

Fire Management *today*

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COMMUNITIES ADAPTING TO WILDLAND FIRE



United States Department of Agriculture
Forest Service

Editor's note ...

In recent years, *Fire Management Today* has for various reasons been in transition:

- In 2015, we were able to publish only three issues.
- In 2016, we were unable to publish any issues at all.
- In 2017, we were able to publish only two issues.
- In 2018, to help make up, we expect to publish five issues. After that, we will be back on track with four issues per year.

Beginning in 2018, we have switched over to online publishing only. To make *Fire Management Today* easier to read online, we will be adopting a new format (which you will be able to print out as needed). Stay tuned!

Special issue coming up ...

The next issue of *Fire Management Today* focuses on global wildland fire management. You can read about how countries around the world are meeting the challenges of wildfire.



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On the Cover:



Oak savanna restoration on the Sherburne National Wildlife Refuge through a 1,724-acre (690-ha) prescribed burn in the wildland-urban interface in Minnesota in 2012.

Photo: Russ Langford, U.S. Fish and Wildlife Service (April 5, 2012).

The USDA Forest Service's Fire and Aviation Management Staff has adopted a logo reflecting three central principles of wildland fire management:

- **Innovation:** We will respect and value thinking minds, voices, and thoughts of those that challenge the status quo while focusing on the greater good.
- **Execution:** We will do what we say we will do. Achieving program objectives, improving diversity, and accomplishing targets are essential to our credibility.
- **Discipline:** What we do, we will do well. Fiscal, managerial, and operational discipline are at the core of our ability to fulfill our mission.



**Firefighter and public safety
is our first priority.**

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By Shawna A. Legarza, Psy.D.
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THE URGENCY OF COMMUNITY ADAPTATION TO WILDLAND FIRE

Over the last few decades, wildfire seasons have grown longer, more large wildfires have been occurring, and the average number of acres burned nationwide annually has been increasing. Scientists predict all of these trends to continue into the future. Wildland fire management is always a challenge, but when wildfires burn into the wildland–urban interface—the places where human development and wildland fuels intersect—they threaten communities, civilian lives, economies, and cultural resources.

The Forest Service has an important role to play in helping communities reduce wildfire risk. Along with other Federal, Tribal, State, and local partners, the Forest Service works to educate communities about the need to adapt to wildfire. But simply telling people and communities what they need to do doesn't result in action. We have to reach out across National Forest System boundaries and work hand-in-hand with neighboring communities to help reduce wildfire risk. Community wildfire risk reduction is the result of trusted relationships built over time and based on best practices. Leaving a doorhanger or passing out literature during a community event is not true engagement.

One of the biggest challenges to community wildfire risk reduction is local capacity to get the work done on the ground. Expanding this capacity by partnering with local

Community wildfire risk reduction is the result of trusted relationships built over time and based on best practices.

communities to form mitigation coalitions or partnerships is a priority. Stakeholders working together can share responsibilities, ideas, projects, and outcomes. We will all accomplish far more together than separately.

Reducing wildfire losses depends on implementing the full suite of long-term, sustainable collaborative community actions for fire adaptation. Research shows that structure hardening—that is, reducing a structure's vulnerability to ember intrusion—is the most effective way to reduce ignition from wildfires. Structure hardening, combined with creating defensible space, not only helps improve the chances that structures will survive wildfires but also enhances safety for firefighters.

But structure hardening and defensible space are not enough. Community fire adaptation also depends on mobilizing adequate local fire protection resources, carrying out effective wildfire prevention programs, establishing safe zones, and reducing hazardous fuels in and near communities. The Forest Service

completes hazardous fuels reduction and landscape restoration treatments on an average of 2.8 million acres (1.1 million ha) each year. These treatments have been proven to work. Assessments of 3,700 fuel treatments since 2006 have shown that they are effective in reducing wildfire behavior and helping to control wildfires.

All of these efforts are more easily accomplished through collaborative partnerships using a good community wildfire protection plan as a guide. The Forest Service works in partnership with national, regional, State, Tribal, and local governments and nongovernmental organizations before wildfires start, helping prepare the public in advance. Working with partners, the agency prepares collaborative responses to wildfires, including taking advantage of teachable moments, for example through community mitigation assistance teams.

Helping communities reduce wildfire risk strengthens relationships and protects local economies—and could save civilian or firefighter lives. In addition, prepared communities are safer to protect and provide more decision space for firefighters looking for defensible space or an anchor point. The wildfires that occurred in California in the fall of 2017, which killed 44 citizens and destroyed thousands of homes, businesses, and other structures, highlight the urgency. Wildfire knows no boundaries and neither should we. ■

HELPING COMMUNITIES ADAPT TO WILDLAND FIRE: SOME POINTERS

Pam Leschak

The wildfire landscape is like a patchwork quilt. Each piece represents a stakeholder: private timber producers; State lands; rural homes and farms; communities; Tribes, pueblos, or reservations; refuges; Federal lands and watersheds; and community parks. And all of those stakeholders have values at risk that they want to protect from wildfire. It is those values at risk and the actions we take to protect them that hold the quilt together and make the whole quilt cohesive. Rely too much on one piece and the others loosen up or fail completely. Making it all work together is cohesive wildfire management.

The National Cohesive Wildland Fire Management Strategy stresses the importance of working together, hand-in-hand, to effectively and safely respond to wildfire when needed, restore forest health, and help communities live safely with wildfire.

The articles in this issue are samples of some of the collaborative efforts that the Forest Service Fire and Aviation Management's Landscapes and Partnerships staff supports. We can "move the needle" toward more community fire adaptation by working collaboratively across

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Burned structure following the 2017 Chetco Bar Fire in Oregon. Photo: Community Mitigation Assistance Team, USDA Forest Service.

The work done on the ground at the local level is what counts.

boundaries at the ground level using best practices. Here are some things to keep in mind as we all work to reduce community wildfire risk:

- **All mitigation is local.** The work done on the ground at the local level is what counts; that's where mitigation/fire adaptation happens. Partnering, planning, and learning must result in hands-on work in the community to treat fuels, create defensible space, harden

homes, build and implement useful community wildfire protection plans (CWPPs), and plan for evacuation.

- **The biggest barrier to community fire adaptation is local capacity.**

Experience and research have shown that most folks who live in high-risk wildfire areas know they have risk and want to do something about it. *The challenge is moving from intent to action.* Many communities, especially small wildland-urban interface communities, don't have the money, expertise, or staff to move mitigation forward. Federal, State, and nongovernmental organizations should focus on building local capacity for effective risk reduction.

• **Work from the front door to the forest.** Community wildfire risk reduction starts at the front door, with hardening structures, then moves (imagine concentric circles) to defensible space; driveway clearance; adequate emergency signage; whole-community preparedness, including fire departments; and ultimately to the forest, where hazardous fuels are treated.

• **Form a mitigation partnership.** The first step to lasting wildfire risk reduction is forming a local mitigation partnership, where participants work collaboratively to reduce risk directly and enlist more community members to help. The only way to get effective sustainable risk reduction is by partnering with like-minded organizations, agencies, land managers, fire departments, and residents. No one has more of a vested interest, knows the landscape better, and understands the consequences to their community better than the folks who live there.

• **The community must create the CWPP.** A successful, effective CWPP (or other community risk assessment tool) must have community and resident involvement and must outline the areas of risk and ways to reduce that risk. Many CWPPs are put together quickly as a way to qualify for funding but omit citizen engagement and true risk identification and mitigation. A CWPP developed by and for the community is more likely to have community engagement to implement risk reduction than one created in a vacuum by a contractor or a single agency.

• **Messaging doesn't result in action.** Messaging is valuable for sharing information, but it does not move people to take action. Messaging and literature remind people to do what they are already

The first step to lasting wildfire risk reduction is forming a local mitigation partnership.

likely to do: “Only you can prevent wildfires.” But messaging does not create behavior change, like cleaning the gutters, cutting trees in the yard, replacing the cedar fences, and so on. Behavior change results when people understand the issue, feel that the risk merits action, understand why the action will help, have support to take action, and have a trusting relationship with the folks who can help them. And that takes face-to-face trusted engagement over time. That takes a warmblooded, committed, concerned person with the patience to work with property owners over time. It takes boots on the ground, a warm handshake, information, trust, help, and persistence!

Messaging is valuable for sharing information, but it does not move people to take action.

• **Don't expect literature, brochures, doorhangers, and social media to result in mitigation.** For many years, we've defaulted to handing out brochures, leaving doorhangers, and posting on social media sites telling people what they need to do to reduce risk on their property. Telling people what to do doesn't work; working hand-in-hand with people in their community and helping them reduce risk does.

• **Mitigation is directly related to perception of risk.** A property owner who feels that the likelihood of a wildfire is high is more likely to mitigate than one who feels that the risk is low. Therefore it's important

that property owners have a realistic understanding of their risk and what they can do about it.

• **Use the teachable moment.** Smoke in the air is a strong indicator of risk, and property owners are more likely to take action when risk is more apparent.

• **Home assessments might be useless.** Home assessments alone don't result in risk reduction. It's critical that home assessments are followed by long-term, repeated followup by the trusted authority, which helps property owners understand the issues and take next steps.

• **Measure progress.** Count acres treated and structures treated (annually) and divide by acres and structures at risk (annually), then run the numbers. For example:

$$12 \text{ structures mitigated} \div 100 \text{ structures at risk} = 12\text{-percent reduction in risk}$$

$$279 \text{ acres of hazardous fuels treated} \div 4,127 \text{ acres at risk} = 6.7\text{-percent reduction in risk}$$

It's not perfect but it's a start.

• **Know your audience.** There's a lot of research out there about why people don't mitigate: they don't have the money, don't think they are at risk, aren't sure what to do, don't want to alter their property, think the Federal or State government will do it for them, and so on. Start the trusted relationship that will build on mitigation by asking why people haven't mitigated, then go from there. Don't assume everyone's the same—they aren't. ■

WILDFIRE RISK MITIGATION: LOCAL SOLUTIONS TO A NATIONAL PROBLEM

Jonathan Bruno

The 2017 fires in northern California (in Santa Rosa and nearby areas) teach the most conspicuous lesson to date that wildfire impacts us all. But this will not be the final lesson on fire's role in our lives. The lesson from California is that, no matter how good our firefighters are, as wildland fire professionals we cannot simply suppress our way out of catastrophe; instead, we must take a hard look not only at our existing approach to managing fires but also at mitigating against the devastating impact of wildfires.

A Rising Challenge

As fire professionals, we talk about suppression tactics, aircraft, and the armies of fearless men and women who risk their lives to save homes and lives. We hear citizens, elected officials, and the media making broad statements like “This was a once-in-a-lifetime event” or “We have never seen anything like this before and it will never happen again.”

Yet every year, we bear witness to more fires that seem different, bigger, and more disastrous than the fires last year or the year before. We see

millions of acres burned, hundreds or thousands of homes destroyed, and more lives lost. We know that if we do not act, then the downward spiral of destruction will continue unchecked, our forests (and the ecosystem services they deliver) will disappear, and our communities will suffer.

As the fire world grasps for understanding and answers, local place-based organizations are grappling with this new reality too. Firefighters have partners—from local fire districts, to nonprofit watershed groups, to forest collaboratives—who are stepping up to work for a more resilient landscape where local people lessen fires' impacts through strategic and thoughtful actions.

The Coalition for the Upper South Platte (CUSP) is one of these place-based groups. CUSP has conducted

years of successful postfire restoration work following large fires along Colorado's Front Range (such as Buffalo Creek, Hayman, and Waldo) and years of fuel reduction and wildfire preemptive work. As recognition of CUSP's work grew, various partners sought its expertise and encouraged CUSP to broaden its reach and share its knowledge at the national level. In 2014, the managers of CUSP formed Coalitions and Collaboratives, Inc. (COCO), a nonprofit organization based in central Colorado.

This story is about CUSP, COCO, and my own journey to become a national resource for wildfire risk reduction. It is intended to highlight what can work. More importantly, it is a call to everyone in the fire service to check his or her assumptions and to make lasting changes in the face of the flaming front.

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Volunteers and Air Force Academy cadets lending a hand to reduce fuels in the Colorado community of Palmer Lake. Photo: Jonathan Bruno.

CUSP—the Early Years

In 1998, the upper South Platte watershed (2,600 square miles (6,730 km²) southwest of the Denver metropolitan area) was undergoing a change. In 1996, the Buffalo Creek Fire had burned 11,700 acres (4,730 ha) in the watershed, and in the intervening 2 years over 13 “hundred-year floods” had scoured the area burned.

Meanwhile, new development from Denver and Colorado Springs was creeping westward into the wildland–urban interface. Douglas County, one of five counties within the upper South Platte watershed, was the fastest growing county in the country.

With the amazing pace of growth came increased pressure on the Pike National Forest. Thousands of weekend warriors raced to the hills every chance they got. Designation as a wild and scenic river was also on the table for portions of the South Platte River.

Denver Water, Aurora Water, and Colorado Springs Utilities depend on the upper South Platte watershed as a critical component of their sourcewater systems. As they faced increased demand on their water systems, they shared the recognition that their forested watersheds needed attention.

In response, the three utilities brought together a wide array of stakeholders and leaders, from Federal and State agency personnel to local government and nonprofit organizations, to review the options for protecting the watershed. They formed CUSP, hired a director, and completed numerous watershed studies to assess the existing condition of the area and create a list of high-priority projects for

With fire-fueled ambition and the memory of the South Canyon Fire fresh in mind, I set out to develop a chipper program that was different.

protecting the watershed. On the list were projects related to abandoned mines, sedimentation in the river, habitat, outdoor recreation, and invasive species.

But the condition of the forest drove much of the dialog and dominated the project list. Years of fire suppression, insect and disease infestations, high-grade logging, the removal of grazing, and burgeoning development across the landscape had changed the fire regime from what it had been historically. The forests—once a mosaic of meadows, high-density north slope stands, and south-facing patches of open ponderosa pine—had become a dense carpet of small-diameter trees. A new fire regime was on the horizon, and people recognized that

the Buffalo Creek Fire was just the tip of a very large iceberg.

In 2002, the concern became a reality: the Hayman Fire, started on June 8, consumed 137,000 acres (55,400 ha) of vital Front Range forests. The impacts on the watershed’s function and on the water providers’ ability to deliver drinking water resonated deeply. In 2003, I was hired by CUSP to lead the volunteer efforts in healing the Hayman burn scar and to create a broader forestry program that would work to limit the effects of the next fire.

In 2003, CUSP was invited to a watershed leaders’ conference in Glenwood Springs, CO, site of the South Canyon Fire, which killed 14 firefighters in 1994. I remember



Local volunteers with the Coalition for the Upper South Platte chip slash in Jefferson County, CO. Photo: Jonathan Bruno.



*A view from above of the Waldo Canyon Fire scar, looking east toward Colorado Springs.
Photo: Jonathan Bruno.*

hiking the South Canyon fire scar like it was yesterday. It added to my passion when I spoke about CUSP and how we had purchased a bumper-pull chipper to start the daunting task of reducing fire risk in area subdivisions.

To successfully help a place, we must “shut up and listen.”

The response was cold. As the watershed leaders heard my words, they asked in puzzlement, “Why is a watershed group chipping in neighborhoods?” Watershed groups at the time were focused on the blue lines on the map: standing in the rivers and streams they cared about and looking down. They did not own or operate chippers; they did not look up and around at the entire watershed.

With fire-fueled ambition and the memory of the South Canyon Fire fresh in mind, I set out to develop a chipper program that was different.

I did not want to create a program that would act like a contracted business, where the owner sat and watched from the comfort of a living room couch while a crew completed the work. I developed the Neighborhood Fuels Reduction Program from a simple premise: if owners and neighbors worked with the CUSP crew and each other, they would gain a deeper understanding of forest health issues, take direct ownership of the program, and build a sense of community.

It worked. From its early days, the chipper program has served homeowner associations and individuals, completing over 5,000 acres (2,000 ha) of risk reduction. The naysayers at the conference started to pay attention. Today, the chipper program is one of CUSP’s most important outreach and awareness programs. The sound of a chipper, the smell of the wood, and the volunteers high-fiving each other as they reduce their community’s risk really has an amazing way of garnering interest from others. And as residents begin engaging, they become more willing to do larger and higher impact treatments.

Moving Forward

In 2005, CUSP began developing community wildfire protection plans. CUSP created the first countywide plans in Teller, Park, and Jefferson Counties. The plans, though broad in scope, became the backbone for developing the CUSP forestry program.

In the early days, when I was first hired, CUSP had a staff of three. Since then, our programs have grown to include over 25 full-time staff. We have a local initial-attack team and fuels crew, inhouse staff for geographic information systems, and support staff. We own a tracked masticator, a whole-tree grapple feed chipper, five work trucks, and numerous saws and tools.

However, the extent of the issue on the Front Range was massive. With over 1.5 million acres (600,000 ha) in need of work to restore forest health or reduce fuels in the wildland–urban interface, CUSP began contracting out forest work. CUSP has paid over \$5 million to local contractors and annually completes about 1,000 acres (400 ha) of fuels and forest restoration work on both private and public land. We operate three slash disposal sites; until recently, we furnished biomass to a local school for heating.

CUSP has created every program and project from the ground up. With the help of a dedicated staff and support from key stakeholders, we developed everything, from contracts and bidding processes to internal policies and protocols. Best management practices, maintenance programs, internal controls, and training programs all grew from a passion for making a positive change in the watershed.

Over the years, CUSP shared what was created. Groups from adjacent areas wanted to learn more, so we met with other watershed organizations and fire departments that were interested in developing a “CUSP-like” program. Anything we developed we freely shared because it was our responsibility to ensure that other organizations did not make the same mistakes we had.

In 2012, the Waldo Canyon Fire burned over 18,000 acres (7,200 ha), destroying 346 homes in Colorado Springs. CUSP was asked to help with recovery efforts, in part because of our expertise in post-Hayman Fire recovery and in community collaboration.

The Waldo Canyon Fire, though close to home, actually occurred outside of the upper South Platte watershed. Soon after the fire, the CUSP board of directors agreed that CUSP had a duty to help. This decision, along

Local collaborative organizations have a vested interest in local place: no one has more to lose than the locals.

with increased requests for support from outside our focus area, led to the creation of COCO.

COCO Formation

COCO was formed to mentor, empower, and engage local organizations, helping them succeed. Local collaborative organizations have a vested interest in local place: no one has more to lose than the locals.

Many organizations across the country proclaim that they will work with the local community to help it reach local goals. Some organizations make a difference; however, far too often the expectations are not realistic or the motives are not aligned.

COCO is different: to successfully help a place, we know we must close our mouths and open our ears; we must strive to understand what drives people, what they care about, and what concerns them. We must “shut up and listen.”

When colleagues ask me how CUSP became so successful, I simply state that it has taken hard work; more importantly, it has taken the commitment of local people to strive for a better future. It is my belief that local citizens—from volunteer firefighters, to business owners, to students, to residents and local leaders—are the most important assets in any wildfire risk reduction strategy.

As the world continues to be compartmentalized, where input from only specialists is valued and only the largest organizations gain financial support, groups like COCO work to change the status quo. Because Federal resources are limited, place-based organizations like COCO that engage at the local level are needed. Mitigation against the impacts of catastrophic fires isn’t accomplished at the highest levels of government or in meeting rooms but rather by people who are embedded in their communities and passionate about their home place—people who are working to build resiliency in their own backyard.

COCO Activities

In 2016–2017, with support from the Forest Service, COCO developed a Cohesive Strategy Program. The program provided resources to



Volunteers and residents in Cape Ferrelo, OR, gather for a lunch and to learn from a Community Mitigation Assistance Team. The key is to engage residents where they are comfortable, whether at their firehouse or in their home. Photo: Jonathan Bruno.



Local residents take matters into their own hands and reduce the wildfire risk in Larkspur, CO. Photo: Jonathan Bruno.

several organizations and helped them hire local specialists in high-risk areas of Colorado. Based on years of experience from CUSP, COCO acted as a conduit for Federal funding to facilitate the growth of mitigation programs in high-risk areas. For example, COCO helped the town of Leadville, CO, find funding and mentorship for hiring a wildfire mitigation specialist; similarly, funding allowed the Coalition for the Poudre River Watershed to hire a forester; and funding enabled a newly formed statewide fire adaptation group, Fire Adapted Colorado, to hire a part-time coordinator.

Action follows when people come together in response to a particular cause or concern and create mutually agreed-upon solutions. The COCO method focuses on what the community cares about, helping groups take action through direct mentorship, guidance, and action. The “boots-on-the-ground

approach” will change wildfire outcomes, whereas websites and meetings will not.

At COCO, we believe that planning and adaptation are essential to success but that meetings and

Action follows when people come together in response to a particular cause or concern and create mutually agreed-upon solutions.

planning should not take up most of the time for capacity-limited organizations. If you have to meet 250 times a year to make a difference on 1 acre, you might want to reassess your priorities and readjust your tactics. COCO is not about reinventing the wheel but rather

about using existing strengths to achieve the greatest results.

COCO does not spend tremendous amounts of time and money on creating the coolest websites or the flashiest brochures. Instead, we focus on listening to the needs of a community and delivering the services that will increase its ability to take action on the ground. I recommend this approach—using your limited resources in the best possible way. Take steps to reduce risk, build collaborative partnerships, and carry out projects that cross boundaries. Reduce your community’s wildfire risk from the front door to the forest.

Community Mitigation Assistance Team

Mitigating risk and helping people have driven me to achieve more. I am unsure where this drive came from—perhaps from the years I worked as a safety officer for a search and rescue team, from the traveling I have done, or simply from my personal desire to protect the places I love. Regardless of my motives, I was given a chance to expand my impact in late 2015, when Pam Leschak from the Forest Service’s Fire and Aviation Management staff called. Pam asked whether I would be interested in participating in a new Forest Service pilot program.

The Community Mitigation Assistance Team (CMAT) program grew from a desire to change the status quo and make a difference in places affected by fire. The team, for which I act as team lead, perfectly complemented my desire to make a larger impact. All of the experiences that I have gained through the creation of the CUSP forestry program are embedded within the CMAT concept. CMAT harnessed the breadth of knowledge within a

multidisciplinary team of mitigation professionals to embed themselves within a community, listen, learn, and guide positive action.

CMAT assesses the local conditions, reviews the barriers, and dives in feet first. We review what works and what does not work. The team helps the local community make the necessary connections it needs to succeed and leaves it with the tools it needs to move forward. Like COCO, CMAT does not do the work for a community; instead, we facilitate the positive actions that the community takes to succeed on its own. Sitting on the couch and watching the action from afar is not an option.

The Phoenix Rising

In mythology, the phoenix is a bird that dies in flame and rises from the ashes. As firefighters and as people who care about forests, we must rise to help communities protect our forests.

How? We need to reexamine our assumptions.

Do you think that continuing to suppress fires will get us out of the current situation? Maybe you've heard someone say:

- "Those people in that neighborhood don't care."
- "They won't participate in a mitigation program."
- "They don't have the capacity to make a difference."

Do you believe that only the largest organizations have the capacity to make a difference? If we all continue to broadly assume that suppression alone will work or that local people don't care and don't have the time to make a difference, then it is time to pack up our bags and head home.

If you want to change the future, consider looking close to home, assessing who is really making a difference, and helping them make positive change by any means possible. That "annoying" person who always comes to your meetings complaining about the forest project ... that old man you see on the tall

ladder cleaning his gutters ... that church group you notice hosting a work party every Sunday ... these are the people who matter most.

In a day and age of meetings, conference calls, and webinars, we must all strive to look beyond the PowerPoint slide to see who and what really matter. Get up from your chair, walk out the door, and hold the ladder. Talk to that "annoying" person, and you will realize that we all have something in common: we love this place and we want to make it better.

If you are interested in learning more or helping to support the development of new, effective organizations in your community, consider where your investment will make the biggest difference. Support efforts at the local level. It is amazing what a bit of time and money can do to get a community moving. ■

SUCCESS STORIES WANTED!

We'd like to know how your work has been going! Let us share your success stories from your State fire program or your individual fire department. Let us know how your State Fire Assistance, Volunteer Fire Assistance, Federal Excess Personal Property, or Firefighter Property program has benefited your community. Make your piece as short as 100 words or longer than 2,000 words, whatever it takes to tell your story!

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**USDA Forest Service
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COMMUNITY MITIGATION ASSISTANCE TEAMS: A PROVEN APPROACH

Pam Leschak



Members of a community mitigation assistance team on assignment near the Bridger-Teton National Forest in the Jackson, WY, area. Photo: USDA Forest Service, Community Mitigation Assistance Team.

Communities in the wildland-urban interface (WUI) have challenges that other communities don't. They struggle to establish and maintain a viable wildfire mitigation effort over time. While many communities understand their risk and want to reduce it, they don't have the local capacity to accomplish it for lack of funds or staffing or because it places more burden on community volunteers. Then, when

The community mitigation assistance team is a national resource aimed at helping communities and agency units impacted by wildfire.

a wildfire strikes, the community struggles to stay ahead of it in terms of last-minute risk reduction, communication with residents, and stress related to an incident.

The national Community Mitigation Assistance Team (CMAT) concept was developed to offer assistance to targeted communities to address these issues by first helping to build local capacity during the off season in anticipation of an event and then

by helping communities cope with wildfire on the landscape by using it as a motivation for risk reduction at the community level.

The CMAT is a strike team of WUI mitigation professionals with extensive experience in effective methods of working with communities, forming partnerships, and getting risk reduction work done on the ground. Sponsored by the Forest Service, it is designed to

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help communities build sustainable local capacity for wildfire mitigation during high-risk times before, during, or after a wildfire, when awareness of the need for risk reduction and the likelihood of action is highest. The team applies community fire adaptation best practices and resilient landscape concepts outlined in the National Cohesive Wildland Fire Management Strategy.

The CMAT concept was field tested in 2015 during the Chelan Complex Fire in Washington, when the team worked closely with the communities of Leavenworth and Wenatchee, the Chumstick Coalition, the county fire departments, residents, city governments, and Washington Fire Adapted Communities Coalition to address mitigation challenges, teach best management practices, and strengthen an existing coalition. The field testing established the value of deploying a highly proficient WUI mitigation team to collaborate with local communities and Forest Service units during the teachable moments before, during, and after a wildfire.

The team helps communities build sustainable local capacity for wildfire mitigation before, during, and after a fire.

Team deployments in 2016 further demonstrated the viability and timing of the CMAT concept, showing acceptance of the need by local communities and Forest Service units. The teams showed a positive return on investment in terms of capacity building, mitigation on the ground over time, coalition building, dissemination of best practices for effective mitigation, reduction of risk to civilians and firefighters, and good will between partners (table 1).

In 2017, CMAT got the thumbs-up to become a national resource aimed at helping communities and agency units impacted by wildfire. Though a Forest Service project, CMAT has

strong, deliberate, cross-boundary interagency partner engagement and awareness and is available to all interagency partners.

The CMAT concept is based on:

- Fire social science showing that residents are more likely to mitigate when they perceive the risk to be high;
- Experience that many communities are frustrated by mitigation measures that don't work and are hungry for best practices;
- Requests from communities for a helping hand to move their mitigation efforts forward;
- The inability of local resources to meet those needs during a teachable moment;
- The understanding that use of best practices at an opportune time yields a good return on investment; and
- Recognition that local capacity is the biggest barrier to mitigation.

CMAT members are partners from Federal, State, and local governments; fire departments; and

Table 1 — *Benefits from community mitigation assistance teams (CMATs) before, during, and after a wildfire.*

CMATs can:	Before a fire	During a fire	After a fire
Help communities, the Forest Service, and other agencies build effective and sustainable cross-boundary wildfire risk reduction partnerships	X		X
Help existing partnerships identify and move past risk reduction barriers	X	X	X
Help communities and agencies move away from mitigation practices that don't work	X	X	X
Teach best mitigation practices that result in risk reduction on the ground	X	X	X
Work collaboratively with communities, incident management teams, and agency units to provide mitigation support and guidance to communities during an incident		X	
Serve as mitigation-focused liaisons and subject matter experts between incident management teams/agencies and fire-impacted communities		X	
Provide followup mentoring for partnership members to help develop mitigation plans, analyze challenges, define outcomes, and build capacity	X		X

nongovernmental organizations. They are chosen based on their knowledge, expertise, and training in *effective* community fire adaptation concepts and practices. Teams may number two to eight people (including trainees), depending on community need; assignments have been for 11 to 14 days (including travel). There is no cost to communities, agency units, and incident management teams that meet the enabling conditions, but participating communities and units are expected to collaborate with the CMAT while it is onsite, act on the team's recommendations resulting from the assignment, and respond to followup tracking of resulting accomplishments.

Communities requesting a CMAT *other than when* an incident is actually occurring should:

- Be at medium to high risk of wildfire;
- Already be working across boundaries with partners to reduce community wildfire risk;
- Have an identified mitigation challenge that warrants CMAT assistance;
- Be available for the team to imbed and be ready to work collaboratively with the team onsite;
- Be able to provide a workspace and support for the team; and
- Commit to implementing recommendations resulting from team assistance.



A community mitigation assistance team working with the Teton Area Wildfire Protection Coalition. Photo: USDA Forest Service, Community Mitigation Assistance Team.

The team applies community fire adaptation best practices and resilient landscape concepts.

Communities, agency units, and incident management teams requesting a CMAT *during a wildfire* should have the ability to work collaboratively with the team to meet just-in-time mitigation challenges as a result of the ongoing incident.

CMATs are available to help communities and agency units

year-round and during ongoing wildfire incidents. All requests are vetted for enabling conditions, likelihood of success, and return on investment. To request a CMAT, contact Pam Leschak, National WUI/Fire Adaptation Program Manager, 208-387-5612 or pleschak@fs.fed. ■

REDUCING THE VULNERABILITY OF HOMES TO WILDFIRE

Stephen L. Quarles

Buildings ignite during wildfires when exposed to:

1. Burning embers (also called firebrands),
2. Radiant heat, and/or
3. Direct flame.

Postfire assessments have shown that wind-blown embers are the most important cause of building ignitions. Embers that land on or adjacent to exterior materials (such as a combustible siding or a wood shake roof not treated with fire retardant) can result in direct ignition. Embers can also enter a building through an open window or through attic or crawl space vents, igniting indoor materials. Embers landing in combustible mulch, a woodpile, or vegetative debris on a roof or gutter can also cause ignition, resulting in building exposure to radiant heat or flame contact. Such building ignitions by embers are referred to as “indirect.”

Building survival during a wildfire depends on defensible space—the type, location, and maintenance of vegetation and other combustibles on the property—and the use of appropriate construction materials and design features in the building. Because of the importance of wind-blown embers in building ignitions, research at the Insurance Institute

Postfire assessments have shown that wind-blown embers are the most important cause of building ignitions.

for Business and Home Safety (IBHS) Research Center focuses on the built environment and the near-building area. IBHS simulates ember exposure on buildings and building components. This article summarizes some of the research and findings.

Test Facility

The IBHS Research Center's large test chamber can hold a full-scale one- or two-story residential or

small commercial building. The test chamber includes a wind tunnel powered by a 105-fan array that can simulate the flow characteristics of the atmospheric boundary layer at speeds greater than 100 miles per hour (71.5 m/s).

For wildfire laboratory experiments, a fluctuating wind speed record is used, typically with gusts in excess of 50 miles per hour (22 m/s). The wind tunnel incorporates a turntable with a diameter of 55 feet (16.8 m) that can rotate 360 degrees, allowing researchers to evaluate the impact of wind direction on the potential for ember deposition and building ignition.

Wind-blown ember experiments use a custom-made apparatus to generate embers. The raw material consists of a mixture of southern yellow pine wood chips and wooden dowels processed from hardwood species sourced in the Midwestern United States. A nominal chip-to-dowel ratio of 80:20 has been used.

Figure 1 shows the chamber and generator layout, and figure 2 shows ember production during an experiment.

Research Findings

Tests at the IBHS Research Center applied to various building components, including roofs, exterior walls and near-building zones, vents, and fencing attachments.

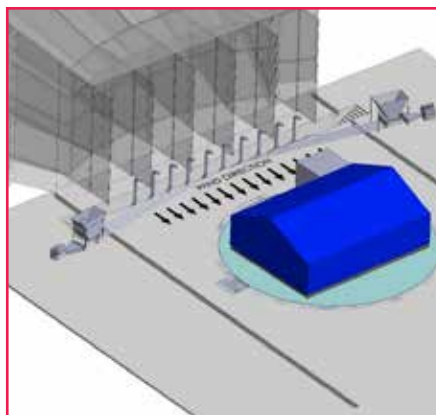


Figure 1—Auger feed and ember-generating system. Fuel is fed into ember generators, and fans in the large structure blow embers at the blue test building. Source: Insurance Institute for Business and Home Safety.

Stephen Quarles is the chief scientist for wildfire and durability at the Insurance Institute for Business and Home Safety, Richburg, SC.



Figure 2—Ember production and impingement on a test building during an experiment at the IBHS Research Center. Photo: Insurance Institute for Business and Home Safety.

Roof

Roof coverings with a class A fire rating are generally recommended for buildings located in wildfire-prone areas. Depending on the shape of the roof and the design of the roof covering, additional measures are often needed to improve the resistance to wind-blown embers.

Building codes have already addressed the vulnerability to an

ember exposure resulting from roof coverings that allow for gaps between the covering and roof deck (such as a barrel-shaped tile covering). Building codes require the open ends of the roof covering to be plugged, a procedure often called “bird stopping.”

Experiments have demonstrated the vulnerability of complex roofs, such as those on split-level homes,

Regular maintenance to remove debris from the roof and gutters will reduce the vulnerability of a building to ember exposures.

homes with dormers, and homes with chimney chases. In these cases, ember accumulation at the roof-to-wall intersection can result in ignition of accumulated vegetative debris.

If the siding can't give comparable protection, the siding becomes the vulnerable component on the roof, not the roof covering (fig. 3). Similarly, ember ignition of debris in a gutter will result in a flame exposure for the edge of the roof, which typically consists of combustible roof sheathing and fascia (fig. 4). Since a vinyl gutter will detach and fall to the ground along with any burning debris, the edge-of-roof flame exposure time will be longer when a metal gutter is used.



Figure 3—Embers ignited pine needle debris at the roof-to-wall intersection, exposing the dormer siding and undereave area to flames. Photo: Insurance Institute for Business and Home Safety.



Figure 4—Embers ignited pine needle debris in gutters, exposing the edge of the roof to flames. Note that the metal gutter (on the right) stayed in place while the debris burned, whereas the vinyl gutter (on the left) detached and fell to the ground. Embers also ignited bark mulch at the base of the building (lower right), exposing the wall to flames. Photo: Insurance Institute for Business and Home Safety.



Figure 5—Wind-blown embers accumulated at the base of this combustible wall. The resulting flames burned up the wall and through the siding into the stud cavity. Photo: Insurance Institute for Business and Home Safety.

Regular maintenance to remove debris from the roof and gutters will reduce the vulnerability of a building to ember exposures. Installing a metal drip edge will also protect the combustible components at the roof edge and eliminate the accumulation of embers at the gap between the roof sheathing and fascia.

Exterior Wall and Near-Building Zone

Embers can ignite bark and other combustible mulch products (fig. 4). When these products are located near a building, the resulting flames can impinge on siding. Ignited siding can spread vertically upward, potentially breaking glass in a window and reaching vents in an undereave area.

Creating a near-building noncombustible zone by substituting a rock mulch product or other hardscape feature for bark or other combustible products would reduce the vulnerability of this area to accumulating embers. Similarly, making sure the concrete foundation separates the ground from the base of the siding would minimize the chance of ignition from an ember accumulation at the base of the wall.

Figure 5 shows an ember ignition of wood shingle siding extending all the way to the ground.

Vents

Postfire reports have discussed ember entry through vents that resulted in interior (attic) fires. Such findings reflect the general importance of embers as a cause of building ignition and the particular vulnerability of vents to ember

To protect vents from wind-blown embers, noncombustible mesh screening was the best overall option.

intrusion. Accordingly, studies at the IBHS Research Center examine the relative importance of the style, type, and location of a vent for the entry of wind-blown embers into an attic.

Experimental results have indicated that vents that present a vertical face to the wind are more vulnerable to the entry of wind-blown embers. Such vents include gable end vents, certain through-roof off-ridge vent designs, and vents in the blocking of open-eave construction (fig. 6).

To protect vents from wind-blown embers, 1/8-inch noncombustible mesh screening was the best overall option. The mesh minimized not

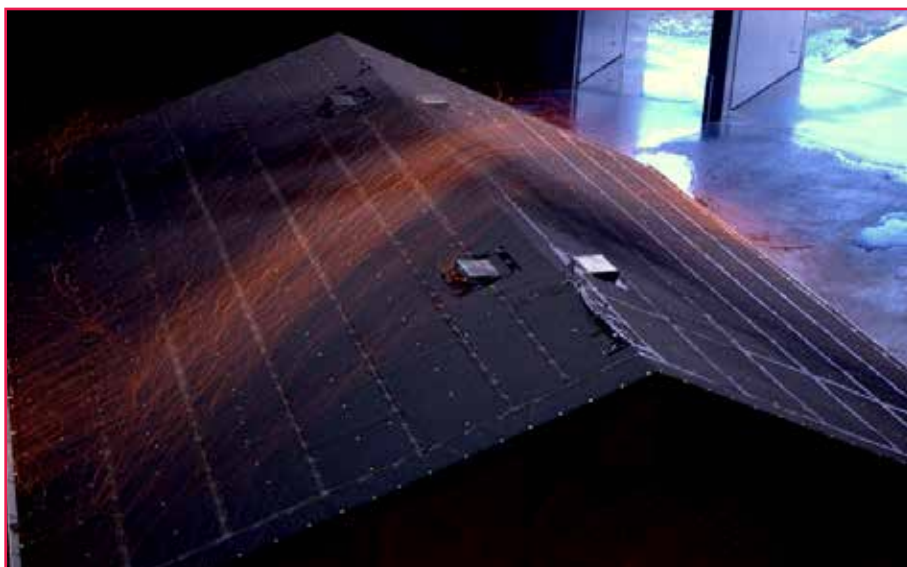


Figure 6—Wind-blown embers flowed over the top of a roof at the IBHS Research Center, some reaching the entry of the off-ridge vent (lower left). The flat surface at the entrance of the vent made it vulnerable to ember entry. A finer mesh screen should be used at the entrance of these vents to minimize ember entry. Photo: Insurance Institute for Business and Home Safety.

For a fence section that attaches to your home, use a noncombustible fence material.



Figure 7—Ignition from wind-blown embers in combustible fencing occurred at locations where vertical planks intersected with horizontal support members. Photo: Insurance Institute for Business and Home Safety.

only the number and size of embers entering the attic but also the maintenance required to keep the screen free from debris that would hinder the moisture management function of the vent.

The best vent design option for resisting ember entry in under-eave (inlet air) vents is a soffited eave design over vents located in the blocking of an open-eave design. For outlet vents, the best option is a ridge vent rated to resist wind-driven rain. Such vents have an external baffle at the vent inlet. Vents accepted by the California Office of the State Fire Marshal also perform well (see <http://osfm.fire.ca.gov/>

[codedevelopment/wildfireprotection-buildingconstruction](http://www.ibhs.org/codedevelopment/wildfireprotection-buildingconstruction)).

Fencing Attachments

Recent research conducted by IBHS and the National Institute of Standards and Technology, both collaboratively and independently, has yielded information about the vulnerability of combustible fencing. The principal takeaways for homeowners included:

- For a fence section that attaches to the home, use a noncombustible fence material. At a minimum, use a 5-foot (1.5-m) noncombustible fence section or gate.
- Flames are more likely to spread

to a building if pine needles, leaf litter, small twigs, and other fine vegetative materials have accumulated at the base of the fence. Clear this area of such debris on a regular basis.

- Do not place combustible mulch near the fence.

Testing showed that fence ignitions from wind-blown embers were more likely to occur where combustible vertical fencing planks attached to horizontal support members (fig. 7). The most vulnerable fence from this perspective was a “privacy fence,” where the fence planks are on the same side of the horizontal support members. Vinyl fencing was not vulnerable to ember exposures alone but did burn when subjected to flame exposures from burning debris.

Practical Lessons for Homeowners

The survival of homes during a wildfire can depend on having the right construction materials and design. Roofs, vents, near-building zones, and attachments such as fences are particularly vulnerable to ignition from wind-blown embers. IBHS research is designed to help homeowners reduce the vulnerability of their homes to ignition by using fire- and ember-resistant materials and techniques on and around their homes.

More information about the vulnerabilities of buildings to wildfire and effective mitigation strategies can be found at www.disastersafety.org/wildfire. ■

PREScribed FIRE TRAINING EXCHANGES: TRAINING, TREATMENT, AND OUTREACH

Jeremy Bailey and Lenya Quinn-Davidson

Imagine this: it's early morning in fire camp. Crews worked late last night mopping up a prescribed burn on national forest land, and now they're crawling out of sleeping bags and into their greens and yellows, preparing for another busy day on the fireline. Everything looks and smells like you'd expect: the sun is just rising, light smoke is in the air, coffee is brewing, and there's a warm buzz of laughter from the kitchen, where the cooks have already been up for hours.

But this is no typical fire camp—it's a Prescribed Fire Training Exchange (TREX) camp. Crew members have come from all over the country and the world, representing all manner of agencies and organizations, and although they were burning on Federal land yesterday, today might find them burning on a local ranch, assisting on a cultural burn with a local Tribe, or hiking through a recently burned area with a fire scientist. That's the beauty of TREX: the program checks all the boxes—National Wildfire Coordinating Group (NWCG) qualifications, ample experience and resources, incident management teams, and formal agreements and memorandums of



TREX crew in action. By forming ad hoc type 3 incident management teams to organize and host the training sessions, individuals, organizations, and agencies are learning that we can manage the potential liabilities of working together and on each other's lands. We do this by using tested avenues like memorandums of understanding, cooperative agreements, shared standards, and collaborative planning. Photo: The Nature Conservancy.

understanding—but the organizers also think outside the box.

Novel Approach

In natural systems, biodiversity is elemental to resilience. Diversity enables adaptation, builds biological capacity for change and improvement, and ensures that natural communities persist rather than collapse. The decade-old TREX model is based on the same premise: that only a sincere commitment to diversity—not only in people, but also in ways of thinking and working together—will bring solutions to the wicked challenges inherent in fire management.

Organized as 14-day wildland fire assignments, TREX events use the highly successful method of experiential learning to integrate professional and nontraditional fire practitioners, invite communities to participate in the planning and implementation of prescribed burning, and provide participants with rare training opportunities. The participants come from various backgrounds, and they range in skill levels from first-time burners to professional burn bosses with decades of experience.

An underlying philosophy of TREX is that everyone has something to learn and knowledge to share:

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- A classically trained burn boss (RXB2/1) with 20 years of experience can gain new insight and knowledge by working alongside a young man or woman who grew up burning with their grandparents.
- An experienced fire ecologist who has published peer-reviewed papers can learn from a family that has managed its property with fire for generations or from a seasoned firefighter who never went to college but has a decade of real-world experience with fire behavior and effects.
- A rancher who uses pickup trucks with slip-in pumper units and all-terrain vehicles with weed sprayers for controlling planned burns can learn about methodical briefing checklists and various effective fire control tactics from an engine boss from a different region.

Training exchanges enable professional firefighters and fire practitioners to work alongside educators, regulators, private and indigenous burners, and others.

Typical TREX Event

A typical TREX event hosts 40 participants from a dozen agencies and organizations as well as various unaffiliated individuals. This burn team comes together for 2 weeks of training and prescribed fire implementation. Following NWCG standards from start to finish, the participants gather in the first couple of days to scout units, become familiar with equipment, attend field trips, and hear presentations.

By the middle of the first week, the typical TREX burn team forms into modules, develops some crew cohesion, and completes its first

burn or two. A TREX burn team might be made up of four eight-person modules, with each module led by an experienced and qualified team leader (single resource boss) who's tasked with leading the module on assigned ignitions as well as on holding and mopup assignments. TREX burn teams often include an incident management team that manages logistics and operations, a fire effects monitor squad tasked with monitoring and documenting fire effects, a training officer who oversees basic wildland firefighting training and certification for participants, and a qualified burn boss who manages the burns.

TREX in Action

By the time this article is published, there will have been more than 70 TREX events in the previous 10 years (fig. 1), accomplishing

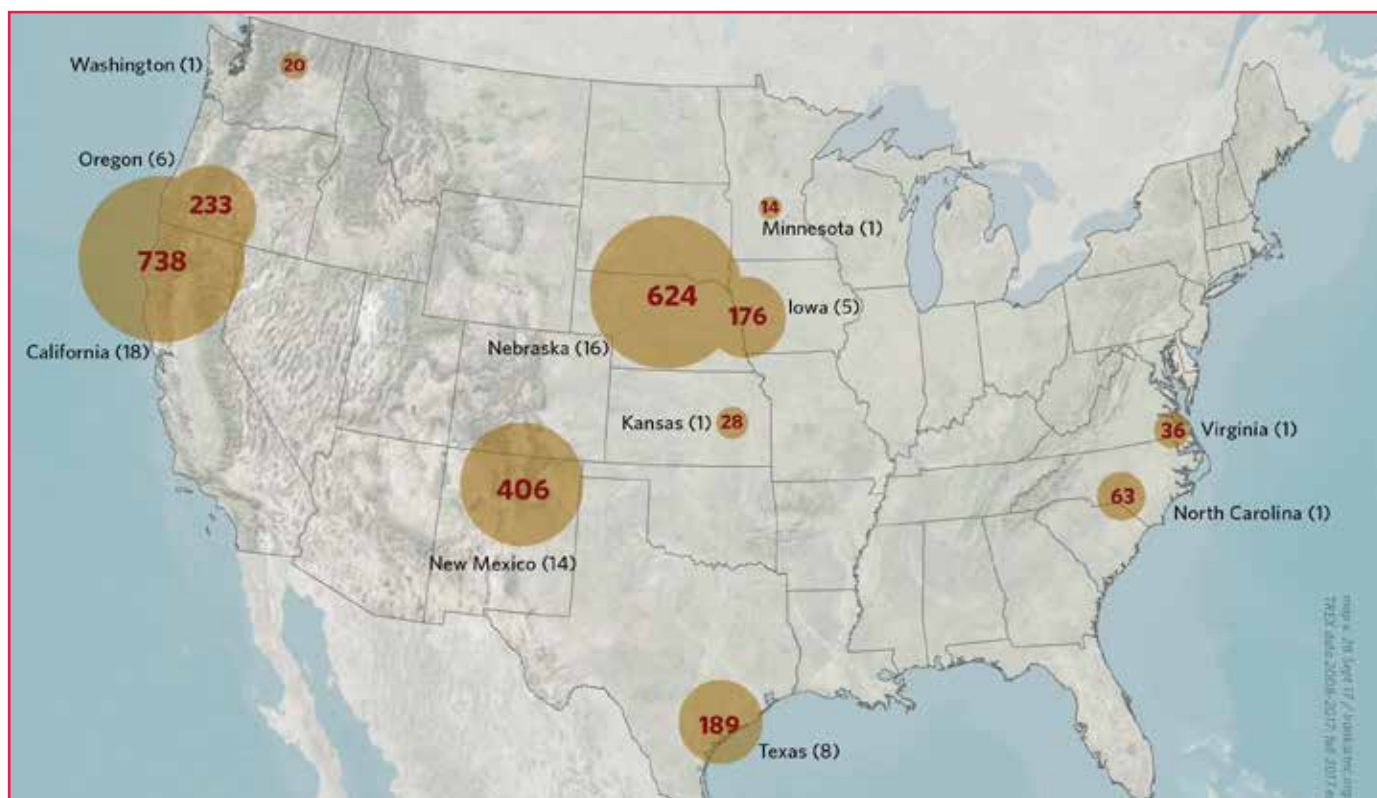


Figure 1—The map shows TREX data from 2008 through fall 2017. Shown in red is the number of participants in a particular State location; shown in parentheses is the number of TREX events in that particular location. Hundreds of participants from various agencies and organizations attend every year; some locations have even hosted TREX for 5 or more years in a row. Participants have come from all over the country and from South and Central America, the Iberian Peninsula, England, Canada, and Mexico. Source: The Nature Conservancy.

more than 100,000 acres (40,000 ha) of planned burns and giving training opportunities to over 2,500 participants. Each TREX has its own flavor designed to integrate the fire practitioners within a local region, take advantage of what is available and supply what is not, and help participants learn from one another.

A recent TREX in New Mexico, organized by the members of the New Mexico Prescribed Fire Council and funded through a New Mexico forest health grant, accomplished 6,200 acres (2,480 ha) of burning in a mountain range that juts up from the St. Augustine Plains. The burning was managed much like what used to be called a wildland fire use fire, where natural barriers, changes in vegetation, and ignition timing helped maintain control and keep the fire within the lines.

In California, one of the longest running TREX events completed dozens of small burns within the wildland–urban interface. The Klamath TREX used two and sometimes three burn teams and focused on fuel reduction around homes. A key goal was to build local capacity, so the organizers recruited locals and gave them basic firefighter training and personal protective equipment, empowering them to play an active role in protecting local homes from the threat of unwanted fire.

In Oregon, the Ashland Fire Department, the Rogue River–Siskiyou National Forest, The Nature Conservancy, and many other local partners regularly host a TREX within the city of Ashland's watershed. Watershed treatments in the area are funded through a small fee added to everyone's water bill.

In Nebraska, the managers of Pheasants Forever work with groups of landowners to combine small



Diversity matters. Having a wide variety of participants in TREX, mixed together and integrated into burn teams, allows greater cross-learning among various fire professionals—Federal, State, and Tribal crews, as well as contract fire crews and municipal firefighters. Photo: The Nature Conservancy.

properties into larger burn units, which often reach 5,000 to 8,000 acres (2,000–3,200 ha) in size. The TREX teams work strategically to create black lines, large black areas, and other anchor points. When they leave, the locals can come back in and use the anchor points to complete the burning.

The leaders who coordinate, organize, and carry out these TREX events are working hard to integrate parts of communities that have not necessarily received equal attention in the past. The Women-in-Fire TREX (WTREX) is one such effort. The first WTREX, hosted in northern California in October 2016, brought together 43 participants (37 women and 6 men) from 13 States and 4 countries, representing Federal agencies, nongovernmental organizations, universities, and Tribes. The training focused on the unique perspectives of women and on the importance of diversity—not only in numbers but also in approach—for the future of fire management.

Future Outlook

As we look ahead in fire, we know that fresh ideas and innovative approaches will be critical. The demand for the TREX model—not only in the United States but also in other parts of the world—speaks to this need. More than 20 TREX events are planned for 2018, and we expect that the model will continue to proliferate, adapt, and improve.

TREX events are backed by the Fire Learning Network, a cooperative program supported by the Forest Service, the Bureau of Indian Affairs, the Bureau of Land Management, the U.S. Fish and Wildlife Service, the National Park Service, and The Nature Conservancy. The partnership has a 15-year track record of helping to restore the Nation's forests and grasslands and to make communities safer from fire. For more information, contact Jeremy Bailey at Jeremy_bailey@tnc.org.

INTERNATIONAL ASSOCIATION OF FIRE CHIEFS: REDUCING WILDFIRE RISK THROUGH LEADERSHIP, EDUCATION, AND MITIGATION

Kaitlin Lutz



The International Association of Fire Chiefs (IAFC) is committed to reducing wildfire risk through its Wildland Fire Programs and through the leadership of its Wildland Fire Policy Committee. The programs cope with the challenges faced by fire and emergency services and other stakeholders in the wildland–urban interface (WUI). The programs invoke the association’s mission to lead, educate, and serve the local fire service.

Organizational Overview

Since 1873, the IAFC has helped leaders of fire and emergency service organizations develop their abilities and professionalism. The association has provided leadership to current and future career, volunteer, fire–rescue, and emergency medical service chiefs, chief fire officers, company officers, and managers of emergency service organizations throughout the international fire service community. It has offered them vision, education, services, and representation.

The IAFC’s Wildland Fire Policy Committee represents the association in national wildland fire leadership groups and oversees the

IAFC’s two Wildland Fire Programs—the Ready, Set, Go! Program and the Fire Department Exchange. The committee is composed of subject matter experts who represent the local fire service at the national and State levels. The committee works on solutions to the challenges outlined in the National Cohesive Wildland Fire Management Strategy, including managing vegetation and fuels;

The association’s
wildland fire programs
encourage the local fire
service and residents
to reduce the risk of
wildland fire.

protecting homes, communities, and other values at risk; managing human-caused ignitions; and responding to wildfire. The committee also supports nationwide efforts to reduce wildfire threats through prevention, public information, mitigation, and preparation and response.

The Ready, Set, Go! Program is the IAFC’s flagship wildland fire program. Ready, Set, Go develops and improves dialogue about wildland fire between the local fire service and the residents they serve.

Fire Department Exchange facilitates face-to-face and web-based

exchanges between fire departments facing resident outreach and fuels reduction challenges in the WUI. The exchange encourages departments to share information to broaden their knowledge, consider alternative measures, create new solutions, and improve their wildland fire outreach and operational processes.

The IAFC works with other national organizations as part of the Fire Adapted Communities Coalition. The IAFC’s cooperation with partners at the national level allows for a unified message and ensures that the IAFC’s Wildland Fire Programs deliver the most accurate and useful information.

Exchanges to Reduce Wildfire Risk

The IAFC and the Fire Adapted Communities Learning Network developed Fire Department Exchange in cooperation with the Forest Service Fire and Aviation Management’s Landscapes and Partnerships staff. The program is based on successful in-person exchanges and web-based networking by the Fire Adapted Communities Learning Network. The network is cooperatively managed by the Watershed Research and Training Center and The Nature Conservancy.

Fire Department Exchange is typically a 3-day face-to-face engagement of representatives from

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10 fire departments from across the country. The participants share best practices, discuss the challenges they face, and gain insight from one another. The exchange starts with individual presentations from each participating department on its strengths and weaknesses. Formal group breakout sessions follow, both large and small, along with other activities to learn about what the host department does on the ground. The evenings are filled with informal discussions and more opportunities for participants to network.

The program began in 2015 with the selection of the Fire Department Exchange Steering Group. The steering group guides the exchange as well as collaborating and communicating with IAFC wildland fire staff and with partners. The steering group members also lead in developing an online and

classroom course called Fire-Adapted Communities for the Fire Service.

The steering group is made up of fire department personnel from Ashland (OR) Fire and Rescue, Santa Fe (NM) Fire Department, Austin (TX) Fire Department, Boise (ID) Fire Department, Colorado Springs (CO) Fire Department, and the Watershed Center. The group first assembled in fall 2015 in Colorado Springs, CO, to establish charter documents and

exchange formats and timelines. It decided that each department in the group would host one exchange for the other four departments while also inviting five additional departments.

In addition, the group established requirements for participants before and after each exchange. Before the exchange, participants complete a questionnaire and a department evaluation form to outline their existing outreach and mitigation programs. This information allows the steering group to customize the entire exchange experience for the participants. Each exchange features an agenda, presentations from the steering group, and networking opportunities based on the participants' expectations and expertise. Participating departments are also invited to give presentations on their outstanding projects and wildfire risk reduction efforts.

The International Association of Fire Chiefs is dedicated to engaging the local fire service in wildfire risk reduction.



Fire Department Exchange participants in Austin, TX. Photo: Amber Wells, International Association of Fire Chiefs.

Perhaps the most valued part of the program is after the exchange, when participants share the valuable information they learned not only with their departments but also with their communities. They do this by completing a postexchange action plan that is tailored to each department's outreach or fuels mitigation goals. Depending on their goals, they might launch a community outreach program, revamp mitigation efforts, or start a prescribed-burn program in their community.

Participants are not on their own in this process. They are paired up with

Fire Department, Oklahoma City (OK) Fire Department, Rapid City (SD) Fire Department, San Diego (CA) Fire and Rescue Department, and Flagstaff (AZ) Fire Department. Each of these departments was selected because it was heavily involved and experienced in community preparedness outreach and successful with its approach to implementing robust mitigation programs.

At the exchange, departments were paired up based on their strengths and their postexchange goals to discuss topics such as fuels management, community outreach,

The department has also made wildfire risk reduction a priority internally. After the exchange, the department's representatives presented what they learned to their coworkers in the department to make sure that both the firefighters and the community are on the same page when it comes to advancing wildfire preparedness and risk reduction.

In September, the department launched a new wildfire preparedness campaign that includes holding community engagement meetings each Thursday in September and October to mark the start of the wildfire season. The department also sent out a wildfire survey to residents to see what misconceptions, misinformation, and knowledge about wildfire exists in the community so it can tailor its outreach efforts accordingly.

Through Fire Department Exchange, participants share best practices, discuss challenges, and gain insight from one another.

a steering group member who helps to guide them through the process of implementing their plans and serves as a mentor to ensure that their plans succeed.

Also, after each exchange, participants get access to an online system for networking with each other. They can post updates on their postexchange action plans, upload documents they have created, and ask other exchange participants for advice. Through the online system, the exchange can continue indefinitely and with ever broader participation as new departments are added after each inperson exchange.

The inaugural Fire Department Exchange was hosted by Santa Fe (NM) Fire Department in October 2016. The five departments that participated in this exchange included Barnegat (NJ) Volunteer

wildfire regulation and planning, and effective response. These discussions were then used to start creating the postexchange action plans that are currently being implemented in their communities.

Oklahoma City Fire Department is a great example of postexchange action plan implementation. Since the exchange, the department has successfully expanded its community outreach by becoming an active member in the IAFC's Ready, Set, Go! Program. Using the program's free materials and information from the exchange, Oklahoma City Fire Department has held numerous events and workshops to promote wildfire awareness and readiness in its community. Through its "Have a Plan, Build a Kit, Stay Informed" workshop, the department is making wildfire risk reduction a priority in the community.

Oklahoma City Fire Department's effective approach to wildfire preparedness illustrates how the knowledge, advice, and expertise of exchange participants can help a department drastically reduce wildfire risk in its community.

In May 2017, Colorado Springs Fire Department hosted the second exchange. The five participating departments included Ventura County (CA) Fire Department, Kittitas Valley (WA) Fire and Rescue, San Juan (NM) County Fire Department, Frenchtown (MT) Rural Fire District, and Horry County (SC) Fire Rescue. This exchange featured indepth discussions on WUI codes and ordinances; fuels mitigation and postrecovery programs; public education, home assessment, and outreach programs; and planning and partnerships. These departments are now working with the steering group to implement their postexchange action plans.

Raising Awareness to Reduce Risk

The Ready, Set, Go! Program is another way the IAFC is helping the local fire service to reduce wildfire risk. Many Fire Department Exchange participants got involved in the exchange process through their extensive work on the Ready, Set, Go! Program. This free program

The Ready, Set, Go! Program encourages dialogue about the risk of wildland fire between the local fire service and residents.

helps fire departments teach residents who live in WUI areas at high risk from wildfire how to best prepare themselves, their families, and their properties against the threat of wildland fire.

The program offers free supporting materials and guidance that help fire service members to easily talk with residents about the wildland fire risk to their community. Engaging in this dialogue is particularly important for the fire service

because national studies have shown that firefighters are uniquely respected in their communities and can project a trusted voice for effective communication. Through the trusted voice of the local fire service, the program urges residents to prepare for wildfire in three ways:

1. To be *Ready* by taking personal responsibility for themselves and their property through mitigation, defensible space, and hardening their homes with fire-resistant materials;
2. To be *Set* through situational awareness, making sure that they understand the risk of wildfire and where to go to get the latest fire status; and
3. To act early and *Go*. The Ready, Set, Go! Program does not mandate evacuation but prompts residents to listen to emergency personnel should there be a need to evacuate.

The Ready, Set, Go! Program is highly customizable and adaptable to the needs of residents in the community that a fire department serves. The program encourages fire departments to develop community engagement plans that can include such activities as holding community chipping days, workshops for residents, and open houses as well as giving

presentations to homeowners' associations, making school visits, and conducting home assessments. No matter what a department's size or budget, the Ready, Set, Go! Program can be an effective tool for engaging residents in wildfire risk reduction. When firefighters instruct residents to take personal responsibility for preparing their properties and families for wildland fire, residents become an active part of the solution to the problem of increasing fire losses. To learn more about the Ready, Set, Go! Program, visit www.wildlandfirersg.org.

National Commitment to Wildfire Risk Reduction

The IAFC's Wildland Fire Programs touch all aspects of the Nation's wildland fire threat by bringing together the fire service, forest managers, local governments, community organizations, WUI residents, and other stakeholders to reduce wildfire risk across the country. Under the leadership of the Wildland Fire Policy Committee, the IAFC is dedicated to engaging the local fire service in wildfire risk reduction through Fire Department Exchange and the Ready, Set, Go! Program. To learn more about the IAFC'S Wildland Fire Programs, visit www.iafc.org/wildland. ■

WILDFIRE MITIGATION THROUGH HOME ASSESSMENTS—COMPLIMENTS OF YOUR LOCAL VOLUNTEER FIRE DEPARTMENT

Lori Shirley

Wildfire mitigation can improve the chances of a home surviving a wildfire. Research has shown that one of the most important sources of information that prompts residents in the wildland–urban interface (WUI) to take action to reduce their wildfire risks is guidance from local fire departments and county wildfire specialists (Miller 2013). Volunteer firefighters make up 70 percent of the U.S. fire service (Haynes and Stein 2017), so they play an essential role in educating communities about how to make their homes and personal property ready before the next wildfire strikes.

The National Volunteer Fire Council (NVFC), in partnership with the Forest Service, supports local volunteer fire and emergency service departments in wildfire-related community education through the Wildland Fire Assessment Program (WFAP). This is the first program specifically designed to prepare fire service volunteers to evaluate individual homes and give residents achievable recommendations for protecting their properties from wildfires in order to make their communities more fire adapted.

Wildfire mitigation not only reduces suppression costs but also lessens the health and safety risks for firefighters and emergency personnel

who are called upon to respond. Volunteer departments often work with limited budgets and face unique challenges, such as having inadequate equipment, gear, and training specifically for fighting wildfires. Mitigation can make a difference, and the WFAP helps to minimize the burden on volunteer departments by providing them with resources

are a natural occurrence; therefore, if people decide to live in wildfire-prone areas then they must be proactive in mitigating associated risks. ... It's critical that fire departments step up and educate their communities to help them protect their homes and families from potential and probable wildfire threats."

The Wildland Fire Assessment Program prepares fire service volunteers to evaluate homes and help residents protect their properties from wildfires.

to perform a home assessment and also arm residents with the knowledge and tools they need to take the necessary steps to reduce their properties' potential vulnerabilities in the event of a wildfire.

Available Resources

Through the WFAP, members of volunteer fire departments get training and resources that teach them about potential wildfire dangers in and around homes and how homeowners can mitigate the risks. The program also empowers homeowners to take personal responsibility for their homes and properties by encouraging them to implement the recommendations made by the department during the assessment.

The WFAP curriculum, available both as a classroom course and online, walks department members through four modules:

- Understanding the WUI problem;
- Identifying the zones around the home (fig. 1)—5 feet (1.5 m), 30 feet (9 m), 100 feet (30 m), and beyond 100 feet—and why this defensible space is at risk during a wildfire;
- Evaluating the home, a free service to homeowners; and
- Using available resources, which include outreach materials to advertise the home evaluation service and local, State, and Federal resources to supplement mitigation efforts.

Lori Shirley is the manager of the National Volunteer Fire Council's Wildland Fire Assessment Program, Greenbelt, MD.

As NVFC Wildland Committee Chair Ron Roy has pointed out, "Wildfires

Using the National Fire Protection Association's home ignition zones



Figure 1—Measures for managing fuels within the home ignition zone, as prescribed by the Firewise program. Source: National Fire Protection Association, Firewise Communities.

as a foundation for the training, the WFAP course details the various zones surrounding a structure, why these areas are hazardous during a wildfire, and how to create defensible space in each zone. The course also covers the importance of a communitywide mitigation approach by carrying out community wildfire protection plans and working with local agencies and key stakeholders in the community to commit to the fire-adapted communities' concept: informed and prepared citizens adapting to living with wildfire and reducing their risk of damage.

The course is conducted in a train-the-trainer format, allowing departments to use course materials to teach their personnel how to perform a successful assessment. The training is customizable so that instructors can include local wildfire statistics and other information relevant to a particular area. To date, 29 classroom WFAP courses have

The course uses a train-the-trainer format, allowing fire departments to teach their personnel how to work with homeowners to assess a home's exposure to risk from wildfires

been held in 16 different States, training nearly 600 people. Another 142 students have completed the training online through the NVFC's Virtual Classroom.

Training participants receive an award-winning toolkit with a checklist and supplemental resources to help them conduct home assessments. The checklist, based on wildfire-related information

from the Insurance Institute for Business and Home Safety and other reputable sources, serves as a basis for a local assessment. Assessors use the checklist to walk through a property alongside the resident to identify opportunities to reduce risk.

Chief Mike Johnson from the Ebbetts Pass Fire District in California has praised the WFAP, noting that the fire district, the community organization Volunteers In Prevention, and local homeowners associations all value the program's toolkit for facilitating fuels reduction around homes. "In California," he said, "we have regulations for defensible space, but this toolkit assisted the students in gaining a deeper understanding, in my opinion, making them more effective when working with the homeowner."

Other resources offered through the WFAP include an online data-tracking tool to help analyze the

The curriculum is available both online and through a lecture course.

impact of assessments as well as liability templates and other administrative documents to assist departments in program implementation. Customizable marketing and promotional materials, including web banners and press releases, help departments promote the assessment service so that the public is aware that free home assessments are available and that their local fire department is there to help.

Coming Soon!

The NVFC will be adding a hands-on training component to the existing classroom course. Departments will be able to participate in an onsite

assessment to help students practice a home evaluation and put their classroom knowledge into action. The onsite assessment piece is expected to become available in 2018 in select pilot locations in areas most susceptible to wildfire threats.

Volunteer fire departments play a critical role in encouraging residents to be proactive in protecting their property from wildfire. The WFAP provides the resources and training that departments need to help WUI communities reduce risk from wildfire. To learn more about the program, schedule a classroom training, take the online course, or access WFAP resources, visit www.nvfc.org/wfap. ■

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ADVANCING FIRE ADAPTATION BY ENGAGING PRACTITIONERS

Michelle Medley-Daniel

For the last 100 years, fire suppression policies have largely kept fire from playing its natural role. Removing fire from ecosystems that depend on it to stay healthy, coupled with more people building houses in flammable natural areas, has created a costly and dangerous wildfire problem. We need to find ways to restore fire to places that need it while protecting homes and communities. We need a new approach to fire management.

Network Approach

Effecting wholesale change in how we deal with wildfire is no easy task. That's where a network approach comes in. A network brings together diverse ideas, focuses on sharing information among its members, and helps those people take innovative action.

The Fire Adapted Communities Learning Network (FAC Net) connects people working on fire adaptation and supports and spreads their work locally, regionally, and nationally (fig. 1). These communities are taking action to improve their resilience and reduce their risk of wildfire impacts. Together, this network of practitioners is changing the

way we live with wildfire in the United States.

Network Impact

FAC Net members are dismantling the silos that have kept “community work,” “fire management,” and “landscape

from wildfire and prescribed burning by developing a smoke health portal and exploring the potential for air filter loans to sensitive residents.

- In southern Colorado and northern New Mexico, prescribed fire training

The Fire Adapted Communities Learning Network connects people working on fire adaptation and spreads their work locally, regionally, and nationally.

resilience” apart. By integrating and expanding their work, they are transitioning from one-off projects to systemwide, long-term strategies for living better with fire. For example:

- Members in the Tahoe Basin are working in tandem on planning and capacity-building issues under the National Environmental Policy Act so they'll be ready to implement projects soon after they've gone through review.
- In Oregon, members are taking an integrated approach and considering how to best increase social license for fire use as they help revise the State's smoke management strategy. While advocating for more flexibility in prescribed fire emissions, they are also addressing health impacts

exchanges, FAC Net, and Fire Learning Network partners are developing regional capacity for integrated fire management. Practitioner organizations are working together to cross-train people and familiarize them with different skill sets for working with fire. Momentum is building—yielding joint projects, collaborative funding proposals, and a shared vision for fire management.

Looking for Partners, Information, Connections?

You can join the network of people across the United States who are taking action to prepare themselves and their communities for wildfire. The FAC Net supports members' work by facilitating information

Michelle Medley-Daniel is program director for the Watershed Research and Training Center, Hayfork, CA.

RESIDENTS REDUCE WILDFIRE RISKS THROUGH THE FIREWISE USA™ PROGRAM

Cathy Prudhomme

Accomplishments are frequently greatest when one or more resident leaders in the community provide coordination, oversight, and encouragement to their neighbors.

The Firewise USA™ national recognition program evolved from a 1986 cooperative agreement between the Forest Service and the National Fire Protection Association (NFPA). The agreement enabled NFPA, as a national nonprofit safety organization with an extensive history of successful fire and safety public education campaigns, to develop the recognition program and corresponding resources and methods for teaching residents living in areas prone to wildfire how to reduce their risks. The recognition program began in 2002 with a dozen pilot sites. Through our partnership with the Forest Service, the National Association of State Foresters, State forestry agencies, and local fire departments, the program is now active in 42 States, with a focus on communities in the

Cathy Prudhomme is the Firewise Communities/USA Program Manager for the National Fire Protection Association's Wildfire Division, Centennial, CO.



Figure 1—The three home ignition zones (0–5 feet [0–1.5 m], 5–30 feet [1.5–9 m], 30–100 feet [9–30 m]). Reducing risks within the three zones increases the chances of a home surviving a wildfire. Source: National Fire Protection Association.

wildland–urban interface, where homes and structures are in direct contact with wildlands and the inhabitants often have come from urban areas (NIFC, n.d.).

National Recognition Program

Under the Firewise USA™ national recognition program, residents living in the wildland–urban interface have been taking action to reduce the wildfire hazards around the exterior of their homes and in the three home ignition zones on their properties (fig. 1). Both kinds of measures have been part of the national Firewise USA™ recognition program since 2002. Such activities are the cornerstone of the program

at 1,479 participating sites, including 170 new sites in 2017 (fig. 2).

Mitigation achievements vary from site to site, with accomplishments frequently greatest when one or more resident leaders in the community provide motivation, coordination, oversight, and encouragement to their neighbors. The number of individuals who step up to play a leading role is astonishingly high; typically, each wears the “resident leader” hat with great pride. Leaders take on that role because they believe in risk reduction and truly want a safer place to live. They deserve immense kudos.

The Firewise USA™ national recognition program emphasizes the

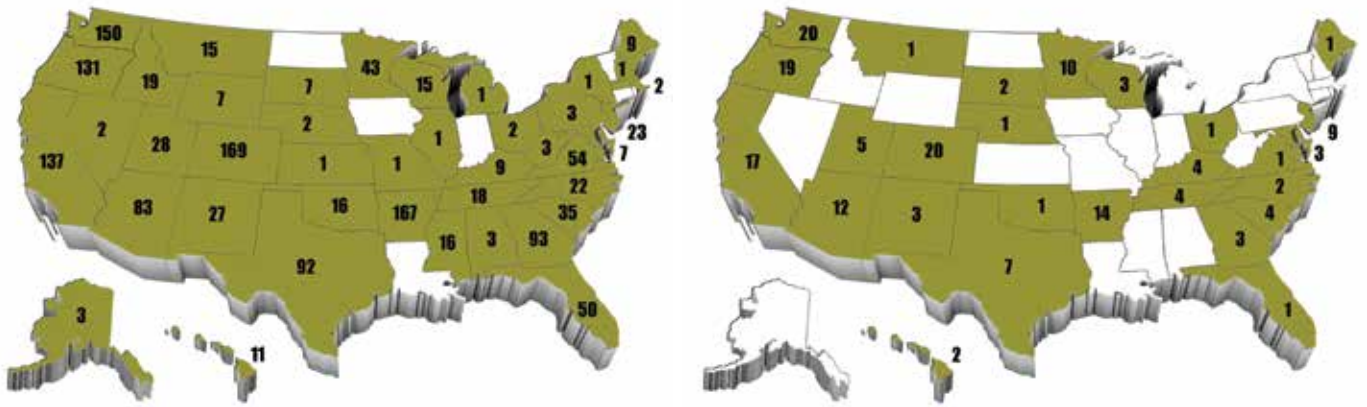


Figure 2—Active sites map (left) and new sites map (right). There are 1,479 active Firewise sites in areas with wildfire potential. In 2017, 170 sites in 24 States qualified as new nationally recognized Firewise sites. Source: National Fire Protection Association.

importance of neighbors working together to maximize the benefits of their mitigation work and to reach beyond their own individual property lines to assist elderly or disabled neighbors who are unable to reduce wildfire risks on their own. Each year, program participants must meet a set of renewal criteria to remain in the program and retain the status of “in good standing.” Projects designed to help elderly or disabled neighbors fit perfectly into the program’s framework and are often a part of the work completed to meet the required annual renewal criteria.

Firewise Portal

In July 2017, in cooperation with the Forest Service, the NFPA launched a tool to encourage and document efforts by Firewise participants to track and measure their mitigation, education, and outreach projects (fig. 3). The Firewise Portal is a comprehensive resource complete with an online application and renewal system. The portal allows for the collection of residential mitigation information on an unprecedented scale.

Within months of its launch, users were providing copious amounts of detail about the types and volume of work they were completing. The portal is an asset for resident leaders, regional coordinators, NFPA,

and State and Federal staff. The data collected will help everyone gain a better understanding of the mitigation that residents are accomplishing at the local level.

Through the portal’s easy-to-use software, reporting risk reduction activities is simple. Every Firewise site has an action plan that outlines the risk reduction priorities for the site. The Firewise Portal is an indepth repository for Firewise sites, letting them document and track their mitigation actions by both hours worked and dollars invested. The portal lets them easily monitor progress towards the goals and objectives outlined in their action plans; the information is archived within the portal. In addition, the portal stores a Firewise participant’s risk assessment, which can be updated as needed.

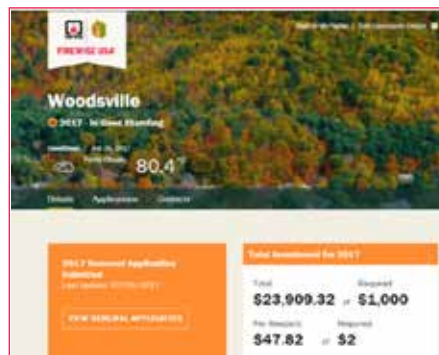


Figure 3—The Firewise Portal documents and tracks risk reduction accomplishments. Source: National Fire Protection Association.

The portal guides users through a user-friendly documentation system that tracks the number of hours residents worked by individual action categories and by location within the home ignition zones (see the sidebar on the next page). It also tracks the related dollars invested in projects (contractor costs, grants, rental equipment, and so forth).

Through the portal, users report a major component of wildfire risk reduction: vegetation removal from individual properties and common areas. By tracking vegetation removal, the State forestry agency that oversees the Firewise program can now access data on the quantities being removed from the participating site’s boundaries. The agency can then share that information with other stakeholders.

Also, the portal has a section that tracks debris removal from an array of sources, including:

- Community-organized curbside fuel pickups,
- Contracted chipping services,
- Local municipal or county department slash pickup,
- Homeowner/property association projects, and
- Other types of contractors.

The portal includes a section for individual homeowners to record slash taken to an offsite disposal location, slash collection days across neighborhoods or communities, and even projects on Wildfire Community Preparedness Day (fig. 4). Included in a recap of each recorded activity is the number of participating residences, the yards of debris removed, and when the activity occurred.

The portal also lists the Firewise USA™ program's State liaisons, who manage their own State-specific data. The end result is a system that's able to assist recognized sites in making themselves safer places to live by becoming more resilient in the face of wildfires.

Other Resources

Homeowners and stakeholders from all wildfire sectors, including forestry agencies, fire departments, and emergency managers, can access Firewise materials and resources



Figure 4—Colorado Springs Fire Department wildfire mitigation crews supporting a local neighborhood chipping event. Photo: Colorado Springs Fire Department.

through Firewise.org. The NFPA invites you to add them to your cache of outreach and education resources.

The newest addition is the Reducing Wildfire Risks in the Home Ignition Zones poster/checklist. The oversized foldout poster has detailed information and graphics that give residents a roadmap to begin their wildfire risk

reduction projects. The resource includes an easy-to-follow checklist for each home ignition zone, listing the tasks that increase a home's survivability when exposed to embers from a wildfire and/or flames from a surface fire. The checklist is a great way for homeowners to begin tracking their accomplishments within the three home ignition zones. ■

Reporting Categories in the Firewise Portal

The Firewise Portal lets users track their mitigation activities by reporting them in the following categories:

- **Dwelling:** Risk reduction work from the roof down to the foundation. Activities include installing fire-resistant roofing, cleaning litter from roofs and gutters, screening vents, installing chimney spark arrestors and screening, ensuring that there are no openings in skylights or siding, enclosing eaves and soffits, clearing decks and porches of flammable materials, ensuring that under-deck areas are free of flammable materials and vegetation, and so forth.
- **Immediate Zone:** 0 to 5 feet (0–1.5 m) from the foundation or attachments (decks/porches). Activities include installing hardscaping components; replacing combustible mulches with stone/gravel; removing trees and shrubs; raking and removing pine needles, leaves, litter, and debris; trimming back tree limbs that

overhang the area; moving firewood into the extended zone; and so forth.

- **Intermediate Zone:** 5 to 30 feet (1.5–9.1 m) from the foundation or attachments (decks/porches). Activities include maintaining the lawn and native grass, clustering trees and shrubs with space between clusters, thinning and limbing trees to reduce crown fire potential, and so forth.

- **Extended Zone:** 30 to 100 feet (9.1–30.5 m) from the foundation or attachments (decks/porches). Activities include removing needles, leaves, litter, and debris; thinning trees to reduce crown fire potential; and so forth.

- **Common Area:** Areas owned by the homeowners association or other jointly owned community property within the site boundary. Activities include thinning trees, conducting mastication and removing brush, maintaining grass, constructing firebreaks, and so forth.

- **Administration:** Meetings, presentations, program oversight, home site visits, and so forth.

FIRE PREVENTION/EDUCATION TEAM AT WORK IN THE NORTHERN ROCKIES

Rita Chandler

The Northern Rockies Coordinating Group (NRCG) was established to provide an interagency approach to wildland fire management and all-risk support across landownerships in the Northern Rockies Geographic Area. Comprising Montana, North Dakota, northern Idaho, and small portions of South Dakota and Wyoming, the Northern Rockies Geographic Area is one of 10 geographic areas across the United States. The NRCG is made up of representatives from agencies, departments, divisions, bureaus, and associations from across the area. Its purpose is to further interagency cooperation, communications, and coordination for wildland fire management and all-risk support in the Northern Rockies Geographic Area.

Fire Prevention and Education Team

The Fire Prevention and Education Committee (FPEC) is a subset of the NRCG. Its mission is “to foster interagency leadership and coordination in support of the establishment of fire-adaptive communities, resilient landscapes and safe, effective wildfire response through public information, education and the promotion of fire prevention messages and measures.”

Rita Chandler is an Assistant Director with Fire and Aviation Management in charge of Cooperative Fire, All-Hazard, and Prevention Programs for the Forest Service, Northern Region, Missoula, MT.

One key message was that individuals have a responsibility to ensure that their actions do not result in a wildfire.

In late July 2017, due to deteriorating fire conditions in the Northern Rockies, the FPEC formed an interagency fire prevention/education team based in Missoula, MT. Prevention/education teams support geographic areas before and during periods of high fire danger or fire activity. Each team comprises three to five trained personnel who come together for a specified period of time to assist the local unit in preventing unwanted human-caused wildfires.

The team for the Northern Rockies was asked to support the mission of the FPEC by increasing public and homeowner awareness about fire danger, prevention, preparedness, and safety. The team worked for the FPEC liaisons from the Forest Service, Bureau of Land Management, and Montana Department of Natural Resources and Conservation, taking an all-lands approach to prevention and community adaptation to wildland fire.

The plan of the interagency liaisons was to:

- Share key fire-related messages and available materials with local, State, and Federal

fire agency representatives (including fire prevention personnel, fire information officers, and other interested or affected personnel); and

- Adjust the messages and materials based on feedback from the representatives.

Accordingly, the prevention/education team outlined a strategy for meeting the objectives of the FPEC liaisons and for coordinating with the seven established zone prevention and restriction committees across the Northern Rockies Geographic Area.

Key Messages

One key message was that *individuals have a responsibility to ensure that their actions do not result in a wildfire*. The fire prevention/education team helped raise awareness about the need to take personal responsibility to reduce human-caused wildfires and the resulting impacts (such as property loss; resource damage; and threats to residents, visitors, and firefighters).

The immediate priority was messaging related to common summer sources of accidental

ignitions in the region, such as offroad vehicles, dragged chains, campfires, and heavy equipment (for logging, ranching, and so on) (fig. 1). The prevention/education team also delivered messages and materials related to issues that were not as common in the region or that typically occur in the fall, including arson, activities by hunters (such as target shooting and building warming fires), and debris burning.

The teams used numerous existing products (especially related to the One Less Spark and Know Before You Go campaigns). The targeted audience included campers, hunters, ranchers, loggers, travelers, and even homeowners.

Another key message was that *homeowners and communities can help themselves and firefighters by creating defensible space around homes and structures*. The fire prevention/education team emphasized the need for homeowners and communities to take responsibility for reducing



Figure 1—Part of the personal responsibility message was to keep vehicles and equipment from producing sparks that might ignite a wildfire. Source: Federal fire prevention/education team.

flammable materials around homes and communities before a wildfire occurs (fig. 2).

The team drew on existing documents and products to convey the message, especially those from well-established fire preparedness campaigns (such as

Ready, Set, Go!; Living With Fire; Be Ember Aware; and Firewise).

A third key message was that *residents need to be prepared in the event that a wildfire results in the need for them to evacuate quickly and safely*. The fire prevention/education team shared information to help residents be ready for evacuation well before evacuation was imminent.

Consistent language is vitally important in messages related to evacuations. The team worked with the appropriate fire and emergency agencies to ensure that messages reflected accurate, timely guidance. They used existing materials and campaigns (such as Ready, Set, Go! and Emergency Preparedness) to help quickly relay the key message.

As the 2017 fire season evolved in the Northern Rockies, communication with fire agency representatives, fire prevention staff, public information officers, and other interested or affected personnel was key to ensuring a clear understanding of priorities. The fire prevention/education team took the time to understand the task at hand, then chose the correct tool for the job. The team used recent data on fire ignitions and trends to decide on the information and materials to develop and distribute. The team was then able to clearly and consistently relay key messages to the public, adapting them as needed in response to changing fire situations. If the right products with the right messages get to the right people at the right time, then fire prevention and education can be effective within local communities.

Outreach Approaches

The NRCG FPEC has adopted a mechanism for tracking prevention and education efforts across the geographic area. The prevention and

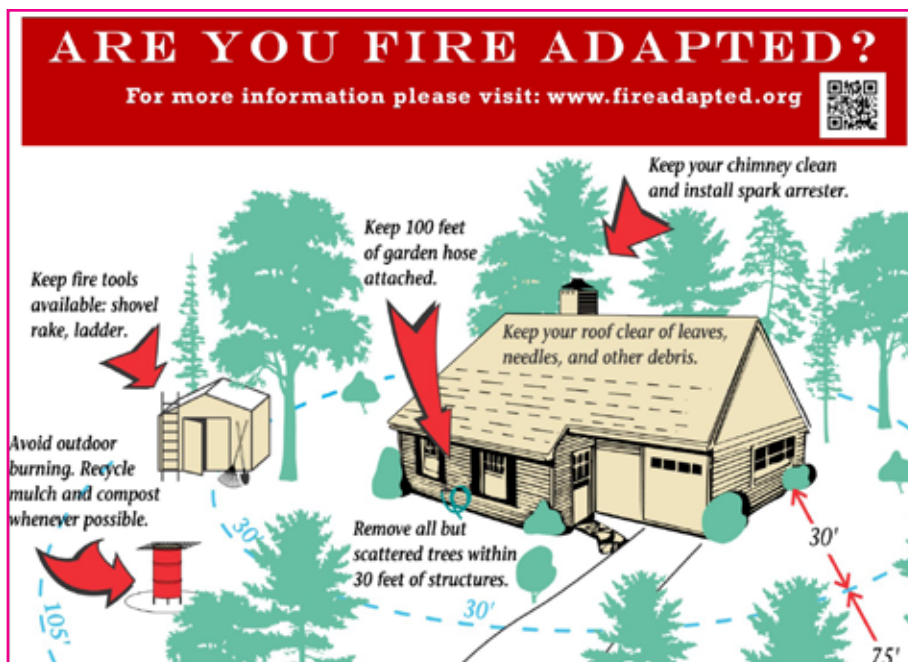


Figure 2—Messaging for homeowners included information they can use to reduce the danger of property damage from wildfires. Source: Federal fire prevention/education team.

Fire-Related Public Outreach

Requests for information and products related to key messages about wildland fire extend to specific events, such as rodeos, festivals, and other community gatherings, where the fire prevention/education team displayed or distributed printed materials, signs, banners, and novelty items. The 2017 Mineral County Fair in Superior, MT, was one example. Displays at the fair's Forest Service booth related to homeowner preparedness, prescribed burning, and current fire restrictions. Fair visitors commented that "this was the best Forest Service presence ever at the fair."



Forest Service booth at the 2017 Mineral County Fair in Superior, MT. Photos: Andrea Colson, Forest Service, Stevensville Ranger District, Bitterroot National Forest, MT.

mitigation officers for the various agencies use an online form to capture and categorize efforts and accomplishments, aligning them with key messages from the National Cohesive Wildland Fire Management Strategy. The goal is to demonstrate the importance of fire-related education, prevention, outreach, and community preparedness and the need to build and maintain local program capacity, funding, and staffing. The statistics from 2016 show a total of 1.2 million public interactions, including 10,000 from 57 school programs alone. Although not all entities entered all pertinent information, this is an example of an interagency effort across the geographic area.

The fire prevention/education team shared key messages through a combination of campaigns, products, and methods tailored to particular areas, needs, and opportunities. The team used traditional media and other opportunities to disseminate information about fire restrictions and closures, incident management, and wildfire activity. The media used

included radio and television (public service announcements), newspapers (news releases and ads), and social media (Facebook, Twitter, and YouTube). Other messaging venues included community businesses (such as movie theaters, sporting goods stores, and convenience stores), government agencies (such as reader boards, campground information signs, and webpages), and community events (such as rodeos, fairs, and festivals) (see the sidebar).

For the fire prevention/education team, success hinged on understanding the communities involved. That included identifying the program or programs best suited to the current situation and using multiple approaches to reach all people on all lands.

The team had lots of different programs and campaigns to draw on: Fire Adapted Communities; Defensible Space; Community Mitigation; Wildland Urban Interface; Conservation Education; Be Smart Outdoors; Community Wildfire Protection Programs; One Less

Spark; Ready, Set, Go!; Firewise; Fire Learning Network; Know Before You Go; and, not least, Only You ... Smokey Bear. The sheer variety can sometimes be confusing to the public as well as to agency personnel, but they all boil down to preparedness, prevention, and community adaptation to wildland fire.

Thinking Outside the Box

Prevention is more than just posters and Smokey Bear messaging through traditional methods of outreach when the summer fire season rolls around. It includes year-round education about the role of wildland fire in the environment; it includes communicating about ecology and fuels mitigation with all stakeholders, cooperators, and communities before there is smoke in the air. As practitioners of fire prevention and education, we must think outside the box, analyze the past, and be innovative in our future efforts to effectively incorporate prevention into a community culture of adaptation to wildland fire. ■

COLLABORATION ACROSS BOUNDARIES: A POLICY PERSPECTIVE ON THE STATE OF WILDLAND FIRE*

Vicki Christiansen

Fire itself can be a gnarly challenge, and the challenges have gotten gnarlier in recent decades.

The topic of collaboration across boundaries is fitting for me and for the Forest Service because our national priorities revolve around just that—collaboration across boundaries—especially when it comes to wildland fire. We are committed to improving the conditions of the Nation's forests, being good neighbors, and sharing stewardship through partnerships, including with many of you here.

My personal passion is connecting people with their natural resources—whether as partners, as volunteers, as homeowners, or just as citizens—and, as you know, there are plenty of opportunities for all that in the wildland–urban interface (WUI). Collaborating across boundaries goes to the core of the National Cohesive Wildland Fire Management Strategy, especially when it comes to the WUI.

Vicki Christiansen is the Interim Chief for the Forest Service, Washington, DC.

** The article is based on a speech delivered by the author at Wildland–Urban Interface 2018, a conference held in Reno, NV, on February 27, 2018.*



Vicki Christiansen (second from left), Forest Service Deputy Chief for State and Private Forestry (now Forest Service Interim Chief), participating in the Wildfire Mitigation Awards ceremony at the WUI 2018 conference. With Chief Christiansen are (from left to right) Chief Tom Jenkins, Fire Chief for the city of Rogers, AR, and President and Chair of the Board for the International Association of Fire Chiefs; Lorraine Carli, Vice President for Outreach and Advocacy, National Fire Protection Association; Chief Ken Pimlott, Director of Cal Fire; and Abby Watkins of Newaygo County Emergency Services, White Cloud, MI, one of nine recipients of the Wildfire Mitigation Award for 2018. Photo: International Association of Fire Chiefs.

National Outlook

At the national level, we have some gnarly challenges ahead. Fire itself can be a gnarly challenge, meaning complex and difficult to deal with, and the challenges have gotten gnarlier in recent decades. In fact, we have changed our language to talk about the fire year instead of the fire season. Over the last few decades, the western fire season has grown at least 2½ months longer, and we have seen the frequency, size, and severity of wildfires increase. Primary drivers are

drought, fuel buildups, and increasing development in the WUI. All these trends are expected to continue.

Last year, we had one of the most severe fire seasons in recent history, with more than 10 million acres (4 million ha) burned nationwide. About 12,000 structures were destroyed by wildfires, including more than 8,000 homes. That is more than five times higher than the annual average of about 1,500 homes destroyed by wildfire.

- During 2017, wildfire activity occurred consistently throughout the year, beginning with the Fall 2016 Fire Siege in the Southeast and continuing in the Great Plains, Southwest, and West in the spring and summer.
- The year progressed with far above-average fire activity, which started earlier than usual in the Northern Rockies and included an active season in the Northwest.
 - » In early July, Montana and northern Idaho had mainly lightning-caused fires in rugged, remote, timbered areas. Many would become long-duration fires (such as the Lolo Peak and Rice Ridge Fires in Montana).
 - » In late July, there were similar scenarios in Oregon, Washington, and northern California.
 - » And central and southern California had geographically dispersed human- and lightning-caused fires from summer through early 2018. All this solidified the term “fire year” rather than “fire season.”
- Nationally, more than 10 million acres (4 million ha) burned

There are forces at play in our operating environment over which we have little or no control.

- across all jurisdictions. This was a 53-percent increase in acres burned compared to the 10-year average of 6.6 million acres (2.7 million ha).
- A total of 2.9 million acres (1.17 million ha) burned on National Forest System lands alone. That was a 92-percent increase in acres compared to the 10-year average of 1.5 million acres (0.61 million ha).
- During 2017, the national preparedness level was at level 4 or 5 for 75 days.

We are in a “new normal of fire activity.” During the peak of fire activity in 2017, about 29,000 fire personnel were deployed. No single agency has the resources to respond to these complex fires ... it really does take everyone! Some of our collective resources are already out on fires again in 2018, and we expect the year-round fire season trend to continue.

Last year, total fire-related costs for the Forest Service were \$2.4 billion,

making it the most expensive fire year in history.

- To cover this cost, we transferred nearly \$526 million from other accounts.
- This came from programs that support national forest activities, such as forest management and hazardous fuel reduction, and programs that support working across boundaries with partners, such as State and volunteer fire assistance.
- In addition to these fire transfers, the increasing 10-year-average cost of fire suppression creates ongoing erosion of our agency’s nonfire budgets (on the order of a \$100- to \$120-million erosion each year).

All this puts tremendous strain on our fire personnel, our nonfire programs, and our agency budgets. In 1995, fire made up 16 percent of the Forest Service’s annual appropriated budget. Last year, about 56 percent of our annual budget was dedicated to wildfire. Along with this shift in resources, there has been a corresponding shift in staff, with a 39-percent reduction in all nonfire personnel. Left unchecked, the share of the budget devoted to fire in 2021 could exceed 67 percent. That equates to reductions of nearly \$700 million from nonfire programs.

Fortunately, Congress included a fire funding fix in its omnibus appropriations bill for fiscal year 2018. The bill, passed by Congress on March 23, 2018, set up an emergency suppression fund for Federal agencies to draw on in fiscal years 2020–27. This solution will let us secure our operating environment by stabilizing our



Firefighters on the Thomas Fire on the Los Padres National Forest near Ventura, CA, in December 2017. The Thomas Fire was the largest in California history at the time, burning 281,893 acres (114,078 ha). Photo: USDA Forest Service.

rising fire suppression budget. We will finally start treating catastrophic wildfires as disasters, dramatically reducing the need to transfer funds from other work. The bill also gives us new tools and expanded authorities to do more to improve forest conditions and deliver values and benefits from forests to the American people. Now it's up to the Forest Service to deliver.

My Leadership Journey

So that's my perspective on what's happening at the national level. But as we all know, fires don't happen at the national level. To paraphrase one former politician, "All wildfire is local." Fire happens in a local context, but that context is a system that is incredibly complex.

We are in a Wildland Fire System, where a full suite of environmental, social, political, financial, and cultural factors drive outcomes in the wildland fire environment (fig. 1). The Wildland Fire System has pieces connected to civil society, to responders, to communities, and to landscapes, including forces at play in our operating environment over which we have little or no control. The Wildland Fire System acknowledges and invites the participation of a broader set of stakeholders in addressing current unacceptable outcomes.

The Wildland Fire System is so incredibly complex that no single entity can do it alone—not the Forest Service, not the States, not any given fire department. We are all in this Wildland Fire System together. Everyone in this room has a role to play, in one way or another, in helping local communities prepare for wildfire ... by creating healthier landscapes, by preparing for an effective response to wildfire, and

by reducing risk to communities through effective mitigation.

My own personal realization of the Wildland Fire System—my "ah-hah moment"—came when I was a brand-new State Forester in the State of Washington in 2006. We

That's when it hit me: I needed to help change the conversation.

had the Tripod Fire Complex, which burned more than 175,000 acres in Okanogan County. Much of the area burned was on the Okanogan–Wenatchee National Forest, where many of the trees were dead or dying due to drought and beetle infestation. The fire cost \$110 million to suppress, including \$13

million from State efforts. We had to catch the fire on the eastern flank, which was under State jurisdiction and where the forests had been thinned on the Loomis State Forest.

As State Forester, my total annual budget for fire suppression was \$13 million, so that one fire ate up our entire fire budget. We had to ask the legislature for a \$60-million supplemental appropriation. As you might imagine, fingers were pointing every which way, and I kept looking over my shoulder to see who was going to come clean up this mess.

That's when it hit me: I needed to help change the conversation. We needed to spend our energy finding collective solutions, not pointing fingers about who had the most responsibility for the wildland fire problem in this Nation.

Warren Buffett once said, "In a chronically leaking boat, energy



Figure 1—The Wildland Fire System, with its five components.

devoted to changing vessels is more productive than energy devoted to patching leaks.”

That’s what we needed to do: stop patching leaks by placing blame and instead build a new vessel by changing the conversation. I spoke up at a meeting of the Forest Fire Committee of the National Association of State Foresters. I talked about the need for taking a

the strategy was the Four Forests Restoration Initiative, which involves restoration treatments across nearly a million acres of dry pine forest on four national forests.

This effort has transcended governors of different political parties. A new paradigm of working together to create resilient landscapes and fire-adapted communities is taking hold.

develop a truly shared national approach to wildland fire management. Based on that earlier footprint from Emmetsburg, MD, we developed a National Cohesive Wildland Fire Management Strategy. The strategy was and is a broad-based collaborative response with three national goals:

1. restoring and maintaining resilient landscapes;
2. creating fire-adapted communities; and
3. safe and effective wildfire response, with decisions based on risk analysis for all ownerships.

A new paradigm of working together to create resilient landscapes and fire-adapted communities is taking hold

more proactive approach. Thirteen of us in national fire leadership roles came together at the National Fire Academy in Emmetsburg, MD. Together, we built the initial footprint of the National Cohesive Wildland Fire Management Strategy.

My next appointment as State Forester was in Arizona. Most of you have probably heard of the Rodeo–Chediski Fire. In 2002, it burned more than 468,000 acres (189,000 ha), making it the largest wildfire in Arizona State history at the time. Over 490 structures were destroyed, and more than 30,000 residents were evacuated.

As a result, a Governor’s Forest Health Council was formed, and the Statewide Strategy for Restoring Arizona Forests was developed in response to citizens’ concerns about the health of Arizona’s forests. Traditional adversaries came together for a common purpose, and the strategy presented a 20-year roadmap for restoring forest health and protecting rural communities from wildfire. A major outcome of

My point is this: we need to recognize how complex the Wildland Fire System is and how huge the wildland fire problem is, driven by factors like long-term drought and beetle infestations that affect enormous parts of our country. And the projections are that these trends will continue due to a changing climate. We have a new normal, so why do we keep responding in old ways?

As someone once said, “People who change after change, will survive; people who change with change, will succeed; people who cause change will lead.”

National Cohesive Wildland Fire Management Strategy

We need to cause change by recognizing that the wildfire problem requires a new approach. Congress gave us a big leadership push with the 2009 FLAME Act when it required the creation of a national cohesive strategy.

That caused us to act. The stakeholders all came together to

The vision for the Cohesive Strategy is, *“To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a Nation, to live with wildland fire.”* This vision acknowledges that there are different missions and authorities among us ... whether we are local, State, Tribal, or Federal fire managers. On most Federal and Tribal lands, we are fire managers AND land managers on the same piece of ground. By contrast, most State and local fire managers protect someone else’s property.

The Cohesive Strategy causes us to look the Wildfire Paradox squarely in the eye: fire is a bad boss but a good servant. We must take the long view, accepting the inevitability of fire visiting our landscapes and preparing ourselves so that when fire does come calling, the consequences are not devastating. Whenever possible, we need to reintroduce fire under conditions we choose. Fire is the primary change agent on many of our Federal lands and has been for millennia.

So the first pillar of the Cohesive Strategy is restoring healthy fire-adapted landscapes. That includes

The Cohesive Strategy causes us to look at the Wildfire Paradox squarely in the eye: fire is a bad boss but a good servant.

both thinning and prescribed fire treatments, and it means getting more fire on the land, not less. If we don't, then our fires are only going to get bigger, more explosive, and more dangerous to homes and communities.

We also need communities in fire-adapted landscapes that are prepared to mitigate risks from wildfire. Today, the WUI contains about a third of the housing units in the United States (44 million homes potentially at risk), and that number is growing, especially in parts of the South and West that are already at moderate to high risk of wildfire. We need to find ways to help landowners and communities expand hazardous fuels treatments and increase the resilience of their own homes and infrastructures.

And we also need an efficient and effective response to wildfire. Keeping people safe from wildfire is a central part of our job. Nothing is more important, and I want to pay tribute to the firefighters we lost in 2017. We are committed to making sound risk-based decisions that do not place the lives of firefighters at needless risk. Our goal is to commit emergency responders to operations where they can succeed in protecting lives and values at risk and then safely go home at the end of the day.

Those are the three pillars of our Cohesive Strategy. All three envision reintroducing fire to the landscape whenever possible under conditions



Prescribed fire in the wildland–urban interface to reduce fuels and protect homes in western Oregon. Photo: Bureau of Land Management.

we choose. We need to strike a balance among the five elements of the Wildland Fire System—social, cultural, political, environmental, and financial—in a way that more reliably protects responders and the public, sustains communities, and conserves the land.

Our Cohesive Strategy gives us a doctrine for getting there. It sets the stage for an all-lands national blueprint for creating synergies in wildland fire management. Our holistic approach to wildland fire management encourages further dialogue between local communities and national policymakers, and that dialogue is key.

Fire-Adapted Communities

That dialogue is key because creating fire-adapted communities is so central to our Cohesive Strategy. Before closing, I want to say a few words about that, even though I'm no expert ... you are, the people here today for this conference!

Creating fire-adapted communities means working from “the front door to the forest,” and that involves everyone. Everyone in the community is in this together, whether homeowners, fire departments, local governments, nonprofit groups, or local Federal land managers. Local cross-jurisdictional partnerships can be more effective in preparing a community for wildfire than any one group working alone.

As you know, the best way to reduce community risk is to harden homes and create defensible space, and that means getting property owners involved. It also means getting their friends and neighbors involved, along with other trusted folks in the community, such as the local fire department.

You don't get people to change their behavior by handing out brochures or leaving doorhangers or putting up signs and billboards. Those

Creating fire-adapted communities means working from “the front door to the forest,” and that involves everyone.

kinds of activities can help raise awareness and make information available. But we motivate people to act by engaging them face to face over time and building trust. Only when they're ready can we help them take the next steps. That's why we need to get friends, neighbors, and trusted members of the community involved.

As you know, the biggest barrier to fire-adapted communities is local capacity. Most folks in the WUI know they're at risk and are willing to take some kind of action, but they don't have the support network for that. A little support at the local level can go a long way.

Willingness to act depends on perception of risk. If you think the risk to your property is high, you're more likely to take action. That's why helping property owners understand the risk to their homes from wildfire can be so effective, especially during teachable moments when smoke is in the air.

All this points to the value of building strong cross-boundary mitigation collaboratives or partnerships to help communities

adapt to wildfire. One example is the community mitigation assistance team. These are teams of WUI mitigation practitioners who are expert at helping communities build local coalitions, at motivating people to act, and at getting them to take effective actions.

The only way to address the wildfire issue is collaboratively, and that's why you're here today, from many different communities of practice. If every forest, every fire department, every community in a fire-prone landscape had a sustainable and effective fire adaptation program, imagine how far we could get in achieving this key goal of the Cohesive Strategy. That's the challenge, and you in this room are leading the way. I salute you and thank you for all you do!

A Societal Issue Requiring Societal Solutions

In closing, fire may be a gnarly problem, but it is not a hopeless problem. It is a societal issue that requires contributions from multiple disciplines, creating synergies—where the sum of our efforts is greater than the individual parts.

We all come from different backgrounds, with different responsibilities—different communities of practice and of place. We all have different outlooks and different constituents, different constraints and opportunities. For example, State and local authorities might not have much leeway to restore fire to the landscape, while Federal agencies have more.

But we are all part of the same wildland fire community, and we all have significant influence on the Wildland Fire System. And I'm certain we all share the same interest in outcomes like healthy landscapes and fire-adapted communities. We need each other, and together we are stronger. We can anchor to our specific communities of practice and place and still bring our individual strengths to the table. We can still embrace other disciplines, including governance, civic engagement, and public policy. It will take all of us to overcome our gnarly challenges!

Gifford Pinchot, the first Chief of the Forest Service, was one of the earliest American visionaries of conservation. He put it well, and I quote: “The vast possibilities of our future will become realities only if we make ourselves responsible for the future.”

And that will take collaboration across boundaries. We are all in this together! ■

FIRE IN AMERICA 2.0: UPDATING THE PAST

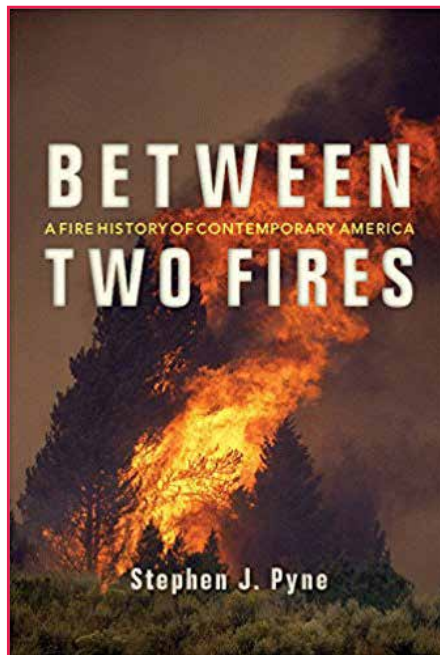
Stephen J. Pyne

The idea for a book series began in conversations with Lincoln Bramwell, chief historian for the Forest Service.* We agreed that the standard history *Fire in America* needed updating.

The book ended, creakily, in the late 1970s. If we date modern American wildland fire from 1910, then the book spanned less than 60 of those years, while another 40 years have passed since it was published. We needed a history to encompass that recent era, which was also the time when the fire community revolutionized its policies and programs.

I proposed a two-book project. One would narrate the national history since 1960—call it the play by play. The other would explore, through a collection of essays, some of the

I proposed a two-book project: a national history since 1960 and a collection of essays with interesting details that a narrative can't easily hold.



Steve Pyne is a professor in the School of Life Sciences, Arizona State University, Tempe, AZ. He recently published Between Two Fires: A Fire History of Contemporary America and To the Last Smoke, a suite of regional fire surveys.

** Lincoln was once a member of the Sawtooth Interagency Hotshot Crew and is the author of Wilderburbs, a look at the wildland–urban interface, including its fire issues.*

*** The Forest Service was willing to absorb the costs of publishing through the Government Printing Office in order to keep costs down. Instead, the University of Arizona Press and I agreed that I would waive royalties and they would match that amount to keep the purchase price as low as possible.*

interesting details that a narrative can't easily hold—think of it as color commentary.

Tom Harbour, then director of Fire and Aviation Management for the Forest Service, was enthusiastic but rightly wanted interagency support. The U.S. Department of the Interior signed on. Later, so did the Joint Fire Science Program.

These are books funded by and written for the American fire community.

Between Two Fires

The narrative, *Between Two Fires: A Fire History of Contemporary America*, was completed by 2013. We tried to publish through the Government Printing Office, but that ambition crashed early in the editing.** Instead, we turned to the University of Arizona Press. The book appeared in November 2015.

Between Two Fires opens with a panoramic survey of the American fire scene in 1960, a time when the Forest Service was a hegemon in ways that are difficult to imagine today. The agency controlled almost every aspect of fire policy, practice, and research. It was the integrative matrix for a national program. It was regarded as a paragon of public administration.

That near-monopoly provides a narrative anchorpoint for showing the evolution in policy and institutional arrangements, beginning with what we might aptly call a fire revolution. It first announced itself in 1962, when Tall Timbers Research Station hosted its first fire ecology conference and the Nature Conservancy conducted its inaugural prescribed burn.

Over the next 15 years, every Federal land agency had its organic act revised or received its first charter. That change in purpose

Fire Management Today

led to reforms in how they wanted to manage fire. The old edifice rapidly fragmented. The National Park Service adopted a policy of fire restoration in 1968; the Forest Service, in 1978. The ideas (and the idealism) behind restoring fire are not new. Again taking 1910 as a

historical marker, as many years have passed since the opening of the fire revolution as had passed before it.

In brief, the 50 years after the Big Blowup were spent creating a national infrastructure, organized around the Forest Service, to

exclude fire as far as possible. The next 50 years were spent promoting a pluralism of policies and interested parties—trying to reassemble the pieces left after the breakup and the many agencies, both public and private, that subsequently joined. I had intended to end the book in 2010 with the centennial of the Big Blowup, but the big fires kept coming and the narrative rolled with them, finally coming to rest in 2013.

So what two fires does the narrative pass between? There are many such pairings: the big blowups of the past and the megafires of today (fig. 1); nature's fires and humanity's; wildfires and prescribed fires; the fires that burn living landscapes and those that burn lithic ones—the combustion of fossil fuels that is the real big burn of today. America's fire history is part of a global fire history.

The text itself has two parallel styles that illustrate this theme by alternating chapters on ideas and institutions with shorter summaries of particular fires or fire seasons. Over the decades, the fires change character: they reveal the evolving fire scene. Save for the prologue and epilogue, the narrative is always itself between two fires. The fire problem is not something we can fix. It's something we live with.

To the Last Smoke

The color commentary began with blogs posted during my research travels in Florida. But there was something every day, and it was material no one seemed to be writing about. The number of essays grew: essays on places, essays on people, essays on programs and policies. They began to self-organize, one cluster around Tallahassee (the Silicon Valley of prescribed fire) and another along my route of travel from north to



Figure 1—*Top: Aftermath of the Big Blowup of 1910, a signature event in early Forest Service history. Driven by high winds, the fire demolished a stand of white pine on the Little North Fork St. Joe River, Coeur d'Alene National Forest, ID. Bottom: Firefighters taking a break on the 2017 Thomas Fire, a modern megafire, the largest in California history at the time. Driven by Santa Ana winds, the fire tore through chaparral on the Los Padres National Forest near Ventura, CA. Photos: USDA Forest Service (1910); USDA Forest Service (December 9, 2017).*

south, where fire and water converge on the Everglades.

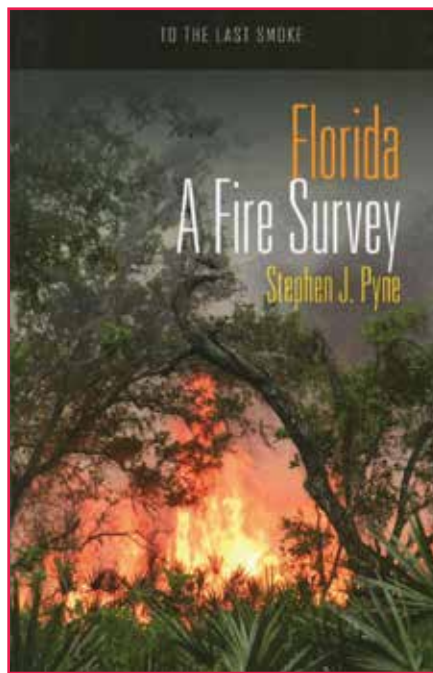
I decided they deserved a frame. A prologue gave a thumbnail history of what makes Florida distinctive. An epilogue placed it within the national narrative, or Florida “between two fires.” The upshot was a manuscript a little under 60,000 words—a short book; printed, about 200 pages. I had a template.

I carried the same loose formula to California, which divided north and south, and to the Northern Rockies, which had two portals, one at Lolo Pass and one at the Gates of the Mountains. Those were the big three fire regions I had wanted to survey.

By now, I began to think of a series of books that would spread into other regions. I still had funds in the research account. I added the Southwest and the Great Plains. The Plains introduced another variation, a minisurvey of 20,000 words, which I decided I needed for Texas, which wasn’t integrated yet wasn’t autonomous either. (Would Texans have wanted it any other way?) The University of Arizona Press agreed to publish the series under the collective title *To the Last Smoke*.

I managed to squeeze out a volume on the Interior West and a minisurvey on the oak woodlands before the funding ran out. Along the way, I had written some topical essays that didn’t fit into any of the targeted regions; I gathered these into a second-order anthology called *Here and There*.

Then Ron Dunton, the assistant director of Fire Management for the Bureau of Land Management, approached me at a conference and asked if I would consider Alaska. Of course I would. The Bureau provided funds through the Joint Fire Science Program, which contributed some



more so I could complete the series as conceived.

The additional money and time meant I could add two books. One would look at the Northeast, not an active arena on the national scene today but of great interest to a historian and in many ways a possible harbinger of what the future might look like elsewhere. The other would assemble three minisurveys: one for the oak woodlands, one for Alaska, and one for the Pacific Northwest.

I was determined to complete my travels and manuscripts by the end of 2017—the 50th anniversary of my first season in fire. Actual publication will probably extend into early 2019.

When published, *To the Last Smoke* will hold nine volumes. The books have evolved. Florida was journalistic—serious, historically informed, but built mostly on personal essays. The subsequent volumes have become more deliberate; more background research, more calculation in the choice of topics, though I have tried to keep a less formal tone.

The nine volumes have value today in explaining why and how America’s fire regions differ—that’s why I wrote them. But I believe they may hold more interest in the future because they present a panorama of the American fire scene at a particular time in our national history, refracted through a single voice and vision.

Reflecting Back

I know only too well how much is missing in both books.

There are gaps in documentation beginning in the 1980s. A lot of stuff is not in the archives; and a lot of stuff was beginning to go digital but was not saved. Despite what may seem its length and density, *Between Two Fires* has serious gaps that I partly filled from my personal experience of having lived through the era. By training and temperament, though, I’m a historian. There are reasons why it’s customary to wait 40 or 50 years before taking on a topic. But I thought we needed something now.

The reconnaissance by region also has omissions. The Southeast got lost because I began with Florida and telescoped the region into that eccentric State. The Southern Appalachians will similarly get compressed into an essay on the 2017 Gatlinburg Fire in Tennessee. The Lake States, enormously important in the leadup to a national fire program, have been less so in the postwar era; they get a long essay in the Northeast volume. The Pacific Northwest, also historically significant in the first half of the 20th century, is less so in the latter half; it gets a minisurvey. There were places missed in the Plains and the Northern Rockies; intriguing States like Arkansas, Minnesota, and Washington got mostly elided; changes in access to Tribal lands made it difficult to

include as many as I would have liked. “Human subjects” constraints limited what I could do by way of personal profiles. Writing, like politics, is the art of the possible. I had to pass between two fires. This is what survived.

There were lots of surprises. I had spent many years viewing fire history on a continental scale. Moving from satellite surveillance into the pixels and polygons of particular places forced me to reconsider what I thought I knew. I had not understood the richness of the Florida fire scene until I walked through it. I had not

appreciated the way in which nearly every fire story in California seems to end in suppression regardless of what fire officers might wish. I had not sensed how powerful the role of generations is in the Northern Rockies until I began to probe through the literature. Until I toured the Great Basin, I had not imagined the ways in which knowledge came and went, along with species. Every place had a fascinating story. Everywhere had something new. The grand tour has been equally enlightening and humbling.

And there is plenty yet to do. ■

Useful Links

Barrett, S.W. 2017. Telling fire’s story through narrative and art. *Fire Science Digest*. 25 (July): 1–11. <https://www.fire-science.gov/Digest/FSdigest25.pdf>. [Date accessed unknown].

Pyne, S.J. [N.d.]. [The contemporary American fire scene. www.stephenpyne.com/i_b_font_size_3_the_contemporary_fire_scene_in_american_font_b_i_130396.htm](http://www.stephenpyne.com/i_b_font_size_3_the_contemporary_fire_scene_in_american_font_b_i_130396.htm). [Date accessed unknown].

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NEXT-GENERATION FIRE MODELING FOR ADVANCED WILDLAND FIRE TRAINING

James H. Furman

The project was designed to answer “burning questions.”

This article, the second in a three-part series pertaining to FIRETEC, focuses on a project funded by the U.S. Department of Defense that should be of particular interest to fire managers. The first article described the development and capabilities of FIRETEC, a physics-based wildland fire model; it also introduced the project portrayed here. This article outlines general project design, expected benefits to the wildland fire community, and preliminary project results. The third article will give additional project results and more specific information on project design, inputs, and analysis.

Testing FIRETEC Capabilities

Fire managers at Eglin Air Force Base (AFB) on the Florida panhandle (fig. 1), in collaboration with Los Alamos National Laboratory in New Mexico, initiated a project to demonstrate and test the capabilities of FIRETEC to simulate fire behavior from prescribed fires in southeastern fuels. The team that developed



Figure 1—Eglin Air Force Base on the Florida panhandle includes about 464,000 acres (186,000 ha) of predominantly longleaf pine forest. Eglin completes about 90,000 acres (36,000 ha) of prescribed burning annually. Source: U.S. Air Force.

the original project comprised the developer of FIRETEC and three wildland fire managers. The fire managers cumulatively have over 60 years of wildland fire experience on more than 1,000 fire events, primarily in longleaf pine and associated southeastern fuel types. The project was designed to test FIRETEC’s capabilities while using it to explore the modeled physics of specific ignition strategy scenarios. The team designed the ignition strategy scenarios to seek answers to management-relevant ignition strategy questions. Funded by the U.S. Department of Defense

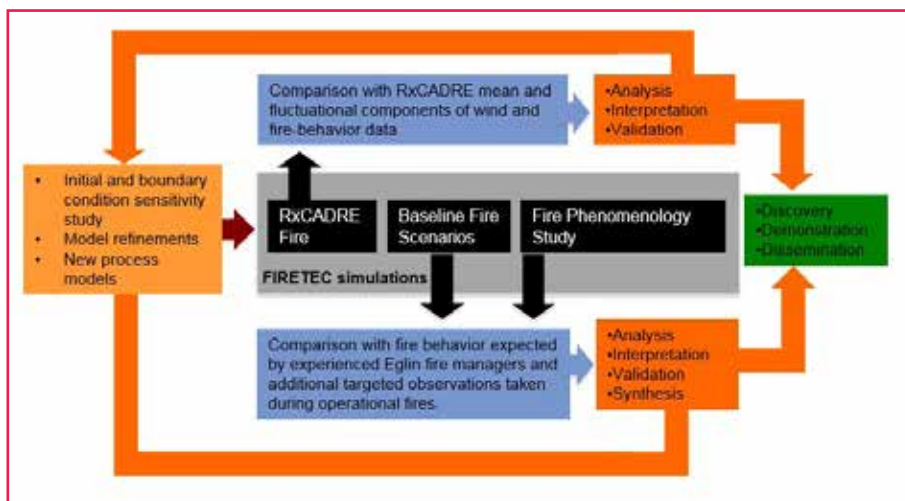


Figure 2—General project schematic. The gray box contains three sets of FIRETEC simulations (the black boxes). Each relates to a different component of the project. “RxCADRE Fire” simulations are run with and compared to data from a 2012 RxCADRE fire (top blue box). Analysis and interpretation from the RxCADRE simulation (upper red box) provide information for the outreach element of the project (green box) as well as the sensitivity study and model refinements (orange box on left). This in turn provides information for improving the FIRETEC simulations for analysis, interpretation, validation, and synthesis (lower red box). “Baseline Fire Scenarios” and “Fire Phenomenology Study” simulations were designed to test FIRETEC’s ability to capture realistic phenomenology associated with variations in environmental conditions and ignition strategies. These simulation results are compared to fire behavior expectations from experienced fire managers (lower blue box). Analysis and interpretation of these simulations, as with the RxCADRE simulations, provide information for discovery and outreach.

James Furman is a Forest Service fire management specialist with Northeastern Area State and Private Forestry.

Environmental Security Technology Certification Program (ESTCP), the project demonstrates FIRETEC's ability to predict the realistic response of fire to variable forest structure, wind speed, and firing pattern scenarios. The project also includes a strong outreach component for disseminating modeling results and lessons learned to fire managers and practitioners. Collaboration and associated data sharing with scientists associated with the Prescribed Fire Combustion Atmospheric Dynamics Research Experiment (RxCADRE) have been key to the success of this project.

Project Design

Figure 2 shows the FIRETEC project design. The project includes three sets of simulations: RxCADRE Fire, baseline fire scenarios, and a fire phenomenology study.

RxCADRE Fire

The RxCADRE project included experimental burns conducted at locations across the Southeast, including Eglin AFB, between 2008 and 2012. Involving more than 90 scientists, RxCADRE included some of the most heavily instrumented fires to date.

This component of the ESTCP project comprises an analysis and comparison of FIRETEC simulations

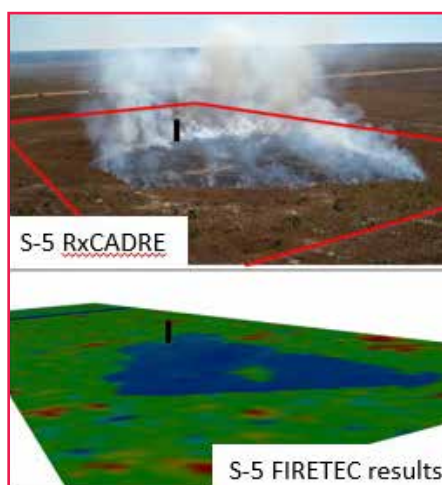


Figure 3—S-5 burn from RxCADRE (top) and FIRETEC simulation (bottom), both at 320 seconds after ignition. FIRETEC inputs included onsite weather and fuels data. In this simulation, a nearest neighbor algorithm was used to correlate data from multiple anemometers that were located around the inlet wind end of the plot. The red lines in the top image show the extent of the FIRETEC computational grid. The black marker in the center of each image marks the location of an instrument tower. The large blue area in the bottom image indicates the modeled burn area. The other colors represent different vegetation types present, generated from a combination of field sampling and high resolution imagery analysis.

using fuels and weather data from a highly instrumented RxCADRE burn. The S-5 burn block was chosen for this comparison. Figure 3 shows the actual burn on the S-5 plot and the corresponding FIRETEC simulation using fuels and wind data from the burn. A more

thorough analysis of the comparison, including methodologies and lessons learned, will be available to fire scientists and modelers in an upcoming peer-reviewed publication.

Baseline Fire Scenarios

The baseline fire scenarios (see figure 2) are a series of simulations used to explore and illustrate FIRETEC's sensitivity to varying vegetation structure, ignition techniques, and wind speeds. Aerial/spot ignition and strip head fire ignition techniques were modeled under low (5-mile-per-hour (8-km/h)) and moderate (12-mile-per-hour (19-km/h)) wind speed scenarios.

Figure 4 shows the design of this component of the project. Eighteen separate FIRETEC simulations were associated with variations in wind speed, ignition type, and vegetation structure.

Three generalized vegetation structures were selected:

1. Grass,
2. Canopy, and
3. Canopy with midstory.

The grass-dominated fuelbed was also present in “canopy” and “canopy with midstory” simulations. For the “canopy” simulations, mature longleaf pine trees were added in

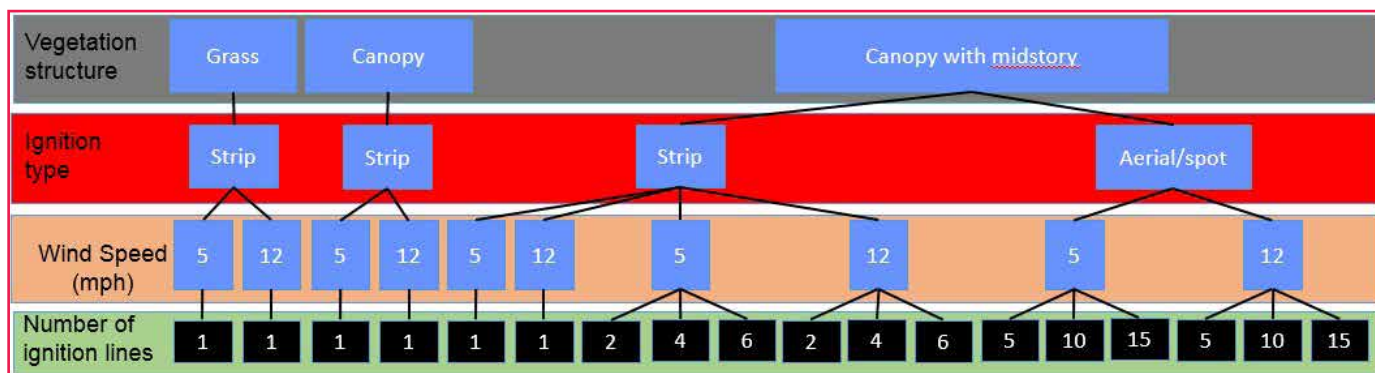


Figure 4—Eighteen baseline fire scenarios. Each black box represents a separate FIRETEC simulation, in turn associated with variables of wind speed, ignition type, and vegetation structure. Black lines indicate the various associations.

order to evaluate the canopy's effect on modeled fire behavior. "Canopy with midstory" represented longleaf pine forest with a well-developed midstory of hardwoods dominated by oaks. A greater number of simulations were chosen for "canopy with midstory" because this condition is typical of longleaf pine communities where prescribed fires are conducted.

Understory composition as well as tree sizes, structure, and distribution were derived from Eglin AFB ecological monitoring data. Modeling the relative contribution of vegetation structure to fire behavior is important because structure affects midflame wind speeds, surface flow, indrafts, convection, and ultimately fire behavior.

Each combination of vegetative structure and ignition scenarios was modeled using wind speeds of 5 miles per hour (8 km/h) and 12 miles per hour (19 km/h). Limiting the simulations to two wind speeds simplified simulation combinations while still allowing analysis of fire behavior at the upper and lower range of wind speeds under which most prescribed fires occur.

For the "canopy with midstory" vegetation structure, both aerial/spot

and strip ignitions were modeled and several sets of ignition line numbers were simulated: 5, 10, and 15 ignition lines for aerial/spot and 2, 4, and 6 lines for strip ignition.

For aerial/spot ignition, the number of ignition lines chosen represented some typical trigger points. After a certain number of ignition lines, a fire manager will often halt ignition to assess fire behavior (and adjust firing patterns if needed). The upper range of 15 ignition lines is also expected to present an opportunity for FIRETEC to model significant thermal lift with associated indrafts and concentration of heat near the center of the fired area. This phenomenon of fire "drawing to the middle," particularly under low wind conditions, is a concern for fire managers.

For strip head fire ignitions, the team chose two, four, and six ignition lines. These values represented the typical upper and lower range of ignition lines that can be simultaneously ignited using hand torches or all-terrain vehicles. For safety reasons, there are typically at least two igniters working simultaneously but rarely more than six, making these scenarios a useful reflection of reality on the ground.

Fire Phenomenology Study

Following the baseline fire scenarios, more focused simulations were completed to identify key trends in phenomenology for specific prescribed fire scenarios. Figure 5 shows initial planned simulations for this component of the project. The study included four different elements (fig. 5):

1. Alignment of spot ignitions,
2. Impact of dash fire ignition,
3. Impact of midstory, and
4. Impact of venting at flanks.

Alignment of spot ignitions.

Accurately aligning or perfectly staggering point source ignitions from a helicopter with regard to wind direction is impossible. Nevertheless, this scenario set was designed to explore differences in interactions between point source ignitions under two different firing patterns. Point source ignition is also a common technique when setting a prescribed fire by hand or when using a torch mounted on an all-terrain vehicle. Either ignition method affords the ability to align or stagger ignition points. Thus, differences in overall modeled fire intensity between inline and staggered aerial ignition points could offer insights useful to fire managers for nonaerial point source ignition strategies (fig. 5).

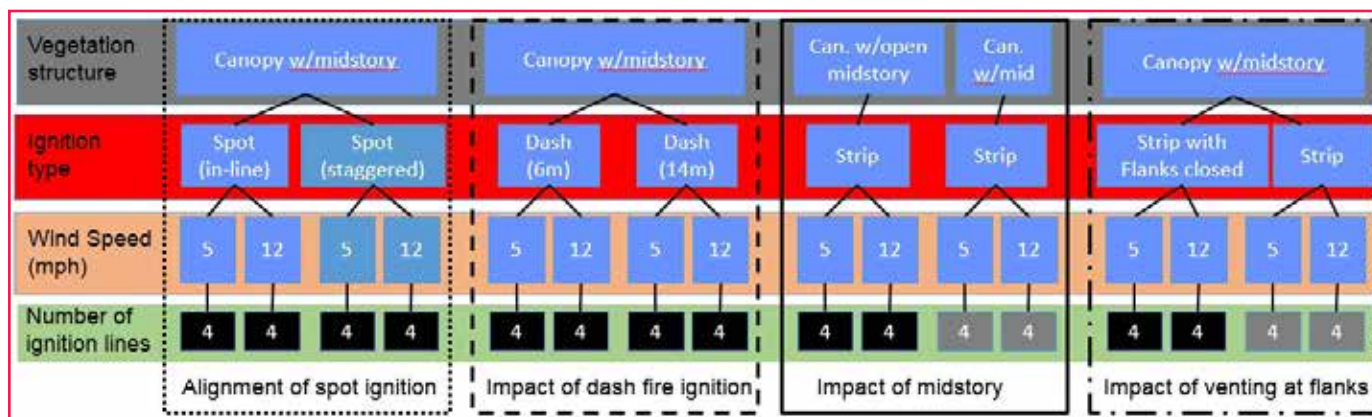


Figure 5—Schematic of the prescribed fire ignition strategy simulations in the fire phenomenology study. Gray boxes indicate FIRETEC model runs leveraged from baseline simulations in Figure 4, and black boxes represent additional simulations. The boxes are linked, as shown by black lines, to variables of wind speed, ignition type, and vegetation structure.

Impact of dash fire ignition. The prescribed fire ignition strategy of lighting varying lengths of dashes perpendicular to the prevailing wind direction produces lower overall fire intensity than setting solid lines of strip head fire. “Dash firing” produces less wind-driven (head) fire and more flanking fire, which is typically lower intensity. The space between dashes also allows for more cool air entrainment and convective cooling.

The study modeled fire behavior produced by two different prescribed fire scenarios using different lengths of dashes (fig. 5). The two scenarios were expected to serve as a natural bridge for comparing point source (least amount of fire applied per unit area) and strip head fire (greatest amount of fire applied per unit area). After some experimentation, dash lengths of 20 feet (6 m) and 46 feet (14 m) were used. Unlit strips between dashes were standardized at 131 feet (40 m).

Impact of midstory. The impact of an open midstory on fire behavior was included in the project for a number of reasons. If longleaf pine forests are burned frequently, the midstory is reduced, as are fuel loadings. An open midstory decreases wind drag, resulting in higher instand winds than in a stand with a heavier midstory component. Moreover, an open midstory is what most managers of longleaf pine forests desire. Vegetation structure and composition data for “open midstory” were obtained from Eglin AFB’s ecological monitoring program for one of Eglin’s “high quality/restored” longleaf pine sites.

Impact of venting at flanks. Wildland firefighters learn that one of the “18 Situations That Shout Watch Out” is having unburned fuels between you and the fire. Many automatically respond by setting

fire from the fireline, “lacing up the flanks” to “create black.” Though often a viable tactic in fighting wildfires, in the prescribed fire arena this technique often causes unnecessarily intense burning that damages resources. A FIRETEC simulation where flanks were lit offers a valuable visual training tool for fire managers, helping to minimize unnecessary resource damage from this practice while also testing FIRETEC’s capacity to model this complex interaction of flaming fronts.

Ignition Scenario Results

Fire behavior models, even one as advanced as FIRETEC, cannot be expected to replicate exact fire behavior. It is also important to understand that standard statistical evaluation of model performance based on replication is not plausible because no two fires are identical. Even when ignition patterns, weather forecast, and plot layouts are similar for operational burns, numerous other factors will produce different fire behavior and fire effects, including

differences in timing, strength, and directions of wind gusts; and differences in fuel arrangements, time of day, time of year, and drought index. These same confounding factors preclude the use of standard statistical validation for fire models when comparing modeled outputs to actual fires. Accordingly, the focus of the FIRETEC simulations in this project is to explore the trends in phenomenology associated with various prescribed fire practices, not to predict exact spread rates, heat release, and so forth for the various scenarios.

Figure 6 shows snapshots from several of the baseline fire scenarios described in figure 4. The 200-plus managers who have viewed these simulations have broadly agreed that FIRETEC accurately captures the general phenomenology associated with each of the scenarios. Specifically, FIRETEC did well in modeling the relative differences in spread rates and fire intensity based on wind speed and vegetation-induced drag.

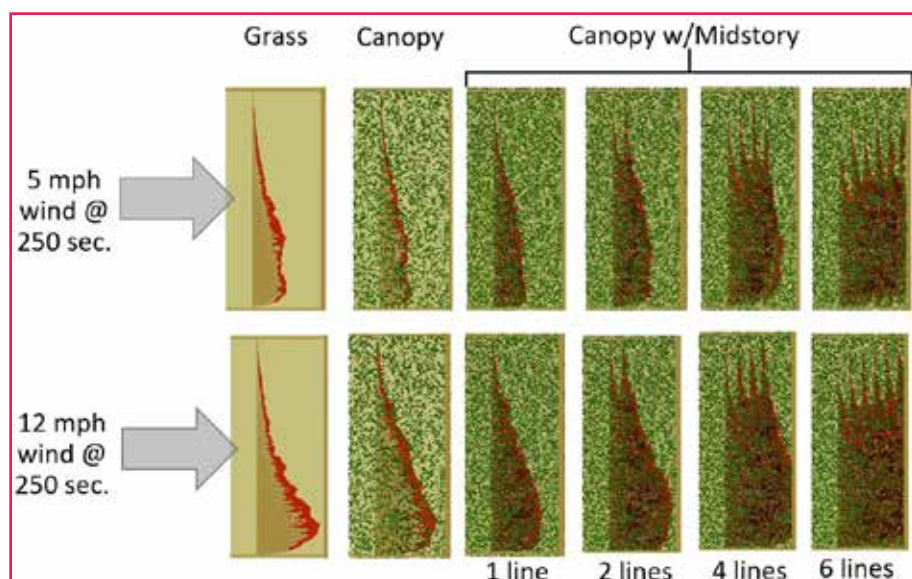


Figure 6—Baseline fire scenarios modeled with FIRETEC illustrate appropriate relative spread rates for varying vegetative structures and wind speeds and for general fire phenomenology associated with multiple ignition lines. The images are bounded by the fuel breaks and therefore do not show the entire computation domain.

Figure 7 shows screen captures for a five-line iteration of conditions explored in the fire phenomenology study illustrated in figure 5. Although analysis is not complete, visually FIRETEC seems to accurately predict the expected fire phenomenology for varying firing techniques under the same environmental conditions. For example, as more fire is applied per unit area, modeled fire behavior becomes more intense (fig. 7). “Closing the flanks” by lighting them after the interior is ignited seems, as expected, to produce the most intense fire behavior overall.

Complex Scenarios and Next Steps

This project was designed by fire managers who worked directly with the developer of FIRETEC to accomplish multiple objectives. Although testing and expanding the capabilities and utility of FIRETEC are a key objective of the project, a key goal of the project’s fire managers is to help accelerate the sometimes brutal learning curve associated with the successful application of prescribed fire. By better understanding fire behavior dynamics in relation to various ignition patterns and environmental factors, fire managers will be able to make better decisions regarding how to choose and modify firing patterns in order to meet specified objectives.

Fire behavior, including spread rates and associated residence time, flame height, thermal lift, and overall fire intensity, can be manipulated by managers who understand and choose appropriate firing patterns. Of course, these phenomena are in turn correlated with certain aspects of ecological fire effects that may be either desirable or undesirable to the manager trying to meet specific objectives.

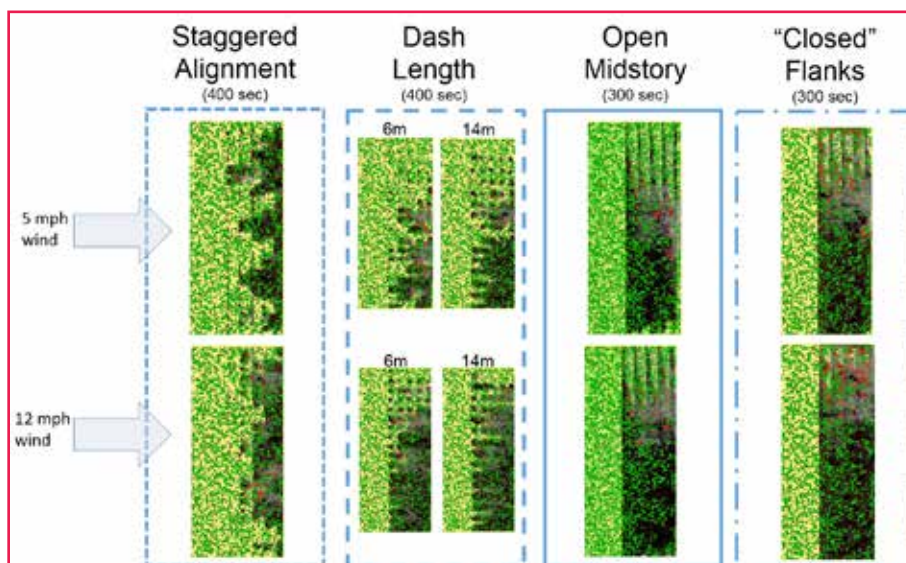


Figure 7—Images from the fire phenomenology study, using five-line ignitions, illustrate modeled differences from varying conditions and ignition patterns. The images are bounded by the fuel breaks and therefore do not show the entire computation domain. The five ignition lines encompass an area of 40.9 acres (16.6 ha).

This project represents the first attempt to model so many complex prescribed fire scenarios using a physics-based fire behavior model. The project might also be unique in that it was designed, in large part, by fire managers seeking answers to specific “burning questions.” FIRETEC’s performance thus far and the resulting simulations have been impressive. This project represents a unique opportunity to explore the capabilities of next-generation fire models as well as the phenomenon we call fire.

Next steps for the project include:

- A quantitative comparison of fire intensities for the different modeled scenarios;
- A peer-reviewed publication on the RxCADRE S-5 simulation;
- Continued outreach efforts, including presentations and poster displays at various venues;
- Facilitation of workshops at several U.S. Department of Defense installations; and
- Additional simulations and analysis as time and budget allow.

This is the second article in a three-part series pertaining to FIRETEC and this project. The next article will provide additional results and analysis and will delve more into specifics of project design. It will also provide updates regarding workshops and other outreach activities associated with the project.

Acknowledgments

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A FIRE IMAGINED

S.D. Fillmore

Author's note: *It has always made sense to me to see fire in terms of life. At various times, we ascribe human traits such as hunger, anger, malice, generosity, and even intent to wildfires. As I was driving home from this particular fire assignment, I reflected on the experience of being in charge of a vulnerable new fire—veritably the parent of the fire. As an actual parent, I am experiencing the wondrous and uncertain process of tending a life that can ultimately go forth and do good or harm. Of course, we do this with new fires all the time ... and the most cynical parents of fire are we. I believe this to be the source of the analogy. Who was involved and where it happened matter very little in the grand scheme of things. This really isn't about one fire in one place. It is about all the times when a fire could have been allowed to do what fires want to do ... for good or ill.*

In tribute to 406.

Like many before it, the wildfire was conceived on a late summer afternoon as a drifting monsoonal cell bunched up, gathered its energy, and raked over the mountainous uplift, all the while spewing hard rain, wind,

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Prisoner Lake Fire in 2012 in Montana's Bob Marshall Wilderness. Even though it was in a wilderness area, a decision was made to suppress the fire. Photo: USDA Forest Service (August 7, 2012).

and lightning. The neighborhood it was born in was both rough and beautiful; the mountain formed minor peaks, valleys, and draws that spilled down from the ridges into deeper cuts and steeper slopes as the watercourses worked ever downward and outward toward the Pacific Northwest coastline.

The wetness that came with the storm dampened the usual sounds of the forest in the first few hours after the fire's arrival. The last outflows of wind from the collapsing cumulonimbus clouds streamed through the upper canopy, throwing off beads of water that fell as false raindrops. Curtains of steam rose from the surrounding boulders and swirled like midwives around

the fragile new fire. The furrowed and moss-draped Douglas-fir trees loomed over the newcomer like reproaching passersby.

The instance of creation had occurred suddenly, with abstract natural violence and few witnesses. The rain kept the fire diminutive for its first inchoate hours; however, the wisps of gray smoke against the bluing sky confessed to the fire's existence before it could learn to run.

Authorities arrived swiftly; this had all been rehearsed before. Professionals moving with intent made their way through the forest, found the fire, and judged it on its merits. It was like so many others;

small, burning valiantly but gently under a fir tree, hemmed in by the dripline where it was still dry and protected. The branches hung low like protective arms around it.

The fire was to be easily controlled with minimal effort. The firefighters moved to do what was expected of them. They were there to keep the peace, to keep the neighborhood intact, and to cease the interruption that this impertinent little fire was bringing to the area.

An unexpected radio call stayed their hands before they had a chance to begin their rote work. Another man had listened to the fire report, and had visualized the potential of the young interloper. He wanted to meet the fire face to face and to assess for himself what potential it had in this world.

He arrived at the fire under the late afternoon shadows of dissipating storm clouds. He recognized that the fire, if left untouched, could grow to perform both wonderful and terrible things. The good or ill extent of these effects would, of course, be largely in the eye of the beholder and decided much later, after the fire had been allowed to mature and then fade. First, however, a group of people existed who must be consulted regarding the future of the new fire.

The fire manager noted the position of the fire—near the top of the ridge, with sparse fuels above. He recognized that it could not burn wildly uphill and instead could be tamely and deliberately nursed downhill. It would move slowly along the forest floor, eating and growing in the manner of disturbances that the old trees remembered only from long ago.

Two good ridgelines flanked the fire; two good ridgelines that would be there to direct and control its

actions. Patience would be required to let the fire exhibit its full potential. Patience, time, and the expertise of those who would watch it grow, steer it when it went in the wrong direction, and teach it to go the right way. This potential future is what the fire manager saw as he stood there watching the tendrils of flame struggle and writhe. He was wistful perhaps—he could admit this to himself—but mostly hopeful that this time was the right time, that this fire was the right fire, and that he would be allowed to let this fire grow into something auspicious.

The fire could grow to do both wonderful and terrible things if left untouched.

There would be hiccups. The fire would certainly make some mistakes along the way. A pocket of trees would be scorched more severely than hoped for; maybe an area that was favored by the local owl pair would be diminished. The winds might blow the smoke in the wrong direction and the neighbors would consider complaining. The fire manager knew that these disturbances would pass quickly and become a memory and a learning experience.

In its exuberance, the fire might even hurt one of the people tending it. The very act of being there set that circumstance. However, the magnitude of the effects of growing a fire can never be known until the privilege of hindsight is revealed.

He knew there would be other costs as well—financial costs. It is no cheap proposition to bring a fire into this

world and let it fully grow. There would be the costs of watching over it for weeks and months and perhaps longer. Would the fire's watchers have the resources available to tend it? Who would watch the fire if they were called away?

Is it more expensive to let a fire grow that can be taught the correct way to exist, or do people wait for the fire that is born at the bottom of the hill and wants not to be tamed, one that wants to feed hungrily at the fuel, consumed in a gorge like a beggar at the banquet table? The chronic alternative is to endure a fire that casts aside the vain efforts to tame it and that destroys the very house in which it briefly lives, raging only until the ropes of man's efforts can be slung over its neck and broken like a stampeding horse, slowly, tediously, and with great risk; until finally the fire's loud voice is muffled, tamed into submission, and all that is left is the charred remains of what once was and will never be again.

"No," the fire manager thought, "let's allow this fire to flourish into a productive thing, to see this fire contribute to the goals of nature in its own unique and individual way."

There would be challenges in the endeavor, but he knew also that with great challenges come great rewards. And so he made his plans and came to love the fire for what he knew in his heart it could become.

Ever a servant to the complexities of this world, he knew that the authority that would allow him to fulfill his vision did not exist with him alone. Standing by the fire's edges, dreaming his dream, he gave his orders, and the firefighters walked back to their equipment to head for home. And so, for this one long evening and night, the fire would be left to exist freely, alone and without bounds.

In the morning, the fire manager went to see the others, to explain his visions for the fire. He spoke of the possibilities that this fire could afford them. He extolled the positive effects of what letting the fire burn could do for the landscape, for the culture, and for the lessons that would be learned and shared.

While listening, the others thought of the past. They remembered a fire that they had tried to nurture before. That fire grew and then surprised them; had figuratively burned them and had not acted according to their expectations. They did not forget the lesson that fire has the potential to go differently from that which they desired.

"This new fire is different," the fire manager persisted. "This one is not able to race up the hill, this one can be guided the right way, and this one can achieve the things we all hope it will."

"But," they retorted, "what will the neighbors think? They could be inconvenienced by this fire, annoyed even, especially when it grows more noticeable as it gets bigger."

"Let the neighbors get to know the fire early," the fire manager suggested. "We'll introduce them when the fire is still small. The neighbors can take ownership in the growing of this fire and help to assume the risk that they have in living in the same neighborhood."

"They would never go for it," the others said dismissively.

A fire like this was just too inconvenient for everyone to deal with.

"Plus," they asked, "How can you guarantee that the fire will follow your directions and intent? How

can you know that it will not take a mind to go a different way than what you want?"

The fire manager could only reply that "we know there are no guarantees in a business such as ours."

"And what about our wildlife," the biologist asked. "How can you ensure that the trees where they live won't be harmed? Can you tell me for certain that the fire will behave as you expect?"

It is no cheap
proposition to bring a
fire into this world and
let it fully grow.

"Well, no, I cannot guarantee that," the fire manager replied. "However, I know that a fire born at the bottom of the hill, at the wrong time, will almost certainly destroy the nests of all the birds in the forest between the two ridges."

"We're not talking about a fire in the future," the others said. "We're talking about the fire we have now. You have to see that there are neighbors nearby, and that the trees have been there a long time, and we just don't want to disturb the peace."

"We understand why you want to let this fire grow," they went on, "but we don't think that this is the right time for it. Maybe if it were a bit later in the year, when the winter rain and snow are closer at hand and we could know that the fire won't move too far ... maybe then we could allow it."

Inwardly, the fire manager knew that these are the reasons that it

always comes down to. How could he argue with the hypothetical wrong time, wrong place, and wrong resources? How could he guarantee that which can never be known? He could promise only that he would try his best utilizing the skills he now possessed.

"True," the fire manager said. "However, we can't know that there will be a fire later this year, and surely you could see that the plans that I've made for the fire are sound. I just need some help for a couple of weeks to help monitor it to the end."

"Who would come to help us?" the others asked cynically. "It's just a fire that no one seems to want, and no one wants to put money or energy into it. The resources that we have are out dealing with the trouble fires. Why make more headaches for us? It's so much easier to just put it out."

"I know that we have been asked to look for opportunities like this," they went on, "but let someone else find a way to make it work. We can at least have our guarantee of success with that. The risk is not worth it to us."

And so it was decided, and so it was that the fire manager walked out of the high office and into the brightening last light of the morning of the last day that the fire would heave its smoke into the sky. A brief radio call was made to the firefighters who were already perched next to the fire, watching it, perhaps even encouraging it in their own abstract way.

They were waiting for the final decision to come down, one way or the other. The call came, they understood the decision, and in a few short hours the heat was gone, the smoke was gone, and the possibilities of a fire on a long summer's day were gone, too. ■

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