# 1910 FIRES: A CENTURY LATER
# COULD IT HAPPEN AGAIN?

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"The future isn't what it used to be."
-Variously ascribed

**Background and Introduction**

The United States has a history of large, catastrophic wildfires. 1910's Big Burn, a complex covering some 3,000,000 acres across Washington, Idaho, and Montana was certainly among the largest. It was also among the deadliest. As Stephen Pyne and Timothy Egan have described, it stunned the nation, changed the day's political dynamic, and galvanized support for the protection of public lands. The Big Burn spawned an enormous effort to control this country's wildfire problem.

One-hundred years later, solving the wildfire problem in this country remains elusive.

Since 1998, at least nine states have suffered their worst wildfires on record. Perhaps like the Big Burn, these recent wildfires were remarkable, but, unlike 1910, not for want of firefighting capacity. In the modern era, these unprecedented wildfires are juxtaposed against the fact that today's firefighting budgets have never been higher, cooperation between federal, state, and local forces have never been better, and firefighting technology has never been greater. How could fires like this - with all of today's money and partnerships, and tools – how could they happen? How could modern wildfires approach the scale and scope of wildfires from a hundred years ago? In 2003, following a decade of record-setting wildfires across the country, the U.S. Forest Service began looking into what would become known as the mega-fire phenomenon. A comparative, coarse-scale assessment of nine "mega-fires" was completed in 2008 1/.

*1/ The report's findings were presented at the Society of American Forester's National Convention in Orlando, Florida on 2 October 2009 in a paper titled, "The Mega-Fire Phenomenon: Observations from a Coarse-Scale Assessment with Implications for Foresters, Land Managers, and Policy-Makers," by Jerry T. Williams and Dr. Albert C. Hyde. The views expressed in these reports and papers are those of the author(s). They do not purport to represent the positions of The Brookings Institution or the U.S. Forest Service.*

Will another 1910-like wildfire happen again? No matter how low the probability, recent mega-fires are testament that large, catastrophic wildfires *can* happen in today's world. Who would believe that, in 2003, 15 people would lose their lives and over 3,000 homes would burn outside of San Diego; in a State that arguably fields the largest firefighting force in the world? Who would think that, within sight of the Acropolis in 2007, 84 people would die from a wildfire running into Athens, Greece? And, who could fathom that, a year ago last February, whole towns would be consumed and 173 people would die from bushfires in Victoria that would become the largest civil disaster in Australia's history?

The increasing frequency of mega-fires makes it un-wise to dismiss them as anomalies and somehow accept them as too rare to address or too difficult to mitigate. Global warming, the vulnerability of deteriorated fire-dependent landscapes, and growth behaviors at the wildland-urban interface have changed the calculus of wildland fire protection in the United States and elsewhere around the world. The trajectories that these factors are taking suggest that mega-fire numbers will grow, not diminish. If we are asking the "chance" of catastrophe, these factors have changed the odds of wildfire disaster.

Mega-fires are important indicators that reflect an unwelcome "new reality." Their impacts go far beyond today's immediate concerns over rising suppression costs. They carry significant implications for foresters, land managers, and policy-makers.

Will another 1910-like wildfire occur? Modern mega-fires offer insights that might help us answer and respond to this question. If you trust the fireman's adage that, "when wildfire's potential consequences are high, going-home gas is cheap," it is in our best interests to take notice, proactively study these catastrophic wildfires, and act on their lessons.

## Discussion

Up until the late 1980's, we could not imagine mega-fires. They are the "Black Swans" 2/ of wildfires. Although infinitesimally small in number, they carry enormous consequence. They are shocking to survivors, long-lasting to affected communities, and, in some ecosystems, immeasurably damaging. They are "mega" as much or more for their impact, as they are for their size.

Their onset challenges a deeply held belief in our ability to control wildfire. They threaten our wildfire protection strategy, but, perhaps more troubling, mega-fires may jeopardize our larger stewardship responsibilities, as well.

*2/ The Black Swan: The Impact of the Highly Improbable, by Nassim Nicholas Taleb 2007. Random House Publishing, New York.*

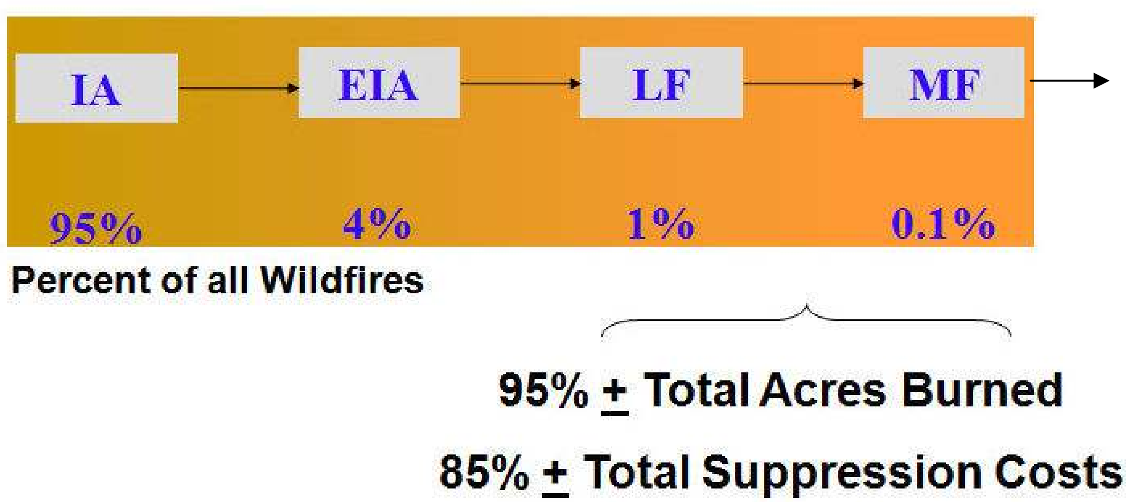
Among federal agencies, the wildfire protection objective attempts to minimize private property loss and natural resource damage without compromise to firefighter safety and at the least suppression cost. This is our *strategic objective*. Our doctrine – nowhere written – was born of 1910. Deeply reflective of our beliefs and inculcated in public and political expectations, it attempts to match increasing wildfire threats with greater suppression force. I'll want to come back to this, but first, let me provide some background.

On average, the United States Forest Service deals with about 10,000 wildfires every year. It is perhaps useful to array these wildfires along a continuum, where they transition from one to another. Although years ago, wildfires were separated by size class to account efficiencies, for our purposes we are more interested in what Stephen Pyne might call, "the context from which [*these four kinds of*] fires take their character." The continuum offers a means of better understanding the tactical and strategic context that defines each.

At the *tactical level*, the continuum makes clear that different kinds of fires hold different characteristics and offer different insights into firefighter safety, firefighting techniques, cost control opportunities, and operational risk. Distinctions can also be observed at the *strategic level.* Here, outcomes associated with different kinds of wildfires tell us something about the soundness of our wildfire protection strategy and the utility of our doctrine. Unless these distinctions are acknowledged in policy, we find ourselves simply "trying harder" or "mobilizing more," in practice with every larger-yet wildfire. This habit often proves dangerous, expensive, and inefficient.

When our wildland fire protection strategy's key measures (i.e. wildfire suppression costs, private property losses, and natural resource damages) are trending opposite our intent and our wildfire protection objective is in doubt, we need to be "heads up."

FIGURE 1. Four Kinds of Wildfires Along the Wildfire Continuum



For our purposes, the continuum asks us to leave our notions about fire, in a linear sense (that a fire simply stays small or gets bigger) and think, instead, about the tactical and strategic problems that occur when fire changes its very character from one transition to another.

Initial attack (IA) wildfires are "new starts," where potential social, economic, or environmental values at risk require a suppression response. Under moderate conditions, they often remain relatively small and are suppressed quickly, at little cost and with little loss. In an average year, about 95% of all wildfires are contained during this initial attack phase. However, as fuels dry out, temperatures rise, humidity drops, wind velocities increase, and where slopes are steeper, fire behavior becomes more intense. As this happens, wildfires sometimes transition into Extended Attack Wildfires.

Extended initial attack (EIA) wildfires represent only about 4% of all wildfires annually, but they are often the most dangerous. Firefighters working at the head of these fires are often caught by surprise. Extended initial attack fires commonly transition rapidly from a wildfire that appears innocuous to a "blow-up" situation. Initial attack objectives (spatial or temporal) are exceeded. When safe practices are overlooked or tactical modifications are not rapidly made, firefighters often find themselves in a very dangerous situation. Extended attack wildfires account for approximately 70% of all fireline-related fatalities. Historically, virtually all multiple-fatality wildfires have occurred during extended attack operations. When extended attack operations fail, wildfires transition into Large Fires.

Large wildfire (LF) incidents account for only about 1% of all wildfires. These fires require greater suppression force, more sophisticated management organizations, and higher levels of support and leadership. Incident commanders select tactics having a high probability of success; ones that minimize suppression costs, with respect to firefighter safety and values at risk. Although they are infrequent, these wildfires represent approximately 95% of the total acres burned and about 85% of total suppression-related expenditures in an average year. Under prolonged droughts and extreme fire weather conditions, where entire landscapes are susceptible to extensive burning, large wildfires may transition into a mega-fire.

Mega-fires (MF) exceed all efforts at direct control until firefighters get some relief in weather or a break in fuels. They are unbounded at the extreme. That is; their size and impact seems limited only by the depth of drought, the amount of available fuel, and the velocity of the wind. Operationally, firefighters are on the defensive. Practically, the first priority is often less about fighting fire than it is about saving lives and protecting property. Public and political pressures to "do more" are common, no matter how dangerous the situation or how slim the odds of control.

Mega-fires might be characterized as a "situation," rather than an "incident." They are *not* just bigger wildfires. These wildfires exceed our memory of "worst case." They make headline-news and evoke deep public angst. They always result in intense political scrutiny. Because mega-fires typically occur at landscape-scales, they usually involve a number of jurisdictional interests, often at different levels of government. Their management extends well beyond conventional firefighting organizations. Command

and coordination functions must accommodate law enforcement, emergency services and disaster relief personnel, public utilities, and local elected officials. Managers must be responsive to an anxious public and a hungry, on-scene media. Emotions almost always run high.

Afterwards, somebody is almost always up for blame. Calls for improved detection, more rapid response, more aggressive attacks, bigger and better tools, more able leadership, and "improved" organizations …next time…are not uncommon. For better or worse, something always comes of them 3/.

Fundamentally, mega-fires define the limits of suppression. They are an indication that our wildfire protection objective is at risk and that our firefighting doctrine has "hit a wall."

The Mega-Fire Project set out to begin better understanding this new phenomenon. The assessment was coarse-scaled and comparative. It evaluated nine mega-fires that occurred across the United States between 1998 and 2007 4/. This paper focuses on the conifer-dominated examples. Among the assessment's findings, several are relevant in attempting to answer the question, "Can a 1910 happen again?"

*Note: Some wildfires become very large as the result of a management decision allowing it. In these cases, burned acres may be traded off over concerns for firefighter safety or in response to otherwise unacceptably high firefighting costs. For the most part, though, the mega-fires evaluated in this assessment became very large, high-consequence incidents despite all attempts to aggressively control them.*

3/ *Western Australia's disastrous Dwellingup Fire (1961) is an exception to the more common suppression-centric fix. Following that fire, government responded by adopting a more balanced fire protection model. Prescribed underburning, strategically placed across the landscape at planned intervals, has been the centerpiece of this fire protection strategy. In the intervening 60-years, suppression costs, private property losses, and fatalities have dropped off significantly.*

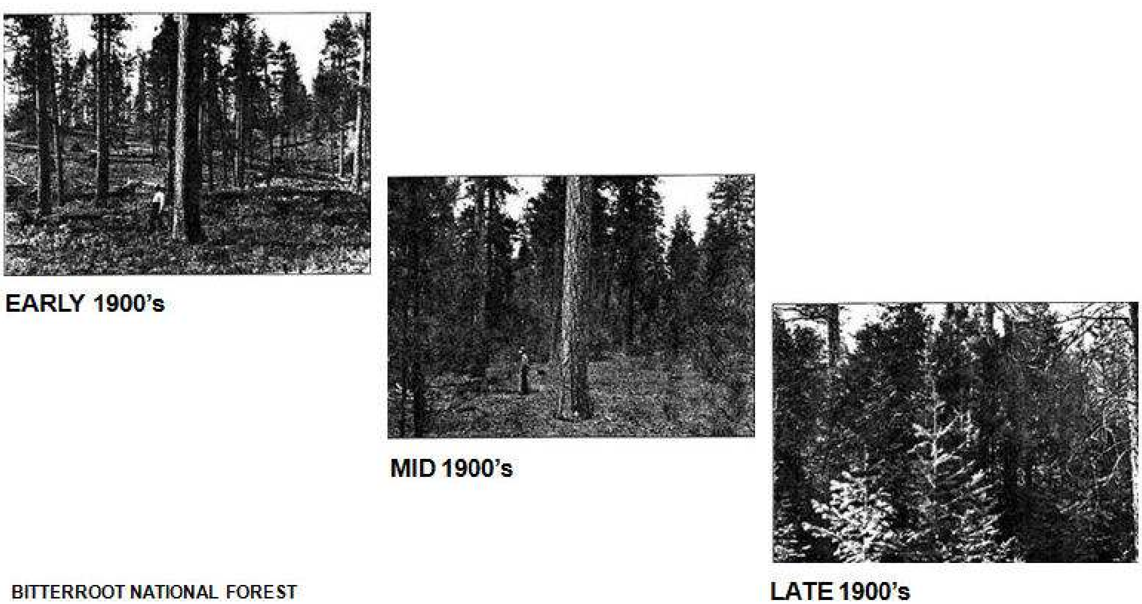
4/ *Volusia-Flagler Complex (205,786 acres, Florida 1998); Valley Complex (212,030 acres, Montana 2000); Hayman Fire (137,760 acres, Colorado 2002); Rodeo-Chedeski Fire (468,638 acres, Arizona 2002); Buscuit Fire (499,965 acres, Oregon 2002); Ponil Complex (92,522 acres, New Mexico 2002); Georgia Bay Complex/Bugaboo (561,000 acres, Georgia and Florida 2007); Boise National Forest portion of the Cascade Complex (302,376 acres, Idaho 2007).*

**Principal Findings:**

- Virtually all of the mega-fires evaluated in this assessment occurred in predominantly dense, late-successional forests. At the landscape-scale, these forests had remained largely un-disturbed for a long time.

- Although mega-fires burned across a wide variety of habitat types and fire regimes, a significant portion of the overall mega-fire acreage studied in this assessment occurred in shorter interval fire-dependent ecosystems, much altered from their historic condition (Figure 2). *Note: In the West, these ecosystems are dominated by dry forest types and represented by ponderosa pine and associated species (i.e. Fire Regime 1). Ironically, one-hundred years ago, these fire regimes were among the most benign, in terms of potential fire behavior. Before 1900, frequent surface fires in these types swept the forest floor at approximately 5-15 year intervals. At these intervals, fuel accumulations - and potential fire behavior - remained checked. Today, in these same dry forest types, a significant number of natural fire cycles have commonly been missed, resulting in considerable build-up of dead fuel and live biomass. These accumulations, in turn, are contributing to severe, high-intensity fire behavior*.

FIGURE 2. A Century of Change in a Short Interval Fire-Dependent Forest (Ponderosa pine)



- On many mega-fire landscapes, the forest conditions that fueled these severe, high-intensity wildfires were often reflected in governing land-use objectives. On public lands, they were called-for in Land / Resource Management Plans. On private lands, they were evidenced in codes, covenants, or industry plans. Dense, late-successional conditions in short interval, fire-dependent ecosystems were put in place for a variety of goals, including wildlife habitat, watersheds, visual quality, basal area growth, and homesites. *Note: Across most mega-fire landscapes, several allocations were often represented. However, they were often complementary or consistent with a dominant theme for un-disturbed conditions. This assessment does not fault the aim; it raises a concern with the means of implementation.*

- In virtually every case, the values that were being managed for were lost or severely compromised, as a result of the mega-fire's impacts.

**Other Findings**

- Virtually all of the mega-fires evaluated here were wind-driven. They all burned under drought conditions. Record-setting fire danger indices were commonly observed. The Energy Release Component (ERC) was above the 100$^{th}$ percentile on day or ignition or shortly after ignition on every mega-fire studied here (ERC reflects large fuel and live fuel moisture contents, as a measure of drought. High ERC's predispose more fuel to burning). Extreme fire weather conditions (high ambient air temperatures, low relative humidity, and high-velocity windspeeds) often resulted in "off-the-charts" fire behavior. Afterwards, most survivors would say that they "had never seen anything like it."

- Several of these mega-fires burned during large-fire episodes, when multiple large wildfires were simultaneously breaking out in the vicinity. In several cases, mega-fires came out of the "backcountry." Given other competing demands and their relative proximity or long distance to high-values elsewhere, they were often assigned a lower priority, at first. After a while, their size and intensity diminished tactical options for control.

- Nearly all of the mega-fires studied here involved several ownerships with different jurisdictional responsibilities and land-use goals. Public and political frictions were particularly intense between ownerships when the program goals of one competed with the interests of another. The "decision space" available to one landowner often depended upon the compatibility of objectives and resilience of their neighbor's land.

- On wetter, cooler sites, where longer interval fire regimes were more broadly represented, two observations might be made: 1) A general absence of landscape-scale diversity commonly described altered conditions. Vegetative "patches" or "mosaics" were less obvious, as discerned from early photographic evidence. Based on their age and condition at the time of burning, many of these longer interval fire regimes may have been nearing the end of their natural fire-return cycle. 2) Regardless of what may have been burning in the longer interval fire regimes, the highest values at risk (and, often, greatest suppression efforts) were generally in the dry forest types, as displayed in decision support documents (e.g. Wildland Fire Situation Assessments) and direction to firefighters (e.g. Incident Action Plans).

- In some cases, type conversions, occurring across large areas, contributed to wildfire hazards (*Note: Type conversions often appeared to confuse fire regime/condition class determinations in some places*). Often, the most noticeable type conversions occurred in shorter interval fire regimes. In the absence of periodic under-burning, fire-intolerant species encroached further down the temperature-moisture gradient onto the warmer, drier sites. In some cases, in an earlier era of exploitation, a history of over-grazing and high-grade logging often accelerated these type conversions.

- The "melding" of transition zones between fire regimes has changed landscape-scale fire behavior. In these areas, recent wildfires are sweeping entire landscapes with high-intensity fire behavior. Wildfires that may have exhibited low- or mixed-severity fire behavior over *much* of the landscape one-hundred years ago, exhibit severe, stand replacement burning over *most* of the landscape today. (Figure 3). Arno and Allison-Bunnell estimate that, before the turn of the last century, about 80% of inland northwest forests were in a more open low-severity or mixed-severity condition. Today, about 85% of these same forests have "closed;" they are now much denser and in a mixed-severity or stand replacement condition (*From*: *Flames in Our Forest by Stephen F. Arno and Steven Allison-Bunnell, 2002. Island Press. Washington, DC).*

FIGURE 3. Modern Conditions and Burning Characteristics in an Altered Short Interval Fire-Dependent Ecosystem (Ponderosa pine)

- On some mega-fires, recent understory thinning and/or prescribed under-burning had occurred within the mega-fire perimeter. On these areas, burn severity and resistance-to-control was much lower, compared to adjacent un-treated stands. In one case, a mega-fire was contained after running into a very large treated area that had been routinely under-burned at 3-5 year intervals. These observations indicate that understory thinning and prescribed burning in these fire regimes – at the appropriate scales -- can make a positive difference, in terms of overall forest resilience and fire protection; even under drought and extreme fire weather conditions.

## Planning-Related Findings

- After-action assessments (post-wildfire reviews) generally focused on operational performance. They rarely linked land management plans and practices to wildfire outcomes. So long as administrators confine their focus on corrective actions to fire operations, Fire Management will be confronted with a problem that they, alone, cannot solve.

- In several plans, it appeared that “no-action” was often perceived as having no consequence. Although project-level environmental assessments addressed - at length - the social, economic, and biological impacts of various treatment alternatives, little or no such rigor was applied to the “no-action” option. Most plans seemed to assume that fire protection could be made commensurate with any level of threat. Generally, potential wildfire-related risks, costs, or consequences of the plan’s allocations or standards and guides were not well documented. Disturbance ecologies, including fire regime dynamics were often absent or under-represented. In a cool, wet climate cycle, this is probably understandable; fire’s consequence was less apparent than it is today.

- Many of the laws that govern the management of fire-prone ecosystems reflect an inherent bias. Mitigation treatments, which might reduce wildfire risk, “compete” against other values that may, temporarily, be degraded. In many cases, these proposed treatments simply cannot get past the short-term risks involved regardless of long-term benefit. On the other hand, wildfires (even those that may eventually result from “no-action”) get a “pass.”

- Because mega-fires are burning at stand replacement intensities across a wide mix of altered fire regimes over such extensive areas, many of today’s mega-fires may be setting the stage for the next generation’s mega-fire. Across broad landscapes, a diverse mosaic of fire regimes, in different successional stages, at different ages, and with a rich mix of fire-tolerant species has given way to more homogeneous conditions. Today’s modified suppression strategies (e.g. trading off acres as the means to reduce costs) are resulting in very large burned-over areas. This large loss of heterogeneity may amplify future mega-fire potential, particularly if global warming scenarios materialize over the coming decades.

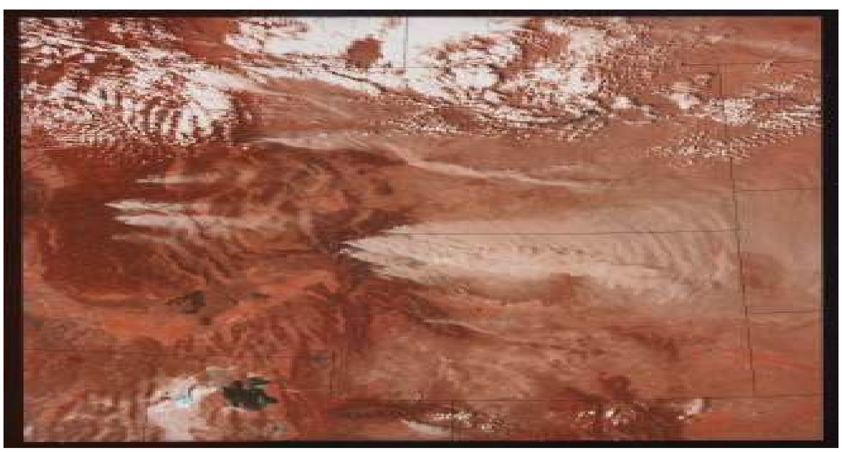
- On federal lands, the forest planning cycle takes many years to complete (7-8 years). A plan’s life is 15-years. Given what many climate scientists are projecting, there is a growing sense of urgency in fire-dependent ecosystems. It is not clear that the development of forest plans can “beat the train to the crossing.” Nor is it clear that a plan’s life will enable long-term mitigation strategies at meaningful scales.

**Conclusions**

Mega-fire potential may be something like the tumblers in a lock. The confluence of drought, extreme fire weather, heavy, continuous fuels over extensive un-disturbed landscapes, multiple large fires burning at the same time (all with high values-at-risk competing for scarce resources), and a severe late season wind event are all "tumblers." When these "tumblers" drop in unison, disaster opens and the chance of trouble suddenly blows-up. The chances of that are slim, but - here, in the Northern Rockies, disaster has threatened more than once over the past many years.

Throughout this region, we have a history of drought and extreme weather. In some fire seasons, well over 90% of the year's total burned acreage will occur within only a few days; not unlike August 20, 1910. Late-season cold fronts often bring an abrupt end to severe fire seasons, but they can be preceded by hellish winds. In 1988, the National Weather Service confirmed the first evidence of a surfacing low-level jet stream that brought 70 mph winds to the region and blew out the Canyon Creek Fire from a patchy 90,000 acres to an incinerated 250,000 acres in a single night. That same day, the lodge at Old Faithful in Yellowstone National Park was threatened (Figure 4).

FIGURE 4. Satellite Imagery of the Idaho/Montana Region on 7 September, 1988.



In 2000 and 2003, both fire seasons were on the verge of catastrophe. Both fire seasons were significantly influenced by drought. Both had multiple large fires simultaneously burning across the region. Both had mobilized one of the highest concentrations of firefighting force ever gathered anywhere. The "August Singularity" passed without much relief. Late-season cold fronts pushed through, but they were relatively weak and passed without much real notice. Mercifully, both fire seasons "came down" somewhat gently. Had either been affected by a Canyon Creek-like wind event, we may have had a 1910-like outcome. As bad as they were, the "tumblers" in 2000 and 2003 did not all drop in unison, as they might have.

In the introduction, I suggested that today's mega-fires may have the potential to become worse than yesterday's events; maybe not in terms of size, but almost certainly in terms of impact. We find people living in all sorts of different forest types in this region. But, the area of most rapid growth has been in the dry forest types; on the dry, warm sites between valley bottom and public forest. In my judgment, it is in these places - in these fire regimes - where mega-fire impacts are almost certainly to be the greatest.

In 1910, the dry forest types in much of the region were still open, still resilient, and still exhibited low- to moderate-fire behavior potential when they burned. In a way, these 1910 stand conditions in the ponderosa pine type may have been a "buffer," now lost. In 1910, when wildfires "roared out of the mountains" onto the warmer, drier sites, they ran into forests that were less hazardous. Pushed by high winds, they swept through the understory, but they burned at lower intensities and passed quickly. Afterwards the forest and most of its values were left largely intact. In a more open condition, it was still possible to save lives and homes. Today, tightly compressed multi-storied stands, choked with upwards of 1,000 trees per acre and packing heavy fuels, dominate these same sites. Insect infestations and standing dead only add to the problem. When these forests burn today, they burn intensely and not much comes through it. Under the "worst-case" weather events that usually accompany the worst wildfires, not much precaution is really possible when the mega-fire threat is imminent. Among those who choose to live in these forested settings, many favor the privacy and sense of seclusion that a dense forest affords; not knowing that the attributes they value so much are the hazards that also threaten them the most. In these places dense forest conditions have placed much at risk (Figures 5 and 6).

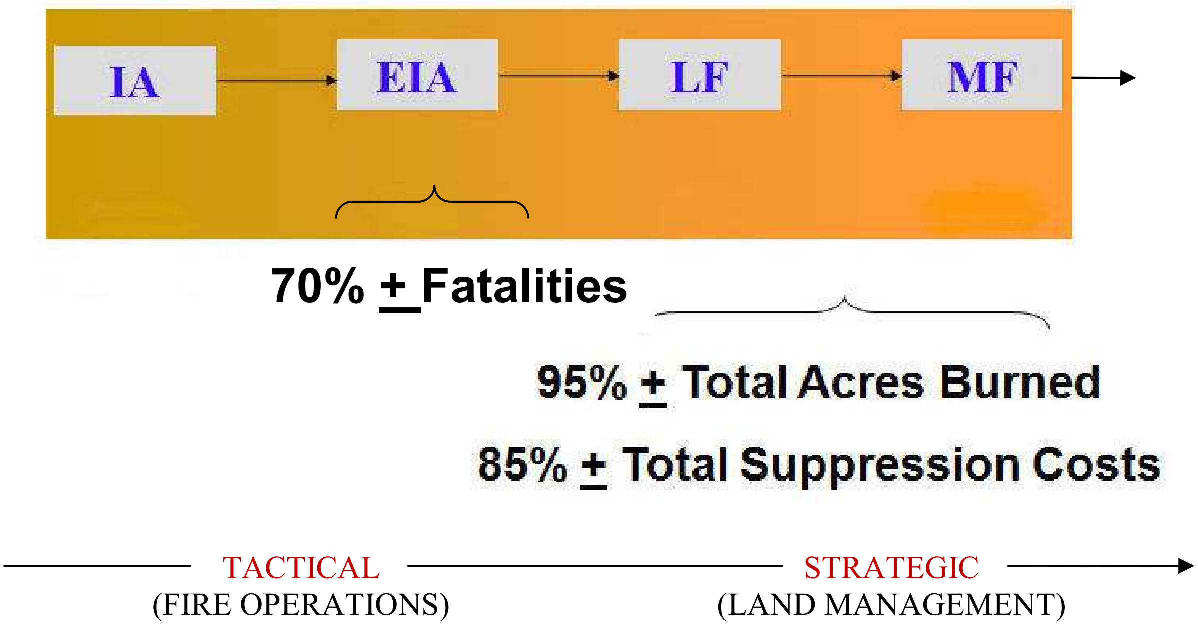
FIGURE 5.  Pre-fire photo of Marysville, Victoria. Australia

FIGURE 6.  Post-fire photo of Marysville, Victoria.  Australia


The future really *isn't* what it used to be.  In the past, a "benevolent" climate cycle, open dry forest types, a diverse, "mosaic-like" landscape in the backcountry, and a relatively low and dispersed population were some insurance against all but the most angry disasters.  Today, though, across broad reaches of the Intermountain West, where drought, deteriorated forest conditions, and landscape homogeneity have all come to a head, the magnitude of a potential disaster may be much greater than we imagine.

Let me go back to the wildfire continuum….

FIGURE 7. Focusing on Solutions to Problems Along the Wildfire Spectrum




Experienced firefighters know to act on important fire danger indicators. They know that, when the weather changes, "blow-up" conditions can develop. During extended attack operations, they know that they need to rapidly change their *tactics* or risk losing lives. Smart, attentive firefighters know that - when their control objective is exceeded and their assumptions about their environment have collapsed - they need to act. Those that fail this most basic task are at risk of joining an awful statistic associated with extended initial attack tragedies.

A similar situation confronts us, now, *strategically*. Plenty of indicators are warning of impending danger:

- Although protection agencies can claim a remarkable suppression success rate, our measures of success (i.e. suppression costs, private property losses, natural resource damages, and firefighter fatalities) are, in many places, climbing. Increasing suppression preparedness budgets and adding capacity is having little or no effect in reversing this trend.

- On public and private lands across the West, the rate of fuel accumulation often remains far greater than the rate of fuel treatment. In short interval fire regimes, over-accumulated fuels – and resultant high-intensity fire behavior - are well beyond the historic range of variability in most places.

- Understory thinning and low-intensity prescribed burning hold promise as the means to mitigate wildfire hazards, but – at today's scales - they are too small 5/. They are expensive. They are also generally perceived as too disruptive, too fraught with risk, and – in the context of most prevailing laws – too at-odds with society's values in the short-term.

- Across broad, undisturbed landscapes, senescent forests lie at risk. Today's bark beetle infestation is tied to warmer-than-normal winters and dense stand conditions. The infestation covers vast swaths and extends up and down the Intermountain West, adding to wildfire risk.

- Fire seasons are beginning earlier and lasting longer. Prolonged droughts have diminished (if not eliminated) late-season moisture differentials. In a "normal year," riparian zones and north slopes often impede fire spread. But, when everything is dry, everything can burn. Today, whole landscapes are susceptible to intense burning. Today, late in the fire season, "mosaic burns" are seldom seen.

Mega-fires are emerging as a leading edge indicator of deteriorated conditions in fire-dependent ecosystems.

In my view, there is an urgency to confront this new mega-fire threat and modify our wildfire protection strategy *6/*. If the last century was about understanding and controlling wildland fire, the next century needs to be about reconciling our aims, with respect to the dynamics that define these fire disturbance regimes. It needs to be about managing our expectations *for the land* in ways that are consistent with the dynamics *of the land*. If the last century was about strengthening the tactical dimensions of fire control, the next century needs to be about restoring fire-dependent lands and, strategically, better aligning our perceptions, our laws, our policies, our plans, and our practices the "new realities" of a changed environment.

*5/ Some estimates for the West maintain that, in order to stem rising costs, losses, and damages in shorter interval fire regimes, a program goal of 3 million treated acres per year for 15 years would have to be reached.*

*6/ Strategy is defined, here, as having three discreet elements: 1) Determination of an end result (e.g. Restore and sustain safe, resilient fire-dependent ecosystems), 2) Establishing the means (social, political, economic – including markets – legislative, organizational, and scientific) for achieving that end result, and 3) Determining the most effective way in which all means can be brought to bear in accomplishing the desired ends. Adapted from: On Strategy, by Harold G. Summers, Jr. Presidio Press, Novato, CA.*

Although we may be beginning to shift, we are not yet there. We have not yet acknowledged the limits of suppression. Born of 1910, our doctrine that attempts to match increasing wildfire threats with greater suppression force has "hit the wall," with those very few wildfires that occur under the most adverse fuel and weather conditions. We may have reached a remarkably high success rate with this doctrine, but the consequences of that remaining 1% represent nearly all of our costs, losses, and damages. The doctrine is not achieving our wildfire protection objective:

*"Minimize private property loss and natural resource damage without compromise to firefighter safety, at the least suppression cost."*

If our wildfire protection objective is to "stand up" against the looming threat of a changing climate, we are going to have to square our strategy with the dynamics of fire-dependent ecosystems.

In some fire-prone forests, the best "hedge" against the mega-fire threat may be a more diverse landscape. In the dry types, the best insurance against loss may be more open, more resilient forest conditions. In these solutions, though, it seems that we are systemically immobilized. Our own doctrine and many of the perceptions that surround firefighting capabilities simply will not acknowledge that we cannot, somehow, close that one-percent. Many of our land management laws, policies, and plans are at odds with the thinning, prescribed burning, and selective cutting needed to mitigate the mega-fire threat. Markets that might help are going away. And policy strategies that might use high-intensity wildfires to clean up the fuels and solve the problem are not always consistent with the ecologies involved. In many places, we find ourselves between a rock and a hard place.

Why should we work to reconcile these dilemmas? Why should we take this on? Some will argue that all of this is too costly, too contentious, and much too complicated to confront. Some will find comfort in the facts that, after all, federal fire protection budgets have never been higher, cooperation between partners has never been stronger, and technological advances have never been greater. Some, against a growing body of evidence, will deny the problem and insist that a few more firefighters, a little better cooperation, or a new technology can somehow fix all of this.

In my judgment, the mega-fire threat will not be fixed on the fireline. History is replete with examples where tactical victories have given way to strategic defeat.

Perhaps the most alarming finding of the mega-fire assessment centered on a confounding irony: Where the aims for air quality, endangered species habitat, watersheds, and other irreplaceable high-value assets called for managing vast, uninterrupted landscapes in stasis (i.e. leaving it un-disturbed), all or most of what we were hoping to preserve was lost or severely compromised. Holding onto un-disturbed late-successional stand conditions over very large areas in short-interval fire regimes may have been feasible in a cool, wet climate cycle, but it is proving unsustainable in a hot, dry climate cycle.

There are examples in this country and abroad where people have found ways to reconcile differences among competing values in the larger interest of a safer, more sustainable "whole." There are models where States have adopted laws that integrate the disturbance dynamics of wildland fire to ensure the health and resilience of the whole ecosystem. The mega-fire threat gives plenty of reason to consider these examples and these models and act.

Strategically, we are at an impasse. We can claim a remarkably high suppression success rate, but we cannot close the margin holding nearly all of the consequence. We seem stalled in our ability to increase mitigation to more meaningful scales, within acceptable limits of risk. And, in these highly dynamic disturbance regimes, our regulatory imperative for un-disturbed conditions is crowding out the ecological imperative for protection.

While we remain immobilized, the conditions that predispose these tragedies continue to incubate.