kurt M. Menning, Practical and Institutional Constraints on Adopting Wide-Scale Prescribed Burning: Lessons from the Mountains of California, in LIVING ON THE EDGE: ECONOMIC, INSTITUTIONAL AND MANAGEMENT PERSPECTIVES ON WILDFIRE HAZARD IN THE URBAN INTERFACE 73, 82 (Austin Troy & Roger G. Kennedy eds., 2007) (stating that "[t]he sociopolitical context around fire—both prescribed and wild—is increasingly complex."); Wishnie, supra note 4, at 1015 (noting that "[w]ildland fire management in the United States is beset by considerable institutional complexity").
20. Gregory Vogt presents compelling first-hand accounts of a wide variety of people who were impacted by the infamous 1989 Yellowstone wildfire. He explores the impact of a major wildfire on an area from several different perspectives. GREGORY VOGT, FORESTS ON FIRE: THE FIGHT TO SAVE OUR TREES, 116-27 (1990).
21. See infra Part II.A.
22. See infra Part II.B.
23. See infra Part II.C.
defining ideal wildfire outcomes.24 This "[l]ack of cooperation means that neighboring land managers may be making very different and even conflicting choices about what fire regime to allow."25 This Section briefly sketches the prevalence and role of each of these groups in owning land that is at risk of wildfire.

A. Government Land Management Agencies

Government land management agencies control public lands.26 At the federal level, the Forest Service in the Department of Agriculture, the Bureau of Land Management, the Fish and Wildlife Service, and the National Park Service in the Department of the Interior are responsible for various wildland holdings.27 The wildfire risks facing these holdings are shockingly high.28 Many states have land management agencies as well.29 However these various state land

24. For example, small private landowners may care about reducing smoke around their residences during fires, whereas government land management agencies might view the fire as a natural occurrence that should be allowed to continue unchecked.

25. Wishnie, supra note 4, at 1008.


27. See id.

28. See, e.g., GORTE, supra note 5, at 9 (citations omitted) (noting that "[i]n 1995, the FS estimated that thirty-nine million acres in the National Forest System (NFS) were at high risk of catastrophic wildfire, and needed some form of fuel treatment. More recently, the Coarse-Scale Analysis reported that fifty-one million NFS acres were at high risk of significant ecological damage from wildfire, and another eighty million acres were at moderate risk. The Coarse-Scale Analysis also reported twenty-three million acres of Department of the Interior lands at high risk and 76 million acres at moderate risk. All other lands (calculated as the total shown in the Coarse-Scale Analysis less the NFS and DOI lands) included 107 million acres at high risk and 314 million acres at moderate risk of ecological damage.").

29. See DIV. OF FORESTRY, ALASKA DEPT OF NATURAL RES., http://forestry.alaska.gov/fire/ (last visited Sept. 23, 2010) (providing a description of the interplay between state and federal land management agencies) ("[f]ire management planning, preparedness, suppression operations, prescribed fire, and related activities will be coordinated on an interagency basis with the full involvement of DOF and its state, federal and local government cooperators. The Division of Forestry, Bureau of Land Management, and the U.S. Forest Service, fight fires within their protection areas on all land ownerships which reduces the duplication of facilities and services. None of the agencies in Alaska have all of the
management agencies operate under differing regimes for fire suppression than federal agencies. Some federal agencies have a "let burn" policy, and as a result, conflicts can arise when properties controlled by agencies with different policies border one another.

The federal government specifies that land management agencies are responsible for controlling the costs of wildfire. U.S. policy often focuses upon ex ante fire prevention: steps that can be taken prior to a fire breaking out. For example, land managers might thin the trees on their land, reduce slash, and educate the public on wildfire prevention to reduce the risk and spread of wildfire on their land. However, these efforts are constrained by significant environmental pressure and budgetary constraints. Unlike ex ante

resources required to accomplish the fire protection job on their own. The Division of Forestry has cooperative agreements with the Departments of Agriculture and Interior, and numerous local government and volunteer fire departments to help get the job done. The state and federal agencies routinely utilize each other's personnel and resources to both manage and fight fires. This is efficient and cost effective.

30. The contrasting suppression goals of state and federal agencies can be seen via the works of the Nat'l Wildfire Coordinating Grp. (NWCG). See Memorandum from William Raage, NWCG Chair, to NWCG Committee Chairs and Geographic Area Coordinating Group (GACG) 4 (July 8, 2010), available at http://www.nwcg.gov/general/memos/nwcg-030-2010.pdf (stating that "[w]ith rare exceptions, state ... agencies support and carry out wildfire suppression programs that provide for rapid and aggressive initial response to wildfires with the intent of minimizing its spread. Federal agencies manage wildfires on federal lands considerate of protecting communities and other state or private resources.").


32. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-07-922T, WILDLAND FIRE: MANAGEMENT IMPROVEMENTS COULD ENHANCE FEDERAL AGENCIES' EFFORTS TO CONTAIN THE COSTS OF FIGHTING FIRES 9-10 (2007) (noting that "the agencies have issued guidance clarifying that land managers, not fire managers, have primary responsibility for containing wildland fire costs").

33. See DAVID CARLE, BURNING QUESTIONS: AMERICA'S FIGHT WITH NATURE'S FIRE 248-51 (2002) (describing agencies focus on ex post suppression, rather than ex ante activity, such as fuel prevention or prescribed burning); Wishnie, supra note 4, at 1009 ("[f]uel treatment programs often require drawn-out, expensive analysis under the National Environmental Policy Act (NEPA), while fire suppression activities are exempt from analysis under NEPA's 'emergency exception.'") (citation omitted). In response to the increased number
fire reduction measures that are carried out by land managers, ex post fire suppression measures carried out by government fire suppression agencies do not face budgetary constraints.  

This legal shell-game [of shifting funds from other agency activities to wildfire suppression] has crippled some of the very projects meant to forestall catastrophic fires by siphoning off money intended for things such as forest thinning and equipment purchases. And in the end, only 80% of the overall amount taken from other agencies is actually repaid, according to the report. Transferring funds for wildfire suppression resulted in canceled and delayed projects, strained relationships with state and local agency partners, and difficulties in managing programs . . . . These impacts affected numerous activities including fuels reduction (the clearing of dead wood and brush in forests) and land acquisition.  

After a fire, rules governing land management practices are substantially relaxed. Such relaxation creates considerable incentives to shift fire suppression from an ex ante activity (which federal policy dictates should be employed) to an ex post activity. Thus, because no system of accountability exists for land manager fire suppression efforts, these perverse incentives are not offset by

and level of wildfires, legislation is being promoted to reduce hazardous fuels and thus reduce the risk and spread of wildfire. California Catastrophic Wildfire Prevention and Community Protection Act of 2009, H.R. 2899, 111th Cong. (2009).

34. Brock N. Meeks, Fight Against Wildfires Chronically Underfunded, MSNBC.COM (June 15, 2004, 6:51 PM), http://www.msnbc.msn.com/id/5175836/. (stating that the “[t]he federal land agencies, and especially the Forest Service, have a blank check to put out fires and thus have no reason to control their costs, . . .”)

35. Id.

36. See Melanie Stidham et al., The Role of Economic Emergency Situation Determinations in Expediting Fire Salvage, 38 ENVTL. L. REP. NEWS & ANALYSIS 10741, 10742 (2008) (providing a description of the incentive to harvest federal lands that have been burned by wildfire).
sanctions, there is no generally-used measure against which fire management costs are measured.37

1. Firefighting Responsibility Is Clear; Appropriate Prioritization Is Not

Wildland agencies at the federal and state level divide fire suppression responsibility in a complicated system of agreements in which responsibility is assigned for covering public and private lands within particular regions.38 Agencies reimburse one another for fire suppression efforts that cross jurisdictions.39 Federally, firefighting has replaced land management as the core competency for the Forest Service.40 In turn, the Forest Service has reallocated funds from other areas to fund fire suppression efforts.41

Agency managers issue policies guiding on-the-ground personnel in prioritizing competing demands for fire suppression.42 The order of

37. See U.S. GOV’T ACCOUNTABILITY OFFICE, supra note 32, at 10 (noting how “[a]gencies have yet to establish a clear measure to evaluate the benefits and costs of alternative firefighting strategies. Some past studies have concluded that the absence of such a measure fundamentally weakens the agencies’ ability to provide effective oversight.”).


39. See Wildfire Protection & Suppression, supra note 38.

40. See Reforming the Fire Service, supra note 14, at 1 (describing a shift in the mission of the Forest Service from the national timber program to responding to severe fires).

41. Id. at 13. (conveying that “...the chief directed the agency to stop land acquisitions, construction projects, and purchases of motor vehicles, computers, and other items so that the money dedicated to those programs could be spent fighting fires instead.”).

42. These teams are referred to as incident command teams, and are tasked with coordinating strategy and tactical decision-making in wildfire suppression. See Montrose District Wildfire Protection and Management, COLO. STATE FOREST
priorities in government fire suppression is "life, property, and resources" and "property" is not interpreted as including timbered land, regardless of the value of the timber to its commercial owner. This definition is instead limited to structures, primarily homes. The anomalous result is that hundreds of acres of timberland can be allowed to burn to save a single, unoccupied home. This situation occurs with increasing frequency due to changing land use patterns as homeowners increasingly build in areas which were once purely forested. The increasing costs of fire suppression can thus be partially attributed to the increase of wildlife-urban interface areas which are a product of new land use patterns.

Prioritization of firefighting resources is difficult, but policies can be flexible in response to emerging circumstances. For example, in 1994, a series of fires diverted resources from protecting federal lands toward protecting wildland-urban interface homes and communities. In response, a report was issued that "altered federal


44. See GORTE, supra note 5, at 6 (stating that "[m]ost observers agree that protecting homes and other structures in the interface is an appropriate goal for safeguarding the highest values at risk from wildfire.").

45. Id.

46. An example of summer homes being prioritized above high commercial timber values can be found in the case of Teegarden v. United States, 42 Fed. Cl. 252 (1998) (quoting a letter from a Forest Supervisor that stated: "[f]irefighter safety is your first priority. Your second priority is the protection of life and property. Mammoth Creek is a significant summer home area, and the spread of the fire there must be prevented. Structural protection may be required. The fire is in an area of high commercial timber values. Third priority is to keep burned acreage to a minimum.").

47. Reforming the Fire Service, supra note 14, at 16 (noting that "[a] major reason for the increasing costs of fire suppression is the growing number of homes built near federal lands in what is called the wildland-urban interface.").

48. See e.g., id. (noting that a major reason for the increasing costs of fire suppression is the presence of homes in the wildland-urban interface).

49. Wishnie, supra note 4, at 1008. (observing that "[f]ire management involves hard choices with regard to use prioritization.").

50. GORTE, supra note 5, at 3 (commenting that during the 1994 fires, federal officials observed that firefighting resources were diverted to protecting nearby
fire policy from priority for private property to equal priority for private property and federal resources, based on values at risk.\textsuperscript{51}

An additional concern is that government agencies must make difficult decisions under exigent circumstances.\textsuperscript{52} In times of severe fires, they must quickly decide which areas to suppress and which to let burn. Within an individual fire, they must decide which among several assets to protect and what firefighting methodologies to use.


51. GORTE, supra note 5, at 3.

52. For a detailed account of wildfire suppression prioritization decisions, see Miller v. United States, 163 F.3d 591, 592 (9th Cir. 1998) (describing the factual circumstances underlying the case) ("[w]hen lightning strikes the dry forests of eastern Oregon in August, fire follows. After ninety days with no rain and with temperatures above normal, a thunderstorm ignited several fires on the Snow Mountain Ranger District ("SMRD") of the Ochoco National Forest on August 6, 1990. Les Holsapple, the fire management officer for the SMRD, first spotted the fire that damaged the Miller's property ("the Bald Butte fire") around 7:00 p.m. In the course of that hour, several other fires were reported on the SMRD. Within fifteen minutes, Holsapple ordered aerial fire retardants and smokejumpers for the Bald Butte fire but was informed that retardant aircraft had already been committed to a fire in the Deschutes National Forest and that smokejumpers would be unable to reach the area before dark. Fire engines and bull dozers were ordered, along with other equipment available under equipment rental agreements. The four fire engines owned by the SMRD were all committed to other fires in the district, and Holsapple directed Dick Smith, the assistant Fire Management Officer who took over the initial attack on the fires, that direct ground-based attack on the Bald Butte fire would be ineffective given its current intensity levels and that they should find and suppress any other small fires before those fires created a problem. At that time the Bald Butte fire covered approximately 700-1,000 acres. The Bald Butte fire was soon declared "escaped," and Holsapple advised the district ranger that it was unsafe to commit resources to the fire at that time. Smith went on to lead efforts to attack another fire on the SMRD, the Buck Springs fire. Although monitoring and suppression planning efforts for the Bald Butte fire were ongoing, on-the-ground fire suppression efforts did not occur until sometime on the afternoon of August 7, 1990, seventeen to twenty-three hours after the Bald Butte fire was first sited (sic). The Bald Butte fire soon joined two other fires, for a total size of approximately 6,000 acres. This coalescence of fires crossed onto the Millers’ property sometime on the afternoon of August 9, 1990.").
A surprising number of factors correlate with, or contribute to, the efficacy of fire suppression efforts.\footnote{53}

Fire science is inexact: no formulaic approach has been proven to consistently produce the best suppression result. Computerized firefighting models exist,\footnote{54} but they are largely unused in practice.\footnote{55} Therefore, the choice of which suppression tool to use is made by incident teams—firefighting leadership groups that control strategic choices based upon their experience.\footnote{56} Firefighting decision-makers rely heavily upon institutional knowledge, informal, unwritten, and shared information of how best to approach a situation based upon past experience.\footnote{57} This knowledge is developed through learning from past wildfires, as well as learning from controlled burns.\footnote{58}

Given the inexact nature of fire management, it is difficult to analyze the decisions made under exigent circumstances. George
Nickas explained the balancing in which firefighting teams must engage when reaching prioritization decisions:

Is it appropriate to attempt to suppress a fire that might burn for weeks in a twenty thousand acre wilderness drainage in order to protect a private cabin on a twenty acre inholding? Is it okay to control a fire in wilderness to reduce the likelihood it will burn up an adjacent timber stand, and should it make a difference if the timber stand is on private or public land? What responsibilities, both legal and ethical, do land managers have to protect private interests from natural events?  

Further, no clear guidance or external accountability exists for fire suppression managers who make these difficult prioritization choices, and internal examinations unsurprisingly result in few recriminating judgments about the decisions made.

2. The Funding Structure For Firefighting Encourages Government Agencies To Allow Fires To Grow

Current funding policies for Government Firefighting Agencies ("GFA's") provide perverse incentives for firefighters to allow wildfires to grow larger and consume greater resources: "[e]ssentially . . . the resources available for wildland fire suppression are unlimited, and thus normal economic analysis is inapplicable."  

A government report found that firefighters viewed funds from emergency supplemental appropriations to be "free money" that was available if fires were allowed to grow particularly large. The result is "wasting federal firefighting funds, which [one critic] calls 'fire


61. Wishnie, supra note 4, at 1033 (citing STEPHEN J. PYNE ET AL., INTRODUCTION TO WILDLAND FIRE 434 (2d ed. 1996)).

62. See GORTE, supra note 5, at 16 (illustrating that "[o]ne critic has observed that emergency supplemental appropriations, to replenish funds borrowed from other accounts to pay for firefighting, are viewed by agency employees as 'free money.'").
boondoggles.” Firefighting agencies also profit when more fires occur. This leads to inadequate ex ante fire management practices and inadequate ex post fire suppression efforts.

One example of the impact incentives can have on firefighting practice can be seen where firefighters are financially encouraged to allow suppressible fires to build towards a conflagration; a large media-worthy fire also called a “campaign” fire, in order to receive increased media attention and emergency appropriations. Conflagration presents emergency conditions which allow agencies to apply for emergency supplemental appropriations. Commentators have criticized the current funding structure and have argued for change, stating that “[f]unding structures for wildland fire management should be restructured to remove incentives to wait for the conflagration.” Firefighters are not forced to internalize the damage caused to private land and receive little negative media attention for failing to protect institutional landowners.

**B. Wildland-Urban Interface Owners**

The land use pattern of residential homes in areas traditionally used as forests or wildland is described as the “wildland-urban interface.” For the purposes of this Article, I define wildland-urban interface owners as parties who own homes or small amounts of land (less than 5,000 acres) in areas that are highly susceptible to wildfire. Construction of private residences in wildland-urban interface areas

---

63. *Id.*

64. *PYNE ET AL., supra* note 61, at 434 (remarking that “[p]rograms with a large number of wildfires pay for themselves in ways that successful programs of fire prevention or prescribed burning do not.”)

65. *See Wishnie, supra* note 4, at 1033.

66. *See id. at* 1009, 1033-34.

67. *See id.*

68. *Id. at* 1009-10.

69. *See Reforming the Fire Service, supra* note 14, at 10 (observing that “[f]ire managers do not lose their jobs for pouring massive resources into fire suppression, or even for burning down someone’s home if it is done in the course of a backfire aimed at stopping a wildfire.”).

70. *GORTE, supra* note 5, at 6 (noting that “[t]he wildland-urban interface has been defined as the area where combustible homes meet combustible vegetation”) (internal quotations omitted).
has increased over the past two decades.\textsuperscript{71} The influx of people into traditionally forested areas increases the risk of wildfire reaching people and homes.\textsuperscript{72}

The potential devastation caused by wildfire to wildland-urban interface owners is, on an individual level, catastrophic. Fire can destroy homes, which often represents the largest asset for a majority of homeowners.\textsuperscript{73} Although this financial loss is not large when compared to the damage to timber values, the percentage loss to a homeowner as compared to an institutional private landowner is tremendous. That is to say that the proportional share of devastating loss is greater for a homeowner than an institutional landowner.\textsuperscript{74} On the other hand, the aggregate loss experienced by wildland-urban interface owners in any given fire may be less than the aggregate loss experienced by government land management agencies or institutional landowners.

In addition to lost home value, homeowners also face numerous additional losses. They may be forced to evacuate in order to avoid wildfire, be subjected to smoke-affected air or water systems,\textsuperscript{75} or experience economic downfall in their communities\textsuperscript{76} because of a catastrophic fire. When describing these impacts, one expert explained: "[H]uman lives are altered. Big fires, beyond the ecology

\textsuperscript{71} See id. (noting that "[w]hile this situation has always existed to some extent, subdivisions in wildland settings appear to have grown significantly over the past two decades.").

\textsuperscript{72} See id. at 5 (stating that "[p]eople have increasingly been building their houses and subdivisions in forests and other wildlands, and this expanding wildland-urban interface has increased the wildfire threat to people and houses.").


\textsuperscript{74} For a private landowner, the proportional share of damage can be understood as the ratio of: amount of property damaged/ total amount of property owned. For the typical wildland-urban interface property owner, the denominator and numerator are both one, showing 100% of their property is damaged by the fire. In contrast, it is unlikely that 100% of the acreage owned by an institutional land owner—defined as having more than 5,000 acres—is damaged in a single fire.

\textsuperscript{75} See GORTE, supra note 5, at 18 (discussing the potential effects wildfires can have on water systems);

\textsuperscript{76} See GORTE, supra note 4, at 1012 (noting the impact wildfires can have on air quality).
of a forest, destroy homes, injure and kill people and alter the local economy.”

Despite these obvious downsides, the growth and prevalence of persons willing to assume the risk of wildfire suggest that the benefits of living in a wildland-urban interface area must overwhelm the potential fire damage for some actors. In addition to the unique natural beauty of these settings, the availability to receive full insurance at a rate not reflective of the entire risk assumed likely contributes to homeowners’ willingness to assume the risk of wildfire.

1. Wildland-Urban Interface Owners Typically Only Have Ex-Ante Obligations For Fire Management

Although wildland-urban interface property managers do not have any ex post obligations to suppress fire, they are sometimes responsible for ex ante fire protection efforts. To encourage loss reduction among homeowners, fire departments heavily emphasize the need for homeowners to proactively protect their properties. Simple actions, such as reducing vegetation near homes or storing firewood away from structures, can be remarkably effective in reducing the risk of damage if a fire reaches a home.

Despite the efficacy of these relatively inexpensive protective measures, many wildland-urban interface owners do not take appropriate precautions. To counteract this, some states impose increased liability against wildland-urban interface owners who do not engage in appropriate vegetation clearing practices. Private

77. VOGT, supra note 20, at 115.
78. See GORTE, supra note 5, at 20.
79. Id. at 6 (remarking that “[t]he characteristics of the structure and their immediate surroundings are the primary determinants of whether a structure burns. In particular, non-flammable roofs and cleared vegetation for at least ten meters (thirty-three feet) and up to forty meters (130 feet) around the structure is highly likely to protect the structure from wildfire, even when neighboring structures burn.”).
80. The Oregon Forestland-Urban Interface Fire Protection Act of 1997 permits a state to collect up to $100,000 in suppression costs from a WUI (wildland-urban interface) landowner if three criteria are met: (1) A wildland fire originates on the owner’s property, (2) the fire spreads within the protection zone around a structure and driveway that does not meet the [fuel-reduction] standards; and (3) Oregon Department of Forestry incurs extraordinary costs to suppress the fire. The cost collection may be greater than $100,000 if a WUI landowner is found to be
insurance companies are also becoming proactive in ex post fire suppression efforts by hiring private firefighting companies to protect properties after a fire starts and a property is at risk, but before the fire reaches the wildland-urban interface property.\textsuperscript{81}

2. Wildland-Urban Interface Properties Are Overprotected From An Economic Perspective

Wildland-urban interface residents receive more protection against wildfires than is economically efficient. Protection comes in two forms: (1) suppression efforts by GFAs, and (2) insurance structures that shield wildland-urban homeowners from the risks that they assume from living in areas with high fire risks.

Protecting structures from fire damage is often not cost-justified, based solely on government expenditure. GFAs give structures higher protection priority than alternative assets.\textsuperscript{82} “Property” is interpreted as structures—not land, regardless of their relative values.\textsuperscript{83} Thus, the result can be the overprotection of structures. A 2003 government report states, “[i]n some western areas, the government pays more in suppressing fires than the fair market value of the structures threatened by those fires. It would literally be cheaper to let the fires burn and pay 100% of the rebuilding cost.”\textsuperscript{84} Other commentators agree that federal firefighting agencies are “[willing] to spend millions to protect homes that may only be worth thousands.”\textsuperscript{85}

This overprotection is fueled by intense public scrutiny and media coverage.\textsuperscript{86} It leads to a situation where “[f]ire commanders say that


\textsuperscript{82} See GORTE, supra note 5, at 6 (noting that “[m]ost observers agree that protecting homes and other structures in the interface is an appropriate goal for safeguarding the highest values at risk from wildfire.”).


\textsuperscript{84} Id. at 66.

\textsuperscript{85} O’Toole, supra note 5 at 11.

\textsuperscript{86} Reforming the Fire Service, supra note 14, at 14.
they sometimes ‘have to sacrifice control of the wildfire to defend buildings.’” A representative for firefighters publicly acknowledged this, stating, “[o]ften we use resources because of the public and political pressure to do something, even though it has no effect on the fire and is an economic waste.” Similarly, insurance overprotects homeowners in wildland-urban interface areas.

The role of the insurance sector can also prove important in providing incentives for adaptive measures. For example, there are proven construction methods and materials known to reduce fire risk for homes in areas subject to risks from wildfires. However the availability of federal disaster assistance has reduced the incentives for insurance companies to adjust premiums and condition the availability of coverage for homeowners adopting these measures.

The result is that insurers are deterred from requiring that homebuilders in wildland-urban interface areas use fire safe materials. Further, homeowners do not fully internalize the risks of living in dangerous high fire risk areas because the government requires insurance companies to provide artificially-lowered insurance rates for primary residences in high fire areas. This

87. Id. at 16 (quoting Gary O. Tokle, The Wildland/Urban Interface in 2025, in PROCEEDINGS OF THE SYMPOSIUM ON WILDLAND FIRE 2000, at 49 (James B. Davis & Robert E. Martin eds., 1987)).
90. See GORTE, supra note 5 (noting that insurance distorts incentives away from insurers requiring the maximum use of fire-safe materials for homebuilders).
91. Kevin Ramakrishna, Subduing the Ceaseless Storm: Breaking the Build-Destroy-Rebuild Cycle Following Major Catastrophes through Taxation and Responsibility, 2 ALB. GOV’T L. REV. 328, 335 (2009).
insurance is not priced according to the risk,\footnote{Id. at 355.} and has led to a “build-destroy-rebuild cycle” in which the wildland-urban interface owner’s loss is subsidized by government insurance schemes.\footnote{Id. at 329 (stating that no national policy exists to break the “build-destroy-rebuild cycle” created by government-sponsored homeowner’s insurance schemes associated with homes that are built in areas with a frequent occurrence of natural disaster, including wildfires).} In response, some insurance companies send privatized firefighting teams to protect the homes that they insure when GFAs are unable to do so.\footnote{See Wollan, supra note 81.}

C. Institutional Private Landowners

For the purposes of this Article, I define institutional private landowners as non-governmental actors who own at least 5,000 acres of forested wildland. This ownership structure may include individuals, trusts, partnerships, or corporations. The role of institutional private landowners in wildfires is virtually unstudied.\footnote{See supra note 5 and accompanying text.} This lack of attention is surprising because the majority of timberland in the United States, and therefore the majority of property affected by wildfire, is held by private institutional landowners.\footnote{GORTE, supra note 5, at 1 (stating that “[d]espite the substantial attention given to the FS [Forest Service] and DOI [Department of the Interior] agencies, the majority of wildlands are privately owned”).} Roughly 809.5 million acres of private forests and rangelands exist in the coterminous forty-eight states, as compared to 426.1 million acres of all federal lands in those states.\footnote{Id. at n.3.} Thus, studies of wildfire policy have, in effect, ignored the 800-pound gorilla in the room.

Private institutional landowners can be significantly affected by backfire. Profit generation through timber harvest is often a key component of the private land value. As such, backfire destroys a portion of the profit generator for private institutional landowners. These losses are generated through the scorching of mature marketable timber, and other less obvious, sources discussed below.\footnote{See infra Part III.}
Institutional landowners take substantial ex ante precaution against wildfire. Because they do not carry insurance, institutional landowners fully internalize the loss caused by wildfire. Consequently, they make decisions on large issues such as engaging in timber harvest practices to reduce the potential for wildfire. Although these efforts may arguably produce undesirable collateral effects of increasing the risk of fire, the willingness of institutional land managers to invest in substantial ex ante protection against fire illustrates that they do not have the moral hazard toward fire that is seen among wildland-urban interface owners.

IV. THE COSTS OF WILDFIRE

To properly understand the costs associated with wildfire it is helpful to categorize the variety of losses caused by wildfire. This Section presents a modernized framework similar to that presented in the 1946 work *Fire in the Forests of the United States*. This Section categorizes the damage to property along the dimensions

99. A 1947 forestry textbook explained that forestry companies in the United States uniformly do not carry insurance against losses due to wildfire although the rate of loss is higher than that used in other insurable fields. Practices are similar in other countries surveyed, with the exception of Scandinavian nations. HERMAN H. CHAPMAN & WALTER H. MEYER, FOREST VALUATION: WITH SPECIAL EMPHASIS ON BASIC ECONOMIC PRINCIPLES 346-49 (1947).

100. See GORTE, supra note 5, at 15 (stating that “[a]Another possibility is to significantly change the traditional approach to timber sales. Stewardship contracting, in various forms, has been tested in various national forests. . . . Some observers believe that such alternative approaches could lead to development of an industry based on small diameter wood, and thus significantly reduce the cost of fuel management.”).

101. See id. (describing that timber harvest and the building of straight roads may reduce the risk of conflagration in some ways, but may increase risk in others).


103. I do not consider costs other than value to the land, such as suppression costs, and fixed business costs, which are outside the framework for just compensation.
of (a) lost stumpage value, (b) infrastructure damage (c) retarded tree growth, (d) waterway and soil composition and productivity, (e) disease and insect damage (f) human activity and mortality, and (g) wildlife losses.

A. Stumpage Value

An obvious cost of wildfire is the financial loss of stumpage, the industry’s term describing the value of mature, marketable trees.\textsuperscript{104} Although some burned timber can be harvested and sold, it is far less valuable than timber that has not been burned.\textsuperscript{105} Further, wildfire typically burns large swaths of timber, the sheer amount of which produces market dynamics that are unfavorable to private landowners.\textsuperscript{106} In non-fire conditions foresters harvest according to prevailing market prices.\textsuperscript{107} Unlike typical tree stands, burned timber cannot wait indefinitely for market prices to reach an acceptable level; it must be harvested before it begins to rot or is diseased.\textsuperscript{108} This time pressure results in a glut of damaged timber on the log-selling market after a heavy fire season.\textsuperscript{109} Similarly, if multiple properties experience wildfire, the costs associated with removing the timber, such as manpower or rental of heavy equipment from logging

\textsuperscript{104}. WEBSTER’S NEW WORLD DICTIONARY, 1331 (3d coll. ed. 1988) (defining “stumpage” as: “1 standing timber or its value; 2 the right to cut such timber.”).


\textsuperscript{106}. See id.

\textsuperscript{107}. See generally Michael Jacobson, To Cut or Not to Cut: Tree Value and Deciding When to Harvest Timber, PENN ST., COLL. OF AGRIC. SCI., AGRIC. RESEARCH & COOP. EXTENSION (2008), available at http://mrext.cas.psu.edu/PDFs/uh188.pdf. Whereas corn or almonds may lose virtually all value if allowed to sit for a few extra months, healthy timber stands can continue to grow for years (while waiting for an increase in prices) and appreciate in value. See id. at 2-3. Unlike other crops, timber does not have to be harvested in a particular season. See ANDREW S. FULLER, PRACTICAL FORESTRY 72 (1884).

\textsuperscript{108}. Weyerhaeuser Co. v. United States, 92 F.3d 1148, 1152 (Fed. Cir. 1996) (noting “that to have delayed salvage operations would have resulted in further losses, for damaged trees are vulnerable to disease.”).

\textsuperscript{109}. See GORTE, supra note 5, at 18 (remarking that “e[x]tensive fire damage to trees can significantly alter the timber supply . . . through a short-term glut from timber salvage . . .”).
contractors increases due to the increase in demand, which in turn further reduces the profit margin for landowners.

B. Infrastructure Damage

Backfire causes damage to the infrastructure of land management operations—buildings and equipment may be burned. The unique nature of outdoor business occupations mandates that unusually valuable equipment be stored in remote areas, the value of which can be surprising. As a result, wildfire can destroy many of the capital investments of an outdoor business operation. Such damage is incurred by landowners in forest settings when their helicopters, bulldozers, water trucks, and storage facilities are damaged or destroyed. Also, at any given time, a timber operation may have millions of dollars in timber harvest equipment on the ground. In the unlikely event that wildfire strikes this equipment may be lost.

Further, firefighting operations can cause damage to privately-owned road systems or fences. In Dovenberg v. U.S. ex rel. U.S. Forest Service, the United States Forest Service used the plaintiff's land as a base of operations for fighting the Shake Table Complex Fire. Dovenberg provides a compelling description of how land can be heavily used and damaged by government firefighting operations:

[i]n response to the fire's expansion onto Mr. Dovenberg's property, the IMT [Incident Management Team] set up a

110. See, e.g., Thune v. United States, 872 F. Supp. 921, 922 (D. Wyo. 1995) (describing a United States Forest Service controlled burn that grew out of control and became a wildfire in the Bridger-Teton National Forest). In Thune, the plaintiff, who ran a small business guiding hunters, maintained a base camp where he stored his hunting gear. Id. at 923. The base camp containing the plaintiff's capital investments in his business were entirely destroyed by the wildfire. Id.

111. See, e.g., id.


113. Id.


115. Id. at *1.
staging area near the entrance to the Ranch. The team also used roads on Mr. Dovenberg’s property to access the fire and to construct a Safety Zone, Drop Points, and a Dozer Line. His roads provided primary access to the fire and were used by up to 1500 firefighters and staff personnel during the four days when the fire remained out of control. The IMT continued to use the Ranch to access the fire area for approximately two weeks following control of the fire. Mr. Dovenberg asserts that the team’s use of the Ranch resulted in the destruction of roads, culverts and fencing, the clearing of areas for staging, the Safety Zone, Drop Points, and the Dozer Line. Mr. Dovenberg submitted a claim for damages to defendant United States on March 13, 2007, which was denied nearly a year later.116

The costs of an incident management team siting on a property to manage a fire can impose substantial costs on privately-owned road systems, fencing, etc.

C. Tree Growth

Wildfire also significantly retards tree growth.117 A forest has trees in every phase of the timber life cycle; from seeds germinating, to seedlings, to saplings, to poles, to standards. Trees at every point in the life cycle reflect the future income stream of the timber operator.118 Fire damage represents a loss in net present value of that income stream. Trees which have grown to the seedling and sapling stages may be damaged or killed by wildfire. The number of trees killed is not immediately obvious. “... [a]pproximately six months [are] necessary to determine the final mortality due to the fire.”119 The growth of trees that survive a wildfire is retarded as a result of having been scarred in the fire.120

__________________________

116. Id.
117. See FOLWEILER, supra note 102 at 20.
118. In many cases damage to important commercial hardwoods is concealed and not discoverable until cutting through the bark. Id. at 25 (noting that “[f]ire damage is insidious because so often the new lesions are concealed by dead bark.”).
119. Id. at 16.
120. Id. at 20.
The extent to which fire damage effects mechanisms influencing growth are not fully known, but some specific sources of damage have been identified: "[t]here is a reduction in the number of vessels that are needed by the tree in carrying on physiological functions such as transporting raw materials from the soil to the leaves. The mechanical properties of the trees are also affected."\textsuperscript{121} Such damage may be hard to prove until several years after the fire occurs or, in the area of tree rings, until after the tree is cut. The costs of seed loss and retarded growth caused in a specific setting by wildfire is difficult to quantify, particularly within a five year period after a fire.

\textit{D. Water And Soil Composition And Productivity}

Wildfire changes the forest landscape in other more subtle ways. Important shifts in the soil composition and waterways effect \textit{future} growth among trees and other organisms. "When the protective mantle of green leaves or needles and the forest debris commonly referred to as litter and humus are removed by fire, the result is reflected in the soil. . .\textsuperscript{122}"

In some forests, the soil, badly damaged by wildfire, is so poor that trees cannot grow regardless of the replanting efforts taken.\textsuperscript{123} Similarly, waterways vital to forest health are damaged by wildfire.\textsuperscript{124} Burned watersheds have less ability to cut down runoff, and in the absence of forest cover, a watershed supplying water to a dam may be prone to rapid.\textsuperscript{125} The silting and inability to stem runoff can cause flooding among saplings, or damage aquatic life in the watershed.\textsuperscript{126}

\textsuperscript{121. Id. at 25.}
\textsuperscript{122. Id. at 21 (commenting that "[w]here frequent fires occur, the $A_o$ horizon is absent because the forest litter is burned before it can be decomposed by slow-acting micro-organisms. The absence of the $A_o$ horizon prevents micro and macro-organisms from living and thus causes the surface soil to be relatively impervious, thereby reducing percolation, and increasing runoff and attendant erosion."}) Id. at 23.
\textsuperscript{123. Id. at 23 (noting that where there is frequent fire among redwoods, "the soil conditions have become so badly damaged that even planted redwood seedlings have difficulty in surviving. It is impossible for natural redwood reproduction to become established on sites that have been burned repeatedly.").}
\textsuperscript{124. Id. at 21.}
\textsuperscript{125. See id.}
\textsuperscript{126. See id at 23.}
E. Disease And Insects

A fire-damaged landscape gives rise to increased disease among, and insect attack against, trees. Fire puts trees at risk by damaging their natural defense mechanisms. A tree’s natural defense mechanisms are especially vulnerable if the tree is exposed to repeated fire. But, the extent of damage is not immediately obvious. “Fire damage is insidious because so often the new lesions are concealed by dead bark . . . Symptoms of dead cambium may not be apparent for several years after the fire.” Trees damaged by disease and insect attack have far less value than their healthy counterparts. Further, disease and insects spread rapidly from unhealthy (burned) trees to the healthy counterparts, without appropriate management.

F. Human Activity

Wildfire also has a detrimental impact on human lives. Among commercial land managers, wildfire diverts man power from timber operations to wildfire fighting activities. Smoke conditions from nearby wildfires can impact workers’ ability to be outside. Mitigation and restoration efforts can consume an entire workforce of foresters and contractors for several months. Wildfire can also devastate landowners and their employees, area residents, foresters, ecologists, nearby business owners, firefighters, tourists, environmentalists,

127. Id. at 24 (noting that “[u]nless a tree is injured in some way so that the cambium layer is broken, spores of wood-rotting diseases seldom gain entrance. When the protective bark tissue is removed by fire, spores are able to gain entrance and commence their damaging work.”).
128. Id.
129. Id. at 25.
130. Rogstad, supra note 105 (noting depressed value of burned trees, and that in some areas markets may not even existed for burned timber).
131. Id.
132. GORTE, supra note 5, at 23 (noting that foresters are used as stand-in firefighters during wildfire).
133. See Rogstad, supra note 105 (providing an example of the involved mitigation measures necessary to counteract wildfire).
historians, and government employees.\textsuperscript{134} Psychological harms may also arise from wildfire and people feel an intense desire to rebuild damaged forests quickly.\textsuperscript{135}

\textbf{G. Wildlife Losses}

Wildlife losses from wildfire can be considerable,\textsuperscript{136} and the deaths are often painful and prolonged.

[a]fter a 120,000 acre fire in Wisconsin in 1930, ‘the carcasses of 18 deer were found in the close proximity; undoubtedly many more died because a 100\% survey was not conducted. It was estimated that after the fire 60\% of the life deer in the region had badly burned feet. A deer was encountered walking on its knees; its hooves and foot bones had broken off due to excessive heat. The deer herds were weakened so badly that they became ready prey to their natural predators, thus providing another factor in diminishing their number.’\textsuperscript{137}

In addition to the psychological harms that workers can experience from seeing such devastation to the wildlife on timberland fiscal losses may also ensue.\textsuperscript{138}

\textbf{H. Countervailing Considerations}

1. Mitigation

Mitigation measures taken by a forest manager to offset damage are a corollary to most sources of damage. For example, foresters

\begin{itemize}
\item \textsuperscript{134} See Vogt, supra note 20 (describing the perspectives of area residents, a forester, an ecologist, a business owner, a firefighter, tourists, an environmentalist, an historian, and a park ranger in response to a major fire).
\item \textsuperscript{135} DVD: Legacy of Fire: The Story of the Tillamook Burn (Tillamook Forest Center, Oregon Department of Forestry 2008) (documentary video showing the regeneration efforts of community groups culminating in the successful re-growth of 350,000 acres of forest devastated by a series of burns).
\item \textsuperscript{136} Folweiler, supra note 102, at 27 (asserting that “[f]ires destroy timber and affect all the wildlife which use the timber for shelter. In large fires particularly game losses are tremendous.”).
\item \textsuperscript{137} Id.
\item \textsuperscript{138} Wildlife have commercial value to land managers who sell the hunting rights to their property. See Dean Lueck, Wildlife Law, in The New Palgrave Dictionary of Economics and the Law 693-701 (Peter Newman ed., 1998).
\end{itemize}
engage large teams of workers after wildfire to mitigate soil erosion, implement water quality measures, replant trees, harvest damaged trees, and attempt to counteract disease and insect. Although the costs of mitigation measures are considerable, they are estimated to be less than the cost of inaction, and are necessary to continue viable timber harvest operations. However, there is no available study that demonstrates the frequency, cost, or efficiency of mitigation measures foresters make to offset the damage caused by wildfire.

2. Benefits Of Wildfire

Although generally characterized as disastrous, wildfires actually produce a mix of ecological costs and benefits. On one hand, fires devastate forests by killing healthy trees and animals, contributing to soil erosion, and damaging air quality. On the other hand, occasional fires are essential to the health of wildlands. Fires rid wildlands of diseased vegetation, reduce competition among plants for resources such as light, and renew soil. In Westvaco Corp. v. United States a timber company adjusted the amount of losses caused by wildfire to account for “the estimated increase in value of the affected area due to ‘pine release’ which is the elimination or reduction of vegetative material, usually woody plants and trees, that interfere with the growth of pine trees being managed.” Indeed, some plant species, such as the Lodgepole Pine, are dependent upon

139. See Rogstad, supra note 105.
140. Id.
141. Id.
142. Id. supra note 5.
144. Garza, supra note 6 (stating that “[f]ires are an integral part of the ecosystem.”).
145. Id. (commenting that “[f]ires . . . enrich and renew the soil and get rid of old and diseased vegetation.”).
146. 639 F.2d 700 (Ct. Cl. 1980).
147. Id. at 703 n.5.
fire for their intergenerational survival; they cannot reproduce without it.148

In addition to ecological and social concerns, there are also legal and tax advantages to property damaged by fire. The losses to commercially-viable trees ("stumpage losses") may be partially or fully offset in two ways. First, fire-damaged timber stands are subject to fewer environmental regulations than regular forests.149 Emergency timber harvest plans can be used to clear more trees more quickly than could otherwise be harvested.150 In some cases, timber that would not have been harvestable, due for example to local regulations, can be harvested under state emergency harvest procedures.151 Second, the owner of burned forest can claim some of the value of lost timber on his taxes.152

V. PRESSING ISSUES OF WILDFIRE LAW

Having set forth a brief background about wildfire issues pertinent to legal analysis, this section takes the next step of identifying the key

148. Id.; see also JAMES A. YOUNG & CHERYL G. YOUNG, SEEDS OF WOODY PLANTS IN NORTH AMERICA 250 (Theodore R. Dudley ed., 1992) (noting that the pinecones of some Lodgepole pine trees only open to release seeds when heated to a temperature that is achieved by fire).

149. See Jon A. Souder & Sally K. Fairfax, Arbitrary Administrators, Capricious Bureaucrats and Prudent Trustees: Does it Matter in the Review of Timber Salvage Sales?, 18 PUB. LAND & RES. L. REV. 165, 185 (1997) (citing as an example the fact that salvage sales for dead trees are exempted from the National Forest Management Act because their "biological growth rate is presumed to be zero.").

150. See Marc Fink, Logging After Wildfire: Salvaging Value or Mugging a Burn Victim?, 19 J. ENVTL. L. & LITIG. 193, 203 (2004) ("... in July 2003, the Forest Service published notice of new categorical exclusions for 'limited timber harvest' including the 'salvage of dead and/or dying trees' on up to 250 acres.") (citation omitted).

151. See Thomas N. Lippe & Kathy Bailey, Regulation of Logging on Private Land in California under Governor Gray Davis, 31 GOLDEN GATE U.L. REV. 351, 364 (2001) (observing that "local ordinances that attempt to regulate the conduct of or impose additional permit requirements on timber operations are generally preempted by state law.").

152. See Rogstad, supra note 105.
legal and policy issues in wildfire law today.\textsuperscript{153} Despite minimal attention among academics, wildfire has garnered substantial public attention. This section draws on media reports and interviews with persons regularly engaged in wildfire issues to identify what I believe are two of the most pressing areas of wildfire law. Further, this section identifies some relevant considerations relating to each issue raised.

\textit{A. Liability For Suppression Costs}

Liability for suppression costs is a key litigation growth area in wildfire law. Some state statutes permit government firefighting agencies to charge parties responsible for starting wildfire the cost of suppressing that fire, a practice known as “cost recovery.”\textsuperscript{154} On its face, cost recovery seems like a reasonable way to replenish public coffers. But, in practice, the liability issues and suppression activity complicate cost-recovery efforts. Historically, the government and an at-fault party settled a cost-recovery claim.\textsuperscript{155} In 2004, cost recovery was estimated to yield four to six million dollars annually.\textsuperscript{156} But recent exorbitant settlements and other factors are influencing parties to litigate rather than settle.\textsuperscript{157} This litigation brings before courts, for the first time in decades, key issues of wildfire liability and suppression.

Many cases of liability spring from the accidental nature of most wildfires. Humans start the majority of wildfires, but very few are arsons.\textsuperscript{158} Power lines and railroads are two notorious sources of fire-starters that can cause wildfire even in the cases of little or no

\textsuperscript{153} One cannot hope to provide comprehensive solutions to these widespread issues in a single article, but taking the first step of identifying the most pressing problems will serve as a catalyst for future study.

\textsuperscript{154} \textit{CDF’s Civil Cost Recovery Program, CAL. DEP’T OF FORESTRY AND FIRE PROT. 1, 2} (2004), available at \url{http://cdfdata.fire.ca.gov/admin/fireplan/fupload/fpp_law_CDFs_Civil_Cost_Recovery_Program1.pdf}.

\textsuperscript{155} Id.

\textsuperscript{156} Id.

\textsuperscript{157} See id. (providing two examples of multimillion dollar negotiated settlements); see also Keiter, supra note 5, at 332.

negligence. While public utilities and railroads are required to employ basic safety measures, such as clearing vegetation near a power line or railroad track, it is difficult if not impossible to properly protect thousands of miles of power lines or railroad tracks. Further, where humans directly cause the start of a wildfire, they may be strictly liable for the cost of suppressing it, regardless of the steps they took to avoid fire risk. While many private persons are judgment proof against civil cost recovery efforts, the strict liability standard becomes problematic for companies who are responsible for the actions of their employees under respondeat superior.

The second complicating factor is determining the appropriate cost of suppression to assess the responsible party. The problem is that suppression costs are both highly discretionary, and completely out of the control of the responsible party. Government agencies exercise absolute authority in wildfire decision-making, and can set the cost of suppression by choosing certain firefighting methodologies and through the timing of their actions. Firefighters have chosen to let a fire burn for several weeks before deciding to fight it. In the

159. See Yoder, supra note 5, 1-3 (noting strict liability regimes for starting a wildfire).
160. The government controls firefighting efforts. Private individuals do not get to make decisions about which or how many resources the government will employ during a wildfire. For an example of how firefighting decisions are made among agencies, but not involving private parties, see Div. of Forestry, Alaska Dep’t of Natural Res., supra note 29 (noting that “[f]ire management planning, preparedness, suppression operations, prescribed fire, and related activities will be coordinated on an interagency basis with the full involvement of DOF and its state, federal and local government cooperators. The Division of Forestry, Bureau of Land Management, and the U.S. Forest Service, fight fires within their protection areas on all land ownerships which reduces the duplication of facilities and services. None of the agencies in Alaska have all of the resources required to accomplish the fire protection job on their own. The Division of Forestry has cooperative agreements with the Departments of Agriculture and Interior, and numerous local government and volunteer fire departments to help get the job done. The state and federal agencies routinely utilize each other’s personnel and resources to both manage and fight fires. This is efficient and cost effective.”).  
161. Id.  
162. This surprising level of discretion is attributable to the need to prioritize among many fires, or obtain agency-oriented objectives such as training opportunities for firefighters or vegetation management through letting fires burn. See Memorandum, supra note 30, at 4 (stating that “[f]ires can now be managed for
interim, the fire may expand far beyond its original size, and the suppression costs may multiple exponentially. Further, firefighting methodologies may vary greatly in cost and efficiency, but the persons deciding which methodologies to employ are not paying the bill in cost-recovery scenarios.

B. Mixed Incentives

Wildland holdings give rise to parties with differing objectives. For example, a heavily forested state park might be adjacent to an environmental reserve, a small subdivision, and/or timberlands owned by a commercial forestry operation. Consequently, when wildfire strikes an area, the goals of affected landowners can vary dramatically. The environmental group may want its holding to experience wildfire, whereas the commercial forestry owner would seek to protect his timber against wildfire, and homeowners seek to protect their homes and personal property. The conflicting multiple objectives, which may change as conditions on the fire change.

Some familiar with firefighting practices allege that the authority is misused by firefighters to allow campaign fires to develop as a means of agency-aggrandizing through attracting public attention and resources. See also supra Part II.

163. Richard Mangan, a wildfire expert employed by the U.S. Forest Service is quoted as saying, “Often we use resources because of the public and political pressure to do something, even though it has no effect on the fire and is an economic waste.” INGALSBE, supra note 88. In 2008, the L.A. Times published an expose on intentional waste of resources by government firefighting agencies, reporting that expense aircraft is often used during fire in response to political pressure, even when it is known that the use of aircraft will not further fire suppression goals. Julie Cart & Bettina Boxall, Air Tanker Drops in Wildfires are Often Just for Show, L.A. TIMES, July 29, 2008, available at http://www.latimes.com/news/local/politics/cal/la-me-wildfires29-2008jul29,0,3486219.story. This is an expense exercise: “Aviation costs amount to about one-fifth of [U.S. Forest Service] fire-suppression spending... $296 million in 2007.” Id.

164. See DIV. OF FORESTRY, ALASKA DEP’T OF NATURAL RES., supra note 29.

165. Ideological differences in the use of land differ starkly, and become especially problematic because the use of one land may hinder the use of adjacent land in wildfire settings. For example, by not harvesting timber, the environmental group creates a more natural setting, but also increases the risk of wildfire spreading across their property to other adjacent timberlands. One landowner fulfilling her objective directly negatively hinders the ability of another landowner to fulfill his objective.
responsibilities, motivations, incentives, and tensions of different
groups come to the fore under the stressful circumstances of wildfire.

On the one hand, government firefighting agencies are especially
useful in quelling these tensions. Having a unitary actor invested
with full authority to make decisions is helpful; the opposite result in
a setting of diverse landowners would almost certainly be chaos.
But, decision-makers at government firefighting agencies are also
incentivized, albeit in different ways. Further, the protections of
sovereign immunity provide considerable opportunity to make
decisions concerning the destruction of private property or important
ecological interests without internalizing the cost. In other words, by
making decisions about what will happen on privately-held lands,
firefighters can cause a great deal of intentional, purposeful damage
for which they cannot legally be held responsible, or made to
compensate. The result can harm the interests of environmentalists
and private landowners, who are left without recourse.

VI. CONCLUSION

This Article provides a broad overview of the most important
information and issues in wildfire law today. This background
information about the key concepts, stakeholders, and issues provides
both background and a challenge to future legal scholars,
policymakers, and practitioners who will work on issues related to
the costly and ever-growing spread of wildfire. Although the central
issues of liability for cost suppression and mixed incentives were
discussed here, many other issues exist along the dimensions of
environmental law, tort liability, and economic analysis of efficient
suppression resources. Increased attention to these issues is
mandated by the incredible loss of natural resources and property lost
in the ceaseless increase of wildfires experienced over the past
decade. By providing critical analysis and policy suggestions,
however, scholars can provide vital, much-needed assistance in
crafting solutions that will stem the natural disasters and alleviate the
high costs wrought upon stakeholders and the general public.