



FIRESCIENCE

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Scanning the Future of Wildfire: Resilience Ahead...Whether We Like It or Not?

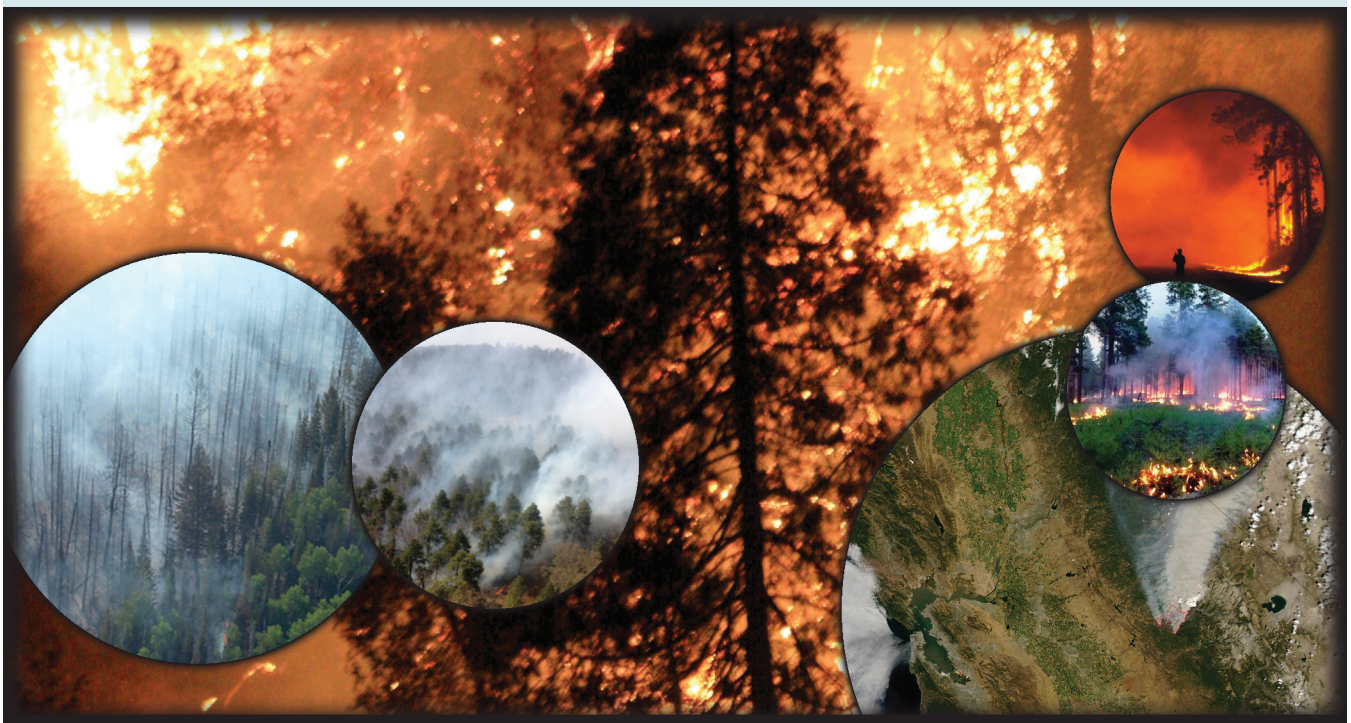
The field of so-called “futures research” provides researchers and stakeholders in a given subject area or system a way to map out and plan for alternate possible scenarios of the future.

A recent research project supported by the Joint Fire Science Program brought together futures researchers and wildfire specialists to envision what the future holds for wildfire impacts and how the wildfire community may respond to the complex suite of emerging challenges.

The consensus of the project’s foresight panel suggests that an era of resilience is ahead: but that this resilience may come either with a very high cost (after some kind of collapse), in a more systematic way (that is, if the wildfire community plans for, and fosters, resilience), or something in between. In any projected future scenario, the panel suggests that the end of the fire suppression paradigm is imminent and that a new paradigm — one that fosters natural resilience of the system, along with natural wildfire—is arising.

A central question emerges from this work:

How will the wildfire community respond to this tipping point?



A Time for Vision

Time travel may be impossible. But what if humans used the best science and the most creative thinking to imagine possible future scenarios and then responded appropriately to present-day circumstances? Take that one step further: What if a group of scholars—trained in what’s known as “futures research”—turned their eyes specifically to the current state of wildfire management after a century of suppression; while at the same time, considering this against the perfect storm of climate change, great social and environmental uncertainty, and a rising tide of catastrophic “unnatural” fires?

You’d have, at the least, an innovative and forward-thinking outlook for wildfire management and transformative ideas for future planning. At the most, such work could help usher out a problematic old-school paradigm in favor of something more science-based, holistic, and generative—as has happened in the past when old, dysfunctional paradigms fall in favor of emerging new science and ideas.

We live in an era unlike any other in human history. Consider that in February 2015 the journal *Nature* published the first direct observational evidence that the carbon dioxide released when humans burn fossil fuels—including those released via forest fires—is responsible for our warming atmosphere (Feldman et al. 2015). By tracking the Earth’s so-called energy account balance, the researchers documented a surplus of energy at the planet’s surface that could only have come from human fossil fuel emissions. It is the world’s first experimental confirmation of this relationship. Yet this direct “smoking gun” evidence of human-triggered climate change is only one of countless studies asserting—and affirmed the world over by the world’s leading climate scientists—that climate change is happening now, that carbon dioxide levels are higher than they’ve ever been in human history, and that civilization as we know it must respond or suffer an ever increasing array of dire consequences.

Meanwhile, there’s the lock-step relationship between climate change and wildfire and its substantial social and environmental repercussions. In their paper “A World on Fire,” Robert Olson and David Bengston address this sobering interaction:

We project that the trend toward larger and more damaging fires will accelerate, driven by two main factors: climate change and fire suppression policy. Decades of suppressing fires as quickly as possible in the United States have created forests that are filled

with an enormous accumulation of forest fuels that would have been cleared out by periodic low-intensity fires in the past. Climate change is creating conditions that make those fuels more likely to ignite: rising temperatures, earlier spring snow melts, longer fire seasons, and more severe droughts. As these wildfires worsen, more people and structures will be in their path due to population growth, especially in the U.S. west and southeast, along with sprawling development patterns and increasing second-home ownership. Managing wildfires will become a far more difficult challenge over the decades ahead.

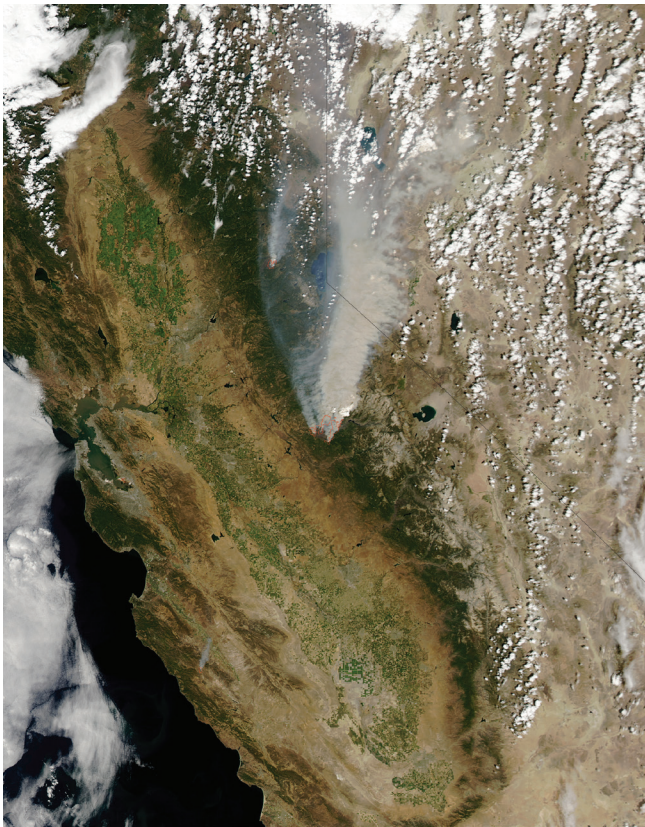
More effective wildfire management will be increasingly necessary in the coming decades. With climate change projected to continue, the inertia of a century of wildfire suppression filling forests with fuel, and increasing eruptions of catastrophic wildfires, evermore people are confronted with the question: What do we do now? In their project funded by the Joint Fire Science Program (JFSP) (JFSP Project No. 12-2-01-61), David Bengston and Robert Olson address this emergent and universal question. Given significant and growing challenges, past approaches to fire management are unlikely to be effective in the future, and thus, more innovative and forward-looking approaches are needed.

It seems the nation is rapidly approaching a tipping point in the historic handling of wildfire and suppression. Further, the current shift in perspective occurring in the wildfire community is not isolated. People around the world face similar issues as they navigate a world confronted with many other emergent challenges resulting from decades of industrialization—much of that progress at severe odds with the Earth’s natural systems. But how will the fire community itself move forward in this time of uncertainty and rapid change? And is there wisdom that the wildfire community can glean from scholars trained to peer into the future?

Why Futures Research?

The wildfire community is well versed in traditional approaches to considering the future. For instance, the Quadrennial Fire Review—released every 4 years—is a synthesis of research and thinking from fire researchers and managers. But futures research takes a fundamentally different tack.

“Unlike the Quadrennial Fire Reviews, in which almost all the input and expertise comes from within the fire and natural resources community, we wanted to get outside the box and think more broadly with



The 2013 Rim Fire of California was the third largest wildfire in recorded state history and the largest wildfire on record in the Sierra Nevada mountain range. This catastrophic crown fire traveled quickly and was extremely difficult to control.

input from outside scholars and thinkers. In this case, from the futures research community,” says Bengston, in an interview. “It’s really a supplemental approach.” Bengston is a social scientist and environmental futurist with the Strategic Foresight Group at the U.S. Forest Service Northern Research Station in St. Paul, Minnesota. He’s authored or co-authored many peer-reviewed papers on the links between social and environmental issues.

Bengston continues, “Science can’t predict certain things because of the inherent uncertainty and complexity of long-term predictions. Futurists recognize this by acknowledging a wide range of uncertainty in alternate future scenarios, then fleshing out the implications of those scenarios. Our hope is that this work leaves stakeholders better prepared for a range of possibilities that could occur.”

By stretching well beyond the fire and natural resource community, scholars less familiar with that community and its current standards, but more versed in futures research, could provide a boon to the work and planning of the community itself. And that’s just what Bengston and Olson set out to do when they piloted their project. Although they didn’t set out to study paradigm shifts per se, the concept arose nonetheless.

“The idea of changing a paradigm comes from the history of science,” says Olson, a senior futurist at the Institute for Alternative Futures in Alexandria, Virginia. “It’s different than changing a theory; it’s about changing the worldview and assumptions on which existing theories in a given area of science are based. We knew when we set out to do this project that a substantial number of people (in the fire and natural resources community) realize that we need a basic shift away from fire suppression. What surprised us the most was that even across a wide variety of possible future scenarios, the kind of paradigm shift we explored not only made sense, our team thought it was nearly inevitable. That was our biggest ‘Aha’ moment.”

“The timing is excellent,” adds Bengston. “The pace and complexity of change we face today is prompting a growing interest in futures research, and governments and organizations around the world are seeking out futurists as they grapple with what’s ahead.”

Discerning the Futures

So what exactly is a “futures” research project, and specifically, how can it help the fire community?

Unprecedented Challenges

U.S. Forest Service General Technical Report NRS-152, "Wildland Fire Management Futures: Insight from a Foresight Panel," lists major challenges the wildland fire management community faces in the 21st century, including:

- The number, size, and intensity of wildland fires have increased significantly in many parts of the world in recent decades, and they are expected to continue to increase in the decades ahead due to projected climate change (Moritz et al. 2012; Stephens et al. 2013). Factors driving increased frequency and size of fires include rising temperatures, longer fire seasons, earlier spring snowmelts, and an accumulation of forest fuels in many areas due to decades of fire suppression.
- The presence of more people and structures in the path of wildland fires has increased the social and economic impacts of fire activity. Related trends include population growth, sprawling development patterns, growing multiple and seasonal homeownership, amenity migration, and interregional population shifts to the West and Southeast (Hammer et al. 2009). Retirement by the

baby boom generation over the next 20 years is expected to intensify most of these trends.

- The cost of wildfire suppression has grown alarmingly and suppression costs are only a small fraction of the full direct, indirect, and postfire costs associated with wildfire. According to Zybach et al. (2009), suppression costs represent no more than 10 percent of actual wildfire costs to society. Studies have estimated that total economic costs can be at least 10 to 50 times suppression costs.
- The frequency of "fire events that cause catastrophic damages in terms of human casualties, economic losses, or both" (San-Miguel-Ayanz et al. 2013) has increased. These large wildfires are distinguished by the extraordinary scope and scale of their impacts. According to Williams (2013), 0.1 percent of wildland fires account for about 95 percent of total area burned and 85 percent of the total costs of suppression. Carbon emissions associated with high-impact fires are positive feedbacks to climate change (Adams 2013).

Source: Olson et al. 2015

"Many of us assume," explains Bengston, "that the kind of future generally seen as 'most likely' is, well, the one that's actually most likely. But we know from early futurist scholars like Herman Kahn at the Hudson Institute that the 'most likely' scenario really isn't. It's actually a low-probability event, and it's risky to plan only for that scenario, or for any one scenario. When the consequences really matter, it's better to plan for a range of alternative future scenarios."

"For example," he adds, "what if there's a collapse? How would fire management respond in that type of world?" As much as we may prefer to imagine a better future, it behooves us to plan for that alternative as well as others.

To that end, Bengston and Olson—working with their research assistants Leif DeVaney (Conservation Biology Graduate Program, University of Minnesota) and Trevor Thompson (Institute for Alternative Futures and Yale School of Forestry and Environmental Studies)—designed a project meant to capture as much innovative thinking as possible by helping participants think about the challenges and opportunities wildfire management would face across a wide range of plausible future conditions. The goal: a contribution to greater capacity for effective planning in this world of rapid change and uncertainty. By casting a net beyond

the wildfire community, the researchers hoped to bring forth new insights and innovations worth sharing.

Casting the Net and Capturing Foresight

Bengston and Olson convened an online gathering of some of the leading academic and professional futurists along with two prominent wildfire professionals. "Even though we wanted the outside perspective of the futurists," says Bengston, "it was important to have a couple of exceptional wildfire specialists on the panel too, for their perspectives and background knowledge. They served as excellent resources to the futurists throughout the discussion."

Then, they asked all the panelists to read a series of background papers to bring them quickly up to speed on wildfire management, policy, and emerging issues. These papers provided a shared context from which to start a conversation.

"We had fun working with seven of the top futurists in the United States. It was an incredibly dynamic and collaborative process because all the panelists got so engaged and invested," says Bengston. "And we have Bob Olson to thank for that. Bob designed the asynchronous approach we

used, which was fantastic. By using social media platforms, panelists could go into the forum we used at their convenience, read up on what others said, consider their own perspective, then add in their thoughts. Because it's not a 'live' forum, everyone had plenty of time to be discerning about what they shared. It produced a truly thoughtful and interesting discussion."

In fact, a key element to the team's approach was this use of Internet-based conferencing technology. Without the social media platform at each panelist's fingertips, the project would have been impossible. More and more, these pioneering tools allow people to respond and act in ways they simply couldn't a few years ago.

The foresight panel that engaged in the project's online conversations included two wildland fire professionals, six futurists, and, for added creativity, a science fiction author. "We had the award-winning sci-fi and fantasy author Elizabeth Hand on board, and she was a terrific thinker and contributor to the group," says Olson. Bengston agrees, "As an author who has developed imaginary futures inspired by current events, she had a lot to say."

"It was incredibly fascinating to jump into," responds Hand. "I'm not a fire scientist, so I came at this as a lay person unfamiliar with the material. What I learned was both interesting and distressing."

To capture the thoughts of each panelist, the team set up a series of discussion "rounds." In Round 1,

Foresight Panel Participants

Futurists

1. **Peter C. Bishop:** Retired associate professor of strategic foresight and director of the graduate program in futures studies at the University of Houston; founding board member of the Association of Professional Futurists; president of Strategic Foresight and Development.
2. **Jamais Cascio:** Professional futurist at OpentheFuture.com; distinguished fellow at the Institute for the Future; senior fellow at the Institute for Ethics and Emerging Technologies; cofounder of WorldChanging.com.
3. **James A. Dator:** Professor and director of the Hawaii Research Center for Futures Studies, Department of Political Science; former president of the World Futures Studies Federation; cofounder of the Institute for Alternative Futures.
4. **Elizabeth Hand:** Award-winning visionary scenario writer; author of 15 novels and 4 collections of short stories; faculty member at the Stonecoast MFA Program in Creative Writing at the University of Southern Maine.
5. **Michael Marien:** Former editor of *Future Survey*, a scanning service published monthly by the World Future Society from 1979-2008; director of GlobalForesightBooks.org; has published a large number of articles in leading futures research journals and other scholarly journals.
6. **Jonathan Peck:** President and senior futurist at the Institute for Alternative Futures; futures work spans scientific, economic, political, and social changes that can be addressed with an understanding of complex systems dynamics.

7. **David Rejeski:** Director of the Science and Technology Innovation Program at the Woodrow Wilson International Center for Scholars; former head of the Future Studies Unit at the U.S. Environmental Protection Agency.

Wildland Fire Professionals

8. **Sarah McCaffrey:** Social scientist with the U.S. Forest Service Northern Research Station's "People and Their Environments" research unit; internationally recognized expert on the social dynamics of fire management.
9. **John Phipps:** Director of the U.S. Forest Service Rocky Mountain Research Station; former senior advisor in the Deputy Chief's Office, U.S. Forest Service, State & Private Forestry; develops policy analysis and options for national fire issues.

Facilitators

10. **Robert L. Olson:** Senior fellow and founding board member of the Institute for Alternative Futures; former project director and consultant to the Director, Congressional Office of Technology Assessment.
11. **David Bengston:** Environmental futurist and research forester with the U.S. Forest Service Northern Research Station.

Source: Olson et al. 2015

the panel reviewed and discussed the initial series of background papers and then compiled a list of major themes which they used to jumpstart the first series of asynchronous discussions. Then, in Round 2, the project leaders posed three alternative future scenarios (see sidebar titled Three Scenarios) that described “a wide range of plausible social, economic, and technological contexts for fire management in the future” (Olson et al. 2015). Panelists responded to prompts about what sorts of changes in wildfire management would be helpful, or required, given each scenario. They also considered best practice adaptations in wildfire management in the face of each possible future.

Interestingly, it was here in Round 2 that discussion of a new paradigm spontaneously emerged and generated substantial insight and innovative thinking in Round 3. “The essence of this paradigm shift,” write the authors, “is that the current prevailing ‘war on fire’ paradigm (focused heavily on suppression) will increasingly fail and that we need to embrace a new paradigm of wildland fire management that focuses on learning to live with fire and creating fire-resilient communities” (Olson et al. 2015) (see Table 1).

Three Scenarios

The following are abbreviated sketches of the three scenarios presented to the foresight panel participants:

Scenario 1: Decline/Collapse

- Slow economic growth and then decline stretching into the foreseeable future
- An increasingly polarized, dysfunctional, ineffective federal government
- A sharp decline in government spending
- Progress in science and technology slowed or derailed in most areas
- Peak oil; the natural gas revolution proves shorter-lived than expected; soaring energy prices; limited financial ability to invest in renewables or nuclear
- Stressed ecosystems, severe water scarcities, some environmental impacts eased by economic decline
- Carbon emissions stay high for a time with growing reliance on tar sands and coal, then decline as growth falters
- Growing social unrest at first; growing local self-sufficiency over time

Scenario 2: Moderate Growth

- Economic recovery with continuing moderate growth in U.S. and global economies
- Easing of political polarization, some improvement in government functioning
- Slight easing of economic disparities and social tensions
- Cuts to entitlements and other government programs, but increased spending in highest priority areas

- Continuing technological advances, but few major breakthroughs
- Boom in shale gas and oil, significant growth in renewables
- Increasing pollution, environmental damage, resource depletion, sprawl
- Accelerating climate change
- Major increase in wildfires in U.S. and globally

Scenario 3: Technology Transformation

- Rapid technological progress accelerates growth, but there is less emphasis on consumption; more emphasis on investment in energy and resource efficiency, renewable energy, advanced manufacturing, and sustainable agriculture
- Revitalized, smaller, and more efficient government; budget cuts in some areas but heavy spending in highest priority areas
- Major breakthroughs in several areas of technology
- Energy system transformation with large investments in energy efficiency, clean energy technologies, smart grids, and energy storage
- Reduced environmental impacts and resource depletion despite growth, but global impacts are still high
- Unprecedented mobilization to deal with climate change
- High receptivity to innovation; adaptive leadership; sense of common purpose animates society (creating a sustainable future, shifting to clean energy, minimizing climate change, and achieving a higher quality of life)

Source: Olson and Bengston 2015

Table 1. Contrasting fire management paradigms (Olson and Bengston 2015)

Dominant Paradigm	New Paradigm
“War on fire”	“Work with the flow” of natural processes
Wildfire is destructive	Wildfire is a necessary natural process
Control wildfire on the landscape	Learn to live with fire on fire-adapted landscapes
Prevent and suppress fires	Create fire-resilient human and natural communities
The problem is that wildfires are escaping our control	The problem is that always suppressing natural wildfire is creating an unsustainable buildup of fuels which results in dangerous “unnatural fire”
The solution is to apply existing procedures and technologies more strongly to bring fires under control	The solution is to develop a more holistic approach to fire management where local communities, adjacent property owners, and governments work together to comanage fire risk

Finally, in the last round, panelists held three central discussions revolving around what was generated via Rounds 1 and 2. These included: (1) Actions and strategies appropriate in all three scenarios; (2) Does the new paradigm, developed in Round 2, “work” in all three scenarios; and (3) Institutionalizing foresight in the wildfire management community (Olson et al. 2015).

Says Leif Devaney, one of the team’s research assistants and a recent PhD graduate in conservation biology, “It was, I believe, a truly groundbreaking project that allowed the incorporation of creative and innovative thinking into the search for solutions to a critical yet underappreciated issue in today’s world—the growth of wildfire and how to deal with it.”

Something Fiery This Way Comes?

“If something cannot go on forever, it will stop.”

– Herbert Stein, Economist

What the futurists arrived at, after their learning and extensive discussion, is a perspective shared by many inside the wildfire community itself: The historic management paradigm is quivering beneath the weight of a century of suppression, and something’s gotta give.

Olson and Bengston write in their paper “A World on Fire,” “The panelists all eventually came to a

High-intensity fires in suppressed systems often devastate the area and severely hinder recovery. According to this study, resilience in suppressed systems may come through intense, expensive, and unwanted “unnatural” events; through an active shift to integrating wildfire back into ecosystems as a natural part of healthy landscapes; or through a mix of both.



Skunk Fire prescribed operations in Arizona in 2014.



Trees torching in High Park Fire in Colorado in 2012.



Postfire landscape in 2001 where the South Hollow Fire burned in the Uinta National Forest.

sobering conclusion: The wildfire threat will worsen, with no end in sight, as long as the current approach to wildfire management continues. Climate change will increasingly stress many forests, making them more vulnerable to fires. Constant fire suppression and the buildup of fuel will increasingly create conditions for megafires that we cannot control. By always aggressively suppressing fires now, we are transferring worsening fire risks into the future” (Olson and Bengston 2015).

Sarah McCaffrey, one of the two wildfire specialists on the panel, is a social scientist with the U.S. Forest Service Northern Research Station’s “People and Their Environments” research unit and an internationally recognized expert on the social dynamics of fire. She says, “In the initial round of discussions, the panelists began to understand how the tendency to focus on modifying hazards—for instance, dams and levees for floods, suppression with wildfire—only tends to raise the threshold: we end up with bigger floods, more massive fires. That realization led the discussion away from the initial focus on technical solutions, which can only help to a point, to recognition that the much bigger issue at hand is

modifying human behavior and response, in terms of both the public and the fire community.”

“That’s when things got more interesting,” she goes on. “That’s when John Phipps (see sidebar titled Q&A Spotlight) outlined a vision of the preferred future of fire resilience, and we all got pretty excited about that. We talked about how to shift the culture to comanagement and resilience... Both this futures project and the QFR [Quadrennial Fire Review] provide useful insights and end up in similar places but from different angles. The challenge will be moving beyond their observations to taking actual steps that support the discussed need to shift away from controlling fire toward coexisting with it.”

“The thing is,” agrees Olson, “this is a reinforcing study. It reminds us of what we already know. The question now is: How do we bust the influence of the old fire suppression paradigm, and more importantly, how do we build in a greater capacity to move forward in a way that builds resilience? My hope is that this work can help accelerate the wave of change coming to the wildfire management community.”

It may be reinforcing, but it’s also novel in its approach to seeking an outside-the-box vision. As in other cases (unrelated to wildfire), when futurist perspectives are applied to situations of concern, a wider and potentially more effective array of response planning is available to stakeholders. “There’s a growing international recognition of the importance of futurists’ work” says Bengston. “It’s up and coming, and there’s evidence around the world of a surge in futures thinking and application.”

In this particular case, the futures panel set down some key findings that both align with, and help advance, what’s already becoming evident within the wildfire community. For instance, the panelists conclusively agreed that “As conditions change, the traditional fire prevention and suppression approach to wildland fire management will prove unsustainable” (Olson et al. 2015).

This will come as little surprise, and examples already exist of communities and regions just beginning to come to terms with the legacy of a hundred years of fire suppression. But this suite of findings taps something even more fundamental. As Olson says, “We’re talking about the whole way human beings relate to nature here. How we move forward right now is crucial to our success as a species. Our approach for the last hundred years has been to try to dominate nature. Now we are seeing the vital importance of learning to work with nature; of working in harmony with natural systems.”



Humans and wildfire have failed to easily coexist during the last 100 years. Fire suppression has led to massive fuel buildup and off-kilter ecosystems, increasing the risk for catastrophic fire nationwide. The Georgia Bay Complex Fires, depicted here, destroyed nearly half-a-million acres in 2007.

His perspective is fueled, in part, by another key finding from the study: “The level of uncertainty about the external developments and future conditions that will set the context for wildland fire management is significantly greater than is recognized in past Quadrennial Fire Reviews (QFRs) and current planning” (Olson et al. 2015). Those are troubling words. If true, it means the system as it stands now—and the wildfire community itself—is not sufficiently prepared for what may lie ahead. Is a future fierier than we’ve yet imagined a likelihood?

Resilience Ahead: One Way or Another

“One of the more depressing moments in the scenario discussions was the observation that, at this point, reestablishing resilience to the system may be most likely via the collapse scenario...”

– Sarah McCaffrey, U.S. Forest Service
and foresight panel participant

Perhaps the most curious and important point of discussion arising amongst the panelists is their consensus that resilience is coming: one way or another. It may sound ironic, but the underlying rationale of their insight is both provocative and reasonable. Here’s the thinking: In the collapse scenario, resilience is reset by nature and “the war on fire would end by force of necessity. With government unable to shoulder much of the fire-protection burden, communities would be forced to assume the primary role themselves through comanagement of risk by citizens and adjacent landowners” (Olson and Bengston 2015). Further, those communities that “fail to accept this role would burn if fire passes through them,” while proactive communities that adopt resilience strategies (e.g., created their own fire-safe

communities) would more likely survive any fires, and the massive buildup of fuel would eventually decline (Olson and Bengston 2015).

Meanwhile, there’s the optimistic third scenario in which humans establish a harmonious approach to working with natural systems, not against them... the so-called technology transformation future. In this case, the panelists are convinced that the known resilience strategies we already have would easily be adopted because, “This approach fits the culture of the scenario, which is open to innovation; supports adaptive leadership; and promotes commitment to moving toward a sustainable future” (Olson and Bengston 2015). In this case, resilience strategies are enacted across the country; massive fuel buildup is strategically eliminated; communities become fire-safe; and with appropriate policies, management, and planning (many of which we already have), the landscape eventually reverts back to a resilient fire regime.

Then there’s that familiar second scenario: business as usual (a.k.a. moderate growth). This one is thorny. In business as usual, the current resistance to shifting away from suppression remains, and the war on fire continues, escalating risks and consequences. The panelists still foresee an eventual move to adopting resilience strategies in one of two ways: (1) In the “preferable way,” a more science-based approach to managing risk arises in wildfire management as evidence grows that pursuing fire resilience is actually more cost effective than continuing efforts focused primarily on suppression; and (2) In the “undesirable way,” current practices would continue for another generation or two—landscapes would experience more and more catastrophic fire events, fighting fires would be increasingly dangerous, and fire suppression costs would continue to escalate, until finally the failure of the fire suppression approach could no longer be denied.



Low-intensity burnout operations on the Slide Fire in the Coconino National Forest in northern Arizona in May 2014. Managers employing effective strategies such as these are a crucial part of the journey to resilience.

Q&A Spotlight: Panelist John Phipps

At the time of his participation on the futures research panel, John Phipps was the senior advisor and Associate Deputy Chief for U.S. Forest Service State and Private Forestry Programs. As of February 2015, he was appointed Director of the U.S. Forest Service Rocky Mountain Research Station.

As a panelist on the futures project, Phipps proposed a “2050 Vision” in Round 2 that synthesized the challenges presented by the so-called war on fire, the need to shift away from that historic management legacy, and the need to generate further discussion of the emerging new paradigm. Here, Phipps talks about his experience on the foresight panel, his thoughts on the future, and what he’d like to see happen next.

How was it, taking part in the foresight panel with the futurists?

I enjoyed it very much. I especially enjoyed the social media part of this. It was really interesting to have all of us in different times and places yet still be able to have these intense, fascinating discussions. It was a great intentional use of a social media platform. And as the wildfire specialists talking to the futurists, Sarah [McCaffrey] and I had fun.

What were the panelists’ views like, coming into the discussion?

At first, they had a fairly pedestrian view: they had a pretty general idea of what wildfire was and what it means now, in terms of how we respond and manage. For instance, they seemed very concerned about the predictions for the large megafires, and at first, they focused mainly on tech solutions to fight those fires. But the background materials they had—and our discussions—helped them see otherwise.

Can you say more about that?

I explained that these megafires are basically human caused. We’ve been selecting for larger fires, then selecting for more intense fires for years. In a very real sense, our behavior has created the conditions for these catastrophic “unnatural” fires. After the big fire of 1910, we went immediately to systematic suppression. Remember the 10 a.m. policy? The one that says, “If there’s an ignition, get the fire out by 10 a.m. the next day?” We did that for decades. The more we suppress systems that are fire adapted—those regions that “grew up” with frequent, low-intensity fire—the riskier things get. We’ve created that risk. Now the landscape is so extensively out of balance that the risk of letting it burn is incredibly high. These fires can skip along at an unprecedented rate.

This sounds like fertile ground for a paradigm shift...

Yes, absolutely. A new paradigm is coming. The question is, how long is it going to take? At this point, once you

understand what’s happened out there, and how human behavior has caused the problem, you begin to see that things can only go in a couple of different ways. One is a catastrophic reset of the system, which no one wants to imagine. Another is that we use evermore resources running up our risks even higher because we are, of course, driven to protect life and property. Even if a community is fire-safe, we usually do everything we can to stop—or exclude—the fire. Then, eventually, some catastrophic event will shift things in the future...it’s really only a matter of time if we keep up with business as usual. At this point, we need to reframe the whole conversation around wildfire like this: It’s not if, but when.

So where does futures research fit in here?

It’s about a risk management approach: that’s the whole point of the different futures scenarios. You anticipate these different scenarios, find the common tactics that work across all of them, then you implement those. And really, this is about going upstream. Once you know what’s going on upstream (what’s causing the risks to escalate) you can adopt management strategies that mediate and reduce those risks, and make the entire system (or suite of systems) healthier and more resilient. The biggest problem so far is that nobody wants to go upstream.

How do you mean?

Think about it. We’ve got all these communities that aren’t fire-safe. There’s a systemic expectation that if a fire erupts, the firefighters and air tankers will arrive in droves to save property. But what if we made it clear that the communities that aren’t being proactive about fire safety don’t get as much resources and backup? Front Range fires are only going to get worse, and air tankers are just not that effective. On bad days in very fire-suppressed areas, fighting those fires can be futile. It’s literally like dropping dollar bills on wildfire.

Then how would you get upstream to reduce those risks?

That was part of how I envisioned my work on the panel. A culminating idea was to define a fireshed; that is, a community with a fire-defined boundary. Then create a local fire advisory governance board that advises the community on how to create a fire resilient management approach and that gets local citizens involved.

The problem, of course, is legislation. Politicians are focused on the immediate needs of their constituents, and going upstream to address these issues is philosophical for them: until the next catastrophe. But even then, we often just throw more money on tech solutions to fix a problem that can’t be fixed without going upstream.

Q&A Spotlight: Panelist John Phipps (*continued*)

Do you think it can be done?

Well, we [the U.S. Forest Service] have an allocation for hazardous fuel reduction. But I think people have a very hard time thinking about the scale, scope, and magnitude of what we'd need to do, right now, to reduce the massive buildup of hazardous fuel across these ecosystems and reintroduce natural, low-impact fire. There has to be low-impact fire across the landscape as part of this plan. There's just no substitute for natural fire.

Consider this: In presettlement California, 20 percent of the state was on fire. All the time. It was a constant mosaic of shifting low-intensity natural fire that meant a healthy, resilient landscape and zero megafires.

People aren't going to want to hear about that...

Maybe not. But it's high time we start having a public conversation about how we really got here and what we can actually do now to go upstream to mediate these risks. For instance, if building standards required people in these areas to adopt and implement appropriate ignition zones around their homes, research has shown that those homes can withstand any fire. Then, over time, we can use management strategies to shift the entire system back to low-intensity natural fire, instead of these unprecedented, unnatural megafires that humans have created. As it stands, it costs a fortune to deal with these fires because of this legacy of suppression. The Forest Service spends \$1.4 billion a year, and those costs will only increase if we don't go upstream.

Plus, no one really wants to admit that human behavior has created this legacy and that this is really a much bigger factor in where we're headed now than climate change. We talk about how climate change and fuel buildup are the problems. But the bottom line is that we humans are the culprits. Our war on fire is what has caused the current dilemma. Climate change is definitely going to exacerbate it, yes, but if we didn't have all the buildup and problems resulting from suppression/exclusion, the whole system would be more resilient in the face of climate change.

You said there's an example of making homes safe inside ignition zones?

Not just one, but many. One example that comes to mind happened in Ventura County, California. There, Fire Chief Bob Roper came in and helped instigate changes that then required homeowners to be fire ready. [NOTE: At the time, Chief Roper was committee chair of the International Association of Fire Chiefs Wildland Fire Policy Committee. There he'd helped launch a program called "Ready, Set, Go" which "teaches residents of the wildland-urban interface—the area where development meets natural vegetation—how to prepare their homes against the threat of a wildland fire, assemble emergency supplies and maintain awareness when threatened by a wildland fire and, finally, how to evacuate early to keep

their families safe and allow emergency responders the room they need to operate safely." (IAFC News Release)]

So, if the homeowners weren't ready by a set time, his team would come in, make the home fire ready, and then bill the homeowner. When fire came through (remember: When, not if...) there were very few houses lost and a dramatic outcome for everyone. The communities are now resilient and fire-safe, and the lessons learned are being adopted by other communities around the country on the wildland-urban interface. That's just one of many examples of shifting the system to go upstream.

Which brings us back to a paradigm shift. Do you think it's happening?

The system is finally shifting. I've been beating this drum about going upstream and reducing risk for years. And we're finally starting to see conversations changing on all this, but not so much the behaviors. Plus, the problem is growing every year. Photosynthesis keeps on happening, and every year we add more and more fuel to these suppressed (and fire excluded) landscapes.

It's daunting to find our way back to the natural pattern: in some ways the gap from here to there is too big to comprehend. But we can't use the same thinking that got us into this problem to solve it.

Are some of the changes proposed by the foresight panel useful?

*That's what the foresight panel did; they came at this whole thing from an outside-the-box point of view (see sidebar titled *Tactics to Foster Resilience*). They went upstream. But until there's leadership at the political level, it's going to be hard to make these changes. Our dominant paradigm is about organizing to react; it's not about going upstream.*

What would you do to change the paradigm?

I'd put all of what we know—the reality of how fire actually works in natural systems—into fireheds across the country and make communities responsible for themselves and their fireheds. This takes the whole problem upstream and makes for realistic comanagement of risk that fosters and promotes local, community-wide resilience. If you haven't changed the risk upstream, there are very few options downstream. Once we get ourselves out of this very destructive habit of responding, and we understand the reality of the problems on a societal level, everything will change.

We did what Smoky asked. We prevented forest fires. Now we need a new message: We did it, but now it's time to fix it.

Fostering Resilience

“It’s gonna tip...where we are now is a wild card.”

– Elizabeth Hand, Award-winning author
and foresight panel participant

If a resilience approach is coming across any given scenario as suppression fails, then what are the central, driving “next steps?” And do these align with other similar work (e.g., Quadrennial Fire Review, National Cohesive Wildland Fire Management Strategy)?

Says science fiction and fantasy author Elizabeth Hand, “People are already more aware that fire has a positive impact on the environment, including wildlife, underbrush, new growth, etc. They’ve seen what happened at Yellowstone. In general, people are starting to get it. The idea that fires should be allowed to burn is becoming more mainstream, and that marks a huge tipping point in the culture from domination to resilience.”

Given this tipping point, how will the wildfire community proceed? What are the best strategies to foster resilience now and minimize the risk of catastrophic consequences? Because of their outside-the-box thinking, the foresight panel’s insights and suggestions could prompt the shift to resilience strategies more quickly. The panel sought to find the most cost-effective, easily adopted, and both proven and novel strategies to facilitate the shift to fire resilience. Importantly, they wanted the most “robust” approaches—tactics that will work across the board in a wide range of possible future scenarios, including those that could work even in a worst case collapse scenario. Remarkably, they found that many of these strategies already exist at small scales. Bringing those more to the forefront could dramatically help foster the shift to resilience.

“We talked a lot about how to get the science and information across to the public in a palatable and interesting way,” says Hand. “We’d love to see the Forest Service and other involved entities really use social media and get kids and younger people involved.”

“Yes,” agrees Olson, “as one of our panelists, David Rejeski argued, we know from research that even children can be taught to do very sophisticated ‘systems thinking’—understanding how different things interact—and tools like social media and ‘serious games’ or ‘playable simulations’ can help people understand these interconnections. There are profound interactions between fire and climate change,

Tactics to Foster Resilience

The foresight panel recommended the following efforts to help the wildland fire management community shift toward fire resilience:

- Do trainings that cultivate an adaptive leadership stance, in which the leader does not have all the answers. A central leadership task is to span organizational boundaries and to facilitate people learning together, experimenting, and cooperating to solve problems.
- Use awards, certifications, and competitions to encourage innovation. For example, create a LEED-type certification program for fire-resistant homes, and organize fire resilience design competitions sponsored with architecture schools, landscape architecture programs, and materials science programs at engineering schools.
- Create an ongoing and innovative public relations effort highlighting the fire resilience approach. Shift Smokey Bear’s message from “Only you can prevent forest fires” to something like “Only you can make your home and community fire resilient.”
- Connect wildfire management to larger global concerns for sustainability and security; low cost steps could include encouraging organizations like the Worldwatch Institute and the World Resources Institute to conduct studies of sustainable approaches to wildfire management.
- Conduct additional social science research to more fully understand the human dimensions of a fire resilience approach.
- Provide additional “how to do it” information on becoming fire resilient in many forms and through many different channels.
- Utilize “serious games” and playable simulations to train first responders and to engage communities, homeowners, and children.
- Help educate the political community about the true nature of wildland fire problems.
- Support the development of a new fire economics that incorporates long-term thinking and the value of life-supporting ecosystem services.
- Finally, the panel agreed that institutionalizing futures planning in wildfire management should be ongoing and directed into routine planning and policy.

Source: Olson and Bengston 2015

and between those things and energy, water, food, and biodiversity. We need to get information across to the public and political leaders in ways that help them see these interconnections. At the deepest level, the whole way we relate to nature requires a paradigm shift. It's crucial to our success as a species to understand that we are not outside or above nature, and nature is not just there for us to exploit. Rather, we come out of nature, we are nature, a unique manifestation with the ability to understand what we are and take responsibility for acting in a way that fosters the well-being of the whole community of life of which we are a part."

"This futures project on fire management has shown us very clearly, and excitingly, that we don't need to throw our hands up. We just need to work with—not against—natural processes," says Olson. "And let's not abandon Smokey," he adds with a grin. "It's time to use his authority to help change course."

Beyond the Futures: A New Paradigm Now?

"Wildfire is one of the most basic and ongoing natural processes on Earth."

— Moritz et al. 2014, *Nature*,
"Learning to Coexist with Wildfire"

As happens with other pivotal moments of change in history, the current paradigm shift in the wildfire community is crossing a threshold. In his best-selling landmark book "The Tipping Point," Malcolm Gladwell even uses the analogy of wildfire. From the book's homepage: "The tipping point is that magic moment when an idea, trend, or social behavior crosses a threshold, tips, and spreads like wildfire."

In this case, the idea that wildfire is a natural and important process, is also spreading...well, like wildfire. Beyond the futures project discussed here, others are voicing the urgent need to change course.

Penny Morgan is a professor in the University of Idaho's Department of Forest, Rangeland, and Fire Sciences. She says that the Quadrennial Fire Review, too, is looking to the future, with broad input from within the fire community itself (as opposed to the futures research project which sought outside input). She responds in an interview, "Fire science and management need to be strategic. Our approaches have been all too often tactical."

"The futures research outlines what many of us are asking ourselves: How do we coexist with wildfire?"

Fires will occur, many will be large, and many will occur at once. Further, many ecosystem services we value depend on fire or other disturbance, though fire effects can also be detrimental. How do we balance that with the need to protect people and property?" poses Morgan. "We need a more nuanced approach to fire management that's not dominated by suppression but includes all the tools in the tool box. We've got to admit that we can't buy enough air tankers to make fire go away."

Steve Bunting, a professor emeritus of rangeland ecology at the University of Idaho who has long been teaching and doing research in fire, is also concerned. "There's a lot of talk about the need for resilience in the fire community, but I don't see it much otherwise (outside the community). We need a concentrated effort to educate the public about resilience and how to coexist with natural fire in ecosystems."

It seems that endeavor, with all the hallmarks of a tipping point, is quietly underway. From Moritz et al.'s (2014) review in *Nature* that drives home the essential and critical need to change the way we live with fire around the globe; to the Quadrennial Fire Review, which employs not only innovative social media crowdsourcing in its quest to strategize a better response to wildfire management, but also captures and documents the emergent paradigm of resilience; to programs like the National Cohesive Wildland Fire Management Strategy, JFSP Fire Science Exchange Network, Fire Adapted Communities Learning Network, and Fire Learning Networks run by The Nature Conservancy—people, stakeholders, and communities are responding to the consequences and complex realities of fire. [Note: Please see Additional Sources and Relevant Websites for links to these and other resources.]

The big question now is: Will it happen rapidly enough to minimize lives, losses, and costs (human and otherwise)? In a Berkeley College of Natural Resources article on the Moritz et al. *Nature* review, Moritz said, "We don't try to 'fight' earthquakes—we anticipate them in the way we plan communities, build buildings and prepare for emergencies. We don't think that way about fire, but our review indicates we should. Human losses will only be mitigated when land-use planning takes fire hazards into account in the same manner as other natural hazards like floods, hurricanes and earthquakes" (Guy 2014). Like the foresight panel, the authors of the *Nature* review urge a rapid paradigm shift in how society interacts with and manages fire.

Steve Pyne is a well-known author and researcher on wildfire with numerous landmark writings on wildfire and the history of wildfire, with more on

the way. Like so many others, he's deeply troubled. "We just haven't owned up to the fact that this is a political issue. We are way past the option of restoration. Resilience is all we have left, and we really don't control fire anymore. It's a pretense. We're crossing the stream on logs. We can use what we know to help guide the system to resilience—but we need to face up to that fact that we're making the best of a bad job and give this paradigm shift, that is definitely happening, the best possible direction. We can use the science, but in many ways we're beyond that: we need to hedge our bets and get smarter about the realities we face. For instance, let's figure out how to do these intense burnouts better, acknowledging these places that need to burn."

Yet Pyne is also optimistic with what's emerging. "This futures project covers a lot of what's addressed in the National Cohesive Wildland Fire Management Strategy, which not everyone is familiar with yet. To me, this cohesive strategy could be our new 'fire constitution.' It's powerful, but without money and political will to back it, it's just not real. It's under the radar for now, but it's a powerful approach to bringing about the shift to resilience."

It may be under the radar, but with the foresight panel's work on this futures research on wildfire, and the inevitable and increasingly apparent tipping point now underway, it seems society could be on the verge of something like that "2050 Vision" and resilience paradigm envisioned by the foresight panel. "I get hopeful when I see communities across the West grappling to protect their communities," concludes Morgan. "People around the country are coming together, finding common ground, and starting to figure out how to precondition the landscape for resilience and fire safety. This is creating jobs and reducing risks. Folks are getting proactive and empowered to shape their own futures. And that's a win-win for everyone, humans and nature alike."

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Fire Learning Network (via Conservation Gateway and The Nature Conservancy): www.conservationgateway.org/ConservationPractices/FireLandscapes/FireLearningNetwork/Pages/fire-learning-network.aspx

JFSP Fire Science Exchange Network, Connect to Local Experts: http://www.firescience.gov/JFSP_exchanges.cfm

National Cohesive Wildland Fire Management Strategy: forestsandrangelands.gov/strategy/

Quadrennial Fire Review: forestsandrangelands.gov/QFR/

World Futures Studies Federation: wfsf.org/



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