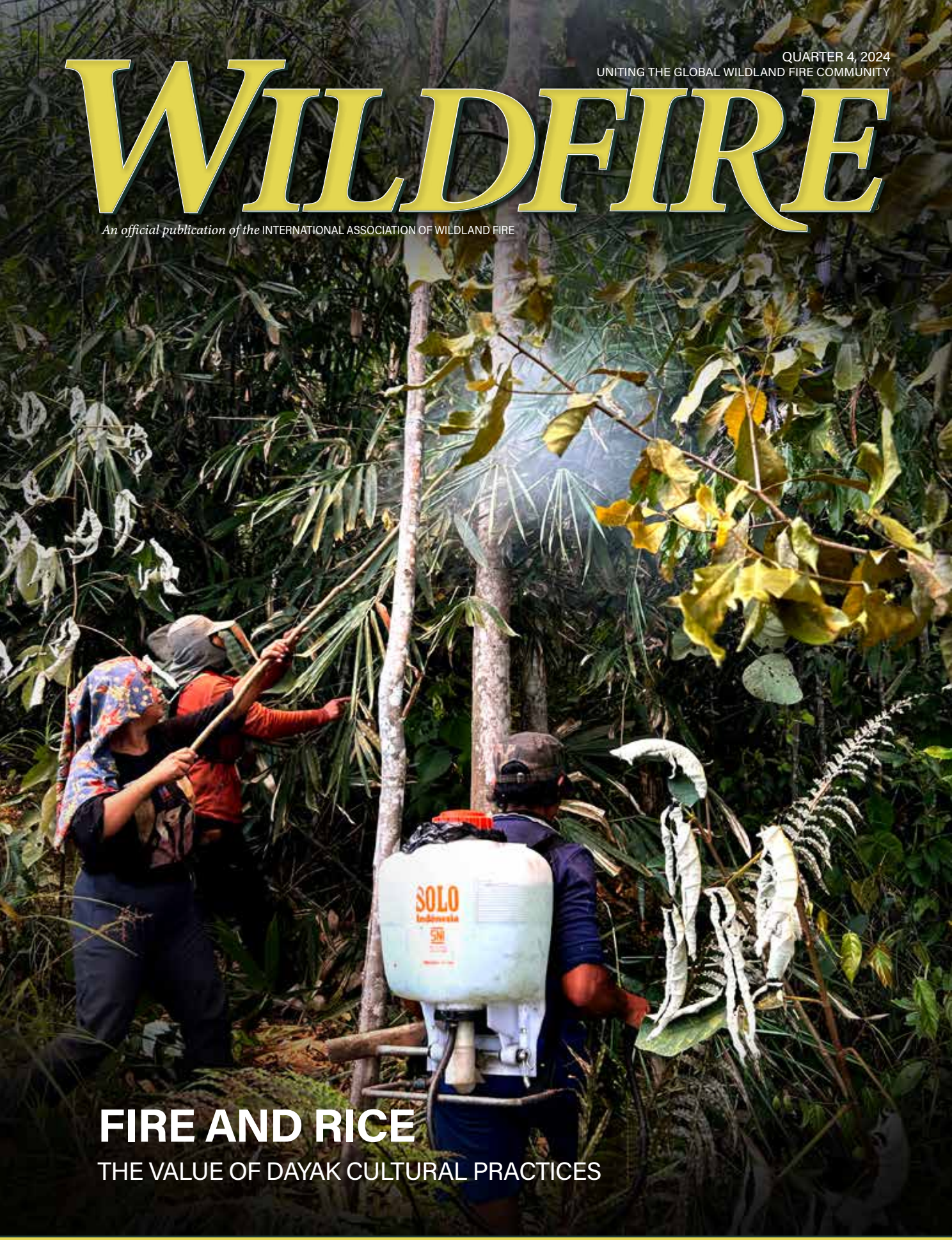
QUARTER 4, 2024
UNITING THE GLOBAL WILDLAND FIRE COMMUNITY

WILDFIRE

An official publication of the INTERNATIONAL ASSOCIATION OF WILDLAND FIRE



FIRE AND RICE

THE VALUE OF DAYAK CULTURAL PRACTICES

CAMP POLAND | LEARNING THROUGH GAMING | EUROPE'S SMART SOLUTIONS

AT-802F

Extended Attack by Land or Sea.

Amphibious Air Tanker.

Stay in the fight all day scooping from nearby water sources.

A single 802F Fire Boss can deliver up to 14,000 gallons of water per hour for extended attack or ground support. Season after season, dollar for dollar, hour for hour; the Air Tractor® AT-802F proves its value.

AIR TRACTOR®

AT802F.COM

Scan to learn more about the AT-802F Amphibious Air Tanker

WILDFIRE
An official publication of the International Association of Wildland Fire

NEWS AND OPINION

FEATURES

ON THE COVER

Traditional burning practices of the Dayak people of Indonesia have been complemented by some modern techniques including hard-shell plastic backpack pesticide pumps temporarily repurposed and used as water-spraying firefighting pumps. See page 18. Photo by Michael Hill.

MOBILE BIOCHAR PRODUCTION

CharBoss®

The CharBoss®, the world's first mobile biochar production system, can help on both fronts and turn unwanted wood waste into nutrient-rich biochar. This valuable soil amendment can either be recycled onsite, enriching soils, or bagged as a product for sales. Go deep into the woods to manage forest growth and mitigate wildfires safely. Air Burners® offers the most cost-effective, earth-conscious solution for organizations to sustainably manage biomass and reduce waste.

GOOD FOR WORK

GOOD FOR NATURE

GOOD FOR BUSINESS

SCAN TO LEARN MORE

AirBurners

772.220.7303 | Sales@AirBurners.com | AirBurners.com

EXPLORING THE WORLD

BY LAURA KING

I was fascinated by Michael Hill's story – our cover story – about the Dayak people of Indonesia and their traditional burning practices (page 18). In a perfect world, people would learn from each other, embrace new knowledge, and welcome lessons from other countries, cultures and ways of thinking.

We know – now more than ever – that's not always the case, so through the lenses of our writers around the world, who provide close-up perspectives of old and new technology and knowledge, our goal is to bring *Wildfire* readers words and pictures that enhance today's practices and make everyone think a little deeper about how and why we're doing what we're doing.

Hill is an associate editor for *Wildfire* magazine. In this issue, we've got his piece that describes the challenging system of fire and rice – burning fields to revitalize them for planting, and the tricky business of controlling fires on steep slopes full of bamboo; a feature by regular contributor Lily Mayers about wildland fire prevention measures in Europe (page 32); and a glimpse into Forest Camp in Poland by Lindon Pronto (also an associate editor) and Jan Kaczmarowski that will make you want to pack your bags, book a flight, and slog it out in the woods for a week.

I was fortunate enough to meet Pronto and several of his global collages at the IAWF 7th International Fire Behavior and Fuels Conference in Ireland in April. Pronto and folks like IAWF vice-president Ciaran Nugent, Alex Held from Germany, Brian Bogdanoff – a U.S. instructor – and Jesus Morcillo i Julia from Spain, are leaders in wildland fire training, management and communication, and boy are they passionate about teaching.

This group of leaders were the cool kids at the conference – everyone wanted to be around them. And no wonder. Their bios and experience speak for themselves but their overwhelming passion for safety was contagious. We'll continue to tap them for stories and insight.

Speaking of training, on page 14, Jared Bandor, a training specialist with the US Forest Service, proposes a requirement for formal, professional education (his words) for wildland firefighters – a concept that isn't new but that may also promote discussion.

"If professional education is institutionalized, alongside training, in the federal wildland fire agencies, personnel and managers could better meet the modern demands of the job that were not as prolific or even existed 40 to 50 years ago," Bandor writes.

Read Bandor's piece and let us know what you think. We'd love to continue the conversation in subsequent issues of *Wildfire* .

"Higher education," Bandor says, "could be the solution for many issues the U.S. federal wildland fire agencies are facing by incentivizing with earnings and advancement, equipping firefighters with knowledge and skills for the next position and increasing public confidence."

Our regular columnists, Bequi Livingston (page 8), and Michael DeGrosky (page 12), provide incredible value, information, context and knowledge in the areas of mental health and leadership. Livingston focuses this time on self-care in the off season (while recognizing that today, for many, there is no off season), while DeGrosky looks at the importance of role models – folks like Michael Hill or Lindon Pronto or Ciaran Nugent, for example. DeGrosky doesn't mention those people by name, but having worked closely with them, and understanding DeGrosky's thinking, it seems as if they fit the bill!

Lastly, there's a neat story on page 27 by Andrew Vanden Heuvel and three of his research students at Calvin University in Michigan, about the online video game Fortnite, which "features realistic fire that spreads dynamically between objects, destroys different materials at different rates, and can be extinguished using various liquid items."

Effectively, Fortnite can act as a fire simulator and therefore educate players about the risks of wildfire and mitigation strategies. Video game players are likely not a target audience identified by wildland fire educators but according to ActivePlayer.io, there are more than 2 million players online at any given time.

Vanden Huevel sums it up: "This fast-paced game teaches wildfire preparedness strategies while reinforcing the idea that everyone can help contribute to the safety of their community."

Perfect.

Managing editor Laura King is an experienced international journalist who has spent more than 15 years writing and editing fire publications. She is the Canadian director for the National Fire Protection Association (NFPA), works closely with FireSmart™ Canada to help residents build resilience to wildland fire, and has participated in the development of the Canadian wildland fire prevention and mitigation strategy.

LEADING ON A GLOBAL SCALE

BY KELLY MARTIN

It is with great enthusiasm that I extend my warmest congratulations to Trevor Howard as the next president of the International Association of Wildland Fire (IAWF). This prestigious role is a testament to Mr. Howard's remarkable dedication, extensive experience, and unwavering commitment to the wildland fire community throughout the world.

Mr. Howard possesses a wealth of knowledge and expertise that spans various regions of Australia. His leadership as the national manager of the prescribed burning strategy at the Australasian Fire and Emergency Service Authorities Council (AFAC) has significantly advanced national capabilities in prescribed burning, showcasing Australia's ability to drive positive change within communities and with practitioners. Mr. Howard has held previous roles with the IAWF, including vice president, and has been a board member since 2022. Mr. Howard is well prepared for this new challenge as he has provided IAWF invaluable insight into the complexities and nuances of wildland fire management on a global scale.

Mr. Howard will lead an esteemed organization that plays a crucial role in facilitating communication and providing leadership for the wildland fire community worldwide. The IAWF's mission to promote understanding and collaboration among professionals is more important than ever, especially as we face increasing challenges related to climate change and its impact on fire behavior and management practices. Mr. Howard's vision for inclusivity and innovation will undoubtedly inspire others to engage in meaningful dialogue and work toward sustainable wildland fire solutions.

I am confident that Mr. Howard's strategic approach will enhance IAWF's initiatives and foster a collaborative environment within and among countries where diverse perspectives can flourish. Mr. Howard's commitment to supporting land management agencies and rural fire services aligns perfectly with IAWF's goals of promoting safety, resilience, and effective management practices across all levels of wildland fire operations.

Congratulations once again to Trevor Howard on this well-deserved achievement. I look forward to supporting Trevor in this leadership position as he guides the IAWF into a new era of growth and excellence. Trevor's dedication will surely leave a lasting impact on the global wildland fire community.

As I step down from my role as IAWF president, I am filled with gratitude for the people who selflessly volunteer their time to serve others and the greater good of the international wildland fire community. This opportunity has taken me to many conferences; along the way I have met new friends and colleagues. The more I am involved with IAWF, the more I feel my knowledge expanding in ways I could not have dreamed of.

Joining a community of fire professionals offers unlimited opportunities to connect with people who are passionate about the same things you are. The more people can connect, the more opportunities for the synergy to develop into new and emerging solutions. We cannot solve problems facing people and communities until we can come together as people and communities in collective and collaborative ways. I urge you to consider joining IAWF as a member of a worldwide network of professionals.

> **We cannot solve problems facing people and communities until we can come together as people and communities in collective and collaborative ways.**

Lastly, I would like to share the concept of integrated fire management (IFM), also known as the 5 Rs, to conceptualize the full cycle of fire management and still value the interconnectedness of the whole. Our problems are becoming more complex and global; here is one way to distill the components and complexities of fire management into segments that are understandable and achievable at individual and a community levels. In 2024 the Food and Agriculture Organization of the United Nations published the second edition of the *Integrated fire management voluntary guidelines*, which includes the 5 Rs.

Phase 1: Review and analysis

Understanding the current condition of a home, a community or landscape sets the beginning of our work and gives us a base from which to start and to return to. At this first phase we learn about vulnerabilities and define the ecological, social, political and economic factors that will influence our work.

Phase 2: Risk reduction

What are the known and the potential unknown risk factors that must be considered when developing an IFM plan? Work from the single house out into the community. What are the actions that can be taken by individual homeowners? Adopt zero-to-five-foot clearance around your home; assess areas of your house that can harbor embers and develop into a fire; home hardening and reducing hazardous fuels.

Phase 3: Readiness

As fire season approaches take personal actions to prepare you home and property to withstand and recover from a wildfire. Practice evacuations with your local sheriff and police departments. Develop a friends and family emergency notification process.

Phase 4: Response

A wildland fire response can take many forms from aggressive suppression to limited response in remote and / or wilderness areas. More communities are participating in prescribed burn associations and learning how homeowners can "Learn to Burn" on their properties and support community vegetation reduction so that when a wildfire does impact a community, actions have been taken to reduce damages.

Phase 5: Recovery

The impacts of some wildfires can be severe, damaging homes, infrastructure, water supplies, and ways of life. Due to ever increasing severe damage from contemporary wildfires, the recovery process helps communities for months, or sometimes years, depending on the need.

Thank you for giving me this opportunity to serve you and our fire community. I look forward to meeting you all again soon.

Kelly Martin has been an IAWF board member since 2019, when she retired as chief of fire and aviation, Yosemite National Park, National Park Service, Pacific West Region. Martin began her federal career as a GS-3 with the Apostle Island National Lakeshore in 1984 while attending college and worked her way up through the wildland fire ranks during her 34-year career. Martin is the past chair of two National Wildfire Coordinating Group (NWCG) programs: Fire Environment Committee (FENC) and the National Fire Management Leadership (M-582) course. Martin is a strong advocate for diversity, inclusion and gender parity throughout the wildland fire community. Her most recent efforts include providing leadership for the Women in Fire Training Exchange (WTREX) since 2016.

PIVOT AND REDIRECT

FINDING CALM IN THE OFF SEASON

BY BEQUI LIVINGSTON

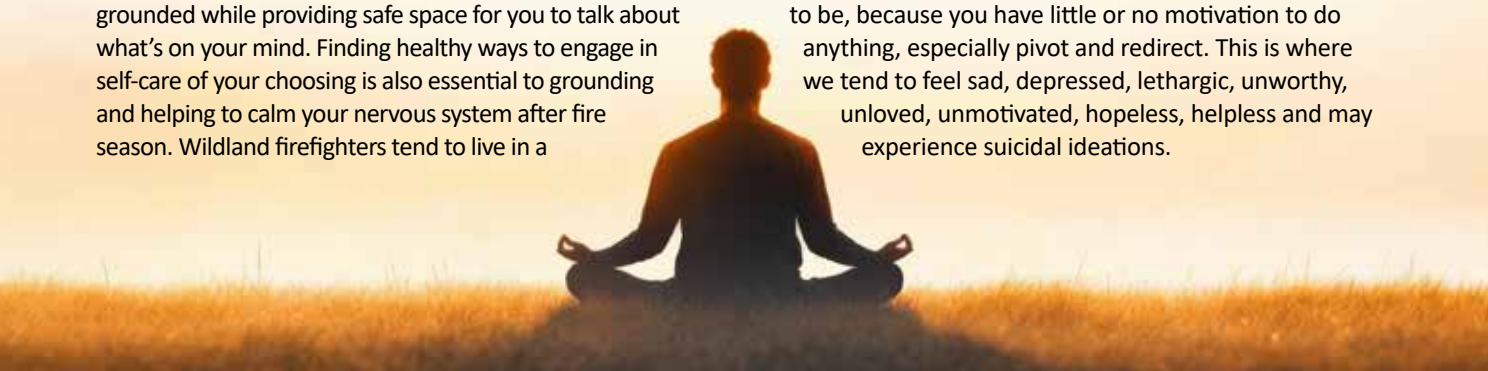
I love the phrase pivot and redirect; it applies perfectly to healing from traumatic stress and grief, especially after fire season.

As we all know, nothing ever stays the same, especially in wildland fire. Everything changes. The seasons change, the tides change, and wildland fire continues to change; yet we as humans, avoid change like the plague. Change can bring comfort but can also bring terror; change can bring good, but it can also bring chaos. When dealing with traumatic stress and grief, especially once the fire season winds down, our thoughts and emotions tend to surface, partially due to our autonomic nervous system being overwhelmed from the stress of the fire season. We do everything we can to distract ourselves from this chaos by reverting to our comfort zones, which can include turning to maladaptive coping behaviors such as busyness, alcohol, substance abuse, or other addictions, because change becomes too hard.

When we pivot, we make sure one foot is planted in a stable safety zone while letting the other foot explore. As the traumatic stress and grief from this past fire season begins to unwind, it's important to keep that one foot planted and grounded; this may include reaching out to your safe and trusted support systems – the people who help keep you grounded while providing safe space for you to talk about what's on your mind. Finding healthy ways to engage in self-care of your choosing is also essential to grounding and helping to calm your nervous system after fire season. Wildland firefighters tend to live in a constant state of adrenaline addiction during the fire season and long after it's over, the sympathetic nervous system on high alert 24/7 as stress hormones continue to circulate through the body. It takes time, patience, and intention to allow the nervous system time to calm down, unwind, and heal.

How do we focus on self-care, especially when we're stuck in the remnants of the sympathetic survival mode of fight and / or flight? In this state we tend to be angry, impatient, judgmental, elusive, anxious, fearful, overworking, arguing, running away, and reverting to our addictions and distractions. Self-care modalities that are helpful in this state include breathwork, mindfulness, somatic movement (such as yoga or Tai Chi), and bodywork (such as massage, chiropractic, or cranio-sacral). Considering trauma-safe therapy with a professional you trust is helpful. Do whatever you can to to s-l-o-w down and find some stillness, even when it's uncomfortable. You can then allow the other foot to move around, redirect, until it too finds stability and safety. As the saying goes in recovery and healing: One step forward and 20 steps back

What self-care techniques work best when you're stuck in the parasympathetic dorsal vagal survival mode of shut down, freeze, and collapse? This is an especially hard place to be, because you have little or no motivation to do anything, especially pivot and redirect. This is where we tend to feel sad, depressed, lethargic, unworthy, unloved, unmotivated, hopeless, helpless and may experience suicidal ideations.



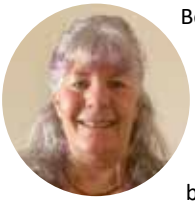
Self-care modalities to consider when stuck in this parasympathetic dorsal vagal mode include active movement such as walking, dancing or jumping jacks to get out of freeze mode, and splashing your face with cold water or holding cold soda cans can help jump-start your system back into a more sympathetic mode. Other helpful modalities include breathwork, somatic movement, and mindfulness if you're able. Social engagement is also important when in this state, to activate the parasympathetic ventral vagal branch. Meeting with friends for coffee or a walk in the woods, participating in a support group, going to a safe event where you'll be around other people, and especially participating in trauma-safe therapy can help re-engage the nervous system. It's too easy to isolate ourselves when in this mode, which isn't healthy.

This delicate dance to find calm is never linear, it's all over the place, like a toddler scribbling with crayons. Yet, we must do our best to keep that one foot planted, grounded, and safe. If both feet are ungrounded, then we may have a hard time moving forward, leaving our nervous system in chaos.

As you learn to pivot and redirect this off-season, may you find strength and courage to prioritize your self-care needs. May you look back at the fire season, doing an after-action-review of yourself, your relationships, and your health. What worked well, and served you best? What didn't work well, and didn't serve you? And what can you do differently, to pivot and redirect, during this off-season, and make some changes to help you heal and prepare for wildfire season 2025?

HELPFUL RESOURCES:

Dr. Arielle Schwartz: www.drarielleschwartz.com
The Mindful Center: www.themindfulcenter.com
First Responder Wellness: www.firstresponder-wellness.com
Recovery Ways: https://www.recoveryways.com/rehab-blog/first-responders-trauma-the-benefits-of-rewiring-neuropathways-via-therapy/



Bequi Livingston was the first woman recruited by the New Mexico-based Smokey Bear Hotshots for its elite wildland firefighting crew. She was the Regional Fire Operations Health and Safety Specialty for the U.S. Forest Service in Albuquerque, New Mexico. Contact her at bequilivingstonfirefit@msn.com

THE POWER YOU NEED WHEN THE HEAT IS ON.

The most reliable work trucks are transformed and reborn year after year for decades. When you're fighting wildland fires from the sky, critical moments require experienced and renewed solutions. The upgraded transmission of the new 412 EPX provides 11% more shaft horsepower at takeoff, resulting in a 15% boost in the hot and high hover. Add in an unprecedented increase for internal, external and cargo hook with 1100 payload pounds added. Proven operational readiness now with more payload, more firemen and women, more water…and more power to fight fire.

BELL

bell.co/publicsafety

FINDING A ROLE MODEL FOR SUCCESS

BY MIKE DEGROSKY

Many years ago, I taught supervision and management courses for a community college. It was night school and few of my students were seeking degrees. They showed up because they were motivated by a central idea – that I would help them craft a role model for their own effectiveness.

At the time, I was acting on my belief that people aspiring to effective leadership needed positive role models as well as my knowledge that many working adults had come up under people who had been excellent technical performers who may not have been fully prepared for organizational leadership.

These days, I can lean on some solid research around the power of positive role models. For example, a 2023 article in Forbes, by Tracy Bower, a PhD sociologist, cited a Gallup/ Amazon poll of 4,000 early to mid-career adults that found that people with positive role models were more likely to say their careers were fulfilling, that they felt established in their careers, and had careers that paid them enough. The poll also found that young people who had mentors were "more likely to have jobs with authority and autonomy and to experience more intrinsic rewards from their jobs." Role models are people we look up to so much that we consider them examples to be imitated. Finding people whose values and behavior inspire us to want to lead like them can accelerate a person's development as a leader. However, leadership role models can be elusive. Leadership is complex. We want leaders to be credible, build trust, have vision, lead by example and with compassion, be authentic, act with transparency, value learning, communicate well, and inspire, motivate and direct us all while maintaining a positive environment. All those attributes can be hard to find in one person. If you have identified such a person, if you have said "I want to lead just like that," by all means, please start emulating that person immediately, if you haven't already.

> **"All leaders are incomplete leaders, works-in-progress. Stop looking for the flawless leader and build your own."**

But what if you do not have that role model, that person who meets all your leadership expectations? Build your own role model of leadership excellence. At some point in my career, I stopped looking for a single leader on whom to pattern my leadership. I've worked for a lot of people. Many had remarkable leadership strengths and were effective leaders but all were regular human beings with regular human-being shortcomings. None was that ideal leadership role model. I believe that is reality for most people. I have previously called attention to a classic Harvard Business Review article titled In Praise of the Incomplete Leader by Deborah Ancona, Thomas Malone, Wanda Orlikowski and Peter Senge in which the authors said "It's time to end the myth of the complete leader: the flawless person at the top who's got it all figured out. In fact, the sooner leaders stop trying to be all things to all people, the better off their organizations will be."

I started noting who, in my experience, would be my benchmark for key leadership skills and attributes and building my concept of an ideal leader – a kind, compassionate human here, an excellent decision maker there, a person who had earned my trust and respect over here, an excellent communicator there. My experience inspired my college classes way back when, and later in training for fire personnel, and it has remained a big part of my leadership development philosophy.

Wildland fire is a great leadership crucible, and the sector has invested heavily in leadership development so, if we are paying attention, we can observe and draw from many good leaders, even if they are incomplete. I have also had to fill in gaps and I expect that anyone taking my approach would. I have pulled from my training and education when I had no role model for what I considered a leadership essential. There exists a mountain of academic research to draw from, against which we can benchmark our experiences. We can learn from historic figures. We can watch a good movie or TV show. Honestly, as a person who views darned near everything through a leadership lens, I consider the show Ted Lasso to be terrific leadership training. We can ask friends and trusted colleagues to tell us about their leadership role models.

I believe now, more than ever, that people aspiring to effective leadership need positive role models and having one will accelerate development as a leader at any level. But I suspect that few of us will find a single person who meets all our leadership expectations. I have embraced the idea that all leaders are incomplete leaders, works-in-progress if you will. I encourage anyone asking to stop looking for the flawless person at the top who's got it all figured out. If you are not one of the lucky few who have found that single leadership role model, build your own; I believe you will be glad you did.

Mike DeGrosky is a student of leadership, lifelong learner, mentor and coach, sometimes writer, and recovering fire chief. He taught for the Department of Leadership Studies at Fort Hays State University for 10 years. Follow Mike via LinkedIn.

TEACHABLE MOMENTS

INSTITUTIONALIZING EDUCATION IN U.S. FEDERAL WILDLAND AGENCIES

BY JARED BANDOR

The days when men could be rallied from nearby towns to suppress wildfires for a few months during the year are long gone. Today, each of the five major U.S. federal land management agencies that have wildland fire suppression responsibilities – Bureau of Land Management, National Parks Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, and the U.S. Forest Service – maintain a permanent wildland fire workforce complimented by a significant temporary workforce. In recent years, professional education has been discussed as an answer to combat the change in severity and complexity of wildfires and the issues the agencies face in suppressing them.

In many career fields of U.S. federal employment, a professional education is highly regarded and often required, but not in wildland fire. Proponents of institutionalizing an education system in the agencies argue that fire personnel who manage large budgets, cultivate trust of the public and politicians, supervise and lead people in dangerous situations, and collaborate with multiple government organizations should have more than a high school education. Opponents to implementing a more formal education argue that there is a well-functioning system in place that includes a governing body that sets standards, a digital system to track and document completed training, and a learning management system to create and deliver the training and educational content. With the increasing complexity of wildfires impacting communities and rising demands on firefighters to do more over the last several decades, the federal wildland fire agencies should invest in workforce education to better prepare their employees' decision making and instill stakeholder trust.

The growing severity of wildfires, the impact on the rural and urban communities, and increasing cost to suppress wildfires demand more from wildland firefighters than

> "Institutionalizing a professional education system will prepare firefighters for the unprecedented severity and complexity of modern wildfires, better equip them as they advance in their careers, and increase stakeholder and public trust in the agencies and the workforces they employ."

ever before. According to the National Interagency Fire Centre, not only in the past two decades, 2004 to 2023, have the average number of acres burned more than doubled compared to the two decades prior, 1984 to 2003, but fires also occur more frequently in the wildland urban interface. NIFC also says that due in part to the increased acres burned and community sprawl, the cost of suppression by federal agencies alone in the last decade has also more than doubled from the previous decade. This rapid and drastic change requires a different set of skills and knowledge to successfully navigate the theater of wildland fire. As wildfires grow into the WUI and across jurisdictional boundaries of private, local, state, federal, and tribal lands, fire managers are met with several complex decisions and pressures.

If professional education is institutionalized, alongside training, in the federal wildland fire agencies, personnel and managers could better meet the modern demands of the job that were not as prolific or even existed 40 to 50 years ago. At least one United States congressional representative believes "Wildfire firefighting . . . is not skilled labor." On its own, the quote might not seem significant and is arguably accurate for entry-level positions. Regardless of experience and education outside of the profession, all firefighters start at the bottom, receiving on-the-job training, accruing time in position, and achieving qualifications to climb the ranks. During a career, however, the demands on the same individuals change but that individual also grows in his / her position and gains on-the-job experience.

Upon reaching supervisory and fire-program management-level positions, individuals are not only required to have tactical on-the-job skills, but also to acquire administrative responsibilities. The duties listed in one 2024 National Parks Service job posting for a supervisory wildland firefighter include maintaining operational preparedness, managing budgets, coordinating interagency wildfire response, compliance with environmental law, and more while not having more than a high school education requirement for the position. In addition, decision making by firefighters is often influenced by political pressure, public trust, professional motivations, and whether one might be held liable. There is a fundamental misunderstanding among politicians and their constituents – the public – about specialized knowledge and skills that developing and promotable firefighters will need to successfully manage the complexities of the wildland fire environment as they progress in their careers. The agencies must use education to professionalize their workforce and in turn gain stakeholders' trust.

Higher education could be the solution for many issues the U.S. federal wildland fire agencies are facing by incentivizing with earnings and advancement, equipping firefighters with knowledge and skills for the next position and increasing public confidence. The most recent data collected from the U.S. Bureau of Labor and Statistics (2023) on higher education, correlates degrees earned with higher annual earnings. The same report also shows the higher level of education one has, the higher salary they earn. Like any industry, compensation and upward mobility in an organization can be a significant motivator in the workforce. It is important to understand that civil service employees have a supervisor of record, but as public servants, they are accountable to the taxpayer as

a stakeholder. A 2021 survey found most employers have confidence in higher education and believe it is valuable to workforce success. The survey results indicate a correlation between employers – in this case stakeholders – valuing higher education and believing employees with higher education possess greater skills and are more successful; this equates to greater employer and public trust that the complex position requirements are attainable by firefighters.

While there are several arguments and data to show institutionalizing education in the federal wildland fire agencies would be a net benefit, opponents argue that the agencies have a robust and bureaucratic training system that already hinders speed to competency, and institutionalizing an education system would be time-consuming and unnecessary.

The National Wildfire Coordinating Group (2024) is a formal body that creates and oversees the system of training across multiple disciplines and functional areas of fire and aviation management. Revising training courses, implementing standards, and issuing guidance via committees including all member agencies is costly and time consuming. In addition, The Wildland Firefighter Learning Portal is a learning management system used by the agencies to host training, advertise training schedules, house hundreds of on-demand courses, and perform student assessments and exams.

The argument against more formal education and training asserts the system is effective but slow and adding another layer would prevent firefighters from attaining necessary qualifications and on-the-job training to prepare them for the next position in a timely manner. While it is true that the system of training is effective and has been since its inception, training is only one side of the workforce development equation. Training is often task driven, skills based and designed to prove competency quickly versus education, which is intellectual, and designed to develop critical thinking and problem-solving skills for long-term growth. Education is just as important, if not more, in fire and aviation management as training for long-term organizational health and success.

While the current training system for the federal wildland fire agencies is valuable and should not be replaced, the climate of wildland fire has evolved and requires a more resilient and progressive approach to workforce development. Institutionalizing a professional education system will prepare firefighters for the unprecedented severity and complexity of modern wildfires, better equip them as they advance in their careers to meet current challenges and increase stakeholder and public trust in the agencies and the workforces they employ. If the federal wildland fire agencies do not adapt, they will fail. Professionalized education must be integrated into the wildland fire workforce to ensure the nation's disasters are not national tragedies.

This article is not meant to be prescriptive or detailed on how to institutionalize education but to provoke thoughts about how the agencies can better prepare their employees to meet the ever-changing demands of wildland fire.

The views and opinions are those of the author and do not necessarily reflect the U.S. government. The author is writing in a personal capacity and does not represent any federal entity.

Jared Bandor works for the United States Forest Service, Region 6, at the Pacific Northwest Training Center, where he serves as training specialist. His main duties are serving as the training officer for regional employees, facilitating and instructing regional level courses, and supporting workforce development initiatives for Fire and Aviation Management (FAM) employees. Bandor has a diverse operational background on handcrews, engines, and helitak, as well as fuels, prevention, and training. He is completing a bachelor's degree in organizational leadership, which he plans to use in future workforce development opportunities in the agency.

A Dayak guide named Samuel, with a friend, near the village of Loksado, demonstrates the use of traditional Dayak fire line scraping tools. Photos by Michael Hill.

FIRE AND RICE

THE VALUE OF DAYAK CULTURAL PRACTICES

BY MICHAEL HILL

On Kalimantan – Indonesia's part of the island of Borneo – Dayak traditional culture is deeply connected to its people's endless cycle of fire and rice.

Dayak people in the mountainous village region of Loksado have retained their ability to use wildfire to clear their fields, but they fear politics and confusion over their highly controlled wildfires and the destructive wildfires in other areas of Kalimantan will soon lead to a ban on their practices.

If the Dayak people are prevented from continuing to use wildfire, as they have done for hundreds of years as part of their system of slash-and-burn field rotations, their culture and identity will collapse.

I was fortunate to be invited to South Kalimantan in 2024 to practice wildfire-use skills with some of Kalimantan's last Dayak people who live a remote, traditional lifestyle using fire to prepare fields to plant rice. The Dayak people use wildfire as a tool

to manage the land on which they plant, and on which they and their ancestors have always relied.

Wildfire is used by the Dayak people to clear small, field-sized, often steep pockets of mountain forest; the ash created by the wildfires fertilizes the rice fields.

I witnessed the Dayak people's control of wildfire as a tool, and it showed me they are global leaders in managing complex wildfire-use situations. Dayak fire knowledge has tremendous value for wildland firefighting agencies worldwide.

Borneo, where the Dayak live, is the third-largest island in the world. Kalimantan's meaning in Indonesian refers to the whole island, while in English, the term describes only the 73 per cent of the land mass located in Indonesia, containing about 70 per cent of the island's population. Kalimantan's land mass covers 554,150 kilometers, divided into five provinces and the non-Indonesian territories of Borneo, Brunei and East Malaysia.

Kalimantan was originally Kalamanthana, or "burning weather Island," meaning its climate is very hot and humid.

Kalimantan is home to many cultures and the Dayak, or people of the interior, are an Indigenous group of traditional people known for their complex spiritual beliefs, welcoming hospitality to strangers, and for being proud of their culture based on their mastery of fire.

Historically, Dayak people are tied to the use of wildfire in their agricultural practices to clean up land, or slash-and-burn farming. Using fire to clear farming plots in a rotating system allows for conservation. Preselected areas or fields are used for a predetermined number of years before they are allowed to go back to nature to recover their fertility, while other fields are cleared by cutting and burning to be ready for planting until the fertile cycle is complete. Then another field is cleared and so on.

The Dayak world is rich with nature and spirits and the rotating system of agriculture and wildfires to clear land is culturally important. Clearing is extremely well controlled with organized family

I witnessed the Dayak people's control of wildfire as a tool . . .

An example of Dayak tactical use of a fire effects to reinforce fire control line in steep terrain.

Potentially explosive cured bamboo fuels being carefully ignited with dot application to manage fire being created.

groups using pre-constructed fire breaks, fire-control tactics, and planning to consider terrain factors, predicted winds, and fuel conditions.

Dayak people are no longer the only Indonesians who live in the interior of Kalimantan where the rainforests long acted as a moist blanket to keep out fires or retard fire growth. Now, cultural changes are happening as the Dayak people join the wave of progress brought by globalism.

Dayak people have maintained an incredible depth of fire-use knowledge, and if given the opportunity on a global scale, this knowledge could be part of the solution to manage wildfire in response to global climate change and potentially influence international fire management practices that are sometimes created for local political gains.

Over my 16 years as an Australian bushfire firefighter, with knowledge of North American and international Indigenous fire use practices, I have observed that Australia does not possess a national set standard course on advanced fire use skills for bush firefighters to the highly refined degree of knowledge that the Dayak people of Loksado possess. A relationship between the Dayak people and the Australian bush fire agencies would be a perfect marriage and would fulfill the needs of both cultures.

My journey with the Dayak people began more than 20 years ago when I was traveling the Indonesian islands as part of a trip across Southeast Asia. While in Borneo, chance led me to a riverboat to journey

with a crew of Indonesian adventurers known as Bugies. We traveled upriver deep into the heart of the island of Borneo and back.

I saw many things on the river and occasionally on land, but I was most fascinated watching the traditional Dayak riverside villages during the burning season. I watched the pockets of smoke rise from the jungle, and in other places I saw blackened, fresh-burned fields among the otherwise jungled riverbank.

As a descendant of ancestors from the people of fire in America – the Cherokee Indian Nation – I was fascinated by the Dayak people's slash-and-burn practice and developed a soft spot for the unique system. I wanted to know so much more.

Since my journey, outside forces have not been kind to the Dayak people. In the wake of recent bad fire seasons in Kalimantan Borneo, a storyline developed that all human-caused fires were a problem and, as a result, in the dry season, all fires were forbidden by law.

In my opinion, the traditional Dayak people were wronged by this blanket no-fire mandate and on discovering this and being invited to help the Dayak tell their story of fire, I agreed without hesitation. I was trained years ago as a US Forest Service fire fuels-management and prescribed-fire use specialist, so I enjoy staying abreast of fire use and management practices worldwide.

The Dayak people showed me they deeply understand their landscape, weather and wildfire behavior. The terrain is a combination of forest and steep mountainsides, and the areas to be burned are filled with heavy fuel loads of slashed, cured bamboo alongside light highly flammable fuels; fires could easily escape if not well managed.

Watching, then helping the Dayak people burn, I felt the magic of generations of Dayak people as they shared with me their knowledge, experience, and wisdom about what wildfire can do and how to respect its dangers.

Tactics used by the Dayak people to manage

I was fascinated by the Dayak people's slash-and-burn practice . . .

Center firing along the top of a steep incline with a heavy fuel load; this is a step in Dayak people's traditional ignition technique to create a convective pull and control later firing operations.

A Dayak firing boss in front with a carrying basket for supplies, and an ignitor behind with a traditional bamboo firing pole.

fires include months of preparation of a burn site by slashing fuels to pretreat and cure them, cutting, burning, and scraping fire line perimeters that are adjusted to control changing fuel conditions, slope, and locations where a fire could breach containment lines.

Fire tools are made on the spot for single use from bamboo, water is gathered to be on standby, allied families work as a team, and every factor is carefully planned.

The Dayak people's traditional fire management is held to an extremely high professional standard because there is so much at stake. The target is to make no mistakes, because anyone hurt would be a family member, and if a fire should escape and burn another's land, tribal law indicates the loser of the fire must pay the damage cost, which would lead to problems retaining the old ways of fire and rice with the Indonesian government.

I watched the Dayak adjust firing patterns on burn sites of medium-to-steep complexity, but I was especially interested in the challenging ignitions across steep ground, which demonstrated knowledge and fire skills.

During one burn on a steep slope, experienced men carried fire across the top of a mountain to slowly burn a portion of the site to build in an upper-level buffer for a future massive firing event down below, while being careful not to place too much hot fire at once that could run up and against the upper fire line.

The landowner always acts as the burn boss, staging participating families with their water containers and bamboo scraper tools held ready above the burners. The burners work together to hold the upslope fire line perimeters while the ignitions take place below


CONAIR
AERIAL FIREFIGHTING
SUPPRESSING
WILDFIRES.
SUPPORTING
FIREFIGHTERS.
The Future of Aerial Firefighting: The Dash 8-400AT
Fast, fuel efficient and tactically flexible. A modern airtanker with a 10,000 litre / 2,642 US gallon capacity to drop water, retardant, or gel over diverse geography. Setting the standard for Next Generation aircraft with OEM support to keep the firefighter flying for decades.
Photo: Alexandre Dubath
conair.ca
Protecting Our World

to prevent any ember-driven spot fires above from escaping, or to stop any flaming fire line slopovers that could increase the size of a fire.

Once the top areas of the steep slope burn were more secure with the ever growing, reinforced burned out buffers, I watched the burners slowly carry more fire down along the extreme mountain inclines, expertly building in depth and safety.

I watched the burners climb halfway down the mountainsides across from the flames they had lit, where the firing would be halted; following steep slopes to the right, the ignition teams moved across the rugged mountainsides to start a new fresh fire, safely protected from its spreading higher and to the left by the previously burned buffer. Slowly and carefully the burners created larger safety zones across the upper portions of the steep mountainous sites.

The next firing was positioned to slowly eat down into the center of massive, potentially explosive, steep, thick, cured, cut and dried bamboo fields.

The ignitors returned after lighting the center fires to the burn's right flank, with their center fuels strongly alight. On this flank, for more protection, the burners used their bamboo ignitions poles with tips alight to carry a strip of fire down steep slopes along the interior edge of preexisting fire trails. The burners touched their poles strategically here and there to the cut bamboo plants inside the fire line to create new ignitions and reinforce the perimeter control lines with a long strip of flames.

The effect of these tactics was a controlled lighting pattern that soon became a flaming mountainside that pulled in smaller, newly lit flank flames in a long line. Dried bamboo was consumed as the fire and its heat were pulled inward toward the much hotter center fires, quickly creating a massively reinforced fire line protecting the whole right flank of the field.

I witnessed other tactics, such as fire being used to reinforce control lines before a burn. I saw fire used in dot ignition applications, strategically placed along the bottom of steep and dangerous mountain slopes that were piled high with even more dried fuels that worked to drive flames across whole hillsides horizontally, in powerful walls of flames.

The Dayak people have rules about burning; men are the wildfire-use ignitors while women and children build fire lines around new fields, slashing the bamboo and other fuels to the ground to cure in the hot sun for months to be ready to be consumed by fire. Women and children hold the fire line defensive positions during the actual burns.

Dayak fires are first ignited by a landowner with a cigarette lighter (a very non-traditional tool), but after the fire takes hold, longer bamboo sticks are used to pick up and carry flames forward and out to pre-selected forest ignition locations.

Another recent addition along with cigarette lighters to the traditional Dayak firing kit is a hard-shell plastic backpack pesticide pump, temporarily repurposed and used as water-spraying firefighting pumps.

In my opinion, the Dayak people's valuable but threatened traditional fire skills, and their wealth of knowledge and wisdom is a critically important resource. The Dayak people's specialty knowledge of wildfire behavior and use is a treasure to humanity and is especially valuable considering extremes due to climate change.

Traditional cultures such as the Dayak people face unprecedented changes brought from powerful forces: the lure of money; technology, and globalization. One hundred years ago, the Dayak people could have escaped newcomers and government rules in their lands by retreating deeper into the forest, but this is no longer an option.

Around the mountainous Borneo community of Loksado, where the Dayak continue burning (for now), the traditional people are asking simply to be able to keep their burning and their rice cultivation; without this cycle, their treasured way of life cannot continue.

Preventing the Dayak people from burning, even for just a brief few seasons, will have a serious impact on their deep wildfire knowledge. If the Dayak people's cultural treasure of knowledge is lost, some of their information might be able to be later collected and shared with others, but it will never be as complete

as it is now.

The Dayak people told me they would be willing and interested in sharing their fire knowledge with the world. The Dayak need only to be approached to do so by wildfire researchers from international fire agencies, and not just academics who might wish to squirrel away their valuable information for the promotion of their own careers.

In return, the Dayak people told me, they wish only to be valued as a people and a culture uniquely empowered by their fire knowledge built across countless generations.

For the Dayak people's valuable fire-use knowledge to remain, it must stay fresh and current. The Dayak people must be allowed to continue their cycle of fire and rice, even if only within their mountainous forest sanctuary setting of the Loksado region. Retaining fire knowledge comes with currency; as one traditional elder said, without this currency and historic fire knowledge, "the Dayak will be nothing."

This Dayak elder explained that the people know well: "Fire can be dangerous. We must be careful with the fire."

Michael Hill began this journey in the 1980s as an American wildfire firefighter, and across his career worked as a hotshot and smokejumper. For many years Hill has been, and still is, deeply interested in Indonesia's wildfires. He serves as an associate editor for *Wildfire* magazine and hosts a YouTube channel at https://www.youtube.com/@TalkingWildfireWithMichaelHill.

LEARNING THROUGH GAMING

FORTNITE AS A TOOL FOR WILDFIRE EDUCATION

BY ANDREW VANDEN HEUVEL, RIGEL REYNOLDS, ZACHARY MEYER, AND SAMUEL NTADOM

In the summer of 2024, we launched an ambitious project to turn the popular video game Fortnite into an innovative tool for wildfire education.

Using a video game to tackle a serious issue like wildfire preparedness might seem unusual, but many game developers see great potential for building player agency and raising environmental awareness through video games.

Fortnite is a free online multiplayer game, best known for its last-player-standing Battle Royale mode. However, Fortnite also contains a creative mode, in which players can design original games using a vast library of pre-built structures, vehicles, and devices. These custom games can be published and shared with Fortnite's 250 million-plus active monthly users. In fact, more than half of all gameplay hours in Fortnite are spent in these user-generated creative islands.

Notably, Fortnite features realistic fire that spreads dynamically between objects, destroys different materials at different rates, and can be extinguished using various liquid items. In many ways, Fortnite can act as a rudimentary fire simulator.

Fortnite Creative offers a powerful platform to create engaging wildfire education experiences and share them with a global audience.

We used Fortnite Creative to develop an interactive wildfire video game and a series of educational videos.

WILDFIRE GAME

Our first objective was to create a video game centered around wildfire prevention. In our game, *Wild Fire,* two teams compete to protect their side of the island from wildfires by using techniques such as clearing debris, hardening structures, and managing vegetation through prescribed burns. As fires randomly ignite across the island, players must find and extinguish hot spots to prevent damage. Teams earn points based on how well they protect their structures.

This fast-paced game teaches wildfire preparedness strategies while reinforcing the idea that everyone can help contribute to the safety of their community.

EDUCATIONAL VIDEOS

Our second approach was to create a series of educational videos in Fortnite based on CAL FIRE's Ready, Set, Go! initiative. The goal was to demonstrate wildfire prevention and preparedness concepts such as creating defensible space, building emergency kits, and planning evacuations.

Fortnite has an integrated replay tool that allows users to capture everything that happens during a gameplay session. Afterward, players can navigate through the 3D environment using a virtual camera to view and record the action from any angle. This feature turns Fortnite Creative into a virtual production studio, enabling players to act out scenes and then go back to film those scenes from any perspective they choose.

Video games offer a powerful way to deliver wildfire education by providing interactive, risk-free environments in which players can experiment with actions and see their consequences. While not hands-on in the traditional sense, these virtual experiences are immersive, which can build empathy, deepen understanding, and connect abstract concepts to the real world.

In Fortnite, players can experience the spread of fire, learn how to mitigate it, and understand how their actions reduce wildfire risk. These experiences bridge the gap between awareness and action, empowering players to believe they really can make a difference.

Educators and wildfire professionals can explore these resources and collaborate with us to enhance and expand their impact by visiting www.andrewvh.com/wildfire-magazine to preview the resources.

Our thanks to Rushton Hurley at Next Vista for Learning, the authors of The Environmental Game Design Playbook and the Fortnite EDU & ArshtRock Climate Workshop facilitators for their inspiration and support.

Andrew Vanden Heuvel is a professor of physics and astronomy who experiments with innovative approaches to science education. This work was carried out with his three research students, Rigel Reynolds, Zachary Meyer, and Samuel Ntadom, physics students at Calvin University in Grand Rapids, MI.

TRAINING AND CERTIFICATION TO HELP YOU **PROTECT COMMUNITIES FROM WILDFIRE RISKS.**

With the growing threat of wildfires, there's never been a more urgent need for wildfire mitigation educators and specialists. NFPA® offers training and certification that equips you with the most current and comprehensive information. It provides you with the authority and expertise to lead in your station and in the field, helping you to protect communities along the way.

CERTIFIED WILDFIRE MITIGATION SPECIALIST (CWMS)

Demonstrate that you understand hazard mitigation measures, planning and preparedness strategies, public education practices, and wildland fire science.

ASSESSING STRUCTURE IGNITION POTENTIAL FROM WILDFIRE TRAINING

Learn how to evaluate wildfire risks, identify and address vulnerabilities, and provide effective wildfire mitigation recommendations with this two-day classroom training.

NFPA®

Learn more at nfpa.org/wildfire

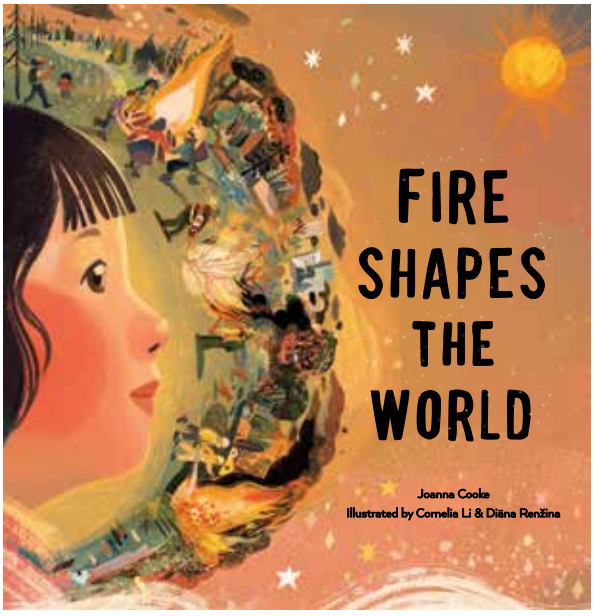
EXPLAINING FIRE

PICTURE BOOK INTRODUCES ECOSYSTEM TO CHIDLREN

BY SCOTT GOODRICK

Where was *Fire Shapes the World* when my daughter was young and asked what I did at work?

Explaining the intricacies of working in wildland fire can be difficult with adults; with children, explaining the role of fire on the landscape can be a monumental task as the explanation is often at odds with the portrayal of wildland fire in modern media.



Fire Shapes the World, by Joanna Cooke and illustrated by Cornelia Li and Diāna Renžina, traces the interwoven story of fire and life on our planet in an accessible manner that is perfect for sharing with children an appreciation for fire's role on the landscape.

The rich illustrations provide abundant detail to captivate a young audience over multiple readings.

The book's flow establishes the role of fire in nature and the adaptability of plants and animals to coexist with this transformative force. As people enter the narrative, the importance of fire to Indigenous people is presented as a human adaptation for living with fire. With time, the Indigenous knowledge central to living with fire fades, mimicking the life-death-renewal cycle of fire as the knowledge needs to be rebuilt, and people must establish a new relationship with fire on the landscape.

Fire Shapes the World is targeted at children four to eight years old. How the author and illustrators were able to fit such a beautiful introduction to fire ecology into 34 enthralling pages is amazing. Adding to the value, the author's note at the end of the book provides substantial background material,

additional reading, and a collection of relevant websites. These resources are essential for teachers to prepare lessons accessible to a wide range of learners and therefore make *Fire Shapes the World* an excellent book for the elementary school classroom.

When the concept of ecosystems is taught at the elementary school level the focus is mostly on a basic description of habitats and the animals that live in them. *Fire Shapes the World* enriches the discussion of ecosystems by introducing fire as a key process that shapes many of our ecosystems. Talking about many forest ecosystems without including fire is about as meaningful as talking about tidal marshland ecosystems and not talking about tides! This focus on fire as a key ecological process is what makes *Fire Shapes the World* stand out as an engaging and informative children's book capable of inspiring a deeper appreciation for the natural world. *Fire Shapes the World* is avaialble through various online sellers.

Scott Goodrick has been a research meteorologist with the U.S. Forest Service, Southern Research Station, since 2002 and serves as director of the station's Center for Forest Health and Disturbance. His general area of research spans fire-atmosphere interactions and smoke management with a focus on how prescribed fire ignition patterns influence plume dynamics and smoke dispersion. Past research has covered fire-climate dynamics, fire weather, and wind-related forest disturbance. Goodrick has authored more than 100 peer-reviewed publications and conference papers. Before joining the Forest Service, Goodrick spent four years as the fire weather meteorologist for the state of Florida and helped develop the weather and smoke components of the state's fire management information system. Goodrick received his MS and PhD in atmospheric science from the University of Alabama in Huntsville. Goodrick serves on the IAWF board of directors.

A fire technician uses a drip torch to light gorse bushes during a prescribed burn in Serra da Cabreira, a mountain range in the Vieira do Minho district of northern Portugal. Photos by Paulo Nunes dos Santos for Sonda Internacional.

EUROPE'S SMART SOLUTIONS

FIGHTING FIRE WITH FIRE AND OTHER PREVENTION INITIATIVES

BY LILY MAYERS

There has been a seismic shift in the goals of modern European fire fighting. The aim "is not to eliminate fire, because it is part of the natural dynamics of ecosystems, but to make fires less dangerous," said Fernando Pulido, director of the Dehesa Research Institute at the University of Extremadura in Badajoz, Spain. "Even with many resources, you cannot do complete fire prevention."

It's a consensus many experts in fires and forestry have been trying to disseminate for decades with varying results. They are unified in their prescription for a problem that is growing worse with every increasingly hot year: the only way to avoid destructive mega fires is through thoughtful land management and the controlled reintegration of fires into ecosystems.

There is however no one golden bullet solution, rather the key to long-term mega fire prevention is the use of a mix of tools tailored to a territory's needs. Across the Iberian Peninsula there are several international, national and local fire smart initiatives being implemented in public and private forests including the use of prescribed burns, extensive livestock grazing, agroforestry land mosaics and the extraction of trees and shrub litter for biomass energy

resources. These solution projects break up continuous fuel loads acting as a barrier to stop or slow fire while reducing the flammability of landscapes surrounding vulnerable towns and, in many cases, boosting rural development.

FIGHTING FIRE WITH FIRE

Managing the land means allowing it to burn periodically to avoid untameable wildfires. This can be achieved in a controlled way, by prescribed fires, which reduce accumulated fuel loads, renew soils, increase water availability, create pastoral areas and importantly create firefighting pathways. In Portugal the tool has been used since the 1980s, being one of the first European countries to introduce a structured legal framework for the practice.

The Serra Cabreira mountain range, in the northern Portuguese region of Braga, is a shining example of authorities proactively using prescribed burning to keep vegetation undergrowth under control and extreme wildfires at bay. The aim is to avoid a disaster like the one that occurred in October 2017, near the municipality of Vieira do Minho, where 1600 hectares burned. At the time, the highly flammable carqueja shrub had grown to more than 1.5 meters high and enveloped much of the land. Because of the available fuel, fires raged from the valley to the mountaintop.

Prescribed fires can't just be lit and left. Before any flame is sparked, fire technicians in Portugal must have a burn plan approved by the National Institute for Nature Conservation and Forests (ICNF). In Spain, prescribed burning is regulated according to the provisions of each autonomous community. After approval, technicians must wait for the ideal on-site weather conditions. The window for burning is typically open for 10 weeks a year between November and March and requires dry but not parched soil, substantial wind speeds, high relative humidity and low temperatures. The specially trained teams control the fire's progression using drip torches, wind speed and direction, slope, vegetation density and hand-held mops to suppress spot fires.

Nelson Rodrigues, 49, is the Vieira do Minho municipal council's head fire technician specializing in prescribed burns and fire analysis. In five-year cycles he and his team have been burning parcels of the Cabreira mountain range. He explains the difference between prescribed fires and wildfires is in the severity of the burn.

"A natural fire destroys the vegetation, destroys the soil and then in the next rains the [burned] soil is washed away and only the rocks remain. [With prescribed burns] we are now burning the top part of the vegetation, the plant doesn't die, the roots don't die, it remains fixed to the soil and in about a month it will start to grow again."

Nelson is confident that due to the interventions a mega fire would not be able to develop in the area he controls; it's a long-term achievement that fills him with pride. "Imagine that we [have] worked on a landscape for a few years and during the next few years there were never big fires. No habitat was destroyed, no type of forest or environment. And it was possible for us to all work together – shepherds, technicians, hunters and farmers."

Fundamental to the program's success is that coordination. "We need pasture and the way to have pasture is through fire." Shepherds traditionally used fire to create clearings for their animals, but in recent decades there has been a shift from traditional fires to authorized burns carried out by technicians. "[Now] it has to be done by technicians, so it is up to us to approach the shepherds, and the simplest

A fire technician from the Viera do Minho city council setting fire to gorse bushes during a prescribed burn in the mountains of the Serra da Cabreira in northern Portugal.

way is to go to their place and be with them, explaining that they need fires in the territory and it doesn't need to be hidden or criminalized, so we can jointly define the areas and work together," Rodrigues said.

Paulo Manuel Martins Ribeiro, 51, lives on the outskirts of Vieira do Minho with his herd of more than 300 goats. He is one of the shepherds routinely working with Rodrigues. The burns secure pastures, as well as open clearings where it is more difficult for predators such as wolves to attack herds. Martins says each year wolves kill at least 60 of his goats. "The broom (Giesta) is an invasive plant. If controlled burning is not done, there will come a point when there will be no grazing areas because it will take over the entire Serra da Cabreira," he said.

SAPADORES PONIES

After a prescribed fire, animals of the area flock to the burn scar knowing the soil's fresh nutrients will soon follow. In the Cabreira mountains the first to arrive is a herd of semi wild native Garrano ponies. The rare breed is known as sapadores (firefighters in Portuguese) because they also function as fire fuel managers; their grazing doesn't remove the vegetation completely but stabilizes and controls its rate of growth. So effective is their grazing that in 2022 the Garrano Horse Breeders Association (ACERG) made a deal with electrical company, REN, and the Vieira do Minho Council's Association for the Planning of Serra da Cabreira (APOSC) to more formally use the ponies for fire prevention.

Under the agreement a herd of 300 horses graze over about 100 hectares of land surrounding REN power lines to maintain the vegetation. "If it weren't for the horses, this area would be overgrown," said ACERG president João Paulo Carneiro Ribeiro, 53. Unlike cattle, which are picky about what they eat, the ponies will devour everything in their path, each chewing about 10 to 15 kilograms of vegetation a day and up to 4,500 kilograms all together. "It eats anything that is green or burnt. It is an animal that eats anything to survive," Carneiro said.

The herd is left to graze wildly but monitored and tracked using GPS collars placed on leading mares. João Paulo Carneiro Ribeiro is confident the initiative could be replicated on similar terrain across the Peninsula. "Everybody talks about the first fires [of the season] and fire prevention. But only during fire season, in the critical time. We don't talk about it all year round and in my view fire prevention should happen all year round. Firefighters, fire brigades, civil protection have to work all year round not just in the spring and summer when the high temperatures arise," Carneiro said.

FIRE FLOCKS

There are other silvopastoral programs reducing fire risk that are even more established across the Peninsula such as Catalonia's Ramats de Foc (Fire Flock) program created in 2017. Under the initiative, herds of goats and sheep graze in understory vegetation control target areas predefined by Catalonia's firefighters and the Department of Agriculture. Eighty shepherds manage about 8,500 hectares of land across Catalonia.

"Our goats act as the gardeners of our environment," said Judit Nadal Feixas, 51, who first joined the program in 2012 with 30 goats from her Gaüses farm in the comarca of Baix Empordà. "What the goats do is eat in the bush up to the

A group of firefighters attend a debrief ahead of a prescribed burn in Serra da Cabreira, northern Portugal.

height they reach, which could normally be up to one and a half meters. They reduce the part of the undergrowth in ways so in the case of a fire there is no vegetation that can burn with vertical continuity."

The program has the added value of being economically self-sustainable through a circular bioeconomy model with a chain of dairy and meat by-products sold to stores, butchers and restaurants under a recognizable brand. Locals now buy the products with the understanding they're funding fire reduction in their region. Judit and her husband Joan sell their goats cheese and meat under the Ramats de Foc seal supporting the cost efficiency of their extensive grazing work. "The goats feed on the undergrowth. Their meat is quality because they have been fed with a quality product. And selling the cheese, in this case organic, allows us to close the circle of the project," she said.

FOREST FUEL

Another solution utilizing a circular bioeconomy structure is the extraction of raw forest materials or biomass in areas of high fire risk to produce renewable energy. Studies are increasingly recognising the role biomass extraction could play in fire management strategies, yet despite its potential in Spain and Portugal it is still a relatively underutilized resource.

The small town of El Pont de Suert in the Catalan Pyrenees, with a population of about 2,200 people, has been preventing extreme wildfires through forest thinning for the creation of biomass energy for the last nine years. To create the biofuel, wood residues are collected from the public forest, dried out, reduced to small wood chips and then used for heating in municipal buildings such as the local pool, day care centre and library. The biofuel replaces natural gas and diesel oil, which in the case of the latter, costs more than three times the price and emits more than 12 times the CO2 to produce 10 megawatt hours of energy. "The fact that this biomass stays in the town and saves on all the diesel or natural gas or all the heating that had to be spent in these facilities, well of course, for me it is the perfect circle," said lead coordinator of the project, engineer and forestry technician, Anna Ivars, 46, of the Catalan government.

The initiative is warming council buildings but its long-term objective is to promote the strength of the forest through active management and selective clearing. Like many forests in the region, the dense pines surrounding El Pont de Suert were planted in the reforestation push of the mid 1900s. Now around 1,000 tonnes of biomass is consumed in public facilities annually. "The wood of better quality is sold," said Ivars, and the rest, "small trees that are crooked, forked trees, wood that is not suitable for sawing," is used for biomass.

Anna Ivars ensures 70 per cent of the forest's strongest and most vital trees remain untouched to balance the needs of the ecosystem. Ivars works patiently, as it's long-term work for future generations to enjoy, "It is a very young project, because of course nine years in the forest is nothing, it is nothing when these trees are already 60 years old," she said, "I am working for the future."

MOSAIC LANDSCAPES

The rural populations of Spain and Portugal have dramatically reduced in the last half century creating

A herd of Garrano ponies grazing in Serra da Cabreira, northern Portugal.

Carlos Donoso, a farmer and pioneer of the Mosaic project in the Extremadura region, uses an electric chainsaw to cut persimmon branches on his organic farm in the village of Acebo, Cáceres province, Spain.

expansive empty spaces and overgrown forests that are creeping increasingly closer to populated urban areas. Between 1960 and 2021, Portugal's rural

population decreased to 3.3. million from 5.7 million, or to 33 per cent from 65 per cent of the total population. In Spain in the same period the rural population declined to 8.9 million from 13.2 million. The Spanish community of Extremadura is one of the most evident cases. "[We] have half the population we had in the past, but the target landscape is the same, so you have to work with other tools," Pulido said.

One such tool, combining multiple land management strategies is mosaic landscapes, also known as fire smart territories. Mega fires can't easily develop or spread through land that's cultivated, grazed, surveilled, and managed, making these land mosaics a vital part of wildfire risk reduction. The most effective are called strategic productive firebreaks, which are areas used to grow crops contributing to the bioeconomy while focusing on critical areas of high fire risk.

Pulido conceived the program in 2016 with the University of Extremadura. "In these marginal lands the forest by natural regeneration grows two per cent every year, so you don't need to plant, you need to manage and drive the forest in the direction you need. This idea that we need trees everywhere here does not work," he said. The program currently has 102 productive firebreaks across Las Hurdes, Sierra de Gata and the Sierra de San Pedro Occidental including resin extraction, forestry, crop farming and livestock grazing across 6,167 hectares of land, reducing the area's fire risk by 10 per cent.

Importantly landowners involved in the project, including those redesigning land for fire prevention, are given technical and administrative support to access subsidies and navigate the complicated and time-consuming bureaucracy associated with effective land management. "Here the bureaucracy is reaching somewhat ridiculous and absurd limits," said farmer Carlos Donoso, 64, who is one of the pioneers of the initiative. He explains, exasperated, that permissions to plant new trees, for example, can take up to two years.

Donoso's property, Becerril Farm, sits on 80 hectares of land just outside the town of Acebo, Cáceres, and hosts various fruit orchards including apple and persimmon

ACERG president João Paulo Carneiro Ribeiro pets a semi-wild Garrano pony in Serra da Cabreira, northern Portugal.

60 YEARS OF EXCELLENCE & INNOVATION

Six decades of unwavering commitment to precision and advancement have shaped the MARK-3® pump into a symbol of reliability and cutting-edge technology. From the front lines to the heart of communities, the MARK-3® has stood the test of time, ensuring that tahe spirit of innovation continues to flow.

waterax.com

WATERAX
WE MOVE WATER

trees and forests of cork oak and chestnut trees. Carlos thinks of his property as a fire smart island in the sea of abandoned pine plantations that encircle it. And he has witnessed the power it can have, "In the great Acebo fire [of 2015], our farm was practically one of the very few in town that did not burn. It is clear: native forest, with livestock and with a little care, acts as a brake." A break that's potentially life saving, given the nearest fire station is almost an hour away in Coria.

A positive by-product these fire smart initiatives share is their ability to directly combat land desertification by attracting and holding populations in rural areas. Donoso believes they can help revitalize towns that are emptying and aging. "Some people are coming, but there's still plenty of room and a lot more people could come," Donoso said.

He believes for both fire prevention and sustainable land management people must be encouraged to return to rural areas and be helped by administrations to sustain the economic activity that justifies them staying. But ultimately, he says, "Those of us who live here are the ones who must take an active part. In the end it is the local population that has to take control of its own destiny."

This report was developed with the support of Journalismfund Europe.

Journalismfund Europe

Lily Mayers is a cross-platform freelance journalist from Sydney, Australia, based in Madrid, Spain. Mayers' career began in television and radio news for Australia's national broadcaster, the ABC. Since moving to Spain in 2020, Mayers' work has focused on the long-form coverage of world news and current affairs.

Paulo Nunes dos Santos is a freelance photojournalist and reporter covering armed conflict, humanitarian crises, political instability, and social issues worldwide. Nunes dos Santos is a frequent contributor to international publications including The New York Times and Jornal Expresso.

vallfirest
the wildfire
company

NEW

UNIVERSAL PUMP FLOTATION SYSTEM

Float. Protect. Perform.

The **Vallfirest UPFS** is the ideal solution for quickly and easily transforming your portable pumps into **efficient floating pumps**. This lightweight, compact, and portable system eliminates the need to invest in additional floating pumps for **aquatic operations**.

It is perfect for first-response situations, operations in flooded areas, or water sources with hard-to-reach suction points. **Thanks to its inflatable design**, it adapts your portable pumps into an efficient and versatile floating solution for any type of intervention.

Scan the code and discover this product

www.vftnorthamerica.com

Different nations, different uniforms, one team. Forest Camp in Poland began in 2023. Applications for the 2025 edition can be submitted through the links on page 46. All photos by Tomasz Stankiewicz, SNEP.

FOREST CAMP

A GRUELLING BUT SPECTACULAR WEEK

BY LINDON PRONTO AND JAN KACZMAROWSKI

"Forest Camp is an immersive experience that blends education, adventure, and cultural exchange. It's perfect for anyone looking to get a solid grounding in basic wildfire fighting techniques and tactics, as well as for seasoned firefighters looking to mentor, share skills, knowledge, and experience."

- Patrick Robinson, co-founder, Eagle Eyes Search, nine-year veteran smokejumper, wildfire drone pilot, and former emergency manager, British Columbia, Canada

Teams of participants, equipped with an analog map of the area, are tasked to find specific points in the forest where, under the supervision of an instructor, they will perform firefighting tasks. Participants should expect all-day foot marches under time pressure deep in the forest and hard physical work with handheld equipment. Teams work independently, possibly at night. Participants are exposed to flames, smoke and heat. Individual responsibility for personal protective equipment is non-negotiable. Emphasis on the safe and practical execution of tasks and teamwork is paramount. But great fun and a friendly atmosphere of global wildfire networking is just as important as proper footwear.

This and more you can again expect at the fourth international edition of Forest Camp in Poland, May 23-26. Forest Camp has been described by participants as the European Disney World of wildland fire fighting – training in essential skills and fundamentals, friendships, comradery, networking, and a looking glass into operations of worldwide wildfire organizations. In addition to the camp's focus on practical training, knowledge exchange, and lasting relationships, networking is a central focus. It's not every day you can suck smoke shoulder to shoulder with people from multiple continents.

Forest Camp is primarily organized by the (Polish) Association of Independent Fire Experts (SNEP pol. Stowarzyszenie Niezależnych Ekspertów Pożarnictwa) with the help of the European Forest Institute through the Waldbrand-Klima-Resilienz Initiative and the Pau Costa Foundation (Spain). Additional institutional partners have been the Polish National Forest Holding "State Forests" and the International Association of Wildland Fire. Key technology collaborators and sponsors have been Vallfirest Technologies (Spain), YETI/Mystery Ranch (United States), Rosenbauer (Austria) and SmokeD (Poland). Additionally, local volunteer fire brigades from nearby villages have provided organizational and logistical support.

Others have written about human factors in decision making and on the fire line. Most, if not all, wildfire fatalities worldwide are influenced by culture, communication, experience level and other human factors, so it underscores the critical need for training and exchange opportunities like Forest Camp. At camp that people from different worlds cross paths. Deep in a Polish forest a Canadian smokejumper, a South African hotshot, and Central European firefighters share knowledge and learn from one another. Alongside them, foresters and scientists – who often study fire but rarely have the chance to extinguish it – play an equally vital role in teamwork and task execution.

The way we do things, the experience we gain, and the tools at our disposal determine whether we live with fire or are devastated by it. Fire fighting is becoming more international – we are sharing resources and responding across borders like never before. Whether via bilateral agreements such as that between the United States and Canada, or Mexico or Australia, or through instruments such as the European Civil Protection Mechanism, ground and aerial firefighting assets and experts are helping in contexts outside their own – places with a different

Forest Camp is organized by the (Polish) Association of Independent Fire Experts (SNEP pol.) with the help of the European Forest Institute and the Pau Costa Foundation. The sand table does not have to be on a table.

fire culture, where different equipment and tactics are used, another language is spoken, and where fire behaves differently. Peacetime exchanges have never been more crucial.

I think many of us take for granted that how our region or nation manages wildfire is how everyone does. So it was super interesting for me to learn from my new friends and colleagues at Forest Camp about how people's home nations or regions manage fire differently.

- Elizabeth Hoover, associate professor, University of California, Berkeley, environmental science, policy, and management (ESPM)

WHY FOREST CAMP?

The idea of Forest Camp was born during a coffee break at a wildfire conference – one of those those moments in the hallway, surrounded by old friends and new acquaintances, your fourth cup of watery coffee in hand.

With the first edition, the idea was to bring experienced experts from abroad to Poland, who would teach Central Europeans (Poles, Germans, Czechs) effective techniques and tactics. Word of the success and experience of Forest Camp spread quickly and the event scope also expanded. By the second edition there were well over 100 participants (and more than 30 additional support personnel / volunteers) from 22 countries (five continents) in attendance. Flags in all the colors of the world hung and fluttered over the camp; for a few days a year, the world feels a bit smaller.

Instead of just a capacity building event for Central European firefighters, Forest Camp has become a meeting point between east and west, north and south; a networking event; and exchange platform for all those affected by wildfire – whether firefighter, forester, professor, land manager or student. It is a community bound by passion, intrigue, and afflicted by a need for adventure. As Henry Mance, then chief of features for the *Financial Times* who participated in Forest Camp to better understand the conditions faced by firefighters around the world put it: "It struck me that the men and women at the camp were thankfully in for the long haul. Around us, the pine canopies were green. But we all knew that the future was orange."

THE FOREST CAMP EXPERIENCE

Forest Camp is an immersive experience that equips participants with practical skills, broadens their understanding of wildfire management, and builds lasting connections. It also challenges participants to see fire from new perspectives. For instance, through sand-table exercises and collaborative scenarios, participants gain valuable insight into global firefighting strategies, reshaping how they think about fire management.

"I would highly recommend the event to colleagues from Latin America, since, in addition to giving you an international networking opportunity, it allows you to learn about tools and practices that can improve decision making in your home country . . . one (tool) that I will take back to my country is the sand table"

– Oscar Jared Díaz Carrillo, master's student, forestry sciences, Postgraduate College, Ministry of Agriculture, Mexico

More than 100 women and men from 22 countries participated in Forest Camp in 2024. These participants didn't know it yet, but they soon had to crawl on their hands and knees through the ash.

technosylva

technosylva.com

The Leading Field-Proven Wildfire Operational Solution

The authoritative platform used by agencies worldwide for their operational decision making and wildfire intelligence.

- Assess initial and ongoing incidents with real-time wildfire spread predictions using high-resolution data and advanced global models.
- Prepare in advance with daily wildfire risk forecasting, based on millions of simulations validated with actual fire behavior.
- Manage the entire lifecycle of an incident and exhance situational awareness with mobile-first capabilities and a multi-hazard common operational picture.

Learn more about our wildfire solutions for Fire Agencies.

Beyond the daily exercises and work plans, Forest Camp fosters global connections and opportunities such as collaborating on research projects. Instructors aim to make Forest Camp as practical and realistic as possible.

For others, like Charles Ruffner, professor of forestry within the School of Forestry and Horticulture at Southern Illinois University, the camp provided opportunities to practice communication and delegation during complex scenarios. These skills go beyond the fire line, preparing participants for leadership roles and boosting confidence in their professional careers. “Although I am a forestry professor and lead students on Rx burns all the time, due to my profession, I have only had a few opportunities to be on large complex incidents and the last two Forest Camps have put me in a leadership position in such intense scenarios.”

Perhaps the most enduring impact of Forest Camp lies in its ability to foster connections. The event is designed to build camaraderie, sparking collaborations that extend far beyond its duration. Richo Richardson, a project firefighter with Forest Fire Management Victoria, in Australia) shared, “After the camp, I was approached by one of the other participants to help in a research project, and I was very honored to contribute.” Brian Verhoeven, a wildfire researcher and fire analyst at the Netherlands Institute for Public Safety, added, “It was amazing to operate in such an international team with people that had very different backgrounds. Because everybody is so enthusiastic, it automatically allows the sharing of knowledge and

Forest Camp provides opportunities to learn new skills, master techniques used in other jurisdictions, and learn from highly regarded instructors from around the world. Elizabeth Hoover, associate professor, Univeristy of Califirnia, Berkley, in action at Forest Camp.

PREDICTION MULTIFUNCTIONAL

PROTECTION

PREVENTION

WFS net®

DIGIVERSUM

Ever heard about us ..... yet?

inca | WFS®

Forest Camp aims to blend technical expertise with cultural exchange and create a platform for growth and collaboration. The experience is tough, and a grind, but the payoff is broad and longlasting. Above, American-Swiss cooperation in a Polish forest.

experience and even though we worked for 'just' two days, we became a very tight group."

These connections are part of a global community of life-long students of fire committed to tackling wildfire challenges together. At its heart, Forest Camp aims to blend technical expertise with cultural exchange, creating a platform for growth and collaboration. As Elizabeth Hoover summarized, "The connections I made, the techniques I learned, and the logistics of pulling together fire professionals from across the globe have profoundly impacted how I approach my work."

In a world where wildfires are becoming more frequent and severe, the lessons from Forest Camp are essential for the future of fire management, which isn't just about skills and connections but about community, learning together, bridging culture and language and integrating innovation and technology in our rapidly changing professions. And we can promise you at least at the end of a day marching through the Polish woods, you can legitimately feel like you earned that beer to go along with all the good (and bad) ideas you might get after all-you-can-eat Polish barbecue.

OK, shameless plug over. We look forward to seeing you somewhere in the Polish forest May 23-26. You can contact us by email (lindon.pronto@efi.int, jmkaczmarowski@gmail.com or SNEP at biuro@snep.pl), or find the organizers' profile on Facebook (facebook.com/snep/PL).

Lindon Pronto (M.Sc. Environmental Governance) has more than 20 years of experience and expertise in wildfire management with employment, research, deployments, and remote support to / in more than 30 countries in the Americas, Europe, Asia, Africa, and the Middle East. Pronto has years of operational experience as a federal wildland firefighter in California. In addition to working in many European projects, Pronto has been commissioned by government agencies, NGOs, international organizations, and consulting firms, serves on national and international expert panels, and has provided thematic expertise to the European Commission, European Parliament, government agencies, and the private sector. As a subject matter expert with extensive communication experience, Pronto has contributed to more than 200 international print, radio and television publications and broadcasts and is an associate editor at *Wildfire* magazine.

Jan Kaczmarowski is a forester from Poland. He works at the General Directorate of State Forests as a senior specialist in the Forest Protection Department. His main task is the coordination of the forest fire protection system at the national level. Kaczmarowski is also a lecturer at the Fire Academy, where he teaches in the postgraduate program titled Forest Fire Protection. Kaczmarowski is an advocate for the implementation of controlled burning in Poland and main forest trainer at the Association of Independent Fire Experts (pol. SNEP). Kaczmarowski also gained experience in fire management abroad. For his work, Kaczmarowski was awarded the IAWF Firebreak Award for Excellence in Wildland Fire Management for outstanding achievements in fire prevention.

The Firefighting Partner You Want

Performance, Experience and Value You Can Count On.

With more than 60 years of experience working alongside the firefighting community, Perimeter Solutions offers the most comprehensive set of fire retardant solutions on the market today – featuring field-proven products, infrastructure, equipment and logistics services. We're the partner you want when you're up against the challenge of fighting wildfires.

When you choose PHOS-CHEK® you're getting more than just retardant. You're getting a company that understands your mission-critical needs and how to deliver them – every day. At Perimeter Solutions, we want to be your best firefighting partner.

Trusted. Solutions That Save.

WHAT YOU GET WITH PERIMETER SOLUTIONS

- ✓ Experience
- ✓ Performance
- ✓ Fire Support Infrastructure
- ✓ Resilient Response
- ✓ Knowledge Base
- ✓ Innovation
- ✓ Reliable, 24/7 Response

Perimeter SOLUTIONS

Experience.
Responsibility.
Integrity.

perimeter-solutions.com

MARK-3 WATSON EDITION:

UNLEASH THE POWER

Engineered with advanced features, it stands as the pinnacle of precision wildland firefighting technology, boasting the best power-to-weight ratio in its category. The MARK-3® pump redefines efficiency, ensuring firefighters have the edge in the battle against flames.

waterax.com

WATERAX

WE MOVE WATER